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VOITH

**Hybrid power
solutions
Microgrid modeling
and simulation**

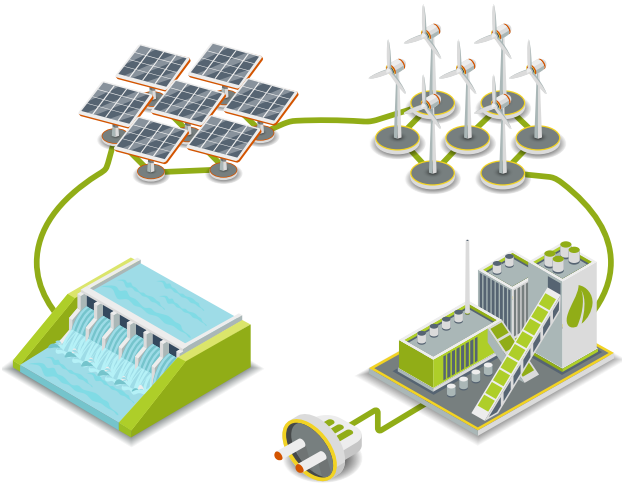


Mastering the challenges of changing energy systems

Today, the energy and grid industry is undergoing a rapid transformation. Trends such as distributed energy, renewables and digitalization are influencing increasingly complex network models and regulatory requirements. As multi-functional power plants, pumped storage facilities have a high potential to meet this challenge as their technology is based on the only long-term, technically proven and cost-effective form of storing energy on a large scale.

Combining wind mills and/or solar farms with a pumped storage plant ensures that the energy generated is immediately and reliably stored when it cannot be directly fed into the power grid.

Joining forces



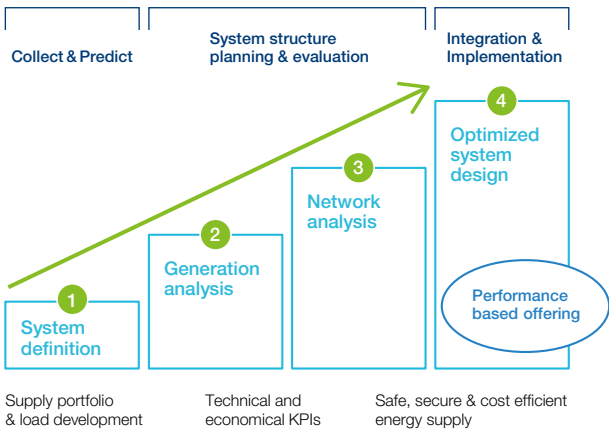
Proven economical distributed energy designs

Voith Hydro and Siemens provide an integrated approach to evaluate the technical feasibility of hybrid power plants under consideration of economical expectations.

To define an optimal, flexible and transparent solution, the dedicated microgrid simulation tool from Siemens was extended by Voith's hydropower expertise to support planning processes.

This approach supports decision makers to ensure profitable business development based on technical resilience.

Microgrid modeling and simulation process



We work in four well-defined steps

1 System definition

- Understand the existing energy supply system
- Define requirements for the future energy supply system
- Identify possible opportunities for alternative energy supply systems
- Describe the relevant parameters for evaluating different energy supply system concepts, including economic and technical parameters

2 Generation analysis

- Simulate relevant scenarios and technology for energy supply and management
- Estimate expected energy supply costs
- Determine high-level project economics
- Identify key technical aspects, e.g., short-circuit levels or grid stability

3 Network analysis

- Identify network weaknesses and feasibility issues
- Indicate the effect on the network
- Compare different network configurations to identify the optimal system design

4 Optimized system design

- Iterative integration of generation and network analysis
- Optimal combination of generation portfolio and network
- Assure technical and economic feasibility
- Determine network tariff / electricity price
- System design
- Financial KPIs for different supply scenarios
- Performance-based offering

The benefits of working with us

Voith in hydropower and Siemens in wind and solar energy are leading in know-how and market share.

When considering a potential project concept, our customers benefit from our accurate analysis of efficient power systems in an early feasibility stage, while considering technical, regulatory and economic industry requirements.

User benefits

- + We supply a report to each stakeholder, providing consultation and support for decision-making.
 - + Detailed analytics on economics, network, reliability and sizing can reduce investment costs, improve profitability and may optimize existing scaling of the power park.
 - + The analysis and studies conducted do not determine the mixture of renewable energy sources at the beginning, and therefore, provide a neutral and independent view of assumed layouts.
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