2050 Heat Roadmap Europe
A low-carbon heating and cooling strategy

# Hourly energy system models for each of the 14 MSs for the business-as-usual scenario

Accessing the outputs of D5.3

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| Project Number: | 695989 |
| Project acronym: | HRE |
| Project title: | Heat Roadmap Europe (HRE): Building the knowledge, skills, and capacity required to enable new policies and encourage new investments in the heating and cooling sector |
| Contract type: | H2020-EE-2015-3-MarketUptake |

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| Deliverable number: | **D5.3** |
| Deliverable title: | **Hourly energy system models for each of the 14 MSs for the business-as-usual scenario** |
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| Project Coordinator | Brian Vad Mathiesen (AAU) |

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|---|---|
| Dissemination Level of this Deliverable: | **PU** |
| *Public* | *PU* |
| *Confidential, only for members of the consortium (including the Commission Services)* | ***C0*** |

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# 1. Introduction

In Europe, there is a clear long-term objective to decarbonise the energy system, but it is currently unclear how this will be achieved in the heating and cooling sector. The Heat Roadmap Europe (HRE) project will enable new policies and prepare the ground for new investments by creating more certainty in relation to the changes that are required.

The overall objective in the HRE project is to provide new capacity and skills for lead-users in the heating and cooling sector, including policymakers, industry, and researchers at local, national, and EU level, by developing the data, tools, methodologies, and results necessary to quantify the impact of implementing more energy efficiency measures on both the demand and supply side of the sector.

WP5 is aimed at developing system-wide hourly energy projections focused on heating and cooling technologies for the largest 14 MSs in Europe, by heating demand. To do this, the projections for the heating and cooling sector developed in WP4 in the FORECAST model must be combined with the JRC-EU-TIMES model to obtain projections for the whole energy system. Then, the yearly outputs from the JRC-EU-TIMES model will be transformed into suitable inputs for the EnergyPLAN tool. EnergyPLAN will then combine the hourly dynamics of energy supply and demand and the annual outputs from JRC-EU-TIMES, producing a detailed snapshot of the operation of the energy system within each year.

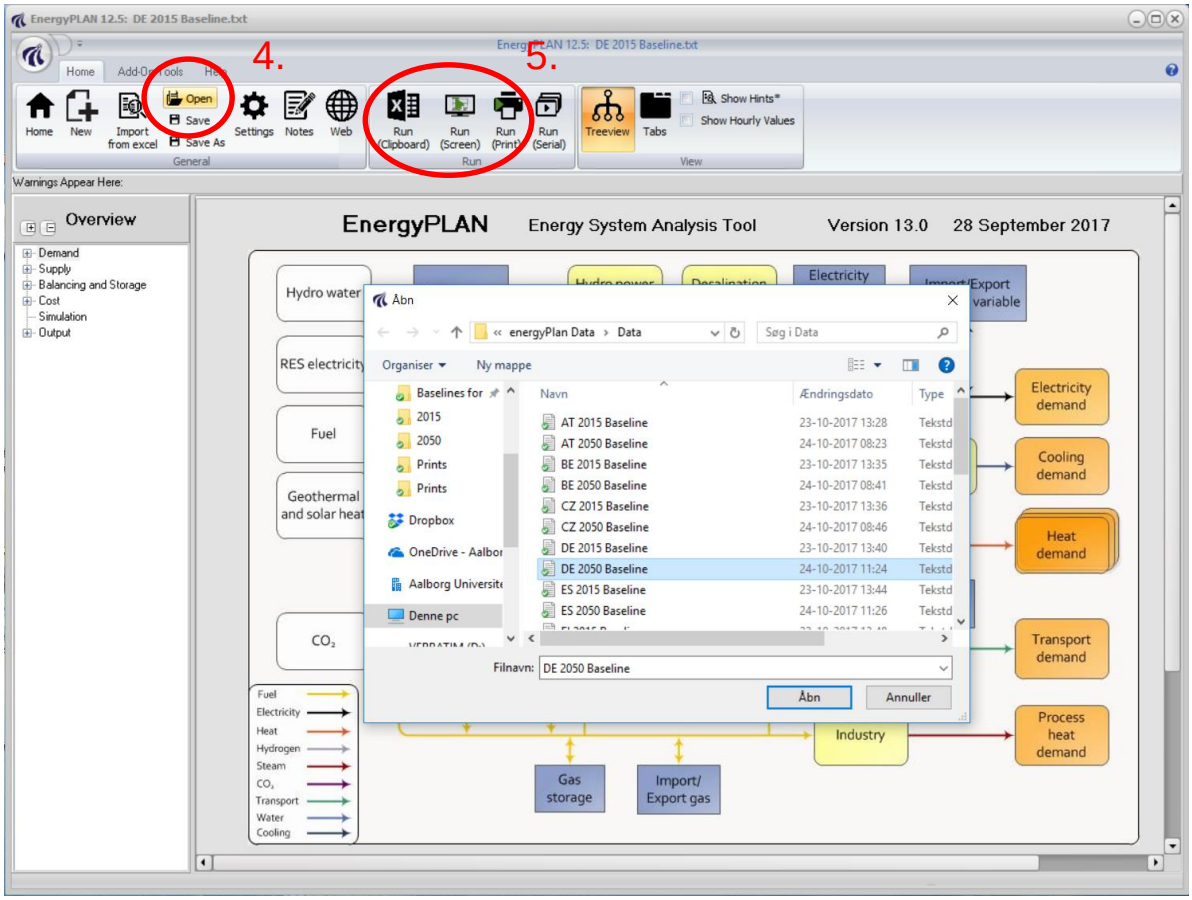
The deliverable D5.3 is the hourly energy system models for the 14 MSs for the business-as-usual scenario. This includes models for 2015 and for 2050 and these are also referred to as the Baseline scenarios. These will be the foundation for the development of the Heat Roadmap scenarios for the 14 MSs, and serve as a point of reference for comparison of the outputs of these roadmaps.

This document provides an explanation of how to access the data files containing the energy system models together with EnergyPLAN version 13.0. It also contains two result sheets for each of the energy system models, where the scenarios can be explored without needing to open the actual data files in the EnergyPLAN model.

# 2. Accessing the energy system models data

The Baseline energy system models for the 14 MSs for 2015 and 2050 can be accessed via the link below. The files come with the EnergyPLAN tool version 13.0, that can be used to run the scenario files. The scenario files and hourly distributions are located in the default locations in the folder structure, to make it easy to use. Follow the steps below to download, open and run the models. More information can be found on http://www.energyplan.eu.

1. Follow the link to download the files. http://heatroadmap.eu/resources/EnergyPLAN%20HRE4%20Baseline%20scenarios_Hourly%20model.rar
2. Extract the data into a folder on your computer. It cannot run when being in the downloaded compressed archive.
3. Open the folder named “EnergyPLAN HRE4 Baseline scenarios” and in here the file named “energyPLAN.exe”.
4. Click the “Open” icon and hereafter choose the model that you wish to run. (See screen shot below)
5. There are three options for viewing the outputs of the opened model:
    a. Run (Clipboard) – To copy the output data to the clipboard prepared for pasting in a spread sheet.
    b. Run (Screen) – To view the output directly on the screen.
    c. Run (Print) – To make a print of the key results as seen in the appendices in this file.



# Input AT 2015.txt

# The EnergyPLAN model 12.4

| | | | |
|---|---|---|---|
| Electricity demand (TWh/year): | | Flexible demand | 3,13 |
| Fixed demand | 55,08 | Fixed imp/exp. | -5,55 |
| Electric heating + HP | 8,45 | Transportation | 3,91 |
| Electric cooling | 0,68 | Total | 65,70 |

| District heating (TWh/year) | Gr.1 | Gr.2 | Gr.3 | Sum |
|---|---|---|---|---|
| District heating demand | 0,00 | 0,00 | 21,22 | 21,22 |
| Solar Thermal | 0,00 | 0,00 | 0,08 | 0,08 |
| Industrial CHP (CSHP) | 0,00 | 0,00 | 0,00 | 0,00 |
| Demand after solar and CSHP | 0,00 | 0,00 | 21,14 | 21,14 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Wind | 2143 | MW | 4,11 | TWh/year | 0,00 | Grid |
| Offshore Wind | 0 | MW | 0 | TWh/year | 0,00 | stabili- |
| Photo Voltaic | 797 | MW | 0,83 | TWh/year | 0,00 | sation |
| River Hydro | 5958 | MW | 21,7 | TWh/year | 0,00 | share |
| Hydro Power | 4365 | MW | 20,53 | TWh/year | | |
| Geothermal/Nuclear | 0 | MW | 0 | TWh/year | | |

| | Capacities | | Efficiencies | | |
|---|---|---|---|---|---|
| Group 2: | MW-e | MJ/s | elec. | Ther | COP |
| CHP | 0 | 0 | 0,40 | 0,50 | |
| Heat Pump | 0 | 0 | | | 3,00 |
| Boiler | | 0 | | 0,50 | |
| Group 3: | | | | | |
| CHP | 1138 | 3045 | 0,32 | 0,86 | |
| Heat Pump | 0 | 2 | | | 4,00 |
| Boiler | | 12017 | | 0,89 | |
| Condensing | 9200 | | 0,37 | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Heatstorage: | gr.2: | 0 | GWh | gr.3: | 0 | GWh |
| Fixed Boiler: | gr.2: | 2,5 | Per cent | gr.3: | 8,0 | Per cent |

| Electricity prod. from | CSHP | Waste | (TWh/year) |
|---|---|---|---|
| Gr.1: | 0,00 | 0,00 | |
| Gr.2: | 0,00 | 0,00 | |
| Gr.3: | 1,82 | 0,00 | |

| | |
|---|---|
| Regulation Strategy: | Technical regulation no. 2 |
| CEEP regulation | 23450000 |
| Minimum Stabilisation share | 0,25 |
| Stabilisation share of CHP | 0,00 |
| Minimum CHP gr 3 load | 114 MW |
| Minimum PP | 460 MW |
| Heat Pump maximum share | 0,50 |
| Maximum import/export | 0 MW |

| | | |
|---|---|---|
| Distr. Name : | const.txt | |
| Addition factor | 0,00 | EUR/MWh |
| Multiplication factor | 1,00 | |
| Dependency factor | 0,00 | EUR/MWh pr. MW |
| Average Market Price | 1 | EUR/MWh |
| Gas Storage | 0 | GWh |
| Syngas capacity | 0 | MW |
| Biogas max to grid | 0 | MW |

Fuel Price level:

| | Capacities | Storage | Efficiencies | |
|---|---|---|---|---|
| | MW-e | GWh | elec. | Ther. |
| Hydro Pump: | 4793 | 48 | 0,00 | |
| Hydro Turbine: | 4793 | | 0,00 | |
| Electrol. Gr.2: | 0 | 0 | 0,40 | 0,50 |
| Electrol. Gr.3: | 0 | 0 | 0,40 | 0,50 |
| Electrol. trans.: | 0 | 0 | 0,00 | |
| Ely. MicroCHP: | 0 | 0 | 0,80 | |
| CAES fuel ratio: | | 0,000 | | |

| (TWh/year) | Coal | Oil | Ngas | Biomass |
|---|---|---|---|---|
| Transport | 0,00 | 85,81 | 0,00 | 0,00 |
| Household | 0,43 | 8,83 | 25,24 | 15,13 |
| Industry | 17,16 | 19,79 | 37,10 | 3,90 |
| Various | 0,01 | 3,13 | 0,17 | 5,18 |

# Output WARNING!!: (1) Critical Excess;

| | District Heating | | | | | | | | | | Electricity | | | | | | | | | | | | | | | | Exchange | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Demand | Production | | | | | | | | | Consumption | | | | | | Production | | | | | | | | Balance | | | |
| | Distr. heating MW | Solar MW | Waste+ CSHP MW | DHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Balance MW | Elec. demand MW | Flex.& Transp. MW | HP MW | Elec-trolyser MW | EH MW | Hydro Pump MW | Tur-bine MW | RES MW | Hy-dro MW | Geo-thermal MW | Waste+ CSHP MW | CHP MW | PP MW | Stab-Load % | Imp MW | Exp MW | CEEP MW | EEP MW | Payment Imp Million EUR | Payment Exp Million EUR |
| January | 5341 | 4 | 50 | 0 | 2415 | 2 | 0 | 2925 | 0 | -55 | 6911 | 793 | 34 | 0 | 2210 | 0 | 0 | 3180 | 3037 | 0 | 207 | 903 | 1909 | 243 | 0 | 14 | 14 | 0 | 0 | 0 |
| February | 4721 | 7 | 50 | 0 | 2466 | 2 | 0 | 2252 | 0 | -55 | 7014 | 805 | 30 | 0 | 1942 | 0 | 0 | 2400 | 2408 | 0 | 207 | 922 | 2714 | 272 | 0 | 0 | 0 | 0 | 0 | 0 |
| March | 3791 | 9 | 50 | 0 | 2343 | 2 | 0 | 1442 | 0 | -55 | 6650 | 810 | 23 | 0 | 1541 | 0 | 0 | 2671 | 2587 | 0 | 207 | 876 | 1786 | 253 | 0 | 0 | 0 | 0 | 0 | 0 |
| April | 1244 | 12 | 50 | 0 | 905 | 2 | 0 | 351 | 0 | -75 | 6057 | 790 | 6 | 0 | 446 | 0 | 0 | 3496 | 2176 | 0 | 207 | 338 | 794 | 186 | 0 | 31 | 31 | 0 | 0 | 0 |
| May | 545 | 13 | 50 | 0 | 325 | 2 | 0 | 245 | 0 | -90 | 5920 | 810 | 1 | 0 | 142 | 0 | 0 | 4529 | 1888 | 0 | 207 | 122 | 477 | 136 | 0 | 236 | 236 | 0 | 0 | 0 |
| June | 545 | 14 | 50 | 0 | 331 | 2 | 0 | 239 | 0 | -90 | 6026 | 807 | 1 | 0 | 140 | 0 | 0 | 4516 | 1792 | 0 | 207 | 124 | 520 | 134 | 0 | 279 | 279 | 0 | 0 | 0 |
| July | 545 | 14 | 50 | 0 | 353 | 2 | 0 | 217 | 0 | -90 | 6035 | 792 | 1 | 0 | 144 | 0 | 0 | 3351 | 2103 | 0 | 207 | 132 | 602 | 174 | 0 | 58 | 58 | 0 | 0 | 0 |
| August | 545 | 12 | 50 | 0 | 365 | 2 | 0 | 206 | 0 | -89 | 5957 | 810 | 1 | 0 | 141 | 0 | 0 | 2998 | 2101 | 0 | 207 | 136 | 903 | 194 | 0 | 39 | 39 | 0 | 0 | 0 |
| September | 545 | 10 | 50 | 0 | 369 | 2 | 0 | 204 | 0 | -88 | 6105 | 798 | 1 | 0 | 140 | 0 | 0 | 2814 | 2375 | 0 | 207 | 138 | 899 | 208 | 0 | 37 | 37 | 0 | 0 | 0 |
| October | 2093 | 7 | 50 | 0 | 1493 | 2 | 0 | 610 | 0 | -68 | 6241 | 801 | 12 | 0 | 809 | 0 | 0 | 2698 | 1957 | 0 | 207 | 558 | 1982 | 236 | 0 | 3 | 3 | 0 | 0 | 0 |
| November | 4002 | 4 | 50 | 0 | 2418 | 2 | 0 | 1583 | 0 | -55 | 6685 | 807 | 25 | 0 | 1632 | 0 | 0 | 2236 | 2740 | 0 | 207 | 904 | 2148 | 272 | 0 | 0 | 0 | 0 | 0 | 0 |
| December | 5112 | 3 | 50 | 0 | 2471 | 2 | 0 | 2640 | 0 | -55 | 6602 | 792 | 33 | 0 | 2111 | 0 | 0 | 1501 | 2875 | 0 | 207 | 924 | 2760 | 311 | 0 | 0 | 0 | 0 | 0 | 0 |
| Average | 2416 | 9 | 50 | 0 | 1352 | 2 | 0 | 1075 | 0 | -72 | 6348 | 801 | 14 | 0 | 948 | 0 | 0 | 3034 | 2337 | 0 | 207 | 505 | 1455 | 218 | 0 | 58 | 58 | 0 | Average price | |
| Maximum | 10014 | 55 | 50 | 0 | 3045 | 2 | 0 | 6918 | 0 | 0 | 9009 | 2261 | 67 | 0 | 4224 | 0 | 0 | 6744 | 3854 | 0 | 207 | 1138 | 7957 | 387 | 0 | 3072 | 3072 | 0 | (EUR/MWh) | |
| Minimum | 233 | 0 | 50 | 0 | 304 | 2 | 0 | 192 | 0 | -314 | 89 | 2 | 0 | 0 | 0 | 0 | 0 | 23 | 0 | 0 | 207 | 114 | 460 | 105 | 0 | 0 | 0 | 0 | 1 | 1 |
| TWh/year | 21,22 | 0,08 | 0,44 | 0,00 | 11,88 | 0,01 | 0,00 | 9,44 | 0,00 | -0,63 | 55,76 | 7,04 | 0,12 | 0,00 | 8,33 | 0,00 | 0,00 | 26,65 | 20,53 | 0,00 | 1,82 | 4,44 | 12,78 | | 0,00 | 0,51 | 0,51 | 0,00 | 0 | 0 |

| FUEL BALANCE (TWh/year): | DHP | CHP2 | CHP3 | Boiler2 | Boiler3 | PP | Geo/Nu. | Hydro | Waste | CAES Elc.ly. | BioCon-version | Electro-Fuel | Wind | Offsh. | PV | Hydro | Solar.Th | Transp. | Industry household | Industry Various | Total | Imp/Exp Corrected Imp/Exp | Imp/Exp Corrected Net | CO2 emission (Mt): Total | CO2 emission (Mt): Net |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Coal | - | - | 6,53 | - | 1,76 | 15,40 | - | - | - | - | - | - | - | - | - | - | - | - | 0,43 | 17,17 | 41,29 | -0,62 | 40,68 | 14,64 | 14,42 |
| Oil | - | - | 1,19 | - | 0,32 | 0,63 | - | - | - | - | - | - | - | - | - | - | - | 85,81 | 7,96 | 22,92 | 118,83 | -0,03 | 118,81 | 31,19 | 31,18 |
| N.Gas | - | - | 6,14 | - | 2,80 | 18,51 | - | - | - | - | - | - | - | - | - | - | - | - | 25,24 | 37,27 | 89,96 | -0,74 | 89,22 | 18,43 | 18,28 |
| Biomass | - | - | - | - | 5,73 | 0,00 | - | - | 0,30 | - | 2,51 | - | - | - | - | - | - | - | 15,13 | 9,08 | 32,75 | 0,00 | 32,75 | 0,04 | 0,04 |
| Renewable | - | - | - | - | - | - | - | 20,53 | - | - | - | - | 4,11 | - | 0,83 | 21,70 | 0,88 | - | - | - | 48,05 | 0,00 | 48,05 | 0,00 | 0,00 |
| H2 etc. | - | - | 0,00 | - | 0,00 | 0,00 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Biofuel | - | - | - | - | 0,00 | - | - | - | - | - | -1,85 | - | - | - | - | - | - | 1,85 | - | - | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Nuclear/CCS | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Total | - | - | 13,86 | - | 10,61 | 34,54 | - | 20,53 | 0,30 | - | 0,66 | - | 4,11 | - | 0,83 | 21,70 | 0,88 | 87,66 | 48,76 | 86,44 | 330,88 | -1,38 | 329,50 | 64,29 | 63,91 |

## District Heating Production

| | Gr.1 | | | | Gr.2 | | | | | | | | | | Gr.3 | | | | | | | | | | RES specification | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | District heating MW | Solar MW | CSHP MW | DHP MW | District heating MW | Solar MW | CSHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Stor-age MW | Ba-lance MW | District heating MW | Solar MW | CSHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Stor-age MW | Ba-lance MW | RES1 Wind MW | RES2 Offsho MW | RES3 Photo MW | RES 4-7 MW | Total MW |
| January | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5341 | 4 | 50 | 2415 | 2 | 0 | 2925 | 0 | 0 | -55 | 850 | 0 | 36 | 2294 | 3180 |
| February | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4721 | 7 | 50 | 2466 | 2 | 0 | 2252 | 0 | 0 | -55 | 582 | 0 | 70 | 1748 | 2400 |
| March | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3791 | 9 | 50 | 2343 | 2 | 0 | 1442 | 0 | 0 | -55 | 724 | 0 | 101 | 1846 | 2671 |
| April | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1244 | 12 | 50 | 905 | 2 | 0 | 351 | 0 | 0 | -75 | 574 | 0 | 127 | 2794 | 3496 |
| May | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 545 | 13 | 50 | 325 | 2 | 0 | 245 | 0 | 0 | -90 | 379 | 0 | 150 | 4001 | 4529 |
| June | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 545 | 14 | 50 | 331 | 2 | 0 | 239 | 0 | 0 | -90 | 192 | 0 | 149 | 4175 | 4516 |
| July | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 545 | 14 | 50 | 353 | 2 | 0 | 217 | 0 | 0 | -90 | 225 | 0 | 151 | 2975 | 3351 |
| August | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 545 | 12 | 50 | 365 | 2 | 0 | 206 | 0 | 0 | -89 | 221 | 0 | 133 | 2644 | 2998 |
| September | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 545 | 10 | 50 | 369 | 2 | 0 | 204 | 0 | 0 | -88 | 508 | 0 | 104 | 2202 | 2814 |
| October | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2093 | 7 | 50 | 1493 | 2 | 0 | 610 | 0 | 0 | -68 | 322 | 0 | 63 | 2313 | 2698 |
| November | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4002 | 4 | 50 | 2418 | 2 | 0 | 1583 | 0 | 0 | -55 | 778 | 0 | 31 | 1427 | 2236 |
| December | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5112 | 3 | 50 | 2471 | 2 | 0 | 2640 | 0 | 0 | -55 | 272 | 0 | 21 | 1207 | 1501 |
| Average | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2416 | 9 | 50 | 1352 | 2 | 0 | 1075 | 0 | 0 | -72 | 468 | 0 | 95 | 2471 | 3034 |
| Maximum | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10014 | 55 | 50 | 3045 | 2 | 0 | 6918 | 0 | 0 | 0 | 2142 | 0 | 797 | 5958 | 6744 |
| Minimum | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 233 | 0 | 50 | 304 | 2 | 0 | 192 | 0 | 0 | -314 | 0 | 0 | 0 | 0 | 23 |
| Total for the whole year TWh/year | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | | 0,00 | 21,22 | 0,08 | 0,44 | 11,88 | 0,01 | 0,00 | 9,44 | 0,00 | | -0,63 | 4,11 | 0,00 | 0,83 | 21,70 | 26,65 |

Own use of heat from industrial CHP: 0,00 TWh/year

ANNUAL COSTS (Million EUR)

| | |
|---|---|
| Total Fuel ex Ngas exchange = | 6175 |
| Uranium = | 0 |
| Coal = | 386 |
| FuelOil = | 611 |
| Gasoil/Diesel= | 2347 |
| Petrol/JP = | 1371 |
| Gas handling = | 600 |
| Biomass = | 859 |
| Food income = | 0 |
| Waste = | 0 |
| Total Ngas Exchange costs = | 2241 |
| Marginal operation costs = | 72 |
| Total Electricity exchange = | -6 |
| Import = | 0 |
| Export = | 0 |
| Bottleneck = | 0 |
| Fixed imp/ex= | -6 |
| Total CO2 emission costs = | 977 |
| Total variable costs = | 9459 |
| Fixed operation costs = | 961 |
| Annual Investment costs = | 2052 |
| TOTAL ANNUAL COSTS = | 12472 |

## NATURAL GAS EXCHANGE

| | DHP & Boilers MW | CHP2 CHP3 MW | PP CAES MW | Indi-vidual MW | Trans port MW | Indu. Var. MW | Demand Sum MW | Bio-gas MW | Syn-gas MW | CO2Hy gas MW | SynHy gas MW | SynHy gas MW | Stor-age MW | Sum MW | Im-port MW | Ex-port MW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| January | 866 | 1249 | 2764 | 6696 | 0 | 4243 | 15818 | 0 | 0 | 0 | 0 | 0 | 0 | 15818 | 15818 | 0 |
| February | 667 | 1275 | 3930 | 5886 | 0 | 4243 | 16001 | 0 | 0 | 0 | 0 | 0 | 0 | 16001 | 16001 | 0 |
| March | 427 | 1212 | 2586 | 4670 | 0 | 4243 | 13137 | 0 | 0 | 0 | 0 | 0 | 0 | 13137 | 13137 | 0 |
| April | 104 | 468 | 1150 | 1343 | 0 | 4243 | 7308 | 0 | 0 | 0 | 0 | 0 | 0 | 7308 | 7308 | 0 |
| May | 72 | 168 | 691 | 430 | 0 | 4243 | 5605 | 0 | 0 | 0 | 0 | 0 | 0 | 5605 | 5605 | 0 |
| June | 71 | 171 | 753 | 430 | 0 | 4243 | 5667 | 0 | 0 | 0 | 0 | 0 | 0 | 5667 | 5667 | 0 |
| July | 64 | 183 | 871 | 430 | 0 | 4243 | 5791 | 0 | 0 | 0 | 0 | 0 | 0 | 5791 | 5791 | 0 |
| August | 61 | 189 | 1308 | 430 | 0 | 4243 | 6230 | 0 | 0 | 0 | 0 | 0 | 0 | 6230 | 6230 | 0 |
| September | 60 | 191 | 1301 | 430 | 0 | 4243 | 6225 | 0 | 0 | 0 | 0 | 0 | 0 | 6225 | 6225 | 0 |
| October | 181 | 772 | 2871 | 2451 | 0 | 4243 | 10518 | 0 | 0 | 0 | 0 | 0 | 0 | 10518 | 10518 | 0 |
| November | 469 | 1250 | 3111 | 4945 | 0 | 4243 | 14018 | 0 | 0 | 0 | 0 | 0 | 0 | 14018 | 14018 | 0 |
| December | 782 | 1278 | 3997 | 6396 | 0 | 4243 | 16696 | 0 | 0 | 0 | 0 | 0 | 0 | 16696 | 16696 | 0 |
| Average | 318 | 699 | 2107 | 2873 | 0 | 4243 | 10241 | 0 | 0 | 0 | 0 | 0 | 0 | 10241 | 10241 | 0 |
| Maximum | 2048 | 1575 | 11524 | 12800 | 0 | 4243 | 29056 | 0 | 0 | 0 | 0 | 0 | 0 | 29056 | 29056 | 0 |
| Minimum | 57 | 157 | 666 | 23 | 0 | 4243 | 5146 | 0 | 0 | 0 | 0 | 0 | 0 | 5146 | 5146 | 0 |
| Total for the whole year TWh/year | 2,80 | 6,14 | 18,51 | 25,24 | 0,00 | 37,27 | 89,96 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 89,96 | 89,96 | 0,00 |

RES Share: 24,4 Percent of Primary Energy 85,6 Percent of Electricity 47,2 TWh electricity from RES

# Input BE 2015.txt

# The EnergyPLAN model 12.4

| | | | |
|---|---|---|---|
| Electricity demand (TWh/year): | | Flexible demand | 3,47 |
| Fixed demand | 67,84 | Fixed imp/exp. | -18,79 |
| Electric heating + HP | 10,19 | Transportation | 1,91 |
| Electric cooling | 1,48 | Total | 66,10 |

| District heating (TWh/year) | Gr.1 | Gr.2 | Gr.3 | Sum |
|---|---|---|---|---|
| District heating demand | 0,00 | 0,00 | 7,59 | 7,59 |
| Solar Thermal | 0,00 | 0,00 | 0,00 | 0,00 |
| Industrial CHP (CSHP) | 0,00 | 0,00 | 0,00 | 0,00 |
| Demand after solar and CSHP | 0,00 | 0,00 | 7,59 | 7,59 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Wind | 1380 | MW | 2,53 | TWh/year | 0,00 | Grid |
| Offshore Wind | 720 | MW | 2,25 | TWh/year | 0,00 | stabili- |
| Photo Voltaic | 2866 | MW | 2,96 | TWh/year | 0,00 | sation |
| River Hydro | 105 | MW | 0,29 | TWh/year | 0,00 | share |
| Hydro Power | 0 | MW | 0 | TWh/year | | |
| Geothermal/Nuclear | 5927 | MW | 46,11 | TWh/year | | |

| | Capacities | | Efficiencies | | |
|---|---|---|---|---|---|
| Group 2: | MW-e | MJ/s | elec. | Ther | COP |
| CHP | 0 | 0 | 0,40 | 0,50 | |
| Heat Pump | 0 | 0 | | | 3,00 |
| Boiler | | 0 | | 0,50 | |
| Group 3: | | | | | |
| CHP | 2371 | 3023 | 0,39 | 0,50 | |
| Heat Pump | 0 | 0 | | | 3,00 |
| Boiler | | 3950 | | 0,90 | |
| Condensing | 10407 | | 0,50 | | |

| | | | | | |
|---|---|---|---|---|---|
| Heatstorage: | gr.2: | 0 | GWh | gr.3: | 0 GWh |
| Fixed Boiler: | gr.2: | 2,5 | Per cent | gr.3: | 5,0 Per cent |

| Electricity prod. from | CSHP | Waste | (TWh/year) |
|---|---|---|---|
| Gr.1: | 0,00 | 0,00 | |
| Gr.2: | 0,00 | 0,00 | |
| Gr.3: | 2,08 | 0,00 | |

| | | |
|---|---|---|
| Regulation Strategy: | Technical regulation no. 2 | |
| CEEP regulation | 23450000 | |
| Minimum Stabilisation share | 0,25 | |
| Stabilisation share of CHP | 0,00 | |
| Minimum CHP gr 3 load | 237 | MW |
| Minimum PP | 0 | MW |
| Heat Pump maximum share | 0,50 | |
| Maximum import/export | 0 | MW |

| | | |
|---|---|---|
| Distr. Name : | const.txt | |
| Addition factor | 0,00 | EUR/MWh |
| Multiplication factor | 1,00 | |
| Dependency factor | 0,00 | EUR/MWh pr. MW |
| Average Market Price | 1 | EUR/MWh |
| Gas Storage | 0 | GWh |
| Syngas capacity | 0 | MW |
| Biogas max to grid | 0 | MW |

Fuel Price level:

| | Capacities | Storage | Efficiencies | |
|---|---|---|---|---|
| | MW-e | GWh | elec. | Ther. |
| Hydro Pump: | 1310 | 13 | 0,00 | |
| Hydro Turbine: | 1310 | | 0,00 | |
| Electrol. Gr.2: | 0 | 0 | 0,40 | 0,50 |
| Electrol. Gr.3: | 0 | 0 | 0,40 | 0,50 |
| Electrol. trans.: | 0 | 0 | 0,00 | |
| Ely. MicroCHP: | 0 | 0 | 0,80 | |
| CAES fuel ratio: | | 0,000 | | |

| (TWh/year) | Coal | Oil | Ngas | Biomass |
|---|---|---|---|---|
| Transport | 0,00 | 110,19 | 0,58 | 0,00 |
| Household | 0,85 | 30,64 | 62,99 | 1,93 |
| Industry | 19,90 | 12,18 | 51,51 | 9,76 |
| Various | 0,00 | 5,12 | 3,56 | 1,28 |

# Output WARNING!!: (1) Critical Excess;

| | District Heating | | | | | | | | | | Electricity | | | | | | | | | | | | | | | | Exchange | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Demand | Production | | | | | | | | | Consumption | | | | | | Production | | | | | | | Balance | | | | |
| | Distr. heating MW | Solar MW | Waste+ CSHP MW | DHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Balance MW | Elec. demand MW | Flex.& Transp. MW | HP MW | Elec-trolyser MW | EH MW | Hydro Pump MW | Tur-bine MW | RES MW | Hy-dro MW | Geo-thermal MW | Waste+ CSHP MW | CHP MW | PP MW | Stab-Load % | Imp MW | Exp MW | CEEP MW | EEP MW | Payment Imp Million EUR | Payment Exp Million EUR |
| January | 1770 | 0 | 0 | 0 | 1584 | 0 | 0 | 236 | 0 | -51 | 8667 | 608 | 0 | 0 | 2153 | 0 | 0 | 941 | 0 | 7046 | 237 | 1242 | 416 | 353 | 0 | 59 | 59 | 0 | 0 | 0 |
| February | 1690 | 0 | 0 | 0 | 1522 | 0 | 0 | 219 | 0 | -51 | 8695 | 614 | 0 | 0 | 2054 | 0 | 0 | 859 | 0 | 6732 | 237 | 1194 | 684 | 355 | 0 | 65 | 65 | 0 | 0 | 0 |
| March | 1478 | 0 | 0 | 0 | 1323 | 0 | 0 | 206 | 0 | -51 | 8265 | 617 | 0 | 0 | 1790 | 0 | 0 | 936 | 0 | 5756 | 237 | 1037 | 424 | 345 | 0 | 73 | 73 | 0 | 0 | 0 |
| April | 529 | 0 | 0 | 0 | 582 | 0 | 0 | 58 | 0 | -110 | 7673 | 607 | 0 | 0 | 1134 | 0 | 0 | 858 | 0 | 4493 | 237 | 457 | 805 | 339 | 0 | 27 | 27 | 0 | 0 | 0 |
| May | 191 | 0 | 0 | 0 | 302 | 0 | 0 | 43 | 0 | -155 | 7425 | 617 | 0 | 0 | 542 | 0 | 0 | 1022 | 0 | 5308 | 237 | 237 | 41 | 331 | 0 | 406 | 406 | 0 | 0 | 0 |
| June | 191 | 0 | 0 | 0 | 302 | 0 | 0 | 43 | 0 | -155 | 7657 | 615 | 0 | 0 | 359 | 0 | 0 | 960 | 0 | 5692 | 237 | 237 | 25 | 336 | 0 | 956 | 956 | 0 | 0 | 1 |
| July | 191 | 0 | 0 | 0 | 302 | 0 | 0 | 43 | 0 | -155 | 7379 | 608 | 0 | 0 | 276 | 0 | 0 | 999 | 0 | 4477 | 237 | 237 | 293 | 326 | 0 | 258 | 258 | 0 | 0 | 0 |
| August | 191 | 0 | 0 | 0 | 302 | 0 | 0 | 43 | 0 | -155 | 7491 | 617 | 0 | 0 | 262 | 0 | 0 | 803 | 0 | 3415 | 237 | 237 | 899 | 330 | 0 | 4 | 4 | 0 | 0 | 0 |
| September | 191 | 0 | 0 | 0 | 302 | 0 | 0 | 43 | 0 | -155 | 7633 | 611 | 0 | 0 | 480 | 0 | 0 | 878 | 0 | 2932 | 237 | 237 | 1817 | 329 | 0 | 0 | 0 | 0 | 0 | 0 |
| October | 790 | 0 | 0 | 0 | 838 | 0 | 0 | 47 | 0 | -94 | 7814 | 612 | 0 | 0 | 1068 | 0 | 0 | 526 | 0 | 5122 | 237 | 657 | 734 | 358 | 0 | 51 | 51 | 0 | 0 | 0 |
| November | 1420 | 0 | 0 | 0 | 1402 | 0 | 0 | 69 | 0 | -51 | 8105 | 615 | 0 | 0 | 1698 | 0 | 0 | 1068 | 0 | 5634 | 237 | 1099 | 850 | 341 | 0 | 0 | 0 | 0 | 0 | 0 |
| December | 1755 | 0 | 0 | 0 | 1597 | 0 | 0 | 209 | 0 | -51 | 7930 | 608 | 0 | 0 | 2131 | 0 | 0 | 1129 | 0 | 6405 | 237 | 1252 | 349 | 342 | 0 | 31 | 31 | 0 | 0 | 0 |
| Average | 864 | 0 | 0 | 0 | 862 | 0 | 0 | 105 | 0 | -103 | 7892 | 612 | 0 | 0 | 1160 | 0 | 0 | 915 | 0 | 5249 | 237 | 676 | 608 | 340 | 0 | 160 | 160 | 0 | Average price | |
| Maximum | 3292 | 0 | 0 | 0 | 3023 | 0 | 0 | 2008 | 0 | 0 | 10499 | 2020 | 0 | 0 | 3462 | 0 | 0 | 4099 | 0 | 7046 | 237 | 2371 | 3381 | 389 | 0 | 6574 | 6574 | 0 | (EUR/MWh) | |
| Minimum | 83 | 0 | 0 | 0 | 302 | 0 | 0 | 43 | 0 | -262 | 156 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 2857 | 237 | 237 | 0 | 209 | 0 | 0 | 0 | 0 | 1 | 1 |
| TWh/year | 7,59 | 0,00 | 0,00 | 0,00 | 7,57 | 0,00 | 0,00 | 0,92 | 0,00 | -0,90 | 69,32 | 5,38 | 0,00 | 0,00 | 10,19 | 0,00 | 0,00 | 8,04 | 0,00 | 46,11 | 2,08 | 5,94 | 5,34 | | 0,00 | 1,41 | 1,41 | 0,00 | 0 | 1 |

| FUEL BALANCE (TWh/year): | DHP | CHP2 | CHP3 | Boiler2 | Boiler3 | PP | Geo/Nu. | Hydro | Waste | CAES Elc.ly. | BioCon-version | Electro-Fuel | Wind | Offsh. | PV | Hydro | Solar.Th | Transp. | Industry household | Industry Various | Total | Imp/Exp Corrected Imp/Exp | Imp/Exp Corrected Net | CO2 emission (Mt): Total | CO2 emission (Mt): Net |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Coal | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0,85 | 19,90 | 20,75 | 0,00 | 20,75 | 7,36 | 7,36 |
| Oil | - | - | - | - | - | 2,16 | - | - | - | - | - | - | - | - | - | - | - | 110,19 | 30,53 | 17,30 | 160,18 | -0,57 | 159,61 | 42,04 | 41,89 |
| N.Gas | - | - | 14,55 | - | 0,98 | 8,52 | - | - | - | - | - | - | - | - | - | - | - | 0,98 | 62,99 | 55,07 | 143,09 | -2,25 | 140,84 | 29,31 | 28,94 |
| Biomass | - | - | 0,72 | - | 0,05 | - | - | - | - | - | 5,39 | - | - | - | - | - | - | - | 1,93 | 11,04 | 19,13 | 0,00 | 19,13 | 0,00 | 0,00 |
| Renewable | - | - | - | - | - | - | - | - | - | - | - | - | 2,53 | 2,25 | 2,96 | 0,29 | 0,09 | - | - | - | 8,13 | 0,00 | 8,13 | 0,00 | 0,00 |
| H2 etc. | - | - | 0,00 | - | 0,00 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Biofuel | - | - | - | - | - | - | - | - | - | - | -5,12 | - | - | - | - | - | - | 5,12 | - | - | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Nuclear/CCS | - | - | - | - | - | - | 153,69 | - | - | - | - | - | - | - | - | - | - | - | - | - | 153,69 | 0,00 | 153,69 | 0,00 | 0,00 |
| Total | - | - | 15,27 | - | 1,02 | 10,69 | 153,69 | - | - | - | 0,28 | - | 2,53 | 2,25 | 2,96 | 0,29 | 0,09 | 116,29 | 96,30 | 103,31 | 504,97 | -2,82 | 502,15 | 78,71 | 78,18 |

## District Heating Production

| | Gr.1 | | | | Gr.2 | | | | | | | | | | Gr.3 | | | | | | | | | | RES specification | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | District heating MW | Solar MW | CSHP MW | DHP MW | District heating MW | Solar MW | CSHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Stor-age MW | Ba-lance MW | District heating MW | Solar MW | CSHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Stor-age MW | Ba-lance MW | RES1 Wind MW | RES2 Offsho MW | RES3 Photo MW | RES 4-7 MW | Total MW |
| January | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1770 | 0 | 0 | 1584 | 0 | 0 | 236 | 0 | 0 | -51 | 414 | 351 | 111 | 65 | 941 |
| February | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1690 | 0 | 0 | 1522 | 0 | 0 | 219 | 0 | 0 | -51 | 328 | 284 | 173 | 74 | 859 |
| March | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1478 | 0 | 0 | 1323 | 0 | 0 | 206 | 0 | 0 | -51 | 297 | 277 | 308 | 54 | 936 |
| April | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 529 | 0 | 0 | 582 | 0 | 0 | 58 | 0 | 0 | -110 | 177 | 150 | 488 | 42 | 858 |
| May | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 191 | 0 | 0 | 302 | 0 | 0 | 43 | 0 | 0 | -155 | 241 | 217 | 539 | 25 | 1022 |
| June | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 191 | 0 | 0 | 302 | 0 | 0 | 43 | 0 | 0 | -155 | 201 | 177 | 572 | 10 | 960 |
| July | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 191 | 0 | 0 | 302 | 0 | 0 | 43 | 0 | 0 | -155 | 231 | 203 | 560 | 5 | 999 |
| August | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 191 | 0 | 0 | 302 | 0 | 0 | 43 | 0 | 0 | -155 | 158 | 148 | 490 | 7 | 803 |
| September | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 191 | 0 | 0 | 302 | 0 | 0 | 43 | 0 | 0 | -155 | 270 | 217 | 377 | 14 | 878 |
| October | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 790 | 0 | 0 | 838 | 0 | 0 | 47 | 0 | 0 | -94 | 137 | 141 | 238 | 10 | 526 |
| November | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1420 | 0 | 0 | 1402 | 0 | 0 | 69 | 0 | 0 | -51 | 493 | 434 | 113 | 28 | 1068 |
| December | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1755 | 0 | 0 | 1597 | 0 | 0 | 209 | 0 | 0 | -51 | 517 | 479 | 77 | 57 | 1129 |
| Average | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 864 | 0 | 0 | 862 | 0 | 0 | 105 | 0 | 0 | -103 | 289 | 257 | 337 | 33 | 915 |
| Maximum | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3292 | 0 | 0 | 3023 | 0 | 0 | 2008 | 0 | 0 | 0 | 849 | 592 | 2866 | 105 | 4099 |
| Minimum | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 83 | 0 | 0 | 302 | 0 | 0 | 43 | 0 | 0 | -262 | 0 | 0 | 0 | 0 | 7 |
| Total for the whole year TWh/year | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | | 0,00 | 7,59 | 0,00 | 0,00 | 7,57 | 0,00 | 0,00 | 0,92 | 0,00 | | -0,90 | 2,53 | 2,25 | 2,96 | 0,29 | 8,04 |

Own use of heat from industrial CHP: 0,00 TWh/year

ANNUAL COSTS (Million EUR)

| | |
|---|---|
| Total Fuel ex Ngas exchange = | 8762 |
| Uranium = | 968 |
| Coal = | 194 |
| FuelOil = | 475 |
| Gasoil/Diesel= | 3863 |
| Petrol/JP = | 1696 |
| Gas handling = | 1129 |
| Biomass = | 437 |
| Food income = | 0 |
| Waste = | 0 |
| Total Ngas Exchange costs = | 3555 |
| Marginal operation costs = | 722 |
| Total Electricity exchange = | -18 |
| Import = | 0 |
| Export = | -1 |
| Bottleneck = | 1 |
| Fixed imp/ex= | -18 |
| Total CO2 emission costs = | 1196 |
| Total variable costs = | 14217 |
| Fixed operation costs = | 861 |
| Annual Investment costs = | 1879 |
| TOTAL ANNUAL COSTS = | 16957 |

## NATURAL GAS EXCHANGE

| | DHP & Boilers MW | CHP2 CHP3 MW | PP CAES MW | Indi-vidual MW | Trans port MW | Indu. Var. MW | Demand Sum MW | Bio-gas MW | Syn-gas MW | CO2Hy gas MW | SynHy gas MW | SynHy gas MW | Stor-age MW | Sum MW | Im-port MW | Ex-port MW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| January | 250 | 3044 | 663 | 13305 | 66 | 6269 | 23598 | 0 | 0 | 0 | 0 | 0 | 0 | 23598 | 23598 | 0 |
| February | 232 | 2925 | 1092 | 12699 | 66 | 6269 | 23283 | 0 | 0 | 0 | 0 | 0 | 0 | 23283 | 23283 | 0 |
| March | 218 | 2542 | 677 | 11084 | 66 | 6269 | 20856 | 0 | 0 | 0 | 0 | 0 | 0 | 20856 | 20856 | 0 |
| April | 61 | 1119 | 1284 | 6986 | 66 | 6269 | 15785 | 0 | 0 | 0 | 0 | 0 | 0 | 15785 | 15785 | 0 |
| May | 46 | 581 | 65 | 3348 | 66 | 6269 | 10375 | 0 | 0 | 0 | 0 | 0 | 0 | 10375 | 10375 | 0 |
| June | 46 | 581 | 40 | 2232 | 66 | 6269 | 9234 | 0 | 0 | 0 | 0 | 0 | 0 | 9234 | 9234 | 0 |
| July | 46 | 581 | 468 | 1717 | 66 | 6269 | 9147 | 0 | 0 | 0 | 0 | 0 | 0 | 9147 | 9147 | 0 |
| August | 46 | 581 | 1435 | 1619 | 66 | 6269 | 10016 | 0 | 0 | 0 | 0 | 0 | 0 | 10016 | 10016 | 0 |
| September | 46 | 581 | 2899 | 2970 | 66 | 6269 | 12832 | 0 | 0 | 0 | 0 | 0 | 0 | 12832 | 12832 | 0 |
| October | 49 | 1610 | 1172 | 6605 | 66 | 6269 | 15771 | 0 | 0 | 0 | 0 | 0 | 0 | 15771 | 15771 | 0 |
| November | 73 | 2694 | 1356 | 10497 | 66 | 6269 | 20955 | 0 | 0 | 0 | 0 | 0 | 0 | 20955 | 20955 | 0 |
| December | 222 | 3069 | 556 | 13153 | 66 | 6269 | 23335 | 0 | 0 | 0 | 0 | 0 | 0 | 23335 | 23335 | 0 |
| Average | 111 | 1657 | 970 | 7171 | 66 | 6269 | 16244 | 0 | 0 | 0 | 0 | 0 | 0 | 16244 | 16244 | 0 |
| Maximum | 2126 | 5810 | 5394 | 21398 | 66 | 6269 | 36776 | 0 | 0 | 0 | 0 | 0 | 0 | 36776 | 36776 | 0 |
| Minimum | 46 | 581 | 0 | 56 | 66 | 6269 | 7018 | 0 | 0 | 0 | 0 | 0 | 0 | 7018 | 7018 | 0 |
| Total for the whole year TWh/year | 0,98 | 14,55 | 8,52 | 62,99 | 0,58 | 55,07 | 142,69 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 142,69 | 142,69 | 0,00 |

RES Share: 5,4 Percent of Primary Energy 10,0 Percent of Electricity 8,3 TWh electricity from RES

# Input CZ 2015.txt

# The EnergyPLAN model 12.4

| | | | |
|---|---|---|---|
| Electricity demand (TWh/year): | | Flexible demand | 2,29 |
| Fixed demand | 47,87 | Fixed imp/exp. | 16,45 |
| Electric heating + HP | 13,80 | Transportation | 3,09 |
| Electric cooling | 0,64 | Total | 84,14 |

| District heating (TWh/year) | Gr.1 | Gr.2 | Gr.3 | Sum |
|---|---|---|---|---|
| District heating demand | 0,00 | 0,00 | 23,60 | 23,60 |
| Solar Thermal | 0,00 | 0,00 | 0,00 | 0,00 |
| Industrial CHP (CSHP) | 0,00 | 0,00 | 0,00 | 0,00 |
| Demand after solar and CSHP | 0,00 | 0,00 | 23,60 | 23,60 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Wind | 181 | MW | 0,28 | TWh/year | 0,00 | Grid |
| Offshore Wind | 0 | MW | 0 | TWh/year | 0,00 | stabili- |
| Photo Voltaic | 2166 | MW | 2,24 | TWh/year | 0,00 | sation |
| River Hydro | 227 | MW | 0,6 | TWh/year | 0,00 | share |
| Hydro Power | 925 | MW | 2,49 | TWh/year | | |
| Geothermal/Nuclear | 3804 | MW | 25,74 | TWh/year | | |

| | Capacities | | Efficiencies | | |
|---|---|---|---|---|---|
| Group 2: | MW-e | MJ/s | elec. | Ther | COP |
| CHP | 0 | 0 | 0,40 | 0,50 | |
| Heat Pump | 0 | 0 | | | 3,00 |
| Boiler | | 0 | | 0,50 | |
| Group 3: | | | | | |
| CHP | 4163 | 5284 | 0,28 | 0,36 | |
| Heat Pump | 2 | 6 | | | 3,40 |
| Boiler | | 13015 | | 0,85 | |
| Condensing | 13200 | | 0,30 | | |

| | | | | | |
|---|---|---|---|---|---|
| Heatstorage: | gr.2: | 0 | GWh | gr.3: | 0 GWh |
| Fixed Boiler: | gr.2: | 2,5 | Per cent | gr.3: | 5,0 Per cent |

| Electricity prod. from | CSHP | Waste | (TWh/year) |
|---|---|---|---|
| Gr.1: | 0,00 | 0,00 | |
| Gr.2: | 0,00 | 0,00 | |
| Gr.3: | 7,07 | 0,00 | |

| | | |
|---|---|---|
| Regulation Strategy: | Technical regulation no. 2 | |
| CEEP regulation | 23450000 | |
| Minimum Stabilisation share | 0,25 | |
| Stabilisation share of CHP | 0,00 | |
| Minimum CHP gr 3 load | 416 | MW |
| Minimum PP | 1320 | MW |
| Heat Pump maximum share | 0,50 | |
| Maximum import/export | 0 | MW |

| | | |
|---|---|---|
| Distr. Name : | const.txt | |
| Addition factor | 0,00 | EUR/MWh |
| Multiplication factor | 1,00 | |
| Dependency factor | 0,00 | EUR/MWh pr. MW |
| Average Market Price | 1 | EUR/MWh |
| Gas Storage | 0 | GWh |
| Syngas capacity | 0 | MW |
| Biogas max to grid | 0 | MW |

Fuel Price level:

| | Capacities | Storage | Efficiencies | |
|---|---|---|---|---|
| | MW-e | GWh | elec. | Ther. |
| Hydro Pump: | 1147 | 11 | 0,00 | |
| Hydro Turbine: | 1147 | | 0,00 | |
| Electrol. Gr.2: | 0 | 0 | 0,40 | 0,50 |
| Electrol. Gr.3: | 0 | 0 | 0,40 | 0,50 |
| Electrol. trans.: | 0 | 0 | 0,00 | |
| Ely. MicroCHP: | 0 | 0 | 0,80 | |
| CAES fuel ratio: | | 0,000 | | |

| (TWh/year) | Coal | Oil | Ngas | Biomass |
|---|---|---|---|---|
| Transport | 0,00 | 67,85 | 0,00 | 0,00 |
| Household | 4,19 | 0,41 | 33,62 | 8,43 |
| Industry | 36,00 | 5,41 | 30,19 | 13,61 |
| Various | 0,15 | 3,90 | 1,09 | 0,76 |

# Output WARNING!!: (1) Critical Excess;

| | District Heating | | | | | | | | | | Electricity | | | | | | | | | | | | | | | Exchange | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Demand | Production | | | | | | | | | Consumption | | | | | | Production | | | | | | | Balance | | | | |
| | Distr. heating MW | Solar MW | Waste+ CSHP MW | DHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Balance MW | Elec. demand MW | Flex.& Transp. MW | HP MW | Elec-trolyser MW | EH MW | Hydro Pump MW | Tur-bine MW | RES MW | Hy-dro MW | Geo-thermal MW | Waste+ CSHP MW | CHP MW | PP MW | Stab-Load % | Imp MW | Exp MW | CEEP MW | EEP MW | Payment Imp Million EUR | Payment Exp Million EUR |
| January | 5711 | 0 | 0 | 0 | 4240 | 6 | 0 | 1546 | 0 | -81 | 6120 | 606 | 2 | 0 | 3472 | 0 | 0 | 339 | 310 | 3950 | 805 | 3341 | 4134 | 362 | 0 | 8 | 8 | 0 | 0 | 0 |
| February | 5301 | 0 | 0 | 0 | 4188 | 6 | 0 | 1188 | 0 | -81 | 6254 | 616 | 2 | 0 | 3214 | 0 | 0 | 306 | 338 | 3928 | 805 | 3299 | 4387 | 365 | 0 | 0 | 0 | 0 | 0 | 0 |
| March | 4526 | 0 | 0 | 0 | 3936 | 6 | 0 | 665 | 0 | -81 | 5898 | 619 | 2 | 0 | 2727 | 0 | 0 | 367 | 308 | 3584 | 805 | 3101 | 3854 | 360 | 0 | 3 | 3 | 0 | 0 | 0 |
| April | 1489 | 0 | 0 | 0 | 1439 | 6 | 0 | 158 | 0 | -114 | 5406 | 603 | 2 | 0 | 818 | 0 | 0 | 562 | 307 | 3042 | 805 | 1133 | 3627 | 341 | 0 | 0 | 0 | 0 | 0 | 0 |
| May | 594 | 0 | 0 | 0 | 598 | 6 | 0 | 128 | 0 | -138 | 5147 | 619 | 2 | 0 | 256 | 0 | 0 | 499 | 276 | 2893 | 805 | 471 | 2615 | 332 | 0 | 1 | 1 | 0 | 0 | 0 |
| June | 594 | 0 | 0 | 0 | 598 | 6 | 0 | 128 | 0 | -138 | 5174 | 617 | 2 | 0 | 256 | 0 | 0 | 470 | 313 | 2777 | 805 | 471 | 2798 | 334 | 0 | 0 | 0 | 0 | 0 | 0 |
| July | 594 | 0 | 0 | 0 | 598 | 6 | 0 | 128 | 0 | -138 | 5060 | 605 | 2 | 0 | 256 | 0 | 0 | 463 | 288 | 2160 | 805 | 471 | 3066 | 330 | 0 | 1 | 1 | 0 | 0 | 0 |
| August | 594 | 0 | 0 | 0 | 598 | 6 | 0 | 128 | 0 | -138 | 5060 | 619 | 2 | 0 | 256 | 0 | 0 | 410 | 198 | 2702 | 805 | 471 | 3129 | 338 | 0 | 0 | 0 | 0 | 0 | 0 |
| September | 594 | 0 | 0 | 0 | 597 | 6 | 0 | 129 | 0 | -138 | 5137 | 610 | 2 | 0 | 256 | 0 | 0 | 316 | 254 | 2363 | 805 | 470 | 2733 | 335 | 0 | 0 | 0 | 0 | 0 | 0 |
| October | 2433 | 0 | 0 | 0 | 2287 | 6 | 0 | 245 | 0 | -105 | 5563 | 612 | 2 | 0 | 1411 | 0 | 0 | 204 | 335 | 2587 | 805 | 1802 | 3234 | 353 | 0 | 0 | 0 | 0 | 0 | 0 |
| November | 4378 | 0 | 0 | 0 | 3926 | 6 | 0 | 527 | 0 | -81 | 5874 | 617 | 2 | 0 | 2634 | 0 | 0 | 176 | 159 | 2574 | 805 | 3093 | 3629 | 360 | 0 | 0 | 0 | 0 | 0 | 0 |
| December | 5482 | 0 | 0 | 0 | 4225 | 6 | 0 | 1332 | 0 | -81 | 5606 | 605 | 2 | 0 | 3328 | 0 | 0 | 161 | 317 | 2631 | 805 | 3328 | 3894 | 363 | 0 | 0 | 0 | 0 | 0 | 0 |
| Average | 2687 | 0 | 0 | 0 | 2265 | 6 | 0 | 525 | 0 | -110 | 5522 | 612 | 2 | 0 | 1571 | 0 | 0 | 356 | 284 | 2930 | 805 | 1785 | 3422 | 348 | 0 | 1 | 1 | 0 | Average price (EUR/MWh) | |
| Maximum | 10846 | 0 | 0 | 0 | 5284 | 6 | 0 | 5556 | 0 | 0 | 7524 | 2089 | 2 | 0 | 6699 | 0 | 0 | 2210 | 413 | 3950 | 805 | 4163 | 9020 | 379 | 0 | 1421 | 1421 | 0 | | |
| Minimum | 209 | 0 | 0 | 0 | 528 | 6 | 0 | 128 | 0 | -453 | 94 | 0 | 2 | 0 | 0 | 0 | 0 | 3 | 0 | 2142 | 805 | 416 | 1320 | 248 | 0 | 0 | 0 | 0 | 1 | 1 |
| TWh/year | 23,60 | 0,00 | 0,00 | 0,00 | 19,90 | 0,06 | 0,00 | 4,61 | 0,00 | -0,96 | 48,51 | 5,38 | 0,02 | 0,00 | 13,80 | 0,00 | 0,00 | 3,13 | 2,49 | 25,74 | 7,07 | 15,68 | 30,06 | | 0,00 | 0,01 | 0,01 | 0,00 | 0 | 0 |

| FUEL BALANCE (TWh/year): | DHP | CHP2 | CHP3 | Boiler2 | Boiler3 | PP | Geo/Nu. | Hydro | Waste | CAES Elc.ly. | BioCon-version | Electro-Fuel | Wind | Offsh. | PV | Hydro | Solar.Th | Transp. | Industry household | Industry Various | Total | Imp/Exp Corrected Imp/Exp | Imp/Exp Corrected Net | CO2 emission (Mt): Total | CO2 emission (Mt): Net |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Coal | - | - | 49,37 | - | 5,42 | 100,20 | - | - | - | - | - | - | - | - | - | - | - | - | 4,19 | 36,15 | 195,33 | -0,03 | 195,30 | 69,26 | 69,25 |
| Oil | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 67,85 | 0,36 | 9,31 | 77,52 | 0,00 | 77,52 | 20,34 | 20,34 |
| N.Gas | - | - | 1,66 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 33,62 | 31,28 | 66,56 | 0,00 | 66,56 | 13,63 | 13,63 |
| Biomass | - | - | 4,56 | - | - | - | - | - | - | - | 4,68 | - | - | - | - | - | - | - | 8,43 | 14,37 | 32,03 | 0,00 | 32,03 | 0,00 | 0,00 |
| Renewable | - | - | - | - | - | - | - | 2,49 | - | - | - | - | 0,28 | - | 2,24 | 0,60 | 0,04 | - | - | - | 5,66 | 0,00 | 5,66 | 0,00 | 0,00 |
| H2 etc. | - | - | 0,00 | - | 0,00 | 0,00 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Biofuel | - | - | 0,00 | - | - | - | - | - | - | - | -4,03 | - | - | - | - | - | - | 4,03 | - | - | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Nuclear/CCS | - | - | - | - | - | - | 85,79 | - | - | - | - | - | - | - | - | - | - | - | - | - | 85,79 | 0,00 | 85,79 | 0,00 | 0,00 |
| Total | - | - | 55,59 | - | 5,42 | 100,20 | 85,79 | 2,49 | - | - | 0,65 | - | 0,28 | - | 2,24 | 0,60 | 0,04 | 71,88 | 46,60 | 91,11 | 462,90 | -0,03 | 462,87 | 103,24 | 103,23 |

## District Heating Production

| | Gr.1 | | | | Gr.2 | | | | | | | | | | Gr.3 | | | | | | | | | | RES specification | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | District heating MW | Solar MW | CSHP MW | DHP MW | District heating MW | Solar MW | CSHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Stor-age MW | Ba-lance MW | District heating MW | Solar MW | CSHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Stor-age MW | Ba-lance MW | RES1 Wind MW | RES2 Offsho MW | RES3 Photo MW | RES 4-7 ic MW | Total MW |
| January | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5711 | 0 | 0 | 4240 | 6 | 0 | 1546 | 0 | 0 | -81 | 74 | 0 | 90 | 176 | 339 |
| February | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5301 | 0 | 0 | 4188 | 6 | 0 | 1188 | 0 | 0 | -81 | 35 | 0 | 154 | 117 | 306 |
| March | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4526 | 0 | 0 | 3936 | 6 | 0 | 665 | 0 | 0 | -81 | 47 | 0 | 233 | 86 | 367 |
| April | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1489 | 0 | 0 | 1439 | 6 | 0 | 158 | 0 | 0 | -114 | 28 | 0 | 362 | 172 | 562 |
| May | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 594 | 0 | 0 | 598 | 6 | 0 | 128 | 0 | 0 | -138 | 16 | 0 | 415 | 68 | 499 |
| June | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 594 | 0 | 0 | 598 | 6 | 0 | 128 | 0 | 0 | -138 | 11 | 0 | 425 | 34 | 470 |
| July | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 594 | 0 | 0 | 598 | 6 | 0 | 128 | 0 | 0 | -138 | 21 | 0 | 418 | 24 | 463 |
| August | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 594 | 0 | 0 | 598 | 6 | 0 | 128 | 0 | 0 | -138 | 11 | 0 | 379 | 20 | 410 |
| September | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 594 | 0 | 0 | 597 | 6 | 0 | 129 | 0 | 0 | -138 | 22 | 0 | 273 | 21 | 316 |
| October | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2433 | 0 | 0 | 2287 | 6 | 0 | 245 | 0 | 0 | -105 | 16 | 0 | 166 | 23 | 204 |
| November | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4378 | 0 | 0 | 3926 | 6 | 0 | 527 | 0 | 0 | -81 | 61 | 0 | 84 | 32 | 176 |
| December | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5482 | 0 | 0 | 4225 | 6 | 0 | 1332 | 0 | 0 | -81 | 45 | 0 | 62 | 54 | 161 |
| Average | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2687 | 0 | 0 | 2265 | 6 | 0 | 525 | 0 | 0 | -110 | 32 | 0 | 255 | 69 | 356 |
| Maximum | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10846 | 0 | 0 | 5284 | 6 | 0 | 5556 | 0 | 0 | 0 | 180 | 0 | 2166 | 227 | 2210 |
| Minimum | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 209 | 0 | 0 | 528 | 6 | 0 | 128 | 0 | 0 | -453 | 0 | 0 | 0 | 0 | 3 |
| Total for the whole year TWh/year | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | | 0,00 | 23,60 | 0,00 | 0,00 | 19,90 | 0,06 | 0,00 | 4,61 | 0,00 | | -0,96 | 0,28 | 0,00 | 2,24 | 0,60 | 3,13 |

Own use of heat from industrial CHP: 0,00 TWh/year

ANNUAL COSTS (Million EUR)

| | |
|---|---|
| Total Fuel ex Ngas exchange = | 6749 |
| Uranium = | 540 |
| Coal = | 1828 |
| FuelOil = | 226 |
| Gasoil/Diesel= | 1495 |
| Petrol/JP = | 1246 |
| Gas handling = | 606 |
| Biomass = | 807 |
| Food income = | 0 |
| Waste = | 0 |
| Total Ngas Exchange costs = | 1658 |
| Marginal operation costs = | 511 |
| Total Electricity exchange = | 16 |
| Import = | 0 |
| Export = | 0 |
| Bottleneck = | 0 |
| Fixed imp/ex= | 16 |
| Total CO2 emission costs = | 1569 |
| Total variable costs = | 10504 |
| Fixed operation costs = | 613 |
| Annual Investment costs = | 1269 |
| TOTAL ANNUAL COSTS = | 12386 |

## NATURAL GAS EXCHANGE

| | DHP & Boilers MW | CHP2 CHP3 MW | PP CAES MW | Indi-vidual MW | Trans port MW | Indu. Var. MW | Demand Sum MW | Bio-gas MW | Syn-gas MW | CO2Hy gas MW | SynHy gas MW | SynHy gas MW | Stor-age MW | Sum MW | Im-port MW | Ex-port MW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| January | 0 | 354 | 0 | 8459 | 0 | 3561 | 12374 | 0 | 0 | 0 | 0 | 0 | 0 | 12374 | 12374 | 0 |
| February | 0 | 349 | 0 | 7830 | 0 | 3561 | 11740 | 0 | 0 | 0 | 0 | 0 | 0 | 11740 | 11740 | 0 |
| March | 0 | 328 | 0 | 6644 | 0 | 3561 | 10533 | 0 | 0 | 0 | 0 | 0 | 0 | 10533 | 10533 | 0 |
| April | 0 | 120 | 0 | 1993 | 0 | 3561 | 5674 | 0 | 0 | 0 | 0 | 0 | 0 | 5674 | 5674 | 0 |
| May | 0 | 50 | 0 | 623 | 0 | 3561 | 4234 | 0 | 0 | 0 | 0 | 0 | 0 | 4234 | 4234 | 0 |
| June | 0 | 50 | 0 | 623 | 0 | 3561 | 4234 | 0 | 0 | 0 | 0 | 0 | 0 | 4234 | 4234 | 0 |
| July | 0 | 50 | 0 | 623 | 0 | 3561 | 4234 | 0 | 0 | 0 | 0 | 0 | 0 | 4234 | 4234 | 0 |
| August | 0 | 50 | 0 | 623 | 0 | 3561 | 4234 | 0 | 0 | 0 | 0 | 0 | 0 | 4234 | 4234 | 0 |
| September | 0 | 50 | 0 | 623 | 0 | 3561 | 4234 | 0 | 0 | 0 | 0 | 0 | 0 | 4234 | 4234 | 0 |
| October | 0 | 191 | 0 | 3439 | 0 | 3561 | 7190 | 0 | 0 | 0 | 0 | 0 | 0 | 7190 | 7190 | 0 |
| November | 0 | 327 | 0 | 6417 | 0 | 3561 | 10306 | 0 | 0 | 0 | 0 | 0 | 0 | 10306 | 10306 | 0 |
| December | 0 | 352 | 0 | 8107 | 0 | 3561 | 12020 | 0 | 0 | 0 | 0 | 0 | 0 | 12020 | 12020 | 0 |
| Average | 0 | 189 | 0 | 3827 | 0 | 3561 | 7577 | 0 | 0 | 0 | 0 | 0 | 0 | 7577 | 7577 | 0 |
| Maximum | 0 | 441 | 0 | 16321 | 0 | 3561 | 20323 | 0 | 0 | 0 | 0 | 0 | 0 | 20323 | 20323 | 0 |
| Minimum | 0 | 44 | 0 | 33 | 0 | 3561 | 3638 | 0 | 0 | 0 | 0 | 0 | 0 | 3638 | 3638 | 0 |
| Total for the whole year TWh/year | 0,00 | 1,66 | 0,00 | 33,62 | 0,00 | 31,28 | 66,56 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 66,56 | 66,56 | 0,00 |

RES Share: 8,1 Percent of Primary Energy 10,9 Percent of Electricity 6,9 TWh electricity from RES

# Input DE 2015.txt

# The EnergyPLAN model 12.4

| | | | |
|---|---|---|---|
| Electricity demand (TWh/year): | | Flexible demand | 26,52 |
| Fixed demand | 470,92 | Fixed imp/exp. | 23,41 |
| Electric heating + HP | 33,62 | Transportation | 19,24 |
| Electric cooling | 2,46 | Total | 576,17 |

| District heating (TWh/year) | Gr.1 | Gr.2 | Gr.3 | Sum |
|---|---|---|---|---|
| District heating demand | 0,00 | 0,00 | 121,96 | 121,96 |
| Solar Thermal | 0,00 | 0,00 | 0,07 | 0,07 |
| Industrial CHP (CSHP) | 0,00 | 0,00 | 0,00 | 0,00 |
| Demand after solar and CSHP | 0,00 | 0,00 | 121,89 | 121,89 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Wind | 41081 | MW | 69,43 | TWh/year | 0,00 | Grid |
| Offshore Wind | 2318 | MW | 7,99 | TWh/year | 0,00 | stabili- |
| Photo Voltaic | 37949 | MW | 39,28 | TWh/year | 0,00 | sation |
| River Hydro | 2977 | MW | 9,6 | TWh/year | 0,00 | share |
| Hydro Power | 1403 | MW | 4,47 | TWh/year | | |
| Geothermal/Nuclear | 11108 | MW | 72,11 | TWh/year | | |

| | Capacities | | Efficiencies | | |
|---|---|---|---|---|---|
| Group 2: | MW-e | MJ/s | elec. | Ther | COP |
| CHP | 0 | 0 | 0,40 | 0,50 | |
| Heat Pump | 0 | 0 | | | 3,00 |
| Boiler | | 0 | | 0,50 | |
| Group 3: | | | | | |
| CHP | 89636 | 47973 | 0,34 | 0,18 | |
| Heat Pump | 0 | 0 | | | 3,00 |
| Boiler | | 64188 | | 0,87 | |
| Condensing | 90000 | | 0,31 | | |

| | | | | | |
|---|---|---|---|---|---|
| Heatstorage: | gr.2: | 0 | GWh | gr.3: | 0 GWh |
| Fixed Boiler: | gr.2: | 2,5 | Per cent | gr.3: | 5,0 Per cent |

| Electricity prod. from | CSHP | Waste | (TWh/year) |
|---|---|---|---|
| Gr.1: | 0,00 | 0,00 | |
| Gr.2: | 0,00 | 0,00 | |
| Gr.3: | 31,37 | 0,00 | |

| | | |
|---|---|---|
| Regulation Strategy: | Technical regulation no. 2 | |
| CEEP regulation | 23450000 | |
| Minimum Stabilisation share | 0,25 | |
| Stabilisation share of CHP | 0,00 | |
| Minimum CHP gr 3 load | 9860 | MW |
| Minimum PP | 0 | MW |
| Heat Pump maximum share | 0,50 | |
| Maximum import/export | 0 | MW |

| | | |
|---|---|---|
| Distr. Name : | const.txt | |
| Addition factor | 0,00 | EUR/MWh |
| Multiplication factor | 1,00 | |
| Dependency factor | 0,00 | EUR/MWh pr. MW |
| Average Market Price | 1 | EUR/MWh |
| Gas Storage | 0 | GWh |
| Syngas capacity | 0 | MW |
| Biogas max to grid | 0 | MW |

Fuel Price level:

| | Capacities | Storage | Efficiencies | |
|---|---|---|---|---|
| | MW-e | GWh | elec. | Ther. |
| Hydro Pump: | 6967 | 70 | 0,00 | |
| Hydro Turbine: | 6967 | | 0,00 | |
| Electrol. Gr.2: | 0 | 0 | 0,40 | 0,50 |
| Electrol. Gr.3: | 0 | 0 | 0,40 | 0,50 |
| Electrol. trans.: | 0 | 0 | 0,00 | |
| Ely. MicroCHP: | 0 | 0 | 0,80 | |
| CAES fuel ratio: | | 0,000 | | |

| (TWh/year) | Coal | Oil | Ngas | Biomass |
|---|---|---|---|---|
| Transport | 0,00 | 646,19 | 1,58 | 0,00 |
| Household | 8,51 | 196,57 | 351,24 | 64,19 |
| Industry | 131,37 | 43,92 | 285,12 | 47,53 |
| Various | 0,00 | 0,00 | 0,00 | 42,78 |

