

Input HeatPumpIndividualWind50percentWithCHP

The EnergyPLAN model 7.20



| | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|--|---------------------------------------|--|------------------------------------|---|--|--|--|--|--|--|--|--|--|---|--|--|--|--|
| Electricity demand (TWh/year): Fixed demand 49.00 Electric heating 0.00 Electric cooling 0.00 | Flexible demand 0.00 Fixed imp/exp. 0.00 Transportation 0.00 Total 49.00 | Capacities Group 2: MW-e MJ/s elec. Ther COP CHP 1350 1647 0.41 0.50 Heat Pump 0 0 3.50 Boiler 7500 0.90 Group 3: MW-e MJ/s elec. Ther COP CHP 2000 2440 0.41 0.50 Heat Pump 0 0 3.50 Boiler 11300 0.90 Condensing 8000 0.52 | | | | | Efficiencies Regulation Strategy: Technical regulation no. 2 KEOL regulation 00000 Minimum Stabilisation share 0.00 Stabilisation share of CHP 0.00 Minimum CHP gr 3 load 450 MW Heat Pump maximum share 0.50 Maximum import/export 0 MW | | | | | Fuel Price level: Capacities Storage Efficiencies MW-e GWh elec. Ther. Hydro Pump: 0 1 0.68 Hydro Turbine: 0 2.44 Electrol. Gr.2: 0 360 0.80 0.15 Electrol. Gr.3: 0 0 0.40 0.50 Electrol. trans.: 0 0 0.80 Ely. MicroCHP: 0 0 0.80 CAES fuel ratio: 1.156 | | | | | | | | | |
| District heating (TWh/year) District heating demand Solar Thermal Industrial CHP (CSHP) Demand after solar and CSHP | Gr.1 2.26 0.02 0.00 2.24 | Gr.2 14.29 0.00 0.00 14.29 | Gr.3 22.63 0.00 1.73 20.90 | Sum 39.18 0.02 1.73 37.43 | Heatsstorage: gr.2: 40 GWh Fixed Boiler: gr.2: 2.5 Per cent | gr.3: 10 GWh gr.3: 1.0 Per cent | Electricity prod. from CSHP Waste (TWh/year) Gr.1: 0.00 0.00 Gr.2: 0.00 0.00 Gr.3: 2.41 0.00 | | | | | Distr. Name : Price_DKV_2005.txt Addition factor 0.00 DKK/MWh Multiplication factor 1.00 Dependency factor 0.00 DKK/MWh pr. MW Average Market Price 277 DKK/MWh | | | | | (TWh/year) Coal Oil Ngas Biomass Transport 0.00 69.20 0.00 0.00 Household 0.01 6.72 4.05 7.29 Industry 3.37 26.92 18.19 5.18 Various 0.00 3.01 19.73 0.00 | | | | |
| Wind 3100 MW Offshore Wind 4500 MW Photo Voltaic 0 MW Wave Power 0 MW Hydro Power 0 MW Geothermal 0 MW | 7.26 TWh/year 17.23 TWh/year 0 TWh/year 0 TWh/year 0 TWh/year 0 TWh/year | 0.00 Grid 0.00 stabili- 0.00 sation 0.00 share | | | | | | | | | | | | | | | | | | | |

