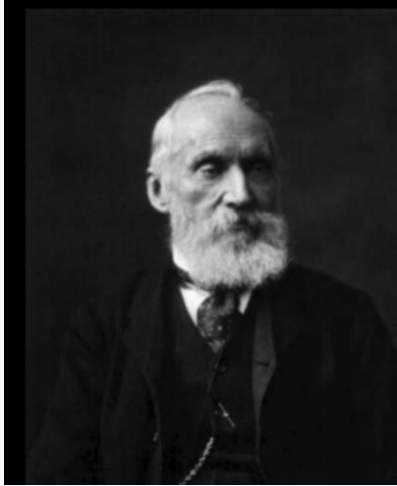




# Real-time Risk Assessment and Capacity Optimization of the Power Grid

An Introduction to Infinigrd

[www.infinigrd.ai](http://www.infinigrd.ai)



Lord Kelvin

**“If you can’t  
measure  
*(or calculate)* it,  
you can’t  
improve it”**

Be data driven, daily. Quantify your power system's current and future risk level. Make calculated decisions on the uncertainty you face in supplying stable energy.



From fluctuating energy supply and evolving load curves, to adverse weather events and complex maintenance schedules, to optimizing capex and reinvestment plans, Promaps™ Realtime will reduce risk, enhance reliability, and improve system planning.

Whatever the complexity of your energy operations and your network, whatever challenges lie ahead, Promaps™ delivers results.



#### Industry first software

**Promaps™ Realtime** is the only proven risk management solution for managing a power system's risk and reliability metrics. **Promaps™ Realtime** provides mathematically defensible System Risk Analyses that help to identify and reduce the risk of costly outages and missed opportunities allowing you to plan and operate more efficiently.



#### Ready to deliver

Within minutes of receiving data, the resulting analysis delivers a real-time picture of your system's risk, the key contributors to risk, and the probability of failure. You can also use the calculations for Predictive and Prescriptive Analytics, **looking ahead at up to 48 hours of Predicted System Performance** over the next 48 hours, as well as to analyze What-If scenarios.



#### A versatile solution

**Promaps™ Realtime** is ready to use by Distribution System Operators (DSO), Transmission System Operators (TSO), Renewable Energy Providers, and electricity intensive industry sensitive to disruptions in their energy supply to improve System Reliability, to Optimize Capital Investment, and to Predict System Risk.

# Key benefits

Using **Promaps™ Realtime** you can maximize operations across your organization and value chain with an industry first: a dynamic, probabilistic risk baseline for your power system.

Now your departments and teams can all have the same visibility into your operational challenges and opportunities while sharing an understanding of the risk implications of ALL actions taken and all changes contemplated/made.



Helps you ensure a stable and secure energy supply, avoiding outages, blackouts, financial penalties, and lost revenue.



Anticipate and take adaptive actions as situations occur; understanding and minimizing their adverse impacts.



Back up swift decision-making with clear data that defines financial metrics on risk and its consequences.



Safely push your system further, meeting reliability criteria and maximizing reliability and profitability.



Expand successfully and efficiently in adding renewable energy options to your fleet.



Be ready for emerging risk reporting requirements.



Streamline regulatory approvals and meet operational security best practices

# Market-leading features

**Promaps™ Realtime** is a unique and proprietary software platform custom implemented by the Promaps Professional Services and Certified Implementation Partners to deliver unique Business Value.

You can be up and running on Promaps in as little as three days, with average implementation times of 2-4 weeks (after delivery of required system data, topography, and metrics). You can "test the waters" with the core functionality then later add data sources to enhance system functionality.