# Output WARNING!!: (1) Critical Excess;

| | District Heating | | | | | | | | | | Electricity | | | | | | | | | | | | | | | Exchange | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Demand | Production | | | | | | | | | Consumption | | | | | | Production | | | | | | | Balance | | | |
| | Distr. heating MW | Solar MW | Waste+ CSHP MW | DHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Balance MW | Elec. demand MW | Flex.& Transp. MW | HP MW | Elec-trolyser MW | EH MW | Hydro Pump MW | Tur-bine MW | RES MW | Hy-dro MW | Geo-thermal MW | Waste+ CSHP MW | CHP MW | PP MW | Stab-Load % | Imp MW | Exp MW | CEEP MW | EEP MW | Payment Imp Million EUR | Payment Exp Million EUR |
| January | 27848 | 3 | 89 | 0 | 18839 | 0 | 0 | 9791 | 0 | -874 | 57464 | 5168 | 0 | 0 | 8090 | 0 | 0 | 19276 | 536 | 9681 | 3571 | 35200 | 4685 | 273 | 0 | 267 | 267 | 0 | 0 | 0 |
| February | 26733 | 5 | 89 | 0 | 22724 | 0 | 0 | 4789 | 0 | -874 | 58764 | 5229 | 0 | 0 | 7766 | 0 | 0 | 12744 | 515 | 9731 | 3571 | 42459 | 6448 | 312 | 0 | 0 | 0 | 0 | 0 | 0 |
| March | 23303 | 7 | 89 | 0 | 19569 | 0 | 0 | 4511 | 0 | -874 | 56384 | 5252 | 0 | 0 | 6717 | 0 | 0 | 16125 | 529 | 8508 | 3571 | 36565 | 6883 | 291 | 0 | 128 | 128 | 0 | 0 | 0 |
| April | 8408 | 11 | 89 | 0 | 8826 | 0 | 0 | 1243 | 0 | -1762 | 51948 | 5153 | 0 | 0 | 2138 | 0 | 0 | 13175 | 569 | 8300 | 3571 | 16492 | 19884 | 295 | 0 | 4 | 4 | 0 | 0 | 0 |
| May | 3672 | 13 | 89 | 0 | 5286 | 0 | 0 | 694 | 0 | -2410 | 50286 | 5252 | 0 | 0 | 701 | 0 | 0 | 16435 | 567 | 8210 | 3571 | 9876 | 18525 | 265 | 0 | 0 | 0 | 0 | 0 | 0 |
| June | 3672 | 13 | 89 | 0 | 5286 | 0 | 0 | 694 | 0 | -2410 | 51918 | 5239 | 0 | 0 | 701 | 0 | 0 | 13729 | 531 | 7620 | 3571 | 9876 | 24173 | 288 | 0 | 2 | 2 | 0 | 0 | 0 |
| July | 3672 | 13 | 89 | 0 | 5286 | 0 | 0 | 694 | 0 | -2410 | 52228 | 5164 | 0 | 0 | 701 | 0 | 0 | 15256 | 503 | 5720 | 3571 | 9876 | 24801 | 279 | 0 | 16 | 16 | 0 | 0 | 0 |
| August | 3672 | 12 | 89 | 0 | 5286 | 0 | 0 | 694 | 0 | -2409 | 51062 | 5252 | 0 | 0 | 701 | 0 | 0 | 11499 | 447 | 7875 | 3571 | 9876 | 25719 | 302 | 0 | 0 | 0 | 0 | 0 | 0 |
| September | 3672 | 9 | 89 | 0 | 5286 | 0 | 0 | 694 | 0 | -2406 | 53076 | 5194 | 0 | 0 | 701 | 0 | 0 | 11891 | 442 | 8346 | 3571 | 9877 | 28264 | 303 | 0 | 4 | 4 | 0 | 0 | 0 |
| October | 12668 | 6 | 89 | 0 | 12950 | 0 | 0 | 1139 | 0 | -1515 | 53917 | 5209 | 0 | 0 | 3455 | 0 | 0 | 7317 | 496 | 7503 | 3571 | 24197 | 22062 | 334 | 0 | 0 | 0 | 0 | 0 | 0 |
| November | 22373 | 3 | 89 | 0 | 18957 | 0 | 0 | 4197 | 0 | -874 | 56973 | 5239 | 0 | 0 | 6439 | 0 | 0 | 17714 | 497 | 8573 | 3571 | 35422 | 6645 | 280 | 0 | 189 | 189 | 0 | 0 | 0 |
| December | 27188 | 2 | 89 | 0 | 19221 | 0 | 0 | 8750 | 0 | -874 | 52935 | 5164 | 0 | 0 | 7899 | 0 | 0 | 17253 | 474 | 8539 | 3571 | 35913 | 4593 | 278 | 0 | 129 | 129 | 0 | 0 | 0 |
| Average | 13884 | 8 | 89 | 0 | 12266 | 0 | 0 | 3165 | 0 | -1643 | 53891 | 5209 | 0 | 0 | 3827 | 0 | 0 | 14379 | 509 | 8209 | 3571 | 22918 | 16069 | 292 | 0 | 62 | 62 | 0 | Average price (EUR/MWh) | |
| Maximum | 53490 | 49 | 89 | 0 | 40851 | 0 | 0 | 37399 | 0 | 0 | 72155 | 9679 | 0 | 0 | 15951 | 0 | 0 | 59856 | 683 | 9774 | 3571 | 76329 | 48025 | 379 | 0 | 32222 | 32222 | 0 | | |
| Minimum | 1503 | 0 | 89 | 0 | 5277 | 0 | 0 | 694 | 0 | -4557 | 361 | 3019 | 0 | 0 | 0 | 0 | 0 | 558 | 0 | 5648 | 3571 | 9860 | 0 | 100 | 0 | 0 | 0 | 0 | 1 | 0 |
| TWh/year | 121,96 | 0,07 | 0,78 | 0,00 | 107,74 | 0,00 | 0,00 | 27,80 | 0,00 | -14,43 | 473,38 | 45,76 | 0,00 | 0,00 | 33,62 | 0,00 | 0,00 | 126,31 | 4,47 | 72,11 | 31,37 | 201,31 | 141,15 | | 0,00 | 0,55 | 0,55 | 0,00 | 0 | 0 |

| FUEL BALANCE (TWh/year): | DHP | CHP2 | CHP3 | Boiler2 | Boiler3 | PP | Geo/Nu. | Hydro | Waste | CAES Elc.ly. | BioCon-version | Electro-Fuel | Wind | Offsh. | PV | Hydro | Solar.Th | Transp. | Industry household | Industry Various | Total | Imp/Exp Corrected Imp/Exp | Imp/Exp Corrected Net | CO2 emission (Mt): Total | CO2 emission (Mt): Net |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Coal | - | - | 350,49 | - | 19,89 | 447,23 | - | - | - | - | - | - | - | - | - | - | - | 8,51 | 131,37 | 957,49 | -1,73 | 955,76 | 339,53 | 338,91 |
| Oil | - | - | 0,61 | - | 0,45 | 3,13 | - | - | - | - | - | - | - | - | - | - | - | 646,19 | 192,69 | 43,92 | 887,00 | -0,01 | 886,99 | 232,78 | 232,78 |
| N.Gas | - | - | 194,21 | - | 7,45 | - | - | - | - | - | - | - | - | - | - | - | - | 5,15 | 351,24 | 285,12 | 843,16 | 0,00 | 843,16 | 172,75 | 173,48 |
| Biomass | - | - | 46,67 | - | 4,16 | 4,97 | - | - | 0,94 | - | 44,77 | - | - | - | - | - | - | - | 64,19 | 90,31 | 256,00 | -0,02 | 255,98 | 0,11 | 0,11 |
| Renewable | - | - | - | - | - | - | - | 4,47 | - | - | - | - | 69,43 | 7,99 | 39,28 | 9,60 | 3,39 | - | - | - | 134,17 | 0,00 | 134,17 | 0,00 | 0,00 |
| H2 etc. | - | - | 0,00 | - | 0,00 | 0,00 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Biofuel | - | - | - | - | - | - | - | - | - | - | -29,85 | - | - | - | - | - | - | 29,85 | - | - | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Nuclear/CCS | - | - | - | - | - | - | 240,36 | - | - | - | - | - | - | - | - | - | - | - | - | - | 240,36 | 0,00 | 240,36 | 0,00 | 0,00 |
| Total | - | - | 591,98 | - | 31,95 | 455,33 | 240,36 | 4,47 | 0,94 | - | 14,92 | - | 69,43 | 7,99 | 39,28 | 9,60 | 3,39 | 681,20 | 616,63 | 550,72 | 3318,19 | -1,76 | 3316,43 | 745,17 | 745,29 |

## District Heating Production

| | Gr.1 | | | | Gr.2 | | | | | | | | | | Gr.3 | | | | | | | | | | RES specification | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | District heating MW | Solar MW | CSHP MW | DHP MW | District heating MW | Solar MW | CSHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Stor-age MW | Ba-lance MW | District heating MW | Solar MW | CSHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Stor-age MW | Ba-lance MW | RES1 Wind MW | RES2 Offsho MW | RES3 Photo MW | RES 4-7 MW | Total ic MW |
| January | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 27848 | 3 | 89 | 18839 | 0 | 0 | 9791 | 0 | 0 | -874 | 15212 | 1144 | 1499 | 1421 | 19276 |
| February | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 26733 | 5 | 89 | 22724 | 0 | 0 | 4789 | 0 | 0 | -874 | 8213 | 955 | 2606 | 971 | 12744 |
| March | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 23303 | 7 | 89 | 19569 | 0 | 0 | 4511 | 0 | 0 | -874 | 9865 | 1012 | 4080 | 1167 | 16125 |
| April | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8408 | 11 | 89 | 8826 | 0 | 0 | 1243 | 0 | 0 | -1762 | 4635 | 672 | 6119 | 1749 | 13175 |
| May | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3672 | 13 | 89 | 5286 | 0 | 0 | 694 | 0 | 0 | -2410 | 5798 | 948 | 7518 | 2171 | 16435 |
| June | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3672 | 13 | 89 | 5286 | 0 | 0 | 694 | 0 | 0 | -2410 | 3858 | 654 | 7378 | 1838 | 13729 |
| July | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3672 | 13 | 89 | 5286 | 0 | 0 | 694 | 0 | 0 | -2410 | 6249 | 764 | 7360 | 883 | 15256 |
| August | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3672 | 12 | 89 | 5286 | 0 | 0 | 694 | 0 | 0 | -2409 | 3490 | 632 | 6695 | 683 | 11499 |
| September | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3672 | 9 | 89 | 5286 | 0 | 0 | 694 | 0 | 0 | -2406 | 5748 | 772 | 4769 | 602 | 11891 |
| October | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 12668 | 6 | 89 | 12950 | 0 | 0 | 1139 | 0 | 0 | -1515 | 3097 | 743 | 2948 | 528 | 7317 |
| November | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 22373 | 3 | 89 | 18957 | 0 | 0 | 4197 | 0 | 0 | -874 | 14403 | 1233 | 1565 | 514 | 17714 |
| December | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 27188 | 2 | 89 | 19221 | 0 | 0 | 8750 | 0 | 0 | -874 | 14209 | 1384 | 1071 | 589 | 17253 |
| Average | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 13884 | 8 | 89 | 12266 | 0 | 0 | 3165 | 0 | 0 | -1643 | 7904 | 910 | 4472 | 1093 | 14379 |
| Maximum | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 53490 | 49 | 89 | 40851 | 0 | 0 | 37399 | 0 | 0 | 0 | 40251 | 1653 | 37949 | 2977 | 59856 |
| Minimum | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1503 | 0 | 89 | 5277 | 0 | 0 | 694 | 0 | 0 | -4557 | 6 | 0 | 0 | 0 | 558 |
| Total for the whole year | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TWh/year | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | | 0,00 | 121,96 | 0,07 | 0,78 | 107,74 | 0,00 | 0,00 | 27,80 | 0,00 | | -14,43 | 69,43 | 7,99 | 39,28 | 9,60 | 126,31 |

Own use of heat from industrial CHP: 0,00 TWh/year

ANNUAL COSTS (Million EUR)

| | |
|---|---|
| Total Fuel ex Ngas exchange = | 57532 |
| Uranium = | 1514 |
| Coal = | 8962 |
| FuelOil = | 1173 |
| Gasoil/Diesel= | 18031 |
| Petrol/JP = | 15219 |
| Gas handling = | 6381 |
| Biomass = | 6252 |
| Food income = | 0 |
| Waste = | 0 |
| Total Ngas Exchange costs = | 20916 |
| Marginal operation costs = | 2007 |
| Total Electricity exchange = | 23 |
| Import = | 0 |
| Export = | 0 |
| Bottleneck = | 0 |
| Fixed imp/ex= | 23 |
| Total CO2 emission costs = | 11327 |
| Total variable costs = | 91805 |
| Fixed operation costs = | 5068 |
| Annual Investment costs = | 11191 |
| TOTAL ANNUAL COSTS = | 108064 |

## NATURAL GAS EXCHANGE

| | DHP & Boilers MW | CHP2 CHP3 MW | PP CAES MW | Indi-vidual MW | Trans port MW | Indu. Var. MW | Demand Sum MW | Bio-gas MW | Syn-gas MW | CO2Hy gas MW | SynHy gas MW | SynHy gas MW | Stor-age MW | Sum MW | Im-port MW | Ex-port MW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| January | 2622 | 33958 | 0 | 84643 | 180 | 32459 | 153862 | 0 | 0 | 0 | 0 | 0 | 0 | 153862 | 153862 | 0 |
| February | 1283 | 40961 | 0 | 81076 | 180 | 32459 | 155959 | 0 | 0 | 0 | 0 | 0 | 0 | 155959 | 155959 | 0 |
| March | 1208 | 35275 | 0 | 70108 | 180 | 32459 | 139230 | 0 | 0 | 0 | 0 | 0 | 0 | 139230 | 139230 | 0 |
| April | 333 | 15910 | 0 | 22471 | 180 | 32459 | 71353 | 0 | 0 | 0 | 0 | 0 | 0 | 71353 | 71353 | 0 |
| May | 186 | 9528 | 0 | 7326 | 180 | 32459 | 49678 | 0 | 0 | 0 | 0 | 0 | 0 | 49678 | 49678 | 0 |
| June | 186 | 9528 | 0 | 7326 | 180 | 32459 | 49678 | 0 | 0 | 0 | 0 | 0 | 0 | 49678 | 49678 | 0 |
| July | 186 | 9528 | 0 | 7326 | 180 | 32459 | 49678 | 0 | 0 | 0 | 0 | 0 | 0 | 49678 | 49678 | 0 |
| August | 186 | 9528 | 0 | 7326 | 180 | 32459 | 49678 | 0 | 0 | 0 | 0 | 0 | 0 | 49678 | 49678 | 0 |
| September | 186 | 9528 | 0 | 7326 | 180 | 32459 | 49679 | 0 | 0 | 0 | 0 | 0 | 0 | 49679 | 49679 | 0 |
| October | 305 | 23343 | 0 | 36097 | 180 | 32459 | 92384 | 0 | 0 | 0 | 0 | 0 | 0 | 92384 | 92384 | 0 |
| November | 1124 | 34172 | 0 | 67134 | 180 | 32459 | 135069 | 0 | 0 | 0 | 0 | 0 | 0 | 135069 | 135069 | 0 |
| December | 2344 | 34646 | 0 | 82533 | 180 | 32459 | 152161 | 0 | 0 | 0 | 0 | 0 | 0 | 152161 | 152161 | 0 |
| Average | 848 | 22109 | 0 | 39986 | 180 | 32459 | 95582 | 0 | 0 | 0 | 0 | 0 | 0 | 95582 | 95582 | 0 |
| Maximum | 10017 | 73636 | 0 | 166649 | 180 | 32459 | 251467 | 0 | 0 | 0 | 0 | 0 | 0 | 251467 | 251467 | 0 |
| Minimum | 186 | 9512 | 0 | 400 | 180 | 32459 | 42737 | 0 | 0 | 0 | 0 | 0 | 0 | 42737 | 42737 | 0 |
| Total for the whole year | | | | | | | | | | | | | | | | |
| TWh/year | 7,45 | 194,21 | 0,00 | 351,24 | 1,58 | 285,12 | 839,59 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 839,59 | 839,59 | 0,00 |

RES Share: 11,8 Percent of Primary Energy 30,2 Percent of Electricity 148,2 TWh electricity from RES

# Input ES 2015.txt

# The EnergyPLAN model 12.4

| | | | |
|---|---|---|---|
| Electricity demand (TWh/year): | | Flexible demand | 14,67 |
| Fixed demand | 198,58 | Fixed imp/exp. | 1,72 |
| Electric heating + HP | 37,75 | Transportation | 7,14 |
| Electric cooling | 10,22 | Total | 270,08 |

| District heating (TWh/year) | Gr.1 | Gr.2 | Gr.3 | Sum |
|---|---|---|---|---|
| District heating demand | 0,00 | 0,00 | 2,63 | 2,63 |
| Solar Thermal | 0,00 | 0,00 | 0,00 | 0,00 |
| Industrial CHP (CSHP) | 0,00 | 0,00 | 0,00 | 0,00 |
| Demand after solar and CSHP | 0,00 | 0,00 | 2,63 | 2,63 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Wind | 23029 | MW | 45,92 | TWh/year | 0,00 | Grid |
| Offshore Wind | 0 | MW | 0 | TWh/year | 0,00 | stabili- |
| Photo Voltaic | 5935 | MW | 8,82 | TWh/year | 0,00 | sation |
| River Hydro | 2733 | MW | 8,63 | TWh/year | 0,00 | share |
| Hydro Power | 10075 | MW | 21,97 | TWh/year | | |
| Geothermal/Nuclear | 7568 | MW | 60,37 | TWh/year | | |

| Group 2: | Capacities MW-e | Capacities MJ/s | Efficiencies elec. | Efficiencies Ther | COP |
|---|---|---|---|---|---|
| CHP | 0 | 0 | 0,40 | 0,50 | |
| Heat Pump | 0 | 0 | | | 3,00 |
| Boiler | | 0 | | 0,50 | |
| Group 3: | | | | | |
| CHP | 858 | 1106 | 0,34 | 0,44 | |
| Heat Pump | 0 | 0 | | | 3,00 |
| Boiler | | 1588 | | 0,90 | |
| Condensing | 41823 | | 0,41 | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Heatstorage: | gr.2: | 0 | GWh | gr.3: | 0 | GWh |
| Fixed Boiler: | gr.2: | 2,5 | Per cent | gr.3: | 10,0 | Per cent |

| Electricity prod. from | CSHP | Waste | (TWh/year) |
|---|---|---|---|
| Gr.1: | 0,00 | 0,00 | |
| Gr.2: | 0,00 | 0,00 | |
| Gr.3: | 19,47 | 0,00 | |

| | | |
|---|---|---|
| Regulation Strategy: | Technical regulation no. 2 | |
| CEEP regulation | 23450000 | |
| Minimum Stabilisation share | 0,25 | |
| Stabilisation share of CHP | 0,00 | |
| Minimum CHP gr 3 load | 86 | MW |
| Minimum PP | 2091 | MW |
| Heat Pump maximum share | 0,50 | |
| Maximum import/export | 0 | MW |

| | | |
|---|---|---|
| Distr. Name : | const.txt | |
| Addition factor | 0,00 | EUR/MWh |
| Multiplication factor | 1,00 | |
| Dependency factor | 0,00 | EUR/MWh pr. MW |
| Average Market Price | 1 | EUR/MWh |
| Gas Storage | 0 | GWh |
| Syngas capacity | 0 | MW |
| Biogas max to grid | 0 | MW |

Fuel Price level:

| | Capacities MW-e | Storage GWh | Efficiencies elec. | Efficiencies Ther. |
|---|---|---|---|---|
| Hydro Pump: | 5264 | 53 | 0,00 | |
| Hydro Turbine: | 5264 | | 0,00 | |
| Electrol. Gr.2: | 0 | 0 | 0,40 | 0,50 |
| Electrol. Gr.3: | 0 | 0 | 0,40 | 0,50 |
| Electrol. trans.: | 0 | 0 | 0,00 | |
| Ely. MicroCHP: | 0 | 0 | 0,80 | |
| CAES fuel ratio: | | 0,000 | | |

| (TWh/year) | Coal | Oil | Ngas | Biomass |
|---|---|---|---|---|
| Transport | 0,00 | 350,73 | 1,03 | 0,00 |
| Household | 1,52 | 29,79 | 56,85 | 25,38 |
| Industry | 16,12 | 10,27 | 112,43 | 45,57 |
| Various | 0,00 | 19,24 | 1,28 | 4,06 |

# Output WARNING!!: (1) Critical Excess;

| | District Heating | | | | | | | | | | Electricity | | | | | | | | | | | | | | | Exchange | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Demand | Production | | | | | | | | | Consumption | | | | | | Production | | | | | | | Balance | | | | |
| | Distr. heating MW | Solar MW | Waste+ CSHP MW | DHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Balance MW | Elec. demand MW | Flex.& Transp. MW | HP MW | Elec-trolyser MW | EH MW | Hydro Pump MW | Tur-bine MW | RES MW | Hy-dro MW | Geo-thermal MW | Waste+ CSHP MW | CHP MW | PP MW | Stab-Load % | Imp MW | Exp MW | CEEP MW | EEP MW | Payment Imp Million EUR | Payment Exp Million EUR |
| January | 621 | 0 | 0 | 0 | 592 | 0 | 0 | 50 | 0 | -21 | 24980 | 2467 | 0 | 0 | 9387 | 0 | 0 | 9025 | 3111 | 7747 | 2217 | 459 | 14545 | 274 | 0 | 219 | 219 | 0 | 0 | 0 |
| February | 568 | 0 | 0 | 0 | 508 | 0 | 0 | 81 | 0 | -21 | 25460 | 2490 | 0 | 0 | 8510 | 0 | 0 | 13819 | 3385 | 7722 | 2217 | 394 | 9637 | 224 | 0 | 821 | 821 | 0 | 0 | 0 |
| March | 446 | 0 | 0 | 0 | 424 | 0 | 0 | 44 | 0 | -22 | 23478 | 2499 | 0 | 0 | 6606 | 0 | 0 | 9696 | 3046 | 7675 | 2217 | 329 | 9816 | 251 | 0 | 168 | 168 | 0 | 0 | 0 |
| April | 188 | 0 | 0 | 0 | 194 | 0 | 0 | 32 | 0 | -39 | 21595 | 2462 | 0 | 0 | 2537 | 0 | 0 | 7227 | 2735 | 7097 | 2217 | 151 | 7301 | 258 | 0 | 49 | 49 | 0 | 0 | 0 |
| May | 94 | 0 | 0 | 0 | 113 | 0 | 0 | 30 | 0 | -49 | 22570 | 2499 | 0 | 0 | 1055 | 0 | 0 | 8271 | 2729 | 5268 | 2217 | 88 | 8000 | 243 | 0 | 121 | 121 | 0 | 0 | 0 |
| June | 94 | 0 | 0 | 0 | 113 | 0 | 0 | 30 | 0 | -49 | 24416 | 2494 | 0 | 0 | 1057 | 0 | 0 | 5698 | 1104 | 5804 | 2217 | 88 | 13210 | 288 | 0 | 0 | 0 | 0 | 0 | 0 |
| July | 94 | 0 | 0 | 0 | 113 | 0 | 0 | 30 | 0 | -49 | 27091 | 2466 | 0 | 0 | 1057 | 0 | 0 | 4808 | 1222 | 7099 | 2217 | 88 | 15293 | 310 | 0 | 0 | 0 | 0 | 0 | 0 |
| August | 94 | 0 | 0 | 0 | 113 | 0 | 0 | 30 | 0 | -49 | 24569 | 2499 | 0 | 0 | 1057 | 0 | 0 | 4984 | 2045 | 7339 | 2217 | 88 | 11680 | 299 | 0 | 79 | 79 | 0 | 0 | 0 |
| September | 94 | 0 | 0 | 0 | 113 | 0 | 0 | 30 | 0 | -49 | 23073 | 2477 | 0 | 0 | 1057 | 0 | 0 | 5258 | 1731 | 7396 | 2217 | 88 | 10276 | 291 | 0 | 252 | 252 | 0 | 0 | 0 |
| October | 225 | 0 | 0 | 0 | 230 | 0 | 0 | 31 | 0 | -35 | 22135 | 2483 | 0 | 0 | 3136 | 0 | 0 | 6403 | 2509 | 6051 | 2217 | 178 | 10969 | 278 | 0 | 194 | 194 | 0 | 0 | 0 |
| November | 483 | 0 | 0 | 0 | 463 | 0 | 0 | 42 | 0 | -22 | 23004 | 2494 | 0 | 0 | 7191 | 0 | 0 | 6227 | 3108 | 6104 | 2217 | 359 | 15298 | 296 | 0 | 185 | 185 | 0 | 0 | 0 |
| December | 599 | 0 | 0 | 0 | 587 | 0 | 0 | 33 | 0 | -21 | 22881 | 2466 | 0 | 0 | 9018 | 0 | 0 | 5427 | 3297 | 7187 | 2217 | 455 | 16434 | 308 | 0 | 41 | 41 | 0 | 0 | 0 |
| Average | 299 | 0 | 0 | 0 | 297 | 0 | 0 | 38 | 0 | -36 | 23770 | 2483 | 0 | 0 | 4298 | 0 | 0 | 7213 | 2501 | 6872 | 2217 | 230 | 11888 | 277 | 0 | 175 | 175 | 0 | Average price | |
| Maximum | 1323 | 0 | 0 | 0 | 1106 | 0 | 0 | 1010 | 0 | 0 | 35854 | 4141 | 0 | 0 | 20443 | 0 | 0 | 29234 | 4891 | 7747 | 2217 | 858 | 33469 | 375 | 0 | 16575 | 16575 | 0 | (EUR/MWh) | |
| Minimum | 30 | 0 | 0 | 0 | 111 | 0 | 0 | 30 | 0 | -110 | 924 | 1670 | 0 | 0 | 0 | 0 | 0 | 579 | 0 | 5252 | 2217 | 86 | 2091 | 101 | 0 | 0 | 0 | 0 | 1 | 0 |
| TWh/year | 2,63 | 0,00 | 0,00 | 0,00 | 2,60 | 0,00 | 0,00 | 0,34 | 0,00 | -0,31 | 208,80 | 21,81 | 0,00 | 0,00 | 37,75 | 0,00 | 0,00 | 63,36 | 21,97 | 60,37 | 19,47 | 2,02 | 104,42 | | 0,00 | 1,53 | 1,53 | 0,00 | 0 | 0 |

| FUEL BALANCE (TWh/year): | DHP | CHP2 | CHP3 | Boiler2 | Boiler3 | PP | Geo/Nu. | Hydro | Waste | CAES Elc.ly. | BioCon-version | Electro-Fuel | Wind | Offsh. | PV | Hydro | Solar.Th | Transp. | Industry household | Industry Various | Total | Imp/Exp Corrected Imp/Exp | Imp/Exp Corrected Net | CO2 emission (Mt): Total | CO2 emission (Mt): Net |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Coal | - | - | - | - | 0,00 | 118,10 | - | - | - | - | - | - | - | - | - | - | - | - | 1,52 | 16,12 | 135,74 | -1,73 | 134,00 | 48,13 | 47,52 |
| Oil | - | - | 0,40 | - | 0,02 | 5,88 | - | - | - | - | - | - | - | - | - | - | - | 350,73 | 27,93 | 29,51 | 414,47 | -0,09 | 414,38 | 108,77 | 108,75 |
| N.Gas | - | - | 4,77 | - | 0,30 | 130,71 | - | - | - | - | - | - | - | - | - | - | - | 1,03 | 56,85 | 113,71 | 307,37 | -1,92 | 305,45 | 62,96 | 62,57 |
| Biomass | - | - | 0,80 | - | 0,05 | - | - | - | - | - | 14,97 | - | - | - | - | - | - | - | 25,38 | 49,63 | 90,83 | 0,00 | 90,83 | 0,00 | 0,00 |
| Renewable | - | - | - | - | - | - | - | 21,97 | - | - | - | - | 45,92 | - | 8,82 | 8,63 | 1,48 | - | - | - | 86,81 | 0,00 | 86,81 | 0,00 | 0,00 |
| H2 etc. | - | - | 0,00 | - | 0,00 | 0,00 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Biofuel | - | - | - | - | - | - | - | - | - | - | -13,71 | - | - | - | - | - | - | 13,71 | - | - | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Nuclear/CCS | - | - | - | - | - | - | 201,23 | - | - | - | - | - | - | - | - | - | - | - | - | - | 201,23 | 0,00 | 201,23 | 0,00 | 0,00 |
| Total | - | - | 5,96 | - | 0,37 | 254,69 | 201,23 | 21,97 | - | - | 1,27 | - | 45,92 | - | 8,82 | 8,63 | 1,48 | 365,47 | 111,68 | 208,97 | 1236,44 | -3,74 | 1232,70 | 219,87 | 218,84 |

District Heating Production

| | Gr.1 | | | | Gr.2 | | | | | | | | | | Gr.3 | | | | | | | | | | RES specification | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | District heating MW | Solar MW | CSHP MW | DHP MW | District heating MW | Solar MW | CSHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Stor-age MW | Ba-lance MW | District heating MW | Solar MW | CSHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Stor-age MW | Ba-lance MW | RES1 Wind MW | RES2 Offsho MW | RES3 Photo MW | RES 4-7 MW | Total ic MW |
| January | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 621 | 0 | 0 | 592 | 0 | 0 | 50 | 0 | 0 | -21 | 7459 | 0 | 545 | 1022 | 9025 |
| February | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 568 | 0 | 0 | 508 | 0 | 0 | 81 | 0 | 0 | -21 | 10995 | 0 | 751 | 2073 | 13819 |
| March | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 446 | 0 | 0 | 424 | 0 | 0 | 44 | 0 | 0 | -22 | 6661 | 0 | 1020 | 2015 | 9696 |
| April | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 188 | 0 | 0 | 194 | 0 | 0 | 32 | 0 | 0 | -39 | 4859 | 0 | 1224 | 1143 | 7227 |
| May | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 94 | 0 | 0 | 113 | 0 | 0 | 30 | 0 | 0 | -49 | 5609 | 0 | 1318 | 1344 | 8271 |
| June | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 94 | 0 | 0 | 113 | 0 | 0 | 30 | 0 | 0 | -49 | 3184 | 0 | 1426 | 1089 | 5698 |
| July | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 94 | 0 | 0 | 113 | 0 | 0 | 30 | 0 | 0 | -49 | 2640 | 0 | 1454 | 714 | 4808 |
| August | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 94 | 0 | 0 | 113 | 0 | 0 | 30 | 0 | 0 | -49 | 3181 | 0 | 1328 | 475 | 4984 |
| September | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 94 | 0 | 0 | 113 | 0 | 0 | 30 | 0 | 0 | -49 | 3656 | 0 | 1114 | 487 | 5258 |
| October | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 225 | 0 | 0 | 230 | 0 | 0 | 31 | 0 | 0 | -35 | 5112 | 0 | 795 | 496 | 6403 |
| November | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 483 | 0 | 0 | 463 | 0 | 0 | 42 | 0 | 0 | -22 | 5008 | 0 | 583 | 636 | 6227 |
| December | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 599 | 0 | 0 | 587 | 0 | 0 | 33 | 0 | 0 | -21 | 4605 | 0 | 479 | 343 | 5427 |
| Average | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 299 | 0 | 0 | 297 | 0 | 0 | 38 | 0 | 0 | -36 | 5228 | 0 | 1004 | 982 | 7213 |
| Maximum | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1323 | 0 | 0 | 1106 | 0 | 0 | 1010 | 0 | 0 | 0 | 22977 | 0 | 5935 | 2733 | 29234 |
| Minimum | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 30 | 0 | 0 | 111 | 0 | 0 | 30 | 0 | 0 | -110 | 7 | 0 | 0 | 0 | 579 |
| Total for the whole year | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TWh/year | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | | 0,00 | 2,63 | 0,00 | 0,00 | 2,60 | 0,00 | 0,00 | 0,34 | 0,00 | | -0,31 | 45,92 | 0,00 | 8,82 | 8,63 | 63,36 |

Own use of heat from industrial CHP: 0,00 TWh/year

ANNUAL COSTS (Million EUR)

| | |
|---|---|
| Total Fuel ex Ngas exchange = | 22232 |
| Uranium = | 1268 |
| Coal = | 1270 |
| FuelOil = | 876 |
| Gasoil/Diesel= | 7905 |
| Petrol/JP = | 6966 |
| Gas handling = | 1675 |
| Biomass = | 2271 |
| Food income = | 0 |
| Waste = | 0 |
| Total Ngas Exchange costs = | 7657 |
| Marginal operation costs = | 1212 |
| Total Electricity exchange = | 2 |
| Import = | 0 |
| Export = | 0 |
| Bottleneck = | 0 |
| Fixed imp/ex= | 2 |
| Total CO2 emission costs = | 3342 |
| Total variable costs = | 34446 |
| Fixed operation costs = | 3088 |
| Annual Investment costs = | 6597 |
| TOTAL ANNUAL COSTS = | 44130 |

NATURAL GAS EXCHANGE

| | DHP & Boilers MW | CHP2 CHP3 MW | PP CAES MW | Indi-vidual MW | Trans port MW | Indu. Var. MW | Demand Sum MW | Bio-gas MW | Syn-gas MW | CO2Hy gas MW | SynHy gas MW | SynHy gas MW | Stor-age MW | Sum MW | Im-port MW | Ex-port MW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| January | 45 | 1084 | 18207 | 14115 | 117 | 12945 | 46513 | 0 | 0 | 0 | 0 | 0 | 0 | 46513 | 46513 | 0 |
| February | 72 | 929 | 12064 | 12839 | 117 | 12945 | 38966 | 0 | 0 | 0 | 0 | 0 | 0 | 38966 | 38966 | 0 |
| March | 39 | 776 | 12287 | 9949 | 117 | 12945 | 36114 | 0 | 0 | 0 | 0 | 0 | 0 | 36114 | 36114 | 0 |
| April | 29 | 355 | 9140 | 3818 | 117 | 12945 | 26403 | 0 | 0 | 0 | 0 | 0 | 0 | 26403 | 26403 | 0 |
| May | 27 | 207 | 10014 | 1592 | 117 | 12945 | 24902 | 0 | 0 | 0 | 0 | 0 | 0 | 24902 | 24902 | 0 |
| June | 27 | 207 | 16537 | 1592 | 117 | 12945 | 31425 | 0 | 0 | 0 | 0 | 0 | 0 | 31425 | 31425 | 0 |
| July | 27 | 207 | 19143 | 1592 | 117 | 12945 | 34032 | 0 | 0 | 0 | 0 | 0 | 0 | 34032 | 34032 | 0 |
| August | 27 | 207 | 14621 | 1592 | 117 | 12945 | 29510 | 0 | 0 | 0 | 0 | 0 | 0 | 29510 | 29510 | 0 |
| September | 27 | 207 | 12864 | 1592 | 117 | 12945 | 27752 | 0 | 0 | 0 | 0 | 0 | 0 | 27752 | 27752 | 0 |
| October | 27 | 421 | 13731 | 4715 | 117 | 12945 | 31957 | 0 | 0 | 0 | 0 | 0 | 0 | 31957 | 31957 | 0 |
| November | 37 | 847 | 19150 | 10837 | 117 | 12945 | 43934 | 0 | 0 | 0 | 0 | 0 | 0 | 43934 | 43934 | 0 |
| December | 29 | 1074 | 20572 | 13580 | 117 | 12945 | 48318 | 0 | 0 | 0 | 0 | 0 | 0 | 48318 | 48318 | 0 |
| Average | 34 | 543 | 14881 | 6472 | 117 | 12945 | 34992 | 0 | 0 | 0 | 0 | 0 | 0 | 34992 | 34992 | 0 |
| Maximum | 898 | 2024 | 41897 | 30787 | 117 | 12945 | 84674 | 0 | 0 | 0 | 0 | 0 | 0 | 84674 | 84674 | 0 |
| Minimum | 27 | 202 | 2617 | 86 | 117 | 12945 | 15995 | 0 | 0 | 0 | 0 | 0 | 0 | 15995 | 15995 | 0 |
| Total for the whole year | | | | | | | | | | | | | | | | |
| TWh/year | 0,30 | 4,77 | 130,71 | 56,85 | 1,03 | 113,71 | 307,37 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 307,37 | 307,37 | 0,00 |

RES Share: 14,4 Percent of Primary Energy 33,7 Percent of Electricity 85,6 TWh electricity from RES

# Input FI 2015.txt — The EnergyPLAN model 12.4

| | | | |
|---|---|---|---|
| Electricity demand (TWh/year): | | Flexible demand | 2,17 |
| Fixed demand | 58,61 | Fixed imp/exp. | -15,51 |
| Electric heating + HP | 19,92 | Transportation | 1,02 |
| Electric cooling | 0,24 | Total | 66,45 |

| District heating (TWh/year) | Gr.1 | Gr.2 | Gr.3 | Sum |
|---|---|---|---|---|
| District heating demand | 0,00 | 0,00 | 48,36 | 48,36 |
| Solar Thermal | 0,00 | 0,00 | 0,18 | 0,18 |
| Industrial CHP (CSHP) | 0,00 | 0,00 | 0,00 | 0,00 |
| Demand after solar and CSHP | 0,00 | 0,00 | 48,18 | 48,18 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Wind | 1275 | MW | 2,38 | TWh/year | 0,00 | Grid |
| Offshore Wind | 0 | MW | 0 | TWh/year | 0,00 | stabili- |
| Photo Voltaic | 0 | MW | 0 | TWh/year | 0,00 | sation |
| River Hydro | 36 | MW | 0,19 | TWh/year | 0,00 | share |
| Hydro Power | 3581 | MW | 15,3 | TWh/year | | |
| Geothermal/Nuclear | 4262 | MW | 34,48 | TWh/year | | |

| | Capacities MW-e | MJ/s | Efficiencies elec. | Ther | COP |
|---|---|---|---|---|---|
| Group 2: | | | | | |
| CHP | 0 | 0 | 0,40 | 0,50 | |
| Heat Pump | 0 | 0 | | | 3,00 |
| Boiler | | 0 | | 0,50 | |
| Group 3: | | | | | |
| CHP | 1863 | 9350 | 0,31 | 1,54 | |
| Heat Pump | 44 | 155 | | | 3,51 |
| Boiler | | 26120 | | 0,90 | |
| Condensing | 11900 | | 0,33 | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Heatstorage: | gr.2: | 0 | GWh | gr.3: | 0 | GWh |
| Fixed Boiler: | gr.2: | 2,5 | Per cent | gr.3: | 10,0 | Per cent |

| Electricity prod. from | CSHP | Waste | (TWh/year) |
|---|---|---|---|
| Gr.1: | 0,00 | 0,00 | |
| Gr.2: | 0,00 | 0,00 | |
| Gr.3: | 1,94 | 0,00 | |

| | | |
|---|---|---|
| Regulation Strategy: | Technical regulation no. 2 | |
| CEEP regulation | 23450000 | |
| Minimum Stabilisation share | 0,25 | |
| Stabilisation share of CHP | 0,00 | |
| Minimum CHP gr 3 load | 93 | MW |
| Minimum PP | 0 | MW |
| Heat Pump maximum share | 0,50 | |
| Maximum import/export | 0 | MW |

| | | |
|---|---|---|
| Distr. Name : | const.txt | |
| Addition factor | 0,00 | EUR/MWh |
| Multiplication factor | 1,00 | |
| Dependency factor | 0,00 | EUR/MWh pr. MW |
| Average Market Price | 1 | EUR/MWh |
| Gas Storage | 0 | GWh |
| Syngas capacity | 0 | MW |
| Biogas max to grid | 0 | MW |

Fuel Price level:

| | Capacities MW-e | Storage GWh | Efficiencies elec. | Ther. |
|---|---|---|---|---|
| Hydro Pump: | 0 | 0 | 0,00 | |
| Hydro Turbine: | 0 | | 0,00 | |
| Electrol. Gr.2: | 0 | 0 | 0,40 | 0,50 |
| Electrol. Gr.3: | 0 | 0 | 0,40 | 0,50 |
| Electrol. trans.: | 0 | 0 | 0,00 | |
| Ely. MicroCHP: | 0 | 0 | 0,80 | |
| CAES fuel ratio: | | 0,000 | | |

| (TWh/year) | Coal | Oil | Ngas | Biomass |
|---|---|---|---|---|
| Transport | 0,00 | 48,22 | 0,00 | 0,00 |
| Household | 0,13 | 3,73 | 3,66 | 13,32 |
| Industry | 7,14 | 24,57 | 11,46 | 26,00 |
| Various | 0,25 | 7,97 | 0,28 | 26,16 |

# Output WARNING!!: (1) Critical Excess;

| | District Heating | | | | | | | | | | Electricity | | | | | | | | | | | | | | | | Exchange | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Demand | Production | | | | | | | | Balance | Consumption | | | | | | Production | | | | | | | | Balance | | | | Payment | |
| | Distr. heating MW | Solar MW | Waste+ CSHP MW | DHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Balance MW | Elec. demand MW | Flex.& Transp. MW | HP MW | Elec-trolyser MW | EH MW | Hydro Pump MW | Tur-bine MW | RES MW | Hy-dro MW | Geo-thermal MW | Waste+ CSHP MW | CHP MW | PP MW | Stab-Load % | Imp MW | Exp MW | CEEP MW | EEP MW | Imp Million EUR | Exp Million EUR |
| January | 11050 | 4 | 9 | 0 | 7755 | 155 | 0 | 3193 | 0 | -65 | 8048 | 361 | 649 | 0 | 4140 | 0 | 0 | 394 | 2097 | 4252 | 221 | 1545 | 2357 | 376 | 0 | 140 | 140 | 0 | 0 | 0 |
| February | 11428 | 10 | 9 | 0 | 7808 | 155 | 0 | 3509 | 0 | -63 | 7718 | 364 | 670 | 0 | 4285 | 0 | 0 | 501 | 1950 | 3332 | 221 | 1556 | 3165 | 371 | 0 | 51 | 51 | 0 | 0 | 0 |
| March | 9524 | 20 | 9 | 0 | 7307 | 155 | 0 | 2106 | 0 | -73 | 7295 | 365 | 562 | 0 | 3552 | 0 | 0 | 389 | 1870 | 4238 | 221 | 1456 | 1877 | 375 | 0 | 94 | 94 | 0 | 0 | 0 |
| April | 3552 | 31 | 9 | 0 | 2779 | 155 | 0 | 676 | 0 | -99 | 6613 | 360 | 221 | 0 | 1216 | 0 | 0 | 284 | 1610 | 4150 | 221 | 554 | 398 | 372 | 0 | 337 | 337 | 0 | 0 | 0 |
| May | 1309 | 37 | 9 | 0 | 691 | 155 | 0 | 531 | 0 | -114 | 5992 | 365 | 95 | 0 | 345 | 0 | 0 | 267 | 1547 | 3143 | 221 | 138 | 163 | 365 | 0 | 79 | 79 | 0 | 0 | 0 |
| June | 1309 | 40 | 9 | 0 | 472 | 155 | 0 | 748 | 0 | -114 | 5775 | 365 | 94 | 0 | 340 | 0 | 0 | 229 | 1626 | 3973 | 221 | 94 | 2 | 371 | 0 | 724 | 724 | 0 | 0 | 0 |
| July | 1309 | 38 | 9 | 0 | 469 | 155 | 0 | 752 | 0 | -114 | 5736 | 361 | 94 | 0 | 340 | 0 | 0 | 128 | 1446 | 4111 | 221 | 93 | 0 | 377 | 0 | 1060 | 1060 | 0 | 0 | 1 |
| August | 1309 | 30 | 9 | 0 | 487 | 155 | 0 | 741 | 0 | -113 | 5791 | 365 | 94 | 0 | 340 | 0 | 0 | 118 | 1520 | 3443 | 221 | 97 | 1 | 375 | 0 | 741 | 741 | 0 | 0 | 0 |
| September | 1309 | 21 | 9 | 0 | 514 | 155 | 0 | 723 | 0 | -113 | 6048 | 362 | 94 | 0 | 340 | 0 | 0 | 213 | 1640 | 3788 | 221 | 102 | 3 | 371 | 0 | 866 | 866 | 0 | 0 | 1 |
| October | 5197 | 9 | 9 | 0 | 4225 | 155 | 0 | 893 | 0 | -93 | 6812 | 363 | 315 | 0 | 1855 | 0 | 0 | 261 | 1701 | 4226 | 221 | 842 | 839 | 376 | 0 | 302 | 302 | 0 | 0 | 0 |
| November | 8630 | 3 | 9 | 0 | 7138 | 155 | 0 | 1403 | 0 | -78 | 7214 | 365 | 513 | 0 | 3210 | 0 | 0 | 323 | 1935 | 4159 | 221 | 1422 | 1473 | 377 | 0 | 176 | 176 | 0 | 0 | 0 |
| December | 10288 | 2 | 9 | 0 | 7559 | 155 | 0 | 2632 | 0 | -68 | 7380 | 361 | 605 | 0 | 3840 | 0 | 0 | 421 | 1973 | 4262 | 221 | 1506 | 2202 | 375 | 0 | 108 | 108 | 0 | 0 | 0 |
| Average | 5505 | 20 | 9 | 0 | 3926 | 155 | 0 | 1488 | 0 | -92 | 6699 | 363 | 333 | 0 | 1979 | 0 | 0 | 293 | 1742 | 3925 | 221 | 782 | 1035 | 373 | 0 | 390 | 390 | 0 | Average price | |
| Maximum | 21767 | 152 | 9 | 0 | 9350 | 155 | 0 | 12253 | 0 | 0 | 9634 | 1612 | 1262 | 0 | 8344 | 0 | 0 | 802 | 2114 | 4262 | 221 | 1863 | 8167 | 393 | 0 | 5074 | 5074 | 0 | (EUR/MWh) | |
| Minimum | 485 | 0 | 9 | 0 | 467 | 155 | 0 | 331 | 0 | -477 | 20 | 0 | 44 | 0 | 0 | 0 | 0 | 22 | 1446 | 3115 | 221 | 93 | 0 | 334 | 0 | 0 | 0 | 0 | 1 | 1 |
| TWh/year | 48,36 | 0,18 | 0,08 | 0,00 | 34,48 | 1,36 | 0,00 | 13,07 | 0,00 | -0,81 | 58,85 | 3,19 | 2,92 | 0,00 | 17,38 | 0,00 | 0,00 | 2,58 | 15,30 | 34,48 | 1,94 | 6,87 | 9,09 | | 0,00 | 3,43 | 3,43 | 0,00 | 0 | 3 |

| FUEL BALANCE (TWh/year): | DHP | CHP2 | CHP3 | Boiler2 | Boiler3 | PP | Geo/Nu. | Hydro | Waste | CAES Elc.ly. | BioCon-version | Electro-Fuel | Wind | Offsh. | PV | Hydro | Solar.Th | Transp. | Industry household | Industry Various | Total | Imp/Exp Corrected Imp/Exp | Imp/Exp Corrected Net | CO2 emission (Mt): Total | CO2 emission (Mt): Net |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Coal | - | - | 14,14 | - | - | 21,89 | - | - | - | - | - | - | - | - | - | - | - | - | 0,13 | 7,39 | 43,55 | -8,25 | 35,29 | 15,44 | 12,52 |
| Oil | - | - | - | - | 1,51 | 3,19 | - | - | - | - | - | - | - | - | - | - | - | 48,22 | 3,73 | 32,54 | 89,20 | -1,20 | 87,99 | 23,41 | 23,09 |
| N.Gas | - | - | 8,20 | - | 5,23 | 2,46 | - | - | - | - | - | - | - | - | - | - | - | - | 3,66 | 11,74 | 31,29 | -0,93 | 30,36 | 6,41 | 6,22 |
| Biomass | - | - | - | - | 7,78 | - | - | - | 0,10 | - | 3,78 | - | - | - | - | - | - | - | 13,32 | 52,16 | 77,14 | 0,00 | 77,14 | 0,01 | 0,01 |
| Renewable | - | - | - | - | - | - | - | 15,30 | - | - | - | - | 2,38 | - | - | 0,19 | 0,18 | - | - | - | 18,06 | 0,00 | 18,06 | 0,00 | 0,00 |
| H2 etc. | - | - | 0,00 | - | 0,00 | 0,00 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Biofuel | - | - | - | - | - | - | - | - | - | - | -2,53 | - | - | - | - | - | - | 2,53 | - | - | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Nuclear/CCS | - | - | - | - | - | - | 114,93 | - | - | - | - | - | - | - | - | - | - | - | - | - | 114,93 | 0,00 | 114,93 | 0,00 | 0,00 |
| Total | - | - | 22,33 | - | 14,52 | 27,54 | 114,93 | 15,30 | 0,10 | - | 1,26 | - | 2,38 | - | - | 0,19 | 0,18 | 50,75 | 20,84 | 103,83 | 374,17 | -10,38 | 363,78 | 45,27 | 41,84 |

## District Heating Production

| | Gr.1 | | | | Gr.2 | | | | | | | | | | Gr.3 | | | | | | | | | | RES specification | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | District heating MW | Solar MW | CSHP MW | DHP MW | District heating MW | Solar MW | CSHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Stor-age MW | Ba-lance MW | District heating MW | Solar MW | CSHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Stor-age MW | Ba-lance MW | RES1 Wind MW | RES2 Offsho MW | RES3 Photo MW | RES 4-7 ic MW | Total MW |
| January | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 11050 | 4 | 9 | 7755 | 155 | 0 | 3193 | 0 | 0 | -65 | 378 | 0 | 0 | 17 | 394 |
| February | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 11428 | 10 | 9 | 7808 | 155 | 0 | 3509 | 0 | 0 | -63 | 480 | 0 | 0 | 20 | 501 |
| March | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9524 | 20 | 9 | 7307 | 155 | 0 | 2106 | 0 | 0 | -73 | 370 | 0 | 0 | 19 | 389 |
| April | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3552 | 31 | 9 | 2779 | 155 | 0 | 676 | 0 | 0 | -99 | 263 | 0 | 0 | 21 | 284 |
| May | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1309 | 37 | 9 | 691 | 155 | 0 | 531 | 0 | 0 | -114 | 238 | 0 | 0 | 30 | 267 |
| June | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1309 | 40 | 9 | 472 | 155 | 0 | 748 | 0 | 0 | -114 | 200 | 0 | 0 | 29 | 229 |
| July | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1309 | 38 | 9 | 469 | 155 | 0 | 752 | 0 | 0 | -114 | 104 | 0 | 0 | 23 | 128 |
| August | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1309 | 30 | 9 | 487 | 155 | 0 | 741 | 0 | 0 | -113 | 94 | 0 | 0 | 24 | 118 |
| September | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1309 | 21 | 9 | 514 | 155 | 0 | 723 | 0 | 0 | -113 | 193 | 0 | 0 | 20 | 213 |
| October | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5197 | 9 | 9 | 4225 | 155 | 0 | 893 | 0 | 0 | -93 | 241 | 0 | 0 | 20 | 261 |
| November | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8630 | 3 | 9 | 7138 | 155 | 0 | 1403 | 0 | 0 | -78 | 303 | 0 | 0 | 20 | 323 |
| December | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10288 | 2 | 9 | 7559 | 155 | 0 | 2632 | 0 | 0 | -68 | 400 | 0 | 0 | 21 | 421 |
| Average | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5505 | 20 | 9 | 3926 | 155 | 0 | 1488 | 0 | 0 | -92 | 271 | 0 | 0 | 22 | 293 |
| Maximum | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 21767 | 152 | 9 | 9350 | 155 | 0 | 12253 | 0 | 0 | 0 | 782 | 0 | 0 | 36 | 802 |
| Minimum | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 485 | 0 | 9 | 467 | 155 | 0 | 331 | 0 | 0 | -477 | 1 | 0 | 0 | 0 | 22 |
| Total for the whole year TWh/year | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | | 0,00 | 48,36 | 0,18 | 0,08 | 34,48 | 1,36 | 0,00 | 13,07 | 0,00 | | -0,81 | 2,38 | 0,00 | 0,00 | 0,19 | 2,58 |

Own use of heat from industrial CHP: 0,00 TWh/year

ANNUAL COSTS (Million EUR)

| | |
|---|---|
| Total Fuel ex Ngas exchange = | 6090 |
| Uranium = | 724 |
| Coal = | 408 |
| FuelOil = | 909 |
| Gasoil/Diesel= | 937 |
| Petrol/JP = | 1113 |
| Gas handling = | 150 |
| Biomass = | 1849 |
| Food income = | 0 |
| Waste = | 0 |
| Total Ngas Exchange costs = | 779 |
| Marginal operation costs = | 580 |
| Total Electricity exchange = | -15 |
| Import = | 0 |
| Export = | -3 |
| Bottleneck = | 3 |
| Fixed imp/ex= | -15 |
| Total CO2 emission costs = | 688 |
| Total variable costs = | 8123 |
| Fixed operation costs = | 756 |
| Annual Investment costs = | 1570 |
| TOTAL ANNUAL COSTS = | 10449 |

## NATURAL GAS EXCHANGE

| | DHP & Boilers MW | CHP2 CHP3 MW | PP CAES MW | Indi-vidual MW | Trans port MW | Indu. Var. MW | Demand Sum MW | Bio-gas MW | Syn-gas MW | CO2Hy gas MW | SynHy gas MW | SynHy gas MW | Stor-age MW | Sum MW | Im-port MW | Ex-port MW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| January | 1277 | 1843 | 638 | 872 | 0 | 1337 | 5967 | 0 | 0 | 0 | 0 | 0 | 0 | 5967 | 5967 | 0 |
| February | 1404 | 1856 | 857 | 902 | 0 | 1337 | 6355 | 0 | 0 | 0 | 0 | 0 | 0 | 6355 | 6355 | 0 |
| March | 842 | 1737 | 508 | 748 | 0 | 1337 | 5172 | 0 | 0 | 0 | 0 | 0 | 0 | 5172 | 5172 | 0 |
| April | 271 | 660 | 108 | 256 | 0 | 1337 | 2632 | 0 | 0 | 0 | 0 | 0 | 0 | 2632 | 2632 | 0 |
| May | 212 | 164 | 44 | 72 | 0 | 1337 | 1829 | 0 | 0 | 0 | 0 | 0 | 0 | 1829 | 1829 | 0 |
| June | 299 | 112 | 0 | 72 | 0 | 1337 | 1820 | 0 | 0 | 0 | 0 | 0 | 0 | 1820 | 1820 | 0 |
| July | 301 | 111 | 0 | 72 | 0 | 1337 | 1821 | 0 | 0 | 0 | 0 | 0 | 0 | 1821 | 1821 | 0 |
| August | 297 | 116 | 0 | 72 | 0 | 1337 | 1821 | 0 | 0 | 0 | 0 | 0 | 0 | 1821 | 1821 | 0 |
| September | 289 | 122 | 1 | 72 | 0 | 1337 | 1821 | 0 | 0 | 0 | 0 | 0 | 0 | 1821 | 1821 | 0 |
| October | 357 | 1004 | 227 | 392 | 0 | 1337 | 3317 | 0 | 0 | 0 | 0 | 0 | 0 | 3317 | 3317 | 0 |
| November | 561 | 1696 | 399 | 675 | 0 | 1337 | 4668 | 0 | 0 | 0 | 0 | 0 | 0 | 4668 | 4668 | 0 |
| December | 1053 | 1797 | 596 | 810 | 0 | 1337 | 5592 | 0 | 0 | 0 | 0 | 0 | 0 | 5592 | 5592 | 0 |
| Average | 595 | 933 | 280 | 417 | 0 | 1337 | 3562 | 0 | 0 | 0 | 0 | 0 | 0 | 3562 | 3562 | 0 |
| Maximum | 4902 | 2222 | 2211 | 1757 | 0 | 1337 | 12134 | 0 | 0 | 0 | 0 | 0 | 0 | 12134 | 12134 | 0 |
| Minimum | 132 | 111 | 0 | 4 | 0 | 1337 | 1584 | 0 | 0 | 0 | 0 | 0 | 0 | 1584 | 1584 | 0 |
| Total for the whole year TWh/year | 5,23 | 8,20 | 2,46 | 3,66 | 0,00 | 11,74 | 31,29 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 31,29 | 31,29 | 0,00 |

RES Share: 25,4 Percent of Primary Energy 17,9 Percent of Electricity 17,9 TWh electricity from RES

# Input FR 2015.txt

# The EnergyPLAN model 12.4

| | | | |
|---|---|---|---|
| Electricity demand (TWh/year): | | Flexible demand | 29,68 |
| Fixed demand | 329,40 | Fixed imp/exp. | 57,12 |
| Electric heating + HP | 86,11 | Transportation | 14,43 |
| Electric cooling | 17,29 | Total | 534,03 |

| District heating (TWh/year) | Gr.1 | Gr.2 | Gr.3 | Sum |
|---|---|---|---|---|
| District heating demand | 0,00 | 0,00 | 30,95 | 30,95 |
| Solar Thermal | 0,00 | 0,00 | 0,03 | 0,03 |
| Industrial CHP (CSHP) | 0,00 | 0,00 | 0,00 | 0,00 |
| Demand after solar and CSHP | 0,00 | 0,00 | 30,92 | 30,92 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Wind | 9773 | MW | 17,60 | TWh/year | 0,00 | Grid |
| Offshore Wind | 0 | MW | 0 | TWh/year | 0,00 | stabili- |
| Photo Voltaic | 5699 | MW | 6,93 | TWh/year | 0,00 | sation |
| River Hydro | 5340 | MW | 17,61 | TWh/year | 0,00 | share |
| Hydro Power | 15305 | MW | 38,31 | TWh/year | | |
| Geothermal/Nuclear | 63261 | MW | 413,4 | TWh/year | | |

| | Capacities MW-e | Capacities MJ/s | Efficiencies elec. | Efficiencies Ther | COP |
|---|---|---|---|---|---|
| Group 2: | | | | | |
| CHP | 0 | 0 | 0,40 | 0,50 | |
| Heat Pump | 0 | 0 | | | 3,00 |
| Boiler | | 0 | | 0,50 | |
| Group 3: | | | | | |
| CHP | 7299 | 9045 | 0,39 | 0,48 | |
| Heat Pump | 5 | 21 | | | 4,37 |
| Boiler | | 18415 | | 0,87 | |
| Condensing | 43200 | | 0,30 | | |

| | | | | | |
|---|---|---|---|---|---|
| Heatstorage: | gr.2: | 0 | GWh | gr.3: | 0 GWh |
| Fixed Boiler: | gr.2: | 2,5 | Per cent | gr.3: | 5,0 Per cent |

| Electricity prod. from | CSHP | Waste | (TWh/year) |
|---|---|---|---|
| Gr.1: | 0,00 | 0,00 | |
| Gr.2: | 0,00 | 0,00 | |
| Gr.3: | 9,04 | 0,00 | |

| | | |
|---|---|---|
| Regulation Strategy: | Technical regulation no. 2 | |
| CEEP regulation | 23450000 | |
| Minimum Stabilisation share | 0,25 | |
| Stabilisation share of CHP | 0,00 | |
| Minimum CHP gr 3 load | 365 | MW |
| Minimum PP | 0 | MW |
| Heat Pump maximum share | 0,50 | |
| Maximum import/export | 0 | MW |

| | | |
|---|---|---|
| Distr. Name : | const.txt | |
| Addition factor | 0,00 | EUR/MWh |
| Multiplication factor | 1,00 | |
| Dependency factor | 0,00 | EUR/MWh pr. MW |
| Average Market Price | 1 | EUR/MWh |
| Gas Storage | 0 | GWh |
| Syngas capacity | 0 | MW |
| Biogas max to grid | 0 | MW |

Fuel Price level:

| | Capacities MW-e | Storage GWh | Efficiencies elec. | Ther. |
|---|---|---|---|---|
| Hydro Pump: | 6978 | 70 | 0,00 | |
| Hydro Turbine: | 6978 | | 0,00 | |
| Electrol. Gr.2: | 0 | 0 | 0,40 | 0,50 |
| Electrol. Gr.3: | 0 | 0 | 0,40 | 0,50 |
| Electrol. trans.: | 0 | 0 | 0,00 | |
| Ely. MicroCHP: | 0 | 0 | 0,80 | |
| CAES fuel ratio: | | 0,000 | | |

| (TWh/year) | Coal | Oil | Ngas | Biomass |
|---|---|---|---|---|
| Transport | 0,00 | 536,37 | 0,00 | 0,00 |
| Household | 2,67 | 50,24 | 241,59 | 83,46 |
| Industry | 49,83 | 36,15 | 140,62 | 38,66 |
| Various | 0,00 | 38,97 | 2,40 | 12,50 |

# Output WARNING!!: (1) Critical Excess;

| | District Heating | | | | | | | | | | Electricity | | | | | | | | | | | | | | | Exchange | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Demand | Production | | | | | | | | Balance | Consumption | | | | | | Production | | | | | | | Balance | | | | |
| | Distr. heating MW | Solar MW | Waste+ CSHP MW | DHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | MW | Elec. demand MW | Flex.& Transp. MW | HP MW | Elec-trolyser MW | EH MW | Hydro Pump MW | Tur-bine MW | RES MW | Hy-dro MW | Geo-thermal MW | Waste+ CSHP MW | CHP MW | PP MW | Stab-Load % | Imp MW | Exp MW | CEEP MW | EEP MW | Payment Imp Million EUR | Payment Exp Million EUR |
| January | 7562 | 2 | 59 | 0 | 6382 | 21 | 0 | 1179 | 0 | -80 | 49696 | 4990 | 5 | 0 | 21771 | 0 | 0 | 6183 | 6900 | 58200 | 1029 | 5150 | 6396 | 365 | 0 | 1293 | 1293 | 0 | 0 | 0 |
| February | 7181 | 2 | 59 | 0 | 6211 | 21 | 0 | 969 | 0 | -80 | 50556 | 5036 | 5 | 0 | 20617 | 0 | 0 | 7201 | 5543 | 54940 | 1029 | 5012 | 7180 | 358 | 0 | 872 | 872 | 0 | 0 | 0 |
| March | 5986 | 3 | 59 | 0 | 5212 | 21 | 0 | 771 | 0 | -80 | 43292 | 5054 | 5 | 0 | 17073 | 0 | 0 | 6228 | 6408 | 48856 | 1029 | 4206 | 4631 | 358 | 0 | 849 | 849 | 0 | 0 | 0 |
| April | 2079 | 4 | 59 | 0 | 1748 | 21 | 0 | 358 | 0 | -111 | 36396 | 4979 | 5 | 0 | 5561 | 0 | 0 | 5287 | 2962 | 42745 | 1029 | 1410 | 811 | 353 | 0 | 2183 | 2183 | 0 | 0 | 0 |
| May | 647 | 5 | 59 | 0 | 460 | 21 | 0 | 235 | 0 | -132 | 33581 | 5054 | 5 | 0 | 1291 | 0 | 0 | 5964 | 2145 | 40370 | 1029 | 371 | 0 | 344 | 0 | 2968 | 2968 | 0 | 0 | 0 |
| June | 647 | 5 | 59 | 0 | 469 | 21 | 0 | 226 | 0 | -133 | 35366 | 5044 | 5 | 0 | 1291 | 0 | 0 | 5024 | 2788 | 42251 | 1029 | 378 | 0 | 353 | 0 | 2244 | 2244 | 0 | 0 | 0 |
| July | 647 | 5 | 59 | 0 | 477 | 21 | 0 | 217 | 0 | -133 | 35961 | 4987 | 5 | 0 | 1291 | 0 | 0 | 3855 | 2610 | 44166 | 1029 | 385 | 1 | 363 | 0 | 2121 | 2121 | 0 | 0 | 0 |
| August | 647 | 5 | 59 | 0 | 487 | 21 | 0 | 208 | 0 | -132 | 33314 | 5053 | 5 | 0 | 1289 | 0 | 0 | 2975 | 2876 | 42507 | 1029 | 393 | 82 | 368 | 0 | 1905 | 1905 | 0 | 0 | 0 |
| September | 647 | 4 | 59 | 0 | 487 | 21 | 0 | 209 | 0 | -132 | 34619 | 5010 | 5 | 0 | 1293 | 0 | 0 | 3815 | 2243 | 42204 | 1029 | 393 | 92 | 362 | 0 | 2412 | 2412 | 0 | 0 | 0 |
| October | 2896 | 3 | 59 | 0 | 2678 | 21 | 0 | 237 | 0 | -102 | 37887 | 5022 | 5 | 0 | 7925 | 0 | 0 | 2967 | 3805 | 45940 | 1029 | 2161 | 2321 | 372 | 0 | 1571 | 1571 | 0 | 0 | 0 |
| November | 5962 | 2 | 59 | 0 | 5529 | 21 | 0 | 433 | 0 | -80 | 40901 | 5044 | 5 | 0 | 17011 | 0 | 0 | 4428 | 6333 | 49150 | 1029 | 4461 | 5655 | 369 | 0 | 746 | 746 | 0 | 0 | 0 |
| December | 7463 | 1 | 59 | 0 | 6381 | 21 | 0 | 1082 | 0 | -80 | 42428 | 4988 | 5 | 0 | 21467 | 0 | 0 | 3783 | 7697 | 53544 | 1029 | 5149 | 6534 | 375 | 0 | 1185 | 1185 | 0 | 0 | 0 |
| Average | 3523 | 3 | 59 | 0 | 3037 | 21 | 0 | 510 | 0 | -106 | 39469 | 5022 | 5 | 0 | 9803 | 0 | 0 | 4798 | 4361 | 47062 | 1029 | 2451 | 2798 | 362 | 0 | 1698 | 1698 | 0 | Average price (EUR/MWh) | |
| Maximum | 15346 | 19 | 59 | 0 | 9045 | 21 | 0 | 7127 | 0 | 0 | 64452 | 8373 | 5 | 0 | 44784 | 0 | 0 | 13813 | 15305 | 58200 | 1029 | 7299 | 32440 | 390 | 0 | 55071 | 55071 | 0 | | |
| Minimum | 233 | 0 | 59 | 0 | 452 | 21 | 0 | 156 | 0 | -454 | 1821 | 3379 | 5 | 0 | 0 | 0 | 0 | 935 | 0 | 40309 | 1029 | 365 | 0 | 297 | 0 | 0 | 0 | 0 | 1 | 0 |
| TWh/year | 30,95 | 0,03 | 0,52 | 0,00 | 26,68 | 0,18 | 0,00 | 4,48 | 0,00 | -0,93 | 346,69 | 44,11 | 0,04 | 0,00 | 86,11 | 0,00 | 0,00 | 42,15 | 38,31 | 413,40 | 9,04 | 21,53 | 24,57 | | 0,00 | 14,92 | 14,92 | 0,00 | 0 | 2 |

| FUEL BALANCE (TWh/year): | DHP | CHP2 | CHP3 | Boiler2 | Boiler3 | PP | Geo/Nu. | Hydro | Waste | CAES Elc.ly. | BioCon-version | Electro-Fuel | Wind | Offsh. | PV | Hydro | Solar.Th | Transp. | Industry household | Industry Various | Total | Imp/Exp Corrected Imp/Exp | Imp/Exp Corrected Net | CO2 emission (Mt): Total | CO2 emission (Mt): Net |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Coal | - | - | - | - | 3,27 | 71,05 | - | - | - | - | - | - | - | - | - | - | - | 2,67 | 49,83 | 126,82 | -43,13 | 83,70 | 44,97 | 29,68 |
| Oil | - | - | - | - | 0,12 | 5,85 | - | - | - | - | - | - | - | - | - | - | - | 536,37 | 49,82 | 75,12 | 667,29 | -3,55 | 663,73 | 175,12 | 174,19 |
| N.Gas | - | - | 27,24 | - | 0,86 | 1,05 | - | - | - | - | - | - | - | - | - | - | - | 0,87 | 241,59 | 143,02 | 414,64 | -0,64 | 414,00 | 84,94 | 84,99 |
| Biomass | - | - | 28,22 | - | 0,90 | 3,95 | - | - | 0,21 | - | 32,21 | - | - | - | - | - | - | - | 83,46 | 51,16 | 200,10 | -2,40 | 197,70 | 0,02 | 0,02 |
| Renewable | - | - | - | - | - | - | - | 38,31 | - | - | - | - | 17,60 | - | 6,93 | 17,61 | 0,38 | - | - | - | 80,83 | 0,00 | 80,83 | 0,00 | 0,00 |
| H2 etc. | - | - | 0,00 | - | 0,00 | 0,00 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Biofuel | - | - | - | - | 0,00 | - | - | - | - | - | -24,29 | - | - | - | - | - | - | 24,29 | - | - | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Nuclear/CCS | - | - | - | - | - | - | 1377,99 | - | - | - | - | - | - | - | - | - | - | - | - | - | 1377,99 | 0,00 | 1377,99 | 0,00 | 0,00 |
| Total | - | - | 55,46 | - | 5,15 | 81,91 | 1377,99 | 38,31 | 0,21 | - | 7,91 | - | 17,60 | - | 6,93 | 17,61 | 0,38 | 561,53 | 377,54 | 319,13 | 2867,67 | -49,72 | 2817,95 | 305,06 | 288,88 |

District Heating Production

| | Gr.1 | | | | Gr.2 | | | | | | | | | | Gr.3 | | | | | | | | | | RES specification | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | District heating MW | Solar MW | CSHP MW | DHP MW | District heating MW | Solar MW | CSHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Stor-age MW | Ba-lance MW | District heating MW | Solar MW | CSHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Stor-age MW | Ba-lance MW | RES1 Wind MW | RES2 Offsho MW | RES3 Photo MW | RES 4-7 MW | Total MW |
| January | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7562 | 2 | 59 | 6382 | 21 | 0 | 1179 | 0 | 0 | -80 | 2946 | 0 | 334 | 2904 | 6183 |
| February | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7181 | 2 | 59 | 6211 | 21 | 0 | 969 | 0 | 0 | -80 | 2804 | 0 | 502 | 3895 | 7201 |
| March | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5986 | 3 | 59 | 5212 | 21 | 0 | 771 | 0 | 0 | -80 | 2249 | 0 | 783 | 3196 | 6228 |
| April | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2079 | 4 | 59 | 1748 | 21 | 0 | 358 | 0 | 0 | -111 | 1484 | 0 | 1026 | 2778 | 5287 |
| May | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 647 | 5 | 59 | 460 | 21 | 0 | 235 | 0 | 0 | -132 | 1723 | 0 | 1131 | 3111 | 5964 |
| June | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 647 | 5 | 59 | 469 | 21 | 0 | 226 | 0 | 0 | -133 | 1316 | 0 | 1265 | 2443 | 5024 |
| July | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 647 | 5 | 59 | 477 | 21 | 0 | 217 | 0 | 0 | -133 | 1437 | 0 | 1247 | 1170 | 3855 |
| August | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 647 | 5 | 59 | 487 | 21 | 0 | 208 | 0 | 0 | -132 | 1050 | 0 | 1082 | 842 | 2975 |
| September | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 647 | 4 | 59 | 487 | 21 | 0 | 209 | 0 | 0 | -132 | 1984 | 0 | 886 | 945 | 3815 |
| October | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2896 | 3 | 59 | 2678 | 21 | 0 | 237 | 0 | 0 | -102 | 1282 | 0 | 568 | 1117 | 2967 |
| November | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5962 | 2 | 59 | 5529 | 21 | 0 | 433 | 0 | 0 | -80 | 3117 | 0 | 365 | 947 | 4428 |
| December | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7463 | 1 | 59 | 6381 | 21 | 0 | 1082 | 0 | 0 | -80 | 2698 | 0 | 277 | 808 | 3783 |
| Average | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3523 | 3 | 59 | 3037 | 21 | 0 | 510 | 0 | 0 | -106 | 2003 | 0 | 789 | 2005 | 4798 |
| Maximum | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 15346 | 19 | 59 | 9045 | 21 | 0 | 7127 | 0 | 0 | 0 | 7867 | 0 | 5699 | 5340 | 13813 |
| Minimum | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 233 | 0 | 59 | 452 | 21 | 0 | 156 | 0 | 0 | -454 | 4 | 0 | 0 | 0 | 935 |
| Total for the whole year TWh/year | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | | 0,00 | 30,95 | 0,03 | 0,52 | 26,68 | 0,18 | 0,00 | 4,48 | 0,00 | | -0,93 | 17,60 | 0,00 | 6,93 | 17,61 | 42,15 |