Output

| District Heating | | | | | | | | | | Electricity | | | | | | | | | | | | | | | Exchange | | | | | | | | | | |
|-------------------|----------|---------|--------|--------|-------|--------|-----------|-------|-------------|-----------------|--------------|------------------|-------|---------------|-------------|--------|-----------|----------------|----------------|-------------|-------|-------------|--------|--------|------------|--------|-----------------|-------------------------|--|---------|--|--|--|---------|--|
| Demand | | | | | | | | | | Production | | | | | | | | | | Consumption | | | | | Production | | | | | Balance | | | | Payment | |
| Distr. heating MW | Solar MW | CSHP MW | DHP MW | CHP MW | HP MW | ELT MW | Boiler MW | EH MW | Ba-lance MW | Elec. demand MW | Flexi-ble 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 | EPP MW | Imp Million DKK | Exp Million DKK | | | | | | | |
| January | 7177 | 1 | 197 | 413 | 2732 | 0 | 0 | 3828 | 0 | 6 | 6305 | 0 | 281 | 0 | 0 | 0 | 0 | 0 | 274 | 2239 | 467 | 100 | 0 | 57 | 57 | 0 | 0 | 0 | | | | | | | |
| February | 7343 | 2 | 197 | 422 | 3520 | 0 | 0 | 3207 | 0 | -4 | 6237 | 0 | 289 | 0 | 0 | 0 | 0 | 0 | 274 | 2885 | 979 | 100 | 0 | 35 | 35 | 0 | 0 | 0 | | | | | | | |
| March | 6256 | 2 | 197 | 359 | 3094 | 0 | 0 | 2608 | 0 | -4 | 6004 | 0 | 244 | 0 | 0 | 0 | 0 | 0 | 274 | 2536 | 778 | 100 | 0 | 63 | 63 | 0 | 0 | 0 | | | | | | | |
| April | 5013 | 3 | 197 | 286 | 2415 | 0 | 0 | 2103 | 0 | 9 | 5291 | 0 | 187 | 0 | 0 | 0 | 0 | 0 | 274 | 1979 | 240 | 100 | 0 | 177 | 177 | 0 | 0 | 0 | | | | | | | |
| May | 3933 | 3 | 197 | 223 | 2937 | 0 | 0 | 573 | 0 | 0 | 5162 | 0 | 132 | 0 | 0 | 0 | 0 | 0 | 274 | 2407 | 643 | 100 | 0 | 98 | 98 | 0 | 0 | 0 | | | | | | | |
| June | 1782 | 3 | 197 | 100 | 1412 | 0 | 0 | 100 | 0 | -29 | 5017 | 0 | 44 | 0 | 0 | 0 | 0 | 0 | 274 | 1157 | 1363 | 100 | 0 | 195 | 195 | 0 | 0 | 0 | | | | | | | |
| July | 1782 | 4 | 197 | 99 | 1401 | 0 | 0 | 67 | 0 | 14 | 4574 | 0 | 36 | 0 | 0 | 0 | 0 | 0 | 274 | 1148 | 1409 | 100 | 0 | 111 | 111 | 0 | 0 | 0 | | | | | | | |
| August | 1782 | 3 | 197 | 100 | 1427 | 0 | 0 | 73 | 0 | -17 | 5263 | 0 | 41 | 0 | 0 | 0 | 0 | 0 | 274 | 1170 | 1538 | 100 | 0 | 139 | 139 | 0 | 0 | 0 | | | | | | | |
| September | 2736 | 3 | 197 | 155 | 2177 | 0 | 0 | 203 | 0 | 2 | 5401 | 0 | 83 | 0 | 0 | 0 | 0 | 0 | 274 | 1784 | 1168 | 100 | 0 | 140 | 140 | 0 | 0 | 0 | | | | | | | |
| October | 4076 | 2 | 197 | 234 | 2430 | 0 | 0 | 1201 | 0 | 12 | 5602 | 0 | 143 | 0 | 0 | 0 | 0 | 0 | 274 | 1991 | 529 | 100 | 0 | 319 | 319 | 0 | 0 | 0 | | | | | | | |
| November | 5347 | 1 | 197 | 307 | 2533 | 0 | 0 | 2316 | 0 | -7 | 6054 | 0 | 203 | 0 | 0 | 0 | 0 | 0 | 274 | 2076 | 463 | 100 | 0 | 260 | 260 | 0 | 0 | 0 | | | | | | | |
| December | 6385 | 1 | 197 | 368 | 2808 | 0 | 0 | 3007 | 0 | 5 | 6056 | 0 | 243 | 0 | 0 | 0 | 0 | 0 | 274 | 2301 | 677 | 100 | 0 | 183 | 183 | 0 | 0 | 0 | | | | | | | |
| Average | 4460 | 2 | 197 | 255 | 2404 | 0 | 0 | 1603 | 0 | -1 | 5578 | 0 | 160 | 0 | 0 | 0 | 0 | 0 | 274 | 1970 | 854 | 100 | 0 | 148 | 148 | 0 | | Average price (DKK/MWh) | | | | | | | |
| Maximum | 12535 | 28 | 197 | 723 | 4088 | 0 | 0 | 8994 | 0 | 2873 | 8603 | 0 | 522 | 0 | 0 | 0 | 0 | 0 | 274 | 3350 | 5196 | 100 | 0 | 3761 | 3761 | 0 | | (DKK/MWh) | | | | | | | |
| Minimum | 1561 | 0 | 197 | 76 | 549 | 0 | 0 | 66 | 0 | -1716 | 2795 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 274 | 450 | 0 | 100 | 0 | 0 | 0 | 0 | | 371 | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------------------|-------|------|------|------|-------|------|------|-------|------|-------|-------|------|------|------|------|------|------|------|-------|------|------|------|-------|------|-------------|------|------|------|---|---|
| Total for the whole year | | | | | | | | | | | | | | | | | | | | | | | | | Million DKK | | | | | |
| TWh/year | 39.18 | 0.02 | 1.73 | 2.24 | 21.12 | 0.00 | 0.00 | 14.08 | 0.00 | -0.01 | 49.00 | 0.00 | 1.41 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 24.49 | 0.00 | 0.00 | 2.41 | 17.31 | 7.50 | 0.00 | 1.30 | 1.30 | 0.00 | 0 | 0 |

