



Heimdall Power

The power of knowing

Brief company overview | March 2022



Our solution can increase
the capacity of the grid by

33%



FERC Order No. 881

“...Specifically, the Commission is requiring: public utility transmission providers to implement ambient-adjusted ratings on the transmission lines over which they provide transmission service; regional transmission organizations (RTO) and independent system operators (ISO) to establish and implement the systems and procedures necessary to allow transmission owners to electronically update transmission line ratings at least hourly...”

177 FERC ¶ 61,179
UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION
18 CFR Part 35
Docket No. RM20-16-000; Order No. 881
Managing Transmission Line Ratings
(Issued December 16, 2021)

AGENCY: Federal Energy Regulatory Commission.

ACTION: Final rule.


SUMMARY: The Federal Energy Regulatory Commission (Commission) is revising both the *pro forma* Open Access Transmission Tariff and the Commission's regulations under the Federal Power Act to improve the accuracy and transparency of electric transmission line ratings. Specifically, the Commission is requiring: public utility transmission providers to implement ambient-adjusted ratings on the transmission lines over which they provide transmission service; regional transmission organizations (RTO) and independent system operators (ISO) to establish and implement the systems and procedures necessary to allow transmission owners to electronically update transmission line ratings at least hourly; public utility transmission providers to use uniquely determined emergency ratings; public utility transmission owners to share transmission line ratings and transmission line rating methodologies with their respective transmission provider(s) and with market monitors in RTOs/ISOs; and public utility transmission providers to maintain a database of transmission owners' transmission line ratings and

Source: <https://www.ferc.gov/media/e-1-rm20-16-000>



A recent major study of how renewable deployment can be improved by Grid-Enhancing Technologies (GETs)

The Benefits of GETs in Kansas and Oklahoma

 **2x** the renewable energy capacity

 Paid for in **6 MONTHS**

 **\$175 MILLION** annual production cost savings

Potential Nationwide Benefits

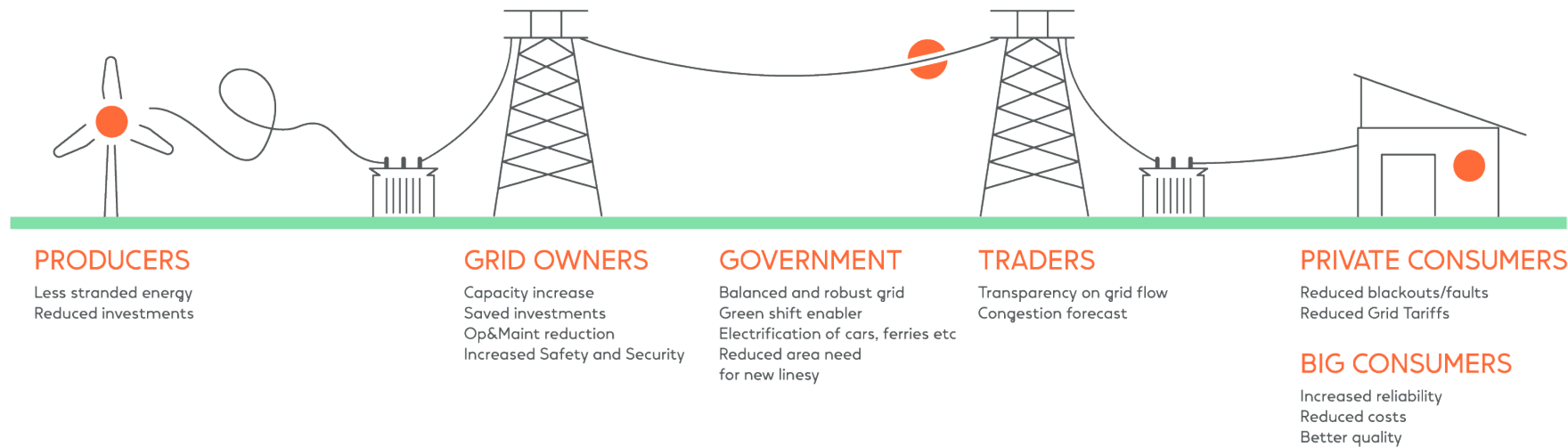
 **OVER \$5 BILLION** Production cost savings

Source: <https://watt-transmission.org/2021/02/22/unlocking-the-queue/>

- Dynamic Line Rating (DLR) technology as a major contributor to the study benefits
- Heimdall Power leverages the power of digitalization with its highly advanced DLR software and hardware.