Own use of heat from industrial CHP: 0,00 TWh/year

ANNUAL COSTS (Million EUR)

| | |
|---|---|
| Total Fuel ex Ngas exchange = | 44040 |
| Uranium = | 8681 |
| Coal = | 1187 |
| FuelOil = | 1976 |
| Gasoil/Diesel= | 14236 |
| Petrol/JP = | 8940 |
| Gas handling = | 3817 |
| Biomass = | 5202 |
| Food income = | 0 |
| Waste = | 0 |
| Total Ngas Exchange costs = | 10308 |
| Marginal operation costs = | 6370 |
| Total Electricity exchange = | 45 |
| Import = | 0 |
| Export = | -2 |
| Bottleneck = | 2 |
| Fixed imp/ex= | 45 |
| Total CO2 emission costs = | 4637 |
| Total variable costs = | 65400 |
| Fixed operation costs = | 8281 |
| Annual Investment costs = | 16954 |
| TOTAL ANNUAL COSTS = | 90634 |

NATURAL GAS EXCHANGE

| | DHP & Boilers MW | CHP2 CHP3 MW | PP CAES MW | Indi-vidual MW | Trans port MW | Indu. Var. MW | Demand Sum MW | Bio-gas MW | Syn-gas MW | CO2Hy gas MW | SynHy gas MW | SynHy gas MW | Stor-age MW | Sum MW | Im-port MW | Ex-port MW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| January | 226 | 6518 | 275 | 61030 | 0 | 16282 | 84330 | 0 | 0 | 0 | 0 | 0 | 0 | 84330 | 84330 | 0 |
| February | 186 | 6343 | 308 | 57866 | 0 | 16282 | 80985 | 0 | 0 | 0 | 0 | 0 | 0 | 80985 | 80985 | 0 |
| March | 148 | 5323 | 199 | 47949 | 0 | 16282 | 69900 | 0 | 0 | 0 | 0 | 0 | 0 | 69900 | 69900 | 0 |
| April | 69 | 1785 | 35 | 15513 | 0 | 16282 | 33683 | 0 | 0 | 0 | 0 | 0 | 0 | 33683 | 33683 | 0 |
| May | 45 | 470 | 0 | 3623 | 0 | 16282 | 20420 | 0 | 0 | 0 | 0 | 0 | 0 | 20420 | 20420 | 0 |
| June | 43 | 479 | 0 | 3623 | 0 | 16282 | 20427 | 0 | 0 | 0 | 0 | 0 | 0 | 20427 | 20427 | 0 |
| July | 42 | 488 | 0 | 3623 | 0 | 16282 | 20434 | 0 | 0 | 0 | 0 | 0 | 0 | 20434 | 20434 | 0 |
| August | 40 | 497 | 4 | 3623 | 0 | 16282 | 20445 | 0 | 0 | 0 | 0 | 0 | 0 | 20445 | 20445 | 0 |
| September | 40 | 497 | 4 | 3623 | 0 | 16282 | 20446 | 0 | 0 | 0 | 0 | 0 | 0 | 20446 | 20446 | 0 |
| October | 45 | 2736 | 100 | 22293 | 0 | 16282 | 41455 | 0 | 0 | 0 | 0 | 0 | 0 | 41455 | 41455 | 0 |
| November | 83 | 5646 | 243 | 47750 | 0 | 16282 | 70003 | 0 | 0 | 0 | 0 | 0 | 0 | 70003 | 70003 | 0 |
| December | 207 | 6517 | 281 | 60212 | 0 | 16282 | 83499 | 0 | 0 | 0 | 0 | 0 | 0 | 83499 | 83499 | 0 |
| Average | 98 | 3102 | 120 | 27503 | 0 | 16282 | 47105 | 0 | 0 | 0 | 0 | 0 | 0 | 47105 | 47105 | 0 |
| Maximum | 1365 | 9238 | 1393 | 125645 | 0 | 16282 | 153427 | 0 | 0 | 0 | 0 | 0 | 0 | 153427 | 153427 | 0 |
| Minimum | 30 | 462 | 0 | 188 | 0 | 16282 | 16962 | 0 | 0 | 0 | 0 | 0 | 0 | 16962 | 16962 | 0 |
| Total for the whole year TWh/year | 0,86 | 27,24 | 1,05 | 241,59 | 0,00 | 143,02 | 413,77 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 413,77 | 413,77 | 0,00 |

RES Share: 9,8 Percent of Primary Energy 23,7 Percent of Electricity 92,6 TWh electricity from RES

# Input HU 2015.txt

# The EnergyPLAN model 12.4

| | | | |
|---|---|---|---|
| Electricity demand (TWh/year): | | Flexible demand | 1,96 |
| Fixed demand | 29,61 | Fixed imp/exp. | -12,10 |
| Electric heating + HP | 6,41 | Transportation | 1,53 |
| Electric cooling | 0,66 | Total | 28,07 |

| District heating (TWh/year) | Gr.1 | Gr.2 | Gr.3 | Sum |
|---|---|---|---|---|
| District heating demand | 0,00 | 0,00 | 10,16 | 10,16 |
| Solar Thermal | 0,00 | 0,00 | 0,00 | 0,00 |
| Industrial CHP (CSHP) | 0,00 | 0,00 | 0,00 | 0,00 |
| Demand after solar and CSHP | 0,00 | 0,00 | 10,16 | 10,16 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Wind | 232 | MW | 0,44 | TWh/year | 0,00 | Grid |
| Offshore Wind | 0 | MW | 0 | TWh/year | 0,00 | stabili- |
| Photo Voltaic | 0 | MW | 0 | TWh/year | 0,00 | sation |
| River Hydro | 49 | MW | 0,17 | TWh/year | 0,00 | share |
| Hydro Power | 0 | MW | 0 | TWh/year | | |
| Geothermal/Nuclear | 1889 | MW | 14,11 | TWh/year | | |

| | Capacities | | Efficiencies | | |
|---|---|---|---|---|---|
| Group 2: | MW-e | MJ/s | elec. | Ther | COP |
| CHP | 0 | 0 | 0,40 | 0,50 | |
| Heat Pump | 0 | 0 | | | 3,00 |
| Boiler | | 0 | | 0,50 | |
| Group 3: | | | | | |
| CHP | 2435 | 3724 | 0,42 | 0,64 | |
| Heat Pump | 0 | 0 | | | 3,00 |
| Boiler | | 5611 | | 0,90 | |
| Condensing | 4824 | | 0,40 | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Heatstorage: | gr.2: | 0 | GWh | gr.3: | 0 | GWh |
| Fixed Boiler: | gr.2: | 2,5 | Per cent | gr.3: | 5,0 | Per cent |

| Electricity prod. from | CSHP | Waste | (TWh/year) |
|---|---|---|---|
| Gr.1: | 0,00 | 0,00 | |
| Gr.2: | 0,00 | 0,00 | |
| Gr.3: | 1,99 | 0,00 | |

| | | |
|---|---|---|
| Regulation Strategy: | Technical regulation no. 2 | |
| CEEP regulation | 23450000 | |
| Minimum Stabilisation share | 0,25 | |
| Stabilisation share of CHP | 0,00 | |
| Minimum CHP gr 3 load | 243 | MW |
| Minimum PP | 241 | MW |
| Heat Pump maximum share | 0,50 | |
| Maximum import/export | 0 | MW |

| | | |
|---|---|---|
| Distr. Name : | const.txt | |
| Addition factor | 0,00 | EUR/MWh |
| Multiplication factor | 1,00 | |
| Dependency factor | 0,00 | EUR/MWh pr. MW |
| Average Market Price | 1 | EUR/MWh |
| Gas Storage | 0 | GWh |
| Syngas capacity | 0 | MW |
| Biogas max to grid | 0 | MW |

Fuel Price level:

| | Capacities | Storage | Efficiencies | |
|---|---|---|---|---|
| | MW-e | GWh | elec. | Ther. |
| Hydro Pump: | 0 | 0 | 0,00 | |
| Hydro Turbine: | 0 | | 0,00 | |
| Electrol. Gr.2: | 0 | 0 | 0,40 | 0,50 |
| Electrol. Gr.3: | 0 | 0 | 0,40 | 0,50 |
| Electrol. trans.: | 0 | 0 | 0,00 | |
| Ely. MicroCHP: | 0 | 0 | 0,80 | |
| CAES fuel ratio: | | 0,000 | | |

| (TWh/year) | Coal | Oil | Ngas | Biomass |
|---|---|---|---|---|
| Transport | 0,00 | 48,27 | 0,00 | 0,00 |
| Household | 1,06 | 1,24 | 44,88 | 5,70 |
| Industry | 5,37 | 1,42 | 19,35 | 1,91 |
| Various | 0,00 | 3,20 | 1,47 | 1,00 |

# Output WARNING!!: (1) Critical Excess;

| | District Heating | | | | | | | | | | Electricity | | | | | | | | | | | | | | | | Exchange | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Demand | Production | | | | | | | | | Consumption | | | | | | Production | | | | | | | | Balance | | | | |
| | Distr. heating MW | Solar MW | Waste+ CSHP MW | DHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Balance MW | Elec. demand MW | Flex.& Transp. MW | HP MW | Elec-trolyser MW | EH MW | Hydro Pump MW | Tur-bine MW | RES MW | Hy-dro MW | Geo-thermal MW | Waste+ CSHP MW | CHP MW | PP MW | Stab-Load % | Imp MW | Exp MW | CEEP MW | EEP MW | Payment Imp Million EUR | Payment Exp Million EUR |
| January | 2490 | 0 | 0 | 0 | 2440 | 0 | 0 | 110 | 0 | -61 | 3572 | 394 | 0 | 0 | 1644 | 0 | 0 | 103 | 0 | 1825 | 227 | 1596 | 661 | 368 | 0 | 4 | 4 | 0 | 0 | 0 |
| February | 2267 | 0 | 0 | 0 | 2246 | 0 | 0 | 82 | 0 | -61 | 3598 | 399 | 0 | 0 | 1491 | 0 | 0 | 88 | 0 | 1822 | 227 | 1468 | 619 | 368 | 0 | 3 | 3 | 0 | 0 | 0 |
| March | 1769 | 0 | 0 | 0 | 1749 | 0 | 0 | 81 | 0 | -61 | 3470 | 401 | 0 | 0 | 1150 | 0 | 0 | 100 | 0 | 1788 | 227 | 1144 | 488 | 363 | 0 | 7 | 7 | 0 | 0 | 0 |
| April | 592 | 0 | 0 | 0 | 585 | 0 | 0 | 110 | 0 | -103 | 3271 | 393 | 0 | 0 | 343 | 0 | 0 | 107 | 0 | 1374 | 227 | 383 | 332 | 344 | 0 | 124 | 124 | 0 | 0 | 0 |
| May | 316 | 0 | 0 | 0 | 380 | 0 | 0 | 66 | 0 | -130 | 3245 | 401 | 0 | 0 | 156 | 0 | 0 | 86 | 0 | 1352 | 227 | 249 | 370 | 345 | 0 | 70 | 70 | 0 | 0 | 0 |
| June | 316 | 0 | 0 | 0 | 379 | 0 | 0 | 67 | 0 | -130 | 3405 | 400 | 0 | 0 | 153 | 0 | 0 | 53 | 0 | 1644 | 227 | 248 | 349 | 355 | 0 | 127 | 127 | 0 | 0 | 0 |
| July | 316 | 0 | 0 | 0 | 387 | 0 | 0 | 59 | 0 | -130 | 3527 | 394 | 0 | 0 | 153 | 0 | 0 | 34 | 0 | 1382 | 227 | 253 | 525 | 357 | 0 | 5 | 5 | 0 | 0 | 0 |
| August | 316 | 0 | 0 | 0 | 388 | 0 | 0 | 58 | 0 | -130 | 3430 | 401 | 0 | 0 | 154 | 0 | 0 | 25 | 0 | 1400 | 227 | 253 | 635 | 360 | 0 | 1 | 1 | 0 | 0 | 0 |
| September | 316 | 0 | 0 | 0 | 388 | 0 | 0 | 58 | 0 | -130 | 3397 | 396 | 0 | 0 | 154 | 0 | 0 | 69 | 0 | 1730 | 227 | 254 | 528 | 358 | 0 | 1 | 1 | 0 | 0 | 0 |
| October | 991 | 0 | 0 | 0 | 1012 | 0 | 0 | 69 | 0 | -90 | 3445 | 397 | 0 | 0 | 616 | 0 | 0 | 50 | 0 | 1778 | 227 | 661 | 499 | 364 | 0 | 10 | 10 | 0 | 0 | 0 |
| November | 1814 | 0 | 0 | 0 | 1814 | 0 | 0 | 61 | 0 | -61 | 3577 | 400 | 0 | 0 | 1181 | 0 | 0 | 76 | 0 | 1456 | 227 | 1186 | 853 | 366 | 0 | 2 | 2 | 0 | 0 | 0 |
| December | 2394 | 0 | 0 | 0 | 2375 | 0 | 0 | 80 | 0 | -61 | 3422 | 394 | 0 | 0 | 1577 | 0 | 0 | 40 | 0 | 1732 | 227 | 1553 | 784 | 373 | 0 | 1 | 1 | 0 | 0 | 0 |
| Average | 1157 | 0 | 0 | 0 | 1177 | 0 | 0 | 75 | 0 | -95 | 3446 | 397 | 0 | 0 | 730 | 0 | 0 | 69 | 0 | 1606 | 227 | 770 | 553 | 360 | 0 | 29 | 29 | 0 | Average price | |
| Maximum | 4676 | 0 | 0 | 0 | 3724 | 0 | 0 | 952 | 0 | 0 | 4656 | 1668 | 0 | 0 | 3142 | 0 | 0 | 237 | 0 | 1825 | 227 | 2435 | 2476 | 385 | 0 | 937 | 937 | 0 | (EUR/MWh) | |
| Minimum | 104 | 0 | 0 | 0 | 372 | 0 | 0 | 58 | 0 | -326 | 150 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 1342 | 227 | 243 | 241 | 319 | 0 | 0 | 0 | 0 | 1 | 1 |
| TWh/year | 10,16 | 0,00 | 0,00 | 0,00 | 10,34 | 0,00 | 0,00 | 0,66 | 0,00 | -0,84 | 30,27 | 3,49 | 0,00 | 0,00 | 6,41 | 0,00 | 0,00 | 0,61 | 0,00 | 14,11 | 1,99 | 6,76 | 4,86 | | 0,00 | 0,26 | 0,26 | 0,00 | 0 | 0 |

| FUEL BALANCE (TWh/year): | DHP | CHP2 | CHP3 | Boiler2 | Boiler3 | PP | Geo/Nu. | Hydro | Waste | CAES Elc.ly. | BioCon-version | Electro-Fuel | Wind | Offsh. | PV | Hydro | Solar.Th | Transp. | Industry household | Industry Various | Total | Imp/Exp Corrected Imp/Exp | Imp/Exp Corrected Net | CO2 emission (Mt): Total | CO2 emission (Mt): Net |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Coal | - | - | 0,43 | - | 0,02 | - | - | - | - | - | - | - | - | - | - | - | - | - | 1,06 | 5,37 | 6,88 | 0,00 | 6,88 | 2,44 | 2,44 |
| Oil | - | - | 0,12 | - | 0,01 | 6,56 | - | - | - | - | - | - | - | - | - | - | - | 48,27 | 1,20 | 4,62 | 60,76 | -0,35 | 60,42 | 15,95 | 15,86 |
| N.Gas | - | - | 12,37 | - | 0,56 | 5,60 | - | - | - | - | - | - | - | - | - | - | - | 0,04 | 44,88 | 20,82 | 84,27 | -0,30 | 83,97 | 17,26 | 17,21 |
| Biomass | - | - | 3,21 | - | 0,15 | - | - | - | - | - | 3,40 | - | - | - | - | - | - | - | 5,70 | 2,91 | 15,37 | 0,00 | 15,37 | 0,00 | 0,00 |
| Renewable | - | - | - | - | - | - | - | - | - | - | - | - | 0,44 | - | - | 0,17 | 0,04 | - | - | - | 0,65 | 0,00 | 0,65 | 0,00 | 0,00 |
| H2 etc. | - | - | 0,00 | - | 0,00 | 0,00 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Biofuel | - | - | 0,00 | - | 0,00 | - | - | - | - | - | -2,12 | - | - | - | - | - | - | 2,12 | - | - | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Nuclear/CCS | - | - | - | - | - | - | 47,04 | - | - | - | - | - | - | - | - | - | - | - | - | - | 47,04 | 0,00 | 47,04 | 0,00 | 0,00 |
| Total | - | - | 16,13 | - | 0,73 | 12,15 | 47,04 | - | - | - | 1,27 | - | 0,44 | - | - | 0,17 | 0,04 | 50,43 | 52,84 | 33,72 | 214,96 | -0,65 | 214,32 | 35,65 | 35,50 |

## District Heating Production

| | Gr.1 | | | | Gr.2 | | | | | | | | | | Gr.3 | | | | | | | | | | RES specification | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | District heating MW | Solar MW | CSHP MW | DHP MW | District heating MW | Solar MW | CSHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Stor-age MW | Ba-lance MW | District heating MW | Solar MW | CSHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Stor-age MW | Ba-lance MW | RES1 Wind MW | RES2 Offsho MW | RES3 Photo MW | RES 4-7 ic MW | Total MW |
| January | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2490 | 0 | 0 | 2440 | 0 | 0 | 110 | 0 | 0 | -61 | 85 | 0 | 0 | 18 | 103 |
| February | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2267 | 0 | 0 | 2246 | 0 | 0 | 82 | 0 | 0 | -61 | 60 | 0 | 0 | 28 | 88 |
| March | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1769 | 0 | 0 | 1749 | 0 | 0 | 81 | 0 | 0 | -61 | 74 | 0 | 0 | 26 | 100 |
| April | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 592 | 0 | 0 | 585 | 0 | 0 | 110 | 0 | 0 | -103 | 71 | 0 | 0 | 36 | 107 |
| May | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 316 | 0 | 0 | 380 | 0 | 0 | 66 | 0 | 0 | -130 | 47 | 0 | 0 | 39 | 86 |
| June | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 316 | 0 | 0 | 379 | 0 | 0 | 67 | 0 | 0 | -130 | 30 | 0 | 0 | 23 | 53 |
| July | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 316 | 0 | 0 | 387 | 0 | 0 | 59 | 0 | 0 | -130 | 27 | 0 | 0 | 7 | 34 |
| August | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 316 | 0 | 0 | 388 | 0 | 0 | 58 | 0 | 0 | -130 | 22 | 0 | 0 | 3 | 25 |
| September | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 316 | 0 | 0 | 388 | 0 | 0 | 58 | 0 | 0 | -130 | 65 | 0 | 0 | 4 | 69 |
| October | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 991 | 0 | 0 | 1012 | 0 | 0 | 69 | 0 | 0 | -90 | 36 | 0 | 0 | 14 | 50 |
| November | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1814 | 0 | 0 | 1814 | 0 | 0 | 61 | 0 | 0 | -61 | 64 | 0 | 0 | 11 | 76 |
| December | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2394 | 0 | 0 | 2375 | 0 | 0 | 80 | 0 | 0 | -61 | 19 | 0 | 0 | 21 | 40 |
| Average | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1157 | 0 | 0 | 1177 | 0 | 0 | 75 | 0 | 0 | -95 | 50 | 0 | 0 | 19 | 69 |
| Maximum | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4676 | 0 | 0 | 3724 | 0 | 0 | 952 | 0 | 0 | 0 | 201 | 0 | 0 | 49 | 237 |
| Minimum | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 104 | 0 | 0 | 372 | 0 | 0 | 58 | 0 | 0 | -326 | 0 | 0 | 0 | 0 | 3 |
| Total for the whole year TWh/year | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | | 0,00 | 10,16 | 0,00 | 0,00 | 10,34 | 0,00 | 0,00 | 0,66 | 0,00 | | -0,84 | 0,44 | 0,00 | 0,00 | 0,17 | 0,61 |

Own use of heat from industrial CHP: 0,00 TWh/year

ANNUAL COSTS (Million EUR)

| | |
|---|---|
| Total Fuel ex Ngas exchange = | 3698 |
| Uranium = | 296 |
| Coal = | 64 |
| FuelOil = | 281 |
| Gasoil/Diesel= | 1064 |
| Petrol/JP = | 922 |
| Gas handling = | 679 |
| Biomass = | 392 |
| Food income = | 0 |
| Waste = | 0 |
| Total Ngas Exchange costs = | 2098 |
| Marginal operation costs = | 243 |
| Total Electricity exchange = | -12 |
| Import = | 0 |
| Export = | 0 |
| Bottleneck = | 0 |
| Fixed imp/ex= | -12 |
| Total CO2 emission costs = | 542 |
| Total variable costs = | 6569 |
| Fixed operation costs = | 240 |
| Annual Investment costs = | 499 |
| TOTAL ANNUAL COSTS = | 7309 |

## NATURAL GAS EXCHANGE

| | DHP & Boilers MW | CHP2 CHP3 MW | PP CAES MW | Indi-vidual MW | Trans port MW | Indu. Var. MW | Demand Sum MW | Bio-gas MW | Syn-gas MW | CO2Hy gas MW | SynHy gas MW | SynHy gas MW | Stor-age MW | Sum MW | Im-port MW | Ex-port MW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| January | 94 | 2920 | 760 | 11506 | 0 | 2370 | 17651 | 0 | 0 | 0 | 0 | 0 | 0 | 17651 | 17651 | 0 |
| February | 70 | 2687 | 713 | 10439 | 0 | 2370 | 16280 | 0 | 0 | 0 | 0 | 0 | 0 | 16280 | 16280 | 0 |
| March | 69 | 2093 | 562 | 8050 | 0 | 2370 | 13144 | 0 | 0 | 0 | 0 | 0 | 0 | 13144 | 13144 | 0 |
| April | 94 | 700 | 382 | 2399 | 0 | 2370 | 5945 | 0 | 0 | 0 | 0 | 0 | 0 | 5945 | 5945 | 0 |
| May | 56 | 455 | 425 | 1077 | 0 | 2370 | 4384 | 0 | 0 | 0 | 0 | 0 | 0 | 4384 | 4384 | 0 |
| June | 57 | 454 | 401 | 1077 | 0 | 2370 | 4359 | 0 | 0 | 0 | 0 | 0 | 0 | 4359 | 4359 | 0 |
| July | 51 | 463 | 604 | 1077 | 0 | 2370 | 4565 | 0 | 0 | 0 | 0 | 0 | 0 | 4565 | 4565 | 0 |
| August | 50 | 464 | 731 | 1077 | 0 | 2370 | 4692 | 0 | 0 | 0 | 0 | 0 | 0 | 4692 | 4692 | 0 |
| September | 50 | 464 | 607 | 1077 | 0 | 2370 | 4568 | 0 | 0 | 0 | 0 | 0 | 0 | 4568 | 4568 | 0 |
| October | 59 | 1210 | 574 | 4315 | 0 | 2370 | 8529 | 0 | 0 | 0 | 0 | 0 | 0 | 8529 | 8529 | 0 |
| November | 52 | 2171 | 982 | 8266 | 0 | 2370 | 13841 | 0 | 0 | 0 | 0 | 0 | 0 | 13841 | 13841 | 0 |
| December | 68 | 2842 | 903 | 11048 | 0 | 2370 | 17231 | 0 | 0 | 0 | 0 | 0 | 0 | 17231 | 17231 | 0 |
| Average | 64 | 1408 | 637 | 5109 | 0 | 2370 | 9589 | 0 | 0 | 0 | 0 | 0 | 0 | 9589 | 9589 | 0 |
| Maximum | 811 | 4456 | 2850 | 22000 | 0 | 2370 | 31197 | 0 | 0 | 0 | 0 | 0 | 0 | 31197 | 31197 | 0 |
| Minimum | 49 | 446 | 277 | 57 | 0 | 2370 | 3200 | 0 | 0 | 0 | 0 | 0 | 0 | 3200 | 3200 | 0 |
| Total for the whole year TWh/year | 0,56 | 12,37 | 5,60 | 44,88 | 0,00 | 20,82 | 84,23 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 84,23 | 84,23 | 0,00 |

RES Share: 7,4 Percent of Primary Energy 1,6 Percent of Electricity 2,0 TWh electricity from RES

# Input IT 2015.txt

# The EnergyPLAN model 12.4

| | | | |
|---|---|---|---|
| Electricity demand (TWh/year): | | Flexible demand | 15,40 |
| Fixed demand | 239,23 | Fixed imp/exp. | -46,30 |
| Electric heating + HP | 28,42 | Transportation | 10,71 |
| Electric cooling | 11,68 | Total | 259,14 |

| District heating (TWh/year) | Gr.1 | Gr.2 | Gr.3 | Sum |
|---|---|---|---|---|
| District heating demand | 0,00 | 0,00 | 36,73 | 36,73 |
| Solar Thermal | 0,00 | 0,00 | 0,01 | 0,01 |
| Industrial CHP (CSHP) | 0,00 | 0,00 | 0,00 | 0,00 |
| Demand after solar and CSHP | 0,00 | 0,00 | 36,72 | 36,72 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Wind | 8720 | MW | 13,06 | TWh/year | 0,00 | Grid |
| Offshore Wind | 0 | MW | 0 | TWh/year | 0,00 | stabili- |
| Photo Voltaic | 18566 | MW | 25,72 | TWh/year | 0,00 | sation |
| River Hydro | 2299 | MW | 8,3 | TWh/year | 0,00 | share |
| Hydro Power | 13702 | MW | 36,78 | TWh/year | | |
| Geothermal/Nuclear | 620 | MW | 4,89 | TWh/year | | |

| | Capacities MW-e | MJ/s | Efficiencies elec. | Ther | COP |
|---|---|---|---|---|---|
| Group 2: | | | | | |
| CHP | 0 | 0 | 0,40 | 0,50 | |
| Heat Pump | 0 | 0 | | | 3,00 |
| Boiler | | 0 | | 0,50 | |
| Group 3: | | | | | |
| CHP | 13018 | 3738 | 0,44 | 0,13 | |
| Heat Pump | 13 | 35 | | | 2,81 |
| Boiler | | 20480 | | 0,85 | |
| Condensing | 48131 | | 0,43 | | |

| | | | | | |
|---|---|---|---|---|---|
| Heatstorage: | gr.2: | 0 | GWh | gr.3: | 0 GWh |
| Fixed Boiler: | gr.2: | 2,5 | Per cent | gr.3: | 10,0 Per cent |

| Electricity prod. from | CSHP | Waste | (TWh/year) |
|---|---|---|---|
| Gr.1: | 0,00 | 0,00 | |
| Gr.2: | 0,00 | 0,00 | |
| Gr.3: | 15,73 | 0,00 | |

| | | |
|---|---|---|
| Regulation Strategy: | Technical regulation no. 2 | |
| CEEP regulation | 23450000 | |
| Minimum Stabilisation share | 0,25 | |
| Stabilisation share of CHP | 0,00 | |
| Minimum CHP gr 3 load | 1302 | MW |
| Minimum PP | 4813 | MW |
| Heat Pump maximum share | 0,50 | |
| Maximum import/export | 0 | MW |

| | | |
|---|---|---|
| Distr. Name : | const.txt | |
| Addition factor | 0,00 | EUR/MWh |
| Multiplication factor | 1,00 | |
| Dependency factor | 0,00 | EUR/MWh pr. MW |
| Average Market Price | 1 | EUR/MWh |
| Gas Storage | 0 | GWh |
| Syngas capacity | 0 | MW |
| Biogas max to grid | 0 | MW |

Fuel Price level:

| | Capacities MW-e | Storage GWh | Efficiencies elec. | Ther. |
|---|---|---|---|---|
| Hydro Pump: | 7551 | 76 | 0,00 | |
| Hydro Turbine: | 7551 | | 0,00 | |
| Electrol. Gr.2: | 0 | 0 | 0,40 | 0,50 |
| Electrol. Gr.3: | 0 | 0 | 0,40 | 0,50 |
| Electrol. trans.: | 0 | 0 | 0,00 | |
| Ely. MicroCHP: | 0 | 0 | 0,80 | |
| CAES fuel ratio: | | 0,000 | | |

| (TWh/year) | Coal | Oil | Ngas | Biomass |
|---|---|---|---|---|
| Transport | 0,00 | 385,88 | 4,82 | 0,00 |
| Household | 0,03 | 31,32 | 258,44 | 33,86 |
| Industry | 27,67 | 27,24 | 131,41 | 25,56 |
| Various | 0,00 | 26,43 | 1,68 | 22,80 |

# Output WARNING!!: (1) Critical Excess;

| | District Heating | | | | | | | | | | Electricity | | | | | | | | | | | | | | | Exchange | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Demand | Production | | | | | | | | Balance | Consumption | | | | | | Production | | | | | | | Balance | | | |
| | Distr. heating MW | Solar MW | Waste+ CSHP MW | DHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Balance MW | Elec. demand MW | Flex.& Transp. MW | HP MW | Elec-trolyser MW | EH MW | Hydro Pump MW | Tur-bine MW | RES MW | Hy-dro MW | Geo-thermal MW | Waste+ CSHP MW | CHP MW | PP MW | Stab-Load % | Imp MW | Exp MW | CEEP MW | EEP MW | Payment Imp Million EUR | Payment Exp Million EUR |
| January | 9373 | 1 | 35 | 0 | 3026 | 35 | 0 | 6355 | 0 | -79 | 27701 | 2949 | 13 | 0 | 7654 | 0 | 0 | 5070 | 3525 | 557 | 1791 | 10535 | 10764 | 309 | 0 | 0 | 0 | 0 | 0 | 0 |
| February | 8871 | 1 | 35 | 0 | 3016 | 35 | 0 | 5863 | 0 | -79 | 28980 | 2983 | 13 | 0 | 7213 | 0 | 0 | 5744 | 3951 | 557 | 1791 | 10501 | 10459 | 306 | 0 | 0 | 0 | 0 | 0 | 0 |
| March | 7077 | 1 | 35 | 0 | 2983 | 35 | 0 | 4101 | 0 | -79 | 28057 | 2996 | 13 | 0 | 5696 | 0 | 0 | 6624 | 3421 | 557 | 1791 | 10388 | 8568 | 293 | 0 | 10 | 10 | 0 | 0 | 0 |
| April | 2464 | 1 | 35 | 0 | 1434 | 35 | 0 | 1087 | 0 | -129 | 25826 | 2941 | 13 | 0 | 1776 | 0 | 0 | 6171 | 4290 | 557 | 1791 | 4994 | 8636 | 283 | 0 | 1 | 1 | 0 | 0 | 0 |
| May | 682 | 2 | 35 | 0 | 398 | 35 | 0 | 381 | 0 | -168 | 26796 | 2996 | 13 | 0 | 262 | 0 | 0 | 6554 | 5974 | 557 | 1791 | 1385 | 10869 | 282 | 0 | 0 | 0 | 0 | 0 | 0 |
| June | 682 | 2 | 35 | 0 | 398 | 35 | 0 | 381 | 0 | -168 | 30240 | 2989 | 13 | 0 | 262 | 0 | 0 | 6510 | 6061 | 557 | 1791 | 1385 | 12358 | 289 | 0 | 0 | 0 | 0 | 0 | 0 |
| July | 682 | 2 | 35 | 0 | 398 | 35 | 0 | 381 | 0 | -168 | 35335 | 2947 | 13 | 0 | 262 | 0 | 0 | 6077 | 5457 | 557 | 1791 | 1385 | 17315 | 308 | 0 | 0 | 0 | 0 | 0 | 0 |
| August | 682 | 2 | 35 | 0 | 398 | 35 | 0 | 381 | 0 | -168 | 28599 | 2996 | 13 | 0 | 262 | 0 | 0 | 5255 | 4306 | 557 | 1791 | 1385 | 15022 | 305 | 0 | 0 | 0 | 0 | 0 | 0 |
| September | 682 | 1 | 35 | 0 | 398 | 35 | 0 | 381 | 0 | -168 | 29160 | 2964 | 13 | 0 | 262 | 0 | 0 | 5297 | 4168 | 557 | 1791 | 1385 | 13987 | 298 | 0 | 0 | 0 | 0 | 0 | 0 |
| October | 3209 | 1 | 35 | 0 | 1812 | 35 | 0 | 1441 | 0 | -116 | 27074 | 2972 | 13 | 0 | 2409 | 0 | 0 | 5003 | 3849 | 557 | 1791 | 6309 | 8792 | 296 | 0 | 0 | 0 | 0 | 0 | 0 |
| November | 6975 | 1 | 35 | 0 | 2978 | 35 | 0 | 4005 | 0 | -79 | 28137 | 2989 | 13 | 0 | 5610 | 0 | 0 | 3677 | 3087 | 557 | 1791 | 10370 | 9826 | 323 | 0 | 0 | 0 | 0 | 0 | 0 |
| December | 8910 | 1 | 35 | 0 | 3038 | 35 | 0 | 5880 | 0 | -79 | 26864 | 2947 | 13 | 0 | 7253 | 0 | 0 | 2378 | 2163 | 557 | 1791 | 10577 | 14217 | 346 | 0 | 0 | 0 | 0 | 0 | 0 |
| Average | 4181 | 1 | 35 | 0 | 1687 | 35 | 0 | 2547 | 0 | -123 | 28564 | 2972 | 13 | 0 | 3235 | 0 | 0 | 5361 | 4187 | 557 | 1791 | 5873 | 11747 | 303 | 0 | 1 | 1 | 0 | Average price | |
| Maximum | 17067 | 6 | 35 | 0 | 3738 | 35 | 0 | 13258 | 0 | 0 | 51319 | 5460 | 13 | 0 | 14185 | 0 | 0 | 24693 | 9956 | 557 | 1791 | 13018 | 32983 | 380 | 0 | 7318 | 7318 | 0 | (EUR/MWh) | |
| Minimum | 391 | 0 | 35 | 0 | 374 | 35 | 0 | 356 | 0 | -409 | 891 | 1753 | 13 | 0 | 0 | 0 | 0 | 53 | 0 | 557 | 1791 | 1302 | 4813 | 102 | 0 | 0 | 0 | 0 | 1 | 0 |
| TWh/year | 36,73 | 0,01 | 0,31 | 0,00 | 14,81 | 0,31 | 0,00 | 22,37 | 0,00 | -1,08 | 250,91 | 26,11 | 0,11 | 0,00 | 28,42 | 0,00 | 0,00 | 47,09 | 36,78 | 4,89 | 15,73 | 51,59 | 103,19 | | 0,00 | 0,01 | 0,01 | 0,00 | 0 | 0 |

| FUEL BALANCE (TWh/year): | DHP | CHP2 | CHP3 | Boiler2 | Boiler3 | PP | Geo/Nu. | Hydro | Waste | CAES Elc.ly. | BioCon-version | Electro-Fuel | Wind | Offsh. | PV | Hydro | Solar.Th | Transp. | Industry household | Industry Various | Total | Imp/Exp Corrected Imp/Exp | Imp/Exp Corrected Net | CO2 emission (Mt): Total | CO2 emission (Mt): Net |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Coal | - | - | - | - | 25,75 | 85,37 | - | - | - | - | - | - | - | - | - | - | - | 0,03 | 27,67 | 138,81 | -0,01 | 138,81 | 49,22 | 49,22 |
| Oil | - | - | 0,85 | - | - | 0,00 | - | - | - | - | - | - | - | - | - | - | - | 385,88 | 30,28 | 53,67 | 470,68 | 0,00 | 470,68 | 123,52 | 123,52 |
| N.Gas | - | - | 109,86 | - | 0,05 | 133,64 | - | - | - | - | - | - | - | - | - | - | - | 13,81 | 258,44 | 133,09 | 648,89 | -0,01 | 648,88 | 133,01 | 134,85 |
| Biomass | - | - | 6,86 | - | 0,52 | 20,96 | - | - | - | - | 23,02 | - | - | - | - | - | - | - | 33,86 | 48,36 | 133,59 | 0,00 | 133,58 | 0,00 | 0,00 |
| Renewable | - | - | - | - | - | - | 4,89 | 36,78 | - | - | - | - | 13,06 | - | 25,72 | 8,30 | 0,88 | - | - | - | 89,63 | 0,00 | 89,63 | 0,00 | 0,00 |
| H2 etc. | - | - | 0,00 | - | 0,00 | 0,00 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Biofuel | - | - | - | - | 0,00 | - | - | - | - | - | -18,39 | - | - | - | - | - | - | 18,39 | - | - | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Nuclear/CCS | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Total | - | - | 117,57 | - | 26,32 | 239,97 | 4,89 | 36,78 | - | - | 4,63 | - | 13,06 | - | 25,72 | 8,30 | 0,88 | 418,08 | 322,61 | 262,79 | 1481,60 | -0,02 | 1481,58 | 305,75 | 307,59 |

## District Heating Production

| | Gr.1 | | | | Gr.2 | | | | | | | | | | Gr.3 | | | | | | | | | | RES specification | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | District heating MW | Solar MW | CSHP MW | DHP MW | District heating MW | Solar MW | CSHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Stor-age MW | Ba-lance MW | District heating MW | Solar MW | CSHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Stor-age MW | Ba-lance MW | RES1 Wind MW | RES2 Offsho | RES3 Photo | RES 4-7 | Total MW |
| January | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9373 | 1 | 35 | 3026 | 35 | 0 | 6355 | 0 | 0 | -79 | 2550 | 0 | 1732 | 788 | 5070 |
| February | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8871 | 1 | 35 | 3016 | 35 | 0 | 5863 | 0 | 0 | -79 | 2604 | 0 | 2254 | 886 | 5744 |
| March | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7077 | 1 | 35 | 2983 | 35 | 0 | 4101 | 0 | 0 | -79 | 2607 | 0 | 3218 | 799 | 6624 |
| April | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2464 | 1 | 35 | 1434 | 35 | 0 | 1087 | 0 | 0 | -129 | 1729 | 0 | 3437 | 1005 | 6171 |
| May | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 682 | 2 | 35 | 398 | 35 | 0 | 381 | 0 | 0 | -168 | 1283 | 0 | 3887 | 1383 | 6554 |
| June | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 682 | 2 | 35 | 398 | 35 | 0 | 381 | 0 | 0 | -168 | 1011 | 0 | 4078 | 1421 | 6510 |
| July | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 682 | 2 | 35 | 398 | 35 | 0 | 381 | 0 | 0 | -168 | 503 | 0 | 4332 | 1241 | 6077 |
| August | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 682 | 2 | 35 | 398 | 35 | 0 | 381 | 0 | 0 | -168 | 559 | 0 | 3871 | 825 | 5255 |
| September | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 682 | 1 | 35 | 398 | 35 | 0 | 381 | 0 | 0 | -168 | 1299 | 0 | 3082 | 916 | 5297 |
| October | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3209 | 1 | 35 | 1812 | 35 | 0 | 1441 | 0 | 0 | -116 | 1829 | 0 | 2222 | 951 | 5003 |
| November | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6975 | 1 | 35 | 2978 | 35 | 0 | 4005 | 0 | 0 | -79 | 1358 | 0 | 1632 | 686 | 3677 |
| December | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8910 | 1 | 35 | 3038 | 35 | 0 | 5880 | 0 | 0 | -79 | 570 | 0 | 1368 | 441 | 2378 |
| Average | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4181 | 1 | 35 | 1687 | 35 | 0 | 2547 | 0 | 0 | -123 | 1487 | 0 | 2928 | 945 | 5361 |
| Maximum | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 17067 | 6 | 35 | 3738 | 35 | 0 | 13258 | 0 | 0 | 0 | 7711 | 0 | 18566 | 2299 | 24693 |
| Minimum | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 391 | 0 | 35 | 374 | 35 | 0 | 356 | 0 | 0 | -409 | 1 | 0 | 0 | 0 | 53 |
| Total for the whole year TWh/year | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | | 0,00 | 36,73 | 0,01 | 0,31 | 14,81 | 0,31 | 0,00 | 22,37 | 0,00 | | -1,08 | 13,06 | 0,00 | 25,72 | 8,30 | 47,09 |

Own use of heat from industrial CHP: 0,00 TWh/year

ANNUAL COSTS (Million EUR)

| | | |
|---|---|---|
| Total Fuel ex Ngas exchange = | | 26685 |
| Uranium = | 0 | |
| Coal = | 1299 | |
| FuelOil = | 1326 | |
| Gasoil/Diesel= | 9713 | |
| Petrol/JP = | 6832 | |
| Gas handling = | 4258 | |
| Biomass = | 3257 | |
| Food income = | 0 | |
| Waste = | 0 | |
| Total Ngas Exchange costs = | | 15941 |
| Marginal operation costs = | | 532 |
| Total Electricity exchange = | | -46 |
| Import = | 0 | |
| Export = | 0 | |
| Bottleneck = | 0 | |
| Fixed imp/ex= | -46 | |
| Total CO2 emission costs = | | 4647 |
| Total variable costs = | | 47759 |
| Fixed operation costs = | | 2584 |
| Annual Investment costs = | | 5624 |
| TOTAL ANNUAL COSTS = | | 55967 |

## NATURAL GAS EXCHANGE

| | DHP & Boilers MW | CHP2 CHP3 MW | PP CAES MW | Indi-vidual MW | Trans port MW | Indu. Var. MW | Demand Sum MW | Bio-gas MW | Syn-gas MW | CO2Hy gas MW | SynHy gas MW | SynHy gas MW | Stor-age MW | Sum MW | Im-port MW | Ex-port MW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| January | 14 | 22437 | 13940 | 69537 | 549 | 15151 | 121628 | 0 | 0 | 0 | 0 | 0 | 0 | 121628 | 121628 | 0 |
| February | 13 | 22363 | 13546 | 65659 | 549 | 15151 | 117281 | 0 | 0 | 0 | 0 | 0 | 0 | 117281 | 117281 | 0 |
| March | 9 | 22123 | 11097 | 51800 | 549 | 15151 | 100729 | 0 | 0 | 0 | 0 | 0 | 0 | 100729 | 100729 | 0 |
| April | 2 | 10636 | 11185 | 16147 | 549 | 15151 | 53670 | 0 | 0 | 0 | 0 | 0 | 0 | 53670 | 53670 | 0 |
| May | 1 | 2949 | 14076 | 2380 | 549 | 15151 | 35107 | 0 | 0 | 0 | 0 | 0 | 0 | 35107 | 35107 | 0 |
| June | 1 | 2949 | 16005 | 2380 | 549 | 15151 | 37036 | 0 | 0 | 0 | 0 | 0 | 0 | 37036 | 37036 | 0 |
| July | 1 | 2949 | 22426 | 2380 | 549 | 15151 | 43456 | 0 | 0 | 0 | 0 | 0 | 0 | 43456 | 43456 | 0 |
| August | 1 | 2949 | 19456 | 2380 | 549 | 15151 | 40486 | 0 | 0 | 0 | 0 | 0 | 0 | 40486 | 40486 | 0 |
| September | 1 | 2950 | 18115 | 2380 | 549 | 15151 | 39146 | 0 | 0 | 0 | 0 | 0 | 0 | 39146 | 39146 | 0 |
| October | 3 | 13437 | 11387 | 21904 | 549 | 15151 | 62432 | 0 | 0 | 0 | 0 | 0 | 0 | 62432 | 62432 | 0 |
| November | 9 | 22085 | 12726 | 51012 | 549 | 15151 | 101532 | 0 | 0 | 0 | 0 | 0 | 0 | 101532 | 101532 | 0 |
| December | 13 | 22526 | 18412 | 65959 | 549 | 15151 | 122611 | 0 | 0 | 0 | 0 | 0 | 0 | 122611 | 122611 | 0 |
| Average | 6 | 12507 | 15214 | 29422 | 549 | 15151 | 72849 | 0 | 0 | 0 | 0 | 0 | 0 | 72849 | 72849 | 0 |
| Maximum | 29 | 27724 | 42717 | 128995 | 549 | 15151 | 201365 | 0 | 0 | 0 | 0 | 0 | 0 | 201365 | 201365 | 0 |
| Minimum | 1 | 2772 | 6233 | 129 | 549 | 15151 | 24836 | 0 | 0 | 0 | 0 | 0 | 0 | 24836 | 24836 | 0 |
| Total for the whole year TWh/year | 0,05 | 109,86 | 133,64 | 258,44 | 4,82 | 133,09 | 639,90 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 639,90 | 639,90 | 0,00 |

RES Share: 15,1 Percent of Primary Energy 37,1 Percent of Electricity 100,8 TWh electricity from RES

# Input NL 2015.txt

# The EnergyPLAN model 12.4

| | | | |
|---|---|---|---|
| Electricity demand (TWh/year): | | Flexible demand | 5,33 |
| Fixed demand | 93,22 | Fixed imp/exp. | -16,50 |
| Electric heating + HP | 17,19 | Transportation | 2,14 |
| Electric cooling | 2,99 | Total | 104,37 |

| District heating (TWh/year) | Gr.1 | Gr.2 | Gr.3 | Sum |
|---|---|---|---|---|
| District heating demand | 0,00 | 0,00 | 20,25 | 20,25 |
| Solar Thermal | 0,00 | 0,00 | 0,00 | 0,00 |
| Industrial CHP (CSHP) | 0,00 | 0,00 | 0,00 | 0,00 |
| Demand after solar and CSHP | 0,00 | 0,00 | 20,25 | 20,25 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Wind | 2840 | MW | 5,22 | TWh/year | 0,00 | Grid |
| Offshore Wind | 394 | MW | 1,29 | TWh/year | 0,00 | stabili- |
| Photo Voltaic | 1052 | MW | 1,13 | TWh/year | 0,00 | sation |
| River Hydro | 37 | MW | 0,04 | TWh/year | 0,00 | share |
| Hydro Power | 0 | MW | 0 | TWh/year | | |
| Geothermal/Nuclear | 482 | MW | 3,55 | TWh/year | | |

| | Capacities | | Efficiencies | | |
|---|---|---|---|---|---|
| Group 2: | MW-e | MJ/s | elec. | Ther | COP |
| CHP | 0 | 0 | 0,40 | 0,50 | |
| Heat Pump | 0 | 0 | | | 3,00 |
| Boiler | | 0 | | 0,50 | |
| Group 3: | | | | | |
| CHP | 4747 | 6800 | 0,41 | 0,59 | |
| Heat Pump | 0 | 1 | | | 3,64 |
| Boiler | | 10448 | | 0,90 | |
| Condensing | 24100 | | 0,43 | | |

| | | | | | |
|---|---|---|---|---|---|
| Heatstorage: | gr.2: | 0 | GWh | gr.3: | 0 GWh |
| Fixed Boiler: | gr.2: | 2,5 | Per cent | gr.3: | 5,0 Per cent |

| Electricity prod. from | CSHP | Waste | (TWh/year) |
|---|---|---|---|
| Gr.1: | 0,00 | 0,00 | |
| Gr.2: | 0,00 | 0,00 | |
| Gr.3: | 14,30 | 0,00 | |

| | | |
|---|---|---|
| Regulation Strategy: | Technical regulation no. 2 | |
| CEEP regulation | 23450000 | |
| Minimum Stabilisation share | 0,25 | |
| Stabilisation share of CHP | 0,00 | |
| Minimum CHP gr 3 load | 475 | MW |
| Minimum PP | 2410 | MW |
| Heat Pump maximum share | 0,50 | |
| Maximum import/export | 0 | MW |

| | | |
|---|---|---|
| Distr. Name : | const.txt | |
| Addition factor | 0,00 | EUR/MWh |
| Multiplication factor | 1,00 | |
| Dependency factor | 0,00 | EUR/MWh pr. MW |
| Average Market Price | 1 | EUR/MWh |
| Gas Storage | 0 | GWh |
| Syngas capacity | 0 | MW |
| Biogas max to grid | 0 | MW |

Fuel Price level:

| | Capacities | Storage | Efficiencies | |
|---|---|---|---|---|
| | MW-e | GWh | elec. | Ther. |
| Hydro Pump: | 0 | 0 | 0,00 | |
| Hydro Turbine: | 0 | | 0,00 | |
| Electrol. Gr.2: | 0 | 0 | 0,40 | 0,50 |
| Electrol. Gr.3: | 0 | 0 | 0,40 | 0,50 |
| Electrol. trans.: | 0 | 0 | 0,00 | |
| Ely. MicroCHP: | 0 | 0 | 0,80 | |
| CAES fuel ratio: | | 0,000 | | |

| (TWh/year) | Coal | Oil | Ngas | Biomass |
|---|---|---|---|---|
| Transport | 0,00 | 141,38 | 0,37 | 0,00 |
| Household | 0,05 | 2,58 | 115,26 | 2,68 |
| Industry | 16,90 | 2,56 | 88,07 | 17,78 |
| Various | 0,00 | 4,16 | 26,76 | 5,93 |

# Output WARNING!!: (1) Critical Excess;

| | District Heating | | | | | | | | | | Electricity | | | | | | | | | | | | | | | | Exchange | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Demand | Production | | | | | | | | | Consumption | | | | | | Production | | | | | | | | Balance | | | | |
| | Distr. heating MW | Solar MW | Waste+ CSHP MW | DHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Balance MW | Elec. demand MW | Flex.& Transp. MW | HP MW | Elec-trolyser MW | EH MW | Hydro Pump MW | Tur-bine MW | RES MW | Hy-dro MW | Geo-thermal MW | Waste+ CSHP MW | CHP MW | PP MW | Stab-Load % | Imp MW | Exp MW | CEEP MW | EEP MW | Payment Imp Million EUR | Payment Exp Million EUR |
| January | 4550 | 0 | 0 | 0 | 4446 | 1 | 0 | 209 | 0 | -107 | 11732 | 846 | 0 | 0 | 4050 | 0 | 0 | 1159 | 0 | 453 | 1628 | 3104 | 9128 | 322 | 0 | 0 | 0 | 0 | 0 | 0 |
| February | 4487 | 0 | 0 | 0 | 4438 | 1 | 0 | 155 | 0 | -107 | 11477 | 853 | 0 | 0 | 3991 | 0 | 0 | 852 | 0 | 453 | 1628 | 3098 | 9485 | 330 | 0 | 0 | 0 | 0 | 0 | 0 |
| March | 4065 | 0 | 0 | 0 | 4041 | 1 | 0 | 129 | 0 | -107 | 10931 | 855 | 0 | 0 | 3598 | 0 | 0 | 983 | 0 | 451 | 1628 | 2821 | 8106 | 320 | 0 | 1 | 1 | 0 | 0 | 0 |
| April | 1504 | 0 | 0 | 0 | 1575 | 1 | 0 | 114 | 0 | -186 | 10279 | 844 | 0 | 0 | 1210 | 0 | 0 | 593 | 0 | 435 | 1628 | 1100 | 6861 | 313 | 0 | 0 | 0 | 0 | 0 | 0 |
| May | 566 | 0 | 0 | 0 | 693 | 1 | 0 | 118 | 0 | -247 | 10221 | 855 | 0 | 0 | 335 | 0 | 0 | 890 | 0 | 157 | 1628 | 484 | 4332 | 261 | 0 | 363 | 363 | 0 | 0 | 0 |
| June | 566 | 0 | 0 | 0 | 693 | 1 | 0 | 118 | 0 | -247 | 10696 | 854 | 0 | 0 | 335 | 0 | 0 | 689 | 0 | 280 | 1628 | 484 | 4424 | 269 | 0 | 382 | 382 | 0 | 0 | 0 |
| July | 566 | 0 | 0 | 0 | 694 | 1 | 0 | 117 | 0 | -247 | 10926 | 845 | 0 | 0 | 340 | 0 | 0 | 775 | 0 | 389 | 1628 | 485 | 5947 | 284 | 0 | 102 | 102 | 0 | 0 | 0 |
| August | 566 | 0 | 0 | 0 | 695 | 1 | 0 | 116 | 0 | -247 | 10818 | 855 | 0 | 0 | 330 | 0 | 0 | 617 | 0 | 440 | 1628 | 485 | 5537 | 290 | 0 | 92 | 92 | 0 | 0 | 0 |
| September | 566 | 0 | 0 | 0 | 697 | 1 | 0 | 114 | 0 | -247 | 10803 | 849 | 0 | 0 | 335 | 0 | 0 | 734 | 0 | 445 | 1628 | 487 | 8028 | 313 | 0 | 0 | 0 | 0 | 0 | 0 |
| October | 2101 | 0 | 0 | 0 | 2151 | 1 | 0 | 114 | 0 | -165 | 10856 | 850 | 0 | 0 | 1766 | 0 | 0 | 428 | 0 | 449 | 1628 | 1502 | 9519 | 335 | 0 | 0 | 0 | 0 | 0 | 0 |
| November | 3616 | 0 | 0 | 0 | 3607 | 1 | 0 | 114 | 0 | -107 | 11398 | 854 | 0 | 0 | 3179 | 0 | 0 | 1320 | 0 | 449 | 1628 | 2518 | 9017 | 314 | 0 | 0 | 0 | 0 | 0 | 0 |
| December | 4558 | 0 | 0 | 0 | 4481 | 1 | 0 | 182 | 0 | -107 | 11312 | 845 | 0 | 0 | 4057 | 0 | 0 | 1442 | 0 | 452 | 1628 | 3129 | 8698 | 312 | 0 | 0 | 0 | 0 | 0 | 0 |
| Average | 2305 | 0 | 0 | 0 | 2347 | 1 | 0 | 134 | 0 | -177 | 10953 | 850 | 0 | 0 | 1957 | 0 | 0 | 874 | 0 | 404 | 1628 | 1639 | 7416 | 305 | 0 | 79 | 79 | 0 | Average price | |
| Maximum | 8707 | 0 | 0 | 0 | 6800 | 1 | 0 | 1906 | 0 | 0 | 15203 | 2234 | 0 | 0 | 7925 | 0 | 0 | 2886 | 0 | 453 | 1628 | 4747 | 19239 | 373 | 0 | 3454 | 3454 | 0 | (EUR/MWh) | |
| Minimum | 226 | 0 | 0 | 0 | 680 | 1 | 0 | 114 | 0 | -570 | 217 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 153 | 1628 | 475 | 2410 | 167 | 0 | 0 | 0 | 0 | 1 | 1 |
| TWh/year | 20,25 | 0,00 | 0,00 | 0,00 | 20,62 | 0,01 | 0,00 | 1,17 | 0,00 | -1,55 | 96,21 | 7,47 | 0,00 | 0,00 | 17,19 | 0,00 | 0,00 | 7,68 | 0,00 | 3,55 | 14,30 | 14,39 | 65,14 | | 0,00 | 0,69 | 0,69 | 0,00 | 0 | 0 |

| FUEL BALANCE (TWh/year): | DHP | CHP2 | CHP3 | Boiler2 | Boiler3 | PP | Geo/Nu. | Hydro | Waste | CAES Elc.ly. | BioCon-version | Electro-Fuel | Wind | Offsh. | PV | Hydro | Solar.Th | Transp. | Industry household | Industry Various | Total | Imp/Exp Corrected Imp/Exp | Imp/Exp Corrected Net | CO2 emission (Mt): Total | CO2 emission (Mt): Net |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Coal | - | - | - | - | - | 59,20 | - | - | - | - | - | - | - | - | - | - | - | - | 0,05 | 16,90 | 76,15 | -0,63 | 75,52 | 27,00 | 26,78 |
| Oil | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 141,38 | 2,40 | 6,72 | 150,50 | 0,00 | 150,50 | 39,50 | 39,50 |
| N.Gas | - | - | 33,75 | - | 1,27 | 92,29 | - | - | - | - | - | - | - | - | - | - | - | 0,66 | 115,26 | 114,83 | 358,06 | -0,98 | 357,08 | 73,35 | 73,21 |
| Biomass | - | - | 0,97 | - | 0,04 | - | - | - | - | - | 10,98 | - | - | - | - | - | - | - | 2,68 | 23,71 | 38,38 | 0,00 | 38,38 | 0,00 | 0,00 |
| Renewable | - | - | - | - | - | - | - | - | - | - | - | - | 5,22 | 1,29 | 1,13 | 0,04 | 0,16 | - | - | - | 7,84 | 0,00 | 7,84 | 0,00 | 0,00 |
| H2 etc. | - | - | 0,00 | - | 0,00 | 0,00 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Biofuel | - | - | - | - | - | - | - | - | - | - | -7,54 | - | - | - | - | - | - | 7,54 | - | - | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Nuclear/CCS | - | - | - | - | - | - | 11,83 | - | - | - | - | - | - | - | - | - | - | - | - | - | 11,83 | 0,00 | 11,83 | 0,00 | 0,00 |
| Total | - | - | 34,71 | - | 1,30 | 151,49 | 11,83 | - | - | - | 3,44 | - | 5,22 | 1,29 | 1,13 | 0,04 | 0,16 | 149,58 | 120,39 | 162,16 | 642,76 | -1,60 | 641,15 | 139,85 | 139,48 |

## District Heating Production

| | Gr.1 | | | | Gr.2 | | | | | | | | | | Gr.3 | | | | | | | | | | RES specification | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | District heating MW | Solar MW | CSHP MW | DHP MW | District heating MW | Solar MW | CSHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Stor-age MW | Ba-lance MW | District heating MW | Solar MW | CSHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Stor-age MW | Ba-lance MW | RES1 Wind MW | RES2 Offsho MW | RES3 Photo MW | RES 4-7 ic MW | Total MW |
| January | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4550 | 0 | 0 | 4446 | 1 | 0 | 209 | 0 | 0 | -107 | 915 | 207 | 35 | 2 | 1159 |
| February | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4487 | 0 | 0 | 4438 | 1 | 0 | 155 | 0 | 0 | -107 | 615 | 150 | 60 | 27 | 852 |
| March | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4065 | 0 | 0 | 4041 | 1 | 0 | 129 | 0 | 0 | -107 | 693 | 165 | 120 | 4 | 983 |
| April | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1504 | 0 | 0 | 1575 | 1 | 0 | 114 | 0 | 0 | -186 | 309 | 83 | 197 | 4 | 593 |
| May | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 566 | 0 | 0 | 693 | 1 | 0 | 118 | 0 | 0 | -247 | 530 | 135 | 222 | 3 | 890 |
| June | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 566 | 0 | 0 | 693 | 1 | 0 | 118 | 0 | 0 | -247 | 359 | 100 | 227 | 2 | 689 |
| July | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 566 | 0 | 0 | 694 | 1 | 0 | 117 | 0 | 0 | -247 | 442 | 117 | 214 | 1 | 775 |
| August | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 566 | 0 | 0 | 695 | 1 | 0 | 116 | 0 | 0 | -247 | 337 | 95 | 184 | 0 | 617 |
| September | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 566 | 0 | 0 | 697 | 1 | 0 | 114 | 0 | 0 | -247 | 473 | 125 | 134 | 1 | 734 |
| October | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2101 | 0 | 0 | 2151 | 1 | 0 | 114 | 0 | 0 | -165 | 267 | 78 | 82 | 1 | 428 |
| November | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3616 | 0 | 0 | 3607 | 1 | 0 | 114 | 0 | 0 | -107 | 1039 | 242 | 38 | 1 | 1320 |
| December | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4558 | 0 | 0 | 4481 | 1 | 0 | 182 | 0 | 0 | -107 | 1145 | 266 | 29 | 2 | 1442 |
| Average | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2305 | 0 | 0 | 2347 | 1 | 0 | 134 | 0 | 0 | -177 | 594 | 147 | 129 | 4 | 874 |
| Maximum | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8707 | 0 | 0 | 6800 | 1 | 0 | 1906 | 0 | 0 | 0 | 1747 | 333 | 1052 | 37 | 2886 |
| Minimum | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 226 | 0 | 0 | 680 | 1 | 0 | 114 | 0 | 0 | -570 | 0 | 0 | 0 | 0 | 1 |
| Total for the whole year TWh/year | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | | 0,00 | 20,25 | 0,00 | 0,00 | 20,62 | 0,01 | 0,00 | 1,17 | 0,00 | | -1,55 | 5,22 | 1,29 | 1,13 | 0,04 | 7,68 |

Own use of heat from industrial CHP: 0,00 TWh/year

ANNUAL COSTS (Million EUR)

| | | |
|---|---|---|
| Total Fuel ex Ngas exchange = | | 9538 |
| Uranium = | 75 | |
| Coal = | 713 | |
| FuelOil = | 163 | |
| Gasoil/Diesel= | 1714 | |
| Petrol/JP = | 3857 | |
| Gas handling = | 2144 | |
| Biomass = | 872 | |
| Food income = | 0 | |
| Waste = | 0 | |
| Total Ngas Exchange costs = | | 8913 |
| Marginal operation costs = | | 264 |
| Total Electricity exchange = | | -16 |
| Import = | 0 | |
| Export = | 0 | |
| Bottleneck = | 0 | |
| Fixed imp/ex= | -16 | |
| Total CO2 emission costs = | | 2126 |
| Total variable costs = | | 20824 |
| Fixed operation costs = | | 430 |
| Annual Investment costs = | | 878 |
| TOTAL ANNUAL COSTS = | | 22132 |

## NATURAL GAS EXCHANGE

| | DHP & Boilers MW | CHP2 CHP3 MW | PP CAES MW | Indi-vidual MW | Trans port MW | Indu. Var. MW | Demand Sum MW | Bio-gas MW | Syn-gas MW | CO2Hy gas MW | SynHy gas MW | SynHy gas MW | Stor-age MW | Sum MW | Im-port MW | Ex-port MW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| January | 226 | 7276 | 12932 | 27153 | 42 | 13073 | 60703 | 0 | 0 | 0 | 0 | 0 | 0 | 60703 | 60703 | 0 |
| February | 167 | 7263 | 13438 | 26761 | 42 | 13073 | 60744 | 0 | 0 | 0 | 0 | 0 | 0 | 60744 | 60744 | 0 |
| March | 140 | 6614 | 11485 | 24123 | 42 | 13073 | 55476 | 0 | 0 | 0 | 0 | 0 | 0 | 55476 | 55476 | 0 |
| April | 123 | 2578 | 9721 | 8113 | 42 | 13073 | 33649 | 0 | 0 | 0 | 0 | 0 | 0 | 33649 | 33649 | 0 |
| May | 128 | 1134 | 6138 | 2246 | 42 | 13073 | 22760 | 0 | 0 | 0 | 0 | 0 | 0 | 22760 | 22760 | 0 |
| June | 127 | 1135 | 6268 | 2246 | 42 | 13073 | 22891 | 0 | 0 | 0 | 0 | 0 | 0 | 22891 | 22891 | 0 |
| July | 126 | 1136 | 8426 | 2246 | 42 | 13073 | 25049 | 0 | 0 | 0 | 0 | 0 | 0 | 25049 | 25049 | 0 |
| August | 125 | 1138 | 7845 | 2246 | 42 | 13073 | 24468 | 0 | 0 | 0 | 0 | 0 | 0 | 24468 | 24468 | 0 |
| September | 123 | 1141 | 11374 | 2246 | 42 | 13073 | 27999 | 0 | 0 | 0 | 0 | 0 | 0 | 27999 | 27999 | 0 |
| October | 123 | 3520 | 13487 | 11842 | 42 | 13073 | 42087 | 0 | 0 | 0 | 0 | 0 | 0 | 42087 | 42087 | 0 |
| November | 124 | 5904 | 12775 | 21316 | 42 | 13073 | 53234 | 0 | 0 | 0 | 0 | 0 | 0 | 53234 | 53234 | 0 |
| December | 197 | 7334 | 12323 | 27204 | 42 | 13073 | 60173 | 0 | 0 | 0 | 0 | 0 | 0 | 60173 | 60173 | 0 |
| Average | 144 | 3842 | 10507 | 13122 | 42 | 13073 | 40729 | 0 | 0 | 0 | 0 | 0 | 0 | 40729 | 40729 | 0 |
| Maximum | 2059 | 11128 | 27258 | 53139 | 42 | 13073 | 99327 | 0 | 0 | 0 | 0 | 0 | 0 | 99327 | 99327 | 0 |
| Minimum | 123 | 1113 | 3415 | 122 | 42 | 13073 | 17888 | 0 | 0 | 0 | 0 | 0 | 0 | 17888 | 17888 | 0 |
| Total for the whole year TWh/year | 1,27 | 33,75 | 92,29 | 115,26 | 0,37 | 114,83 | 357,77 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 357,77 | 357,77 | 0,00 |

RES Share: 7,2 Percent of Primary Energy 6,3 Percent of Electricity 8,1 TWh electricity from RES

# Input PL 2015.txt

# The EnergyPLAN model 12.4

| | | | |
|---|---|---|---|
| Electricity demand (TWh/year): | | Flexible demand | 6,32 |
| Fixed demand | 114,16 | Fixed imp/exp. | -3,92 |
| Electric heating + HP | 19,27 | Transportation | 3,54 |
| Electric cooling | 1,04 | Total | 140,41 |

| District heating (TWh/year) | Gr.1 | Gr.2 | Gr.3 | Sum |
|---|---|---|---|---|
| District heating demand | 0,00 | 0,00 | 57,77 | 57,77 |
| Solar Thermal | 0,00 | 0,00 | 0,40 | 0,40 |
| Industrial CHP (CSHP) | 0,00 | 0,00 | 0,00 | 0,00 |
| Demand after solar and CSHP | 0,00 | 0,00 | 57,37 | 57,37 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Wind | 4048 | MW | 7,06 | TWh/year | 0,00 | Grid |
| Offshore Wind | 0 | MW | 0 | TWh/year | 0,00 | stabili- |
| Photo Voltaic | 0 | MW | 0 | TWh/year | 0,00 | sation |
| River Hydro | 452 | MW | 2 | TWh/year | 0,00 | share |
| Hydro Power | 716 | MW | 2,36 | TWh/year | | |
| Geothermal/Nuclear | 0 | MW | 0 | TWh/year | | |

| | Capacities MW-e | MJ/s | Efficiencies elec. | Ther | COP |
|---|---|---|---|---|---|
| Group 2: | | | | | |
| CHP | 0 | 0 | 0,40 | 0,50 | |
| Heat Pump | 0 | 0 | | | 3,00 |
| Boiler | | 0 | | 0,50 | |
| Group 3: | | | | | |
| CHP | 5167 | 7073 | 0,31 | 0,42 | |
| Heat Pump | 0 | 0 | | | 3,00 |
| Boiler | | 30804 | | 0,85 | |
| Condensing | 55400 | | 0,30 | | |

| | | | | | |
|---|---|---|---|---|---|
| Heatstorage: | gr.2: | 0 | GWh | gr.3: | 0 GWh |
| Fixed Boiler: | gr.2: | 2,5 | Per cent | gr.3: | 5,0 Per cent |

| Electricity prod. from | CSHP | Waste | (TWh/year) |
|---|---|---|---|
| Gr.1: | 0,00 | 0,00 | |
| Gr.2: | 0,00 | 0,00 | |
| Gr.3: | 10,98 | 0,00 | |

| | | |
|---|---|---|
| Regulation Strategy: | Technical regulation no. 2 | |
| CEEP regulation | 23450000 | |
| Minimum Stabilisation share | 0,25 | |
| Stabilisation share of CHP | 0,00 | |
| Minimum CHP gr 3 load | 517 | MW |
| Minimum PP | 1662 | MW |
| Heat Pump maximum share | 0,50 | |
| Maximum import/export | 0 | MW |

| | | |
|---|---|---|
| Distr. Name : | const.txt | |
| Addition factor | 0,00 | EUR/MWh |
| Multiplication factor | 1,00 | |
| Dependency factor | 0,00 | EUR/MWh pr. MW |
| Average Market Price | 1 | EUR/MWh |
| Gas Storage | 0 | GWh |
| Syngas capacity | 0 | MW |
| Biogas max to grid | 0 | MW |

Fuel Price level:

| | Capacities MW-e | Storage GWh | Efficiencies elec. | Ther. |
|---|---|---|---|---|
| Hydro Pump: | 1782 | 18 | 0,00 | |
| Hydro Turbine: | 1782 | | 0,00 | |
| Electrol. Gr.2: | 0 | 0 | 0,40 | 0,50 |
| Electrol. Gr.3: | 0 | 0 | 0,40 | 0,50 |
| Electrol. trans.: | 0 | 0 | 0,00 | |
| Ely. MicroCHP: | 0 | 0 | 0,80 | |
| CAES fuel ratio: | 0,000 | | | |

| (TWh/year) | Coal | Oil | Ngas | Biomass |
|---|---|---|---|---|
| Transport | 0,00 | 168,77 | 0,00 | 0,00 |
| Household | 57,17 | 7,08 | 58,31 | 27,84 |
| Industry | 68,07 | 9,01 | 57,25 | 32,31 |
| Various | 14,67 | 20,99 | 0,41 | 15,09 |

