



WHITE PAPER

Designing durable and reliable energy assets

Navigating the Energy Transition

The energy sector is undergoing a profound transformation. As the world accelerates toward carbon neutrality, the pressure to innovate is intense. Established companies and agile startups are racing to deliver new generations of wind turbines, hydroelectric plants, and fusion reactors. The stakes are high: every design decision can influence not only project costs and timelines, but also the safety, reliability, and sustainability of energy infrastructure for decades to come.

The Challenge: Building for Longevity and Safety

Design teams face a complex landscape. The need to rapidly develop new systems is matched by the imperative to ensure these assets are robust, safe, and maintainable. Unexpected failures - whether due to material fatigue, overlooked risks, or insufficient testing - can lead to costly downtime, environmental incidents, and reputational damage. In the energy sector, such failures can have far-reaching consequences, impacting communities, ecosystems, and national economies.

Key questions for design teams:

- How can we confidently predict and optimize the reliability and durability of new assets?
- How do we balance speed-to-market with rigorous safety and compliance?
- What tools and processes help us avoid costly surprises and ensure long-term value?

Empowering Better Design Decisions

At HBK, we understand the unique pressures facing energy sector innovators. Our approach is to help design teams turn engineering data into actionable insights - enabling smarter, safer, and more sustainable decisions from day one.

How we help:

1. Risk Identification and Mitigation

We support teams in digitizing risk and reliability analysis, making it easier to collaborate and identify potential failure modes. By applying proven methods like FMEA and Fault Tree Analysis, supported by the ReliaSoft platform, engineers can systematically recognize risks such as pollution, flooding, or blackouts, and develop strategies to mitigate them before assets are built.

ReliaSoft RCM++ further helps teams validate maintenance plans and ensure that reliability is built into both design and operational strategies.



Online FMEAs and dashboarding with ReliaSoft Cloud for efficient worldwide team collaboration

2. Design for Reliability

Our solutions enable rapid reliability simulation of different design scenarios, using digital twins and reliability block diagrams. ReliaSoft BlockSim allows teams to compare materials, components, and systems, ensuring that every choice is informed by real-world data and industry standards. Whether you're evaluating the fatigue life of a wind turbine blade or the reliability of a hydroelectric generator, simulation helps you optimize for performance, safety, and cost.

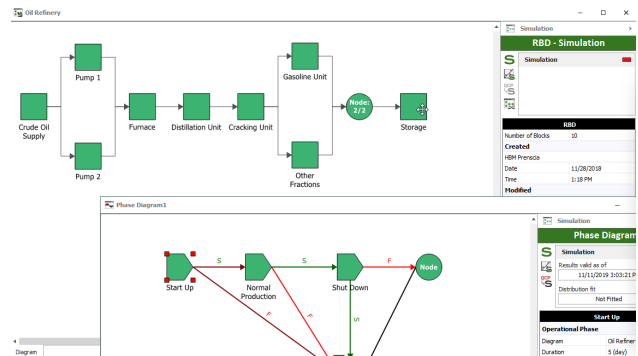


Image: BlockSim simulation dashboard

Reliability predictions can be benchmarked against standards using Lambda Predict, helping teams make informed decisions even when field data is limited.

3. Fatigue Life and Durability Prediction

We help engineers predict where and when fatigue failure might occur, using nCode DesignLife to integrate with leading FEA platforms. This means you can predict durability hotspots, virtually test multiple design iterations, and ensure compliance with global standards - before committing to costly prototypes or production runs.

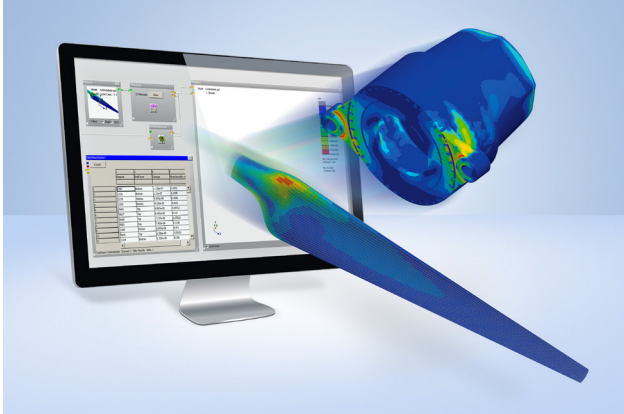


Image: FEA fatigue analysis and durability hotspots

Result: Transforming Energy Asset Design for Lasting Impact

By integrating advanced risk analysis, reliability simulation, and durability prediction - powered by ReliaSoft and nCode - energy sector design teams unlock a new level of confidence and control over their projects. The result is not just a better design process, but a strategic advantage:

- **Accelerate Innovation, Reduce Risk:** Teams can move faster from concept to production, knowing that every design is optimized for reliability and safety. This means fewer costly surprises, reduced risk of failure, and a smoother path to market.
- **Maximize Asset Value:** By optimizing for durability and maintainability from the outset, companies extend the operational life of their assets, reduce lifecycle costs, and deliver greater value to stakeholders and customers.
- **Protect Reputation and Compliance:** Proactive risk management ensures compliance with global standards and helps safeguard against environmental or safety incidents that can damage brand reputation.
- **Enable Sustainable Growth:** Reliable, long-lasting assets support the transition to greener energy, helping organizations meet ambitious sustainability targets and build trust with regulators, investors, and communities.

With ReliaSoft and nCode solutions embedded in the design workflow, energy innovators are empowered to deliver assets that set new benchmarks for reliability, safety, and sustainability - driving success in a rapidly evolving market.