| FUEL BALANCE (TWh/year): | | | | | | | | | | | | | | | | | | | | Imp/Exp Corrected | | | CO2 emission (Mt): | | |
|--------------------------|------|-------|---------|---------|------|---------|-------|----------|-------|------|------|--------|----|------|----------|---------|---------|----------|---------|-------------------|---------|--------|--------------------|-------|-------|
| DHP | CHP2 | CHP3 | Boiler2 | Boiler3 | PP | Geo-th. | Hydro | Elc.ly.s | Waste | CAES | Wind | Offsh. | PV | Wave | Solar.Th | Transp. | househ. | Industry | Various | Total | Imp/Exp | Netto | Total | Netto | |
| Coal | 0.04 | 1.54 | 2.48 | 0.13 | 0.16 | 5.28 | - | - | - | - | - | - | - | - | - | - | - | 0.01 | 3.37 | - | 13.01 | -0.92 | 12.09 | 4.45 | 4.13 |
| Oil | 0.77 | 0.34 | 0.55 | 2.78 | 3.57 | 0.40 | - | - | - | - | - | - | - | - | - | 69.20 | 6.72 | 26.92 | 3.01 | 114.27 | -0.07 | 114.20 | 30.44 | 30.42 | |
| N.Gas | 0.62 | 7.15 | 11.47 | 2.23 | 2.86 | 8.51 | - | - | - | - | - | - | - | - | - | - | - | 4.05 | 18.19 | 19.73 | 74.81 | -1.49 | 73.32 | 15.27 | 14.97 |
| Biomass | 1.06 | 7.35 | 11.37 | 1.65 | 2.26 | 0.20 | - | - | - | - | - | - | - | - | - | - | - | 7.29 | 5.18 | - | 36.36 | -0.02 | 36.34 | 0.00 | 0.00 |
| Renewable | - | - | - | - | - | - | - | - | - | - | 7.26 | 17.23 | - | - | 0.02 | - | - | - | - | - | 24.51 | 0.00 | 24.51 | 0.00 | 0.00 |
| H2 etc. | - | 0.00 | 0.00 | 0.00 | 0.00 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Geothermal | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Total | 2.49 | 16.38 | 25.87 | 6.79 | 8.86 | 14.39 | - | - | - | - | 7.26 | 17.23 | - | - | 0.02 | 69.20 | 18.07 | 53.66 | 22.74 | 262.96 | -2.50 | 260.46 | 50.16 | 49.52 | |