# Output WARNING!!: (1) Critical Excess;

| | District Heating | | | | | | | | | | Electricity | | | | | | | | | | | | | | | Exchange | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Demand | Production | | | | | | | | | Consumption | | | | | | Production | | | | | | | Balance | | | |
| | Distr. heating MW | Solar MW | Waste+ CSHP MW | DHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Balance MW | Elec. demand MW | Flex.& Transp. MW | HP MW | Elec-trolyser MW | EH MW | Hydro Pump MW | Tur-bine MW | RES MW | Hy-dro MW | Geo-thermal MW | Waste+ CSHP MW | CHP MW | PP MW | Stab-Load % | Imp MW | Exp MW | CEEP MW | EEP MW | Payment Imp Million EUR | Exp Million EUR |
| January | 13179 | 14 | 6 | 0 | 5508 | 0 | 0 | 7688 | 0 | -37 | 13857 | 1115 | 0 | 0 | 4638 | 0 | 0 | 1824 | 356 | 0 | 1250 | 4024 | 15772 | 331 | 0 | 27 | 27 | 0 | 0 | 0 |
| February | 12652 | 22 | 6 | 0 | 5618 | 0 | 0 | 7043 | 0 | -37 | 13875 | 1126 | 0 | 0 | 4451 | 0 | 0 | 1127 | 211 | 0 | 1250 | 4105 | 16374 | 345 | 0 | 11 | 11 | 0 | 0 | 0 |
| March | 10973 | 44 | 6 | 0 | 4264 | 0 | 0 | 6696 | 0 | -37 | 13471 | 1130 | 0 | 0 | 3823 | 0 | 0 | 1334 | 203 | 0 | 1250 | 3115 | 9815 | 295 | 0 | 1007 | 1007 | 0 | 0 | 0 |
| April | 4061 | 65 | 6 | 0 | 2320 | 0 | 0 | 1714 | 0 | -44 | 12651 | 1112 | 0 | 0 | 1262 | 0 | 0 | 1176 | 168 | 0 | 1250 | 1695 | 6204 | 272 | 0 | 1604 | 1604 | 0 | 0 | 0 |
| May | 1904 | 75 | 6 | 0 | 904 | 0 | 0 | 968 | 0 | -50 | 12374 | 1130 | 0 | 0 | 463 | 0 | 0 | 816 | 124 | 0 | 1250 | 661 | 4184 | 256 | 0 | 2667 | 2667 | 0 | 0 | 0 |
| June | 1904 | 79 | 6 | 0 | 1151 | 0 | 0 | 719 | 0 | -51 | 12422 | 1128 | 0 | 0 | 456 | 0 | 0 | 593 | 186 | 0 | 1250 | 841 | 5840 | 288 | 0 | 1305 | 1305 | 0 | 0 | 0 |
| July | 1904 | 79 | 6 | 0 | 1421 | 0 | 0 | 448 | 0 | -50 | 12755 | 1114 | 0 | 0 | 470 | 0 | 0 | 757 | 286 | 0 | 1250 | 1038 | 11799 | 326 | 0 | 376 | 376 | 0 | 0 | 0 |
| August | 1904 | 65 | 6 | 0 | 1374 | 0 | 0 | 507 | 0 | -49 | 12702 | 1130 | 0 | 0 | 456 | 0 | 0 | 483 | 270 | 0 | 1250 | 1004 | 9395 | 323 | 0 | 394 | 394 | 0 | 0 | 0 |
| September | 1904 | 50 | 6 | 0 | 1557 | 0 | 0 | 339 | 0 | -48 | 12816 | 1120 | 0 | 0 | 463 | 0 | 0 | 687 | 312 | 0 | 1250 | 1137 | 17083 | 351 | 0 | 0 | 0 | 0 | 0 | 0 |
| October | 6044 | 29 | 6 | 0 | 3694 | 0 | 0 | 2357 | 0 | -42 | 13324 | 1122 | 0 | 0 | 1997 | 0 | 0 | 693 | 263 | 0 | 1250 | 2699 | 10306 | 334 | 0 | 143 | 143 | 0 | 0 | 0 |
| November | 10196 | 14 | 6 | 0 | 5711 | 0 | 0 | 4502 | 0 | -37 | 13783 | 1128 | 0 | 0 | 3535 | 0 | 0 | 1363 | 347 | 0 | 1250 | 4172 | 13705 | 345 | 0 | 2 | 2 | 0 | 0 | 0 |
| December | 12422 | 10 | 6 | 0 | 5742 | 0 | 0 | 6701 | 0 | -37 | 13377 | 1114 | 0 | 0 | 4359 | 0 | 0 | 1527 | 489 | 0 | 1250 | 4195 | 19856 | 352 | 0 | 3 | 3 | 0 | 0 | 0 |
| Average | 6577 | 46 | 6 | 0 | 3266 | 0 | 0 | 3303 | 0 | -43 | 13115 | 1123 | 0 | 0 | 2194 | 0 | 0 | 1032 | 268 | 0 | 1250 | 2386 | 11680 | 318 | 0 | 630 | 630 | 0 | Average price (EUR/MWh) | |
| Maximum | 25670 | 283 | 6 | 0 | 7073 | 0 | 0 | 19252 | 0 | 0 | 17546 | 2714 | 0 | 0 | 9267 | 0 | 0 | 3805 | 573 | 0 | 1250 | 5167 | 50165 | 388 | 0 | 23117 | 23117 | 0 | | |
| Minimum | 721 | 0 | 6 | 0 | 707 | 0 | 0 | 329 | 0 | -323 | 180 | 0 | 0 | 0 | 0 | 0 | 0 | 89 | 0 | 0 | 1250 | 517 | 1662 | 125 | 0 | 0 | 0 | 0 | 1 | 0 |
| TWh/year | 57,77 | 0,40 | 0,06 | 0,00 | 28,69 | 0,00 | 0,00 | 29,01 | 0,00 | -0,38 | 115,20 | 9,86 | 0,00 | 0,00 | 19,27 | 0,00 | 0,00 | 9,06 | 2,36 | 0,00 | 10,98 | 20,96 | 102,59 | | 0,00 | 5,54 | 5,54 | 0,00 | 0 | 1 |

| FUEL BALANCE (TWh/year): | DHP | CHP2 | CHP3 | Boiler2 | Boiler3 | PP | Geo/Nu. | Hydro | Waste | CAES Elc.ly. | BioCon-version | Electro-Fuel | Wind | Offsh. | PV | Hydro | Solar.Th | Transp. | Industry household | Industry Various | Total | Imp/Exp Corrected Imp/Exp | Net | CO2 emission (Mt): Total | Net |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Coal | - | - | 52,56 | - | 30,96 | 341,98 | - | - | - | - | - | - | - | - | - | - | - | - | 57,17 | 82,74 | 565,41 | -18,46 | 546,95 | 200,49 | 193,95 |
| Oil | - | - | - | - | 0,22 | - | - | - | - | - | - | - | - | - | - | - | - | 168,77 | 7,06 | 30,00 | 206,05 | 0,00 | 206,05 | 54,07 | 54,07 |
| N.Gas | - | - | 12,19 | - | 0,32 | - | - | - | - | - | - | - | - | - | - | - | - | 12,39 | 58,31 | 57,66 | 140,87 | 0,00 | 140,87 | 28,98 | 31,52 |
| Biomass | - | - | 3,71 | - | 2,63 | - | - | - | 0,07 | - | 12,75 | - | - | - | - | - | - | - | 27,84 | 47,40 | 94,41 | 0,00 | 94,41 | 0,01 | 0,01 |
| Renewable | - | - | - | - | - | - | - | 2,36 | - | - | - | - | 7,06 | - | - | 2,00 | 0,42 | - | - | - | 11,84 | 0,00 | 11,84 | 0,00 | 0,00 |
| H2 etc. | - | - | 0,00 | - | 0,00 | 0,00 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Biofuel | - | - | 0,00 | - | 0,00 | - | - | - | - | - | -9,48 | - | - | - | - | - | - | 9,48 | - | - | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Nuclear/CCS | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Total | - | - | 68,46 | - | 34,13 | 341,98 | - | 2,36 | 0,07 | - | 3,28 | - | 7,06 | - | - | 2,00 | 0,42 | 190,64 | 150,38 | 217,80 | 1018,57 | -18,46 | 1000,12 | 283,55 | 279,55 |

## District Heating Production

| | Gr.1 | | | | Gr.2 | | | | | | | | | | Gr.3 | | | | | | | | | | RES specification | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | District heating MW | Solar MW | CSHP MW | DHP MW | District heating MW | Solar MW | CSHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Stor-age MW | Ba-lance MW | District heating MW | Solar MW | CSHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Stor-age MW | Ba-lance MW | RES1 Wind MW | RES2 Offsho MW | RES3 Photo MW | RES 4-7 MW | Total MW |
| January | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 13179 | 14 | 6 | 5508 | 0 | 0 | 7688 | 0 | 0 | -37 | 1482 | 0 | 0 | 342 | 1824 |
| February | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 12652 | 22 | 6 | 5618 | 0 | 0 | 7043 | 0 | 0 | -37 | 797 | 0 | 0 | 330 | 1127 |
| March | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10973 | 44 | 6 | 4264 | 0 | 0 | 6696 | 0 | 0 | -37 | 979 | 0 | 0 | 355 | 1334 |
| April | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4061 | 65 | 6 | 2320 | 0 | 0 | 1714 | 0 | 0 | -44 | 789 | 0 | 0 | 387 | 1176 |
| May | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1904 | 75 | 6 | 904 | 0 | 0 | 968 | 0 | 0 | -50 | 504 | 0 | 0 | 312 | 816 |
| June | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1904 | 79 | 6 | 1151 | 0 | 0 | 719 | 0 | 0 | -51 | 337 | 0 | 0 | 256 | 593 |
| July | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1904 | 79 | 6 | 1421 | 0 | 0 | 448 | 0 | 0 | -50 | 628 | 0 | 0 | 129 | 757 |
| August | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1904 | 65 | 6 | 1374 | 0 | 0 | 507 | 0 | 0 | -49 | 391 | 0 | 0 | 92 | 483 |
| September | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1904 | 50 | 6 | 1557 | 0 | 0 | 339 | 0 | 0 | -48 | 597 | 0 | 0 | 90 | 687 |
| October | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6044 | 29 | 6 | 3694 | 0 | 0 | 2357 | 0 | 0 | -42 | 585 | 0 | 0 | 108 | 693 |
| November | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10196 | 14 | 6 | 5711 | 0 | 0 | 4502 | 0 | 0 | -37 | 1204 | 0 | 0 | 158 | 1363 |
| December | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 12422 | 10 | 6 | 5742 | 0 | 0 | 6701 | 0 | 0 | -37 | 1348 | 0 | 0 | 179 | 1527 |
| Average | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6577 | 46 | 6 | 3266 | 0 | 0 | 3303 | 0 | 0 | -43 | 804 | 0 | 0 | 228 | 1032 |
| Maximum | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 25670 | 283 | 6 | 7073 | 0 | 0 | 19252 | 0 | 0 | 0 | 3465 | 0 | 0 | 452 | 3805 |
| Minimum | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 721 | 0 | 6 | 707 | 0 | 0 | 329 | 0 | 0 | -323 | 1 | 0 | 0 | 0 | 89 |
| Total for the whole year TWh/year | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | | 0,00 | 57,77 | 0,40 | 0,06 | 28,69 | 0,00 | 0,00 | 29,01 | 0,00 | | -0,38 | 7,06 | 0,00 | 0,00 | 2,00 | 9,06 |

Own use of heat from industrial CHP: 0,00 TWh/year

ANNUAL COSTS (Million EUR)

| | | |
|---|---|---|
| Total Fuel ex Ngas exchange = | | 16545 |
| Uranium = | 0 | |
| Coal = | 5292 | |
| FuelOil = | 735 | |
| Gasoil/Diesel= | 4373 | |
| Petrol/JP = | 2686 | |
| Gas handling = | 1101 | |
| Biomass = | 2358 | |
| Food income = | 0 | |
| Waste = | 0 | |
| Total Ngas Exchange costs = | | 3201 |
| Marginal operation costs = | | 334 |
| Total Electricity exchange = | | 8 |
| Import = | 0 | |
| Export = | -1 | |
| Bottleneck = | 1 | |
| Fixed imp/ex= | 8 | |
| Total CO2 emission costs = | | 4310 |
| Total variable costs = | | 24398 |
| Fixed operation costs = | | 498 |
| Annual Investment costs = | | 1072 |
| TOTAL ANNUAL COSTS = | | 25968 |

## NATURAL GAS EXCHANGE

| | DHP & Boilers MW | CHP2 CHP3 MW | PP CAES MW | Indi-vidual MW | Trans port MW | Indu. Var. MW | Demand Sum MW | Bio-gas MW | Syn-gas MW | CO2Hy gas MW | SynHy gas MW | SynHy gas MW | Stor-age MW | Sum MW | Im-port MW | Ex-port MW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| January | 84 | 2341 | 0 | 14034 | 0 | 6564 | 23022 | 0 | 0 | 0 | 0 | 0 | 0 | 23022 | 23022 | 0 |
| February | 77 | 2388 | 0 | 13449 | 0 | 6564 | 22477 | 0 | 0 | 0 | 0 | 0 | 0 | 22477 | 22477 | 0 |
| March | 73 | 1812 | 0 | 11567 | 0 | 6564 | 20016 | 0 | 0 | 0 | 0 | 0 | 0 | 20016 | 20016 | 0 |
| April | 19 | 986 | 0 | 3819 | 0 | 6564 | 11388 | 0 | 0 | 0 | 0 | 0 | 0 | 11388 | 11388 | 0 |
| May | 11 | 384 | 0 | 1401 | 0 | 6564 | 8360 | 0 | 0 | 0 | 0 | 0 | 0 | 8360 | 8360 | 0 |
| June | 8 | 489 | 0 | 1401 | 0 | 6564 | 8462 | 0 | 0 | 0 | 0 | 0 | 0 | 8462 | 8462 | 0 |
| July | 5 | 604 | 0 | 1401 | 0 | 6564 | 8574 | 0 | 0 | 0 | 0 | 0 | 0 | 8574 | 8574 | 0 |
| August | 6 | 584 | 0 | 1401 | 0 | 6564 | 8554 | 0 | 0 | 0 | 0 | 0 | 0 | 8554 | 8554 | 0 |
| September | 4 | 662 | 0 | 1401 | 0 | 6564 | 8630 | 0 | 0 | 0 | 0 | 0 | 0 | 8630 | 8630 | 0 |
| October | 26 | 1570 | 0 | 6042 | 0 | 6564 | 14201 | 0 | 0 | 0 | 0 | 0 | 0 | 14201 | 14201 | 0 |
| November | 49 | 2427 | 0 | 10695 | 0 | 6564 | 19736 | 0 | 0 | 0 | 0 | 0 | 0 | 19736 | 19736 | 0 |
| December | 73 | 2440 | 0 | 13191 | 0 | 6564 | 22269 | 0 | 0 | 0 | 0 | 0 | 0 | 22269 | 22269 | 0 |
| Average | 36 | 1388 | 0 | 6638 | 0 | 6564 | 14626 | 0 | 0 | 0 | 0 | 0 | 0 | 14626 | 14626 | 0 |
| Maximum | 209 | 3006 | 0 | 28042 | 0 | 6564 | 37814 | 0 | 0 | 0 | 0 | 0 | 0 | 37814 | 37814 | 0 |
| Minimum | 4 | 301 | 0 | 76 | 0 | 6564 | 6944 | 0 | 0 | 0 | 0 | 0 | 0 | 6944 | 6944 | 0 |
| Total for the whole year TWh/year | 0,32 | 12,19 | 0,00 | 58,31 | 0,00 | 57,66 | 128,48 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 128,48 | 128,48 | 0,00 |

RES Share: 10,4 Percent of Primary Energy 8,9 Percent of Electricity 12,6 TWh electricity from RES

# Input RO 2015.txt

# The EnergyPLAN model 12.4

| | | | |
|---|---|---|---|
| Electricity demand (TWh/year): | | Flexible demand | 3,50 |
| Fixed demand | 47,57 | Fixed imp/exp. | 3,29 |
| Electric heating + HP | 4,86 | Transportation | 2,16 |
| Electric cooling | 0,43 | Total | 61,81 |

| District heating (TWh/year) | Gr.1 | Gr.2 | Gr.3 | Sum |
|---|---|---|---|---|
| District heating demand | 0,00 | 0,00 | 14,89 | 14,89 |
| Solar Thermal | 0,00 | 0,00 | 0,00 | 0,00 |
| Industrial CHP (CSHP) | 0,00 | 0,00 | 0,00 | 0,00 |
| Demand after solar and CSHP | 0,00 | 0,00 | 14,89 | 14,89 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Wind | 2569 | MW | 4,38 | TWh/year | 0,00 | Grid |
| Offshore Wind | 0 | MW | 0 | TWh/year | 0,00 | stabili- |
| Photo Voltaic | 1231 | MW | 1,49 | TWh/year | 0,00 | sation |
| River Hydro | 0 | MW | 0 | TWh/year | 0,00 | share |
| Hydro Power | 6282 | MW | 19,14 | TWh/year | | |
| Geothermal/Nuclear | 1300 | MW | 10,09 | TWh/year | | |

| | Capacities | | Efficiencies | | |
|---|---|---|---|---|---|
| Group 2: | MW-e | MJ/s | elec. | Ther | COP |
| CHP | 0 | 0 | 0,40 | 0,50 | |
| Heat Pump | 0 | 0 | | | 3,00 |
| Boiler | | 0 | | 0,50 | |
| Group 3: | | | | | |
| CHP | 2835 | 6274 | 0,29 | 0,65 | |
| Heat Pump | 0 | 0 | | | 3,00 |
| Boiler | | 7774 | | 0,90 | |
| Condensing | 10526 | | 0,31 | | |

| | | | | | |
|---|---|---|---|---|---|
| Heatstorage: | gr.2: | 0 | GWh | gr.3: | 0 GWh |
| Fixed Boiler: | gr.2: | 2,5 | Per cent | gr.3: | 5,0 Per cent |

| Electricity prod. from | CSHP | Waste | (TWh/year) |
|---|---|---|---|
| Gr.1: | 0,00 | 0,00 | |
| Gr.2: | 0,00 | 0,00 | |
| Gr.3: | 5,26 | 0,00 | |

| | | |
|---|---|---|
| Regulation Strategy: | Technical regulation no. 2 | |
| CEEP regulation | 23450000 | |
| Minimum Stabilisation share | 0,25 | |
| Stabilisation share of CHP | 0,00 | |
| Minimum CHP gr 3 load | 283 | MW |
| Minimum PP | 1053 | MW |
| Heat Pump maximum share | 0,50 | |
| Maximum import/export | 0 | MW |

| | | |
|---|---|---|
| Distr. Name : | const.txt | |
| Addition factor | 0,00 | EUR/MWh |
| Multiplication factor | 1,00 | |
| Dependency factor | 0,00 | EUR/MWh pr. MW |
| Average Market Price | 1 | EUR/MWh |
| Gas Storage | 0 | GWh |
| Syngas capacity | 0 | MW |
| Biogas max to grid | 0 | MW |

Fuel Price level:

| | Capacities | Storage | Efficiencies | |
|---|---|---|---|---|
| | MW-e | GWh | elec. | Ther. |
| Hydro Pump: | 92 | 1 | 0,00 | |
| Hydro Turbine: | 92 | | 0,00 | |
| Electrol. Gr.2: | 0 | 0 | 0,40 | 0,50 |
| Electrol. Gr.3: | 0 | 0 | 0,40 | 0,50 |
| Electrol. trans.: | 0 | 0 | 0,00 | |
| Ely. MicroCHP: | 0 | 0 | 0,80 | |
| CAES fuel ratio: | | 0,000 | | |

| (TWh/year) | Coal | Oil | Ngas | Biomass |
|---|---|---|---|---|
| Transport | 0,00 | 62,67 | 0,00 | 0,00 |
| Household | 0,08 | 0,89 | 34,25 | 28,64 |
| Industry | 15,44 | 5,10 | 33,38 | 14,35 |
| Various | 0,09 | 2,63 | 0,85 | 0,74 |

# Output WARNING!!: (1) Critical Excess;

| | District Heating | | | | | | | | | | Electricity | | | | | | | | | | | | | | | | Exchange | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Demand | Production | | | | | | | | | Consumption | | | | | | Production | | | | | | | | Balance | | | | |
| | Distr. heating MW | Solar MW | Waste+ CSHP MW | DHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Balance MW | Elec. demand MW | Flex.& Transp. MW | HP MW | Elec-trolyser MW | EH MW | Hydro Pump MW | Tur-bine MW | RES MW | Hy-dro MW | Geo-thermal MW | Waste+ CSHP MW | CHP MW | PP MW | Stab-Load % | Imp MW | Exp MW | CEEP MW | EEP MW | Payment Imp Million EUR | Payment Exp Million EUR |
| January | 3425 | 0 | 0 | 0 | 3368 | 0 | 0 | 114 | 0 | -57 | 5970 | 640 | 0 | 0 | 1286 | 0 | 0 | 743 | 2461 | 1222 | 599 | 1522 | 1785 | 334 | 0 | 2 | 2 | 0 | 0 | 0 |
| February | 3140 | 0 | 0 | 0 | 3091 | 0 | 0 | 105 | 0 | -57 | 6088 | 647 | 0 | 0 | 1165 | 0 | 0 | 769 | 2558 | 1218 | 599 | 1397 | 1577 | 332 | 0 | 1 | 1 | 0 | 0 | 0 |
| March | 2441 | 0 | 0 | 0 | 2374 | 0 | 0 | 124 | 0 | -57 | 5754 | 649 | 0 | 0 | 869 | 0 | 0 | 830 | 2342 | 1170 | 599 | 1073 | 1466 | 323 | 0 | 3 | 3 | 0 | 0 | 0 |
| April | 1033 | 0 | 0 | 0 | 998 | 0 | 0 | 123 | 0 | -87 | 5249 | 638 | 0 | 0 | 273 | 0 | 0 | 959 | 2196 | 1164 | 599 | 451 | 1223 | 308 | 0 | 14 | 14 | 0 | 0 | 0 |
| May | 633 | 0 | 0 | 0 | 654 | 0 | 0 | 86 | 0 | -107 | 5001 | 649 | 0 | 0 | 106 | 0 | 0 | 551 | 2230 | 762 | 599 | 296 | 1562 | 325 | 0 | 3 | 3 | 0 | 0 | 0 |
| June | 633 | 0 | 0 | 0 | 647 | 0 | 0 | 94 | 0 | -107 | 5193 | 648 | 0 | 0 | 102 | 0 | 0 | 578 | 2350 | 1109 | 599 | 292 | 1219 | 325 | 0 | 18 | 18 | 0 | 0 | 0 |
| July | 633 | 0 | 0 | 0 | 654 | 0 | 0 | 87 | 0 | -107 | 5358 | 639 | 0 | 0 | 104 | 0 | 0 | 505 | 2239 | 1171 | 599 | 295 | 1675 | 333 | 0 | 3 | 3 | 0 | 0 | 0 |
| August | 633 | 0 | 0 | 0 | 656 | 0 | 0 | 85 | 0 | -107 | 5219 | 649 | 0 | 0 | 104 | 0 | 0 | 615 | 1573 | 1168 | 599 | 296 | 2203 | 326 | 0 | 0 | 0 | 0 | 0 | 0 |
| September | 633 | 0 | 0 | 0 | 654 | 0 | 0 | 86 | 0 | -107 | 5215 | 643 | 0 | 0 | 105 | 0 | 0 | 653 | 2030 | 1180 | 599 | 296 | 1659 | 323 | 0 | 4 | 4 | 0 | 0 | 0 |
| October | 1423 | 0 | 0 | 0 | 1399 | 0 | 0 | 102 | 0 | -78 | 5367 | 644 | 0 | 0 | 437 | 0 | 0 | 601 | 2510 | 1211 | 599 | 632 | 1386 | 331 | 0 | 11 | 11 | 0 | 0 | 0 |
| November | 2480 | 0 | 0 | 0 | 2446 | 0 | 0 | 91 | 0 | -57 | 5460 | 648 | 0 | 0 | 887 | 0 | 0 | 750 | 1257 | 1210 | 599 | 1106 | 2652 | 328 | 0 | 0 | 0 | 0 | 0 | 0 |
| December | 3261 | 0 | 0 | 0 | 3207 | 0 | 0 | 111 | 0 | -57 | 5711 | 639 | 0 | 0 | 1214 | 0 | 0 | 486 | 2402 | 1212 | 599 | 1449 | 1835 | 344 | 0 | 1 | 1 | 0 | 0 | 0 |
| Average | 1695 | 0 | 0 | 0 | 1677 | 0 | 0 | 101 | 0 | -82 | 5464 | 644 | 0 | 0 | 553 | 0 | 0 | 669 | 2179 | 1149 | 599 | 758 | 1687 | 328 | 0 | 5 | 5 | 0 | Average price | |
| Maximum | 6478 | 0 | 0 | 0 | 6274 | 0 | 0 | 2415 | 0 | 0 | 7685 | 2154 | 0 | 0 | 2578 | 0 | 0 | 3157 | 3166 | 1222 | 599 | 2835 | 4679 | 375 | 0 | 1310 | 1310 | 0 | (EUR/MWh) | |
| Minimum | 401 | 0 | 0 | 0 | 627 | 0 | 0 | 85 | 0 | -311 | 123 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 750 | 599 | 283 | 1053 | 206 | 0 | 0 | 0 | 0 | 1 | 1 |
| TWh/year | 14,89 | 0,00 | 0,00 | 0,00 | 14,73 | 0,00 | 0,00 | 0,88 | 0,00 | -0,72 | 48,00 | 5,66 | 0,00 | 0,00 | 4,86 | 0,00 | 0,00 | 5,87 | 19,14 | 10,09 | 5,26 | 6,66 | 14,82 | | 0,00 | 0,04 | 0,04 | 0,00 | 0 | 0 |

| FUEL BALANCE (TWh/year): | DHP | CHP2 | CHP3 | Boiler2 | Boiler3 | PP | Geo/Nu. | Hydro | Waste | CAES Elc.ly. | BioCon-version | Electro-Fuel | Wind | Offsh. | PV | Hydro | Solar.Th | Transp. | Industry household | Industry Various | Total | Imp/Exp Corrected Imp/Exp | Imp/Exp Corrected Net | CO2 emission (Mt): Total | CO2 emission (Mt): Net |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Coal | - | - | 9,34 | - | 0,41 | 34,59 | - | - | - | - | - | - | - | - | - | - | - | - | 0,08 | 15,53 | 59,94 | -0,10 | 59,84 | 21,26 | 21,22 |
| Oil | - | - | 0,23 | - | 0,01 | - | - | - | - | - | - | - | - | - | - | - | - | 62,67 | 0,89 | 7,73 | 71,53 | 0,00 | 71,53 | 18,77 | 18,77 |
| N.Gas | - | - | 5,29 | - | 0,23 | 13,23 | - | - | - | - | - | - | - | - | - | - | - | 0,08 | 34,25 | 34,23 | 87,30 | -0,04 | 87,27 | 17,88 | 17,89 |
| Biomass | - | - | 7,77 | - | 0,34 | - | - | - | - | - | 4,18 | - | - | - | - | - | - | - | 28,64 | 15,09 | 56,02 | 0,00 | 56,02 | 0,00 | 0,00 |
| Renewable | - | - | - | - | - | - | - | 19,14 | - | - | - | - | 4,38 | - | 1,49 | - | - | - | - | - | 25,02 | 0,00 | 25,02 | 0,00 | 0,00 |
| H2 etc. | - | - | 0,00 | - | 0,00 | 0,00 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Biofuel | - | - | 0,00 | - | - | - | - | - | - | - | -3,13 | - | - | - | - | - | - | 3,13 | - | - | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Nuclear/CCS | - | - | - | - | - | - | 33,65 | - | - | - | - | - | - | - | - | - | - | - | - | - | 33,65 | 0,00 | 33,65 | 0,00 | 0,00 |
| Total | - | - | 22,62 | - | 0,98 | 47,81 | 33,65 | 19,14 | - | - | 1,06 | - | 4,38 | - | 1,49 | - | - | 65,88 | 63,86 | 72,58 | 333,46 | -0,14 | 333,32 | 57,91 | 57,88 |

## District Heating Production

| | Gr.1 | | | | Gr.2 | | | | | | | | | | Gr.3 | | | | | | | | | | RES specification | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | District heating MW | Solar MW | CSHP MW | DHP MW | District heating MW | Solar MW | CSHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Stor-age MW | Ba-lance MW | District heating MW | Solar MW | CSHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Stor-age MW | Ba-lance MW | RES1 Wind MW | RES2 Offsho MW | RES3 Photo ' MW | RES 4-7 lic MW | Total MW |
| January | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3425 | 0 | 0 | 3368 | 0 | 0 | 114 | 0 | 0 | -57 | 688 | 0 | 54 | 0 | 743 |
| February | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3140 | 0 | 0 | 3091 | 0 | 0 | 105 | 0 | 0 | -57 | 651 | 0 | 118 | 0 | 769 |
| March | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2441 | 0 | 0 | 2374 | 0 | 0 | 124 | 0 | 0 | -57 | 664 | 0 | 167 | 0 | 830 |
| April | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1033 | 0 | 0 | 998 | 0 | 0 | 123 | 0 | 0 | -87 | 733 | 0 | 225 | 0 | 959 |
| May | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 633 | 0 | 0 | 654 | 0 | 0 | 86 | 0 | 0 | -107 | 288 | 0 | 263 | 0 | 551 |
| June | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 633 | 0 | 0 | 647 | 0 | 0 | 94 | 0 | 0 | -107 | 299 | 0 | 279 | 0 | 578 |
| July | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 633 | 0 | 0 | 654 | 0 | 0 | 87 | 0 | 0 | -107 | 226 | 0 | 279 | 0 | 505 |
| August | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 633 | 0 | 0 | 656 | 0 | 0 | 85 | 0 | 0 | -107 | 363 | 0 | 252 | 0 | 615 |
| September | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 633 | 0 | 0 | 654 | 0 | 0 | 86 | 0 | 0 | -107 | 467 | 0 | 186 | 0 | 653 |
| October | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1423 | 0 | 0 | 1399 | 0 | 0 | 102 | 0 | 0 | -78 | 485 | 0 | 117 | 0 | 601 |
| November | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2480 | 0 | 0 | 2446 | 0 | 0 | 91 | 0 | 0 | -57 | 693 | 0 | 57 | 0 | 750 |
| December | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3261 | 0 | 0 | 3207 | 0 | 0 | 111 | 0 | 0 | -57 | 447 | 0 | 39 | 0 | 486 |
| Average | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1695 | 0 | 0 | 1677 | 0 | 0 | 101 | 0 | 0 | -82 | 499 | 0 | 170 | 0 | 669 |
| Maximum | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6478 | 0 | 0 | 6274 | 0 | 0 | 2415 | 0 | 0 | 0 | 2511 | 0 | 1231 | 0 | 3157 |
| Minimum | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 401 | 0 | 0 | 627 | 0 | 0 | 85 | 0 | 0 | -311 | 0 | 0 | 0 | 0 | 2 |
| Total for the whole year TWh/year | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | | 0,00 | 14,89 | 0,00 | 0,00 | 14,73 | 0,00 | 0,00 | 0,88 | 0,00 | | -0,72 | 4,38 | 0,00 | 1,49 | 0,00 | 5,87 |

Own use of heat from industrial CHP: 0,00 TWh/year

ANNUAL COSTS (Million EUR)

| | |
|---|---|
| Total Fuel ex Ngas exchange = | 5708 |
| Uranium = | 212 |
| Coal = | 561 |
| FuelOil = | 194 |
| Gasoil/Diesel= | 1490 |
| Petrol/JP = | 1055 |
| Gas handling = | 662 |
| Biomass = | 1534 |
| Food income = | 0 |
| Waste = | 0 |
| Total Ngas Exchange costs = | 2173 |
| Marginal operation costs = | 231 |
| Total Electricity exchange = | 3 |
| Import = | 0 |
| Export = | 0 |
| Bottleneck = | 0 |
| Fixed imp/ex= | 3 |
| Total CO2 emission costs = | 880 |
| Total variable costs = | 8996 |
| Fixed operation costs = | 754 |
| Annual Investment costs = | 1521 |
| TOTAL ANNUAL COSTS = | 11271 |

## NATURAL GAS EXCHANGE

| | DHP & Boilers MW | CHP2 CHP3 MW | PP CAES MW | Indi-vidual MW | Trans port MW | Indu. Var. MW | Demand Sum MW | Bio-gas MW | Syn-gas MW | CO2Hy gas MW | SynHy gas MW | SynHy gas MW | Stor-age MW | Sum MW | Im-port MW | Ex-port MW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| January | 30 | 1209 | 1593 | 9060 | 0 | 3897 | 15789 | 0 | 0 | 0 | 0 | 0 | 0 | 15789 | 15789 | 0 |
| February | 27 | 1110 | 1407 | 8207 | 0 | 3897 | 14648 | 0 | 0 | 0 | 0 | 0 | 0 | 14648 | 14648 | 0 |
| March | 32 | 852 | 1308 | 6125 | 0 | 3897 | 12214 | 0 | 0 | 0 | 0 | 0 | 0 | 12214 | 12214 | 0 |
| April | 32 | 358 | 1091 | 1924 | 0 | 3897 | 7302 | 0 | 0 | 0 | 0 | 0 | 0 | 7302 | 7302 | 0 |
| May | 22 | 235 | 1394 | 733 | 0 | 3897 | 6281 | 0 | 0 | 0 | 0 | 0 | 0 | 6281 | 6281 | 0 |
| June | 24 | 232 | 1088 | 733 | 0 | 3897 | 5974 | 0 | 0 | 0 | 0 | 0 | 0 | 5974 | 5974 | 0 |
| July | 23 | 235 | 1495 | 733 | 0 | 3897 | 6382 | 0 | 0 | 0 | 0 | 0 | 0 | 6382 | 6382 | 0 |
| August | 22 | 236 | 1966 | 733 | 0 | 3897 | 6853 | 0 | 0 | 0 | 0 | 0 | 0 | 6853 | 6853 | 0 |
| September | 22 | 235 | 1480 | 733 | 0 | 3897 | 6367 | 0 | 0 | 0 | 0 | 0 | 0 | 6367 | 6367 | 0 |
| October | 27 | 502 | 1237 | 3086 | 0 | 3897 | 8749 | 0 | 0 | 0 | 0 | 0 | 0 | 8749 | 8749 | 0 |
| November | 24 | 878 | 2366 | 6241 | 0 | 3897 | 13406 | 0 | 0 | 0 | 0 | 0 | 0 | 13406 | 13406 | 0 |
| December | 29 | 1151 | 1638 | 8569 | 0 | 3897 | 15283 | 0 | 0 | 0 | 0 | 0 | 0 | 15283 | 15283 | 0 |
| Average | 26 | 602 | 1506 | 3899 | 0 | 3897 | 9930 | 0 | 0 | 0 | 0 | 0 | 0 | 9930 | 9930 | 0 |
| Maximum | 627 | 2252 | 4176 | 18166 | 0 | 3897 | 26503 | 0 | 0 | 0 | 0 | 0 | 0 | 26503 | 26503 | 0 |
| Minimum | 22 | 225 | 940 | 40 | 0 | 3897 | 5124 | 0 | 0 | 0 | 0 | 0 | 0 | 5124 | 5124 | 0 |
| Total for the whole year TWh/year | 0,23 | 5,29 | 13,23 | 34,25 | 0,00 | 34,23 | 87,22 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 87,22 | 87,22 | 0,00 |

RES Share: 24,3 Percent of Primary Energy 37,7 Percent of Electricity 27,3 TWh electricity from RES

# Input SE 2015.txt

# The EnergyPLAN model 12.4

| | | | |
|---|---|---|---|
| Electricity demand (TWh/year): | | Flexible demand | 4,34 |
| Fixed demand | 97,68 | Fixed imp/exp. | 15,87 |
| Electric heating + HP | 36,35 | Transportation | 2,65 |
| Electric cooling | 0,78 | Total | 157,67 |

| District heating (TWh/year) | Gr.1 | Gr.2 | Gr.3 | Sum |
|---|---|---|---|---|
| District heating demand | 0,00 | 0,00 | 52,04 | 52,04 |
| Solar Thermal | 0,00 | 0,00 | 0,06 | 0,06 |
| Industrial CHP (CSHP) | 0,00 | 0,00 | 0,00 | 0,00 |
| Demand after solar and CSHP | 0,00 | 0,00 | 51,98 | 51,98 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Wind | 4329 | MW | 8,16 | TWh/year | 0,00 | Grid |
| Offshore Wind | 140 | MW | 0,47 | TWh/year | 0,00 | stabili- |
| Photo Voltaic | 0 | MW | 0 | TWh/year | 0,00 | sation |
| River Hydro | 8117 | MW | 32,53 | TWh/year | 0,00 | share |
| Hydro Power | 10198 | MW | 45,84 | TWh/year | | |
| Geothermal/Nuclear | 9408 | MW | 56,88 | TWh/year | | |

| | Capacities MW-e | Capacities MJ/s | Efficiencies elec. | Efficiencies Ther | Efficiencies COP |
|---|---|---|---|---|---|
| Group 2: | | | | | |
| CHP | 0 | 0 | 0,40 | 0,50 | |
| Heat Pump | 0 | 0 | | | 3,00 |
| Boiler | | 0 | | 0,50 | |
| Group 3: | | | | | |
| CHP | 3340 | 12880 | 0,28 | 1,07 | |
| Heat Pump | 364 | 1216 | | | 3,34 |
| Boiler | | 28027 | | 0,90 | |
| Condensing | 19500 | | 0,34 | | |

| | | | | | |
|---|---|---|---|---|---|
| Heatstorage: | gr.2: | 0 | GWh | gr.3: | 0 GWh |
| Fixed Boiler: | gr.2: | 2,5 | Per cent | gr.3: | 5,0 Per cent |

| Electricity prod. from | CSHP | Waste | (TWh/year) |
|---|---|---|---|
| Gr.1: | 0,00 | 0,00 | |
| Gr.2: | 0,00 | 0,00 | |
| Gr.3: | 0,80 | 0,00 | |

| | | | |
|---|---|---|---|
| Regulation Strategy: | Technical regulation no. 2 | | |
| CEEP regulation | 23450000 | | |
| Minimum Stabilisation share | 0,25 | | |
| Stabilisation share of CHP | 0,00 | | |
| Minimum CHP gr 3 load | 334 | MW | |
| Minimum PP | 0 | MW | |
| Heat Pump maximum share | 0,50 | | |
| Maximum import/export | 0 | MW | |

| | | | |
|---|---|---|---|
| Distr. Name : | const.txt | | |
| Addition factor | 0,00 | EUR/MWh | |
| Multiplication factor | 1,00 | | |
| Dependency factor | 0,00 | EUR/MWh pr. MW | |
| Average Market Price | 1 | EUR/MWh | |
| Gas Storage | 0 | GWh | |
| Syngas capacity | 0 | MW | |
| Biogas max to grid | 0 | MW | |

Fuel Price level:

| | Capacities MW-e | Storage GWh | Efficiencies elec. | Efficiencies Ther. |
|---|---|---|---|---|
| Hydro Pump: | 109 | 1 | 0,00 | |
| Hydro Turbine: | 109 | | 0,00 | |
| Electrol. Gr.2: | 0 | 0 | 0,40 | 0,50 |
| Electrol. Gr.3: | 0 | 0 | 0,40 | 0,50 |
| Electrol. trans.: | 0 | 0 | 0,00 | |
| Ely. MicroCHP: | 0 | 0 | 0,80 | |
| CAES fuel ratio: | | 0,000 | | |

| (TWh/year) | Coal | Oil | Ngas | Biomass |
|---|---|---|---|---|
| Transport | 0,00 | 81,71 | 0,00 | 0,00 |
| Household | 0,00 | 3,07 | 1,89 | 9,08 |
| Industry | 12,80 | 18,30 | 7,60 | 46,79 |
| Various | 0,00 | 2,73 | 0,25 | 48,41 |

# Output WARNING!!: (1) Critical Excess;

| | District Heating | | | | | | | | | | Electricity | | | | | | | | | | | | | | | | Exchange | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Demand | Production | | | | | | | | | Consumption | | | | | | Production | | | | | | | | Balance | | | | |
| | Distr. heating MW | Solar MW | Waste+ CSHP MW | DHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Balance MW | Elec. demand MW | Flex.& Transp. MW | HP MW | Elec-trolyser MW | EH MW | Hydro Pump MW | Tur-bine MW | RES MW | Hy-dro MW | Geo-thermal MW | Waste+ CSHP MW | CHP MW | PP MW | Stab-Load % | Imp MW | Exp MW | CEEP MW | EEP MW | Payment Imp Million EUR | Payment Exp Million EUR |
| January | 11979 | 1 | 15 | 0 | 10114 | 734 | 0 | 1297 | 0 | -182 | 13619 | 790 | 388 | 0 | 8618 | 0 | 0 | 4639 | 8081 | 7724 | 91 | 2623 | 1202 | 318 | 0 | 105 | 105 | 0 | 0 | 0 |
| February | 12078 | 3 | 15 | 0 | 10119 | 757 | 0 | 1370 | 0 | -187 | 13443 | 798 | 396 | 0 | 8687 | 0 | 0 | 6362 | 7202 | 7683 | 91 | 2624 | 1271 | 292 | 0 | 93 | 93 | 0 | 0 | 0 |
| March | 10583 | 7 | 15 | 0 | 9543 | 617 | 0 | 595 | 0 | -193 | 12410 | 802 | 331 | 0 | 7571 | 0 | 0 | 5089 | 5863 | 7236 | 91 | 2475 | 2059 | 304 | 0 | 90 | 90 | 0 | 0 | 0 |
| April | 3812 | 10 | 15 | 0 | 3667 | 364 | 0 | 93 | 0 | -338 | 10884 | 788 | 154 | 0 | 2484 | 0 | 0 | 3461 | 4296 | 7209 | 91 | 951 | 705 | 312 | 0 | 276 | 276 | 0 | 0 | 0 |
| May | 1195 | 12 | 15 | 0 | 1288 | 328 | 0 | 1 | 0 | -449 | 10190 | 802 | 104 | 0 | 500 | 0 | 0 | 4830 | 3575 | 4971 | 91 | 334 | 1 | 258 | 0 | 490 | 490 | 0 | 0 | 0 |
| June | 1195 | 13 | 15 | 0 | 1289 | 327 | 0 | 1 | 0 | -449 | 9676 | 800 | 104 | 0 | 500 | 0 | 0 | 5354 | 3109 | 4750 | 91 | 334 | 1 | 240 | 0 | 635 | 635 | 0 | 0 | 0 |
| July | 1195 | 12 | 15 | 0 | 1288 | 328 | 0 | 1 | 0 | -449 | 8802 | 789 | 104 | 0 | 500 | 0 | 0 | 3816 | 3423 | 6093 | 91 | 334 | 1 | 287 | 0 | 543 | 543 | 0 | 0 | 0 |
| August | 1195 | 10 | 15 | 0 | 1289 | 328 | 0 | 1 | 0 | -447 | 9464 | 802 | 105 | 0 | 500 | 0 | 0 | 4923 | 3061 | 5484 | 91 | 334 | 2 | 255 | 0 | 684 | 684 | 0 | 0 | 0 |
| September | 1195 | 7 | 15 | 0 | 1295 | 323 | 0 | 1 | 0 | -445 | 9918 | 794 | 104 | 0 | 500 | 0 | 0 | 3006 | 3770 | 5909 | 91 | 336 | 6 | 306 | 0 | 457 | 457 | 0 | 0 | 0 |
| October | 5686 | 4 | 15 | 0 | 5482 | 397 | 0 | 87 | 0 | -298 | 11198 | 796 | 194 | 0 | 3870 | 0 | 0 | 5742 | 4645 | 7061 | 91 | 1422 | 102 | 272 | 0 | 576 | 576 | 0 | 0 | 0 |
| November | 9708 | 1 | 15 | 0 | 9199 | 477 | 0 | 209 | 0 | -193 | 12338 | 800 | 278 | 0 | 6912 | 0 | 0 | 5082 | 7418 | 6497 | 91 | 2385 | 272 | 300 | 0 | 191 | 191 | 0 | 0 | 0 |
| December | 11418 | 1 | 15 | 0 | 9913 | 689 | 0 | 988 | 0 | -187 | 12652 | 790 | 367 | 0 | 8195 | 0 | 0 | 3961 | 8231 | 7119 | 91 | 2571 | 1377 | 326 | 0 | 78 | 78 | 0 | 0 | 0 |
| Average | 5924 | 7 | 15 | 0 | 5365 | 472 | 0 | 385 | 0 | -318 | 11210 | 796 | 219 | 0 | 4061 | 0 | 0 | 4685 | 5218 | 6476 | 91 | 1391 | 583 | 289 | 0 | 352 | 352 | 0 | Average price | |
| Maximum | 23356 | 47 | 15 | 0 | 12880 | 1216 | 0 | 9245 | 0 | 0 | 16787 | 2409 | 701 | 0 | 17191 | 0 | 0 | 9635 | 10198 | 7724 | 91 | 3340 | 9455 | 386 | 0 | 14216 | 14216 | 0 | (EUR/MWh) | |
| Minimum | 565 | 0 | 15 | 0 | 1288 | 283 | 0 | 0 | 0 | -1035 | 102 | 0 | 85 | 0 | 28 | 0 | 0 | 723 | 1279 | 4703 | 91 | 334 | 0 | 173 | 0 | 0 | 0 | 0 | 1 | 1 |
| TWh/year | 52,04 | 0,06 | 0,13 | 0,00 | 47,12 | 4,14 | 0,00 | 3,38 | 0,00 | -2,80 | 98,46 | 6,99 | 1,92 | 0,00 | 35,67 | 0,00 | 0,00 | 41,15 | 45,84 | 56,88 | 0,80 | 12,22 | 5,12 | | 0,00 | 3,10 | 3,10 | 0,00 | 0 | 3 |

| FUEL BALANCE (TWh/year): | DHP | CHP2 | CHP3 | Boiler2 | Boiler3 | PP | Geo/Nu. | Hydro | Waste | CAES Elc.ly. | BioCon-version | Electro-Fuel | Wind | Offsh. | PV | Hydro | Solar.Th | Transp. | household. | Industry Various | Total | Imp/Exp Corrected Imp/Exp | Net | CO2 emission (Mt): Total | Net |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Coal | - | - | 7,98 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 12,80 | 20,78 | 0,00 | 20,78 | 7,37 | 7,37 |
| Oil | - | - | 1,92 | - | 0,12 | 15,06 | - | - | - | - | - | - | - | - | - | - | - | 81,71 | 2,99 | 21,03 | 122,84 | -9,11 | 113,73 | 32,24 | 29,85 |
| N.Gas | - | - | 1,59 | - | 0,32 | - | - | - | - | - | - | - | - | - | - | - | - | - | 1,89 | 7,85 | 11,65 | 0,00 | 11,65 | 2,39 | 2,39 |
| Biomass | - | - | 32,55 | - | 3,31 | - | - | - | 0,16 | - | 4,55 | - | - | - | - | - | - | - | 9,08 | 95,20 | 144,85 | 0,00 | 144,85 | 0,02 | 0,02 |
| Renewable | - | - | - | - | - | - | - | 45,84 | - | - | - | - | 8,16 | 0,47 | - | 32,53 | 0,15 | - | - | - | 87,14 | 0,00 | 87,14 | 0,00 | 0,00 |
| H2 etc. | - | - | 0,00 | - | 0,00 | 0,00 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Biofuel | - | - | 0,00 | - | - | - | - | - | - | - | -3,22 | - | - | - | - | - | - | 3,22 | - | - | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Nuclear/CCS | - | - | - | - | - | - | 189,61 | - | - | - | - | - | - | - | - | - | - | - | - | - | 189,61 | 0,00 | 189,61 | 0,00 | 0,00 |
| Total | - | - | 44,04 | - | 3,76 | 15,06 | 189,61 | 45,84 | 0,16 | - | 1,33 | - | 8,16 | 0,47 | - | 32,53 | 0,15 | 84,93 | 13,96 | 136,88 | 576,87 | -9,11 | 567,76 | 42,01 | 39,62 |

## District Heating Production

| | Gr.1 | | | | Gr.2 | | | | | | | | | | Gr.3 | | | | | | | | | | RES specification | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | District heating MW | Solar MW | CSHP MW | DHP MW | District heating MW | Solar MW | CSHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Stor-age MW | Ba-lance MW | District heating MW | Solar MW | CSHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Stor-age MW | Ba-lance MW | RES1 Wind MW | RES2 Offsho MW | RES3 Photo MW | RES 4-7 MW | Total ic MW |
| January | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 11979 | 1 | 15 | 10114 | 734 | 0 | 1297 | 0 | 0 | -182 | 1546 | 69 | 0 | 3024 | 4639 |
| February | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 12078 | 3 | 15 | 10119 | 757 | 0 | 1370 | 0 | 0 | -187 | 1225 | 63 | 0 | 5074 | 6362 |
| March | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10583 | 7 | 15 | 9543 | 617 | 0 | 595 | 0 | 0 | -193 | 853 | 56 | 0 | 4179 | 5089 |
| April | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3812 | 10 | 15 | 3667 | 364 | 0 | 93 | 0 | 0 | -338 | 825 | 44 | 0 | 2592 | 3461 |
| May | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1195 | 12 | 15 | 1288 | 328 | 0 | 1 | 0 | 0 | -449 | 815 | 40 | 0 | 3975 | 4830 |
| June | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1195 | 13 | 15 | 1289 | 327 | 0 | 1 | 0 | 0 | -449 | 603 | 39 | 0 | 4712 | 5354 |
| July | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1195 | 12 | 15 | 1288 | 328 | 0 | 1 | 0 | 0 | -449 | 614 | 34 | 0 | 3169 | 3816 |
| August | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1195 | 10 | 15 | 1289 | 328 | 0 | 1 | 0 | 0 | -447 | 480 | 37 | 0 | 4405 | 4923 |
| September | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1195 | 7 | 15 | 1295 | 323 | 0 | 1 | 0 | 0 | -445 | 652 | 52 | 0 | 2303 | 3006 |
| October | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5686 | 4 | 15 | 5482 | 397 | 0 | 87 | 0 | 0 | -298 | 595 | 63 | 0 | 5084 | 5742 |
| November | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9708 | 1 | 15 | 9199 | 477 | 0 | 209 | 0 | 0 | -193 | 1144 | 70 | 0 | 3868 | 5082 |
| December | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 11418 | 1 | 15 | 9913 | 689 | 0 | 988 | 0 | 0 | -187 | 1792 | 70 | 0 | 2099 | 3961 |
| Average | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5924 | 7 | 15 | 5365 | 472 | 0 | 385 | 0 | 0 | -318 | 928 | 53 | 0 | 3703 | 4685 |
| Maximum | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 23356 | 47 | 15 | 12880 | 1216 | 0 | 9245 | 0 | 0 | 0 | 4299 | 140 | 0 | 8117 | 9635 |
| Minimum | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 565 | 0 | 15 | 1288 | 283 | 0 | 0 | 0 | 0 | -1035 | 6 | 0 | 0 | 0 | 723 |
| Total for the whole year TWh/year | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | | 0,00 | 52,04 | 0,06 | 0,13 | 47,12 | 4,14 | 0,00 | 3,38 | 0,00 | | -2,80 | 8,16 | 0,47 | 0,00 | 32,53 | 41,15 |

Own use of heat from industrial CHP: 0,00 TWh/year

ANNUAL COSTS (Million EUR)

| | |
|---|---|
| Total Fuel ex Ngas exchange = | 9162 |
| Uranium = | 1195 |
| Coal = | 194 |
| FuelOil = | 943 |
| Gasoil/Diesel= | 1322 |
| Petrol/JP = | 2042 |
| Gas handling = | 80 |
| Biomass = | 3385 |
| Food income = | 0 |
| Waste = | 0 |
| Total Ngas Exchange costs = | 290 |
| Marginal operation costs = | 955 |
| Total Electricity exchange = | 15 |
| Import = | 0 |
| Export = | -3 |
| Bottleneck = | 3 |
| Fixed imp/ex= | 15 |
| Total CO2 emission costs = | 639 |
| Total variable costs = | 11061 |
| Fixed operation costs = | 2362 |
| Annual Investment costs = | 4797 |
| TOTAL ANNUAL COSTS = | 18219 |

## NATURAL GAS EXCHANGE

| | DHP & Boilers MW | CHP2 CHP3 MW | PP CAES MW | Indi-vidual MW | Trans port MW | Indu. Var. MW | Demand Sum MW | Bio-gas MW | Syn-gas MW | CO2Hy gas MW | SynHy gas MW | SynHy gas MW | Stor-age MW | Sum MW | Im-port MW | Ex-port MW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| January | 124 | 341 | 0 | 456 | 0 | 894 | 1815 | 0 | 0 | 0 | 0 | 0 | 0 | 1815 | 1815 | 0 |
| February | 131 | 341 | 0 | 461 | 0 | 894 | 1827 | 0 | 0 | 0 | 0 | 0 | 0 | 1827 | 1827 | 0 |
| March | 57 | 322 | 0 | 401 | 0 | 894 | 1674 | 0 | 0 | 0 | 0 | 0 | 0 | 1674 | 1674 | 0 |
| April | 9 | 124 | 0 | 131 | 0 | 894 | 1157 | 0 | 0 | 0 | 0 | 0 | 0 | 1157 | 1157 | 0 |
| May | 0 | 43 | 0 | 27 | 0 | 894 | 964 | 0 | 0 | 0 | 0 | 0 | 0 | 964 | 964 | 0 |
| June | 0 | 43 | 0 | 27 | 0 | 894 | 964 | 0 | 0 | 0 | 0 | 0 | 0 | 964 | 964 | 0 |
| July | 0 | 43 | 0 | 27 | 0 | 894 | 964 | 0 | 0 | 0 | 0 | 0 | 0 | 964 | 964 | 0 |
| August | 0 | 43 | 0 | 27 | 0 | 894 | 964 | 0 | 0 | 0 | 0 | 0 | 0 | 964 | 964 | 0 |
| September | 0 | 44 | 0 | 27 | 0 | 894 | 964 | 0 | 0 | 0 | 0 | 0 | 0 | 964 | 964 | 0 |
| October | 8 | 185 | 0 | 206 | 0 | 894 | 1293 | 0 | 0 | 0 | 0 | 0 | 0 | 1293 | 1293 | 0 |
| November | 20 | 310 | 0 | 366 | 0 | 894 | 1590 | 0 | 0 | 0 | 0 | 0 | 0 | 1590 | 1590 | 0 |
| December | 95 | 334 | 0 | 434 | 0 | 894 | 1757 | 0 | 0 | 0 | 0 | 0 | 0 | 1757 | 1757 | 0 |
| Average | 37 | 181 | 0 | 215 | 0 | 894 | 1327 | 0 | 0 | 0 | 0 | 0 | 0 | 1327 | 1327 | 0 |
| Maximum | 885 | 435 | 0 | 911 | 0 | 894 | 3124 | 0 | 0 | 0 | 0 | 0 | 0 | 3124 | 3124 | 0 |
| Minimum | 0 | 43 | 0 | 1 | 0 | 894 | 940 | 0 | 0 | 0 | 0 | 0 | 0 | 940 | 940 | 0 |
| Total for the whole year TWh/year | 0,32 | 1,59 | 0,00 | 1,89 | 0,00 | 7,85 | 11,65 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 11,65 | 11,65 | 0,00 |

RES Share: 40,2 Percent of Primary Energy 86,7 Percent of Electricity 96,0 TWh electricity from RES

# Input UK 2015.txt

# The EnergyPLAN model 12.4

| | | | |
|---|---|---|---|
| Electricity demand (TWh/year): | | Flexible demand | 20,07 |
| Fixed demand | 259,70 | Fixed imp/exp. | -21,31 |
| Electric heating + HP | 70,23 | Transportation | 4,96 |
| Electric cooling | 3,36 | Total | 337,01 |

| District heating (TWh/year) | Gr.1 | Gr.2 | Gr.3 | Sum |
|---|---|---|---|---|
| District heating demand | 0,00 | 0,00 | 19,44 | 19,44 |
| Solar Thermal | 0,00 | 0,00 | 0,00 | 0,00 |
| Industrial CHP (CSHP) | 0,00 | 0,00 | 0,00 | 0,00 |
| Demand after solar and CSHP | 0,00 | 0,00 | 19,44 | 19,44 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Wind | 11921 | MW | 25,10 | TWh/year | 0,00 | Grid |
| Offshore Wind | 4632 | MW | 17,15 | TWh/year | 0,00 | stabili- |
| Photo Voltaic | 6606 | MW | 7 | TWh/year | 0,00 | sation |
| River Hydro | 0 | MW | 0 | TWh/year | 0,00 | share |
| Hydro Power | 1715 | MW | 4,1 | TWh/year | | |
| Geothermal/Nuclear | 8951 | MW | 47,41 | TWh/year | | |

| | Capacities | | Efficiencies | | |
|---|---|---|---|---|---|
| Group 2: | MW-e | MJ/s | elec. | Ther | COP |
| CHP | 0 | 0 | 0,40 | 0,50 | |
| Heat Pump | 0 | 0 | | | 3,00 |
| Boiler | | 0 | | 0,50 | |
| Group 3: | | | | | |
| CHP | 5027 | 6417 | 0,41 | 0,53 | |
| Heat Pump | 0 | 0 | | | 3,00 |
| Boiler | | 10686 | | 0,90 | |
| Condensing | 62100 | | 0,39 | | |

| | | | | | |
|---|---|---|---|---|---|
| Heatstorage: | gr.2: | 0 | GWh | gr.3: | 0 GWh |
| Fixed Boiler: | gr.2: | 2,5 | Per cent | gr.3: | 5,0 Per cent |

| Electricity prod. from | CSHP | Waste | (TWh/year) |
|---|---|---|---|
| Gr.1: | 0,00 | 0,00 | |
| Gr.2: | 0,00 | 0,00 | |
| Gr.3: | 23,15 | 0,00 | |

| | | |
|---|---|---|
| Regulation Strategy: | Technical regulation no. 2 | |
| CEEP regulation | 23450000 | |
| Minimum Stabilisation share | 0,25 | |
| Stabilisation share of CHP | 0,00 | |
| Minimum CHP gr 3 load | 503 | MW |
| Minimum PP | 6210 | MW |
| Heat Pump maximum share | 0,50 | |
| Maximum import/export | 0 | MW |

| | | |
|---|---|---|
| Distr. Name : | const.txt | |
| Addition factor | 0,00 | EUR/MWh |
| Multiplication factor | 1,00 | |
| Dependency factor | 0,00 | EUR/MWh pr. MW |
| Average Market Price | 1 | EUR/MWh |
| Gas Storage | 0 | GWh |
| Syngas capacity | 0 | MW |
| Biogas max to grid | 0 | MW |

Fuel Price level:

| | Capacities | Storage | Efficiencies | |
|---|---|---|---|---|
| | MW-e | GWh | elec. | Ther. |
| Hydro Pump: | 2744 | 27 | 0,00 | |
| Hydro Turbine: | 2744 | | 0,00 | |
| Electrol. Gr.2: | 0 | 0 | 0,40 | 0,50 |
| Electrol. Gr.3: | 0 | 0 | 0,40 | 0,50 |
| Electrol. trans.: | 0 | 0 | 0,00 | |
| Ely. MicroCHP: | 0 | 0 | 0,80 | |
| CAES fuel ratio: | | 0,000 | | |

| (TWh/year) | Coal | Oil | Ngas | Biomass |
|---|---|---|---|---|
| Transport | 0,00 | 569,14 | 0,00 | 0,00 |
| Household | 4,86 | 13,84 | 338,58 | 10,80 |
| Industry | 53,12 | 54,98 | 105,88 | 34,25 |
| Various | 0,01 | 3,44 | 1,80 | 8,47 |

# Output WARNING!!: (1) Critical Excess;

| | District Heating | | | | | | | | | | Electricity | | | | | | | | | | | | | | | Exchange | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Demand | Production | | | | | | | | | Consumption | | | | | | Production | | | | | | | | Balance | | |
| | Distr. heating MW | Solar MW | Waste+ CSHP MW | DHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Balance MW | Elec. demand MW | Flex.& Transp. MW | HP MW | Elec-trolyser MW | EH MW | Hydro Pump MW | Tur-bine MW | RES MW | Hy-dro MW | Geo-thermal MW | Waste+ CSHP MW | CHP MW | PP MW | Stab-Load % | Imp MW | Exp MW | CEEP MW | EEP MW | Payment Imp Million EUR | Payment Exp Million EUR |
| January | 4276 | 0 | 0 | 0 | 4188 | 0 | 0 | 193 | 0 | -105 | 35029 | 2839 | 0 | 0 | 16114 | 0 | 0 | 7321 | 535 | 5957 | 2635 | 3281 | 31932 | 316 | 0 | 0 | 0 | 0 | 0 | 0 |
| February | 4296 | 0 | 0 | 0 | 4232 | 0 | 0 | 169 | 0 | -105 | 35295 | 2854 | 0 | 0 | 16193 | 0 | 0 | 5895 | 517 | 5836 | 2635 | 3315 | 33755 | 327 | 0 | 0 | 0 | 0 | 0 | 0 |
| March | 3895 | 0 | 0 | 0 | 3861 | 0 | 0 | 138 | 0 | -105 | 32660 | 2860 | 0 | 0 | 14613 | 0 | 0 | 6392 | 473 | 5111 | 2635 | 3025 | 30093 | 319 | 0 | 3 | 3 | 0 | 0 | 0 |
| April | 1562 | 0 | 0 | 0 | 1644 | 0 | 0 | 111 | 0 | -192 | 28647 | 2835 | 0 | 0 | 5433 | 0 | 0 | 4192 | 433 | 5255 | 2635 | 1288 | 20385 | 316 | 0 | 0 | 0 | 0 | 0 | 0 |
| May | 500 | 0 | 0 | 0 | 649 | 0 | 0 | 111 | 0 | -259 | 27044 | 2861 | 0 | 0 | 1274 | 0 | 0 | 6352 | 453 | 5196 | 2635 | 508 | 13538 | 273 | 0 | 0 | 0 | 0 | 0 | 0 |
| June | 500 | 0 | 0 | 0 | 648 | 0 | 0 | 111 | 0 | -259 | 26958 | 2857 | 0 | 0 | 1233 | 0 | 0 | 4629 | 425 | 5176 | 2635 | 508 | 15027 | 296 | 0 | 25 | 25 | 0 | 0 | 0 |
| July | 500 | 0 | 0 | 0 | 648 | 0 | 0 | 111 | 0 | -259 | 26779 | 2838 | 0 | 0 | 1253 | 0 | 0 | 4766 | 422 | 5196 | 2635 | 508 | 14703 | 293 | 0 | 5 | 5 | 0 | 0 | 0 |
| August | 500 | 0 | 0 | 0 | 648 | 0 | 0 | 111 | 0 | -259 | 26840 | 2860 | 0 | 0 | 1253 | 0 | 0 | 4428 | 424 | 4935 | 2635 | 508 | 15399 | 299 | 0 | 6 | 6 | 0 | 0 | 0 |
| September | 500 | 0 | 0 | 0 | 648 | 0 | 0 | 111 | 0 | -259 | 28049 | 2845 | 0 | 0 | 1253 | 0 | 0 | 4061 | 474 | 5049 | 2635 | 508 | 16795 | 307 | 0 | 1 | 1 | 0 | 0 | 0 |
| October | 2103 | 0 | 0 | 0 | 2159 | 0 | 0 | 113 | 0 | -170 | 30022 | 2849 | 0 | 0 | 7562 | 0 | 0 | 3962 | 481 | 5594 | 2635 | 1691 | 24081 | 327 | 0 | 0 | 0 | 0 | 0 | 0 |
| November | 3626 | 0 | 0 | 0 | 3608 | 0 | 0 | 123 | 0 | -105 | 31804 | 2857 | 0 | 0 | 13558 | 0 | 0 | 7143 | 507 | 5548 | 2635 | 2827 | 27564 | 308 | 0 | 0 | 0 | 0 | 0 | 0 |
| December | 4347 | 0 | 0 | 0 | 4261 | 0 | 0 | 191 | 0 | -105 | 30445 | 2838 | 0 | 0 | 16393 | 0 | 0 | 8077 | 457 | 5932 | 2635 | 3338 | 27015 | 301 | 0 | 0 | 0 | 0 | 0 | 0 |
| Average | 2213 | 0 | 0 | 0 | 2262 | 0 | 0 | 133 | 0 | -182 | 29947 | 2849 | 0 | 0 | 7995 | 0 | 0 | 5606 | 467 | 5398 | 2635 | 1772 | 22491 | 307 | 0 | 3 | 3 | 0 | Average price | |
| Maximum | 8905 | 0 | 0 | 0 | 6417 | 0 | 0 | 4229 | 0 | 0 | 48241 | 4002 | 0 | 0 | 34333 | 0 | 0 | 14258 | 629 | 5957 | 2635 | 5027 | 56262 | 381 | 0 | 2810 | 2810 | 0 | (EUR/MWh) | |
| Minimum | 199 | 0 | 0 | 0 | 642 | 0 | 0 | 111 | 0 | -554 | 378 | 2285 | 0 | 0 | 0 | 0 | 0 | 96 | 0 | 4932 | 2635 | 503 | 6210 | 173 | 0 | 0 | 0 | 0 | 1 | 1 |
| TWh/year | 19,44 | 0,00 | 0,00 | 0,00 | 19,87 | 0,00 | 0,00 | 1,17 | 0,00 | -1,60 | 263,06 | 25,03 | 0,00 | 0,00 | 70,23 | 0,00 | 0,00 | 49,25 | 4,10 | 47,41 | 23,15 | 15,57 | 197,56 | | 0,00 | 0,03 | 0,03 | 0,00 | 0 | 0 |

| FUEL BALANCE (TWh/year): | DHP | CHP2 | CHP3 | Boiler2 | Boiler3 | PP | Geo/Nu. | Hydro | Waste | CAES Elc.ly. | BioCon-version | Electro-Fuel | Wind | Offsh. | PV | Hydro | Solar.Th | Transp. | Industry household | Industry Various | Total | Imp/Exp Corrected Imp/Exp | Imp/Exp Corrected Net | CO2 emission (Mt): Total | CO2 emission (Mt): Net |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Coal | - | - | 2,00 | - | 0,07 | 249,57 | - | - | - | - | - | - | - | - | - | - | - | - | 4,86 | 53,13 | 309,63 | -0,04 | 309,60 | 109,80 | 109,78 |
| Oil | - | - | 0,72 | - | 0,02 | 0,06 | - | - | - | - | - | - | - | - | - | - | - | 569,14 | 12,91 | 58,42 | 641,27 | 0,00 | 641,27 | 168,30 | 168,30 |
| N.Gas | - | - | 31,27 | - | 1,08 | 256,93 | - | - | - | - | - | - | - | - | - | - | - | 0,63 | 338,58 | 107,68 | 736,16 | -0,04 | 736,12 | 150,80 | 150,92 |
| Biomass | - | - | 3,65 | - | 0,13 | - | - | - | - | - | 39,90 | - | - | - | - | - | - | - | 10,80 | 42,72 | 97,20 | 0,00 | 97,20 | 0,00 | 0,00 |
| Renewable | - | - | - | - | - | - | - | 4,10 | - | - | - | - | 25,10 | 17,15 | 7,00 | - | 0,77 | - | - | - | 54,12 | 0,00 | 54,12 | 0,00 | 0,00 |
| H2 etc. | - | - | 0,00 | - | 0,00 | 0,00 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Biofuel | - | - | 0,00 | - | 0,00 | - | - | - | - | - | -28,24 | - | - | - | - | - | - | 28,24 | - | - | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Nuclear/CCS | - | - | - | - | - | - | 158,05 | - | - | - | - | - | - | - | - | - | - | - | - | - | 158,05 | 0,00 | 158,05 | 0,00 | 0,00 |
| Total | - | - | 37,64 | - | 1,29 | 506,56 | 158,05 | 4,10 | - | - | 11,66 | - | 25,10 | 17,15 | 7,00 | - | 0,77 | 598,01 | 367,15 | 261,95 | 1996,43 | -0,07 | 1996,35 | 428,89 | 429,00 |

District Heating Production

| | Gr.1 | | | | Gr.2 | | | | | | | | | | Gr.3 | | | | | | | | | | RES specification | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | District heating MW | Solar MW | CSHP MW | DHP MW | District heating MW | Solar MW | CSHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Stor-age MW | Ba-lance MW | District heating MW | Solar MW | CSHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Stor-age MW | Ba-lance MW | RES1 Wind MW | RES2 Offsho MW | RES3 Photo MW | RES 4-7 MW | Total MW |
| January | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4276 | 0 | 0 | 4188 | 0 | 0 | 193 | 0 | 0 | -105 | 4471 | 2611 | 238 | 0 | 7321 |
| February | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4296 | 0 | 0 | 4232 | 0 | 0 | 169 | 0 | 0 | -105 | 3327 | 2131 | 437 | 0 | 5895 |
| March | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3895 | 0 | 0 | 3861 | 0 | 0 | 138 | 0 | 0 | -105 | 3451 | 2174 | 767 | 0 | 6392 |
| April | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1562 | 0 | 0 | 1644 | 0 | 0 | 111 | 0 | 0 | -192 | 1702 | 1277 | 1214 | 0 | 4192 |
| May | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 500 | 0 | 0 | 649 | 0 | 0 | 111 | 0 | 0 | -259 | 2984 | 1956 | 1412 | 0 | 6352 |
| June | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 500 | 0 | 0 | 648 | 0 | 0 | 111 | 0 | 0 | -259 | 1815 | 1440 | 1374 | 0 | 4629 |
| July | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 500 | 0 | 0 | 648 | 0 | 0 | 111 | 0 | 0 | -259 | 1941 | 1550 | 1275 | 0 | 4766 |
| August | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 500 | 0 | 0 | 648 | 0 | 0 | 111 | 0 | 0 | -259 | 1911 | 1496 | 1022 | 0 | 4428 |
| September | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 500 | 0 | 0 | 648 | 0 | 0 | 111 | 0 | 0 | -259 | 1745 | 1481 | 835 | 0 | 4061 |
| October | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2103 | 0 | 0 | 2159 | 0 | 0 | 113 | 0 | 0 | -170 | 1978 | 1495 | 489 | 0 | 3962 |
| November | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3626 | 0 | 0 | 3608 | 0 | 0 | 123 | 0 | 0 | -105 | 4111 | 2738 | 294 | 0 | 7143 |
| December | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4347 | 0 | 0 | 4261 | 0 | 0 | 191 | 0 | 0 | -105 | 4823 | 3060 | 194 | 0 | 8077 |
| Average | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2213 | 0 | 0 | 2262 | 0 | 0 | 133 | 0 | 0 | -182 | 2858 | 1952 | 797 | 0 | 5606 |
| Maximum | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8905 | 0 | 0 | 6417 | 0 | 0 | 4229 | 0 | 0 | 0 | 6855 | 3548 | 6606 | 0 | 14258 |
| Minimum | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 199 | 0 | 0 | 642 | 0 | 0 | 111 | 0 | 0 | -554 | 26 | 2 | 0 | 0 | 96 |
| Total for the whole year TWh/year | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | | 0,00 | 19,44 | 0,00 | 0,00 | 19,87 | 0,00 | 0,00 | 1,17 | 0,00 | | -1,60 | 25,10 | 17,15 | 7,00 | 0,00 | 49,25 |

Own use of heat from industrial CHP: 0,00 TWh/year

ANNUAL COSTS (Million EUR)

| | |
|---|---|
| Total Fuel ex Ngas exchange = | 35324 |
| Uranium = | 996 |
| Coal = | 2898 |
| FuelOil = | 1440 |
| Gasoil/Diesel= | 10071 |
| Petrol/JP = | 12688 |
| Gas handling = | 5045 |
| Biomass = | 2186 |
| Food income = | 0 |
| Waste = | 0 |
| Total Ngas Exchange costs = | 18324 |
| Marginal operation costs = | 1279 |
| Total Electricity exchange = | -21 |
| Import = | 0 |
| Export = | 0 |
| Bottleneck = | 0 |
| Fixed imp/ex= | -21 |
| Total CO2 emission costs = | 6519 |
| Total variable costs = | 61424 |
| Fixed operation costs = | 2575 |
| Annual Investment costs = | 5471 |
| TOTAL ANNUAL COSTS = | 69469 |

