SIEMENS

DIGITAL INDUSTRIES SOFTWARE

Simulation for energy transition

Harness the power of multiphysics simulation software and design exploration to accelerate sustainability progress while improving performance

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Decarbonization is a critical topic across industries, including energy and utilities. As a growing energy business, the stakes are rising for you to find new ways to power your operations more sustainably and be more transparent with your environmental, social, and governance (ESG) strategies. The greatest challenge is to comply with government mandates while at the same time ensuring cost-effective production processes. We see three main themes as central to the decarbonization strategy for energy organizations: Digital transformation, the rise of renewable energy sources, and higher than normal market volatility. To ensure business resilience and growth, energy businesses must evolve at a rapid pace to design and deliver more efficient assets and optimize existing systems faster while reducing emissions and costs. Businesses must stay nimble and adjust quickly to take advantage of the changing technological and market conditions.

However, it is not just decarbonization that is impacting the energy industry. The last few years have seen the emergence of supply chain constraints, increased fuel prices, and digitalization of the modern grid. Digital technologies offer a huge potential in reducing carbon emissions through technologies that gather and analyze data and enable processed information to be sent to smart devices for end users. These technologies can not only help monitor energy usage but also balance supply and demand in modern electricity grids.[1]

Many governments and organizations have set ambitious goals to reach net-zero by 2050, driving growth for renewables to new heights. In fact, wind and solar energy sources accounted for 10.31% of electricity generation worldwide in 2021, up from a 9.28% share a year earlier.[2]

While these trends are interlinked, the combined effect of these trends can create more challenges for energy organizations. And in this age of hyperconnectivity, systems and technologies are becoming more complex, raising new challenges for engineers and designers to create smart and sustainable products. What is needed is a closed-loop approach with better collaboration across an asset's lifecycle—one that integrates your multidisciplinary engineering teams to design and create more sustainable and affordable products with less production and maintenance costs.

Key industry trends

Market volatility

50%

increase in energy prices since 2022

Source

Sustainability

45%

reduction in emissions is required to meet the 2050 net-zero goals

Source

Energy demand

2%

increase in global energy consumption per year

Source

Introduce **simulation early** in the design phase

What if you could bring all your multidisciplinary processes onto one integrated environment? What if you could get immediate feedback on the performance and energy efficiency of a system that needed optimizing? Innovative organizations are taking advantage of simulation-driven design methods to reduce emissions, improve performance, and stay ahead of the competition. Research from the Aberdeen Group verifies this shift to simulation-driven design.[3] *See figure 1.*

Historically, simulation and test platforms have been complex and fraught with limitations. The tools were managed by simulation specialists, which made the process quite time-consuming and expensive. However, advanced simulation technologies can help free your designers and engineers to visualize the individual components of their systems in real-time to explore "what-if" scenarios and automatically optimize designs against multiple objectives. Whether you are designing a power plant or energy equipment, decisions made earlier in the design stage can help your engineers avoid costly and unforeseen problems that may occur during a product's performance and deliver the products on time while reducing costs.
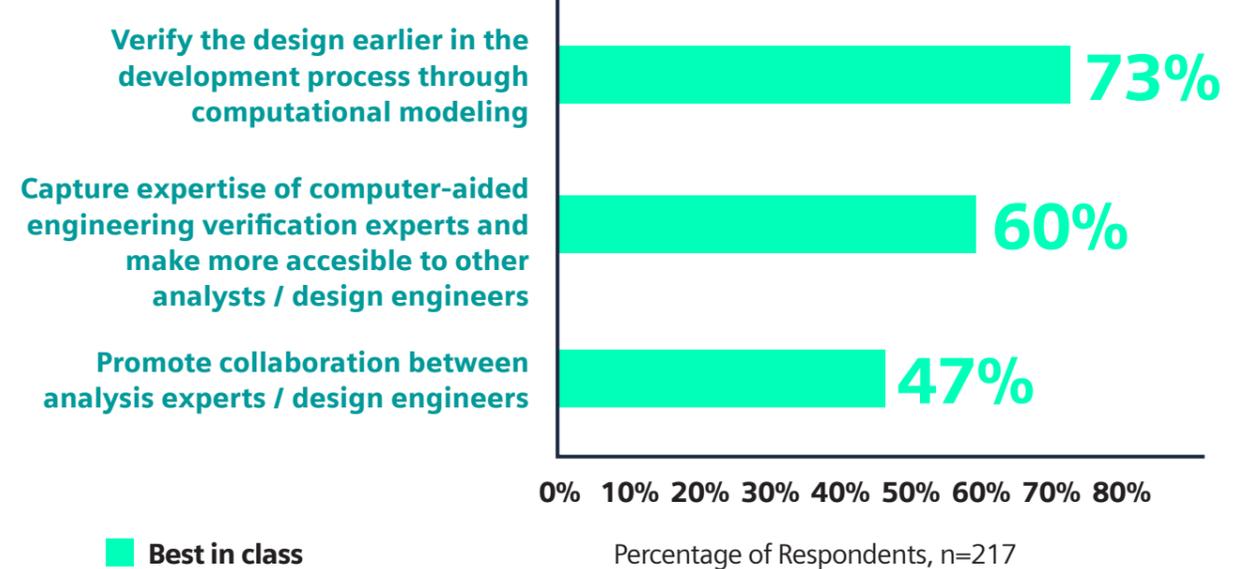
Verify the design earlier in the development process through computational modeling — **73%**

Capture expertise of computer-aided engineering verification experts and make more accesible to other analysts / design engineers — **60%**

Promote collaboration between analysis experts / design engineers — **47%**

0% 10% 20% 30% 40% 50% 60% 70% 80%

■ Best in class   Percentage of Respondents, n=217

Figure 1: More organizations are using simulation early in the design phase.
(Source - Aberdeen Group, May 2017)

Empower engineering **innovation**

Siemens offers a complete end-to-end multiphysics software solution to help you break down silos and empower engineers to explore and predict real-world interactions of the products they design. Furthermore, engineering teams can use design space exploration technology to automate design modification, analysis, and evaluation to develop the best solution quickly.