| District Heating Production | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------------|-------|------|------|------|------------------|-------|------|------|------|------|--------|------|---------|----------|------------------|-------|------|-------|------|------|--------|------|---------|----------|-------------------|-------------|------------|-----------|----------|--|
| Gr.1 | | | | | Gr.2 | | | | | | | | | | Gr.3 | | | | | | | | | | RES specification | | | | | |
| District heating | Solar | CSHP | DHP | | District heating | Solar | CSHP | CHP | HP | ELT | Boiler | EH | Storage | Bal-ance | District heating | Solar | CSHP | CHP | HP | ELT | Boiler | EH | Storage | Bal-ance | RES1 Wind | RES2 Offsho | RES3 Photo | RES4 Wave | Total er | |
| 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 | MW | MW | |
| January | 414 | 1 | 0 | 413 | 2618 | 0 | 0 | 1013 | 0 | 0 | 1605 | 0 | 22123 | 1 | 4146 | 0 | 197 | 1720 | 0 | 0 | 2223 | 0 | 5764 | 6 | 743 | 2918 | 0 | 0 | 3662 | |
| February | 424 | 2 | 0 | 422 | 2678 | 0 | 0 | 1369 | 0 | 0 | 1310 | 0 | 22054 | -1 | 4241 | 0 | 197 | 2151 | 0 | 0 | 1896 | 0 | 5096 | -3 | 1095 | 1328 | 0 | 0 | 2424 | |
| March | 361 | 2 | 0 | 359 | 2282 | 0 | 0 | 1176 | 0 | 0 | 1107 | 0 | 22207 | 0 | 3614 | 0 | 197 | 1918 | 0 | 0 | 1502 | 0 | 5055 | -4 | 867 | 1855 | 0 | 0 | 2722 | |
| April | 289 | 3 | 0 | 286 | 1829 | 0 | 0 | 857 | 0 | 0 | 972 | 0 | 21504 | -1 | 2896 | 0 | 197 | 1558 | 0 | 0 | 1131 | 0 | 4548 | 10 | 710 | 2451 | 0 | 0 | 3161 | |
| May | 227 | 3 | 0 | 223 | 1435 | 0 | 0 | 1161 | 0 | 0 | 266 | 0 | 19394 | 7 | 2272 | 0 | 197 | 1775 | 0 | 0 | 307 | 0 | 4526 | -8 | 720 | 1348 | 0 | 0 | 2068 | |
| June | 103 | 3 | 0 | 100 | 650 | 0 | 0 | 613 | 0 | 0 | 62 | 0 | 14660 | -25 | 1030 | 0 | 197 | 799 | 0 | 0 | 37 | 0 | 5584 | -4 | 752 | 1709 | 0 | 0 | 2461 | |
| July | 103 | 4 | 0 | 99 | 650 | 0 | 0 | 598 | 0 | 0 | 41 | 0 | 27994 | 11 | 1030 | 0 | 197 | 803 | 0 | 0 | 26 | 0 | 5524 | 3 | 505 | 1384 | 0 | 0 | 1890 | |
| August | 103 | 3 | 0 | 100 | 650 | 0 | 0 | 621 | 0 | 0 | 41 | 0 | 25815 | -12 | 1030 | 0 | 197 | 806 | 0 | 0 | 32 | 0 | 6154 | -6 | 721 | 1739 | 0 | 0 | 2461 | |
| September | 158 | 3 | 0 | 155 | 998 | 0 | 0 | 921 | 0 | 0 | 75 | 0 | 26247 | 2 | 1581 | 0 | 197 | 1256 | 0 | 0 | 128 | 0 | 5823 | 0 | 707 | 1690 | 0 | 0 | 2397 | |
| October | 235 | 2 | 0 | 234 | 1486 | 0 | 0 | 919 | 0 | 0 | 567 | 0 | 28232 | 1 | 2354 | 0 | 197 | 1511 | 0 | 0 | 635 | 0 | 6249 | 11 | 1192 | 2078 | 0 | 0 | 3270 | |
| November | 308 | 1 | 0 | 307 | 1950 | 0 | 0 | 911 | 0 | 0 | 1036 | 0 | 30586 | 3 | 3089 | 0 | 197 | 1622 | 0 | 0 | 1279 | 0 | 3512 | -10 | 1146 | 2558 | 0 | 0 | 3704 | |
| December | 368 | 1 | 0 | 368 | 2329 | 0 | 0 | 1042 | 0 | 0 | 1285 | 0 | 31382 | 2 | 3688 | 0 | 197 | 1765 | 0 | 0 | 1722 | 0 | 6168 | 4 | 773 | 2457 | 0 | 0 | 3229 | |
| Average | 257 | 2 | 0 | 255 | 1627 | 0 | 0 | 932 | 0 | 0 | 696 | 0 | 24374 | -1 | 2576 | 0 | 197 | 1472 | 0 | 0 | 907 | 0 | 5340 | 0 | 826 | 1962 | 0 | 0 | 2788 | |
| Maximum | 723 | 28 | 0 | 723 | 4572 | 0 | 0 | 1647 | 0 | 0 | 3756 | 0 | 40000 | 1472 | 7240 | 0 | 197 | 2440 | 0 | 0 | 5239 | 0 | 10000 | 1618 | 3100 | 4500 | 0 | 0 | 7564 | |
| Minimum | 90 | 0 | 0 | 76 | 569 | 0 | 0 | 0 | 0 | 0 | 41 | 0 | 0 | -936 | 902 | 0 | 197 | 549 | 0 | 0 | 26 | 0 | -1070 | | 0 | 0 | 0 | 0 | 2 | |
| Total for the whole year | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TWh/year | 2.26 | 0.02 | 0.00 | 2.24 | 14.29 | 0.00 | 0.00 | 8.19 | 0.00 | 0.00 | 6.11 | 0.00 | -0.01 | | 22.63 | 0.00 | 1.73 | 12.93 | 0.00 | 0.00 | 7.97 | 0.00 | 0.00 | | 7.26 | 17.23 | 0.00 | 0.00 | 24.49 | |

ANNUAL COSTS (Million DKK)

| | |
|------------------------------|-------|
| Total Fuel = | 59625 |
| Coal = | 726 |
| FuelOil = | 8341 |
| Gasoil/Diesel= | 13572 |
| Petrol/JP = | 17399 |
| Ngas = | 13930 |
| Biomass = | 5659 |
| Waste = | 0 |
| Maginal operation costs = | 475 |
| Total Electricity exchange = | 0 |
| Import = | 0 |
| Export = | 0 |
| Bottleneck = | 0 |
| Fixed imp/ex= | 0 |
| Total CO2 emission costs = | 7524 |
| Total variable costs = | 67625 |
| Fixed operation costs = | 3126 |
| Annual Investment costs = | 9263 |
| TOTAL ANNUAL COSTS = | 80013 |