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VALUATION OF RENEWABLE ELECTRICITY SOURCES LOAD DIAGRAM

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OVERVIEW

The renewable energy sources (RES) cannot be operated with sufficient return for investor without some kind of economic support in current conditions in the Czech Republic. The support is set up with regard to the market value of electricity generated by RES. The method of calculation this value of electricity is described further.

METHODS

The value of electricity generation (and consumption as well) depends on the load diagram. The value of the diagram depends on several factors: maximum power, utilization time, diagram volatility, readiness to start, etc. The value can be calculated by comparison with other electricity sources, this is the same approach that is used in market environment.

The set of electricity sources in the Czech Republic is diversified, power generation is based on: nuclear, coal fired, gas turbines, hydro, wind, photovoltaic, etc. Any diagram cannot be therefore cover by one type of power station and energy source. One approach how to find suitable energy sources is to calculate such called marginal electricity cost of all relevant types of the electricity sources and combine them to desired diagram. Another approach is to use prices from the market. The first approach was used in the past, this year the second approach was studied and tested.

The Czech electricity market was liberalized in the past decade. Any subject can after completion of some administrative steps buy electricity in the market or it can use the service of electricity dealer. The Power Exchange Central Europe (PXE) is the main electricity market in the country and is in fact the price maker.

Te PXE prices were studied and it was decided to use long-term contract prices as they are more stable comparing with spot prices. On the other hand long-term prices do not reflect the events with short term influence to prices. Such events can cause both an increase and a decrease of price, an average price is not significantly affected in long term. The hourly deviations of the diagram have more important influence to the value of this diagram. It is very difficult to make the estimations of the value of system and ancillary services for the following period as the price of the services varies from hour to hour. Finally it was decided to use the average values in the previous three years and to increase them by an expected rate of growth of electricity price.

RESULTS

The maximization model was created as the owner of the source has an endeavour to gain maximum revenue from the source. The expected production load diagram could be covered by all available PXE products: annual, quarterly, monthly. The difference between planned production and PXE products was balanced by system services. The optimization process was performed by optimization software Mathematica. Later after making some optimization model improvements Excel spreadsheet was tested for calculations.

CONCLUSIONS

The above mentioned model can be used to find the value of the load diagram supplied by renewable energy sources especially wind and photovoltaic power stations. The dependency of results on system service prices was the main issue of the model. Eventually the monthly averages were used for optimization process. On the other hand the suitability of Excel spreadsheet for this type of calculation was the pleasant surprise.