Collecting new insights from the grid will affect us all







Heimdall Power in brief


We digitize the power grid by
combining sensors and software


 Founded 2016

 Oslo & Stavanger, Norway (soon also in US)

 37 employees

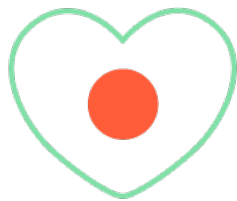
 Installations in 9 European countries

 100+ installations on live lines with any incidents

 ISO 9001 and 14001 certified



Values



Integrity

We provide a complete solution for power grids optimization and earn confidence from our customers, suppliers, employees and stakeholders by focusing on safety and information security.



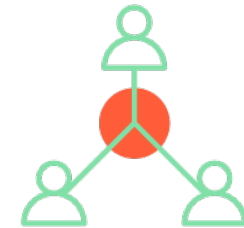
Innovation

We pursue new ideas and solutions and are courageous in shaping the future and continuously improve our technology and services.



Sustainability

We are committed to the Green Shift and contribute to six of UN's Sustainability Goals by having a sustainable mindset in our business practices.



Collaboration

We believe in the power of teamwork and support collaboration across teams, departments and partners.

Be kind and do good.

We provide you with max power, max control, max uptime — with minimum investment



Increased line capacity through dynamic line rating (DLR) or ambient adjusted line rating (AAR)



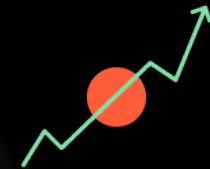
Prediction of snow and ice building



Location of short circuits or broken lines



Diagnostics for maintenance planning



Reports for investment planning

Discover how Heimdall Power helps you turn data into insight



HARDWARE

A unique low-cost sensor package called Heimdall Neuron™



SOFTWARE

A secure cloud-based software called Heimdall Brain™










PEOPLE

Innovative and responsive experts from across the industry



A wide range of use-cases

Utility challenge

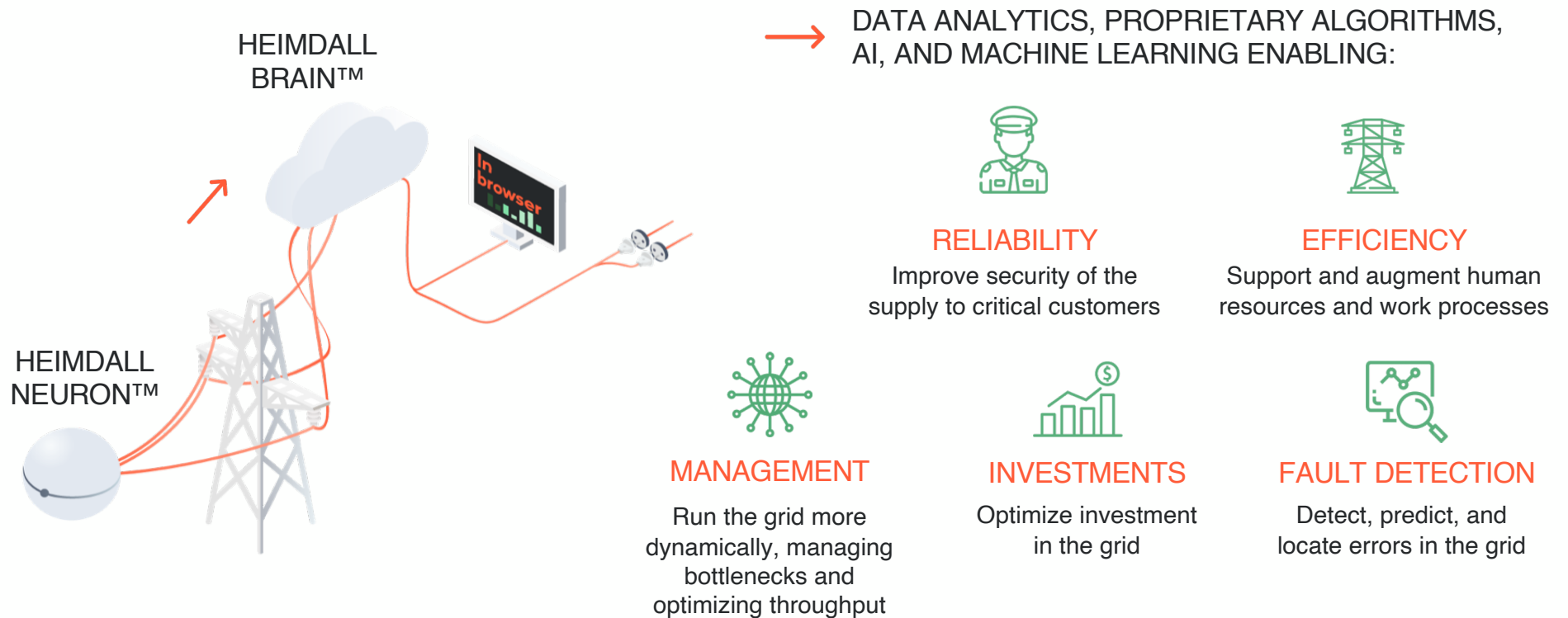
-  Need to **connect** new renewable energy sources and industrial customers to the grid
-  Experience **congestion** between areas and states
-  Must take out a line for **maintenance** or construction
-  Manage an **emergency** situation
-  Need more **flexibility** for balancing and system security
-  Need to guide **investments** in grid capacity
-  Need to **comply with FERC Order 881**, requiring at least AAR

