-----------------------------------------------------------------------------------------------------------------Formula

**Projected cost of electricity (2015)**

--------------------------------------------------------------------------------------CHP (biomass) and DHN case

CHP **Elforsk (2014)** (slide 99)

* CAPEX: 46800 sek/KWe

Cross checked with the the other ref. (Technology data for energy plants (2012) and the value for medium CHP (wood chips) was 2.6 MEUR/MWe where medium is defined as 10-50 MW. The specific investment for the small CHP (wood chips) was 3.6 to 4.9 MEUR/MWe, where small is defined as 1 to 10 MWe, accordingly the relevant value would be 3.6 MEUR/MWe (corresponding to 10 MWe), which is equivalent to 37,000 SEK/kWe. Then the figure looks high.

Other reference checked, iea ETSAP (2008)[[1]](#footnote-1), had a range of 3000 to 6000 USD/kW for CHP plants up to 50 MW. Assuming 5000 USD/kW to correspond to 10 MW, then the specific investment would be around 43,100 USD/kW. Still the El Forsk figure is higher.

* OPEX fixed: 1050 sek/Kwe

Checked across (Technology data for energy plants (2012)) and the value is within range

Checked across IEA ETSAP and it’s a bit on the higher side

* OPEX variable: 21 sek/Mwhfuel

Checked across (Technology data for energy plants (2012)) and it’s double the value 10 sek/MWh (however not sure whether it is MWh fuel or MWH electricity)

* Fuel: 200 sek/Mwhfuel

Within range, checked across report[[2]](#footnote-2) involving Swedish energy agency, 174 SEK/MWh in 2016 Q3 for wood chips

TES **Technology data for energy plants (2012)**

* CAPEX: 1700 sek/m3 (slide 169)

Checked across a thesis from KTH[[3]](#footnote-3) 475 EUR/m3, equivalent to 4871 SEK/m3, the storage type is water tank, couldn’t find the reference though

Another reference [[4]](#footnote-4) considering 0.96 million Euro for a 2000 m3 storage for biomass based plant (boiler) with supplementary peak boiler (electric). Equivalent to 4946 SEK/m3

NETWORK **Cost analysis (2013) and DHC book**

* CAPEX: 15000 sek/house (slide 7)
* Checked on this [[5]](#footnote-5) slide 30, and the specific cost was based on distance for 250 EUR/m, will look it through again
* Another reference checked [[6]](#footnote-6), shows the total cost for “inner city area” to be 1000 EUR/m, which is equivalent to 10319 SEK/m (for 45 MW and 300 mm pipe diameter)
* OPEX fixed: 6.4% of CAPEX
* OPEX variable: 1% of CAPEX
* Total OPEX considered as 1% of total distribution cost or 10-15% of the annualized total cost[[7]](#footnote-7)
* Heat losses: 10% of OPEX
* Pressure losses neglected

PEAK BOILER **The role of DH (2010)** (slide 5)

* CAPEX: 1.57e10^6 sek/MW

Checked on this [[8]](#footnote-8) slide 30, and the specific cost was 80 EUR/kW, equivalent to 821000/MW

Another reference [[9]](#footnote-9) listed the investment cost for an electric boiler of 5 MW to be 0.71 Mil Euro, equivalent to 1.46 Mil SEK/MW

* OPEX fixed: 3% of CAPEX
* OPEX variable: 1.57e10^6 sek/MWh

-----------------------------------------------------------------------------------------------------------------------HP

HP

* CAPEX: 14560 sek/kW **(Experience)**
* Fuel (el): 0.35 sek/kWh

Backup heater

* CAPEX: 1360 sek/kW **Technology data for energy plants (2012)**
* Fuel (el): 0.35 sek/kWh

TES **Technology data for energy plants (2012)**

* CAPEX: 2700 sek/,

---------------------------------------------------------------------------------------------------------Large scale HP

Please check the below figures for large scale HP through a European context (Probably Danish).

<https://www.euroheat.org/wp-content/uploads/2016/04/160420_1600_1730_1st-place_Dominik-Dominkovic_presentation.pdf>   (slide 7)

Investment cost: 8650.8          [SEK/kWt]

Fixed O&M         : 56.6              [(SEK/kW)/year]

Variable O&M    : 0.0051         [SEK/kWh]

The values seem coherent with what we had for the small scale we got earlier (80 kW VS 30+ MW).

Same figures are available for large scale electric boilers, but these are not back-up.

1. <https://iea-etsap.org/E-TechDS/PDF/E05-BiomassforHP-GS-AD-gct.pdf> [↑](#footnote-ref-1)
2. https://www.energimyndigheten.se/globalassets/statistik/priser/sm1701\_2.pdf [↑](#footnote-ref-2)
3. https://www.diva-portal.org/smash/get/diva2:956741/FULLTEXT01.pdf [↑](#footnote-ref-3)
4. https://journals.aau.dk/index.php/sepm/article/view/1632/1418 [↑](#footnote-ref-4)
5. https://www.euroheat.org/wp-content/uploads/2016/04/UP-RES\_M6\_District\_Heating\_and\_Cooling.pdf [↑](#footnote-ref-5)
6. https://iea-etsap.org/E-TechDS/PDF/E16\_DistrHeat\_EA\_Final\_Jan2013\_GSOK.pdf [↑](#footnote-ref-6)
7. https://iea-etsap.org/E-TechDS/PDF/E16\_DistrHeat\_EA\_Final\_Jan2013\_GSOK.pdf [↑](#footnote-ref-7)
8. https://www.euroheat.org/wp-content/uploads/2016/04/UP-RES\_M6\_District\_Heating\_and\_Cooling.pdf [↑](#footnote-ref-8)
9. https://journals.aau.dk/index.php/sepm/article/view/1632/1418 [↑](#footnote-ref-9)