## Software features

- APIs can connect Promaps Technology to relevant IoT systems and/or your digital twin platform
- Get reliable (near) real-time forward prediction (up to 48 hours) of vulnerability of the power grid
- Failure probability for each component, branch, and system
- Risk for loss of load in MWh/h for each load and/or for the entire system
- Web-based operational dashboard for intuitive live reports, KPIs, and overall system status
- Model scenarios and test risk mitigation actions and strategies on an intelligent digital twin of your power system

## Software features

Our specialists provide:



Project scoping to get you up and running



Live integration with your control systems



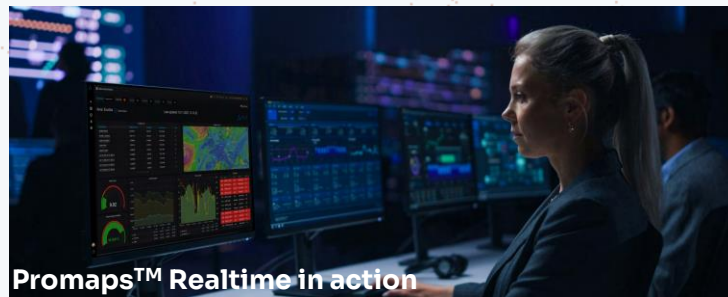
Ongoing technical support, with automatic software upgrades

# How Promaps™ Realtime works

**Promaps™ Realtime** delivers probabilistic risk analysis of power supply security through our proprietary simulation tool.

Using big data and a digital twin of your power system, in concert with proprietary mathematic modeling, we calculate the anticipated energy that will not be delivered. This approach also helps you to identify the location, nature, size and root cause of system-wide problems.

Every 5 minutes, Promaps inputs a full-model export from your SCADA system. We then recalculate statistical component failure rates and repair and reconnection times, as well as dynamic, weather-dependent failure rates for power lines. A simulation tool combines a flow model of your power system with reliability models of each system component to deliver Predictive/Prescriptive System Analytics.



Be proactive as well as reactive with ever-smarter technology

Promaps™ Realtime is designed to improve your risk management capabilities.

Our software also opens up the possibility for greater bilateral cooperation – across organizations and system borders – when running and maintaining vital power infrastructure. This includes closer partnerships between TSOs and regional DSOs, and between a TSO and neighboring TSOs.

- Easily expandable – start with what you have now and build from there
- A range of modules to support operations, operational and maintenance planning, emergency preparedness, and investment and re-investment
- Ready to work with an intelligent digital twin system
- Built for machine learning (AI/ML)
- Supports cross-organization and cross-system/border cooperation

# Our credentials



## 25+

**years of expertise**

Our technical team brings more than two decades of power systems know-how to Promaps™ solutions



## 8+

**year track record**

Promaps™ Realtime has been used by utilities to increase energy supply reliability while saving time and money since 2016



## 15+

**years of R&D**

Invested in developing and refining Promaps™ Realtime



## 4

**industry accolades**

Technology award nominations since 2014

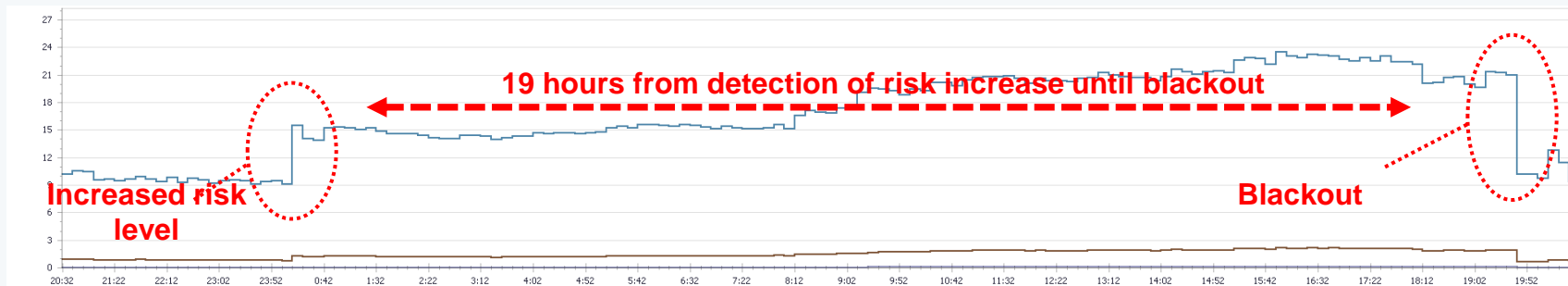
**"Promaps™ Realtime insights are the most sensitive results data we have in our entire organization."**

An executive at a major Nordic DSO



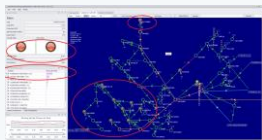
# Case Study 1: Analysis of major blackout in Norway

With Infinigrd technology installed, the increased risk level would have been detected – and a blackout could have been averted!