NATURAL GAS EXCHANGE

| | DHP & Boilers MW | CHP2 CHP3 MW | PP CAES MW | Indi-vidual MW | Trans port MW | Indu. Var. MW | Demand Sum MW | Bio-gas MW | Syn-gas MW | CO2Hy gas MW | SynHy gas MW | SynHy gas MW | Stor-age MW | Sum MW | Im-port MW | Ex-port MW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| January | 178 | 6589 | 41529 | 77685 | 0 | 12259 | 138239 | 0 | 0 | 0 | 0 | 0 | 0 | 138239 | 138239 | 0 |
| February | 156 | 6658 | 43899 | 78068 | 0 | 12259 | 141040 | 0 | 0 | 0 | 0 | 0 | 0 | 141040 | 141040 | 0 |
| March | 127 | 6076 | 39136 | 70452 | 0 | 12259 | 128049 | 0 | 0 | 0 | 0 | 0 | 0 | 128049 | 128049 | 0 |
| April | 102 | 2586 | 26511 | 26191 | 0 | 12259 | 67649 | 0 | 0 | 0 | 0 | 0 | 0 | 67649 | 67649 | 0 |
| May | 102 | 1021 | 17606 | 6043 | 0 | 12259 | 37030 | 0 | 0 | 0 | 0 | 0 | 0 | 37030 | 37030 | 0 |
| June | 102 | 1020 | 19542 | 6043 | 0 | 12259 | 38966 | 0 | 0 | 0 | 0 | 0 | 0 | 38966 | 38966 | 0 |
| July | 102 | 1020 | 19121 | 6043 | 0 | 12259 | 38545 | 0 | 0 | 0 | 0 | 0 | 0 | 38545 | 38545 | 0 |
| August | 102 | 1020 | 20026 | 6043 | 0 | 12259 | 39450 | 0 | 0 | 0 | 0 | 0 | 0 | 39450 | 39450 | 0 |
| September | 102 | 1020 | 21843 | 6043 | 0 | 12259 | 41267 | 0 | 0 | 0 | 0 | 0 | 0 | 41267 | 41267 | 0 |
| October | 105 | 3397 | 31317 | 36455 | 0 | 12259 | 83533 | 0 | 0 | 0 | 0 | 0 | 0 | 83533 | 83533 | 0 |
| November | 113 | 5677 | 35848 | 65364 | 0 | 12259 | 119261 | 0 | 0 | 0 | 0 | 0 | 0 | 119261 | 119261 | 0 |
| December | 176 | 6703 | 35134 | 79032 | 0 | 12259 | 133304 | 0 | 0 | 0 | 0 | 0 | 0 | 133304 | 133304 | 0 |
| Average | 122 | 3560 | 29249 | 38545 | 0 | 12259 | 83735 | 0 | 0 | 0 | 0 | 0 | 0 | 83735 | 83735 | 0 |
| Maximum | 3904 | 10096 | 73169 | 165521 | 0 | 12259 | 246514 | 0 | 0 | 0 | 0 | 0 | 0 | 246514 | 246514 | 0 |
| Minimum | 102 | 1010 | 8076 | 331 | 0 | 12259 | 21778 | 0 | 0 | 0 | 0 | 0 | 0 | 21778 | 21778 | 0 |
| Total for the whole year TWh/year | 1,08 | 31,27 | 256,93 | 338,58 | 0,00 | 107,68 | 735,53 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 735,53 | 735,53 | 0,00 |

RES Share: 7,6 Percent of Primary Energy 17,1 Percent of Electricity 54,9 TWh electricity from RES

# Input AT 2050.txt

# The EnergyPLAN model 12.4

| | | | |
|---|---|---|---|
| Electricity demand (TWh/year): | | Flexible demand | 3,38 |
| Fixed demand | 69,39 | Fixed imp/exp. | 10,36 |
| Electric heating + HP | 8,08 | Transportation | 24,83 |
| Electric cooling | 1,61 | Total | 117,65 |

| District heating (TWh/year) | Gr.1 | Gr.2 | Gr.3 | Sum |
|---|---|---|---|---|
| District heating demand | 0,00 | 0,00 | 27,73 | 27,73 |
| Solar Thermal | 0,00 | 0,00 | 1,34 | 1,34 |
| Industrial CHP (CSHP) | 0,00 | 0,00 | 0,00 | 0,00 |
| Demand after solar and CSHP | 0,00 | 0,00 | 26,39 | 26,39 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Wind | 19033 | MW | 38,72 | TWh/year | 0,00 | Grid |
| Offshore Wind | 0 | MW | 0 | TWh/year | 0,00 | stabili- |
| Photo Voltaic | 4136 | MW | 4,27 | TWh/year | 0,00 | sation |
| River Hydro | 6280 | MW | 23,16 | TWh/year | 0,00 | share |
| Hydro Power | 5739 | MW | 26,8 | TWh/year | | |
| Geothermal/Nuclear | 719 | MW | 5,98 | TWh/year | | |

| | Capacities | | Efficiencies | | |
|---|---|---|---|---|---|
| Group 2: | MW-e | MJ/s | elec. | Ther | COP |
| CHP | 0 | 0 | 0,40 | 0,50 | |
| Heat Pump | 0 | 0 | | | 3,00 |
| Boiler | | 0 | | 0,50 | |
| Group 3: | | | | | |
| CHP | 2728 | 3468 | 0,32 | 0,40 | |
| Heat Pump | 0 | 0 | | | 3,00 |
| Boiler | | 15703 | | 0,90 | |
| Condensing | 17500 | | 0,53 | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Heatstorage: | gr.2: | 0 | GWh | gr.3: | 0 | GWh |
| Fixed Boiler: | gr.2: | 2,5 | Per cent | gr.3: | 5,0 | Per cent |

| Electricity prod. from | CSHP | Waste | (TWh/year) |
|---|---|---|---|
| Gr.1: | 0,00 | 0,00 | |
| Gr.2: | 0,00 | 0,00 | |
| Gr.3: | 0,39 | 0,00 | |

| | | |
|---|---|---|
| Regulation Strategy: | Technical regulation no. 2 | |
| CEEP regulation | 23450000 | |
| Minimum Stabilisation share | 0,10 | |
| Stabilisation share of CHP | 0,00 | |
| Minimum CHP gr 3 load | 273 | MW |
| Minimum PP | 875 | MW |
| Heat Pump maximum share | 0,50 | |
| Maximum import/export | 0 | MW |

| | | |
|---|---|---|
| Distr. Name : | const.txt | |
| Addition factor | 0,00 | EUR/MWh |
| Multiplication factor | 1,00 | |
| Dependency factor | 0,00 | EUR/MWh pr. MW |
| Average Market Price | 1 | EUR/MWh |
| Gas Storage | 0 | GWh |
| Syngas capacity | 0 | MW |
| Biogas max to grid | 0 | MW |

Fuel Price level:

| | Capacities | Storage | Efficiencies | |
|---|---|---|---|---|
| | MW-e | GWh | elec. | Ther. |
| Hydro Pump: | 4793 | 48 | 0,00 | |
| Hydro Turbine: | 4793 | | 0,00 | |
| Electrol. Gr.2: | 0 | 0 | 0,40 | 0,50 |
| Electrol. Gr.3: | 0 | 0 | 0,40 | 0,50 |
| Electrol. trans.: | 0 | 0 | 0,00 | |
| Ely. MicroCHP: | 0 | 0 | 0,80 | |
| CAES fuel ratio: | | 0,000 | | |

| (TWh/year) | Coal | Oil | Ngas | Biomass |
|---|---|---|---|---|
| Transport | 0,00 | 42,59 | 0,00 | 0,00 |
| Household | 0,00 | 0,00 | 16,87 | 2,90 |
| Industry | 17,61 | 6,11 | 16,76 | 5,88 |
| Various | 0,01 | 3,13 | 0,17 | 24,43 |

# Output WARNING!!: (1) Critical Excess;

| | District Heating | | | | | | | | | | Electricity | | | | | | | | | | | | | | | | Exchange | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Demand | Production | | | | | | | | | Consumption | | | | | | Production | | | | | | | Balance | | | | |
| | Distr. heating MW | Solar MW | Waste+ CSHP MW | DHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Balance MW | Elec. demand MW | Flex.& Transp. MW | HP MW | Elec-trolyser MW | EH MW | Hydro Pump MW | Tur-bine MW | RES MW | Hy-dro MW | Geo-thermal MW | Waste+ CSHP MW | CHP MW | PP MW | Stab-Load % | Imp MW | Exp MW | CEEP MW | EEP MW | Payment Imp Million EUR | Payment Exp Million EUR |
| January | 6980 | 73 | 26 | 0 | 1689 | 0 | 0 | 5225 | 0 | -33 | 8760 | 3157 | 711 | 0 | 1432 | 0 | 0 | 10451 | 3210 | 681 | 44 | 1328 | 2266 | 448 | 0 | 2740 | 2740 | 0 | 0 | 0 |
| February | 6170 | 114 | 26 | 0 | 2049 | 0 | 0 | 4014 | 0 | -33 | 8891 | 3236 | 624 | 0 | 1257 | 0 | 0 | 7504 | 3129 | 681 | 44 | 1611 | 3162 | 549 | 0 | 944 | 944 | 0 | 0 | 0 |
| March | 4954 | 154 | 26 | 0 | 1690 | 0 | 0 | 3116 | 0 | -33 | 8429 | 3266 | 497 | 0 | 1001 | 0 | 0 | 9075 | 2975 | 681 | 44 | 1329 | 2143 | 474 | 0 | 1875 | 1875 | 0 | 0 | 0 |
| April | 1626 | 193 | 26 | 0 | 682 | 0 | 0 | 820 | 0 | -96 | 7687 | 3139 | 143 | 0 | 287 | 0 | 0 | 9140 | 2722 | 681 | 44 | 536 | 1468 | 406 | 0 | 2156 | 2156 | 0 | 0 | 0 |
| May | 713 | 225 | 26 | 0 | 369 | 0 | 0 | 242 | 0 | -150 | 7559 | 3267 | 46 | 0 | 92 | 0 | 0 | 8952 | 2707 | 681 | 44 | 290 | 1195 | 363 | 0 | 1728 | 1728 | 0 | 0 | 0 |
| June | 713 | 230 | 26 | 0 | 392 | 0 | 0 | 218 | 0 | -153 | 7737 | 3250 | 45 | 0 | 90 | 0 | 0 | 7375 | 2983 | 681 | 44 | 308 | 1542 | 420 | 0 | 632 | 632 | 0 | 0 | 0 |
| July | 713 | 232 | 26 | 0 | 419 | 0 | 0 | 191 | 0 | -155 | 7775 | 3153 | 46 | 0 | 94 | 0 | 0 | 6319 | 3238 | 681 | 44 | 330 | 2136 | 505 | 0 | 502 | 502 | 0 | 0 | 0 |
| August | 713 | 207 | 26 | 0 | 439 | 0 | 0 | 183 | 0 | -143 | 7665 | 3266 | 46 | 0 | 92 | 0 | 0 | 5729 | 2950 | 681 | 44 | 345 | 3015 | 557 | 0 | 517 | 517 | 0 | 0 | 0 |
| September | 713 | 165 | 26 | 0 | 420 | 0 | 0 | 219 | 0 | -116 | 7767 | 3191 | 45 | 0 | 90 | 0 | 0 | 7667 | 2789 | 681 | 44 | 330 | 2237 | 464 | 0 | 1477 | 1477 | 0 | 0 | 0 |
| October | 2734 | 115 | 26 | 0 | 1422 | 0 | 0 | 1228 | 0 | -57 | 7916 | 3211 | 261 | 0 | 526 | 0 | 0 | 5905 | 2663 | 681 | 44 | 1118 | 3074 | 561 | 0 | 391 | 391 | 0 | 0 | 0 |
| November | 5229 | 66 | 26 | 0 | 1825 | 0 | 0 | 3345 | 0 | -33 | 8473 | 3250 | 525 | 0 | 1058 | 0 | 0 | 8617 | 3082 | 681 | 44 | 1435 | 2454 | 502 | 0 | 1828 | 1828 | 0 | 0 | 0 |
| December | 6680 | 55 | 26 | 0 | 2638 | 0 | 0 | 3994 | 0 | -33 | 8367 | 3153 | 679 | 0 | 1368 | 0 | 0 | 3726 | 4148 | 681 | 44 | 2075 | 4260 | 747 | 0 | 186 | 186 | 0 | 0 | 0 |
| Average | 3157 | 153 | 26 | 0 | 1168 | 0 | 0 | 1896 | 0 | -86 | 8083 | 3212 | 305 | 0 | 615 | 0 | 0 | 7532 | 3051 | 681 | 44 | 919 | 2414 | 500 | 0 | 1247 | 1247 | 0 | Average price | |
| Maximum | 13086 | 900 | 26 | 0 | 3468 | 0 | 0 | 12568 | 0 | 0 | 11422 | 9541 | 1360 | 0 | 2738 | 0 | 0 | 25216 | 5555 | 681 | 44 | 2728 | 14760 | 968 | 0 | 15446 | 15446 | 0 | (EUR/MWh) | |
| Minimum | 305 | 0 | 26 | 0 | 347 | 0 | 0 | 158 | 0 | -373 | 103 | 0 | 0 | 0 | 0 | 0 | 0 | 238 | 0 | 681 | 44 | 273 | 875 | 121 | 0 | 0 | 0 | 0 | 1 | 0 |
| TWh/year | 27,73 | 1,34 | 0,23 | 0,00 | 10,26 | 0,00 | 0,00 | 16,66 | 0,00 | -0,76 | 71,00 | 28,21 | 2,68 | 0,00 | 5,40 | 0,00 | 0,00 | 66,16 | 26,80 | 5,98 | 0,39 | 8,07 | 21,20 | | 0,00 | 10,95 | 10,95 | 0,00 | 0 | 3 |

| FUEL BALANCE (TWh/year): | DHP | CHP2 | CHP3 | Boiler2 | Boiler3 | PP | Geo/Nu. | Hydro | Waste | CAES Elc.ly. | BioCon-version | Electro-Fuel | Wind | Offsh. | PV | Hydro | Solar.Th | Transp. | Industry household. | Industry Various | Total | Imp/Exp Corrected Imp/Exp | Imp/Exp Corrected Net | CO2 emission (Mt): Total | CO2 emission (Mt): Net |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Coal | - | - | 6,50 | - | - | 17,13 | - | - | - | - | - | - | - | - | - | - | - | - | - | 17,62 | 41,25 | -8,84 | 32,40 | 14,63 | 11,49 |
| Oil | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 42,59 | - | 9,24 | 51,83 | 0,00 | 51,83 | 13,60 | 13,60 |
| N.Gas | - | - | 0,66 | - | - | 22,88 | - | - | - | - | - | - | - | - | - | - | - | - | 16,87 | 16,93 | 57,34 | -11,82 | 45,52 | 11,75 | 9,32 |
| Biomass | - | - | 18,24 | - | 18,51 | - | - | - | - | - | 1,12 | - | - | - | - | - | - | - | 2,90 | 30,31 | 71,08 | 0,00 | 71,08 | 0,00 | 0,00 |
| Renewable | - | - | - | - | - | - | 5,98 | 26,80 | - | - | - | - | 38,72 | - | 4,27 | 23,16 | 1,34 | - | - | - | 100,28 | 0,00 | 100,28 | 0,00 | 0,00 |
| H2 etc. | - | - | 0,00 | - | 0,00 | 0,00 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Biofuel | - | - | 0,00 | - | - | - | - | - | - | - | -0,81 | - | - | - | - | - | - | 0,81 | - | - | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Nuclear/CCS | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0,00 | 0,00 | 0,00 | -7954,8 | -7954,85 |
| Total | - | - | 25,40 | - | 18,51 | 40,01 | 5,98 | 26,80 | - | - | 0,31 | - | 38,72 | - | 4,27 | 23,16 | 1,34 | 43,40 | 19,77 | 74,10 | 321,77 | -20,66 | 301,11 | -7914,8 | -7920,43 |

## District Heating Production

| | Gr.1 | | | | Gr.2 | | | | | | | | | | Gr.3 | | | | | | | | | | RES specification | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | District heating MW | Solar MW | CSHP MW | DHP MW | District heating MW | Solar MW | CSHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Stor-age MW | Ba-lance MW | District heating MW | Solar MW | CSHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Stor-age MW | Ba-lance MW | RES1 Wind MW | RES2 Offsho MW | RES3 Photo MW | RES 4-7 ic MW | Total MW |
| January | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6980 | 73 | 26 | 1689 | 0 | 0 | 5225 | 0 | 0 | -33 | 7822 | 0 | 185 | 2444 | 10451 |
| February | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6170 | 114 | 26 | 2049 | 0 | 0 | 4014 | 0 | 0 | -33 | 5463 | 0 | 358 | 1683 | 7504 |
| March | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4954 | 154 | 26 | 1690 | 0 | 0 | 3116 | 0 | 0 | -33 | 6738 | 0 | 520 | 1817 | 9075 |
| April | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1626 | 193 | 26 | 682 | 0 | 0 | 820 | 0 | 0 | -96 | 5379 | 0 | 653 | 3109 | 9140 |
| May | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 713 | 225 | 26 | 369 | 0 | 0 | 242 | 0 | 0 | -150 | 3630 | 0 | 772 | 4551 | 8952 |
| June | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 713 | 230 | 26 | 392 | 0 | 0 | 218 | 0 | 0 | -153 | 1887 | 0 | 766 | 4722 | 7375 |
| July | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 713 | 232 | 26 | 419 | 0 | 0 | 191 | 0 | 0 | -155 | 2196 | 0 | 773 | 3350 | 6319 |
| August | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 713 | 207 | 26 | 439 | 0 | 0 | 183 | 0 | 0 | -143 | 2132 | 0 | 681 | 2917 | 5729 |
| September | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 713 | 165 | 26 | 420 | 0 | 0 | 219 | 0 | 0 | -116 | 4818 | 0 | 534 | 2315 | 7667 |
| October | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2734 | 115 | 26 | 1422 | 0 | 0 | 1228 | 0 | 0 | -57 | 3113 | 0 | 323 | 2470 | 5905 |
| November | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5229 | 66 | 26 | 1825 | 0 | 0 | 3345 | 0 | 0 | -33 | 7218 | 0 | 158 | 1242 | 8617 |
| December | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6680 | 55 | 26 | 2638 | 0 | 0 | 3994 | 0 | 0 | -33 | 2625 | 0 | 108 | 992 | 3726 |
| Average | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3157 | 153 | 26 | 1168 | 0 | 0 | 1896 | 0 | 0 | -86 | 4408 | 0 | 486 | 2637 | 7532 |
| Maximum | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 13086 | 900 | 26 | 3468 | 0 | 0 | 12568 | 0 | 0 | 0 | 19022 | 0 | 4136 | 6280 | 25216 |
| Minimum | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 305 | 0 | 26 | 347 | 0 | 0 | 158 | 0 | 0 | -373 | 0 | 0 | 0 | 0 | 238 |
| Total for the whole year TWh/year | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | | 0,00 | 27,73 | 1,34 | 0,23 | 10,26 | 0,00 | 0,00 | 16,66 | 0,00 | | -0,76 | 38,72 | 0,00 | 4,27 | 23,16 | 66,16 |

Own use of heat from industrial CHP: 0,00 TWh/year

ANNUAL COSTS (Million EUR)

| | | |
|---|---|---|
| Total Fuel ex Ngas exchange | = | 4229 |
| Uranium | = | 0 |
| Coal | = | 386 |
| FuelOil | = | 225 |
| Gasoil/Diesel | = | 838 |
| Petrol/JP | = | 774 |
| Gas handling | = | 350 |
| Biomass | = | 1657 |
| Food income | = | 0 |
| Waste | = | 0 |
| Total Ngas Exchange costs | = | 1428 |
| Marginal operation costs | = | 202 |
| Total Electricity exchange | = | 9 |
| Import | = | 0 |
| Export | = | -3 |
| Bottleneck | = | 3 |
| Fixed imp/ex | = | 9 |
| Total CO2 emission costs | = | -120306 |
| Total variable costs | = | -114438 |
| Fixed operation costs | = | 1928 |
| Annual Investment costs | = | 4208 |
| TOTAL ANNUAL COSTS | = | -108303 |

## NATURAL GAS EXCHANGE

| | DHP & Boilers MW | CHP2 CHP3 MW | PP CAES MW | Indi-vidual MW | Trans port MW | Indu. Var. MW | Demand Sum MW | Bio-gas MW | Syn-gas MW | CO2Hy gas MW | SynHy gas MW | SynHy gas MW | Stor-age MW | Sum MW | Im-port MW | Ex-port MW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| January | 0 | 108 | 2445 | 4475 | 0 | 1927 | 8956 | 0 | 0 | 0 | 0 | 0 | 0 | 8956 | 8956 | 0 |
| February | 0 | 131 | 3413 | 3934 | 0 | 1927 | 9405 | 0 | 0 | 0 | 0 | 0 | 0 | 9405 | 9405 | 0 |
| March | 0 | 108 | 2313 | 3121 | 0 | 1927 | 7470 | 0 | 0 | 0 | 0 | 0 | 0 | 7470 | 7470 | 0 |
| April | 0 | 44 | 1584 | 897 | 0 | 1927 | 4452 | 0 | 0 | 0 | 0 | 0 | 0 | 4452 | 4452 | 0 |
| May | 0 | 24 | 1290 | 287 | 0 | 1927 | 3528 | 0 | 0 | 0 | 0 | 0 | 0 | 3528 | 3528 | 0 |
| June | 0 | 25 | 1664 | 287 | 0 | 1927 | 3903 | 0 | 0 | 0 | 0 | 0 | 0 | 3903 | 3903 | 0 |
| July | 0 | 27 | 2305 | 287 | 0 | 1927 | 4547 | 0 | 0 | 0 | 0 | 0 | 0 | 4547 | 4547 | 0 |
| August | 0 | 28 | 3253 | 287 | 0 | 1927 | 5496 | 0 | 0 | 0 | 0 | 0 | 0 | 5496 | 5496 | 0 |
| September | 0 | 27 | 2414 | 287 | 0 | 1927 | 4656 | 0 | 0 | 0 | 0 | 0 | 0 | 4656 | 4656 | 0 |
| October | 0 | 91 | 3318 | 1638 | 0 | 1927 | 6974 | 0 | 0 | 0 | 0 | 0 | 0 | 6974 | 6974 | 0 |
| November | 0 | 117 | 2648 | 3305 | 0 | 1927 | 7998 | 0 | 0 | 0 | 0 | 0 | 0 | 7998 | 7998 | 0 |
| December | 0 | 169 | 4597 | 4275 | 0 | 1927 | 10968 | 0 | 0 | 0 | 0 | 0 | 0 | 10968 | 10968 | 0 |
| Average | 0 | 75 | 2605 | 1921 | 0 | 1927 | 6528 | 0 | 0 | 0 | 0 | 0 | 0 | 6528 | 6528 | 0 |
| Maximum | 0 | 222 | 15928 | 8555 | 0 | 1927 | 25527 | 0 | 0 | 0 | 0 | 0 | 0 | 25527 | 25527 | 0 |
| Minimum | 0 | 22 | 944 | 15 | 0 | 1927 | 2909 | 0 | 0 | 0 | 0 | 0 | 0 | 2909 | 2909 | 0 |
| Total for the whole year TWh/year | 0,00 | 0,66 | 22,88 | 16,87 | 0,00 | 16,93 | 57,34 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 57,34 | 57,34 | 0,00 |

RES Share: 53,3 Percent of Primary Energy 62,4 Percent of Electricity 104,7 TWh electricity from RES

# Input BE 2050.txt

# The EnergyPLAN model 12.4

| | | | |
|---|---|---|---|
| Electricity demand (TWh/year): | | Flexible demand | 3,78 |
| Fixed demand | 92,53 | Fixed imp/exp. | -22,05 |
| Electric heating + HP | 9,25 | Transportation | 22,07 |
| Electric cooling | 1,19 | Total | 106,77 |

| District heating (TWh/year) | Gr.1 | Gr.2 | Gr.3 | Sum |
|---|---|---|---|---|
| District heating demand | 0,00 | 0,00 | 11,36 | 11,36 |
| Solar Thermal | 0,00 | 0,00 | 0,00 | 0,00 |
| Industrial CHP (CSHP) | 0,00 | 0,00 | 0,00 | 0,00 |
| Demand after solar and CSHP | 0,00 | 0,00 | 11,36 | 11,36 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Wind | 5000 | MW | 9,85 | TWh/year | 0,00 | Grid |
| Offshore Wind | 3864 | MW | 13,03 | TWh/year | 0,00 | stabili- |
| Photo Voltaic | 14651 | MW | 15,01 | TWh/year | 0,00 | sation |
| River Hydro | 105 | MW | 0,28 | TWh/year | 0,00 | share |
| Hydro Power | 0 | MW | 0 | TWh/year | | |
| Geothermal/Nuclear | 87 | MW | 0,72 | TWh/year | | |

| | Capacities | | Efficiencies | | |
|---|---|---|---|---|---|
| Group 2: | MW-e | MJ/s | elec. | Ther | COP |
| CHP | 0 | 0 | 0,40 | 0,50 | |
| Heat Pump | 0 | 0 | | | 3,00 |
| Boiler | | 0 | | 0,50 | |
| Group 3: | | | | | |
| CHP | 2258 | 2062 | 0,35 | 0,32 | |
| Heat Pump | 0 | 0 | | | 3,00 |
| Boiler | | 5912 | | 0,90 | |
| Condensing | 20100 | | 0,58 | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Heatstorage: | gr.2: | 0 | GWh | gr.3: | 0 | GWh |
| Fixed Boiler: | gr.2: | 2,5 | Per cent | gr.3: | 5,0 | Per cent |

| Electricity prod. from | CSHP | Waste | (TWh/year) |
|---|---|---|---|
| Gr.1: | 0,00 | 0,00 | |
| Gr.2: | 0,00 | 0,00 | |
| Gr.3: | 0,00 | 0,00 | |

| | | |
|---|---|---|
| Regulation Strategy: | Technical regulation no. 2 | |
| CEEP regulation | 23450000 | |
| Minimum Stabilisation share | 0,10 | |
| Stabilisation share of CHP | 0,00 | |
| Minimum CHP gr 3 load | 226 | MW |
| Minimum PP | 2010 | MW |
| Heat Pump maximum share | 0,50 | |
| Maximum import/export | 0 | MW |

| | | |
|---|---|---|
| Distr. Name : | const.txt | |
| Addition factor | 0,00 | EUR/MWh |
| Multiplication factor | 1,00 | |
| Dependency factor | 0,00 | EUR/MWh pr. MW |
| Average Market Price | 1 | EUR/MWh |
| Gas Storage | 0 | GWh |
| Syngas capacity | 0 | MW |
| Biogas max to grid | 0 | MW |

Fuel Price level:

| | Capacities | Storage | Efficiencies | |
|---|---|---|---|---|
| | MW-e | GWh | elec. | Ther. |
| Hydro Pump: | 1310 | 13 | 0,00 | |
| Hydro Turbine: | 1310 | | 0,00 | |
| Electrol. Gr.2: | 0 | 0 | 0,40 | 0,50 |
| Electrol. Gr.3: | 0 | 0 | 0,40 | 0,50 |
| Electrol. trans.: | 0 | 0 | 0,00 | |
| Ely. MicroCHP: | 0 | 0 | 0,80 | |
| CAES fuel ratio: | | 0,000 | | |

| (TWh/year) | Coal | Oil | Ngas | Biomass |
|---|---|---|---|---|
| Transport | 0,00 | 96,82 | 0,00 | 0,00 |
| Household | 0,00 | 0,00 | 49,50 | 16,70 |
| Industry | 22,30 | 0,46 | 57,43 | 24,88 |
| Various | 0,00 | 5,12 | 3,56 | 14,21 |

# Output WARNING!!: (1) Critical Excess;

| | District Heating | | | | | | | | | | Electricity | | | | | | | | | | | | | | | Exchange | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Demand | Production | | | | | | | | Balance | Consumption | | | | | | Production | | | | | | | Balance | | | | |
| | Distr. heating MW | Solar MW | Waste+ CSHP MW | DHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Balance MW | Elec. demand MW | Flex.& Transp. MW | HP MW | Elec-trolyser MW | EH MW | Hydro Pump MW | Tur-bine MW | RES MW | Hy-dro MW | Geo-thermal MW | Waste+ CSHP MW | CHP MW | PP MW | Stab-Load % | Imp MW | Exp MW | CEEP MW | EEP MW | Payment Imp Million EUR | Payment Exp Million EUR |
| January | 2649 | 0 | 0 | 0 | 1671 | 0 | 0 | 1002 | 0 | -25 | 11778 | 2895 | 352 | 0 | 1601 | 0 | 0 | 4223 | 0 | 82 | 0 | 1830 | 7980 | 695 | 0 | 0 | 0 | 0 | 0 | 0 |
| February | 2530 | 0 | 0 | 0 | 1668 | 0 | 0 | 886 | 0 | -25 | 11817 | 2965 | 336 | 0 | 1528 | 0 | 0 | 3846 | 0 | 82 | 0 | 1827 | 8380 | 724 | 0 | 0 | 0 | 0 | 0 | 0 |
| March | 2212 | 0 | 0 | 0 | 1625 | 0 | 0 | 611 | 0 | -25 | 11225 | 2992 | 293 | 0 | 1334 | 0 | 0 | 4361 | 0 | 82 | 0 | 1780 | 7120 | 680 | 0 | 9 | 9 | 0 | 0 | 0 |
| April | 792 | 0 | 0 | 0 | 705 | 0 | 0 | 119 | 0 | -32 | 10404 | 2878 | 185 | 0 | 841 | 0 | 0 | 4114 | 0 | 82 | 0 | 772 | 6925 | 684 | 0 | 96 | 96 | 0 | 0 | 0 |
| May | 285 | 0 | 0 | 0 | 256 | 0 | 0 | 66 | 0 | -37 | 10029 | 2992 | 89 | 0 | 403 | 0 | 0 | 4959 | 0 | 82 | 0 | 281 | 5824 | 595 | 0 | 144 | 144 | 0 | 0 | 0 |
| June | 285 | 0 | 0 | 0 | 257 | 0 | 0 | 65 | 0 | -37 | 10284 | 2977 | 59 | 0 | 269 | 0 | 0 | 4749 | 0 | 82 | 0 | 281 | 6003 | 613 | 0 | 38 | 38 | 0 | 0 | 0 |
| July | 285 | 0 | 0 | 0 | 255 | 0 | 0 | 67 | 0 | -37 | 9852 | 2890 | 45 | 0 | 207 | 0 | 0 | 4927 | 0 | 82 | 0 | 280 | 5355 | 586 | 0 | 159 | 159 | 0 | 0 | 0 |
| August | 285 | 0 | 0 | 0 | 257 | 0 | 0 | 65 | 0 | -37 | 10018 | 2991 | 43 | 0 | 195 | 0 | 0 | 3989 | 0 | 82 | 0 | 281 | 6430 | 670 | 0 | 47 | 47 | 0 | 0 | 0 |
| September | 285 | 0 | 0 | 0 | 257 | 0 | 0 | 65 | 0 | -37 | 10309 | 2925 | 79 | 0 | 357 | 0 | 0 | 4269 | 0 | 82 | 0 | 282 | 6543 | 640 | 0 | 16 | 16 | 0 | 0 | 0 |
| October | 1182 | 0 | 0 | 0 | 996 | 0 | 0 | 216 | 0 | -30 | 10599 | 2943 | 175 | 0 | 795 | 0 | 0 | 2610 | 0 | 82 | 0 | 1090 | 8218 | 792 | 0 | 0 | 0 | 0 | 0 | 0 |
| November | 2125 | 0 | 0 | 0 | 1637 | 0 | 0 | 513 | 0 | -25 | 11005 | 2977 | 278 | 0 | 1263 | 0 | 0 | 4950 | 0 | 82 | 0 | 1793 | 6187 | 610 | 0 | 0 | 0 | 0 | 0 | 0 |
| December | 2627 | 0 | 0 | 0 | 1666 | 0 | 0 | 986 | 0 | -25 | 10765 | 2891 | 348 | 0 | 1583 | 0 | 0 | 5133 | 0 | 82 | 0 | 1824 | 6036 | 592 | 0 | 0 | 0 | 0 | 0 | 0 |
| Average | 1293 | 0 | 0 | 0 | 936 | 0 | 0 | 388 | 0 | -31 | 10669 | 2943 | 190 | 0 | 863 | 0 | 0 | 4345 | 0 | 82 | 0 | 1025 | 6745 | 657 | 0 | 43 | 43 | 0 | Average price | |
| Maximum | 4927 | 0 | 0 | 0 | 2062 | 0 | 0 | 2865 | 0 | 0 | 14296 | 7639 | 566 | 0 | 2575 | 0 | 0 | 20077 | 0 | 82 | 0 | 2258 | 17821 | 999 | 0 | 10250 | 10250 | 0 | (EUR/MWh) | |
| Minimum | 125 | 0 | 0 | 0 | 206 | 0 | 0 | 65 | 0 | -146 | 76 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 0 | 82 | 0 | 226 | 2010 | 104 | 0 | 0 | 0 | 0 | 1 | 0 |
| TWh/year | 11,36 | 0,00 | 0,00 | 0,00 | 8,22 | 0,00 | 0,00 | 3,41 | 0,00 | -0,27 | 93,72 | 25,85 | 1,67 | 0,00 | 7,58 | 0,00 | 0,00 | 38,17 | 0,00 | 0,72 | 0,00 | 9,00 | 59,25 | | 0,00 | 0,38 | 0,38 | 0,00 | 0 | 0 |

| FUEL BALANCE (TWh/year): | DHP | CHP2 | CHP3 | Boiler2 | Boiler3 | PP | Geo/Nu. | Hydro | Waste | CAES Elc.ly. | BioCon-version | Electro-Fuel | Wind | Offsh. | PV | Hydro | Solar.Th | Transp. | Industry household. | Industry Various | Total | Imp/Exp Corrected Imp/Exp | Imp/Exp Corrected Net | CO2 emission (Mt): Total | CO2 emission (Mt): Net |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Coal | - | - | 0,43 | - | 0,06 | 24,13 | - | - | - | - | - | - | - | - | - | - | - | - | - | 22,30 | 46,93 | -0,15 | 46,77 | 16,64 | 16,59 |
| Oil | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 96,82 | - | 5,58 | 102,40 | 0,00 | 102,40 | 26,87 | 26,87 |
| N.Gas | - | - | 13,73 | - | 2,04 | 78,02 | - | - | - | - | - | - | - | - | - | - | - | - | 49,50 | 60,99 | 204,27 | -0,49 | 203,77 | 41,84 | 41,74 |
| Biomass | - | - | 11,38 | - | 1,69 | - | - | - | - | - | 9,69 | - | - | - | - | - | - | - | 16,70 | 39,09 | 78,55 | 0,00 | 78,55 | 0,00 | 0,00 |
| Renewable | - | - | - | - | - | - | 0,72 | - | - | - | - | - | 9,85 | 13,03 | 15,01 | 0,28 | - | - | - | - | 38,89 | 0,00 | 38,89 | 0,00 | 0,00 |
| H2 etc. | - | - | 0,00 | - | 0,00 | 0,00 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Biofuel | - | - | 0,00 | - | 0,00 | - | - | - | - | - | -7,11 | - | - | - | - | - | - | 7,11 | - | - | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Nuclear/CCS | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0,00 | 0,00 | 0,00 | -23862, | -23862,85 |
| Total | - | - | 25,53 | - | 3,79 | 102,15 | 0,72 | - | - | - | 2,58 | - | 9,85 | 13,03 | 15,01 | 0,28 | - | 103,93 | 66,20 | 127,96 | 471,03 | -0,65 | 470,38 | -23777, | -23777,65 |

## District Heating Production

| | Gr.1 | | | | Gr.2 | | | | | | | | | | Gr.3 | | | | | | | | | | RES specification | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | District heating MW | Solar MW | CSHP MW | DHP MW | District heating MW | Solar MW | CSHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Stor-age MW | Ba-lance MW | District heating MW | Solar MW | CSHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Stor-age MW | Ba-lance MW | RES1 Wind MW | RES2 Offsho MW | RES3 Photo MW | RES 4-7 MW | Total MW |
| January | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2649 | 0 | 0 | 1671 | 0 | 0 | 1002 | 0 | 0 | -25 | 1594 | 2004 | 561 | 64 | 4223 |
| February | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2530 | 0 | 0 | 1668 | 0 | 0 | 886 | 0 | 0 | -25 | 1272 | 1627 | 875 | 73 | 3846 |
| March | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2212 | 0 | 0 | 1625 | 0 | 0 | 611 | 0 | 0 | -25 | 1150 | 1601 | 1557 | 53 | 4361 |
| April | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 792 | 0 | 0 | 705 | 0 | 0 | 119 | 0 | 0 | -32 | 700 | 896 | 2476 | 41 | 4114 |
| May | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 285 | 0 | 0 | 256 | 0 | 0 | 66 | 0 | 0 | -37 | 941 | 1263 | 2731 | 24 | 4959 |
| June | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 285 | 0 | 0 | 257 | 0 | 0 | 65 | 0 | 0 | -37 | 788 | 1051 | 2900 | 10 | 4749 |
| July | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 285 | 0 | 0 | 255 | 0 | 0 | 67 | 0 | 0 | -37 | 901 | 1183 | 2839 | 5 | 4927 |
| August | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 285 | 0 | 0 | 257 | 0 | 0 | 65 | 0 | 0 | -37 | 621 | 880 | 2481 | 7 | 3989 |
| September | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 285 | 0 | 0 | 257 | 0 | 0 | 65 | 0 | 0 | -37 | 1059 | 1287 | 1911 | 13 | 4269 |
| October | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1182 | 0 | 0 | 996 | 0 | 0 | 216 | 0 | 0 | -30 | 543 | 856 | 1201 | 10 | 2610 |
| November | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2125 | 0 | 0 | 1637 | 0 | 0 | 513 | 0 | 0 | -25 | 1900 | 2453 | 569 | 27 | 4950 |
| December | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2627 | 0 | 0 | 1666 | 0 | 0 | 986 | 0 | 0 | -25 | 1994 | 2697 | 386 | 56 | 5133 |
| Average | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1293 | 0 | 0 | 936 | 0 | 0 | 388 | 0 | 0 | -31 | 1121 | 1483 | 1709 | 32 | 4345 |
| Maximum | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4927 | 0 | 0 | 2062 | 0 | 0 | 2865 | 0 | 0 | 0 | 3211 | 3283 | 14651 | 105 | 20077 |
| Minimum | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 125 | 0 | 0 | 206 | 0 | 0 | 65 | 0 | 0 | -146 | 0 | 0 | 0 | 0 | 9 |
| Total for the whole year TWh/year | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | | 0,00 | 11,36 | 0,00 | 0,00 | 8,22 | 0,00 | 0,00 | 3,41 | 0,00 | | -0,27 | 9,85 | 13,03 | 15,01 | 0,28 | 38,17 |

Own use of heat from industrial CHP: 0,00 TWh/year

ANNUAL COSTS (Million EUR)

| | |
|---|---|
| Total Fuel ex Ngas exchange = | 7276 |
| Uranium = | 0 |
| Coal = | 439 |
| FuelOil = | 136 |
| Gasoil/Diesel= | 1799 |
| Petrol/JP = | 1859 |
| Gas handling = | 1124 |
| Biomass = | 1920 |
| Food income = | 0 |
| Waste = | 0 |
| Total Ngas Exchange costs = | 5089 |
| Marginal operation costs = | 192 |
| Total Electricity exchange = | -22 |
| Import = | 0 |
| Export = | 0 |
| Bottleneck = | 0 |
| Fixed imp/ex= | -22 |
| Total CO2 emission costs = | -361418 |
| Total variable costs = | -348883 |
| Fixed operation costs = | 1056 |
| Annual Investment costs = | 2491 |
| TOTAL ANNUAL COSTS = | -345336 |

## NATURAL GAS EXCHANGE

| | DHP & Boilers MW | CHP2 CHP3 MW | PP CAES MW | Indi-vidual MW | Trans port MW | Indu. Var. MW | Demand Sum MW | Bio-gas MW | Syn-gas MW | CO2Hy gas MW | SynHy gas MW | SynHy gas MW | Stor-age MW | Sum MW | Im-port MW | Ex-port MW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| January | 599 | 2790 | 10508 | 10455 | 0 | 6943 | 31296 | 0 | 0 | 0 | 0 | 0 | 0 | 31296 | 31296 | 0 |
| February | 530 | 2785 | 11035 | 9980 | 0 | 6943 | 31272 | 0 | 0 | 0 | 0 | 0 | 0 | 31272 | 31272 | 0 |
| March | 365 | 2713 | 9375 | 8710 | 0 | 6943 | 28107 | 0 | 0 | 0 | 0 | 0 | 0 | 28107 | 28107 | 0 |
| April | 71 | 1176 | 9119 | 5490 | 0 | 6943 | 22800 | 0 | 0 | 0 | 0 | 0 | 0 | 22800 | 22800 | 0 |
| May | 39 | 428 | 7669 | 2631 | 0 | 6943 | 17711 | 0 | 0 | 0 | 0 | 0 | 0 | 17711 | 17711 | 0 |
| June | 39 | 429 | 7904 | 1754 | 0 | 6943 | 17070 | 0 | 0 | 0 | 0 | 0 | 0 | 17070 | 17070 | 0 |
| July | 40 | 426 | 7051 | 1349 | 0 | 6943 | 15810 | 0 | 0 | 0 | 0 | 0 | 0 | 15810 | 15810 | 0 |
| August | 39 | 429 | 8467 | 1272 | 0 | 6943 | 17150 | 0 | 0 | 0 | 0 | 0 | 0 | 17150 | 17150 | 0 |
| September | 39 | 430 | 8616 | 2334 | 0 | 6943 | 18361 | 0 | 0 | 0 | 0 | 0 | 0 | 18361 | 18361 | 0 |
| October | 129 | 1662 | 10822 | 5190 | 0 | 6943 | 24747 | 0 | 0 | 0 | 0 | 0 | 0 | 24747 | 24747 | 0 |
| November | 306 | 2734 | 8147 | 8249 | 0 | 6943 | 26379 | 0 | 0 | 0 | 0 | 0 | 0 | 26379 | 26379 | 0 |
| December | 589 | 2782 | 7949 | 10336 | 0 | 6943 | 28599 | 0 | 0 | 0 | 0 | 0 | 0 | 28599 | 28599 | 0 |
| Average | 232 | 1563 | 8882 | 5635 | 0 | 6943 | 23255 | 0 | 0 | 0 | 0 | 0 | 0 | 23255 | 23255 | 0 |
| Maximum | 1712 | 3443 | 23467 | 16816 | 0 | 6943 | 50080 | 0 | 0 | 0 | 0 | 0 | 0 | 50080 | 50080 | 0 |
| Minimum | 39 | 344 | 2647 | 44 | 0 | 6943 | 10017 | 0 | 0 | 0 | 0 | 0 | 0 | 10017 | 10017 | 0 |
| Total for the whole year TWh/year | 2,04 | 13,73 | 78,02 | 49,50 | 0,00 | 60,99 | 204,27 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 204,27 | 204,27 | 0,00 |

RES Share: 24,9 Percent of Primary Energy 34,7 Percent of Electricity 42,9 TWh electricity from RES

# Input CZ 2050.txt

# The EnergyPLAN model 12.4

| | | | |
|---|---|---|---|
| Electricity demand (TWh/year): | | Flexible demand | 2,57 |
| Fixed demand | 63,53 | Fixed imp/exp. | -9,24 |
| Electric heating + HP | 9,75 | Transportation | 17,23 |
| Electric cooling | 1,54 | Total | 85,38 |

| District heating (TWh/year) | Gr.1 | Gr.2 | Gr.3 | Sum |
|---|---|---|---|---|
| District heating demand | 0,00 | 0,00 | 27,93 | 27,93 |
| Solar Thermal | 0,00 | 0,00 | 0,94 | 0,94 |
| Industrial CHP (CSHP) | 0,00 | 0,00 | 0,00 | 0,00 |
| Demand after solar and CSHP | 0,00 | 0,00 | 26,99 | 26,99 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Wind | 2558 | MW | 4,22 | TWh/year | 0,00 | Grid |
| Offshore Wind | 0 | MW | 0 | TWh/year | 0,00 | stabili- |
| Photo Voltaic | 14085 | MW | 14,41 | TWh/year | 0,00 | sation |
| River Hydro | 227 | MW | 0,6 | TWh/year | 0,00 | share |
| Hydro Power | 1074 | MW | 2,89 | TWh/year | | |
| Geothermal/Nuclear | 5367 | MW | 43,36 | TWh/year | | |

| | Capacities | | Efficiencies | | |
|---|---|---|---|---|---|
| Group 2: | MW-e | MJ/s | elec. | Ther | COP |
| CHP | 0 | 0 | 0,40 | 0,50 | |
| Heat Pump | 0 | 0 | | | 3,00 |
| Boiler | | 0 | | 0,50 | |
| Group 3: | | | | | |
| CHP | 7591 | 10468 | 0,28 | 0,38 | |
| Heat Pump | 0 | 0 | | | 3,00 |
| Boiler | | 15403 | | 0,89 | |
| Condensing | 11900 | | 0,40 | | |

| | | | | | |
|---|---|---|---|---|---|
| Heatstorage: | gr.2: | 0 | GWh | gr.3: | 0 GWh |
| Fixed Boiler: | gr.2: | 2,5 | Per cent | gr.3: | 5,0 Per cent |

| Electricity prod. from | CSHP | Waste | (TWh/year) |
|---|---|---|---|
| Gr.1: | 0,00 | 0,00 | |
| Gr.2: | 0,00 | 0,00 | |
| Gr.3: | 3,30 | 0,00 | |

| | | |
|---|---|---|
| Regulation Strategy: | Technical regulation no. 2 | |
| CEEP regulation | 23450000 | |
| Minimum Stabilisation share | 0,10 | |
| Stabilisation share of CHP | 0,00 | |
| Minimum CHP gr 3 load | 683 | MW |
| Minimum PP | 0 | MW |
| Heat Pump maximum share | 0,50 | |
| Maximum import/export | 0 | MW |

| | | |
|---|---|---|
| Distr. Name : | const.txt | |
| Addition factor | 0,00 | EUR/MWh |
| Multiplication factor | 1,00 | |
| Dependency factor | 0,00 | EUR/MWh pr. MW |
| Average Market Price | 1 | EUR/MWh |
| Gas Storage | 0 | GWh |
| Syngas capacity | 0 | MW |
| Biogas max to grid | 0 | MW |

Fuel Price level:

| | Capacities | Storage | Efficiencies | |
|---|---|---|---|---|
| | MW-e | GWh | elec. | Ther. |
| Hydro Pump: | 1147 | 11 | 0,00 | |
| Hydro Turbine: | 1147 | | 0,00 | |
| Electrol. Gr.2: | 0 | 0 | 0,40 | 0,50 |
| Electrol. Gr.3: | 0 | 0 | 0,40 | 0,50 |
| Electrol. trans.: | 0 | 0 | 0,00 | |
| Ely. MicroCHP: | 0 | 0 | 0,80 | |
| CAES fuel ratio: | | 0,000 | | |

| (TWh/year) | Coal | Oil | Ngas | Biomass |
|---|---|---|---|---|
| Transport | 0,00 | 63,81 | 0,00 | 0,00 |
| Household | 0,00 | 0,00 | 24,60 | 1,04 |
| Industry | 29,53 | 3,68 | 21,75 | 13,09 |
| Various | 0,15 | 3,90 | 1,09 | 3,60 |

# Output WARNING!!: (1) Critical Excess;

| | District Heating | | | | | | | | | | Electricity | | | | | | | | | | | | | | | | Exchange | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Demand | Production | | | | | | | | | Consumption | | | | | | Production | | | | | | | | Balance | | | | |
| | Distr. heating MW | Solar MW | Waste+ CSHP MW | DHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Balance MW | Elec. demand MW | Flex.& Transp. MW | HP MW | Elec-trolyser MW | EH MW | Hydro Pump MW | Tur-bine MW | RES MW | Hy-dro MW | Geo-thermal MW | Waste+ CSHP MW | CHP MW | PP MW | Stab-Load % | Imp MW | Exp MW | CEEP MW | EEP MW | Payment Imp Million EUR | Payment Exp Million EUR |
| January | 6759 | 39 | 8 | 0 | 4263 | 0 | 0 | 2613 | 0 | -164 | 8175 | 2217 | 323 | 0 | 2131 | 0 | 0 | 1822 | 368 | 6650 | 376 | 3091 | 78 | 825 | 0 | 592 | 592 | 0 | 0 | 0 |
| February | 6273 | 67 | 8 | 0 | 4297 | 0 | 0 | 2064 | 0 | -164 | 8354 | 2271 | 299 | 0 | 1973 | 0 | 0 | 1624 | 399 | 6612 | 376 | 3116 | 58 | 844 | 0 | 340 | 340 | 0 | 0 | 0 |
| March | 5356 | 98 | 8 | 0 | 3404 | 0 | 0 | 2009 | 0 | -164 | 7877 | 2292 | 253 | 0 | 1674 | 0 | 0 | 2280 | 321 | 6035 | 376 | 2469 | 40 | 788 | 0 | 476 | 476 | 0 | 0 | 0 |
| April | 1762 | 146 | 8 | 0 | 1418 | 0 | 0 | 583 | 0 | -393 | 7223 | 2203 | 76 | 0 | 502 | 0 | 0 | 2924 | 257 | 5124 | 376 | 1028 | 159 | 716 | 0 | 915 | 915 | 0 | 0 | 0 |
| May | 703 | 170 | 8 | 0 | 942 | 0 | 0 | 159 | 0 | -576 | 6913 | 2292 | 24 | 0 | 157 | 0 | 0 | 2985 | 243 | 4875 | 376 | 683 | 240 | 709 | 0 | 1068 | 1068 | 0 | 0 | 0 |
| June | 703 | 175 | 8 | 0 | 942 | 0 | 0 | 159 | 0 | -581 | 6996 | 2281 | 23 | 0 | 154 | 0 | 0 | 2942 | 274 | 4680 | 376 | 683 | 251 | 707 | 0 | 803 | 803 | 0 | 0 | 0 |
| July | 703 | 175 | 8 | 0 | 942 | 0 | 0 | 159 | 0 | -581 | 6879 | 2213 | 24 | 0 | 160 | 0 | 0 | 3033 | 369 | 3644 | 376 | 683 | 647 | 685 | 0 | 527 | 527 | 0 | 0 | 0 |
| August | 703 | 155 | 8 | 0 | 942 | 0 | 0 | 159 | 0 | -561 | 6871 | 2292 | 24 | 0 | 155 | 0 | 0 | 2629 | 256 | 4554 | 376 | 683 | 454 | 727 | 0 | 663 | 663 | 0 | 0 | 0 |
| September | 703 | 117 | 8 | 0 | 943 | 0 | 0 | 159 | 0 | -524 | 6883 | 2240 | 24 | 0 | 156 | 0 | 0 | 2107 | 354 | 3985 | 376 | 684 | 957 | 749 | 0 | 213 | 213 | 0 | 0 | 0 |
| October | 2879 | 73 | 8 | 0 | 2812 | 0 | 0 | 287 | 0 | -301 | 7431 | 2254 | 131 | 0 | 867 | 0 | 0 | 1326 | 454 | 4360 | 376 | 2039 | 1100 | 836 | 0 | 23 | 23 | 0 | 0 | 0 |
| November | 5181 | 38 | 8 | 0 | 4922 | 0 | 0 | 377 | 0 | -164 | 7845 | 2281 | 245 | 0 | 1616 | 0 | 0 | 1453 | 221 | 4339 | 376 | 3569 | 1069 | 833 | 0 | 93 | 93 | 0 | 0 | 0 |
| December | 6487 | 30 | 8 | 0 | 5675 | 0 | 0 | 938 | 0 | -164 | 7485 | 2214 | 310 | 0 | 2045 | 0 | 0 | 1116 | 427 | 4434 | 376 | 4115 | 655 | 864 | 0 | 121 | 121 | 0 | 0 | 0 |
| Average | 3180 | 107 | 8 | 0 | 2622 | 0 | 0 | 804 | 0 | -362 | 7408 | 2254 | 146 | 0 | 964 | 0 | 0 | 2188 | 329 | 4936 | 376 | 1902 | 476 | 774 | 0 | 487 | 487 | 0 | Average price | |
| Maximum | 12836 | 672 | 8 | 0 | 10468 | 0 | 0 | 9002 | 0 | 0 | 10057 | 6461 | 622 | 0 | 4112 | 0 | 0 | 14997 | 846 | 6650 | 376 | 7591 | 6724 | 973 | 0 | 10069 | 10069 | 0 | (EUR/MWh) | |
| Minimum | 248 | 0 | 8 | 0 | 942 | 0 | 0 | 159 | 0 | -950 | 98 | 0 | 0 | 0 | 0 | 0 | 0 | 19 | 0 | 3613 | 376 | 683 | 0 | 218 | 0 | 0 | 0 | 0 | 1 | 1 |
| TWh/year | 27,93 | 0,94 | 0,07 | 0,00 | 23,03 | 0,00 | 0,00 | 7,06 | 0,00 | -3,18 | 65,07 | 19,80 | 1,28 | 0,00 | 8,47 | 0,00 | 0,00 | 19,22 | 2,89 | 43,36 | 3,30 | 16,70 | 4,19 | | 0,00 | 4,27 | 4,27 | 0,00 | 0 | 2 |

| FUEL BALANCE (TWh/year): | DHP | CHP2 | CHP3 | Boiler2 | Boiler3 | PP | Geo/Nu. | Hydro | Waste | CAES Elc.ly. | BioCon-version | Electro-Fuel | Wind | Offsh. | PV | Hydro | Solar.Th | Transp. | Industry household | Industry Various | Total | Imp/Exp Corrected Imp/Exp | Imp/Exp Corrected Net | CO2 emission (Mt): Total | CO2 emission (Mt): Net |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Coal | - | - | 34,42 | - | 0,83 | 5,96 | - | - | - | - | - | - | - | - | - | - | - | - | - | 29,68 | 70,89 | -6,08 | 64,80 | 25,14 | 22,98 |
| Oil | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 63,81 | - | 7,58 | 71,39 | 0,00 | 71,39 | 18,74 | 18,74 |
| N.Gas | - | - | 1,87 | - | - | 0,32 | - | - | - | - | - | - | - | - | - | - | - | - | 24,60 | 22,84 | 49,64 | -0,33 | 49,30 | 10,17 | 10,10 |
| Biomass | - | - | 24,17 | - | 7,11 | 4,18 | - | - | 0,09 | - | 2,19 | - | - | - | - | - | - | - | 1,04 | 16,69 | 55,47 | -4,27 | 51,19 | 0,01 | 0,01 |
| Renewable | - | - | - | - | - | - | 0,15 | 2,89 | - | - | - | - | 4,22 | - | 14,41 | 0,60 | 0,94 | - | - | - | 23,19 | 0,00 | 23,19 | 0,00 | 0,00 |
| H2 etc. | - | - | 0,00 | - | 0,00 | 0,00 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Biofuel | - | - | - | - | 0,00 | - | - | - | - | - | -1,60 | - | - | - | - | - | - | 1,60 | - | - | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Nuclear/CCS | - | - | - | - | - | - | 144,04 | - | - | - | - | - | - | - | - | - | - | - | - | - | 144,04 | 0,00 | 144,04 | -12009,-12009,12 | |
| Total | - | - | 60,46 | - | 7,93 | 10,46 | 144,19 | 2,89 | 0,09 | - | 0,59 | - | 4,22 | - | 14,41 | 0,60 | 0,94 | 65,41 | 25,64 | 76,79 | 414,61 | -10,69 | 403,93 | -11955,-11957,30 | |

## District Heating Production

| | Gr.1 | | | | Gr.2 | | | | | | | | | | Gr.3 | | | | | | | | | | RES specification | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | District heating MW | Solar MW | CSHP MW | DHP MW | District heating MW | Solar MW | CSHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Stor-age MW | Ba-lance MW | District heating MW | Solar MW | CSHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Stor-age MW | Ba-lance MW | RES1 Wind MW | RES2 Offsho MW | RES3 Photo MW | RES 4-7 ic MW | Total MW |
| January | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6759 | 39 | 8 | 4263 | 0 | 0 | 2613 | 0 | 0 | -164 | 1072 | 0 | 576 | 175 | 1822 |
| February | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6273 | 67 | 8 | 4297 | 0 | 0 | 2064 | 0 | 0 | -164 | 523 | 0 | 984 | 116 | 1624 |
| March | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5356 | 98 | 8 | 3404 | 0 | 0 | 2009 | 0 | 0 | -164 | 701 | 0 | 1494 | 85 | 2280 |
| April | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1762 | 146 | 8 | 1418 | 0 | 0 | 583 | 0 | 0 | -393 | 424 | 0 | 2329 | 171 | 2924 |
| May | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 703 | 170 | 8 | 942 | 0 | 0 | 159 | 0 | 0 | -576 | 247 | 0 | 2671 | 67 | 2985 |
| June | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 703 | 175 | 8 | 942 | 0 | 0 | 159 | 0 | 0 | -581 | 176 | 0 | 2733 | 33 | 2942 |
| July | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 703 | 175 | 8 | 942 | 0 | 0 | 159 | 0 | 0 | -581 | 319 | 0 | 2690 | 23 | 3033 |
| August | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 703 | 155 | 8 | 942 | 0 | 0 | 159 | 0 | 0 | -561 | 172 | 0 | 2438 | 19 | 2629 |
| September | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 703 | 117 | 8 | 943 | 0 | 0 | 159 | 0 | 0 | -524 | 335 | 0 | 1751 | 21 | 2107 |
| October | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2879 | 73 | 8 | 2812 | 0 | 0 | 287 | 0 | 0 | -301 | 241 | 0 | 1063 | 22 | 1326 |
| November | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5181 | 38 | 8 | 4922 | 0 | 0 | 377 | 0 | 0 | -164 | 886 | 0 | 536 | 31 | 1453 |
| December | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6487 | 30 | 8 | 5675 | 0 | 0 | 938 | 0 | 0 | -164 | 665 | 0 | 398 | 53 | 1116 |
| Average | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3180 | 107 | 8 | 2622 | 0 | 0 | 804 | 0 | 0 | -362 | 480 | 0 | 1640 | 68 | 2188 |
| Maximum | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 12836 | 672 | 8 | 10468 | 0 | 0 | 9002 | 0 | 0 | 0 | 2551 | 0 | 14085 | 227 | 14997 |
| Minimum | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 248 | 0 | 8 | 942 | 0 | 0 | 159 | 0 | 0 | -950 | 0 | 0 | 0 | 0 | 19 |
| Total for the whole year TWh/year | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | | 0,00 | 27,93 | 0,94 | 0,07 | 23,03 | 0,00 | 0,00 | 7,06 | 0,00 | | -3,18 | 4,22 | 0,00 | 14,41 | 0,60 | 19,22 |

Own use of heat from industrial CHP: 0,00 TWh/year

ANNUAL COSTS (Million EUR)

| | |
|---|---|
| Total Fuel ex Ngas exchange = | 6046 |
| Uranium = | 907 |
| Coal = | 663 |
| FuelOil = | 184 |
| Gasoil/Diesel= | 1866 |
| Petrol/JP = | 642 |
| Gas handling = | 442 |
| Biomass = | 1340 |
| Food income = | 0 |
| Waste = | 0 |
| Total Ngas Exchange costs = | 1237 |
| Marginal operation costs = | 711 |
| Total Electricity exchange = | -9 |
| Import = | 0 |
| Export = | -2 |
| Bottleneck = | 2 |
| Fixed imp/ex= | -9 |
| Total CO2 emission costs = | -181717 |
| Total variable costs = | -173732 |
| Fixed operation costs = | 1158 |
| Annual Investment costs = | 2625 |
| TOTAL ANNUAL COSTS = | -169950 |

## NATURAL GAS EXCHANGE

| | DHP & Boilers MW | CHP2 CHP3 MW | PP CAES MW | Indi-vidual MW | Trans port MW | Indu. Var. MW | Demand Sum MW | Bio-gas MW | Syn-gas MW | CO2Hy gas MW | SynHy gas MW | SynHy gas MW | Stor-age MW | Sum MW | Im-port MW | Ex-port MW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| January | 0 | 346 | 6 | 6189 | 0 | 2600 | 9142 | 0 | 0 | 0 | 0 | 0 | 0 | 9142 | 9142 | 0 |
| February | 0 | 349 | 5 | 5729 | 0 | 2600 | 8683 | 0 | 0 | 0 | 0 | 0 | 0 | 8683 | 8683 | 0 |
| March | 0 | 277 | 3 | 4861 | 0 | 2600 | 7741 | 0 | 0 | 0 | 0 | 0 | 0 | 7741 | 7741 | 0 |
| April | 0 | 115 | 12 | 1458 | 0 | 2600 | 4186 | 0 | 0 | 0 | 0 | 0 | 0 | 4186 | 4186 | 0 |
| May | 0 | 77 | 19 | 456 | 0 | 2600 | 3151 | 0 | 0 | 0 | 0 | 0 | 0 | 3151 | 3151 | 0 |
| June | 0 | 77 | 19 | 456 | 0 | 2600 | 3152 | 0 | 0 | 0 | 0 | 0 | 0 | 3152 | 3152 | 0 |
| July | 0 | 77 | 50 | 456 | 0 | 2600 | 3183 | 0 | 0 | 0 | 0 | 0 | 0 | 3183 | 3183 | 0 |
| August | 0 | 77 | 35 | 456 | 0 | 2600 | 3168 | 0 | 0 | 0 | 0 | 0 | 0 | 3168 | 3168 | 0 |
| September | 0 | 77 | 74 | 456 | 0 | 2600 | 3207 | 0 | 0 | 0 | 0 | 0 | 0 | 3207 | 3207 | 0 |
| October | 0 | 228 | 85 | 2516 | 0 | 2600 | 5430 | 0 | 0 | 0 | 0 | 0 | 0 | 5430 | 5430 | 0 |
| November | 0 | 400 | 83 | 4696 | 0 | 2600 | 7778 | 0 | 0 | 0 | 0 | 0 | 0 | 7778 | 7778 | 0 |
| December | 0 | 461 | 51 | 5932 | 0 | 2600 | 9044 | 0 | 0 | 0 | 0 | 0 | 0 | 9044 | 9044 | 0 |
| Average | 0 | 213 | 37 | 2801 | 0 | 2600 | 5651 | 0 | 0 | 0 | 0 | 0 | 0 | 5651 | 5651 | 0 |
| Maximum | 0 | 850 | 520 | 11942 | 0 | 2600 | 15328 | 0 | 0 | 0 | 0 | 0 | 0 | 15328 | 15328 | 0 |
| Minimum | 0 | 77 | 0 | 24 | 0 | 2600 | 2701 | 0 | 0 | 0 | 0 | 0 | 0 | 2701 | 2701 | 0 |
| Total for the whole year TWh/year | 0,00 | 1,87 | 0,32 | 24,60 | 0,00 | 22,84 | 49,64 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 49,64 | 49,64 | 0,00 |

RES Share: 19,0 Percent of Primary Energy 33,7 Percent of Electricity 30,6 TWh electricity from RES

# Input DE 2050.txt

# The EnergyPLAN model 12.4

| | | | |
|---|---|---|---|
| Electricity demand (TWh/year): | | Flexible demand | 27,94 |
| Fixed demand | 544,93 | Fixed imp/exp. | -89,75 |
| Electric heating + HP | 39,46 | Transportation | 124,98 |
| Electric cooling | 3,63 | Total | 651,19 |

| District heating (TWh/year) | Gr.1 | Gr.2 | Gr.3 | Sum |
|---|---|---|---|---|
| District heating demand | 0,00 | 0,00 | 164,25 | 164,25 |
| Solar Thermal | 0,00 | 0,00 | 2,09 | 2,09 |
| Industrial CHP (CSHP) | 0,00 | 0,00 | 0,00 | 0,00 |
| Demand after solar and CSHP | 0,00 | 0,00 | 162,16 | 162,16 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Wind | 50644 | MW | 91,30 | TWh/year | 0,00 | Grid |
| Offshore Wind | 20732 | MW | 75,86 | TWh/year | 0,00 | stabili- |
| Photo Voltaic | 75469 | MW | 77,44 | TWh/year | 0,00 | sation |
| River Hydro | 2977 | MW | 11,39 | TWh/year | 0,00 | share |
| Hydro Power | 1441 | MW | 4,57 | TWh/year | | |
| Geothermal/Nuclear | 1155 | MW | 9,61 | TWh/year | | |

| | Capacities | | Efficiencies | | |
|---|---|---|---|---|---|
| Group 2: | MW-e | MJ/s | elec. | Ther | COP |
| CHP | 0 | 0 | 0,40 | 0,50 | |
| Heat Pump | 0 | 0 | | | 3,00 |
| Boiler | | 0 | | 0,50 | |
| Group 3: | | | | | |
| CHP | 31940 | 56201 | 0,26 | 0,45 | |
| Heat Pump | 0 | 0 | | | 3,00 |
| Boiler | | 86446 | | 0,90 | |
| Condensing | 123900 | | 0,60 | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Heatstorage: | gr.2: | 0 | GWh | gr.3: | 0 | GWh |
| Fixed Boiler: | gr.2: | 2,5 | Per cent | gr.3: | 5,0 | Per cent |

| Electricity prod. from | CSHP | Waste | (TWh/year) |
|---|---|---|---|
| Gr.1: | 0,00 | 0,00 | |
| Gr.2: | 0,00 | 0,00 | |
| Gr.3: | 2,15 | 0,00 | |

| | | |
|---|---|---|
| Regulation Strategy: | Technical regulation no. 2 | |
| CEEP regulation | 23450000 | |
| Minimum Stabilisation share | 0,10 | |
| Stabilisation share of CHP | 0,00 | |
| Minimum CHP gr 3 load | 2396 | MW |
| Minimum PP | 6195 | MW |
| Heat Pump maximum share | 0,50 | |
| Maximum import/export | 0 | MW |

| | | |
|---|---|---|
| Distr. Name : | const.txt | |
| Addition factor | 0,00 | EUR/MWh |
| Multiplication factor | 1,00 | |
| Dependency factor | 0,00 | EUR/MWh pr. MW |
| Average Market Price | 1 | EUR/MWh |
| Gas Storage | 0 | GWh |
| Syngas capacity | 0 | MW |
| Biogas max to grid | 0 | MW |

Fuel Price level:

| | Capacities Storage | | Efficiencies | |
|---|---|---|---|---|
| | MW-e | GWh | elec. | Ther. |
| Hydro Pump: | 6967 | 70 | 0,00 | |
| Hydro Turbine: | 6967 | | 0,00 | |
| Electrol. Gr.2: | 0 | 0 | 0,40 | 0,50 |
| Electrol. Gr.3: | 0 | 0 | 0,40 | 0,50 |
| Electrol. trans.: | 0 | 0 | 0,00 | |
| Ely. MicroCHP: | 0 | 0 | 0,80 | |
| CAES fuel ratio: | 0,000 | | | |

| (TWh/year) | Coal | Oil | Ngas | Biomass |
|---|---|---|---|---|
| Transport | 0,00 | 429,53 | 0,35 | 0,00 |
| Household | 0,00 | 0,74 | 255,36 | 17,77 |
| Industry | 137,16 | 17,23 | 147,84 | 92,57 |
| Various | 0,00 | 0,00 | 0,00 | 50,45 |