Siemens Simcenter™ is a flexible, open, and scalable portfolio of solutions designed to help organizations deploy an efficient multidisciplinary simulation process. The solutions can be used for workflow customization, architecture-driven simulation, model-based software engineering as well as model and data management.

The Simcenter Amesim™ software offers broad capabilities to improve systems engineering productivity from the early development phase until final performance validation. In addition, the solution supports renewable energy production by helping manufacturers optimize wind turbines. For example, by using the Amesim technology, your engineers can simulate the rotating velocity of the wind turbine and assess the electrical power generated by the input wind velocity. Furthermore, you can integrate the software with other computer-aided engineering (CAE), computer-aided design (CAD) solutions, existing Simcenter solutions, the Teamcenter® PLM portfolio, and Excel spreadsheets which your teams can centrally manage.

Thanks to the seamless user experience, your engineering teams can focus on what they do best—innovating.

Hydro-Québec

See how the largest power utility in Canada and operator of an extensive high-voltage transmission system uses Siemens Simcenter testing solutions to maximize their testing efficiency onsite. Test data, which is widely used to validate assumptions on the complex models, help them monitor vibration levels and better predict optimal turbine maintenance intervals.

Read more

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One advantage of Simcenter testing solutions is the seamless integration of the hardware and software.

François Lafleur, Researcher
Hydro-Québec
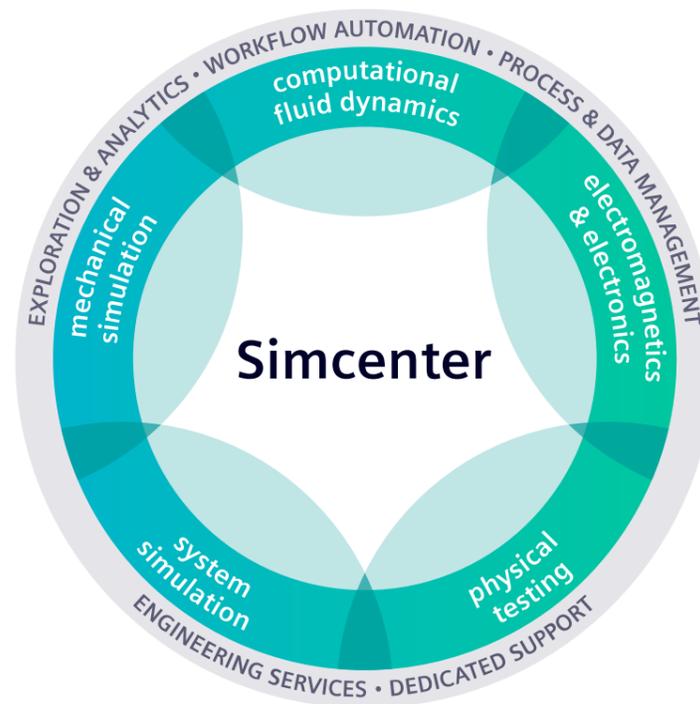
Digitalize to decarbonize

Sustainable growth is no longer a nice-to-have capability but is now a key focus area that will drive growth for many organizations. To stay competitive, energy organizations will have to be strategic about their sustainability initiatives. Digitalization will be a key enabler for decarbonization efforts with many organizations switching to new business models and processes. Now is the time for energy businesses to transition and transform toward a more sustainable future powered by advanced simulation technologies.

A catalyst for the digital enterprise

Discover Siemens Xcelerator as a Service, a comprehensive portfolio of software and services designed to help you solve your most complex engineering design challenges. The application development platform can help you speed up the digital transformation cycle and unlock a powerful industrial network effect. With Siemens Xcelerator on the cloud, you gain the ability to create a comprehensive digital twin—now in a more accessible, scalable, and flexible form.

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The simulations revealed the mechanisms behind the pressure fluctuations we observed on the rig".

Dr. Daniel Moëll, Combustion Engineer, Siemens Energy.

Read more

Watch on-demand webinar

Watch this on-demand webinar to learn how Siemens advanced engineering simulation technologies can help you develop new capabilities to meet your energy transition objectives.

Watch now

References

1. Energy efficiency and digitalization,
   International Energy Agency (IEA) Article

2. Statista Report: "Share of electricity generation from wind
   and solar energy sources worldwide from 2010 to 2021"

3. The Benefits of Simulation-Driven Design, Aberdeen Group, 2017

About Siemens Digital Industries Software

Siemens Digital Industries Software helps organizations
of all sizes digitally transform using software, hardware,
and services from the Siemens Xcelerator business
platform. Siemens' software and the comprehensive
digital twin enable companies to optimize their design,
engineering, and manufacturing processes to turn
today's ideas into the sustainable products of the future.
From chips to entire systems, from product to process,
across all industries.

Siemens Digital Industries Software.
Technology to transform the everyday.

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