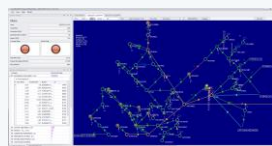


The situation if Promaps had been installed – postpone down regulation of power plant and avoid blackout

Before failure, critical lines detected



Critically high risk for failure detected, **high risk of fallout for one line (Line A)**



**Cascade list** showing effect on loads in case of fallout of Line A



Representation of **all loads not fully covered** if Line A fail

Scenario analysis: Postpone planned down regulation of power plant



Starting point: Power plant fully operational, Line A fully operational



**Scenario analysis:** assuming Line A fails -> all loads covered

Source: Infinigrd analysis based on real data, charts small/shaded due to sensitive data



# Use Case 1: System operation and planning

## Constant surveillance of the grid's risk level now and 48 hours into the future



### In operation:

- Monitor system risk in real time: one look at the screen for assessing if the risk is okay or not
- If high risk state occurs - go into “study mode” and test which action can be done to reduce high risk before it is set in operation

### In planning of operation:

- Risk forecast next 45min - 48 hours taking into account planned outages, maintenance schedules, weather, production, configuration and load etc.
- Reserve planning: spinning reserve, countertrade, grid temporary limits and other operational calculation and evaluation

### Risk calculations:

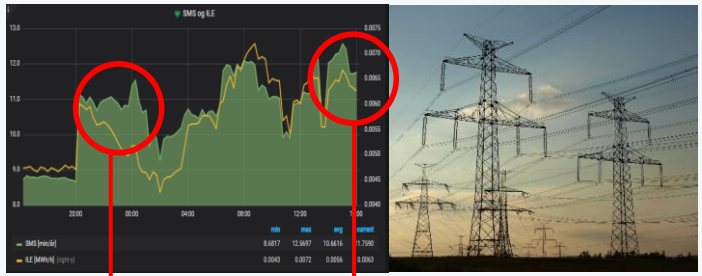
- Provides base case risk analysis to the rest of the grid owner value chain

### Value proposition for grid owner:

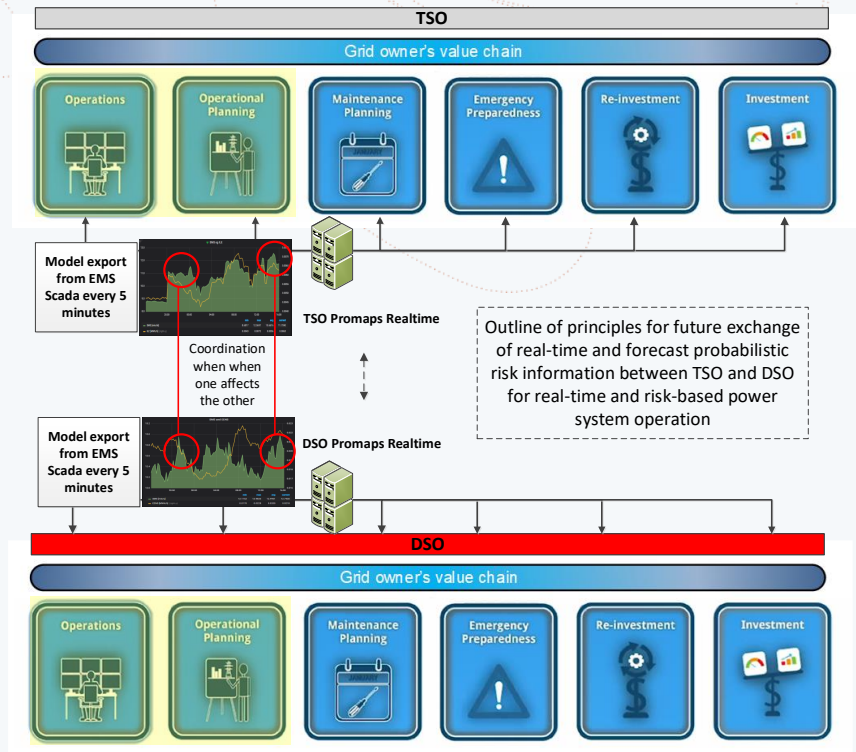
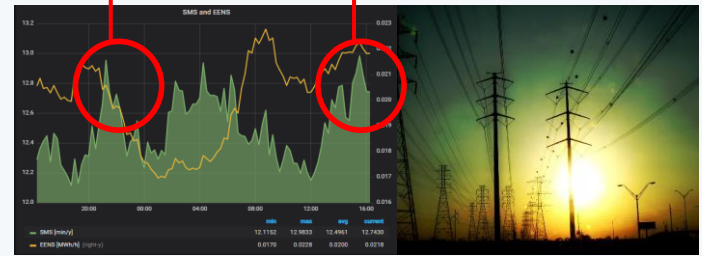
- Get a quantified real-time risk level and forecast with associated costs.
- Take risk-reducing measures in the power system in operational operation and operational planning.
- Purchase of rotating power reserve
- Test (through simulation) the impact of planned measures such as switching off components for revisions and maintenance
- Testing the best strategies for contingency planning (e.g. impact of weather forecast)
- Testing the impact of new technology such as more variable renewable production and more variable consumer patterns