How we can help

- What opportunities are there to increase utilization of capacity on the existing grid?
- What are the true capacities of the congested lines, and how to use capacity better?
- What capacity is there on alternative lines (long-term rerouting)?
- How much current can be rerouted within various short time periods?
- How to limit the need for reserves and increase access to reserves?
- When and where to invest (to limit risk of stranded grid assets)?
- How can AAR and/or DLR solutions best meet compliance options and customer needs?



Heimdall Power is digitizing the grid

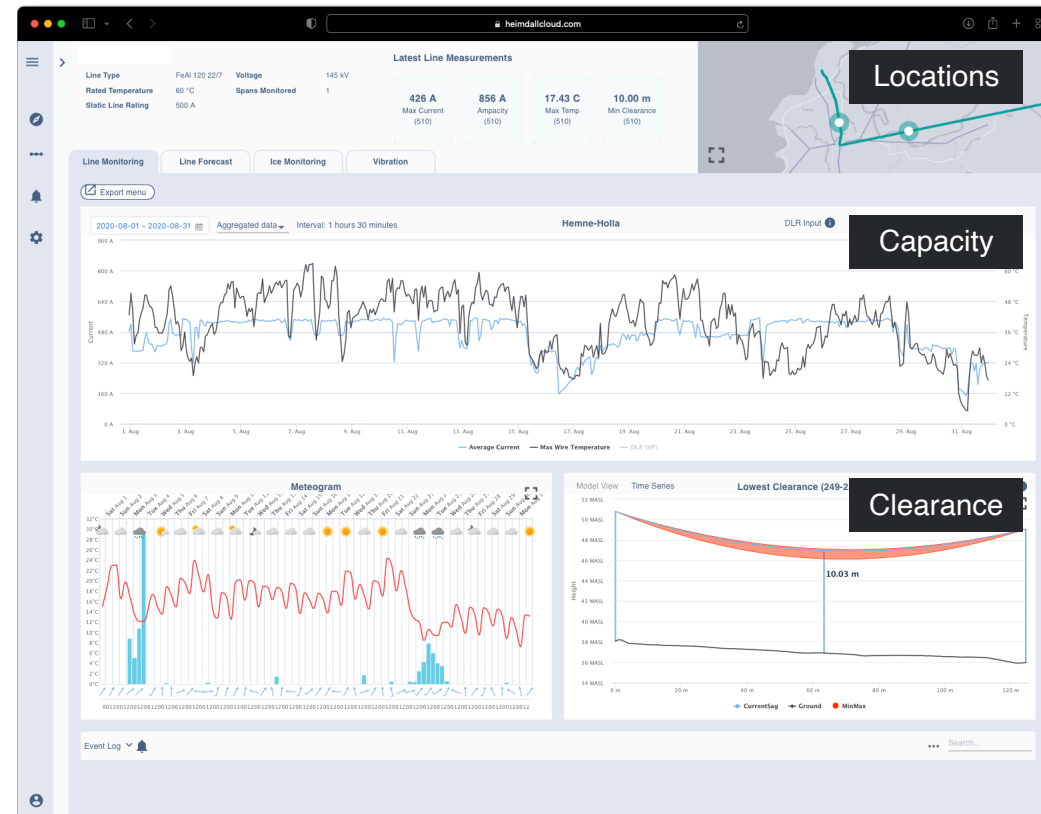




The Heimdall Brain™ is a unique software platform

100% in-house developed with seamless integration to our sensors

- Modern and easy-to-use web application at heimdallcloud.com
- User interface developed in close cooperation with the largest grid owners in Norway
- Under continuous development and improvement by Heimdall's software team, built on Microsoft Azure. Industry leading cybersecurity.
- Machine learning improves our solutions day by day, year by year.
- Client controlled data access
- Our API integrates smoothly to most partner platforms and/or SCADA systems

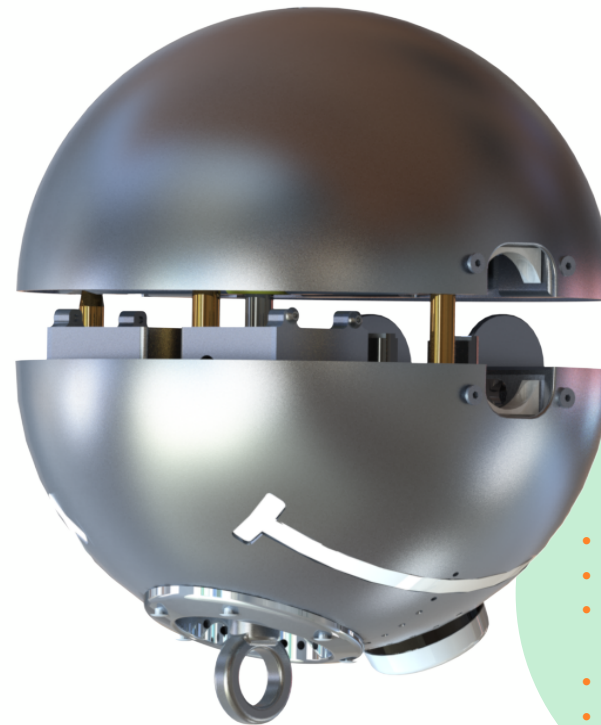




The Neuron™ is a platform for sensors

Heimdall Neuron™ in brief

- Heimdall Neuron™ is an advanced monitoring device for high voltage power lines that leverages various sensor technologies and a patented system design.
- Years of R&D – and testing through Norwegian winters – have culminated in a device that is self-sustained and robust.
- Communication over multiple wireless IoT Network Protocols to cover even the most remote locations.
- Engineered to be installed safely and quickly on live power lines.



KEY FEATURES

- Sensor “fusion”
- Power harvesting
- Redundant communication
- Easy to install
- No maintenance



Engineered for large scale deployment



“From when I received the Neuron, it took me less than 5 minutes to install it on the wire. It will be easy to install lots of these.”

T.A. Midtlie,
Elvia (largest distribution
operator in Norway)



Autonomous drone
installation on
powered lines from
Q1 2022

Patent pending.



Heimdall Power

Track record with system operators in



-  Norway
-  Sweden
-  Finland
-  France
-  Austria
-  Switzerland
-  Slovenia
-  Germany
-  Italy



Heimdall Power

Thank you

For questions feel free to contact us!

Robert Mork (robert@heimdallpower.com)

heimdallpower.com