# Output WARNING!!: (1) Critical Excess;

| | District Heating | | | | | | | | | | Electricity | | | | | | | | | | | | | | | | | Exchange | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Demand | Production | | | | | | | | | Consumption | | | | | | Production | | | | | | | | Balance | | | | | Payment | |
| | Distr. heating MW | Solar MW | Waste+ CSHP MW | DHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Balance MW | Elec. demand MW | Flex.& Transp. MW | HP MW | Elec-trolyser MW | EH MW | Hydro Pump MW | Tur-bine MW | RES GW | Hy-dro MW | Geo-thermal MW | Waste+ CSHP MW | CHP MW | PP MW | Stab-Load % | Imp MW | Exp MW | CEEP MW | EEP MW | Imp Million EUR | Exp EUR |
| January | 37504 | 85 | 162 | 0 | 32341 | 0 | 0 | 5499 | 0 | -583 | 66562 | 17137 | 2283 | 0 | 7227 | 0 | 0 | 35 | 494 | 1094 | 245 | 18380 | 29098 | 568 | 0 | 1164 | 1164 | 0 | 0 | 0 |
| February | 36002 | 143 | 162 | 0 | 34621 | 0 | 0 | 1659 | 0 | -583 | 68072 | 17534 | 2190 | 0 | 6930 | 0 | 0 | 26 | 564 | 1094 | 245 | 19675 | 36955 | 677 | 0 | 278 | 278 | 0 | 0 | 0 |
| March | 31383 | 217 | 162 | 0 | 29635 | 0 | 0 | 1952 | 0 | -583 | 65306 | 17686 | 1891 | 0 | 5982 | 0 | 0 | 32 | 544 | 1094 | 245 | 16842 | 30854 | 604 | 0 | 787 | 787 | 0 | 0 | 0 |
| April | 11323 | 317 | 162 | 0 | 10678 | 0 | 0 | 1094 | 0 | -928 | 60160 | 17042 | 605 | 0 | 1922 | 0 | 0 | 27 | 613 | 1094 | 245 | 6068 | 35150 | 635 | 0 | 365 | 365 | 0 | 0 | 0 |
| May | 4945 | 385 | 162 | 0 | 4664 | 0 | 0 | 935 | 0 | -1201 | 58264 | 17686 | 197 | 0 | 622 | 0 | 0 | 34 | 584 | 1094 | 245 | 2650 | 28612 | 514 | 0 | 646 | 646 | 0 | 0 | 0 |
| June | 4945 | 386 | 162 | 0 | 4660 | 0 | 0 | 935 | 0 | -1199 | 60218 | 17601 | 197 | 0 | 622 | 0 | 0 | 28 | 580 | 1094 | 245 | 2649 | 35997 | 612 | 0 | 248 | 248 | 0 | 0 | 0 |
| July | 4945 | 390 | 162 | 0 | 4655 | 0 | 0 | 942 | 0 | -1204 | 60622 | 17112 | 198 | 0 | 625 | 0 | 0 | 31 | 491 | 1094 | 245 | 2645 | 33291 | 569 | 0 | 631 | 631 | 0 | 0 | 0 |
| August | 4945 | 353 | 162 | 0 | 4681 | 0 | 0 | 935 | 0 | -1186 | 59257 | 17683 | 198 | 0 | 625 | 0 | 0 | 25 | 474 | 1094 | 245 | 2660 | 38291 | 648 | 0 | 94 | 94 | 0 | 0 | 0 |
| September | 4945 | 258 | 162 | 0 | 4711 | 0 | 0 | 936 | 0 | -1122 | 61500 | 17308 | 198 | 0 | 625 | 0 | 0 | 25 | 465 | 1094 | 245 | 2678 | 39942 | 640 | 0 | 258 | 258 | 0 | 0 | 0 |
| October | 17061 | 167 | 162 | 0 | 16586 | 0 | 0 | 935 | 0 | -789 | 62446 | 17408 | 973 | 0 | 3082 | 0 | 0 | 18 | 522 | 1094 | 245 | 9426 | 44522 | 755 | 0 | 0 | 0 | 0 | 0 | 0 |
| November | 30131 | 90 | 162 | 0 | 28088 | 0 | 0 | 2373 | 0 | -583 | 65991 | 17600 | 1810 | 0 | 5732 | 0 | 0 | 34 | 492 | 1094 | 245 | 15963 | 30344 | 564 | 0 | 1266 | 1266 | 0 | 0 | 0 |
| December | 36616 | 62 | 162 | 0 | 32468 | 0 | 0 | 4507 | 0 | -583 | 61300 | 17116 | 2226 | 0 | 7047 | 0 | 0 | 34 | 431 | 1094 | 245 | 18452 | 24081 | 533 | 0 | 1235 | 1235 | 0 | 0 | 0 |
| Average | 18699 | 238 | 162 | 0 | 17279 | 0 | 0 | 1899 | 0 | -879 | 62450 | 17409 | 1078 | 0 | 3414 | 0 | 0 | 29 | 521 | 1094 | 245 | 9820 | 33896 | 609 | 0 | 583 | 583 | 0 | Average price | |
| Maximum | 72038 | 1469 | 162 | 0 | 56201 | 0 | 0 | 56120 | 0 | 0 | 83626 | 46439 | 4494 | 0 | 14229 | 0 | 0 | 105 | 756 | 1094 | 245 | 31940 | 96224 | 986 | 0 | 62773 | 62773 | 0 | (EUR/MWh) | |
| Minimum | 2024 | 0 | 162 | 0 | 4215 | 0 | 0 | 935 | 0 | -3288 | 231 | 3181 | 0 | 0 | 0 | 0 | 0 | 1 | 50 | 1094 | 245 | 2396 | 6195 | 100 | 0 | 0 | 0 | 0 | 1 | 0 |
| TWh/year | 164,25 | 2,09 | 1,43 | 0,00 | 151,78 | 0,00 | 0,00 | 16,68 | 0,00 | -7,73 | 548,56 | 152,92 | 9,47 | 0,00 | 29,99 | 0,00 | 0,00 | 256 | 4,57 | 9,61 | 2,15 | 86,26 | 297,74 | | 0,00 | 5,12 | 5,12 | 0,00 | 0 | 0 |

| FUEL BALANCE (TWh/year): | DHP | CHP2 | CHP3 | Boiler2 | Boiler3 | PP | Geo/Nu. | Hydro | Waste | CAES Elc.ly. | BioCon-version | Electro-Fuel | Wind | Offsh. | PV | Hydro | Solar.Th | Transp. | Industry household | Industry Various | Total | Imp/Exp Corrected Imp/Exp | Net | CO2 emission (Mt): Total | Net |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Coal | - | - | 189,42 | - | - | 93,42 | - | - | - | - | - | - | - | - | - | - | - | - | - | 137,16 | 420,00 | -1,61 | 418,39 | 148,93 | 148,36 |
| Oil | - | - | 4,59 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 429,53 | 0,74 | 17,23 | 452,09 | 0,00 | 452,09 | 118,65 | 118,65 |
| N.Gas | - | - | - | - | - | 402,81 | - | - | - | - | - | - | - | - | - | - | - | 1,21 | 255,36 | 147,84 | 807,22 | -6,93 | 800,29 | 165,36 | 164,12 |
| Biomass | - | - | 142,52 | - | 18,54 | - | - | - | 1,72 | - | 11,78 | - | - | - | - | - | - | - | 17,77 | 143,02 | 335,34 | 0,00 | 335,34 | 0,20 | 0,20 |
| Renewable | - | - | - | - | - | - | 9,61 | 4,57 | - | - | - | - | 91,30 | 75,86 | 77,44 | 9,60 | 2,09 | - | - | - | 272,26 | 0,00 | 272,26 | 0,00 | 0,00 |
| H2 etc. | - | - | 0,00 | - | 0,00 | 0,00 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Biofuel | - | - | - | - | - | - | - | - | - | - | -8,15 | - | - | - | - | - | - | 8,15 | - | - | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Nuclear/CCS | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0,00 | 0,00 | 0,00 | -62786, | -62786,82 |
| Total | - | - | 336,53 | - | 18,54 | 496,23 | 9,61 | 4,57 | 1,72 | - | 3,62 | - | 91,30 | 75,86 | 77,44 | 9,60 | 2,09 | 438,90 | 273,87 | 445,25 | 2286,92 | -8,54 | 2278,38 | -62353, | -62355,49 |

District Heating Production

| | Gr.1 | | | | Gr.2 | | | | | | | | | | Gr.3 | | | | | | | | | | RES specification | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | District heating MW | Solar MW | CSHP MW | DHP MW | District heating MW | Solar MW | CSHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Stor-age MW | Ba-lance MW | District heating MW | Solar MW | CSHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Stor-age MW | Ba-lance MW | RES1 Wind GW | RES2 Offsho GW | RES3 Photo GW | RES 4-7 GW | Total ic GW |
| January | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 37504 | 85 | 162 | 32341 | 0 | 0 | 5499 | 0 | 0 | -583 | 20 | 11 | 3 | 2 | 35 |
| February | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 36002 | 143 | 162 | 34621 | 0 | 0 | 1659 | 0 | 0 | -583 | 11 | 9 | 5 | 1 | 26 |
| March | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 31383 | 217 | 162 | 29635 | 0 | 0 | 1952 | 0 | 0 | -583 | 13 | 10 | 8 | 1 | 32 |
| April | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 11323 | 317 | 162 | 10678 | 0 | 0 | 1094 | 0 | 0 | -928 | 6 | 6 | 12 | 2 | 27 |
| May | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4945 | 385 | 162 | 4664 | 0 | 0 | 935 | 0 | 0 | -1201 | 8 | 9 | 15 | 2 | 34 |
| June | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4945 | 386 | 162 | 4660 | 0 | 0 | 935 | 0 | 0 | -1199 | 5 | 6 | 15 | 2 | 28 |
| July | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4945 | 390 | 162 | 4655 | 0 | 0 | 942 | 0 | 0 | -1204 | 8 | 7 | 15 | 1 | 31 |
| August | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4945 | 353 | 162 | 4681 | 0 | 0 | 935 | 0 | 0 | -1186 | 5 | 6 | 13 | 1 | 25 |
| September | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4945 | 258 | 162 | 4711 | 0 | 0 | 936 | 0 | 0 | -1122 | 8 | 7 | 9 | 1 | 25 |
| October | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 17061 | 167 | 162 | 16586 | 0 | 0 | 935 | 0 | 0 | -789 | 4 | 7 | 6 | 1 | 18 |
| November | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 30131 | 90 | 162 | 28088 | 0 | 0 | 2373 | 0 | 0 | -583 | 19 | 12 | 3 | 1 | 34 |
| December | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 36616 | 62 | 162 | 32468 | 0 | 0 | 4507 | 0 | 0 | -583 | 19 | 13 | 2 | 1 | 34 |
| Average | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 18699 | 238 | 162 | 17279 | 0 | 0 | 1899 | 0 | 0 | -879 | 10 | 9 | 9 | 1 | 29 |
| Maximum | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 72038 | 1469 | 162 | 56201 | 0 | 0 | 56120 | 0 | 0 | 0 | 50 | 15 | 75 | 3 | 105 |
| Minimum | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2024 | 0 | 162 | 4215 | 0 | 0 | 935 | 0 | 0 | -3288 | 0 | 0 | 0 | 0 | 1 |
| Total for the whole year TWh/year | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | | 0,00 | 164,25 | 2,09 | 1,43 | 151,78 | 0,00 | 0,00 | 16,68 | 0,00 | | -7,73 | 91 | 76 | 77 | 11 | 256 |

Own use of heat from industrial CHP: 0,00 TWh/year

ANNUAL COSTS (Million EUR)

| | | |
|---|---|---|
| Total Fuel ex Ngas exchange = | | 33327 |
| Uranium = | 0 | |
| Coal = | 3931 | |
| FuelOil = | 535 | |
| Gasoil/Diesel= | 7694 | |
| Petrol/JP = | 8547 | |
| Gas handling = | 4581 | |
| Biomass = | 8039 | |
| Food income = | 0 | |
| Waste = | 0 | |
| Total Ngas Exchange costs = | | 20088 |
| Marginal operation costs = | | 1170 |
| Total Electricity exchange = | | -86 |
| Import = | 0 | |
| Export = | 0 | |
| Bottleneck = | 0 | |
| Fixed imp/ex= | -86 | |
| Total CO2 emission costs = | | -947776 |
| Total variable costs = | | -893277 |
| Fixed operation costs = | | 6601 |
| Annual Investment costs = | | 15506 |
| TOTAL ANNUAL COSTS = | | -871170 |

NATURAL GAS EXCHANGE

| | DHP & Boilers MW | CHP2 CHP3 MW | PP CAES MW | Indi-vidual MW | Trans port MW | Indu. Var. MW | Demand Sum MW | Bio-gas MW | Syn-gas MW | CO2Hy gas MW | SynHy gas MW | SynHy gas MW | Stor-age MW | Sum MW | Im-port MW | Ex-port MW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| January | 0 | 0 | 39366 | 61537 | 40 | 16831 | 117774 | 0 | 0 | 0 | 0 | 0 | 0 | 117774 | 117774 | 0 |
| February | 0 | 0 | 49996 | 58944 | 40 | 16831 | 125811 | 0 | 0 | 0 | 0 | 0 | 0 | 125811 | 125811 | 0 |
| March | 0 | 0 | 41743 | 50970 | 40 | 16831 | 109584 | 0 | 0 | 0 | 0 | 0 | 0 | 109584 | 109584 | 0 |
| April | 0 | 0 | 47554 | 16337 | 40 | 16831 | 80761 | 0 | 0 | 0 | 0 | 0 | 0 | 80761 | 80761 | 0 |
| May | 0 | 0 | 38709 | 5326 | 40 | 16831 | 60906 | 0 | 0 | 0 | 0 | 0 | 0 | 60906 | 60906 | 0 |
| June | 0 | 0 | 48700 | 5326 | 40 | 16831 | 70897 | 0 | 0 | 0 | 0 | 0 | 0 | 70897 | 70897 | 0 |
| July | 0 | 0 | 45039 | 5326 | 40 | 16831 | 67236 | 0 | 0 | 0 | 0 | 0 | 0 | 67236 | 67236 | 0 |
| August | 0 | 0 | 51804 | 5326 | 40 | 16831 | 74000 | 0 | 0 | 0 | 0 | 0 | 0 | 74000 | 74000 | 0 |
| September | 0 | 0 | 54038 | 5326 | 40 | 16831 | 76234 | 0 | 0 | 0 | 0 | 0 | 0 | 76234 | 76234 | 0 |
| October | 0 | 0 | 60234 | 26244 | 40 | 16831 | 103348 | 0 | 0 | 0 | 0 | 0 | 0 | 103348 | 103348 | 0 |
| November | 0 | 0 | 41052 | 48808 | 40 | 16831 | 106731 | 0 | 0 | 0 | 0 | 0 | 0 | 106731 | 106731 | 0 |
| December | 0 | 0 | 32579 | 60003 | 40 | 16831 | 109453 | 0 | 0 | 0 | 0 | 0 | 0 | 109453 | 109453 | 0 |
| Average | 0 | 0 | 45858 | 29071 | 40 | 16831 | 91799 | 0 | 0 | 0 | 0 | 0 | 0 | 91799 | 91799 | 0 |
| Maximum | 0 | 0 | 130182 | 121158 | 40 | 16831 | 242259 | 0 | 0 | 0 | 0 | 0 | 0 | 242259 | 242259 | 0 |
| Minimum | 0 | 0 | 8381 | 291 | 40 | 16831 | 25542 | 0 | 0 | 0 | 0 | 0 | 0 | 25542 | 25542 | 0 |
| Total for the whole year TWh/year | 0,00 | 0,00 | 402,81 | 255,36 | 0,35 | 147,84 | 806,36 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 806,36 | 806,36 | 0,00 |

RES Share: 26,6 Percent of Primary Energy 43,4 Percent of Electricity 306,7 TWh electricity from RES

# Input ES 2050.txt

# The EnergyPLAN model 12.4

| | | | |
|---|---|---|---|
| Electricity demand (TWh/year): | | Flexible demand | 15,00 |
| Fixed demand | 255,12 | Fixed imp/exp. | -7,04 |
| Electric heating + HP | 42,42 | Transportation | 68,39 |
| Electric cooling | 17,84 | Total | 391,73 |

| District heating (TWh/year) | Gr.1 | Gr.2 | Gr.3 | Sum |
|---|---|---|---|---|
| District heating demand | 0,00 | 0,00 | 8,05 | 8,05 |
| Solar Thermal | 0,00 | 0,00 | 0,00 | 0,00 |
| Industrial CHP (CSHP) | 0,00 | 0,00 | 0,00 | 0,00 |
| Demand after solar and CSHP | 0,00 | 0,00 | 8,05 | 8,05 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Wind | 48574 | MW | 103,75 | TWh/year | 0,00 | Grid |
| Offshore Wind | 7470 | MW | 25,9 | TWh/year | 0,00 | stabili- |
| Photo Voltaic | 26201 | MW | 38,32 | TWh/year | 0,00 | sation |
| River Hydro | 2733 | MW | 8,94 | TWh/year | 0,00 | share |
| Hydro Power | 11151 | MW | 23,68 | TWh/year | | |
| Geothermal/Nuclear | 6302 | MW | 50,79 | TWh/year | | |

| | Capacities MW-e | Capacities MJ/s | Efficiencies elec. | Efficiencies Ther | COP |
|---|---|---|---|---|---|
| Group 2: | | | | | |
| CHP | 0 | 0 | 0,40 | 0,50 | |
| Heat Pump | 0 | 0 | | | 3,00 |
| Boiler | | 0 | | 0,50 | |
| Group 3: | | | | | |
| CHP | 5894 | 3206 | 0,35 | 0,19 | |
| Heat Pump | 0 | 0 | | | 3,00 |
| Boiler | | 4861 | | 0,90 | |
| Condensing | 62200 | | 0,62 | | |

| | | | | | |
|---|---|---|---|---|---|
| Heatstorage: | gr.2: | 0 | GWh | gr.3: | 0 GWh |
| Fixed Boiler: | gr.2: | 2,5 | Per cent | gr.3: | 5,0 Per cent |

| Electricity prod. from | CSHP | Waste (TWh/year) |
|---|---|---|
| Gr.1: | 0,00 | 0,00 |
| Gr.2: | 0,00 | 0,00 |
| Gr.3: | 3,63 | 0,00 |

| | | |
|---|---|---|
| Regulation Strategy: | Technical regulation no. 2 | |
| CEEP regulation | 23450000 | |
| Minimum Stabilisation share | 0,10 | |
| Stabilisation share of CHP | 0,00 | |
| Minimum CHP gr 3 load | 707 | MW |
| Minimum PP | 3110 | MW |
| Heat Pump maximum share | 0,50 | |
| Maximum import/export | 0 | MW |

| | | |
|---|---|---|
| Distr. Name : | const.txt | |
| Addition factor | 0,00 | EUR/MWh |
| Multiplication factor | 1,00 | |
| Dependency factor | 0,00 | EUR/MWh pr. MW |
| Average Market Price | 1 | EUR/MWh |
| Gas Storage | 0 | GWh |
| Syngas capacity | 0 | MW |
| Biogas max to grid | 0 | MW |

Fuel Price level:

| | Capacities MW-e | Storage GWh | Efficiencies elec. | Ther. |
|---|---|---|---|---|
| Hydro Pump: | 5264 | 53 | 0,00 | |
| Hydro Turbine: | 5264 | | 0,00 | |
| Electrol. Gr.2: | 0 | 0 | 0,40 | 0,50 |
| Electrol. Gr.3: | 0 | 0 | 0,40 | 0,50 |
| Electrol. trans.: | 0 | 0 | 0,00 | |
| Ely. MicroCHP: | 0 | 0 | 0,80 | |
| CAES fuel ratio: | 0,000 | | | |

| (TWh/year) | Coal | Oil | Ngas | Biomass |
|---|---|---|---|---|
| Transport | 0,00 | 426,82 | 0,00 | 0,00 |
| Household | 0,00 | 3,03 | 59,07 | 11,15 |
| Industry | 21,11 | 6,15 | 31,13 | 97,47 |
| Various | 0,00 | 19,24 | 1,28 | 2,86 |

# Output WARNING!!: (1) Critical Excess;

| | District Heating | | | | | | | | | | Electricity | | | | | | | | | | | | | | | | Exchange | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Demand | Production | | | | | | | | | Consumption | | | | | | Production | | | | | | | Balance | | | | | |
| | Distr. heating MW | Solar MW | Waste+ CSHP MW | DHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Balance MW | Elec. demand MW | Flex.& Transp. MW | HP MW | Elec-trolyser MW | EH MW | Hydro Pump MW | Tur-bine MW | RES MW | Hy-dro MW | Geo-thermal MW | Waste+ CSHP MW | CHP MW | PP MW | Stab-Load % | Imp MW | Exp MW | CEEP MW | EEP MW | Payment Imp Million EUR | Payment Exp Million EUR |
| January | 1902 | 0 | 0 | 0 | 1745 | 0 | 0 | 221 | 0 | -64 | 32423 | 9345 | 146 | 0 | 10401 | 0 | 0 | 22862 | 3394 | 6518 | 413 | 3207 | 16801 | 556 | 0 | 1682 | 1682 | 0 | 0 | 0 |
| February | 1737 | 0 | 0 | 0 | 1343 | 0 | 0 | 458 | 0 | -64 | 33052 | 9562 | 132 | 0 | 9430 | 0 | 0 | 32541 | 3207 | 6496 | 413 | 2468 | 10305 | 412 | 0 | 4056 | 4056 | 0 | 0 | 0 |
| March | 1365 | 0 | 0 | 0 | 1227 | 0 | 0 | 206 | 0 | -68 | 30507 | 9645 | 103 | 0 | 7320 | 0 | 0 | 24818 | 3059 | 6457 | 413 | 2255 | 11574 | 476 | 0 | 1803 | 1803 | 0 | 0 | 0 |
| April | 574 | 0 | 0 | 0 | 611 | 0 | 0 | 82 | 0 | -119 | 28082 | 9293 | 39 | 0 | 2817 | 0 | 0 | 20954 | 2895 | 5971 | 413 | 1123 | 9399 | 489 | 0 | 1325 | 1325 | 0 | 0 | 0 |
| May | 287 | 0 | 0 | 0 | 392 | 0 | 0 | 47 | 0 | -151 | 29517 | 9645 | 16 | 0 | 1164 | 0 | 0 | 22882 | 2712 | 4432 | 413 | 720 | 10377 | 458 | 0 | 1994 | 1994 | 0 | 0 | 0 |
| June | 287 | 0 | 0 | 0 | 392 | 0 | 0 | 46 | 0 | -151 | 32185 | 9598 | 16 | 0 | 1172 | 0 | 0 | 17660 | 1287 | 4882 | 413 | 721 | 17211 | 582 | 0 | 4 | 4 | 0 | 0 | 0 |
| July | 287 | 0 | 0 | 0 | 392 | 0 | 0 | 46 | 0 | -151 | 35820 | 9331 | 16 | 0 | 1172 | 0 | 0 | 16099 | 1424 | 5972 | 413 | 721 | 20958 | 653 | 0 | 51 | 51 | 0 | 0 | 0 |
| August | 287 | 0 | 0 | 0 | 392 | 0 | 0 | 46 | 0 | -151 | 32540 | 9643 | 16 | 0 | 1172 | 0 | 0 | 16445 | 2384 | 6174 | 413 | 721 | 16948 | 622 | 0 | 515 | 515 | 0 | 0 | 0 |
| September | 287 | 0 | 0 | 0 | 392 | 0 | 0 | 46 | 0 | -151 | 30314 | 9438 | 16 | 0 | 1172 | 0 | 0 | 16236 | 2019 | 6222 | 413 | 721 | 15795 | 619 | 0 | 1268 | 1268 | 0 | 0 | 0 |
| October | 690 | 0 | 0 | 0 | 730 | 0 | 0 | 68 | 0 | -108 | 28894 | 9493 | 49 | 0 | 3485 | 0 | 0 | 18288 | 2828 | 5091 | 413 | 1343 | 14354 | 571 | 0 | 1197 | 1197 | 0 | 0 | 0 |
| November | 1479 | 0 | 0 | 0 | 1385 | 0 | 0 | 161 | 0 | -66 | 29871 | 9598 | 112 | 0 | 7958 | 0 | 0 | 17417 | 3404 | 5135 | 413 | 2546 | 19197 | 631 | 0 | 1374 | 1374 | 0 | 0 | 0 |
| December | 1833 | 0 | 0 | 0 | 1803 | 0 | 0 | 94 | 0 | -64 | 29695 | 9333 | 140 | 0 | 9992 | 0 | 0 | 16007 | 3731 | 6046 | 413 | 3314 | 19239 | 648 | 0 | 392 | 392 | 0 | 0 | 0 |
| Average | 916 | 0 | 0 | 0 | 900 | 0 | 0 | 125 | 0 | -109 | 31075 | 9493 | 67 | 0 | 4762 | 0 | 0 | 20140 | 2696 | 5782 | 413 | 1655 | 15204 | 560 | 0 | 1293 | 1293 | 0 | Average price (EUR/MWh) | |
| Maximum | 4051 | 0 | 0 | 0 | 3206 | 0 | 0 | 3113 | 0 | 0 | 48111 | 25379 | 318 | 0 | 22653 | 0 | 0 | 76048 | 6006 | 6518 | 413 | 5894 | 55977 | 978 | 0 | 36790 | 36790 | 0 | | |
| Minimum | 93 | 0 | 0 | 0 | 385 | 0 | 0 | 46 | 0 | -337 | 1137 | 1708 | 0 | 0 | 0 | 0 | 0 | 878 | 0 | 4418 | 413 | 707 | 3110 | 114 | 0 | 0 | 0 | 0 | 1 | 0 |
| TWh/year | 8,05 | 0,00 | 0,00 | 0,00 | 7,91 | 0,00 | 0,00 | 1,10 | 0,00 | -0,96 | 272,96 | 83,39 | 0,59 | 0,00 | 41,83 | 0,00 | 0,00 | 176,91 | 23,68 | 50,79 | 3,63 | 14,54 | 133,55 | | 0,00 | 11,36 | 11,36 | 0,00 | 0 | 0 |

| FUEL BALANCE (TWh/year): | DHP | CHP2 | CHP3 | Boiler2 | Boiler3 | PP | Geo/Nu. | Hydro | Waste | CAES Elc.ly. | BioCon-version | Electro-Fuel | Wind | Offsh. | PV | Hydro | Solar.Th | Transp. | Industry household | Industry Various | Total | Imp/Exp Corrected Imp/Exp | Imp/Exp Corrected Net | CO2 emission (Mt): Total | CO2 emission (Mt): Net |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Coal | - | - | - | - | - | 1,24 | - | - | - | - | - | - | - | - | - | - | - | - | - | 21,11 | 22,35 | -0,11 | 22,25 | 7,93 | 7,89 |
| Oil | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 426,82 | 3,03 | 25,39 | 455,24 | 0,00 | 455,24 | 119,47 | 119,47 |
| N.Gas | - | - | - | - | - | 208,00 | - | - | - | - | - | - | - | - | - | - | - | - | 59,07 | 32,41 | 299,48 | -17,69 | 281,79 | 61,35 | 57,72 |
| Biomass | - | - | 42,06 | - | 1,22 | 6,17 | - | - | - | - | 62,28 | - | - | - | - | - | - | - | 11,15 | 100,33 | 223,20 | -0,52 | 222,68 | 0,00 | 0,00 |
| Renewable | - | - | - | - | - | - | - | 23,68 | - | - | - | - | 103,75 | 25,90 | 38,32 | 8,65 | - | - | - | - | 200,58 | 0,00 | 200,58 | 0,00 | 0,00 |
| H2 etc. | - | - | 0,00 | - | 0,00 | 0,00 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Biofuel | - | - | - | - | - | - | - | - | - | - | -28,96 | - | - | - | - | - | - | 28,96 | - | - | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Nuclear/CCS | - | - | - | - | - | - | 169,28 | - | - | - | - | - | - | - | - | - | - | - | - | - | 169,28 | 0,00 | 169,28 | -6656,1 | -6656,16 |
| Total | - | - | 42,06 | - | 1,22 | 215,41 | 169,28 | 23,68 | - | - | 33,32 | - | 103,75 | 25,90 | 38,32 | 8,65 | - | 455,78 | 73,25 | 179,24 | 1370,14 | -18,32 | 1351,82 | -6467,4 | -6471,08 |

25-oktober-2017 [10:37]

## District Heating Production

| | Gr.1 | | | | Gr.2 | | | | | | | | | | Gr.3 | | | | | | | | | | RES specification | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | District heating MW | Solar MW | CSHP MW | DHP MW | District heating MW | Solar MW | CSHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Stor-age MW | Ba-lance MW | District heating MW | Solar MW | CSHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Stor-age MW | Ba-lance MW | RES1 Wind MW | RES2 Offsho MW | RES3 Photo MW | RES 4-7 MW | Total ic MW |
| January | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1902 | 0 | 0 | 1745 | 0 | 0 | 221 | 0 | 0 | -64 | 16649 | 2800 | 2355 | 1058 | 22862 |
| February | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1737 | 0 | 0 | 1343 | 0 | 0 | 458 | 0 | 0 | -64 | 24167 | 3009 | 3255 | 2109 | 32541 |
| March | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1365 | 0 | 0 | 1227 | 0 | 0 | 206 | 0 | 0 | -68 | 15033 | 3301 | 4434 | 2051 | 24818 |
| April | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 574 | 0 | 0 | 611 | 0 | 0 | 82 | 0 | 0 | -119 | 11106 | 3340 | 5328 | 1180 | 20954 |
| May | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 287 | 0 | 0 | 392 | 0 | 0 | 47 | 0 | 0 | -151 | 12745 | 3018 | 5738 | 1381 | 22882 |
| June | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 287 | 0 | 0 | 392 | 0 | 0 | 46 | 0 | 0 | -151 | 7401 | 2922 | 6210 | 1126 | 17660 |
| July | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 287 | 0 | 0 | 392 | 0 | 0 | 46 | 0 | 0 | -151 | 6144 | 2868 | 6337 | 750 | 16099 |
| August | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 287 | 0 | 0 | 392 | 0 | 0 | 46 | 0 | 0 | -151 | 7338 | 2811 | 5786 | 510 | 16445 |
| September | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 287 | 0 | 0 | 392 | 0 | 0 | 46 | 0 | 0 | -151 | 8295 | 2573 | 4845 | 523 | 16236 |
| October | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 690 | 0 | 0 | 730 | 0 | 0 | 68 | 0 | 0 | -108 | 11572 | 2739 | 3445 | 532 | 18288 |
| November | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1479 | 0 | 0 | 1385 | 0 | 0 | 161 | 0 | 0 | -66 | 11245 | 2978 | 2522 | 672 | 17417 |
| December | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1833 | 0 | 0 | 1803 | 0 | 0 | 94 | 0 | 0 | -64 | 10537 | 3023 | 2068 | 378 | 16007 |
| Average | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 916 | 0 | 0 | 900 | 0 | 0 | 125 | 0 | 0 | -109 | 11811 | 2948 | 4362 | 1018 | 20140 |
| Maximum | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4051 | 0 | 0 | 3206 | 0 | 0 | 3113 | 0 | 0 | 0 | 48476 | 7470 | 26201 | 2766 | 76048 |
| Minimum | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 93 | 0 | 0 | 385 | 0 | 0 | 46 | 0 | 0 | -337 | 17 | 0 | 0 | 33 | 878 |
| Total for the whole year TWh/year | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | | 0,00 | 8,05 | 0,00 | 0,00 | 7,91 | 0,00 | 0,00 | 1,10 | 0,00 | | -0,96 | 103,75 | 25,90 | 38,32 | 8,94 | 176,91 |

Own use of heat from industrial CHP: 0,00 TWh/year

ANNUAL COSTS (Million EUR)

| | |
|---|---|
| Total Fuel ex Ngas exchange = | 25085 |
| Uranium = | 1066 |
| Coal = | 209 |
| FuelOil = | 617 |
| Gasoil/Diesel= | 1830 |
| Petrol/JP = | 14876 |
| Gas handling = | 1207 |
| Biomass = | 5279 |
| Food income = | 0 |
| Waste = | 0 |
| Total Ngas Exchange costs = | 7461 |
| Marginal operation costs = | 1181 |
| Total Electricity exchange = | -6 |
| Import = | 0 |
| Export = | 0 |
| Bottleneck = | 0 |
| Fixed imp/ex= | -6 |
| Total CO2 emission costs = | -98305 |
| Total variable costs = | -64584 |
| Fixed operation costs = | 5361 |
| Annual Investment costs = | 11335 |
| TOTAL ANNUAL COSTS = | -47888 |

## NATURAL GAS EXCHANGE

| | DHP & Boilers MW | CHP2 CHP3 MW | PP CAES MW | Indi-vidual MW | Trans port MW | Indu. Var. MW | Demand Sum MW | Bio-gas MW | Syn-gas MW | CO2Hy gas MW | SynHy gas MW | SynHy gas MW | Stor-age MW | Sum MW | Im-port MW | Ex-port MW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| January | 0 | 0 | 26166 | 14667 | 0 | 3690 | 44522 | 0 | 0 | 0 | 0 | 0 | 0 | 44522 | 44522 | 0 |
| February | 0 | 0 | 16050 | 13340 | 0 | 3690 | 33080 | 0 | 0 | 0 | 0 | 0 | 0 | 33080 | 33080 | 0 |
| March | 0 | 0 | 18026 | 10338 | 0 | 3690 | 32053 | 0 | 0 | 0 | 0 | 0 | 0 | 32053 | 32053 | 0 |
| April | 0 | 0 | 14638 | 3967 | 0 | 3690 | 22294 | 0 | 0 | 0 | 0 | 0 | 0 | 22294 | 22294 | 0 |
| May | 0 | 0 | 16161 | 1655 | 0 | 3690 | 21505 | 0 | 0 | 0 | 0 | 0 | 0 | 21505 | 21505 | 0 |
| June | 0 | 0 | 26804 | 1655 | 0 | 3690 | 32148 | 0 | 0 | 0 | 0 | 0 | 0 | 32148 | 32148 | 0 |
| July | 0 | 0 | 32641 | 1655 | 0 | 3690 | 37985 | 0 | 0 | 0 | 0 | 0 | 0 | 37985 | 37985 | 0 |
| August | 0 | 0 | 26395 | 1655 | 0 | 3690 | 31739 | 0 | 0 | 0 | 0 | 0 | 0 | 31739 | 31739 | 0 |
| September | 0 | 0 | 24600 | 1655 | 0 | 3690 | 29944 | 0 | 0 | 0 | 0 | 0 | 0 | 29944 | 29944 | 0 |
| October | 0 | 0 | 22356 | 4899 | 0 | 3690 | 30945 | 0 | 0 | 0 | 0 | 0 | 0 | 30945 | 30945 | 0 |
| November | 0 | 0 | 29899 | 11260 | 0 | 3690 | 44849 | 0 | 0 | 0 | 0 | 0 | 0 | 44849 | 44849 | 0 |
| December | 0 | 0 | 29964 | 14111 | 0 | 3690 | 47764 | 0 | 0 | 0 | 0 | 0 | 0 | 47764 | 47764 | 0 |
| Average | 0 | 0 | 23679 | 6725 | 0 | 3690 | 34094 | 0 | 0 | 0 | 0 | 0 | 0 | 34094 | 34094 | 0 |
| Maximum | 0 | 0 | 87181 | 31989 | 0 | 3690 | 119565 | 0 | 0 | 0 | 0 | 0 | 0 | 119565 | 119565 | 0 |
| Minimum | 0 | 0 | 4844 | 90 | 0 | 3690 | 8623 | 0 | 0 | 0 | 0 | 0 | 0 | 8623 | 8623 | 0 |
| Total for the whole year TWh/year | 0,00 | 0,00 | 208,00 | 59,07 | 0,00 | 32,41 | 299,48 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 299,48 | 299,48 | 0,00 |

RES Share: 30,9 Percent of Primary Energy 59,4 Percent of Electricity 218,9 TWh electricity from RES

# Input FI 2050.txt

# The EnergyPLAN model 12.4

| | | | |
|---|---|---|---|
| Electricity demand (TWh/year): | | Flexible demand | 2,34 |
| Fixed demand | 71,13 | Fixed imp/exp. | -6,48 |
| Electric heating + HP | 16,58 | Transportation | 8,28 |
| Electric cooling | 0,29 | Total | 92,14 |

| District heating (TWh/year) | Gr.1 | Gr.2 | Gr.3 | Sum |
|---|---|---|---|---|
| District heating demand | 0,00 | 0,00 | 47,28 | 47,28 |
| Solar Thermal | 0,00 | 0,00 | 2,86 | 2,86 |
| Industrial CHP (CSHP) | 0,00 | 0,00 | 0,00 | 0,00 |
| Demand after solar and CSHP | 0,00 | 0,00 | 44,42 | 44,42 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Wind | 9107 | MW | 18,55 | TWh/year | 0,00 | Grid |
| Offshore Wind | 1000 | MW | 0 | TWh/year | 0,00 | stabili- |
| Photo Voltaic | 4859 | MW | 4,91 | TWh/year | 0,00 | sation |
| River Hydro | 36 | MW | 0,19 | TWh/year | 0,00 | share |
| Hydro Power | 4621 | MW | 20,9 | TWh/year | | |
| Geothermal/Nuclear | 4600 | MW | 37,18 | TWh/year | | |

| | Capacities | | Efficiencies | | |
|---|---|---|---|---|---|
| Group 2: | MW-e | MJ/s | elec. | Ther | COP |
| CHP | 0 | 0 | 0,40 | 0,50 | |
| Heat Pump | 0 | 0 | | | 3,00 |
| Boiler | | 0 | | 0,50 | |
| Group 3: | | | | | |
| CHP | 1964 | 2484 | 0,24 | 0,30 | |
| Heat Pump | 0 | 0 | | | 3,00 |
| Boiler | | 25537 | | 0,90 | |
| Condensing | 12000 | | 0,40 | | |

| | | | | | |
|---|---|---|---|---|---|
| Heatstorage: | gr.2: | 0 | GWh | gr.3: | 0 GWh |
| Fixed Boiler: | gr.2: | 2,5 | Per cent | gr.3: | 5,0 Per cent |

| Electricity prod. from | CSHP | Waste | (TWh/year) |
|---|---|---|---|
| Gr.1: | 0,00 | 0,00 | |
| Gr.2: | 0,00 | 0,00 | |
| Gr.3: | 0,00 | 0,00 | |

| | | |
|---|---|---|
| Regulation Strategy: | Technical regulation no. 2 | |
| CEEP regulation | 23450000 | |
| Minimum Stabilisation share | 0,10 | |
| Stabilisation share of CHP | 0,00 | |
| Minimum CHP gr 3 load | 98 | MW |
| Minimum PP | 0 | MW |
| Heat Pump maximum share | 0,50 | |
| Maximum import/export | 0 | MW |

| | | |
|---|---|---|
| Distr. Name : | const.txt | |
| Addition factor | 0,00 | EUR/MWh |
| Multiplication factor | 1,00 | |
| Dependency factor | 0,00 | EUR/MWh pr. MW |
| Average Market Price | 1 | EUR/MWh |
| Gas Storage | 0 | GWh |
| Syngas capacity | 0 | MW |
| Biogas max to grid | 0 | MW |

Fuel Price level:

| | Capacities | Storage | Efficiencies | |
|---|---|---|---|---|
| | MW-e | GWh | elec. | Ther. |
| Hydro Pump: | 0 | 0 | 0,00 | |
| Hydro Turbine: | 0 | | 0,00 | |
| Electrol. Gr.2: | 0 | 0 | 0,40 | 0,50 |
| Electrol. Gr.3: | 0 | 0 | 0,40 | 0,50 |
| Electrol. trans.: | 0 | 0 | 0,00 | |
| Ely. MicroCHP: | 0 | 0 | 0,80 | |
| CAES fuel ratio: | | 0,000 | | |

| (TWh/year) | Coal | Oil | Ngas | Biomass |
|---|---|---|---|---|
| Transport | 0,00 | 46,30 | 0,00 | 0,00 |
| Household | 0,00 | 0,00 | 5,81 | 1,82 |
| Industry | 8,02 | 12,69 | 4,07 | 0,00 |
| Various | 0,25 | 7,96 | 0,28 | 13,87 |

# Output WARNING!!: (1) Critical Excess;

| | District Heating | | | | | | | | | | Electricity | | | | | | | | | | | | | | | Exchange | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Demand | Production | | | | | | | | | Consumption | | | | | | Production | | | | | | | Balance | | | |
| | Distr. heating MW | Solar MW | Waste+ CSHP MW | DHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Balance MW | Elec. demand MW | Flex.& Transp. MW | HP MW | Elec-trolyser MW | EH MW | Hydro Pump MW | Tur-bine MW | RES MW | Hy-dro MW | Geo-thermal MW | Waste+ CSHP MW | CHP MW | PP MW | Stab-Load % | Imp MW | Exp MW | CEEP MW | EEP MW | Payment Imp Million EUR | Payment Exp Million EUR |
| January | 10803 | 57 | 17 | 0 | 2025 | 0 | 0 | 8704 | 0 | 0 | 9768 | 1191 | 852 | 0 | 3097 | 0 | 0 | 3030 | 2864 | 4584 | 0 | 1601 | 2326 | 787 | 0 | 235 | 235 | 0 | 0 | 0 |
| February | 11173 | 159 | 17 | 0 | 2054 | 0 | 0 | 8942 | 0 | 0 | 9368 | 1217 | 882 | 0 | 3207 | 0 | 0 | 3976 | 2663 | 3593 | 0 | 1624 | 2318 | 712 | 0 | 237 | 237 | 0 | 0 | 0 |
| March | 9312 | 323 | 17 | 0 | 1756 | 0 | 0 | 7216 | 0 | 0 | 8854 | 1227 | 730 | 0 | 2650 | 0 | 0 | 3469 | 2554 | 4569 | 0 | 1388 | 1069 | 736 | 0 | 324 | 324 | 0 | 0 | 0 |
| April | 3472 | 496 | 17 | 0 | 705 | 0 | 0 | 2278 | 0 | -24 | 8025 | 1185 | 250 | 0 | 914 | 0 | 0 | 2962 | 2199 | 4475 | 0 | 558 | 299 | 732 | 0 | 855 | 855 | 0 | 0 | 0 |
| May | 1280 | 595 | 17 | 0 | 273 | 0 | 0 | 443 | 0 | -49 | 7272 | 1227 | 70 | 0 | 255 | 0 | 0 | 2973 | 2112 | 3388 | 0 | 216 | 266 | 693 | 0 | 868 | 868 | 0 | 0 | 0 |
| June | 1280 | 633 | 17 | 0 | 163 | 0 | 0 | 523 | 0 | -56 | 7008 | 1222 | 70 | 0 | 254 | 0 | 0 | 2671 | 2220 | 4284 | 0 | 129 | 29 | 740 | 0 | 1517 | 1517 | 0 | 0 | 1 |
| July | 1280 | 606 | 17 | 0 | 235 | 0 | 0 | 473 | 0 | -51 | 6960 | 1189 | 70 | 0 | 254 | 0 | 0 | 1878 | 1975 | 4433 | 0 | 186 | 67 | 799 | 0 | 803 | 803 | 0 | 0 | 0 |
| August | 1280 | 481 | 17 | 0 | 425 | 0 | 0 | 397 | 0 | -41 | 7027 | 1227 | 69 | 0 | 249 | 0 | 0 | 1583 | 2076 | 3712 | 0 | 336 | 312 | 814 | 0 | 184 | 184 | 0 | 0 | 0 |
| September | 1280 | 333 | 17 | 0 | 390 | 0 | 0 | 563 | 0 | -23 | 7340 | 1202 | 71 | 0 | 259 | 0 | 0 | 2092 | 2239 | 4085 | 0 | 308 | 132 | 777 | 0 | 721 | 721 | 0 | 0 | 0 |
| October | 5081 | 140 | 17 | 0 | 1286 | 0 | 0 | 3639 | 0 | -1 | 8267 | 1209 | 382 | 0 | 1387 | 0 | 0 | 2131 | 2323 | 4557 | 0 | 1017 | 894 | 812 | 0 | 415 | 415 | 0 | 0 | 0 |
| November | 8437 | 52 | 17 | 0 | 1913 | 0 | 0 | 6454 | 0 | 0 | 8756 | 1222 | 661 | 0 | 2398 | 0 | 0 | 2458 | 2643 | 4485 | 0 | 1513 | 1462 | 809 | 0 | 262 | 262 | 0 | 0 | 0 |
| December | 10059 | 29 | 17 | 0 | 1933 | 0 | 0 | 8079 | 0 | 0 | 8957 | 1190 | 791 | 0 | 2877 | 0 | 0 | 3152 | 2695 | 4595 | 0 | 1528 | 1435 | 763 | 0 | 329 | 329 | 0 | 0 | 0 |
| Average | 5383 | 326 | 17 | 0 | 1095 | 0 | 0 | 3965 | 0 | -20 | 8131 | 1209 | 407 | 0 | 1480 | 0 | 0 | 2693 | 2379 | 4232 | 0 | 866 | 881 | 765 | 0 | 561 | 561 | 0 | Average price | |
| Maximum | 21281 | 2130 | 17 | 0 | 2484 | 0 | 0 | 18780 | 0 | 0 | 11695 | 3159 | 1717 | 0 | 6241 | 0 | 0 | 8931 | 2887 | 4595 | 0 | 1964 | 10024 | 994 | 0 | 7682 | 7682 | 0 | (EUR/MWh) | |
| Minimum | 475 | 0 | 17 | 0 | 124 | 0 | 0 | 269 | 0 | -141 | 18 | 0 | 0 | 0 | 0 | 0 | 0 | 45 | 1975 | 3359 | 0 | 98 | 0 | 385 | 0 | 0 | 0 | 0 | 1 | 1 |
| TWh/year | 47,28 | 2,86 | 0,15 | 0,00 | 9,62 | 0,00 | 0,00 | 34,83 | 0,00 | -0,18 | 71,42 | 10,62 | 3,58 | 0,00 | 13,00 | 0,00 | 0,00 | 23,65 | 20,90 | 37,18 | 0,00 | 7,60 | 7,74 | | 0,00 | 4,93 | 4,93 | 0,00 | 0 | 3 |

FUEL BALANCE (TWh/year):

| | DHP | CHP2 | CHP3 | Boiler2 | Boiler3 | PP | Geo/Nu. | Hydro | Waste | CAES Elc.ly. | BioCon-version | Electro-Fuel | Wind | Offsh. | PV | Hydro | Solar.Th | Transp. | Industry household | Industry Various | Total | Imp/Exp Corrected Imp/Exp | Imp/Exp Corrected Net | CO2 emission (Mt): Total | CO2 emission (Mt): Net |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Coal | - | - | 6,54 | - | - | 4,00 | - | - | - | - | - | - | - | - | - | - | - | - | - | 8,27 | 18,80 | -2,55 | 16,26 | 6,67 | 5,76 |
| Oil | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 46,30 | - | 20,65 | 66,95 | 0,00 | 66,95 | 17,57 | 17,57 |
| N.Gas | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 5,81 | 4,35 | 10,16 | 0,00 | 10,16 | 2,08 | 2,08 |
| Biomass | - | - | 25,09 | - | 38,70 | 15,34 | - | - | 0,19 | - | 14,25 | - | - | - | - | - | - | - | 1,82 | 13,87 | 109,27 | -9,78 | 99,49 | 0,02 | 0,02 |
| Renewable | - | - | - | - | - | - | - | 20,90 | - | - | - | - | 18,55 | - | 4,91 | 0,19 | 2,86 | - | - | - | 47,41 | 0,00 | 47,41 | 0,00 | 0,00 |
| H2 etc. | - | - | 0,00 | - | 0,00 | 0,00 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Biofuel | - | - | 0,00 | - | - | - | - | - | - | - | -9,95 | - | - | - | - | - | - | 9,95 | - | - | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Nuclear/CCS | - | - | - | - | - | - | 123,93 | - | - | - | - | - | - | - | - | - | - | - | - | - | 123,93 | 0,00 | 123,93 | -1762,0 | -1762,09 |
| Total | - | - | 31,63 | - | 38,70 | 19,34 | 123,93 | 20,90 | 0,19 | - | 4,30 | - | 18,55 | - | 4,91 | 0,19 | 2,86 | 56,25 | 7,63 | 47,14 | 376,52 | -12,33 | 364,19 | -1735,7 | -1736,65 |

## District Heating Production

| | Gr.1 | | | | Gr.2 | | | | | | | | | | Gr.3 | | | | | | | | | | RES specification | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | District heating MW | Solar MW | CSHP MW | DHP MW | District heating MW | Solar MW | CSHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Stor-age MW | Ba-lance MW | District heating MW | Solar MW | CSHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Stor-age MW | Ba-lance MW | RES1 Wind MW | RES2 Offsho MW | RES3 Photo MW | RES 4-7 ic MW | Total MW |
| January | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10803 | 57 | 17 | 2025 | 0 | 0 | 8704 | 0 | 0 | 0 | 2923 | 0 | 90 | 17 | 3030 |
| February | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 11173 | 159 | 17 | 2054 | 0 | 0 | 8942 | 0 | 0 | 0 | 3692 | 0 | 263 | 20 | 3976 |
| March | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9312 | 323 | 17 | 1756 | 0 | 0 | 7216 | 0 | 0 | 0 | 2870 | 0 | 579 | 19 | 3469 |
| April | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3472 | 496 | 17 | 705 | 0 | 0 | 2278 | 0 | 0 | -24 | 2053 | 0 | 889 | 21 | 2962 |
| May | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1280 | 595 | 17 | 273 | 0 | 0 | 443 | 0 | 0 | -49 | 1864 | 0 | 1079 | 30 | 2973 |
| June | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1280 | 633 | 17 | 163 | 0 | 0 | 523 | 0 | 0 | -56 | 1572 | 0 | 1070 | 29 | 2671 |
| July | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1280 | 606 | 17 | 235 | 0 | 0 | 473 | 0 | 0 | -51 | 834 | 0 | 1021 | 23 | 1878 |
| August | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1280 | 481 | 17 | 425 | 0 | 0 | 397 | 0 | 0 | -41 | 757 | 0 | 803 | 24 | 1583 |
| September | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1280 | 333 | 17 | 390 | 0 | 0 | 563 | 0 | 0 | -23 | 1526 | 0 | 546 | 20 | 2092 |
| October | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5081 | 140 | 17 | 1286 | 0 | 0 | 3639 | 0 | 0 | -1 | 1879 | 0 | 231 | 20 | 2131 |
| November | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8437 | 52 | 17 | 1913 | 0 | 0 | 6454 | 0 | 0 | 0 | 2352 | 0 | 86 | 20 | 2458 |
| December | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10059 | 29 | 17 | 1933 | 0 | 0 | 8079 | 0 | 0 | 0 | 3085 | 0 | 45 | 21 | 3152 |
| Average | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5383 | 326 | 17 | 1095 | 0 | 0 | 3965 | 0 | 0 | -20 | 2111 | 0 | 559 | 22 | 2693 |
| Maximum | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 21281 | 2130 | 17 | 2484 | 0 | 0 | 18780 | 0 | 0 | 0 | 5870 | 0 | 4859 | 36 | 8931 |
| Minimum | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 475 | 0 | 17 | 124 | 0 | 0 | 269 | 0 | 0 | -141 | 6 | 0 | 0 | 0 | 45 |
| Total for the whole year TWh/year | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | | 0,00 | 47,28 | 2,86 | 0,15 | 9,62 | 0,00 | 0,00 | 34,83 | 0,00 | | -0,18 | 18,55 | 0,00 | 4,91 | 0,19 | 23,65 |

Own use of heat from industrial CHP: 0,00 TWh/year

ANNUAL COSTS (Million EUR)

| | |
|---|---|
| Total Fuel ex Ngas exchange = | 5924 |
| Uranium = | 781 |
| Coal = | 176 |
| FuelOil = | 502 |
| Gasoil/Diesel= | 940 |
| Petrol/JP = | 878 |
| Gas handling = | 96 |
| Biomass = | 2552 |
| Food income = | 0 |
| Waste = | 0 |
| Total Ngas Exchange costs = | 253 |
| Marginal operation costs = | 629 |
| Total Electricity exchange = | -6 |
| Import = | 0 |
| Export = | -3 |
| Bottleneck = | 3 |
| Fixed imp/ex= | -6 |
| Total CO2 emission costs = | -26383 |
| Total variable costs = | -19583 |
| Fixed operation costs = | 1481 |
| Annual Investment costs = | 3322 |
| TOTAL ANNUAL COSTS = | -14780 |

## NATURAL GAS EXCHANGE

| | DHP & Boilers MW | CHP2 CHP3 MW | PP CAES MW | Indi-vidual MW | Trans port MW | Indu. Var. MW | Demand Sum MW | Bio-gas MW | Syn-gas MW | CO2Hy gas MW | SynHy gas MW | SynHy gas MW | Stor-age MW | Sum MW | Im-port MW | Ex-port MW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| January | 0 | 0 | 0 | 1384 | 0 | 495 | 1879 | 0 | 0 | 0 | 0 | 0 | 0 | 1879 | 1879 | 0 |
| February | 0 | 0 | 0 | 1433 | 0 | 495 | 1928 | 0 | 0 | 0 | 0 | 0 | 0 | 1928 | 1928 | 0 |
| March | 0 | 0 | 0 | 1187 | 0 | 495 | 1682 | 0 | 0 | 0 | 0 | 0 | 0 | 1682 | 1682 | 0 |
| April | 0 | 0 | 0 | 407 | 0 | 495 | 902 | 0 | 0 | 0 | 0 | 0 | 0 | 902 | 902 | 0 |
| May | 0 | 0 | 0 | 114 | 0 | 495 | 609 | 0 | 0 | 0 | 0 | 0 | 0 | 609 | 609 | 0 |
| June | 0 | 0 | 0 | 114 | 0 | 495 | 609 | 0 | 0 | 0 | 0 | 0 | 0 | 609 | 609 | 0 |
| July | 0 | 0 | 0 | 114 | 0 | 495 | 609 | 0 | 0 | 0 | 0 | 0 | 0 | 609 | 609 | 0 |
| August | 0 | 0 | 0 | 114 | 0 | 495 | 609 | 0 | 0 | 0 | 0 | 0 | 0 | 609 | 609 | 0 |
| September | 0 | 0 | 0 | 114 | 0 | 495 | 609 | 0 | 0 | 0 | 0 | 0 | 0 | 609 | 609 | 0 |
| October | 0 | 0 | 0 | 622 | 0 | 495 | 1117 | 0 | 0 | 0 | 0 | 0 | 0 | 1117 | 1117 | 0 |
| November | 0 | 0 | 0 | 1071 | 0 | 495 | 1566 | 0 | 0 | 0 | 0 | 0 | 0 | 1566 | 1566 | 0 |
| December | 0 | 0 | 0 | 1285 | 0 | 495 | 1781 | 0 | 0 | 0 | 0 | 0 | 0 | 1781 | 1781 | 0 |
| Average | 0 | 0 | 0 | 661 | 0 | 495 | 1157 | 0 | 0 | 0 | 0 | 0 | 0 | 1157 | 1157 | 0 |
| Maximum | 0 | 0 | 0 | 2789 | 0 | 495 | 3285 | 0 | 0 | 0 | 0 | 0 | 0 | 3285 | 3285 | 0 |
| Minimum | 0 | 0 | 0 | 6 | 0 | 495 | 501 | 0 | 0 | 0 | 0 | 0 | 0 | 501 | 501 | 0 |
| Total for the whole year TWh/year | 0,00 | 0,00 | 0,00 | 5,81 | 0,00 | 4,35 | 10,16 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 10,16 | 10,16 | 0,00 |

RES Share: 41,6 Percent of Primary Energy 45,9 Percent of Electricity 56,7 TWh electricity from RES

# Input FR 2050.txt

# The EnergyPLAN model 12.4

| | | | |
|---|---|---|---|
| Electricity demand (TWh/year): | | Flexible demand | 32,10 |
| Fixed demand | 426,19 | Fixed imp/exp. | 90,78 |
| Electric heating + HP | 76,82 | Transportation | 135,67 |
| Electric cooling | 17,44 | Total | 779,00 |

| District heating (TWh/year) | Gr.1 | Gr.2 | Gr.3 | Sum |
|---|---|---|---|---|
| District heating demand | 0,00 | 0,00 | 46,45 | 46,45 |
| Solar Thermal | 0,00 | 0,00 | 2,52 | 2,52 |
| Industrial CHP (CSHP) | 0,00 | 0,00 | 0,00 | 0,00 |
| Demand after solar and CSHP | 0,00 | 0,00 | 43,93 | 43,93 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Wind | 62533 | MW | 121,08 | TWh/year | 0,00 | Grid |
| Offshore Wind | 4875 | MW | 19,46 | TWh/year | 0,00 | stabili- |
| Photo Voltaic | 78628 | MW | 94,43 | TWh/year | 0,00 | sation |
| River Hydro | 5340 | MW | 17,61 | TWh/year | 0,00 | share |
| Hydro Power | 22344 | MW | 52,77 | TWh/year | | |
| Geothermal/Nuclear | 53909 | MW | 435,84 | TWh/year | | |

| Group 2: | Capacities MW-e | MJ/s | Efficiencies elec. | Ther | COP |
|---|---|---|---|---|---|
| CHP | 0 | 0 | 0,40 | 0,50 | |
| Heat Pump | 0 | 0 | | | 3,00 |
| Boiler | | 0 | | 0,50 | |
| Group 3: | | | | | |
| CHP | 16285 | 13859 | 0,38 | 0,32 | |
| Heat Pump | 0 | 0 | | | 3,00 |
| Boiler | | 27637 | | 0,90 | |
| Condensing | 95200 | | 0,40 | | |

| | | | | | |
|---|---|---|---|---|---|
| Heatstorage: | gr.2: | 0 | GWh | gr.3: | 0 GWh |
| Fixed Boiler: | gr.2: | 2,5 | Per cent | gr.3: | 5,0 Per cent |

| Electricity prod. from | CSHP | Waste | (TWh/year) |
|---|---|---|---|
| Gr.1: | 0,00 | 0,00 | |
| Gr.2: | 0,00 | 0,00 | |
| Gr.3: | 4,55 | 0,00 | |

| | | |
|---|---|---|
| Regulation Strategy: | Technical regulation no. 2 | |
| CEEP regulation | 23450000 | |
| Minimum Stabilisation share | 0,10 | |
| Stabilisation share of CHP | 0,00 | |
| Minimum CHP gr 3 load | 814 | MW |
| Minimum PP | 0 | MW |
| Heat Pump maximum share | 0,50 | |
| Maximum import/export | 0 | MW |

| | | |
|---|---|---|
| Distr. Name : | const.txt | |
| Addition factor | 0,00 | EUR/MWh |
| Multiplication factor | 1,00 | |
| Dependency factor | 0,00 | EUR/MWh pr. MW |
| Average Market Price | 1 | EUR/MWh |
| Gas Storage | 0 | GWh |
| Syngas capacity | 0 | MW |
| Biogas max to grid | 0 | MW |

Fuel Price level:

| | Capacities MW-e | Storage GWh | Efficiencies elec. | Ther. |
|---|---|---|---|---|
| Hydro Pump: | 6978 | 70 | 0,00 | |
| Hydro Turbine: | 6978 | | 0,00 | |
| Electrol. Gr.2: | 0 | 0 | 0,40 | 0,50 |
| Electrol. Gr.3: | 0 | 0 | 0,40 | 0,50 |
| Electrol. trans.: | 0 | 0 | 0,00 | |
| Ely. MicroCHP: | 0 | 0 | 0,80 | |
| CAES fuel ratio: | 0,000 | | | |

| (TWh/year) | Coal | Oil | Ngas | Biomass |
|---|---|---|---|---|
| Transport | 0,00 | 450,54 | 0,00 | 0,00 |
| Household | 0,00 | 0,00 | 136,48 | 34,36 |
| Industry | 24,85 | 35,37 | 65,22 | 99,65 |
| Various | 0,00 | 38,93 | 2,40 | 11,83 |

# Output WARNING!!: (1) Critical Excess;

| | District Heating | | | | | | | | | | Electricity | | | | | | | | | | | | | | | | | Exchange | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Demand | Production | | | | | | | | Ba- | Consumption | | | | | | Production | | | | | | | | Balance | | | | | Payment | |
| | Distr. heating MW | Solar MW | Waste+ CSHP MW | DHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | lance MW | Elec. demand MW | Flex.& Transp. MW | HP MW | Elec- trolyser MW | EH MW | Hydro Pump MW | Tur- bine MW | RES GW | Hy- dro MW | Geo- thermal MW | Waste+ CSHP MW | CHP MW | PP MW | Stab- Load % | Imp MW | Exp MW | CEEP MW | EEP MW | Imp Million EUR | Exp EUR |
| January | 11349 | 132 | 232 | 0 | 7315 | 0 | 0 | 3823 | 0 | -153 | 64264 | 18804 | 3056 | 0 | 16378 | 0 | 0 | 29 | 7325 | 61359 | 518 | 8596 | 8946 | 744 | 0 | 3266 | 3266 | 0 | 0 | 0 |
| February | 10777 | 190 | 232 | 0 | 7439 | 0 | 0 | 3069 | 0 | -153 | 65399 | 19235 | 2893 | 0 | 15507 | 0 | 0 | 32 | 6232 | 57922 | 518 | 8742 | 10771 | 720 | 0 | 2716 | 2716 | 0 | 0 | 0 |
| March | 8984 | 285 | 232 | 0 | 6156 | 0 | 0 | 2464 | 0 | -153 | 55807 | 19400 | 2397 | 0 | 12849 | 0 | 0 | 32 | 7247 | 51508 | 518 | 7234 | 6488 | 701 | 0 | 4027 | 4027 | 0 | 0 | 0 |
| April | 3120 | 356 | 232 | 0 | 2255 | 0 | 0 | 701 | 0 | -424 | 46670 | 18701 | 776 | 0 | 4157 | 0 | 0 | 30 | 5516 | 45066 | 518 | 2650 | 3355 | 678 | 0 | 6146 | 6146 | 0 | 0 | 0 |
| May | 971 | 402 | 232 | 0 | 702 | 0 | 0 | 271 | 0 | -637 | 42758 | 19401 | 181 | 0 | 971 | 0 | 0 | 33 | 4607 | 42561 | 518 | 825 | 959 | 632 | 0 | 8898 | 8898 | 0 | 0 | 0 |
| June | 971 | 445 | 232 | 0 | 702 | 0 | 0 | 265 | 0 | -673 | 44700 | 19307 | 180 | 0 | 962 | 0 | 0 | 31 | 5278 | 44545 | 518 | 824 | 1351 | 665 | 0 | 8101 | 8101 | 0 | 0 | 0 |
| July | 971 | 444 | 232 | 0 | 702 | 0 | 0 | 266 | 0 | -674 | 45267 | 18777 | 181 | 0 | 972 | 0 | 0 | 31 | 4576 | 46563 | 518 | 825 | 1527 | 681 | 0 | 8979 | 8979 | 0 | 0 | 0 |
| August | 971 | 394 | 232 | 0 | 710 | 0 | 0 | 267 | 0 | -632 | 41791 | 19397 | 180 | 0 | 965 | 0 | 0 | 25 | 5321 | 44814 | 518 | 834 | 2096 | 712 | 0 | 6074 | 6074 | 0 | 0 | 0 |
| September | 971 | 321 | 232 | 0 | 722 | 0 | 0 | 270 | 0 | -575 | 44012 | 18990 | 184 | 0 | 984 | 0 | 0 | 29 | 4506 | 44495 | 518 | 848 | 2685 | 672 | 0 | 7465 | 7465 | 0 | 0 | 0 |
| October | 4346 | 216 | 232 | 0 | 3644 | 0 | 0 | 561 | 0 | -307 | 48559 | 19098 | 1113 | 0 | 5950 | 0 | 0 | 20 | 5994 | 48434 | 518 | 4282 | 7790 | 770 | 0 | 1844 | 1844 | 0 | 0 | 0 |
| November | 8948 | 144 | 232 | 0 | 5999 | 0 | 0 | 2726 | 0 | -153 | 52657 | 19307 | 2385 | 0 | 12796 | 0 | 0 | 29 | 6907 | 51818 | 518 | 7050 | 5539 | 708 | 0 | 3411 | 3411 | 0 | 0 | 0 |
| December | 11201 | 111 | 232 | 0 | 7596 | 0 | 0 | 3416 | 0 | -153 | 54677 | 18782 | 3011 | 0 | 16135 | 0 | 0 | 25 | 8539 | 56450 | 518 | 8926 | 6353 | 756 | 0 | 2814 | 2814 | 0 | 0 | 0 |
| Average | 5288 | 287 | 232 | 0 | 3655 | 0 | 0 | 1505 | 0 | -391 | 50504 | 19099 | 1375 | 0 | 7370 | 0 | 0 | 29 | 6008 | 49617 | 518 | 4295 | 4807 | 703 | 0 | 5315 | 5315 | 0 | Average price | |
| Maximum | 23031 | 1758 | 232 | 0 | 13859 | 0 | 0 | 21751 | 0 | 0 | 83729 | 50613 | 6282 | 0 | 33670 | 0 | 0 | 114 | 20255 | 61359 | 518 | 16285 | 78526 | 971 | 0 | 81824 | 81824 | 0 | (EUR/MWh) | |
| Minimum | 350 | 0 | 232 | 0 | 693 | 0 | 0 | 264 | 0 | -925 | 1112 | 3654 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 42497 | 518 | 814 | 0 | 284 | 0 | 0 | 0 | 0 | 1 | 0 |
| TWh/year | 46,45 | 2,52 | 2,04 | 0,00 | 32,10 | 0,00 | 0,00 | 13,22 | 0,00 | -3,44 | 443,63 | 167,77 | 12,08 | 0,00 | 64,74 | 0,00 | 0,00 | 253 | 52,77 | 435,84 | 4,55 | 37,72 | 42,22 | | 0,00 | 46,69 | 46,69 | 0,00 | 0 | 1 |

| FUEL BALANCE (TWh/year): | DHP | CHP2 | CHP3 | Boiler2 | Boiler3 | PP | Geo/Nu. | Hydro | Waste | CAES Elc.ly. | BioCon- version | Electro- Fuel | Wind | Offsh. | PV | Hydro | Solar.Th | Transp. | Industry household | Industry Various | Total | Imp/Exp Corrected Imp/Exp | Net | CO2 emission (Mt): Total | Net |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Coal | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 24,85 | 24,85 | 0,00 | 24,85 | 8,81 | 8,81 |
| Oil | - | - | 3,83 | - | - | 4,04 | - | - | - | - | - | - | - | - | - | - | - | 450,54 | - | 74,30 | 532,72 | -4,47 | 528,24 | 139,81 | 138,63 |
| N.Gas | - | - | 0,06 | - | - | 0,07 | - | - | - | - | - | - | - | - | - | - | - | - | 136,48 | 67,62 | 204,23 | -0,07 | 204,16 | 41,83 | 41,82 |
| Biomass | - | - | 96,12 | - | 14,69 | 101,44 | - | - | - | - | 85,58 | - | - | - | - | - | - | - | 34,36 | 111,48 | 443,67 | -112,18 | 331,49 | 0,00 | 0,00 |
| Renewable | - | - | - | - | - | - | - | 52,77 | - | - | - | - | 121,08 | 19,46 | 94,43 | 17,61 | 2,52 | - | - | - | 307,88 | 0,00 | 307,88 | 0,00 | 0,00 |
| H2 etc. | - | - | 0,00 | - | 0,00 | 0,00 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Biofuel | - | - | - | - | - | - | - | - | - | - | -49,42 | - | - | - | - | - | - | 49,42 | - | - | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Nuclear/CCS | - | - | - | - | - | - | 1452,79 | - | - | - | - | - | - | - | - | - | - | - | - | - | 1452,79 | 0,00 | 1452,79 | -3367,1 | -3367,19 |
| Total | - | - | 100,01 | - | 14,69 | 105,55 | 1452,79 | 52,77 | - | - | 36,16 | - | 121,08 | 19,46 | 94,43 | 17,61 | 2,52 | 499,96 | 170,84 | 278,25 | 2966,13 | -116,72 | 2849,40 | -3176,7 | -3177,93 |

District Heating Production

| | Gr.1 | | | | Gr.2 | | | | | | | | | | Gr.3 | | | | | | | | | | RES specification | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | District heating MW | Solar MW | CSHP MW | DHP MW | District heating MW | Solar MW | CSHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Stor-age MW | Ba-lance MW | District heating MW | Solar MW | CSHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Stor-age MW | Ba-lance MW | RES1 Wind GW | RES2 Offsho GW | RES3 Photo GW | RES 4-7 GW | Total ic GW |
| January | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 11349 | 132 | 232 | 7315 | 0 | 0 | 3823 | 0 | 0 | -153 | 20 | 3 | 4 | 3 | 29 |
| February | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10777 | 190 | 232 | 7439 | 0 | 0 | 3069 | 0 | 0 | -153 | 19 | 3 | 6 | 4 | 32 |
| March | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8984 | 285 | 232 | 6156 | 0 | 0 | 2464 | 0 | 0 | -153 | 15 | 2 | 11 | 3 | 32 |
| April | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3120 | 356 | 232 | 2255 | 0 | 0 | 701 | 0 | 0 | -424 | 10 | 2 | 14 | 3 | 30 |
| May | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 971 | 402 | 232 | 702 | 0 | 0 | 271 | 0 | 0 | -637 | 12 | 2 | 16 | 3 | 33 |
| June | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 971 | 445 | 232 | 702 | 0 | 0 | 265 | 0 | 0 | -673 | 9 | 2 | 18 | 2 | 31 |
| July | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 971 | 444 | 232 | 702 | 0 | 0 | 266 | 0 | 0 | -674 | 10 | 2 | 18 | 1 | 31 |
| August | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 971 | 394 | 232 | 710 | 0 | 0 | 267 | 0 | 0 | -632 | 7 | 2 | 15 | 1 | 25 |
| September | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 971 | 321 | 232 | 722 | 0 | 0 | 270 | 0 | 0 | -575 | 14 | 2 | 12 | 1 | 29 |
| October | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4346 | 216 | 232 | 3644 | 0 | 0 | 561 | 0 | 0 | -307 | 9 | 2 | 7 | 1 | 20 |
| November | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8948 | 144 | 232 | 5999 | 0 | 0 | 2726 | 0 | 0 | -153 | 21 | 3 | 4 | 1 | 29 |
| December | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 11201 | 111 | 232 | 7596 | 0 | 0 | 3416 | 0 | 0 | -153 | 19 | 3 | 3 | 1 | 25 |
| Average | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5288 | 287 | 232 | 3655 | 0 | 0 | 1505 | 0 | 0 | -391 | 14 | 2 | 11 | 2 | 29 |
| Maximum | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 23031 | 1758 | 232 | 13859 | 0 | 0 | 21751 | 0 | 0 | 0 | 51 | 5 | 79 | 5 | 114 |
| Minimum | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 350 | 0 | 232 | 693 | 0 | 0 | 264 | 0 | 0 | -925 | 0 | 0 | 0 | 0 | 2 |
| Total for the whole year | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TWh/year | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | | 0,00 | 46,45 | 2,52 | 2,04 | 32,10 | 0,00 | 0,00 | 13,22 | 0,00 | | -3,44 | 121 | 19 | 94 | 18 | 253 |

Own use of heat from industrial CHP: 0,00 TWh/year

ANNUAL COSTS (Million EUR)

| | |
|---|---|
| Total Fuel ex Ngas exchange = | 41503 |
| Uranium = | 9153 |
| Coal = | 233 |
| FuelOil = | 2004 |
| Gasoil/Diesel= | 10871 |
| Petrol/JP = | 6566 |
| Gas handling = | 2027 |
| Biomass = | 10649 |
| Food income = | 0 |
| Waste = | 0 |
| Total Ngas Exchange costs = | 5088 |
| Marginal operation costs = | 6815 |
| Total Electricity exchange = | 67 |
| Import = | 0 |
| Export = | -1 |
| Bottleneck = | 1 |
| Fixed imp/ex= | 67 |
| Total CO2 emission costs = | -48286 |
| Total variable costs = | 5186 |
| Fixed operation costs = | 12767 |
| Annual Investment costs = | 27172 |
| TOTAL ANNUAL COSTS = | 45125 |

NATURAL GAS EXCHANGE

| | DHP & Boilers MW | CHP2 CHP3 MW | PP CAES MW | Indi-vidual MW | Trans port MW | Indu. Var. MW | Demand Sum MW | Bio-gas MW | Syn-gas MW | CO2Hy gas MW | SynHy gas MW | SynHy gas MW | Stor-age MW | Sum MW | Im-port MW | Ex-port MW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| January | 0 | 14 | 14 | 34477 | 0 | 7698 | 42203 | 0 | 0 | 0 | 0 | 0 | 0 | 42203 | 42203 | 0 |
| February | 0 | 14 | 17 | 32690 | 0 | 7698 | 40420 | 0 | 0 | 0 | 0 | 0 | 0 | 40420 | 40420 | 0 |
| March | 0 | 12 | 10 | 27087 | 0 | 7698 | 34808 | 0 | 0 | 0 | 0 | 0 | 0 | 34808 | 34808 | 0 |
| April | 0 | 4 | 5 | 8763 | 0 | 7698 | 16471 | 0 | 0 | 0 | 0 | 0 | 0 | 16471 | 16471 | 0 |
| May | 0 | 1 | 1 | 2047 | 0 | 7698 | 9748 | 0 | 0 | 0 | 0 | 0 | 0 | 9748 | 9748 | 0 |
| June | 0 | 1 | 2 | 2047 | 0 | 7698 | 9748 | 0 | 0 | 0 | 0 | 0 | 0 | 9748 | 9748 | 0 |
| July | 0 | 1 | 2 | 2047 | 0 | 7698 | 9748 | 0 | 0 | 0 | 0 | 0 | 0 | 9748 | 9748 | 0 |
| August | 0 | 1 | 3 | 2047 | 0 | 7698 | 9749 | 0 | 0 | 0 | 0 | 0 | 0 | 9749 | 9749 | 0 |
| September | 0 | 1 | 4 | 2047 | 0 | 7698 | 9750 | 0 | 0 | 0 | 0 | 0 | 0 | 9750 | 9750 | 0 |
| October | 0 | 7 | 12 | 12594 | 0 | 7698 | 20311 | 0 | 0 | 0 | 0 | 0 | 0 | 20311 | 20311 | 0 |
| November | 0 | 12 | 9 | 26975 | 0 | 7698 | 34693 | 0 | 0 | 0 | 0 | 0 | 0 | 34693 | 34693 | 0 |
| December | 0 | 15 | 10 | 34015 | 0 | 7698 | 41738 | 0 | 0 | 0 | 0 | 0 | 0 | 41738 | 41738 | 0 |
| Average | 0 | 7 | 8 | 15537 | 0 | 7698 | 23250 | 0 | 0 | 0 | 0 | 0 | 0 | 23250 | 23250 | 0 |
| Maximum | 0 | 27 | 123 | 70980 | 0 | 7698 | 78722 | 0 | 0 | 0 | 0 | 0 | 0 | 78722 | 78722 | 0 |
| Minimum | 0 | 1 | 0 | 106 | 0 | 7698 | 7806 | 0 | 0 | 0 | 0 | 0 | 0 | 7806 | 7806 | 0 |
| Total for the whole year | | | | | | | | | | | | | | | | |
| TWh/year | 0,00 | 0,06 | 0,07 | 136,48 | 0,00 | 67,62 | 204,23 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 204,23 | 204,23 | 0,00 |