# Use Case 2: TSO-DSO coordinated operation



High risk for black outs,  
need for coordinated  
actions

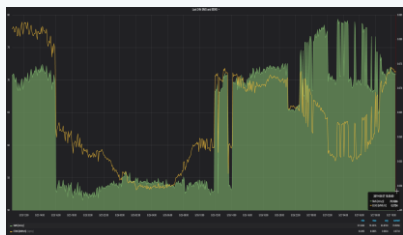


Source: Infigrid analysis

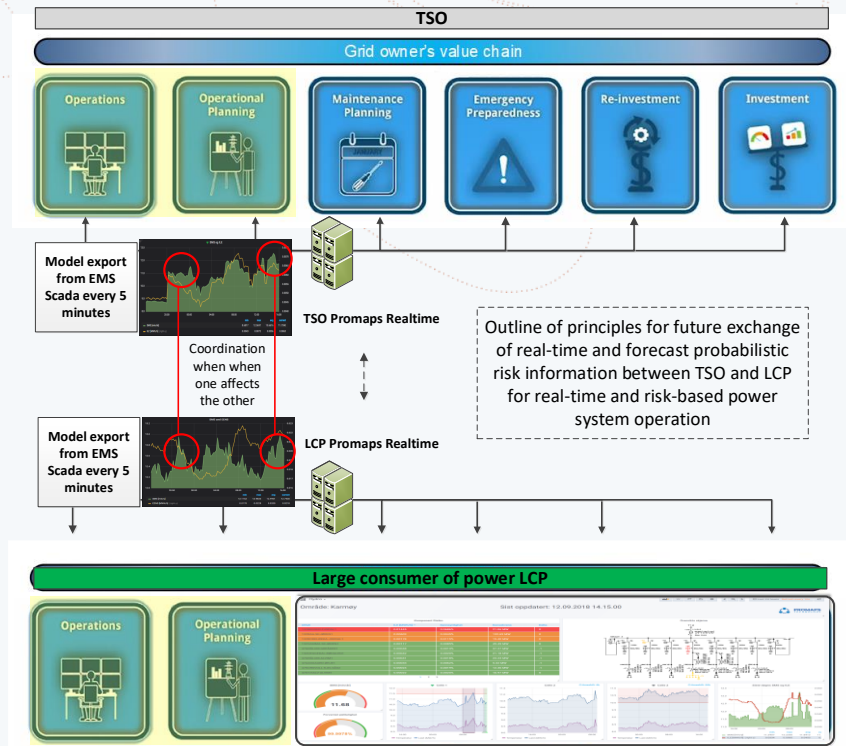


# Use Case 3: TSO-Large Consumer of Power (LCP)

Identifying the root-cause of an increased risk in the power system. Allow for LCP and TSO to coordinate corrective measures



