Managing the Mix of the Future Energy Supply

If things can get worse, they usually do.

If you think about the challenges related to the energy supply of our civilization in the coming decades, this sentence applies at least in view of the growing complexity of the problem.

The electricity demand of the world population will continue to grow, not only on a global basis but also in the industrialized countries, as substituting fossil fuels in industry, transportation and private sectors will certainly lead to an even higher level of electrification. While solar, wind and other renewable energy sources continue to demonstrate that they are exceeding projected growth and cost reduction rates, one cannot overlook the key issues of their intermittency and uneven regional distribution.

Clearly, the energy transition will take many years, and current fossil technology will coexist with the renewables for a considerable amount of time, but also in the long run there doesn't seem to be a single solution for meeting our demand for power and heat.

The future energy supply will very probably consist of a wide spectrum of generation and storage technologies that will need to be customized for regional availability of energy sources and storage options and optimized together with the local demand patterns to create a reliable and cost-effective solution.

Why is simulation so important?

Many options and novel concepts must be evaluated, and various solutions for generation, storage, power-to-gas technologies, heat pumps etc. must be combined with each other and the existing assets to find the right mix. Simplified models may miss actual technical limitations and thus lead to unrealistic results in terms of expectable capacity, efficiency, and availability of the overall system.

Another oftentimes underestimated drawback of simplified models is that adjusting such models correctly to real-life equipment is in fact very difficult, same as proving that such models are 'more-or-less' correct. Building a simulation model with functionality that is very close to vendor information allows directly using such information for parametrizing the models. Proving model accuracy against vendor information is also a much more straight forward task than assessing when and where a 'simple' model may be 'good enough'. With sufficient detail in the model, there is also the necessary transparency for the result, developing a natural trust in the prediction.

What level of detail shall be applied in the scenarios?

When considering renewable energy sources, there is practically no way around evaluating the entire year with sufficient granularity to evaluate the interplay of renewable power sources with storage technologies and existing equipment as close to reality as possible. Assumptions of 'typical' or 'average' days or a sophisticated pick from historical data will not provide sufficient information on the performance that can be expected from a specific mix of technologies, since the entire range of ambient and load conditions in combination with possible storage cycles must be evaluated.

Why is EBSILON® Professional the right tool?

EBSILON® Professional is a comprehensive heat balance software that allows for in-depth thermodynamic analysis of complex energy systems benefiting from more than 25 years of continuous development and hundreds of users in the power industry, at utilities and in academic research.

In a state-of-the art graphical user interface the user can freely configure combinations of standard modules for the plant equipment or add user-defined modules written in an easy-to-learn scripting language. Most importantly for the evaluation of large scenario calculations, EBSILON includes a time series feature to evaluate the combination of intermittent generation with power and heat accumulation devices. An interface to Python as the bridge to advanced data analytics as well as powerful Excel add-in interfaces to time series and individual case simulations complete the options to manage large amounts of scenario data.

ENEXSA cooperates with STEAG Energy Services in the development of EBSILON and offers customized application-specific training seminars as well as modelling services for power generation processes.

If you want to learn more about EBSILON, please contact ENEXSA!

Contact Information: Josef Petek, Manager Commercial Operations, ENEXSA GmbH, Parkring 18, 8074 Raaba-Grambach, Austria ■ www.enexsa.com
josef.petek@enexsa.com