RES Share: 25,3 Percent of Primary Energy 63,0 Percent of Electricity 382,2 TWh electricity from RES

# Input HU 2050.txt

# The EnergyPLAN model 12.4

| | | | |
|---|---|---|---|
| Electricity demand (TWh/year): | | Flexible demand | 2,17 |
| Fixed demand | 38,41 | Fixed imp/exp. | 0,99 |
| Electric heating + HP | 4,82 | Transportation | 11,77 |
| Electric cooling | 2,82 | Total | 60,98 |

| District heating (TWh/year) | Gr.1 | Gr.2 | Gr.3 | Sum |
|---|---|---|---|---|
| District heating demand | 0,00 | 0,00 | 12,31 | 12,31 |
| Solar Thermal | 0,00 | 0,00 | 0,37 | 0,37 |
| Industrial CHP (CSHP) | 0,00 | 0,00 | 0,00 | 0,00 |
| Demand after solar and CSHP | 0,00 | 0,00 | 11,94 | 11,94 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Wind | 4970 | MW | 10,05 | TWh/year | 0,00 | Grid |
| Offshore Wind | 0 | MW | 0 | TWh/year | 0,00 | stabili- |
| Photo Voltaic | 3762 | MW | 4,2 | TWh/year | 0,00 | sation |
| River Hydro | 49 | MW | 0,17 | TWh/year | 0,00 | share |
| Hydro Power | 0 | MW | 0 | TWh/year | | |
| Geothermal/Nuclear | 4016 | MW | 32,69 | TWh/year | | |

| | Capacities MW-e | Capacities MJ/s | Efficiencies elec. | Efficiencies Ther | COP |
|---|---|---|---|---|---|
| Group 2: | | | | | |
| CHP | 0 | 0 | 0,40 | 0,50 | |
| Heat Pump | 0 | 0 | | | 3,00 |
| Boiler | | 0 | | 0,50 | |
| Group 3: | | | | | |
| CHP | 2965 | 2884 | 0,37 | 0,36 | |
| Heat Pump | 0 | 0 | | | 3,00 |
| Boiler | | 6799 | | 0,90 | |
| Condensing | 7200 | | 0,28 | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Heatstorage: | gr.2: | 0 | GWh | gr.3: | 0 | GWh |
| Fixed Boiler: | gr.2: | 2,5 | Per cent | gr.3: | 5,0 | Per cent |

| Electricity prod. from | CSHP | Waste | (TWh/year) |
|---|---|---|---|
| Gr.1: | 0,00 | 0,00 | |
| Gr.2: | 0,00 | 0,00 | |
| Gr.3: | 0,00 | 0,00 | |

| | | |
|---|---|---|
| Regulation Strategy: | Technical regulation no. 2 | |
| CEEP regulation | 23450000 | |
| Minimum Stabilisation share | 0,10 | |
| Stabilisation share of CHP | 0,00 | |
| Minimum CHP gr 3 load | 222 | MW |
| Minimum PP | 0 | MW |
| Heat Pump maximum share | 0,50 | |
| Maximum import/export | 0 | MW |

| | | |
|---|---|---|
| Distr. Name : | const.txt | |
| Addition factor | 0,00 | EUR/MWh |
| Multiplication factor | 1,00 | |
| Dependency factor | 0,00 | EUR/MWh pr. MW |
| Average Market Price | 1 | EUR/MWh |
| Gas Storage | 0 | GWh |
| Syngas capacity | 0 | MW |
| Biogas max to grid | 0 | MW |

Fuel Price level:

| | Capacities MW-e | Storage GWh | Efficiencies elec. | Ther. |
|---|---|---|---|---|
| Hydro Pump: | 0 | 0 | 0,00 | |
| Hydro Turbine: | 0 | | 0,00 | |
| Electrol. Gr.2: | 0 | 0 | 0,40 | 0,50 |
| Electrol. Gr.3: | 0 | 0 | 0,40 | 0,50 |
| Electrol. trans.: | 0 | 0 | 0,00 | |
| Ely. MicroCHP: | 0 | 0 | 0,80 | |
| CAES fuel ratio: | | 0,000 | | |

| (TWh/year) | Coal | Oil | Ngas | Biomass |
|---|---|---|---|---|
| Transport | 0,00 | 43,72 | 0,00 | 0,00 |
| Household | 0,00 | 0,00 | 30,30 | 3,37 |
| Industry | 1,00 | 1,17 | 6,47 | 9,37 |
| Various | 0,00 | 3,20 | 1,47 | 4,32 |

# Output WARNING!!: (1) Critical Excess;

| | District Heating | | | | | | | | | | Electricity | | | | | | | | | | | | | | | | Exchange | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Demand | Production | | | | | | | | | Consumption | | | | | | Production | | | | | | | Balance | | | | |
| | Distr. heating MW | Solar MW | Waste+ CSHP MW | DHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Balance MW | Elec. demand MW | Flex.& Transp. MW | HP MW | Elec-trolyser MW | EH MW | Hydro Pump MW | Tur-bine MW | RES MW | Hy-dro MW | Geo-thermal MW | Waste+ CSHP MW | CHP MW | PP MW | Stab-Load % | Imp MW | Exp MW | CEEP MW | EEP MW | Payment Imp Million EUR | Payment Exp Million EUR |
| January | 3017 | 16 | 16 | 0 | 1530 | 0 | 0 | 1482 | 0 | -28 | 4766 | 1561 | 0 | 0 | 1234 | 0 | 0 | 2109 | 0 | 4103 | 0 | 1573 | 352 | 749 | 0 | 463 | 463 | 0 | 0 | 0 |
| February | 2747 | 28 | 16 | 0 | 1720 | 0 | 0 | 1010 | 0 | -28 | 4800 | 1599 | 0 | 0 | 1122 | 0 | 0 | 1711 | 0 | 4099 | 0 | 1769 | 329 | 794 | 0 | 274 | 274 | 0 | 0 | 0 |
| March | 2144 | 40 | 16 | 0 | 1233 | 0 | 0 | 883 | 0 | -28 | 4630 | 1613 | 0 | 0 | 865 | 0 | 0 | 2171 | 0 | 4039 | 0 | 1268 | 205 | 731 | 0 | 461 | 461 | 0 | 0 | 0 |
| April | 717 | 55 | 16 | 0 | 454 | 0 | 0 | 237 | 0 | -44 | 4393 | 1552 | 0 | 0 | 258 | 0 | 0 | 2297 | 0 | 3316 | 0 | 466 | 585 | 679 | 0 | 348 | 348 | 0 | 0 | 0 |
| May | 383 | 64 | 16 | 0 | 281 | 0 | 0 | 80 | 0 | -58 | 4479 | 1613 | 0 | 0 | 114 | 0 | 0 | 1862 | 0 | 3278 | 0 | 289 | 1051 | 731 | 0 | 161 | 161 | 0 | 0 | 0 |
| June | 383 | 67 | 16 | 0 | 286 | 0 | 0 | 74 | 0 | -60 | 4787 | 1605 | 0 | 0 | 116 | 0 | 0 | 1511 | 0 | 3787 | 0 | 294 | 1069 | 789 | 0 | 41 | 41 | 0 | 0 | 0 |
| July | 383 | 67 | 16 | 0 | 289 | 0 | 0 | 71 | 0 | -60 | 5028 | 1559 | 0 | 0 | 116 | 0 | 0 | 1384 | 0 | 3330 | 0 | 297 | 1829 | 813 | 0 | 24 | 24 | 0 | 0 | 0 |
| August | 383 | 59 | 16 | 0 | 294 | 0 | 0 | 71 | 0 | -56 | 4875 | 1613 | 0 | 0 | 117 | 0 | 0 | 1181 | 0 | 3362 | 0 | 302 | 1885 | 839 | 0 | 12 | 12 | 0 | 0 | 0 |
| September | 383 | 46 | 16 | 0 | 275 | 0 | 0 | 96 | 0 | -50 | 4613 | 1577 | 0 | 0 | 114 | 0 | 0 | 2002 | 0 | 3937 | 0 | 283 | 677 | 728 | 0 | 483 | 483 | 0 | 0 | 0 |
| October | 1201 | 33 | 16 | 0 | 958 | 0 | 0 | 229 | 0 | -35 | 4617 | 1587 | 0 | 0 | 464 | 0 | 0 | 1216 | 0 | 4022 | 0 | 985 | 705 | 832 | 0 | 147 | 147 | 0 | 0 | 0 |
| November | 2198 | 18 | 16 | 0 | 1710 | 0 | 0 | 482 | 0 | -28 | 4772 | 1605 | 0 | 0 | 889 | 0 | 0 | 1676 | 0 | 3459 | 0 | 1758 | 677 | 783 | 0 | 191 | 191 | 0 | 0 | 0 |
| December | 2901 | 12 | 16 | 0 | 2176 | 0 | 0 | 724 | 0 | -28 | 4565 | 1559 | 0 | 0 | 1186 | 0 | 0 | 605 | 0 | 3941 | 0 | 2237 | 712 | 921 | 0 | 73 | 73 | 0 | 0 | 0 |
| Average | 1401 | 42 | 16 | 0 | 932 | 0 | 0 | 453 | 0 | -42 | 4694 | 1587 | 0 | 0 | 549 | 0 | 0 | 1641 | 0 | 3722 | 0 | 959 | 843 | 783 | 0 | 223 | 223 | 0 | Average price | |
| Maximum | 5666 | 259 | 16 | 0 | 2884 | 0 | 0 | 4679 | 0 | 0 | 6980 | 4074 | 0 | 0 | 2336 | 0 | 0 | 7416 | 0 | 4103 | 0 | 2965 | 5409 | 999 | 0 | 4534 | 4534 | 0 | (EUR/MWh) | |
| Minimum | 126 | 0 | 16 | 0 | 216 | 0 | 0 | 70 | 0 | -177 | 180 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 3261 | 0 | 222 | 0 | 323 | 0 | 0 | 0 | 0 | 1 | 1 |
| TWh/year | 12,31 | 0,37 | 0,14 | 0,00 | 8,19 | 0,00 | 0,00 | 3,98 | 0,00 | -0,37 | 41,23 | 13,94 | 0,00 | 0,00 | 4,82 | 0,00 | 0,00 | 14,41 | 0,00 | 32,69 | 0,00 | 8,42 | 7,41 | | 0,00 | 1,95 | 1,95 | 0,00 | 0 | 1 |

| FUEL BALANCE (TWh/year): | DHP | CHP2 | CHP3 | Boiler2 | Boiler3 | PP | Geo/Nu. | Hydro | Waste | CAES Elc.ly. | BioCon-version | Electro-Fuel | Wind | Offsh. | PV | Hydro | Solar.Th | Transp. | Industry household | Industry Various | Total | Imp/Exp Corrected Imp/Exp | Imp/Exp Corrected Net | CO2 emission (Mt): Total | CO2 emission (Mt): Net |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Coal | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 1,00 | 1,00 | 0,00 | 1,00 | 0,35 | 0,35 |
| Oil | - | - | 0,04 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 43,72 | - | 4,37 | 48,13 | 0,00 | 48,13 | 12,63 | 12,63 |
| N.Gas | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 30,30 | 7,94 | 38,24 | 0,00 | 38,24 | 7,83 | 7,83 |
| Biomass | - | - | 22,65 | - | 4,42 | 26,46 | - | - | - | - | 1,41 | - | - | - | - | - | - | - | 3,37 | 13,69 | 72,00 | -6,98 | 65,02 | 0,00 | 0,00 |
| Renewable | - | - | - | - | - | - | 8,04 | - | - | - | - | - | 10,05 | - | 4,20 | 0,17 | 0,37 | - | - | - | 22,82 | 0,00 | 22,82 | 0,00 | 0,00 |
| H2 etc. | - | - | 0,00 | - | 0,00 | 0,00 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Biofuel | - | - | - | - | - | - | - | - | - | - | -1,01 | - | - | - | - | - | - | 1,01 | - | - | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Nuclear/CCS | - | - | - | - | - | - | 82,17 | - | - | - | - | - | - | - | - | - | - | - | - | - | 82,17 | 0,00 | 82,17 | -11529,27 | -11529,27 |
| Total | - | - | 22,69 | - | 4,42 | 26,46 | 90,21 | - | - | - | 0,40 | - | 10,05 | - | 4,20 | 0,17 | 0,37 | 44,73 | 33,67 | 27,00 | 264,36 | -6,98 | 257,38 | -11508,27 | -11508,45 |

District Heating Production

| | Gr.1 | | | | Gr.2 | | | | | | | | | | Gr.3 | | | | | | | | | | RES specification | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | District heating MW | Solar MW | CSHP MW | DHP MW | District heating MW | Solar MW | CSHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Stor-age MW | Ba-lance MW | District heating MW | Solar MW | CSHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Stor-age MW | Ba-lance MW | RES1 Wind MW | RES2 Offsho MW | RES3 Photo MW | RES 4-7 MW | Total MW |
| January | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3017 | 16 | 16 | 1530 | 0 | 0 | 1482 | 0 | 0 | -28 | 1919 | 0 | 171 | 18 | 2109 |
| February | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2747 | 28 | 16 | 1720 | 0 | 0 | 1010 | 0 | 0 | -28 | 1367 | 0 | 315 | 28 | 1711 |
| March | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2144 | 40 | 16 | 1233 | 0 | 0 | 883 | 0 | 0 | -28 | 1683 | 0 | 462 | 26 | 2171 |
| April | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 717 | 55 | 16 | 454 | 0 | 0 | 237 | 0 | 0 | -44 | 1620 | 0 | 641 | 36 | 2297 |
| May | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 383 | 64 | 16 | 281 | 0 | 0 | 80 | 0 | 0 | -58 | 1084 | 0 | 739 | 39 | 1862 |
| June | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 383 | 67 | 16 | 286 | 0 | 0 | 74 | 0 | 0 | -60 | 704 | 0 | 784 | 23 | 1511 |
| July | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 383 | 67 | 16 | 289 | 0 | 0 | 71 | 0 | 0 | -60 | 627 | 0 | 750 | 7 | 1384 |
| August | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 383 | 59 | 16 | 294 | 0 | 0 | 71 | 0 | 0 | -56 | 514 | 0 | 663 | 3 | 1181 |
| September | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 383 | 46 | 16 | 275 | 0 | 0 | 96 | 0 | 0 | -50 | 1486 | 0 | 511 | 4 | 2002 |
| October | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1201 | 33 | 16 | 958 | 0 | 0 | 229 | 0 | 0 | -35 | 838 | 0 | 364 | 14 | 1216 |
| November | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2198 | 18 | 16 | 1710 | 0 | 0 | 482 | 0 | 0 | -28 | 1471 | 0 | 194 | 11 | 1676 |
| December | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2901 | 12 | 16 | 2176 | 0 | 0 | 724 | 0 | 0 | -28 | 450 | 0 | 134 | 21 | 605 |
| Average | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1401 | 42 | 16 | 932 | 0 | 0 | 453 | 0 | 0 | -42 | 1144 | 0 | 478 | 19 | 1641 |
| Maximum | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5666 | 259 | 16 | 2884 | 0 | 0 | 4679 | 0 | 0 | 0 | 4372 | 0 | 3762 | 49 | 7416 |
| Minimum | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 126 | 0 | 16 | 216 | 0 | 0 | 70 | 0 | 0 | -177 | 0 | 0 | 0 | 0 | 3 |
| Total for the whole year TWh/year | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | | 0,00 | 12,31 | 0,37 | 0,14 | 8,19 | 0,00 | 0,00 | 3,98 | 0,00 | | -0,37 | 10,05 | 0,00 | 4,20 | 0,17 | 14,41 |

Own use of heat from industrial CHP: 0,00 TWh/year

ANNUAL COSTS (Million EUR)

| | |
|---|---|
| Total Fuel ex Ngas exchange = | 4493 |
| Uranium = | 518 |
| Coal = | 9 |
| FuelOil = | 107 |
| Gasoil/Diesel= | 1147 |
| Petrol/JP = | 555 |
| Gas handling = | 391 |
| Biomass = | 1766 |
| Food income = | 0 |
| Waste = | 0 |
| Total Ngas Exchange costs = | 953 |
| Marginal operation costs = | 533 |
| Total Electricity exchange = | 1 |
| Import = | 0 |
| Export = | -1 |
| Bottleneck = | 1 |
| Fixed imp/ex= | 1 |
| Total CO2 emission costs = | -174928 |
| Total variable costs = | -168948 |
| Fixed operation costs = | 771 |
| Annual Investment costs = | 1682 |
| TOTAL ANNUAL COSTS = | -166496 |

NATURAL GAS EXCHANGE

| | DHP & Boilers MW | CHP2 CHP3 MW | PP CAES MW | Indi-vidual MW | Trans port MW | Indu. Var. MW | Demand Sum MW | Bio-gas MW | Syn-gas MW | CO2Hy gas MW | SynHy gas MW | SynHy gas MW | Stor-age MW | Sum MW | Im-port MW | Ex-port MW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| January | 0 | 0 | 0 | 7768 | 0 | 904 | 8672 | 0 | 0 | 0 | 0 | 0 | 0 | 8672 | 8672 | 0 |
| February | 0 | 0 | 0 | 7048 | 0 | 904 | 7952 | 0 | 0 | 0 | 0 | 0 | 0 | 7952 | 7952 | 0 |
| March | 0 | 0 | 0 | 5435 | 0 | 904 | 6339 | 0 | 0 | 0 | 0 | 0 | 0 | 6339 | 6339 | 0 |
| April | 0 | 0 | 0 | 1620 | 0 | 904 | 2523 | 0 | 0 | 0 | 0 | 0 | 0 | 2523 | 2523 | 0 |
| May | 0 | 0 | 0 | 727 | 0 | 904 | 1631 | 0 | 0 | 0 | 0 | 0 | 0 | 1631 | 1631 | 0 |
| June | 0 | 0 | 0 | 727 | 0 | 904 | 1631 | 0 | 0 | 0 | 0 | 0 | 0 | 1631 | 1631 | 0 |
| July | 0 | 0 | 0 | 727 | 0 | 904 | 1631 | 0 | 0 | 0 | 0 | 0 | 0 | 1631 | 1631 | 0 |
| August | 0 | 0 | 0 | 727 | 0 | 904 | 1631 | 0 | 0 | 0 | 0 | 0 | 0 | 1631 | 1631 | 0 |
| September | 0 | 0 | 0 | 727 | 0 | 904 | 1631 | 0 | 0 | 0 | 0 | 0 | 0 | 1631 | 1631 | 0 |
| October | 0 | 0 | 0 | 2913 | 0 | 904 | 3817 | 0 | 0 | 0 | 0 | 0 | 0 | 3817 | 3817 | 0 |
| November | 0 | 0 | 0 | 5581 | 0 | 904 | 6485 | 0 | 0 | 0 | 0 | 0 | 0 | 6485 | 6485 | 0 |
| December | 0 | 0 | 0 | 7459 | 0 | 904 | 8363 | 0 | 0 | 0 | 0 | 0 | 0 | 8363 | 8363 | 0 |
| Average | 0 | 0 | 0 | 3449 | 0 | 904 | 4353 | 0 | 0 | 0 | 0 | 0 | 0 | 4353 | 4353 | 0 |
| Maximum | 0 | 0 | 0 | 14853 | 0 | 904 | 15757 | 0 | 0 | 0 | 0 | 0 | 0 | 15757 | 15757 | 0 |
| Minimum | 0 | 0 | 0 | 39 | 0 | 904 | 943 | 0 | 0 | 0 | 0 | 0 | 0 | 943 | 943 | 0 |
| Total for the whole year TWh/year | 0,00 | 0,00 | 0,00 | 30,30 | 0,00 | 7,94 | 38,24 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 38,24 | 38,24 | 0,00 |

RES Share: 35,9 Percent of Primary Energy 32,7 Percent of Electricity 38,3 TWh electricity from RES

# Input IT 2050.txt

# The EnergyPLAN model 12.4

| | | | |
|---|---|---|---|
| Electricity demand (TWh/year): | | Flexible demand | 16,47 |
| Fixed demand | 309,62 | Fixed imp/exp. | -49,75 |
| Electric heating + HP | 29,20 | Transportation | 94,30 |
| Electric cooling | 18,34 | Total | 418,18 |

| District heating (TWh/year) | Gr.1 | Gr.2 | Gr.3 | Sum |
|---|---|---|---|---|
| District heating demand | 0,00 | 0,00 | 39,16 | 39,16 |
| Solar Thermal | 0,00 | 0,00 | 0,23 | 0,23 |
| Industrial CHP (CSHP) | 0,00 | 0,00 | 0,00 | 0,00 |
| Demand after solar and CSHP | 0,00 | 0,00 | 38,93 | 38,93 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Wind | 49200 | MW | 79,37 | TWh/year | 0,00 | Grid |
| Offshore Wind | 0 | MW | 0 | TWh/year | 0,00 | stabili- |
| Photo Voltaic | 48357 | MW | 65,98 | TWh/year | 0,00 | sation |
| River Hydro | 2299 | MW | 8,32 | TWh/year | 0,00 | share |
| Hydro Power | 17373 | MW | 46,5 | TWh/year | | |
| Geothermal/Nuclear | 1896 | MW | 15,51 | TWh/year | | |

| | Capacities MW-e | Capacities MJ/s | Efficiencies elec. | Efficiencies Ther | COP |
|---|---|---|---|---|---|
| Group 2: | | | | | |
| CHP | 0 | 0 | 0,40 | 0,50 | |
| Heat Pump | 0 | 0 | | | 3,00 |
| Boiler | | 0 | | 0,50 | |
| Group 3: | | | | | |
| CHP | 17784 | 13315 | 0,34 | 0,26 | |
| Heat Pump | 0 | 0 | | | 3,00 |
| Boiler | | 21835 | | 0,90 | |
| Condensing | 73800 | | 0,62 | | |

| | | | | | |
|---|---|---|---|---|---|
| Heatstorage: | gr.2: | 0 | GWh | gr.3: | 0 GWh |
| Fixed Boiler: | gr.2: | 2,5 | Per cent | gr.3: | 5,0 Per cent |

| Electricity prod. from | CSHP | Waste | (TWh/year) |
|---|---|---|---|
| Gr.1: | 0,00 | 0,00 | |
| Gr.2: | 0,00 | 0,00 | |
| Gr.3: | 0,00 | 0,00 | |

| | | |
|---|---|---|
| Regulation Strategy: | Technical regulation no. 2 | |
| CEEP regulation | 23450000 | |
| Minimum Stabilisation share | 0,10 | |
| Stabilisation share of CHP | 0,00 | |
| Minimum CHP gr 3 load | 889 | MW |
| Minimum PP | 3690 | MW |
| Heat Pump maximum share | 0,50 | |
| Maximum import/export | 0 | MW |

| | | |
|---|---|---|
| Distr. Name : | const.txt | |
| Addition factor | 0,00 | EUR/MWh |
| Multiplication factor | 1,00 | |
| Dependency factor | 0,00 | EUR/MWh pr. MW |
| Average Market Price | 1 | EUR/MWh |
| Gas Storage | 0 | GWh |
| Syngas capacity | 0 | MW |
| Biogas max to grid | 0 | MW |

Fuel Price level:

| | Capacities MW-e | Storage GWh | Efficiencies elec. | Ther. |
|---|---|---|---|---|
| Hydro Pump: | 7551 | 76 | 0,00 | |
| Hydro Turbine: | 7551 | | 0,00 | |
| Electrol. Gr.2: | 0 | 0 | 0,40 | 0,50 |
| Electrol. Gr.3: | 0 | 0 | 0,40 | 0,50 |
| Electrol. trans.: | 0 | 0 | 0,00 | |
| Ely. MicroCHP: | 0 | 0 | 0,80 | |
| CAES fuel ratio: | | 0,000 | | |

| (TWh/year) | Coal | Oil | Ngas | Biomass |
|---|---|---|---|---|
| Transport | 0,00 | 346,53 | 1,17 | 0,00 |
| Household | 0,00 | 1,79 | 223,19 | 9,58 |
| Industry | 48,52 | 4,54 | 64,38 | 33,83 |
| Various | 0,00 | 26,43 | 1,68 | 22,54 |

# Output WARNING!!: (1) Critical Excess;

| | District Heating | | | | | | | | | | Electricity | | | | | | | | | | | | | | | | Exchange | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Demand | Production | | | | | | | | Ba- | Consumption | | | | | | Production | | | | | | | Balance | | | | | Payment |
| | Distr. heating | Solar | Waste+ CSHP | DHP | CHP | HP | ELT | Boiler | EH | lance | Elec. demand | Flex.& Transp. | HP | Elec- trolyser | EH | Hydro Pump | Tur- bine | RES | Hy- dro | Geo- thermal | Waste+ CSHP | CHP | PP | Stab- Load | Imp | Exp | CEEP | EEP | Imp Exp |
| | MW | MW | MW | MW | MW | MW | MW | MW | MW | MW | MW | MW | MW | MW | MW | MW | MW | MW | MW | MW | MW | MW | MW | % | MW | MW | MW | MW | Million EUR |
| January | 9993 | 16 | 54 | 0 | 8389 | 0 | 0 | 1634 | 0 | -99 | 36056 | 12405 | 0 | 0 | 7866 | 0 | 0 | 20577 | 4060 | 1766 | 0 | 11205 | 14131 | 578 | 0 | 1076 | 1076 | 0 | 0 0 |
| February | 9458 | 20 | 54 | 0 | 8036 | 0 | 0 | 1447 | 0 | -99 | 37720 | 12705 | 0 | 0 | 7409 | 0 | 0 | 22260 | 4788 | 1766 | 0 | 10734 | 13646 | 583 | 0 | 1024 | 1024 | 0 | 0 0 |
| March | 7546 | 28 | 54 | 0 | 6162 | 0 | 0 | 1402 | 0 | -99 | 36521 | 12819 | 0 | 0 | 5853 | 0 | 0 | 24720 | 4000 | 1766 | 0 | 8230 | 12084 | 517 | 0 | 1271 | 1271 | 0 | 0 0 |
| April | 2627 | 30 | 54 | 0 | 2183 | 0 | 0 | 549 | 0 | -188 | 33623 | 12333 | 0 | 0 | 1835 | 0 | 0 | 20334 | 5156 | 1766 | 0 | 2915 | 13054 | 552 | 0 | 1096 | 1096 | 0 | 0 0 |
| May | 727 | 35 | 54 | 0 | 675 | 0 | 0 | 223 | 0 | -259 | 35025 | 12820 | 0 | 0 | 258 | 0 | 0 | 19254 | 7221 | 1766 | 0 | 902 | 13906 | 580 | 0 | 609 | 609 | 0 | 0 0 |
| June | 727 | 37 | 54 | 0 | 675 | 0 | 0 | 223 | 0 | -261 | 39750 | 12755 | 0 | 0 | 270 | 0 | 0 | 18146 | 7846 | 1766 | 0 | 901 | 18727 | 646 | 0 | 274 | 274 | 0 | 0 0 |
| July | 727 | 39 | 54 | 0 | 675 | 0 | 0 | 223 | 0 | -263 | 46567 | 12386 | 0 | 0 | 268 | 0 | 0 | 15536 | 7198 | 1766 | 0 | 902 | 28157 | 738 | 0 | 0 | 0 | 0 | 0 0 |
| August | 727 | 35 | 54 | 0 | 676 | 0 | 0 | 223 | 0 | -260 | 37770 | 12817 | 0 | 0 | 269 | 0 | 0 | 14269 | 5677 | 1766 | 0 | 903 | 22736 | 714 | 0 | 159 | 159 | 0 | 0 0 |
| September | 727 | 28 | 54 | 0 | 677 | 0 | 0 | 223 | 0 | -254 | 38111 | 12534 | 0 | 0 | 269 | 0 | 0 | 16832 | 5441 | 1766 | 0 | 904 | 20502 | 642 | 0 | 195 | 195 | 0 | 0 0 |
| October | 3421 | 21 | 54 | 0 | 2979 | 0 | 0 | 529 | 0 | -162 | 35285 | 12610 | 0 | 0 | 2477 | 0 | 0 | 17719 | 5190 | 1766 | 0 | 3979 | 16747 | 613 | 0 | 692 | 692 | 0 | 0 0 |
| November | 7437 | 15 | 54 | 0 | 6905 | 0 | 0 | 562 | 0 | -99 | 36625 | 12755 | 0 | 0 | 5762 | 0 | 0 | 13056 | 4110 | 1766 | 0 | 9223 | 21740 | 734 | 0 | 416 | 416 | 0 | 0 0 |
| December | 9499 | 13 | 54 | 0 | 9056 | 0 | 0 | 476 | 0 | -99 | 34966 | 12390 | 0 | 0 | 7452 | 0 | 0 | 7474 | 2853 | 1766 | 0 | 12096 | 24956 | 839 | 0 | 0 | 0 | 0 | 0 0 |
| Average | 4458 | 26 | 54 | 0 | 3916 | 0 | 0 | 641 | 0 | -179 | 37336 | 12610 | 0 | 0 | 3324 | 0 | 0 | 17493 | 5294 | 1766 | 0 | 5230 | 18390 | 645 | 0 | 566 | 566 | 0 | Average price |
| Maximum | 18196 | 140 | 54 | 0 | 13315 | 0 | 0 | 15863 | 0 | 0 | 68295 | 34514 | 0 | 0 | 14575 | 0 | 0 | 77988 | 12397 | 1766 | 0 | 17784 | 59067 | 992 | 0 | 39529 | 39529 | 0 | (EUR/MWh) |
| Minimum | 417 | 0 | 54 | 0 | 666 | 0 | 0 | 223 | 0 | -525 | 1169 | 1875 | 0 | 0 | 0 | 0 | 0 | 333 | 0 | 1766 | 0 | 889 | 3690 | 100 | 0 | 0 | 0 | 0 | 1 0 |
| TWh/year | 39,16 | 0,23 | 0,47 | 0,00 | 34,40 | 0,00 | 0,00 | 5,63 | 0,00 | -1,57 | 327,96 | 110,77 | 0,00 | 0,00 | 29,20 | 0,00 | 0,00 | 153,66 | 46,50 | 15,51 | 0,00 | 45,94 | 161,54 | | 0,00 | 4,97 | 4,97 | 0,00 | 0 0 |

| FUEL BALANCE (TWh/year): | DHP | CHP2 | CHP3 | Boiler2 | Boiler3 | PP | Geo/Nu. | Hydro | Waste | CAES Elc.ly. | BioCon- version | Electro- Fuel | Wind | Offsh. | PV | Hydro | Solar.Th | Transp. | Industry household | Industry Various | Total | Imp/Exp Corrected Imp/Exp | Net | CO2 emission (Mt): Total | Net |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Coal | - | - | 10,94 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 48,52 | 59,46 | 0,00 | 59,46 | 21,08 | 21,08 |
| Oil | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 346,53 | 1,79 | 30,97 | 379,29 | 0,00 | 379,29 | 99,54 | 99,54 |
| N.Gas | - | - | 29,70 | - | - | 260,54 | - | - | - | - | - | - | - | - | - | - | - | 1,17 | 223,19 | 66,06 | 580,66 | -8,02 | 572,65 | 118,94 | 117,30 |
| Biomass | - | - | 94,25 | - | 6,26 | - | - | - | - | - | 10,49 | - | - | - | - | - | - | - | 9,58 | 56,37 | 176,95 | 0,00 | 176,95 | 0,00 | 0,00 |
| Renewable | - | - | - | - | - | - | 15,51 | 46,50 | - | - | - | - | 79,37 | - | 65,98 | 8,32 | 0,23 | - | - | - | 215,90 | 0,00 | 215,90 | 0,00 | 0,00 |
| H2 etc. | - | - | 0,00 | - | 0,00 | 0,00 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Biofuel | - | - | 0,00 | - | - | - | - | - | - | - | -7,70 | - | - | - | - | - | - | 7,70 | - | - | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Nuclear/CCS | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0,00 | 0,00 | 0,00 | -14226, | -14226,40 |
| Total | - | - | 134,89 | - | 6,26 | 260,54 | 15,51 | 46,50 | - | - | 2,79 | - | 79,37 | - | 65,98 | 8,32 | 0,23 | 355,40 | 234,56 | 201,92 | 1412,26 | -8,02 | 1404,24 | -13986, | -13988,47 |

District Heating Production

| | Gr.1 | | | | Gr.2 | | | | | | | | | | Gr.3 | | | | | | | | | | RES specification | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | District heating MW | Solar MW | CSHP MW | DHP MW | District heating MW | Solar MW | CSHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Stor-age MW | Ba-lance MW | District heating MW | Solar MW | CSHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Stor-age MW | Ba-lance MW | RES1 Wind MW | RES2 Offsho MW | RES3 Photo MW | RES 4-7 MW | Total ic MW |
| January | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9993 | 16 | 54 | 8389 | 0 | 0 | 1634 | 0 | 0 | -99 | 15363 | 0 | 4424 | 790 | 20577 |
| February | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9458 | 20 | 54 | 8036 | 0 | 0 | 1447 | 0 | 0 | -99 | 15605 | 0 | 5767 | 888 | 22260 |
| March | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7546 | 28 | 54 | 6162 | 0 | 0 | 1402 | 0 | 0 | -99 | 15659 | 0 | 8261 | 801 | 24720 |
| April | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2627 | 30 | 54 | 2183 | 0 | 0 | 549 | 0 | 0 | -188 | 10505 | 0 | 8822 | 1007 | 20334 |
| May | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 727 | 35 | 54 | 675 | 0 | 0 | 223 | 0 | 0 | -259 | 7884 | 0 | 9985 | 1385 | 19254 |
| June | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 727 | 37 | 54 | 675 | 0 | 0 | 223 | 0 | 0 | -261 | 6246 | 0 | 10476 | 1423 | 18146 |
| July | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 727 | 39 | 54 | 675 | 0 | 0 | 223 | 0 | 0 | -263 | 3151 | 0 | 11141 | 1243 | 15536 |
| August | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 727 | 35 | 54 | 676 | 0 | 0 | 223 | 0 | 0 | -260 | 3497 | 0 | 9945 | 827 | 14269 |
| September | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 727 | 28 | 54 | 677 | 0 | 0 | 223 | 0 | 0 | -254 | 8011 | 0 | 7903 | 918 | 16832 |
| October | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3421 | 21 | 54 | 2979 | 0 | 0 | 529 | 0 | 0 | -162 | 11082 | 0 | 5684 | 953 | 17719 |
| November | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7437 | 15 | 54 | 6905 | 0 | 0 | 562 | 0 | 0 | -99 | 8201 | 0 | 4166 | 688 | 13056 |
| December | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9499 | 13 | 54 | 9056 | 0 | 0 | 476 | 0 | 0 | -99 | 3544 | 0 | 3488 | 442 | 7474 |
| Average | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4458 | 26 | 54 | 3916 | 0 | 0 | 641 | 0 | 0 | -179 | 9036 | 0 | 7511 | 947 | 17493 |
| Maximum | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 18196 | 140 | 54 | 13315 | 0 | 0 | 15863 | 0 | 0 | 0 | 44072 | 0 | 48357 | 2299 | 77988 |
| Minimum | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 417 | 0 | 54 | 666 | 0 | 0 | 223 | 0 | 0 | -525 | 7 | 0 | 0 | 0 | 333 |
| Total for the whole year | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TWh/year | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | | 0,00 | 39,16 | 0,23 | 0,47 | 34,40 | 0,00 | 0,00 | 5,63 | 0,00 | | -1,57 | 79,37 | 0,00 | 65,98 | 8,32 | 153,66 |

Own use of heat from industrial CHP: 0,00 TWh/year

ANNUAL COSTS (Million EUR)

| | | |
|---|---|---|
| Total Fuel ex Ngas exchange = | | 22474 |
| Uranium = | 0 | |
| Coal = | 557 | |
| FuelOil = | 753 | |
| Gasoil/Diesel= | 7991 | |
| Petrol/JP = | 5486 | |
| Gas handling = | 3433 | |
| Biomass = | 4255 | |
| Food income = | 0 | |
| Waste = | 0 | |
| Total Ngas Exchange costs = | | 14466 |
| Marginal operation costs = | | 839 |
| Total Electricity exchange = | | -47 |
| Import = | 0 | |
| Export = | 0 | |
| Bottleneck = | 0 | |
| Fixed imp/ex= | -47 | |
| Total CO2 emission costs = | | -212600 |
| Total variable costs = | | -174869 |
| Fixed operation costs = | | 5280 |
| Annual Investment costs = | | 11815 |
| TOTAL ANNUAL COSTS = | | -157774 |

NATURAL GAS EXCHANGE

| | DHP & Boilers MW | CHP2 CHP3 MW | PP CAES MW | Indi-vidual MW | Trans port MW | Indu. Var. MW | Demand Sum MW | Bio-gas MW | Syn-gas MW | CO2Hy gas MW | SynHy gas MW | SynHy gas MW | Stor-age MW | Sum MW | Im-port MW | Ex-port MW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| January | 0 | 7244 | 22793 | 60053 | 133 | 7520 | 97743 | 0 | 0 | 0 | 0 | 0 | 0 | 97743 | 97743 | 0 |
| February | 0 | 6939 | 22009 | 56704 | 133 | 7520 | 93306 | 0 | 0 | 0 | 0 | 0 | 0 | 93306 | 93306 | 0 |
| March | 0 | 5321 | 19491 | 44735 | 133 | 7520 | 77200 | 0 | 0 | 0 | 0 | 0 | 0 | 77200 | 77200 | 0 |
| April | 0 | 1885 | 21055 | 13945 | 133 | 7520 | 44538 | 0 | 0 | 0 | 0 | 0 | 0 | 44538 | 44538 | 0 |
| May | 0 | 583 | 22429 | 2056 | 133 | 7520 | 32722 | 0 | 0 | 0 | 0 | 0 | 0 | 32722 | 32722 | 0 |
| June | 0 | 583 | 30205 | 2056 | 133 | 7520 | 40497 | 0 | 0 | 0 | 0 | 0 | 0 | 40497 | 40497 | 0 |
| July | 0 | 583 | 45414 | 2056 | 133 | 7520 | 55706 | 0 | 0 | 0 | 0 | 0 | 0 | 55706 | 55706 | 0 |
| August | 0 | 584 | 36672 | 2056 | 133 | 7520 | 46965 | 0 | 0 | 0 | 0 | 0 | 0 | 46965 | 46965 | 0 |
| September | 0 | 585 | 33068 | 2056 | 133 | 7520 | 43362 | 0 | 0 | 0 | 0 | 0 | 0 | 43362 | 43362 | 0 |
| October | 0 | 2573 | 27011 | 18917 | 133 | 7520 | 56154 | 0 | 0 | 0 | 0 | 0 | 0 | 56154 | 56154 | 0 |
| November | 0 | 5962 | 35065 | 44054 | 133 | 7520 | 92735 | 0 | 0 | 0 | 0 | 0 | 0 | 92735 | 92735 | 0 |
| December | 0 | 7820 | 40251 | 56963 | 133 | 7520 | 112688 | 0 | 0 | 0 | 0 | 0 | 0 | 112688 | 112688 | 0 |
| Average | 0 | 3381 | 29661 | 25409 | 133 | 7520 | 66105 | 0 | 0 | 0 | 0 | 0 | 0 | 66105 | 66105 | 0 |
| Maximum | 0 | 11497 | 95269 | 111401 | 133 | 7520 | 208766 | 0 | 0 | 0 | 0 | 0 | 0 | 208766 | 208766 | 0 |
| Minimum | 0 | 575 | 5952 | 111 | 133 | 7520 | 14292 | 0 | 0 | 0 | 0 | 0 | 0 | 14292 | 14292 | 0 |
| Total for the whole year | | | | | | | | | | | | | | | | |
| TWh/year | 0,00 | 29,70 | 260,54 | 223,19 | 1,17 | 66,06 | 580,66 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 580,66 | 580,66 | 0,00 |

RES Share: 27,8 Percent of Primary Energy 58,3 Percent of Electricity 247,8 TWh electricity from RES

# Input NL 2050.txt

# The EnergyPLAN model 12.4

| | | | |
|---|---|---|---|
| Electricity demand (TWh/year): | | Flexible demand | 5,77 |
| Fixed demand | 110,50 | Fixed imp/exp. | -4,85 |
| Electric heating + HP | 6,54 | Transportation | 27,35 |
| Electric cooling | 1,47 | Total | 146,78 |

| District heating (TWh/year) | Gr.1 | Gr.2 | Gr.3 | Sum |
|---|---|---|---|---|
| District heating demand | 0,00 | 0,00 | 27,77 | 27,77 |
| Solar Thermal | 0,00 | 0,00 | 0,11 | 0,11 |
| Industrial CHP (CSHP) | 0,00 | 0,00 | 0,00 | 0,00 |
| Demand after solar and CSHP | 0,00 | 0,00 | 27,66 | 27,66 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Wind | 5229 | MW | 10,26 | TWh/year | 0,00 | Grid |
| Offshore Wind | 11865 | MW | 41,02 | TWh/year | 0,00 | stabili- |
| Photo Voltaic | 9921 | MW | 10,61 | TWh/year | 0,00 | sation |
| River Hydro | 37 | MW | 4,02 | TWh/year | 0,00 | share |
| Hydro Power | 0 | MW | 0 | TWh/year | | |
| Geothermal/Nuclear | 1568 | MW | 12,72 | TWh/year | | |

| | Capacities MW-e | Capacities MJ/s | Efficiencies elec. | Efficiencies Ther | COP |
|---|---|---|---|---|---|
| Group 2: | | | | | |
| CHP | 0 | 0 | 0,40 | 0,50 | |
| Heat Pump | 0 | 0 | | | 3,00 |
| Boiler | | 0 | | 0,50 | |
| Group 3: | | | | | |
| CHP | 10799 | 13216 | 0,41 | 0,51 | |
| Heat Pump | 0 | 0 | | | 3,00 |
| Boiler | | 14328 | | 0,90 | |
| Condensing | 23100 | | 0,63 | | |

| | | | | | |
|---|---|---|---|---|---|
| Heatstorage: | gr.2: | 0 | GWh | gr.3: | 0 GWh |
| Fixed Boiler: | gr.2: | 2,5 | Per cent | gr.3: | 5,0 Per cent |

| Electricity prod. from | CSHP | Waste | (TWh/year) |
|---|---|---|---|
| Gr.1: | 0,00 | 0,00 | |
| Gr.2: | 0,00 | 0,00 | |
| Gr.3: | 15,75 | 0,00 | |

| | | |
|---|---|---|
| Regulation Strategy: | Technical regulation no. 2 | |
| CEEP regulation | 23450000 | |
| Minimum Stabilisation share | 0,10 | |
| Stabilisation share of CHP | 0,00 | |
| Minimum CHP gr 3 load | 1404 | MW |
| Minimum PP | 1155 | MW |
| Heat Pump maximum share | 0,50 | |
| Maximum import/export | 0 | MW |

| | | |
|---|---|---|
| Distr. Name : | const.txt | |
| Addition factor | 0,00 | EUR/MWh |
| Multiplication factor | 1,00 | |
| Dependency factor | 0,00 | EUR/MWh pr. MW |
| Average Market Price | 1 | EUR/MWh |
| Gas Storage | 0 | GWh |
| Syngas capacity | 0 | MW |
| Biogas max to grid | 0 | MW |

Fuel Price level:

| | Capacities MW-e | Storage GWh | Efficiencies elec. | Ther. |
|---|---|---|---|---|
| Hydro Pump: | 0 | 0 | 0,00 | |
| Hydro Turbine: | 0 | | 0,00 | |
| Electrol. Gr.2: | 0 | 0 | 0,40 | 0,50 |
| Electrol. Gr.3: | 0 | 0 | 0,40 | 0,50 |
| Electrol. trans.: | 0 | 0 | 0,00 | |
| Ely. MicroCHP: | 0 | 0 | 0,80 | |
| CAES fuel ratio: | | 0,000 | | |

| (TWh/year) | Coal | Oil | Ngas | Biomass |
|---|---|---|---|---|
| Transport | 0,00 | 156,93 | 0,00 | 0,00 |
| Household | 0,00 | 1,13 | 61,56 | 18,52 |
| Industry | 24,84 | 3,77 | 71,16 | 23,17 |
| Various | 0,00 | 4,16 | 26,76 | 11,63 |

# Output WARNING!!: (1) Critical Excess;

| | District Heating | | | | | | | | | | Electricity | | | | | | | | | | | | | | | | Exchange | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Demand | Production | | | | | | | | | Consumption | | | | | | Production | | | | | | | Balance | | | | | |
| | Distr. heating MW | Solar MW | Waste+ CSHP MW | DHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Balance MW | Elec. demand MW | Flex.& Transp. MW | HP MW | Elec-trolyser MW | EH MW | Hydro Pump MW | Tur-bine MW | RES MW | Hy-dro MW | Geo-thermal MW | Waste+ CSHP MW | CHP MW | PP MW | Stab-Load % | Imp MW | Exp MW | CEEP MW | EEP MW | Payment Imp Million EUR | Payment Exp Million EUR |
| January | 6239 | 4 | 0 | 0 | 4537 | 0 | 0 | 2009 | 0 | -310 | 13778 | 3711 | 236 | 0 | 1303 | 0 | 0 | 9059 | 0 | 1581 | 1793 | 3708 | 3583 | 451 | 0 | 1248 | 1248 | 0 | 0 | 0 |
| February | 6153 | 6 | 0 | 0 | 5301 | 0 | 0 | 1156 | 0 | -310 | 13474 | 3798 | 233 | 0 | 1288 | 0 | 0 | 7013 | 0 | 1582 | 1793 | 4331 | 4267 | 536 | 0 | 744 | 744 | 0 | 0 | 0 |
| March | 5575 | 12 | 0 | 0 | 4406 | 0 | 0 | 1467 | 0 | -310 | 12825 | 3831 | 210 | 0 | 1159 | 0 | 0 | 8156 | 0 | 1577 | 1793 | 3601 | 3486 | 477 | 0 | 1139 | 1139 | 0 | 0 | 0 |
| April | 2063 | 18 | 0 | 0 | 2505 | 0 | 0 | 313 | 0 | -774 | 12037 | 3690 | 70 | 0 | 389 | 0 | 0 | 5622 | 0 | 1533 | 1793 | 2047 | 5053 | 554 | 0 | 413 | 413 | 0 | 0 | 0 |
| May | 776 | 21 | 0 | 0 | 1718 | 0 | 0 | 158 | 0 | -1121 | 11895 | 3831 | 20 | 0 | 109 | 0 | 0 | 7880 | 0 | 776 | 1793 | 1404 | 4451 | 433 | 0 | 1000 | 1000 | 0 | 0 | 0 |
| June | 776 | 22 | 0 | 0 | 1718 | 0 | 0 | 158 | 0 | -1122 | 12335 | 3812 | 20 | 0 | 108 | 0 | 0 | 6553 | 0 | 1111 | 1793 | 1404 | 5186 | 496 | 0 | 325 | 325 | 0 | 0 | 0 |
| July | 776 | 21 | 0 | 0 | 1718 | 0 | 0 | 158 | 0 | -1121 | 12434 | 3706 | 19 | 0 | 106 | 0 | 0 | 7110 | 0 | 1406 | 1793 | 1404 | 4766 | 482 | 0 | 767 | 767 | 0 | 0 | 0 |
| August | 776 | 18 | 0 | 0 | 1718 | 0 | 0 | 158 | 0 | -1118 | 12293 | 3830 | 20 | 0 | 108 | 0 | 0 | 5937 | 0 | 1546 | 1793 | 1404 | 5430 | 535 | 0 | 411 | 411 | 0 | 0 | 0 |
| September | 776 | 13 | 0 | 0 | 1718 | 0 | 0 | 158 | 0 | -1114 | 12541 | 3748 | 20 | 0 | 108 | 0 | 0 | 6704 | 0 | 1560 | 1793 | 1404 | 5071 | 496 | 0 | 666 | 666 | 0 | 0 | 0 |
| October | 2881 | 8 | 0 | 0 | 3336 | 0 | 0 | 182 | 0 | -646 | 12718 | 3770 | 103 | 0 | 569 | 0 | 0 | 4342 | 0 | 1571 | 1793 | 2726 | 6221 | 628 | 0 | 44 | 44 | 0 | 0 | 0 |
| November | 4959 | 4 | 0 | 0 | 3574 | 0 | 0 | 1691 | 0 | -310 | 13381 | 3812 | 186 | 0 | 1027 | 0 | 0 | 10390 | 0 | 1569 | 1793 | 2921 | 2711 | 372 | 0 | 1530 | 1530 | 0 | 0 | 0 |
| December | 6251 | 3 | 0 | 0 | 3597 | 0 | 0 | 2961 | 0 | -310 | 13278 | 3706 | 237 | 0 | 1308 | 0 | 0 | 11230 | 0 | 1578 | 1793 | 2939 | 2203 | 340 | 0 | 1767 | 1767 | 0 | 0 | 0 |
| Average | 3161 | 13 | 0 | 0 | 2981 | 0 | 0 | 883 | 0 | -715 | 12747 | 3771 | 114 | 0 | 631 | 0 | 0 | 7504 | 0 | 1449 | 1793 | 2436 | 4368 | 483 | 0 | 840 | 840 | 0 | Average price | |
| Maximum | 11940 | 80 | 0 | 0 | 11476 | 0 | 0 | 10148 | 0 | 0 | 17378 | 9640 | 462 | 0 | 2554 | 0 | 0 | 21723 | 0 | 1582 | 1793 | 9378 | 16914 | 915 | 0 | 18421 | 18421 | 0 | (EUR/MWh) | |
| Minimum | 309 | 0 | 0 | 0 | 1718 | 0 | 0 | 158 | 0 | -1567 | 94 | 0 | 0 | 0 | 0 | 0 | 0 | 457 | 0 | 766 | 1793 | 1404 | 1155 | 124 | 0 | 0 | 0 | 0 | 1 | 0 |
| TWh/year | 27,77 | 0,11 | 0,00 | 0,00 | 26,19 | 0,00 | 0,00 | 7,75 | 0,00 | -6,28 | 111,97 | 33,12 | 1,00 | 0,00 | 5,54 | 0,00 | 0,00 | 65,92 | 0,00 | 12,72 | 15,75 | 21,40 | 38,37 | | 0,00 | 7,37 | 7,37 | 0,00 | 0 | 2 |

| FUEL BALANCE (TWh/year): | DHP | CHP2 | CHP3 | Boiler2 | Boiler3 | PP | Geo/Nu. | Hydro | Waste | CAES Elc.ly. | BioCon-version | Electro-Fuel | Wind | Offsh. | PV | Hydro | Solar.Th | Transp. | Industry household | Industry Various | Total | Imp/Exp Corrected Imp/Exp | Imp/Exp Corrected Net | CO2 emission (Mt): Total | CO2 emission (Mt): Net |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Coal | - | - | 1,38 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 24,84 | 26,22 | 0,00 | 26,22 | 9,30 | 9,30 |
| Oil | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 156,93 | 1,13 | 7,93 | 165,99 | 0,00 | 165,99 | 43,56 | 43,56 |
| N.Gas | - | - | 39,61 | - | - | 60,90 | - | - | - | - | - | - | - | - | - | - | - | - | 61,56 | 97,92 | 259,99 | -11,71 | 248,28 | 53,26 | 50,86 |
| Biomass | - | - | 10,66 | - | 8,61 | - | - | - | - | - | 3,62 | - | - | - | - | - | - | - | 18,52 | 34,80 | 76,21 | 0,00 | 76,21 | 0,00 | 0,00 |
| Renewable | - | - | - | - | - | - | 3,06 | - | - | - | - | - | 10,26 | 41,02 | 10,61 | 0,01 | 0,11 | - | - | - | 69,08 | 0,00 | 69,08 | 0,00 | 0,00 |
| H2 etc. | - | - | 0,00 | - | 0,00 | 0,00 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Biofuel | - | - | 0,00 | - | - | - | - | - | - | - | -2,69 | - | - | - | - | - | - | 2,69 | - | - | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Nuclear/CCS | - | - | - | - | - | - | 32,22 | - | - | - | - | - | - | - | - | - | - | - | - | - | 32,22 | 0,00 | 32,22 | -2674,5 | -2674,53 |
| Total | - | - | 51,65 | - | 8,61 | 60,90 | 35,28 | - | - | - | 0,93 | - | 10,26 | 41,02 | 10,61 | 0,01 | 0,11 | 159,62 | 81,21 | 165,49 | 629,72 | -11,71 | 618,02 | -2568,4 | -2570,81 |

## District Heating Production

| | Gr.1 | | | | Gr.2 | | | | | | | | | | Gr.3 | | | | | | | | | | RES specification | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | District heating MW | Solar MW | CSHP MW | DHP MW | District heating MW | Solar MW | CSHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Stor-age MW | Ba-lance MW | District heating MW | Solar MW | CSHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Stor-age MW | Ba-lance MW | RES1 Wind MW | RES2 Offsho MW | RES3 Photo MW | RES 4-7 MW | Total MW |
| January | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6239 | 4 | 0 | 4537 | 0 | 0 | 2009 | 0 | 0 | -310 | 1783 | 6492 | 327 | 457 | 9059 |
| February | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6153 | 6 | 0 | 5301 | 0 | 0 | 1156 | 0 | 0 | -310 | 1211 | 4768 | 561 | 473 | 7013 |
| March | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5575 | 12 | 0 | 4406 | 0 | 0 | 1467 | 0 | 0 | -310 | 1358 | 5213 | 1128 | 457 | 8156 |
| April | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2063 | 18 | 0 | 2505 | 0 | 0 | 313 | 0 | 0 | -774 | 617 | 2697 | 1851 | 457 | 5622 |
| May | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 776 | 21 | 0 | 1718 | 0 | 0 | 158 | 0 | 0 | -1121 | 1046 | 4294 | 2083 | 457 | 7880 |
| June | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 776 | 22 | 0 | 1718 | 0 | 0 | 158 | 0 | 0 | -1122 | 717 | 3243 | 2137 | 457 | 6553 |
| July | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 776 | 21 | 0 | 1718 | 0 | 0 | 158 | 0 | 0 | -1121 | 877 | 3762 | 2013 | 457 | 7110 |
| August | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 776 | 18 | 0 | 1718 | 0 | 0 | 158 | 0 | 0 | -1118 | 673 | 3081 | 1726 | 457 | 5937 |
| September | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 776 | 13 | 0 | 1718 | 0 | 0 | 158 | 0 | 0 | -1114 | 941 | 4047 | 1259 | 457 | 6704 |
| October | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2881 | 8 | 0 | 3336 | 0 | 0 | 182 | 0 | 0 | -646 | 537 | 2580 | 768 | 457 | 4342 |
| November | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4959 | 4 | 0 | 3574 | 0 | 0 | 1691 | 0 | 0 | -310 | 2025 | 7551 | 358 | 457 | 10390 |
| December | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6251 | 3 | 0 | 3597 | 0 | 0 | 2961 | 0 | 0 | -310 | 2228 | 8276 | 269 | 457 | 11230 |
| Average | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3161 | 13 | 0 | 2981 | 0 | 0 | 883 | 0 | 0 | -715 | 1169 | 4670 | 1208 | 458 | 7504 |
| Maximum | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 11940 | 80 | 0 | 11476 | 0 | 0 | 10148 | 0 | 0 | 0 | 3353 | 10239 | 9921 | 494 | 21723 |
| Minimum | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 309 | 0 | 0 | 1718 | 0 | 0 | 158 | 0 | 0 | -1567 | 0 | 0 | 0 | 457 | 457 |
| Total for the whole year | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TWh/year | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | | 0,00 | 27,77 | 0,11 | 0,00 | 26,19 | 0,00 | 0,00 | 7,75 | 0,00 | | -6,28 | 10,26 | 41,02 | 10,61 | 4,02 | 65,92 |

Own use of heat from industrial CHP: 0,00 TWh/year

ANNUAL COSTS (Million EUR)

| | |
|---|---|
| Total Fuel ex Ngas exchange = | 9794 |
| Uranium = | 203 |
| Coal = | 245 |
| FuelOil = | 193 |
| Gasoil/Diesel= | 2228 |
| Petrol/JP = | 3630 |
| Gas handling = | 1371 |
| Biomass = | 1923 |
| Food income = | 0 |
| Waste = | 0 |
| Total Ngas Exchange costs = | 6477 |
| Marginal operation costs = | 351 |
| Total Electricity exchange = | -4 |
| Import = | 0 |
| Export = | -2 |
| Bottleneck = | 2 |
| Fixed imp/ex= | -4 |
| Total CO2 emission costs = | -39040 |
| Total variable costs = | -22422 |
| Fixed operation costs = | 1742 |
| Annual Investment costs = | 3888 |
| TOTAL ANNUAL COSTS = | -16792 |

## NATURAL GAS EXCHANGE

| | DHP & Boilers MW | CHP2 CHP3 MW | PP CAES MW | Indi-vidual MW | Trans port MW | Indu. Var. MW | Demand Sum MW | Bio-gas MW | Syn-gas MW | CO2Hy gas MW | SynHy gas MW | SynHy gas MW | Stor-age MW | Sum MW | Im-port MW | Ex-port MW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| January | 0 | 6863 | 5687 | 14502 | 0 | 11148 | 38199 | 0 | 0 | 0 | 0 | 0 | 0 | 38199 | 38199 | 0 |
| February | 0 | 8017 | 6773 | 14293 | 0 | 11148 | 40231 | 0 | 0 | 0 | 0 | 0 | 0 | 40231 | 40231 | 0 |
| March | 0 | 6665 | 5533 | 12884 | 0 | 11148 | 36229 | 0 | 0 | 0 | 0 | 0 | 0 | 36229 | 36229 | 0 |
| April | 0 | 3789 | 8020 | 4333 | 0 | 11148 | 27290 | 0 | 0 | 0 | 0 | 0 | 0 | 27290 | 27290 | 0 |
| May | 0 | 2598 | 7064 | 1199 | 0 | 11148 | 22010 | 0 | 0 | 0 | 0 | 0 | 0 | 22010 | 22010 | 0 |
| June | 0 | 2598 | 8232 | 1199 | 0 | 11148 | 23178 | 0 | 0 | 0 | 0 | 0 | 0 | 23178 | 23178 | 0 |
| July | 0 | 2598 | 7566 | 1199 | 0 | 11148 | 22511 | 0 | 0 | 0 | 0 | 0 | 0 | 22511 | 22511 | 0 |
| August | 0 | 2598 | 8620 | 1199 | 0 | 11148 | 23565 | 0 | 0 | 0 | 0 | 0 | 0 | 23565 | 23565 | 0 |
| September | 0 | 2598 | 8049 | 1199 | 0 | 11148 | 22994 | 0 | 0 | 0 | 0 | 0 | 0 | 22994 | 22994 | 0 |
| October | 0 | 5046 | 9875 | 6325 | 0 | 11148 | 32393 | 0 | 0 | 0 | 0 | 0 | 0 | 32393 | 32393 | 0 |
| November | 0 | 5406 | 4302 | 11385 | 0 | 11148 | 32241 | 0 | 0 | 0 | 0 | 0 | 0 | 32241 | 32241 | 0 |
| December | 0 | 5440 | 3497 | 14529 | 0 | 11148 | 34614 | 0 | 0 | 0 | 0 | 0 | 0 | 34614 | 34614 | 0 |
| Average | 0 | 4509 | 6933 | 7008 | 0 | 11148 | 29598 | 0 | 0 | 0 | 0 | 0 | 0 | 29598 | 29598 | 0 |
| Maximum | 0 | 17358 | 26847 | 28381 | 0 | 11148 | 71873 | 0 | 0 | 0 | 0 | 0 | 0 | 71873 | 71873 | 0 |
| Minimum | 0 | 2598 | 1833 | 65 | 0 | 11148 | 15645 | 0 | 0 | 0 | 0 | 0 | 0 | 15645 | 15645 | 0 |
| Total for the whole year | | | | | | | | | | | | | | | | |
| TWh/year | 0,00 | 39,61 | 60,90 | 61,56 | 0,00 | 97,92 | 259,99 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 259,99 | 259,99 | 0,00 |

RES Share: 23,1 Percent of Primary Energy 42,5 Percent of Electricity 73,4 TWh electricity from RES

# Input PL 2050.txt

# The EnergyPLAN model 12.4

| | | | |
|---|---|---|---|
| Electricity demand (TWh/year): | | Flexible demand | 7,57 |
| Fixed demand | 155,37 | Fixed imp/exp. | -36,31 |
| Electric heating + HP | 25,07 | Transportation | 44,08 |
| Electric cooling | 3,88 | Total | 199,66 |

| District heating (TWh/year) | Gr.1 | Gr.2 | Gr.3 | Sum |
|---|---|---|---|---|
| District heating demand | 0,00 | 0,00 | 62,27 | 62,27 |
| Solar Thermal | 0,00 | 0,00 | 3,58 | 3,58 |
| Industrial CHP (CSHP) | 0,00 | 0,00 | 0,00 | 0,00 |
| Demand after solar and CSHP | 0,00 | 0,00 | 58,69 | 58,69 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Wind | 28113 | MW | 52,42 | TWh/year | 0,00 | Grid |
| Offshore Wind | 912 | MW | 3 | TWh/year | 0,00 | stabili- |
| Photo Voltaic | 16886 | MW | 17,92 | TWh/year | 0,00 | sation |
| River Hydro | 452 | MW | 2,01 | TWh/year | 0,00 | share |
| Hydro Power | 2112 | MW | 6,71 | TWh/year | | |
| Geothermal/Nuclear | 6087 | MW | 49,08 | TWh/year | | |

| | Capacities MW-e | MJ/s | Efficiencies elec. | Ther | COP |
|---|---|---|---|---|---|
| Group 2: | | | | | |
| CHP | 0 | 0 | 0,40 | 0,50 | |
| Heat Pump | 0 | 0 | | | 3,00 |
| Boiler | | 0 | | 0,50 | |
| Group 3: | | | | | |
| CHP | 14191 | 16864 | 0,34 | 0,41 | |
| Heat Pump | 0 | 0 | | | 3,00 |
| Boiler | | 33204 | | 0,87 | |
| Condensing | 42600 | | 0,46 | | |

| | | | | | |
|---|---|---|---|---|---|
| Heatstorage: | gr.2: | 0 | GWh | gr.3: | 0 GWh |
| Fixed Boiler: | gr.2: | 2,5 | Per cent | gr.3: | 5,0 Per cent |

| Electricity prod. from | CSHP | Waste | (TWh/year) |
|---|---|---|---|
| Gr.1: | 0,00 | 0,00 | |
| Gr.2: | 0,00 | 0,00 | |
| Gr.3: | 10,40 | 0,00 | |

| | | |
|---|---|---|
| Regulation Strategy: | Technical regulation no. 2 | |
| CEEP regulation | 23450000 | |
| Minimum Stabilisation share | 0,10 | |
| Stabilisation share of CHP | 0,00 | |
| Minimum CHP gr 3 load | 1419 | MW |
| Minimum PP | 0 | MW |
| Heat Pump maximum share | 0,50 | |
| Maximum import/export | 0 | MW |

| | | |
|---|---|---|
| Distr. Name : | const.txt | |
| Addition factor | 0,00 | EUR/MWh |
| Multiplication factor | 1,00 | |
| Dependency factor | 0,00 | EUR/MWh pr. MW |
| Average Market Price | 1 | EUR/MWh |
| Gas Storage | 0 | GWh |
| Syngas capacity | 0 | MW |
| Biogas max to grid | 0 | MW |

Fuel Price level:

| | Capacities MW-e | Storage GWh | Efficiencies elec. | Ther. |
|---|---|---|---|---|
| Hydro Pump: | 1782 | 18 | 0,00 | |
| Hydro Turbine: | 1782 | | 0,00 | |
| Electrol. Gr.2: | 0 | 0 | 0,40 | 0,50 |
| Electrol. Gr.3: | 0 | 0 | 0,40 | 0,50 |
| Electrol. trans.: | 0 | 0 | 0,00 | |
| Ely. MicroCHP: | 0 | 0 | 0,80 | |
| CAES fuel ratio: | 0,000 | | | |

| (TWh/year) | Coal | Oil | Ngas | Biomass |
|---|---|---|---|---|
| Transport | 0,00 | 264,70 | 0,00 | 0,00 |
| Household | 0,00 | 0,47 | 56,87 | 9,16 |
| Industry | 49,36 | 12,24 | 38,98 | 66,39 |
| Various | 14,67 | 20,99 | 0,41 | 13,78 |

# Output WARNING!!: (1) Critical Excess;

| | District Heating | | | | | | | | | | Electricity | | | | | | | | | | | | | | | | Exchange | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Demand | Production | | | | | | | | | Consumption | | | | | | Production | | | | | | | Balance | | | | | |
| | Distr. heating MW | Solar MW | Waste+ CSHP MW | DHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Balance MW | Elec. demand MW | Flex.& Transp. MW | HP MW | Elec-trolyser MW | EH MW | Hydro Pump MW | Tur-bine MW | RES MW | Hy-dro MW | Geo-thermal MW | Waste+ CSHP MW | CHP MW | PP MW | Stab-Load % | Imp MW | Exp MW | CEEP MW | EEP MW | Payment Imp Million EUR | Payment Exp Million EUR |
| January | 14205 | 122 | 0 | 0 | 8536 | 0 | 0 | 5763 | 0 | -215 | 19025 | 5784 | 453 | 0 | 5581 | 0 | 0 | 12091 | 844 | 5587 | 1184 | 7183 | 2104 | 552 | 0 | 2284 | 2284 | 0 | 0 | 0 |
| February | 13638 | 198 | 0 | 0 | 10631 | 0 | 0 | 3028 | 0 | -219 | 19050 | 5924 | 434 | 0 | 5349 | 0 | 0 | 7541 | 630 | 5587 | 1184 | 8945 | 3347 | 673 | 0 | 611 | 611 | 0 | 0 | 0 |
| March | 11828 | 391 | 0 | 0 | 8711 | 0 | 0 | 2945 | 0 | -219 | 18495 | 5978 | 373 | 0 | 4600 | 0 | 0 | 9933 | 679 | 5587 | 1184 | 7330 | 1711 | 588 | 0 | 1113 | 1113 | 0 | 0 | 0 |
| April | 4378 | 585 | 0 | 0 | 3298 | 0 | 0 | 1040 | 0 | -545 | 17388 | 5751 | 122 | 0 | 1510 | 0 | 0 | 9658 | 570 | 5587 | 1184 | 2775 | 2116 | 535 | 0 | 1254 | 1254 | 0 | 0 | 0 |
| May | 2052 | 675 | 0 | 0 | 1838 | 0 | 0 | 369 | 0 | -829 | 17135 | 5978 | 45 | 0 | 557 | 0 | 0 | 7956 | 467 | 5587 | 1184 | 1546 | 3640 | 580 | 0 | 799 | 799 | 0 | 0 | 0 |
| June | 2052 | 703 | 0 | 0 | 1841 | 0 | 0 | 358 | 0 | -849 | 17326 | 5948 | 45 | 0 | 557 | 0 | 0 | 6700 | 669 | 5587 | 1184 | 1549 | 4337 | 631 | 0 | 284 | 284 | 0 | 0 | 0 |
| July | 2052 | 706 | 0 | 0 | 1824 | 0 | 0 | 377 | 0 | -854 | 18028 | 5775 | 45 | 0 | 557 | 0 | 0 | 8640 | 778 | 5587 | 1184 | 1535 | 3781 | 581 | 0 | 1234 | 1234 | 0 | 0 | 0 |
| August | 2052 | 586 | 0 | 0 | 1863 | 0 | 0 | 361 | 0 | -758 | 17854 | 5977 | 45 | 0 | 557 | 0 | 0 | 6236 | 874 | 5587 | 1184 | 1567 | 5011 | 654 | 0 | 160 | 160 | 0 | 0 | 0 |
| September | 2052 | 444 | 0 | 0 | 1874 | 0 | 0 | 379 | 0 | -644 | 17685 | 5844 | 45 | 0 | 557 | 0 | 0 | 7006 | 842 | 5587 | 1184 | 1577 | 4577 | 624 | 0 | 774 | 774 | 0 | 0 | 0 |
| October | 6515 | 261 | 0 | 0 | 5642 | 0 | 0 | 968 | 0 | -356 | 18300 | 5880 | 196 | 0 | 2411 | 0 | 0 | 6074 | 803 | 5587 | 1184 | 4748 | 4615 | 681 | 0 | 359 | 359 | 0 | 0 | 0 |
| November | 10990 | 127 | 0 | 0 | 7850 | 0 | 0 | 3232 | 0 | -219 | 18923 | 5948 | 345 | 0 | 4254 | 0 | 0 | 9979 | 844 | 5587 | 1184 | 6605 | 2869 | 598 | 0 | 1733 | 1733 | 0 | 0 | 0 |
| December | 13390 | 88 | 0 | 0 | 8057 | 0 | 0 | 5463 | 0 | -219 | 18366 | 5777 | 426 | 0 | 5246 | 0 | 0 | 11036 | 1154 | 5587 | 1184 | 6780 | 1489 | 544 | 0 | 1549 | 1549 | 0 | 0 | 0 |
| Average | 7089 | 408 | 0 | 0 | 5150 | 0 | 0 | 2026 | 0 | -495 | 18130 | 5880 | 214 | 0 | 2640 | 0 | 0 | 8579 | 764 | 5587 | 1184 | 4333 | 3298 | 603 | 0 | 1015 | 1015 | 0 | Average price | |
| Maximum | 27670 | 2340 | 0 | 0 | 16864 | 0 | 0 | 25466 | 0 | 0 | 24089 | 15919 | 905 | 0 | 11153 | 0 | 0 | 36569 | 1846 | 5587 | 1184 | 14191 | 19031 | 957 | 0 | 22167 | 22167 | 0 | (EUR/MWh) | |
| Minimum | 778 | 0 | 0 | 0 | 1686 | 0 | 0 | 354 | 0 | -1686 | 247 | 0 | 0 | 0 | 0 | 0 | 0 | 253 | 0 | 5587 | 1184 | 1419 | 0 | 157 | 0 | 0 | 0 | 0 | 1 | 0 |
| TWh/year | 62,27 | 3,58 | 0,00 | 0,00 | 45,23 | 0,00 | 0,00 | 17,80 | 0,00 | -4,34 | 159,25 | 51,65 | 1,88 | 0,00 | 23,19 | 0,00 | 0,00 | 75,36 | 6,71 | 49,08 | 10,40 | 38,06 | 28,97 | | 0,00 | 8,92 | 8,92 | 0,00 | 0 | 1 |

| FUEL BALANCE (TWh/year): | DHP | CHP2 | CHP3 | Boiler2 | Boiler3 | PP | Geo/Nu. | Hydro | Waste | CAES Elc.ly. | BioCon-version | Electro-Fuel | Wind | Offsh. | PV | Hydro | Solar.Th | Transp. | Industry household | Industry Various | Total | Imp/Exp Corrected Imp/Exp | Imp/Exp Corrected Net | CO2 emission (Mt): Total | CO2 emission (Mt): Net |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Coal | - | - | 23,47 | - | 13,46 | 62,97 | - | - | - | - | - | - | - | - | - | - | - | - | - | 64,03 | 163,93 | -19,38 | 144,55 | 58,13 | 51,26 |
| Oil | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 264,70 | 0,47 | 33,23 | 298,40 | 0,00 | 298,40 | 78,31 | 78,31 |
| N.Gas | - | - | 23,92 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 56,87 | 39,39 | 120,18 | 0,00 | 120,18 | 24,62 | 24,62 |
| Biomass | - | - | 63,75 | - | 7,00 | - | - | - | - | - | 8,72 | - | - | - | - | - | - | - | 9,16 | 80,17 | 168,79 | 0,00 | 168,79 | 0,00 | 0,00 |
| Renewable | - | - | - | - | - | - | 0,72 | 6,71 | - | - | - | - | 52,42 | 3,00 | 17,92 | 2,01 | 3,58 | - | - | - | 86,37 | 0,00 | 86,37 | 0,00 | 0,00 |
| H2 etc. | - | - | 0,00 | - | 0,00 | 0,00 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Biofuel | - | - | 0,00 | - | 0,00 | - | - | - | - | - | -5,75 | - | - | - | - | - | - | 5,75 | - | - | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Nuclear/CCS | - | - | - | - | - | - | 161,19 | - | - | - | - | - | - | - | - | - | - | - | - | - | 161,19 | 0,00 | 161,19 | -48027, | -48027,86 |
| Total | - | - | 111,14 | - | 20,46 | 62,97 | 161,91 | 6,71 | - | - | 2,97 | - | 52,42 | 3,00 | 17,92 | 2,01 | 3,58 | 270,45 | 66,50 | 216,82 | 998,87 | -19,38 | 979,49 | -47866, | -47873,67 |