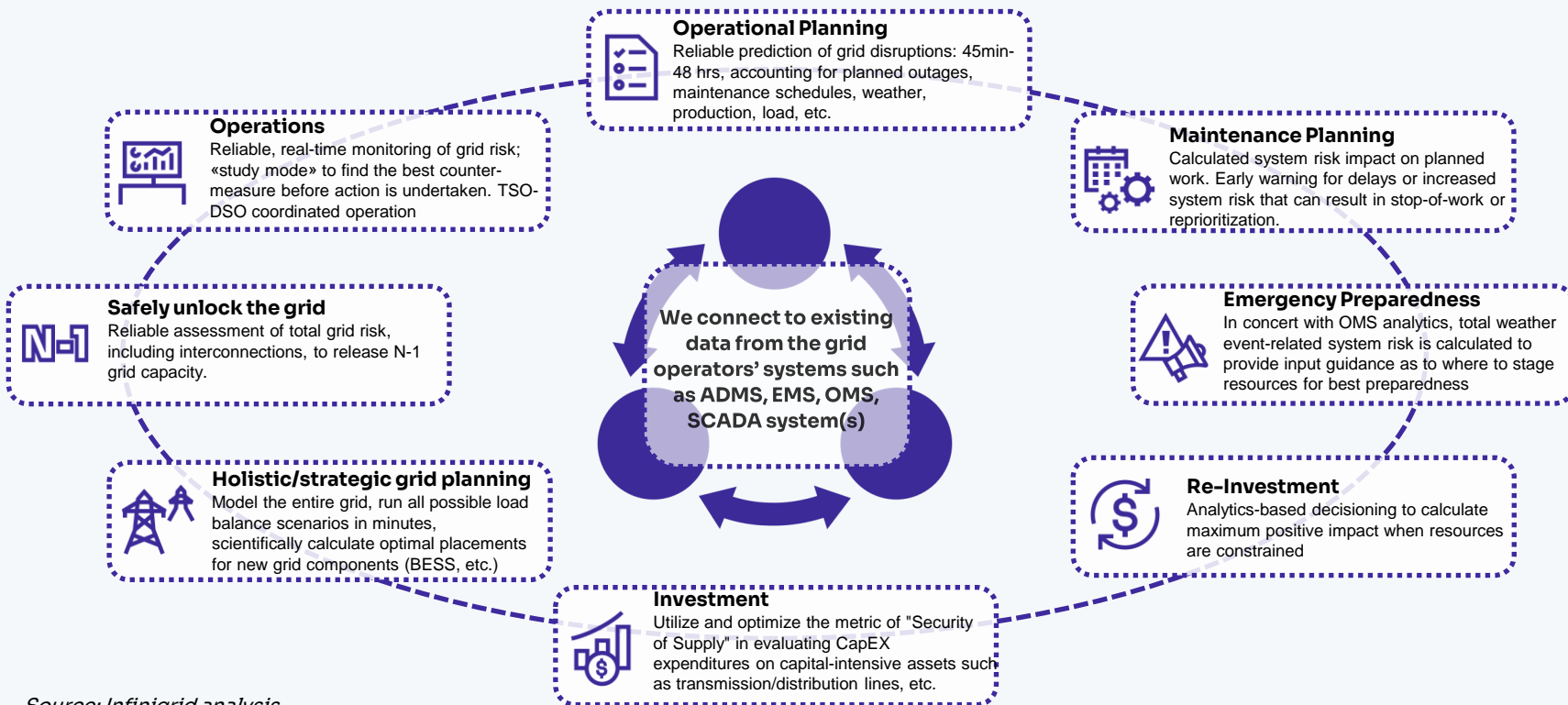
Norsk Hydro consumptions: 12% of Norway's total consumption





# Addressing the entire grid owner value chain

## One source of truth for entire grid operations





**Get in touch**

## Infinigrid AS

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