District Heating Production

| | Gr.1 | | | | Gr.2 | | | | | | | | | | Gr.3 | | | | | | | | | | RES specification | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | District heating MW | Solar MW | CSHP MW | DHP MW | District heating MW | Solar MW | CSHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Stor-age MW | Ba-lance MW | District heating MW | Solar MW | CSHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Stor-age MW | Ba-lance MW | RES1 Wind MW | RES2 Offsho MW | RES3 Photo MW | RES 4-7 MW | Total ic MW |
| January | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14205 | 122 | 0 | 8536 | 0 | 0 | 5763 | 0 | 0 | -215 | 10759 | 433 | 555 | 343 | 12091 |
| February | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 13638 | 198 | 0 | 10631 | 0 | 0 | 3028 | 0 | 0 | -219 | 5930 | 359 | 920 | 332 | 7541 |
| March | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 11828 | 391 | 0 | 8711 | 0 | 0 | 2945 | 0 | 0 | -219 | 7248 | 381 | 1948 | 356 | 9933 |
| April | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4378 | 585 | 0 | 3298 | 0 | 0 | 1040 | 0 | 0 | -545 | 5907 | 250 | 3112 | 388 | 9658 |
| May | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2052 | 675 | 0 | 1838 | 0 | 0 | 369 | 0 | 0 | -829 | 3815 | 356 | 3472 | 313 | 7956 |
| June | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2052 | 703 | 0 | 1841 | 0 | 0 | 358 | 0 | 0 | -849 | 2573 | 243 | 3626 | 257 | 6700 |
| July | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2052 | 706 | 0 | 1824 | 0 | 0 | 377 | 0 | 0 | -854 | 4709 | 286 | 3515 | 130 | 8640 |
| August | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2052 | 586 | 0 | 1863 | 0 | 0 | 361 | 0 | 0 | -758 | 2974 | 235 | 2934 | 93 | 6236 |
| September | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2052 | 444 | 0 | 1874 | 0 | 0 | 379 | 0 | 0 | -644 | 4499 | 289 | 2127 | 91 | 7006 |
| October | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6515 | 261 | 0 | 5642 | 0 | 0 | 968 | 0 | 0 | -356 | 4408 | 277 | 1281 | 109 | 6074 |
| November | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10990 | 127 | 0 | 7850 | 0 | 0 | 3232 | 0 | 0 | -219 | 8783 | 467 | 570 | 160 | 9979 |
| December | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 13390 | 88 | 0 | 8057 | 0 | 0 | 5463 | 0 | 0 | -219 | 9942 | 526 | 388 | 180 | 11036 |
| Average | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7089 | 408 | 0 | 5150 | 0 | 0 | 2026 | 0 | 0 | -495 | 5968 | 342 | 2040 | 229 | 8579 |
| Maximum | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 27670 | 2340 | 0 | 16864 | 0 | 0 | 25466 | 0 | 0 | 0 | 24453 | 631 | 16886 | 452 | 36569 |
| Minimum | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 778 | 0 | 0 | 1686 | 0 | 0 | 354 | 0 | 0 | -1686 | 4 | 0 | 0 | 0 | 253 |
| Total for the whole year | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TWh/year | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | | 0,00 | 62,27 | 3,58 | 0,00 | 45,23 | 0,00 | 0,00 | 17,80 | 0,00 | | -4,34 | 52,42 | 3,00 | 17,92 | 2,01 | 75,36 |

Own use of heat from industrial CHP: 0,00 TWh/year

ANNUAL COSTS (Million EUR)

| | |
|---|---|
| Total Fuel ex Ngas exchange = | 18944 |
| Uranium = | 1015 |
| Coal = | 1534 |
| FuelOil = | 807 |
| Gasoil/Diesel= | 7971 |
| Petrol/JP = | 2544 |
| Gas handling = | 967 |
| Biomass = | 4104 |
| Food income = | 0 |
| Waste = | 0 |
| Total Ngas Exchange costs = | 2994 |
| Marginal operation costs = | 926 |
| Total Electricity exchange = | -32 |
| Import = | 0 |
| Export = | -1 |
| Bottleneck = | 1 |
| Fixed imp/ex= | -32 |
| Total CO2 emission costs = | -727575 |
| Total variable costs = | -704744 |
| Fixed operation costs = | 2648 |
| Annual Investment costs = | 6072 |
| TOTAL ANNUAL COSTS = | -696025 |

NATURAL GAS EXCHANGE

| | DHP & Boilers MW | CHP2 CHP3 MW | PP CAES MW | Indi-vidual MW | Trans port MW | Indu. Var. MW | Demand Sum MW | Bio-gas MW | Syn-gas MW | CO2Hy gas MW | SynHy gas MW | SynHy gas MW | Stor-age MW | Sum MW | Im-port MW | Ex-port MW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| January | 0 | 4514 | 0 | 13687 | 0 | 4484 | 22686 | 0 | 0 | 0 | 0 | 0 | 0 | 22686 | 22686 | 0 |
| February | 0 | 5622 | 0 | 13117 | 0 | 4484 | 23223 | 0 | 0 | 0 | 0 | 0 | 0 | 23223 | 23223 | 0 |
| March | 0 | 4607 | 0 | 11281 | 0 | 4484 | 20372 | 0 | 0 | 0 | 0 | 0 | 0 | 20372 | 20372 | 0 |
| April | 0 | 1744 | 0 | 3725 | 0 | 4484 | 9953 | 0 | 0 | 0 | 0 | 0 | 0 | 9953 | 9953 | 0 |
| May | 0 | 972 | 0 | 1366 | 0 | 4484 | 6822 | 0 | 0 | 0 | 0 | 0 | 0 | 6822 | 6822 | 0 |
| June | 0 | 973 | 0 | 1366 | 0 | 4484 | 6824 | 0 | 0 | 0 | 0 | 0 | 0 | 6824 | 6824 | 0 |
| July | 0 | 965 | 0 | 1366 | 0 | 4484 | 6815 | 0 | 0 | 0 | 0 | 0 | 0 | 6815 | 6815 | 0 |
| August | 0 | 985 | 0 | 1366 | 0 | 4484 | 6835 | 0 | 0 | 0 | 0 | 0 | 0 | 6835 | 6835 | 0 |
| September | 0 | 991 | 0 | 1366 | 0 | 4484 | 6841 | 0 | 0 | 0 | 0 | 0 | 0 | 6841 | 6841 | 0 |
| October | 0 | 2984 | 0 | 5893 | 0 | 4484 | 13361 | 0 | 0 | 0 | 0 | 0 | 0 | 13361 | 13361 | 0 |
| November | 0 | 4151 | 0 | 10431 | 0 | 4484 | 19067 | 0 | 0 | 0 | 0 | 0 | 0 | 19067 | 19067 | 0 |
| December | 0 | 4261 | 0 | 12865 | 0 | 4484 | 21611 | 0 | 0 | 0 | 0 | 0 | 0 | 21611 | 21611 | 0 |
| Average | 0 | 2723 | 0 | 6474 | 0 | 4484 | 13682 | 0 | 0 | 0 | 0 | 0 | 0 | 13682 | 13682 | 0 |
| Maximum | 0 | 8919 | 0 | 27350 | 0 | 4484 | 40468 | 0 | 0 | 0 | 0 | 0 | 0 | 40468 | 40468 | 0 |
| Minimum | 0 | 892 | 0 | 74 | 0 | 4484 | 5450 | 0 | 0 | 0 | 0 | 0 | 0 | 5450 | 5450 | 0 |
| Total for the whole year | | | | | | | | | | | | | | | | |
| TWh/year | 0,00 | 23,92 | 0,00 | 56,87 | 0,00 | 39,39 | 120,18 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 120,18 | 120,18 | 0,00 |

RES Share: 25,5 Percent of Primary Energy 49,2 Percent of Electricity 104,6 TWh electricity from RES

# Input RO 2050.txt

# The EnergyPLAN model 12.4

| | | | |
|---|---|---|---|
| Electricity demand (TWh/year): | | Flexible demand | 3,85 |
| Fixed demand | 61,59 | Fixed imp/exp. | -5,27 |
| Electric heating + HP | 5,80 | Transportation | 12,12 |
| Electric cooling | 2,27 | Total | 80,36 |

| District heating (TWh/year) | Gr.1 | Gr.2 | Gr.3 | Sum |
|---|---|---|---|---|
| District heating demand | 0,00 | 0,00 | 18,34 | 18,34 |
| Solar Thermal | 0,00 | 0,00 | 0,00 | 0,00 |
| Industrial CHP (CSHP) | 0,00 | 0,00 | 0,00 | 0,00 |
| Demand after solar and CSHP | 0,00 | 0,00 | 18,34 | 18,34 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Wind | 4589 | MW | 8,32 | TWh/year | 0,00 | Grid |
| Offshore Wind | 825 | MW | 2,67 | TWh/year | 0,00 | stabili- |
| Photo Voltaic | 4434 | MW | 5,3 | TWh/year | 0,00 | sation |
| River Hydro | 0 | MW | 0 | TWh/year | 0,00 | share |
| Hydro Power | 6344 | MW | 19,55 | TWh/year | | |
| Geothermal/Nuclear | 2003 | MW | 16,1 | TWh/year | | |

| | Capacities | | Efficiencies | | |
|---|---|---|---|---|---|
| Group 2: | MW-e | MJ/s | elec. | Ther | COP |
| CHP | 0 | 0 | 0,40 | 0,50 | |
| Heat Pump | 0 | 0 | | | 3,00 |
| Boiler | | 0 | | 0,50 | |
| Group 3: | | | | | |
| CHP | 6533 | 8144 | 0,39 | 0,49 | |
| Heat Pump | 0 | 0 | | | 3,00 |
| Boiler | | 9575 | | 0,90 | |
| Condensing | 11800 | | 0,42 | | |

| | | | | | |
|---|---|---|---|---|---|
| Heatstorage: | gr.2: | 0 | GWh | gr.3: | 0 GWh |
| Fixed Boiler: | gr.2: | 2,5 | Per cent | gr.3: | 5,0 Per cent |

| Electricity prod. from | CSHP | Waste | (TWh/year) |
|---|---|---|---|
| Gr.1: | 0,00 | 0,00 | |
| Gr.2: | 0,00 | 0,00 | |
| Gr.3: | 2,37 | 0,00 | |

| | | |
|---|---|---|
| Regulation Strategy: | Technical regulation no. 2 | |
| CEEP regulation | 23450000 | |
| Minimum Stabilisation share | 0,10 | |
| Stabilisation share of CHP | 0,00 | |
| Minimum CHP gr 3 load | 784 | MW |
| Minimum PP | 590 | MW |
| Heat Pump maximum share | 0,50 | |
| Maximum import/export | 0 | MW |

| | | |
|---|---|---|
| Distr. Name : | const.txt | |
| Addition factor | 0,00 | EUR/MWh |
| Multiplication factor | 1,00 | |
| Dependency factor | 0,00 | EUR/MWh pr. MW |
| Average Market Price | 1 | EUR/MWh |
| Gas Storage | 0 | GWh |
| Syngas capacity | 0 | MW |
| Biogas max to grid | 0 | MW |

Fuel Price level:

| | Capacities | Storage | Efficiencies | |
|---|---|---|---|---|
| | MW-e | GWh | elec. | Ther. |
| Hydro Pump: | 92 | 1 | 0,00 | |
| Hydro Turbine: | 92 | | 0,00 | |
| Electrol. Gr.2: | 0 | 0 | 0,40 | 0,50 |
| Electrol. Gr.3: | 0 | 0 | 0,40 | 0,50 |
| Electrol. trans.: | 0 | 0 | 0,00 | |
| Ely. MicroCHP: | 0 | 0 | 0,80 | |
| CAES fuel ratio: | | 0,000 | | |

| (TWh/year) | Coal | Oil | Ngas | Biomass |
|---|---|---|---|---|
| Transport | 0,00 | 83,80 | 0,00 | 0,00 |
| Household | 0,00 | 0,00 | 26,11 | 2,82 |
| Industry | 0,10 | 7,28 | 14,30 | 12,84 |
| Various | 0,09 | 2,63 | 0,85 | 0,69 |

# Output WARNING!!: (1) Critical Excess;

| | District Heating | | | | | | | | | | Electricity | | | | | | | | | | | | | | | Exchange | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Demand | Production | | | | | | | | | Consumption | | | | | | Production | | | | | | | | Balance | | |
| | Distr. heating MW | Solar MW | Waste+ CSHP MW | DHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Balance MW | Elec. demand MW | Flex.& Transp. MW | HP MW | Elec-trolyser MW | EH MW | Hydro Pump MW | Tur-bine MW | RES MW | Hy-dro MW | Geo-thermal MW | Waste+ CSHP MW | CHP MW | PP MW | Stab-Load % | Imp MW | Exp MW | CEEP MW | EEP MW | Payment Imp Million EUR | Payment Exp Million EUR |
| January | 4219 | 0 | 0 | 0 | 3864 | 0 | 0 | 467 | 0 | -112 | 7851 | 1792 | 0 | 0 | 1535 | 0 | 0 | 1910 | 2436 | 1949 | 270 | 3100 | 953 | 788 | 0 | 39 | 39 | 0 | 0 | 0 |
| February | 3867 | 0 | 0 | 0 | 3648 | 0 | 0 | 332 | 0 | -112 | 8006 | 1830 | 0 | 0 | 1389 | 0 | 0 | 2038 | 2566 | 1943 | 270 | 2926 | 895 | 782 | 0 | 11 | 11 | 0 | 0 | 0 |
| March | 3007 | 0 | 0 | 0 | 2771 | 0 | 0 | 348 | 0 | -113 | 7570 | 1845 | 0 | 0 | 1039 | 0 | 0 | 2192 | 2365 | 1867 | 270 | 2223 | 954 | 751 | 0 | 17 | 17 | 0 | 0 | 0 |
| April | 1272 | 0 | 0 | 0 | 1239 | 0 | 0 | 262 | 0 | -229 | 6921 | 1782 | 0 | 0 | 324 | 0 | 0 | 2438 | 2099 | 1856 | 270 | 994 | 818 | 696 | 0 | 48 | 48 | 0 | 0 | 0 |
| May | 780 | 0 | 0 | 0 | 979 | 0 | 0 | 105 | 0 | -303 | 6694 | 1845 | 0 | 0 | 124 | 0 | 0 | 1645 | 2400 | 1215 | 270 | 785 | 1753 | 778 | 0 | 5 | 5 | 0 | 0 | 0 |
| June | 780 | 0 | 0 | 0 | 979 | 0 | 0 | 105 | 0 | -303 | 7030 | 1837 | 0 | 0 | 124 | 0 | 0 | 1739 | 2502 | 1769 | 270 | 785 | 1336 | 776 | 0 | 12 | 12 | 0 | 0 | 0 |
| July | 780 | 0 | 0 | 0 | 979 | 0 | 0 | 105 | 0 | -303 | 7332 | 1789 | 0 | 0 | 124 | 0 | 0 | 1642 | 2405 | 1868 | 270 | 785 | 1681 | 795 | 0 | 6 | 6 | 0 | 0 | 0 |
| August | 780 | 0 | 0 | 0 | 979 | 0 | 0 | 104 | 0 | -303 | 7133 | 1845 | 0 | 0 | 124 | 0 | 0 | 1815 | 1704 | 1863 | 270 | 785 | 2066 | 767 | 0 | 1 | 1 | 0 | 0 | 0 |
| September | 780 | 0 | 0 | 0 | 979 | 0 | 0 | 105 | 0 | -303 | 6941 | 1808 | 0 | 0 | 126 | 0 | 0 | 1873 | 1998 | 1882 | 270 | 785 | 1488 | 749 | 0 | 21 | 21 | 0 | 0 | 0 |
| October | 1752 | 0 | 0 | 0 | 1783 | 0 | 0 | 164 | 0 | -195 | 7086 | 1818 | 0 | 0 | 521 | 0 | 0 | 1666 | 2544 | 1931 | 270 | 1430 | 1008 | 783 | 0 | 25 | 25 | 0 | 0 | 0 |
| November | 3055 | 0 | 0 | 0 | 2922 | 0 | 0 | 245 | 0 | -112 | 7181 | 1837 | 0 | 0 | 1059 | 0 | 0 | 1879 | 1255 | 1930 | 270 | 2344 | 1816 | 767 | 0 | 18 | 18 | 0 | 0 | 0 |
| December | 4016 | 0 | 0 | 0 | 3724 | 0 | 0 | 405 | 0 | -112 | 7511 | 1790 | 0 | 0 | 1449 | 0 | 0 | 1434 | 2426 | 1933 | 270 | 2987 | 1126 | 826 | 0 | 27 | 27 | 0 | 0 | 0 |
| Average | 2088 | 0 | 0 | 0 | 2068 | 0 | 0 | 229 | 0 | -209 | 7270 | 1818 | 0 | 0 | 660 | 0 | 0 | 1854 | 2226 | 1833 | 270 | 1659 | 1327 | 772 | 0 | 19 | 19 | 0 | Average price | |
| Maximum | 7979 | 0 | 0 | 0 | 7700 | 0 | 0 | 4573 | 0 | 0 | 10111 | 4772 | 0 | 0 | 3076 | 0 | 0 | 7792 | 3539 | 1949 | 270 | 6177 | 5647 | 975 | 0 | 3792 | 3792 | 0 | (EUR/MWh) | |
| Minimum | 494 | 0 | 0 | 0 | 977 | 0 | 0 | 104 | 0 | -588 | 145 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 0 | 1196 | 270 | 784 | 590 | 298 | 0 | 0 | 0 | 0 | 1 | 1 |
| TWh/year | 18,34 | 0,00 | 0,00 | 0,00 | 18,16 | 0,00 | 0,00 | 2,01 | 0,00 | -1,83 | 63,86 | 15,97 | 0,00 | 0,00 | 5,80 | 0,00 | 0,00 | 16,28 | 19,55 | 16,10 | 2,37 | 14,57 | 11,65 | | 0,00 | 0,17 | 0,17 | 0,00 | 0 | 0 |

| FUEL BALANCE (TWh/year): | DHP | CHP2 | CHP3 | Boiler2 | Boiler3 | PP | Geo/Nu. | Hydro | Waste | CAES Elc.ly. | BioCon-version | Electro-Fuel | Wind | Offsh. | PV | Hydro | Solar.Th | Transp. | Industry household. | Industry Various | Total | Imp/Exp Corrected Imp/Exp | Imp/Exp Corrected Net | CO2 emission (Mt): Total | CO2 emission (Mt): Net |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Coal | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0,19 | 0,19 | 0,00 | 0,19 | 0,07 | 0,07 |
| Oil | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 83,80 | - | 9,91 | 93,71 | 0,00 | 93,71 | 24,59 | 24,59 |
| N.Gas | - | - | 5,66 | - | 0,34 | - | - | - | - | - | - | - | - | - | - | - | - | - | 26,11 | 15,15 | 47,26 | 0,00 | 47,26 | 9,68 | 9,68 |
| Biomass | - | - | 31,33 | - | 1,89 | 27,74 | - | - | - | - | 4,92 | - | - | - | - | - | - | - | 2,82 | 13,53 | 82,24 | -0,40 | 81,83 | 0,00 | 0,00 |
| Renewable | - | - | - | - | - | - | - | 19,55 | - | - | - | - | 8,32 | 2,67 | 5,30 | - | - | - | - | - | 35,84 | 0,00 | 35,84 | 0,00 | 0,00 |
| H2 etc. | - | - | 0,00 | - | 0,00 | 0,00 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Biofuel | - | - | - | - | - | - | - | - | - | - | -2,58 | - | - | - | - | - | - | 2,58 | - | - | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Nuclear/CCS | - | - | - | - | - | - | 53,67 | - | - | - | - | - | - | - | - | - | - | - | - | - | 53,67 | 0,00 | 53,67 | -21272,- | 21272,39 |
| Total | - | - | 36,99 | - | 2,23 | 27,74 | 53,67 | 19,55 | - | - | 2,34 | - | 8,32 | 2,67 | 5,30 | - | - | 86,38 | 28,93 | 38,78 | 312,90 | -0,40 | 312,50 | -21238,- | 21238,05 |

## District Heating Production

| | Gr.1 | | | | Gr.2 | | | | | | | | | | Gr.3 | | | | | | | | | | RES specification | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | District heating MW | Solar MW | CSHP MW | DHP MW | District heating MW | Solar MW | CSHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Stor-age MW | Ba-lance MW | District heating MW | Solar MW | CSHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Stor-age MW | Ba-lance MW | RES1 Wind MW | RES2 Offsho MW | RES3 Photo MW | RES 4-7 MW | Total MW |
| January | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4219 | 0 | 0 | 3864 | 0 | 0 | 467 | 0 | 0 | -112 | 1293 | 425 | 191 | 0 | 1910 |
| February | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3867 | 0 | 0 | 3648 | 0 | 0 | 332 | 0 | 0 | -112 | 1230 | 389 | 418 | 0 | 2038 |
| March | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3007 | 0 | 0 | 2771 | 0 | 0 | 348 | 0 | 0 | -113 | 1258 | 343 | 591 | 0 | 2192 |
| April | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1272 | 0 | 0 | 1239 | 0 | 0 | 262 | 0 | 0 | -229 | 1379 | 258 | 801 | 0 | 2438 |
| May | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 780 | 0 | 0 | 979 | 0 | 0 | 105 | 0 | 0 | -303 | 555 | 153 | 937 | 0 | 1645 |
| June | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 780 | 0 | 0 | 979 | 0 | 0 | 105 | 0 | 0 | -303 | 575 | 172 | 993 | 0 | 1739 |
| July | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 780 | 0 | 0 | 979 | 0 | 0 | 105 | 0 | 0 | -303 | 438 | 209 | 995 | 0 | 1642 |
| August | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 780 | 0 | 0 | 979 | 0 | 0 | 104 | 0 | 0 | -303 | 698 | 220 | 897 | 0 | 1815 |
| September | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 780 | 0 | 0 | 979 | 0 | 0 | 105 | 0 | 0 | -303 | 887 | 326 | 660 | 0 | 1873 |
| October | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1752 | 0 | 0 | 1783 | 0 | 0 | 164 | 0 | 0 | -195 | 920 | 333 | 413 | 0 | 1666 |
| November | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3055 | 0 | 0 | 2922 | 0 | 0 | 245 | 0 | 0 | -112 | 1305 | 374 | 200 | 0 | 1879 |
| December | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4016 | 0 | 0 | 3724 | 0 | 0 | 405 | 0 | 0 | -112 | 854 | 444 | 136 | 0 | 1434 |
| Average | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2088 | 0 | 0 | 2068 | 0 | 0 | 229 | 0 | 0 | -209 | 947 | 304 | 603 | 0 | 1854 |
| Maximum | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7979 | 0 | 0 | 7700 | 0 | 0 | 4573 | 0 | 0 | 0 | 4495 | 825 | 4434 | 0 | 7792 |
| Minimum | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 494 | 0 | 0 | 977 | 0 | 0 | 104 | 0 | 0 | -588 | 0 | 0 | 0 | 0 | 6 |
| Total for the whole year TWh/year | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | | 0,00 | 18,34 | 0,00 | 0,00 | 18,16 | 0,00 | 0,00 | 2,01 | 0,00 | | -1,83 | 8,32 | 2,67 | 5,30 | 0,00 | 16,28 |

Own use of heat from industrial CHP: 0,00 TWh/year

ANNUAL COSTS (Million EUR)

| | |
|---|---|
| Total Fuel ex Ngas exchange = | 6299 |
| Uranium = | 338 |
| Coal = | 2 |
| FuelOil = | 241 |
| Gasoil/Diesel= | 2538 |
| Petrol/JP = | 755 |
| Gas handling = | 410 |
| Biomass = | 2015 |
| Food income = | 0 |
| Waste = | 0 |
| Total Ngas Exchange costs = | 1177 |
| Marginal operation costs = | 335 |
| Total Electricity exchange = | -5 |
| Import = | 0 |
| Export = | 0 |
| Bottleneck = | 0 |
| Fixed imp/ex= | -5 |
| Total CO2 emission costs = | -322818 |
| Total variable costs = | -315012 |
| Fixed operation costs = | 1039 |
| Annual Investment costs = | 2173 |
| TOTAL ANNUAL COSTS = | -311800 |

NATURAL GAS EXCHANGE

| | DHP & Boilers MW | CHP2 CHP3 MW | PP CAES MW | Indi-vidual MW | Trans port MW | Indu. Var. MW | Demand Sum MW | Bio-gas MW | Syn-gas MW | CO2Hy gas MW | SynHy gas MW | SynHy gas MW | Stor-age MW | Sum MW | Im-port MW | Ex-port MW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| January | 79 | 1204 | 0 | 6907 | 0 | 1725 | 9915 | 0 | 0 | 0 | 0 | 0 | 0 | 9915 | 9915 | 0 |
| February | 56 | 1137 | 0 | 6257 | 0 | 1725 | 9175 | 0 | 0 | 0 | 0 | 0 | 0 | 9175 | 9175 | 0 |
| March | 59 | 864 | 0 | 4669 | 0 | 1725 | 7316 | 0 | 0 | 0 | 0 | 0 | 0 | 7316 | 7316 | 0 |
| April | 45 | 386 | 0 | 1467 | 0 | 1725 | 3622 | 0 | 0 | 0 | 0 | 0 | 0 | 3622 | 3622 | 0 |
| May | 18 | 305 | 0 | 558 | 0 | 1725 | 2606 | 0 | 0 | 0 | 0 | 0 | 0 | 2606 | 2606 | 0 |
| June | 18 | 305 | 0 | 558 | 0 | 1725 | 2606 | 0 | 0 | 0 | 0 | 0 | 0 | 2606 | 2606 | 0 |
| July | 18 | 305 | 0 | 558 | 0 | 1725 | 2606 | 0 | 0 | 0 | 0 | 0 | 0 | 2606 | 2606 | 0 |
| August | 18 | 305 | 0 | 558 | 0 | 1725 | 2606 | 0 | 0 | 0 | 0 | 0 | 0 | 2606 | 2606 | 0 |
| September | 18 | 305 | 0 | 558 | 0 | 1725 | 2606 | 0 | 0 | 0 | 0 | 0 | 0 | 2606 | 2606 | 0 |
| October | 28 | 556 | 0 | 2353 | 0 | 1725 | 4661 | 0 | 0 | 0 | 0 | 0 | 0 | 4661 | 4661 | 0 |
| November | 42 | 911 | 0 | 4758 | 0 | 1725 | 7435 | 0 | 0 | 0 | 0 | 0 | 0 | 7435 | 7435 | 0 |
| December | 69 | 1160 | 0 | 6532 | 0 | 1725 | 9486 | 0 | 0 | 0 | 0 | 0 | 0 | 9486 | 9486 | 0 |
| Average | 39 | 644 | 0 | 2972 | 0 | 1725 | 5380 | 0 | 0 | 0 | 0 | 0 | 0 | 5380 | 5380 | 0 |
| Maximum | 777 | 2399 | 0 | 13848 | 0 | 1725 | 17940 | 0 | 0 | 0 | 0 | 0 | 0 | 17940 | 17940 | 0 |
| Minimum | 18 | 305 | 0 | 30 | 0 | 1725 | 2077 | 0 | 0 | 0 | 0 | 0 | 0 | 2077 | 2077 | 0 |
| Total for the whole year TWh/year | 0,34 | 5,66 | 0,00 | 26,11 | 0,00 | 15,15 | 47,26 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 47,26 | 47,26 | 0,00 |

RES Share: 37,7 Percent of Primary Energy 59,4 Percent of Electricity 59,8 TWh electricity from RES

# Input SE 2050.txt

# The EnergyPLAN model 12.4

| | | | |
|---|---|---|---|
| Electricity demand (TWh/year): | | Flexible demand | 4,73 |
| Fixed demand | 144,11 | Fixed imp/exp. | 49,17 |
| Electric heating + HP | 24,40 | Transportation | 19,82 |
| Electric cooling | 0,74 | Total | 242,97 |

| District heating (TWh/year) | Gr.1 | Gr.2 | Gr.3 | Sum |
|---|---|---|---|---|
| District heating demand | 0,00 | 0,00 | 44,51 | 44,51 |
| Solar Thermal | 0,00 | 0,00 | 3,27 | 3,27 |
| Industrial CHP (CSHP) | 0,00 | 0,00 | 0,00 | 0,00 |
| Demand after solar and CSHP | 0,00 | 0,00 | 41,24 | 41,24 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Wind | 14771 | MW | 29,92 | TWh/year | 0,00 | Grid |
| Offshore Wind | 8250 | MW | 29,72 | TWh/year | 0,00 | stabili- |
| Photo Voltaic | 9927 | MW | 10,03 | TWh/year | 0,00 | sation |
| River Hydro | 8117 | MW | 32,53 | TWh/year | 0,00 | share |
| Hydro Power | 10198 | MW | 45,79 | TWh/year | | |
| Geothermal/Nuclear | 9420 | MW | 75,92 | TWh/year | | |

| | Capacities MW-e | MJ/s | Efficiencies elec. | Ther | COP |
|---|---|---|---|---|---|
| Group 2: | | | | | |
| CHP | 0 | 0 | 0,40 | 0,50 | |
| Heat Pump | 0 | 0 | | | 3,00 |
| Boiler | | 0 | | 0,50 | |
| Group 3: | | | | | |
| CHP | 7589 | 7835 | 0,34 | 0,35 | |
| Heat Pump | 0 | 0 | | | 3,00 |
| Boiler | | 23971 | | 0,90 | |
| Condensing | 19600 | | 0,40 | | |

| | | | | | |
|---|---|---|---|---|---|
| Heatstorage: | gr.2: | 0 | GWh | gr.3: | 0 GWh |
| Fixed Boiler: | gr.2: | 2,5 | Per cent | gr.3: | 5,0 Per cent |

| Electricity prod. from | CSHP | Waste | (TWh/year) |
|---|---|---|---|
| Gr.1: | 0,00 | 0,00 | |
| Gr.2: | 0,00 | 0,00 | |
| Gr.3: | 0,00 | 0,00 | |

| | | |
|---|---|---|
| Regulation Strategy: | Technical regulation no. 2 | |
| CEEP regulation | 23450000 | |
| Minimum Stabilisation share | 0,10 | |
| Stabilisation share of CHP | 0,00 | |
| Minimum CHP gr 3 load | 379 | MW |
| Minimum PP | 0 | MW |
| Heat Pump maximum share | 0,50 | |
| Maximum import/export | 0 | MW |

| | | |
|---|---|---|
| Distr. Name : | const.txt | |
| Addition factor | 0,00 | EUR/MWh |
| Multiplication factor | 1,00 | |
| Dependency factor | 0,00 | EUR/MWh pr. MW |
| Average Market Price | 1 | EUR/MWh |
| Gas Storage | 0 | GWh |
| Syngas capacity | 0 | MW |
| Biogas max to grid | 0 | MW |

Fuel Price level:

| | Capacities MW-e | Storage GWh | Efficiencies elec. | Ther. |
|---|---|---|---|---|
| Hydro Pump: | 109 | 1 | 0,00 | |
| Hydro Turbine: | 109 | | 0,00 | |
| Electrol. Gr.2: | 0 | 0 | 0,40 | 0,50 |
| Electrol. Gr.3: | 0 | 0 | 0,40 | 0,50 |
| Electrol. trans.: | 0 | 0 | 0,00 | |
| Ely. MicroCHP: | 0 | 0 | 0,80 | |
| CAES fuel ratio: | | 0,000 | | |

| (TWh/year) | Coal | Oil | Ngas | Biomass |
|---|---|---|---|---|
| Transport | 0,00 | 58,69 | 0,00 | 0,00 |
| Household | 0,00 | 0,00 | 4,23 | 4,93 |
| Industry | 3,27 | 9,81 | 9,93 | 11,18 |
| Various | 0,00 | 2,73 | 0,25 | 37,04 |

# Output WARNING!!: (1) Critical Excess;

| | District Heating | | | | | | | | | | Electricity | | | | | | | | | | | | | | | | Exchange | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Demand | Production | | | | | | | | Ba- | Consumption | | | | | | Production | | | | | | | Balance | | | | | Payment |
| | Distr. heating | Solar | Waste+ CSHP | DHP | CHP | HP | ELT | Boiler | EH | lance | Elec. demand | Flex.& Transp. | HP | Elec- trolyser | EH | Hydro Pump | Tur- bine | RES | Hy- dro | Geo- thermal | Waste+ CSHP | CHP | PP | Stab- Load | Imp | Exp | CEEP | EEP | Imp Exp |
| | MW | MW | MW | MW | MW | MW | MW | MW | MW | MW | MW | MW | MW | MW | MW | MW | MW | MW | MW | MW | MW | MW | MW | % | MW | MW | MW | MW | Million EUR |
| January | 10245 | 69 | 0 | 0 | 4695 | 0 | 0 | 5500 | 0 | -19 | 20082 | 2752 | 419 | 0 | 5468 | 0 | 0 | 13105 | 6050 | 10309 | 0 | 4548 | 649 | 616 | 0 | 342 | 342 | 0 | 0 0 |
| February | 10330 | 185 | 0 | 0 | 4405 | 0 | 0 | 5759 | 0 | -19 | 19821 | 2815 | 424 | 0 | 5525 | 0 | 0 | 14077 | 5590 | 10255 | 0 | 4267 | 467 | 590 | 0 | 474 | 474 | 0 | 0 0 |
| March | 9052 | 372 | 0 | 0 | 4547 | 0 | 0 | 4152 | 0 | -20 | 18291 | 2839 | 369 | 0 | 4810 | 0 | 0 | 12070 | 5921 | 9658 | 0 | 4404 | 193 | 623 | 0 | 340 | 340 | 0 | 0 0 |
| April | 3260 | 550 | 0 | 0 | 1738 | 0 | 0 | 1123 | 0 | -151 | 16028 | 2737 | 120 | 0 | 1570 | 0 | 0 | 10263 | 4773 | 9622 | 0 | 1684 | 43 | 616 | 0 | 332 | 332 | 0 | 0 0 |
| May | 1022 | 671 | 0 | 0 | 406 | 0 | 0 | 259 | 0 | -314 | 14994 | 2839 | 24 | 0 | 318 | 0 | 0 | 11762 | 5111 | 6635 | 0 | 394 | 103 | 519 | 0 | 232 | 232 | 0 | 0 0 |
| June | 1022 | 703 | 0 | 0 | 396 | 0 | 0 | 260 | 0 | -337 | 14190 | 2825 | 24 | 0 | 318 | 0 | 0 | 11699 | 4964 | 6340 | 0 | 384 | 46 | 511 | 0 | 478 | 478 | 0 | 0 0 |
| July | 1022 | 675 | 0 | 0 | 400 | 0 | 0 | 265 | 0 | -318 | 12832 | 2748 | 24 | 0 | 318 | 0 | 0 | 9758 | 3945 | 8132 | 0 | 387 | 0 | 576 | 0 | 703 | 703 | 0 | 0 0 |
| August | 1022 | 544 | 0 | 0 | 435 | 0 | 0 | 279 | 0 | -237 | 13850 | 2838 | 24 | 0 | 313 | 0 | 0 | 10314 | 4872 | 7320 | 0 | 422 | 66 | 559 | 0 | 370 | 370 | 0 | 0 0 |
| September | 1022 | 383 | 0 | 0 | 498 | 0 | 0 | 305 | 0 | -164 | 14590 | 2779 | 24 | 0 | 323 | 0 | 0 | 9188 | 5764 | 7887 | 0 | 483 | 340 | 615 | 0 | 348 | 348 | 0 | 0 0 |
| October | 4863 | 194 | 0 | 0 | 2702 | 0 | 0 | 2028 | 0 | -61 | 16493 | 2795 | 189 | 0 | 2463 | 0 | 0 | 11809 | 4272 | 9424 | 0 | 2617 | 35 | 576 | 0 | 621 | 621 | 0 | 0 0 |
| November | 8303 | 76 | 0 | 0 | 4660 | 0 | 0 | 3586 | 0 | -20 | 18183 | 2825 | 337 | 0 | 4390 | 0 | 0 | 12653 | 5549 | 8672 | 0 | 4514 | 226 | 591 | 0 | 282 | 282 | 0 | 0 0 |
| December | 9766 | 39 | 0 | 0 | 4407 | 0 | 0 | 5339 | 0 | -19 | 18648 | 2748 | 400 | 0 | 5211 | 0 | 0 | 13003 | 5775 | 9502 | 0 | 4269 | 568 | 599 | 0 | 511 | 511 | 0 | 0 0 |
| Average | 5067 | 372 | 0 | 0 | 2437 | 0 | 0 | 2398 | 0 | -140 | 16490 | 2795 | 198 | 0 | 2580 | 0 | 0 | 11636 | 5213 | 8643 | 0 | 2361 | 227 | 583 | 0 | 420 | 420 | 0 | Average price |
| Maximum | 19976 | 1924 | 0 | 0 | 7835 | 0 | 0 | 18730 | 0 | 0 | 24777 | 8108 | 838 | 0 | 10921 | 0 | 0 | 28017 | 10198 | 10309 | 0 | 7589 | 11949 | 930 | 0 | 24822 | 24822 | 0 | (EUR/MWh) |
| Minimum | 483 | 0 | 0 | 0 | 392 | 0 | 0 | 253 | 0 | -392 | 47 | 0 | 0 | 0 | 0 | 0 | 0 | 2133 | 220 | 6277 | 0 | 379 | 0 | 197 | 0 | 0 | 0 | 0 | 1 0 |
| TWh/year | 44,51 | 3,27 | 0,00 | 0,00 | 21,41 | 0,00 | 0,00 | 21,06 | 0,00 | -1,23 | 144,85 | 24,55 | 1,74 | 0,00 | 22,66 | 0,00 | 0,00 | 102,21 | 45,79 | 75,92 | 0,00 | 20,73 | 2,00 | | 0,00 | 3,69 | 3,69 | 0,00 | 0 1 |

| FUEL BALANCE (TWh/year): | DHP | CHP2 | CHP3 | Boiler2 | Boiler3 | PP | Geo/Nu. | Hydro | Waste | CAES Elc.ly. | BioCon- version | Electro- Fuel | Wind | Offsh. | PV | Hydro | Solar.Th | Transp. | Industry household | Industry Various | Total | Imp/Exp Corrected Imp/Exp | Net | CO2 emission (Mt): Total | Net |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Coal | - | - | 0,14 | - | - | 0,01 | - | - | - | - | - | - | - | - | - | - | - | - | - | 3,27 | 3,42 | -0,02 | 3,40 | 1,21 | 1,21 |
| Oil | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 58,69 | - | 12,54 | 71,23 | 0,00 | 71,23 | 18,69 | 18,69 |
| N.Gas | - | - | 9,28 | - | - | 0,76 | - | - | - | - | - | - | - | - | - | - | - | - | 4,23 | 10,18 | 24,45 | -1,39 | 23,05 | 5,01 | 4,72 |
| Biomass | - | - | 51,91 | - | 23,41 | 4,23 | - | - | - | - | 1,40 | - | - | - | - | - | - | - | 4,93 | 48,22 | 134,09 | -7,80 | 126,29 | 0,00 | 0,00 |
| Renewable | - | - | - | - | - | - | - | 45,79 | - | - | - | - | 29,92 | 29,72 | 10,03 | 32,53 | 3,27 | - | - | - | 151,27 | 0,00 | 151,27 | 0,00 | 0,00 |
| H2 etc. | - | - | 0,00 | - | 0,00 | 0,00 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Biofuel | - | - | 0,00 | - | - | - | - | - | - | - | -1,04 | - | - | - | - | - | - | 1,04 | - | - | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Nuclear/CCS | - | - | - | - | - | - | 253,08 | - | - | - | - | - | - | - | - | - | - | - | - | - | 253,08 | 0,00 | 253,08 | -1335,7 | -1335,79 |
| Total | - | - | 61,33 | - | 23,41 | 4,99 | 253,08 | 45,79 | - | - | 0,36 | - | 29,92 | 29,72 | 10,03 | 32,53 | 3,27 | 59,73 | 9,16 | 74,21 | 637,54 | -9,22 | 628,32 | -1310,8 | -1311,17 |

## District Heating Production

| | Gr.1 | | | | Gr.2 | | | | | | | | | | Gr.3 | | | | | | | | | | RES specification | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | District heating MW | Solar MW | CSHP MW | DHP MW | District heating MW | Solar MW | CSHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Stor-age MW | Ba-lance MW | District heating MW | Solar MW | CSHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Stor-age MW | Ba-lance MW | RES1 Wind MW | RES2 Offsho MW | RES3 Photo MW | RES 4-7 MW | Total ic MW |
| January | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10245 | 69 | 0 | 4695 | 0 | 0 | 5500 | 0 | 0 | -19 | 5562 | 4325 | 193 | 3024 | 13105 |
| February | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10330 | 185 | 0 | 4405 | 0 | 0 | 5759 | 0 | 0 | -19 | 4471 | 3982 | 550 | 5074 | 14077 |
| March | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9052 | 372 | 0 | 4547 | 0 | 0 | 4152 | 0 | 0 | -20 | 3156 | 3571 | 1165 | 4179 | 12070 |
| April | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3260 | 550 | 0 | 1738 | 0 | 0 | 1123 | 0 | 0 | -151 | 3069 | 2835 | 1766 | 2592 | 10263 |
| May | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1022 | 671 | 0 | 406 | 0 | 0 | 259 | 0 | 0 | -314 | 3037 | 2603 | 2146 | 3975 | 11762 |
| June | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1022 | 703 | 0 | 396 | 0 | 0 | 260 | 0 | 0 | -337 | 2228 | 2586 | 2174 | 4712 | 11699 |
| July | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1022 | 675 | 0 | 400 | 0 | 0 | 265 | 0 | 0 | -318 | 2293 | 2248 | 2048 | 3169 | 9758 |
| August | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1022 | 544 | 0 | 435 | 0 | 0 | 279 | 0 | 0 | -237 | 1814 | 2452 | 1642 | 4405 | 10314 |
| September | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1022 | 383 | 0 | 498 | 0 | 0 | 305 | 0 | 0 | -164 | 2440 | 3316 | 1129 | 2303 | 9188 |
| October | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4863 | 194 | 0 | 2702 | 0 | 0 | 2028 | 0 | 0 | -61 | 2215 | 3953 | 558 | 5084 | 11809 |
| November | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8303 | 76 | 0 | 4660 | 0 | 0 | 3586 | 0 | 0 | -20 | 4188 | 4388 | 210 | 3868 | 12653 |
| December | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9766 | 39 | 0 | 4407 | 0 | 0 | 5339 | 0 | 0 | -19 | 6420 | 4372 | 112 | 2099 | 13003 |
| Average | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5067 | 372 | 0 | 2437 | 0 | 0 | 2398 | 0 | 0 | -140 | 3407 | 3384 | 1142 | 3703 | 11636 |
| Maximum | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 19976 | 1924 | 0 | 7835 | 0 | 0 | 18730 | 0 | 0 | 0 | 14680 | 8250 | 9927 | 8117 | 28017 |
| Minimum | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 483 | 0 | 0 | 392 | 0 | 0 | 253 | 0 | 0 | -392 | 23 | 0 | 0 | 0 | 2133 |
| Total for the whole year TWh/year | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | | 0,00 | 44,51 | 3,27 | 0,00 | 21,41 | 0,00 | 0,00 | 21,06 | 0,00 | | -1,23 | 29,92 | 29,72 | 10,03 | 32,53 | 102,21 |

Own use of heat from industrial CHP: 0,00 TWh/year

ANNUAL COSTS (Million EUR)

| | |
|---|---|
| Total Fuel ex Ngas exchange = | 7452 |
| Uranium = | 1594 |
| Coal = | 32 |
| FuelOil = | 305 |
| Gasoil/Diesel= | 1051 |
| Petrol/JP = | 1169 |
| Gas handling = | 136 |
| Biomass = | 3164 |
| Food income = | 0 |
| Waste = | 0 |
| Total Ngas Exchange costs = | 609 |
| Marginal operation costs = | 1258 |
| Total Electricity exchange = | 46 |
| Import = | 0 |
| Export = | -1 |
| Bottleneck = | 1 |
| Fixed imp/ex= | 46 |
| Total CO2 emission costs = | -19925 |
| Total variable costs = | -10561 |
| Fixed operation costs = | 3595 |
| Annual Investment costs = | 7833 |
| TOTAL ANNUAL COSTS = | 867 |

## NATURAL GAS EXCHANGE

| | DHP & Boilers MW | CHP2 CHP3 MW | PP CAES MW | Indi-vidual MW | Trans port MW | Indu. Var. MW | Demand Sum MW | Bio-gas MW | Syn-gas MW | CO2Hy gas MW | SynHy gas MW | SynHy gas MW | Stor-age MW | Sum MW | Im-port MW | Ex-port MW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| January | 0 | 2035 | 246 | 1021 | 0 | 1159 | 4461 | 0 | 0 | 0 | 0 | 0 | 0 | 4461 | 4461 | 0 |
| February | 0 | 1910 | 177 | 1031 | 0 | 1159 | 4276 | 0 | 0 | 0 | 0 | 0 | 0 | 4276 | 4276 | 0 |
| March | 0 | 1971 | 73 | 898 | 0 | 1159 | 4101 | 0 | 0 | 0 | 0 | 0 | 0 | 4101 | 4101 | 0 |
| April | 0 | 754 | 16 | 293 | 0 | 1159 | 2222 | 0 | 0 | 0 | 0 | 0 | 0 | 2222 | 2222 | 0 |
| May | 0 | 176 | 39 | 59 | 0 | 1159 | 1433 | 0 | 0 | 0 | 0 | 0 | 0 | 1433 | 1433 | 0 |
| June | 0 | 172 | 17 | 59 | 0 | 1159 | 1408 | 0 | 0 | 0 | 0 | 0 | 0 | 1408 | 1408 | 0 |
| July | 0 | 173 | 0 | 59 | 0 | 1159 | 1392 | 0 | 0 | 0 | 0 | 0 | 0 | 1392 | 1392 | 0 |
| August | 0 | 189 | 25 | 59 | 0 | 1159 | 1432 | 0 | 0 | 0 | 0 | 0 | 0 | 1432 | 1432 | 0 |
| September | 0 | 216 | 128 | 59 | 0 | 1159 | 1563 | 0 | 0 | 0 | 0 | 0 | 0 | 1563 | 1563 | 0 |
| October | 0 | 1171 | 13 | 460 | 0 | 1159 | 2804 | 0 | 0 | 0 | 0 | 0 | 0 | 2804 | 2804 | 0 |
| November | 0 | 2020 | 85 | 820 | 0 | 1159 | 4084 | 0 | 0 | 0 | 0 | 0 | 0 | 4084 | 4084 | 0 |
| December | 0 | 1910 | 215 | 972 | 0 | 1159 | 4256 | 0 | 0 | 0 | 0 | 0 | 0 | 4256 | 4256 | 0 |
| Average | 0 | 1056 | 86 | 482 | 0 | 1159 | 2783 | 0 | 0 | 0 | 0 | 0 | 0 | 2783 | 2783 | 0 |
| Maximum | 0 | 3396 | 4519 | 2039 | 0 | 1159 | 10543 | 0 | 0 | 0 | 0 | 0 | 0 | 10543 | 10543 | 0 |
| Minimum | 0 | 170 | 0 | 3 | 0 | 1159 | 1332 | 0 | 0 | 0 | 0 | 0 | 0 | 1332 | 1332 | 0 |
| Total for the whole year TWh/year | 0,00 | 9,28 | 0,76 | 4,23 | 0,00 | 10,18 | 24,45 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 24,45 | 24,45 | 0,00 |

RES Share: 44,8 Percent of Primary Energy 95,9 Percent of Electricity 167,2 TWh electricity from RES

# Input UK 2050.txt

# The EnergyPLAN model 12.4

| | | | |
|---|---|---|---|
| Electricity demand (TWh/year): | | Flexible demand | 20,73 |
| Fixed demand | 331,61 | Fixed imp/exp. | -19,89 |
| Electric heating + HP | 51,74 | Transportation | 95,96 |
| Electric cooling | 3,71 | Total | 483,86 |

| District heating (TWh/year) | Gr.1 | Gr.2 | Gr.3 | Sum |
|---|---|---|---|---|
| District heating demand | 0,00 | 0,00 | 31,39 | 31,39 |
| Solar Thermal | 0,00 | 0,00 | 0,00 | 0,00 |
| Industrial CHP (CSHP) | 0,00 | 0,00 | 0,00 | 0,00 |
| Demand after solar and CSHP | 0,00 | 0,00 | 31,39 | 31,39 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Wind | 48000 | MW | 108,21 | TWh/year | 0,00 | Grid |
| Offshore Wind | 15820 | MW | 62,51 | TWh/year | 0,00 | stabili- |
| Photo Voltaic | 32943 | MW | 34,55 | TWh/year | 0,00 | sation |
| River Hydro | 140 | MW | 50,75 | TWh/year | 0,00 | share |
| Hydro Power | 2171 | MW | 5,92 | TWh/year | | |
| Geothermal/Nuclear | 18186 | MW | 146,59 | TWh/year | | |

| | Capacities | | Efficiencies | | |
|---|---|---|---|---|---|
| Group 2: | MW-e | MJ/s | elec. | Ther | COP |
| CHP | 0 | 0 | 0,40 | 0,50 | |
| Heat Pump | 0 | 0 | | | 3,00 |
| Boiler | | 0 | | 0,50 | |
| Group 3: | | | | | |
| CHP | 19146 | 6481 | 0,35 | 0,12 | |
| Heat Pump | 0 | 0 | | | 3,00 |
| Boiler | | 17255 | | 0,90 | |
| Condensing | 70600 | | 0,62 | | |

| | | | | | |
|---|---|---|---|---|---|
| Heatstorage: | gr.2: | 0 | GWh | gr.3: | 0 GWh |
| Fixed Boiler: | gr.2: | 2,5 | Per cent | gr.3: | 5,0 Per cent |

| Electricity prod. from | CSHP | Waste | (TWh/year) |
|---|---|---|---|
| Gr.1: | 0,00 | 0,00 | |
| Gr.2: | 0,00 | 0,00 | |
| Gr.3: | 0,00 | 0,00 | |

| | | |
|---|---|---|
| Regulation Strategy: | Technical regulation no. 2 | |
| CEEP regulation | 23450000 | |
| Minimum Stabilisation share | 0,10 | |
| Stabilisation share of CHP | 0,00 | |
| Minimum CHP gr 3 load | 1436 | MW |
| Minimum PP | 0 | MW |
| Heat Pump maximum share | 0,50 | |
| Maximum import/export | 0 | MW |

| | | |
|---|---|---|
| Distr. Name : | const.txt | |
| Addition factor | 0,00 | EUR/MWh |
| Multiplication factor | 1,00 | |
| Dependency factor | 0,00 | EUR/MWh pr. MW |
| Average Market Price | 1 | EUR/MWh |
| Gas Storage | 0 | GWh |
| Syngas capacity | 0 | MW |
| Biogas max to grid | 0 | MW |

Fuel Price level:

| | Capacities | Storage | Efficiencies | |
|---|---|---|---|---|
| | MW-e | GWh | elec. | Ther. |
| Hydro Pump: | 2744 | 27 | 0,00 | |
| Hydro Turbine: | 2744 | | 0,00 | |
| Electrol. Gr.2: | 0 | 0 | 0,40 | 0,50 |
| Electrol. Gr.3: | 0 | 0 | 0,40 | 0,50 |
| Electrol. trans.: | 0 | 0 | 0,00 | |
| Ely. MicroCHP: | 0 | 0 | 0,80 | |
| CAES fuel ratio: | | 0,000 | | |

| (TWh/year) | Coal | Oil | Ngas | Biomass |
|---|---|---|---|---|
| Transport | 0,00 | 536,10 | 0,00 | 0,00 |
| Household | 0,00 | 1,16 | 227,36 | 6,61 |
| Industry | 30,82 | 53,97 | 41,12 | 23,99 |
| Various | 0,01 | 3,44 | 1,80 | 7,40 |

# Output WARNING!!: (1) Critical Excess;

| | District Heating | | | | | | | | | | Electricity | | | | | | | | | | | | | | | | Exchange | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Demand | Production | | | | | | | | Balance | Consumption | | | | | | Production | | | | | | | Balance | | | | Payment | |
| | Distr. heating MW | Solar MW | Waste+ CSHP MW | DHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | | Elec. demand MW | Flex.& Transp. MW | HP MW | Elec-trolyser MW | EH MW | Hydro Pump MW | Tur-bine MW | RES MW | Hy-dro MW | Geo-thermal MW | Waste+ CSHP MW | CHP MW | PP MW | Stab-Load % | Imp MW | Exp MW | CEEP MW | EEP MW | Imp Million EUR | Exp |
| January | 6904 | 0 | 0 | 0 | 4036 | 0 | 0 | 2923 | 0 | -55 | 44729 | 13075 | 958 | 0 | 10912 | 0 | 0 | 34030 | 811 | 18414 | 0 | 11924 | 5857 | 511 | 0 | 3624 | 3624 | 0 | 0 | 0 |
| February | 6937 | 0 | 0 | 0 | 4291 | 0 | 0 | 2700 | 0 | -55 | 45071 | 13380 | 963 | 0 | 10966 | 0 | 0 | 29587 | 791 | 18039 | 0 | 12677 | 8971 | 562 | 0 | 1948 | 1948 | 0 | 0 | 0 |
| March | 6289 | 0 | 0 | 0 | 3843 | 0 | 0 | 2500 | 0 | -55 | 41687 | 13497 | 869 | 0 | 9895 | 0 | 0 | 31863 | 709 | 15801 | 0 | 11353 | 6195 | 510 | 0 | 2238 | 2238 | 0 | 0 | 0 |
| April | 2522 | 0 | 0 | 0 | 1874 | 0 | 0 | 715 | 0 | -67 | 36534 | 13003 | 322 | 0 | 3671 | 0 | 0 | 25189 | 647 | 16247 | 0 | 5536 | 6327 | 542 | 0 | 2679 | 2679 | 0 | 0 | 0 |
| May | 808 | 0 | 0 | 0 | 610 | 0 | 0 | 275 | 0 | -77 | 34455 | 13497 | 75 | 0 | 858 | 0 | 0 | 32787 | 478 | 16065 | 0 | 1802 | 2556 | 408 | 0 | 7066 | 7066 | 0 | 0 | 0 |
| June | 808 | 0 | 0 | 0 | 638 | 0 | 0 | 246 | 0 | -77 | 34304 | 13431 | 74 | 0 | 835 | 0 | 0 | 26866 | 613 | 16003 | 0 | 1885 | 4535 | 474 | 0 | 3521 | 3521 | 0 | 0 | 0 |
| July | 808 | 0 | 0 | 0 | 633 | 0 | 0 | 252 | 0 | -77 | 34021 | 13056 | 74 | 0 | 853 | 0 | 0 | 27071 | 599 | 16064 | 0 | 1870 | 3869 | 470 | 0 | 3733 | 3733 | 0 | 0 | 0 |
| August | 808 | 0 | 0 | 0 | 653 | 0 | 0 | 231 | 0 | -77 | 34104 | 13495 | 75 | 0 | 850 | 0 | 0 | 25424 | 623 | 15259 | 0 | 1930 | 6081 | 496 | 0 | 3057 | 3057 | 0 | 0 | 0 |
| September | 808 | 0 | 0 | 0 | 669 | 0 | 0 | 215 | 0 | -77 | 35723 | 13207 | 74 | 0 | 840 | 0 | 0 | 24140 | 694 | 15611 | 0 | 1977 | 7774 | 523 | 0 | 2615 | 2615 | 0 | 0 | 0 |
| October | 3396 | 0 | 0 | 0 | 2525 | 0 | 0 | 935 | 0 | -64 | 38292 | 13284 | 449 | 0 | 5119 | 0 | 0 | 23045 | 788 | 17294 | 0 | 7459 | 8137 | 589 | 0 | 1844 | 1844 | 0 | 0 | 0 |
| November | 5856 | 0 | 0 | 0 | 3493 | 0 | 0 | 2418 | 0 | -55 | 40588 | 13431 | 808 | 0 | 9200 | 0 | 0 | 33302 | 724 | 17151 | 0 | 10318 | 4088 | 483 | 0 | 3820 | 3820 | 0 | 0 | 0 |
| December | 7019 | 0 | 0 | 0 | 3119 | 0 | 0 | 3955 | 0 | -55 | 38844 | 13060 | 975 | 0 | 11101 | 0 | 0 | 36238 | 618 | 18337 | 0 | 9213 | 2608 | 454 | 0 | 5299 | 5299 | 0 | 0 | 0 |
| Average | 3574 | 0 | 0 | 0 | 2193 | 0 | 0 | 1446 | 0 | -66 | 38174 | 13284 | 475 | 0 | 5414 | 0 | 0 | 29145 | 674 | 16688 | 0 | 6479 | 5563 | 502 | 0 | 3465 | 3465 | 0 | Average price | |
| Maximum | 14379 | 0 | 0 | 0 | 6481 | 0 | 0 | 12314 | 0 | 0 | 61693 | 35574 | 2042 | 0 | 23251 | 0 | 0 | 71189 | 1440 | 18414 | 0 | 19146 | 51393 | 958 | 0 | 49213 | 49213 | 0 | (EUR/MWh) | |
| Minimum | 321 | 0 | 0 | 0 | 486 | 0 | 0 | 179 | 0 | -344 | 237 | 2360 | 0 | 0 | 0 | 0 | 0 | 2248 | 0 | 15249 | 0 | 1436 | 0 | 197 | 0 | 0 | 0 | 0 | 1 | 0 |
| TWh/year | 31,39 | 0,00 | 0,00 | 0,00 | 19,26 | 0,00 | 0,00 | 12,70 | 0,00 | -0,58 | 335,32 | 116,69 | 4,18 | 0,00 | 47,56 | 0,00 | 0,00 | 256,01 | 5,92 | 146,59 | 0,00 | 56,91 | 48,87 | | 0,00 | 30,44 | 30,44 | 0,00 | 0 | 1 |

| FUEL BALANCE (TWh/year): | DHP | CHP2 | CHP3 | Boiler2 | Boiler3 | PP | Geo/Nu. | Hydro | Waste | CAES Elc.ly. | BioCon-version | Electro-Fuel | Wind | Offsh. | PV | Hydro | Solar.Th | Transp. | Industry household | Industry Various | Total | Imp/Exp Corrected Imp/Exp | Net | CO2 emission (Mt): Total | Net |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Coal | - | - | 46,81 | - | 4,01 | 0,22 | - | - | - | - | - | - | - | - | - | - | - | - | - | 30,83 | 81,88 | -0,14 | 81,74 | 29,03 | 28,98 |
| Oil | - | - | - | - | 0,00 | - | - | - | - | - | - | - | - | - | - | - | - | 536,10 | 1,16 | 57,41 | 594,67 | 0,00 | 594,67 | 156,07 | 156,07 |
| N.Gas | - | - | 30,50 | - | 2,61 | 78,60 | - | - | - | - | - | - | - | - | - | - | - | 0,44 | 227,36 | 42,92 | 382,43 | -48,95 | 333,48 | 78,34 | 68,40 |
| Biomass | - | - | 87,34 | - | 7,49 | - | - | - | - | - | 11,35 | - | - | - | - | - | - | - | 6,61 | 31,39 | 144,17 | 0,00 | 144,17 | 0,00 | 0,00 |
| Renewable | - | - | - | - | - | - | 0,21 | 5,92 | - | - | - | - | 108,21 | 62,51 | 34,55 | 0,54 | - | - | - | - | 262,14 | 0,00 | 262,14 | 0,00 | 0,00 |
| H2 etc. | - | - | 0,00 | - | 0,00 | 0,00 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Biofuel | - | - | 0,00 | - | - | - | - | - | - | - | -8,47 | - | - | - | - | - | - | 8,47 | - | - | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Nuclear/CCS | - | - | - | - | - | - | 487,91 | - | - | - | - | - | - | - | - | - | - | - | - | - | 487,91 | 0,00 | 487,91 | -5095,9 | -5095,94 |
| Total | - | - | 164,65 | - | 14,11 | 78,82 | 488,12 | 5,92 | - | - | 2,88 | - | 108,21 | 62,51 | 34,55 | 0,54 | - | 545,01 | 235,13 | 162,55 | 1953,21 | -49,09 | 1904,11 | -4832,5 | -4842,49 |

## District Heating Production

| | Gr.1 | | | | Gr.2 | | | | | | | | | | Gr.3 | | | | | | | | | | RES specification | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | District heating MW | Solar MW | CSHP MW | DHP MW | District heating MW | Solar MW | CSHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Stor-age MW | Ba-lance MW | District heating MW | Solar MW | CSHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Stor-age MW | Ba-lance MW | RES1 Wind MW | RES2 Offsho MW | RES3 Photo MW | RES 4-7 MW | Total ic MW |
| January | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6904 | 0 | 0 | 4036 | 0 | 0 | 2923 | 0 | 0 | -55 | 17455 | 9387 | 1172 | 6016 | 34030 |
| February | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6937 | 0 | 0 | 4291 | 0 | 0 | 2700 | 0 | 0 | -55 | 13917 | 7756 | 2152 | 5762 | 29587 |
| March | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6289 | 0 | 0 | 3843 | 0 | 0 | 2500 | 0 | 0 | -55 | 14208 | 7882 | 3786 | 5988 | 31863 |
| April | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2522 | 0 | 0 | 1874 | 0 | 0 | 715 | 0 | 0 | -67 | 8593 | 4747 | 6003 | 5845 | 25189 |
| May | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 808 | 0 | 0 | 610 | 0 | 0 | 275 | 0 | 0 | -77 | 12810 | 7152 | 6987 | 5838 | 32787 |
| June | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 808 | 0 | 0 | 638 | 0 | 0 | 246 | 0 | 0 | -77 | 8948 | 5364 | 6796 | 5759 | 26866 |
| July | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 808 | 0 | 0 | 633 | 0 | 0 | 252 | 0 | 0 | -77 | 9405 | 5735 | 6303 | 5628 | 27071 |
| August | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 808 | 0 | 0 | 653 | 0 | 0 | 231 | 0 | 0 | -77 | 9266 | 5542 | 5044 | 5570 | 25424 |
| September | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 808 | 0 | 0 | 669 | 0 | 0 | 215 | 0 | 0 | -77 | 8802 | 5526 | 4118 | 5694 | 24140 |
| October | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3396 | 0 | 0 | 2525 | 0 | 0 | 935 | 0 | 0 | -64 | 9490 | 5533 | 2411 | 5612 | 23045 |
| November | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5856 | 0 | 0 | 3493 | 0 | 0 | 2418 | 0 | 0 | -55 | 16252 | 9800 | 1448 | 5802 | 33302 |
| December | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7019 | 0 | 0 | 3119 | 0 | 0 | 3955 | 0 | 0 | -55 | 18563 | 10912 | 952 | 5811 | 36238 |
| Average | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3574 | 0 | 0 | 2193 | 0 | 0 | 1446 | 0 | 0 | -66 | 12318 | 7116 | 3934 | 5777 | 29145 |
| Maximum | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14379 | 0 | 0 | 6481 | 0 | 0 | 12314 | 0 | 0 | 0 | 25067 | 12534 | 32943 | 12875 | 71189 |
| Minimum | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 321 | 0 | 0 | 486 | 0 | 0 | 179 | 0 | 0 | -344 | 940 | 8 | 0 | 66 | 2248 |
| Total for the whole year TWh/year | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | | 0,00 | 31,39 | 0,00 | 0,00 | 19,26 | 0,00 | 0,00 | 12,70 | 0,00 | | -0,58 | 108,21 | 62,51 | 34,55 | 50,75 | 256,01 |

Own use of heat from industrial CHP: 0,00 TWh/year

ANNUAL COSTS (Million EUR)

| | |
|---|---|
| Total Fuel ex Ngas exchange = | 31870 |
| Uranium = | 3074 |
| Coal = | 766 |
| FuelOil = | 1395 |
| Gasoil/Diesel= | 8729 |
| Petrol/JP = | 11375 |
| Gas handling = | 3044 |
| Biomass = | 3487 |
| Food income = | 0 |
| Waste = | 0 |
| Total Ngas Exchange costs = | 9516 |
| Marginal operation costs = | 2490 |
| Total Electricity exchange = | -15 |
| Import = | 0 |
| Export = | -1 |
| Bottleneck = | 1 |
| Fixed imp/ex= | -15 |
| Total CO2 emission costs = | -73454 |
| Total variable costs = | -29593 |
| Fixed operation costs = | 8549 |
| Annual Investment costs = | 19109 |
| TOTAL ANNUAL COSTS = | -1934 |

## NATURAL GAS EXCHANGE

| | DHP & Boilers MW | CHP2 CHP3 MW | PP CAES MW | Indi-vidual MW | Trans port MW | Indu. Var. MW | Demand Sum MW | Bio-gas MW | Syn-gas MW | CO2Hy gas MW | SynHy gas MW | SynHy gas MW | Stor-age MW | Sum MW | Im-port MW | Ex-port MW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| January | 602 | 6391 | 9419 | 52166 | 0 | 4886 | 73464 | 0 | 0 | 0 | 0 | 0 | 0 | 73464 | 73464 | 0 |
| February | 556 | 6794 | 14428 | 52423 | 0 | 4886 | 79087 | 0 | 0 | 0 | 0 | 0 | 0 | 79087 | 79087 | 0 |
| March | 515 | 6085 | 9963 | 47309 | 0 | 4886 | 68758 | 0 | 0 | 0 | 0 | 0 | 0 | 68758 | 68758 | 0 |
| April | 147 | 2967 | 10176 | 17587 | 0 | 4886 | 35764 | 0 | 0 | 0 | 0 | 0 | 0 | 35764 | 35764 | 0 |
| May | 57 | 966 | 4110 | 4058 | 0 | 4886 | 14076 | 0 | 0 | 0 | 0 | 0 | 0 | 14076 | 14076 | 0 |
| June | 51 | 1010 | 7293 | 4058 | 0 | 4886 | 17298 | 0 | 0 | 0 | 0 | 0 | 0 | 17298 | 17298 | 0 |
| July | 52 | 1002 | 6222 | 4058 | 0 | 4886 | 16220 | 0 | 0 | 0 | 0 | 0 | 0 | 16220 | 16220 | 0 |
| August | 48 | 1034 | 9781 | 4058 | 0 | 4886 | 19807 | 0 | 0 | 0 | 0 | 0 | 0 | 19807 | 19807 | 0 |
| September | 44 | 1060 | 12502 | 4058 | 0 | 4886 | 22550 | 0 | 0 | 0 | 0 | 0 | 0 | 22550 | 22550 | 0 |
| October | 192 | 3998 | 13088 | 24480 | 0 | 4886 | 46644 | 0 | 0 | 0 | 0 | 0 | 0 | 46644 | 46644 | 0 |
| November | 498 | 5530 | 6575 | 43892 | 0 | 4886 | 61381 | 0 | 0 | 0 | 0 | 0 | 0 | 61381 | 61381 | 0 |
| December | 814 | 4938 | 4194 | 53071 | 0 | 4886 | 67903 | 0 | 0 | 0 | 0 | 0 | 0 | 67903 | 67903 | 0 |
| Average | 298 | 3472 | 8948 | 25883 | 0 | 4886 | 43487 | 0 | 0 | 0 | 0 | 0 | 0 | 43487 | 43487 | 0 |
| Maximum | 2535 | 10262 | 82656 | 111149 | 0 | 4886 | 179328 | 0 | 0 | 0 | 0 | 0 | 0 | 179328 | 179328 | 0 |
| Minimum | 37 | 770 | 0 | 222 | 0 | 4886 | 5915 | 0 | 0 | 0 | 0 | 0 | 0 | 5915 | 5915 | 0 |
| Total for the whole year TWh/year | 2,61 | 30,50 | 78,60 | 227,36 | 0,00 | 42,92 | 381,99 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 381,99 | 381,99 | 0,00 |

RES Share: 20,8 Percent of Primary Energy 62,1 Percent of Electricity 292,3 TWh electricity from RES