



Grid Interactive UPS : Improving Grid Resiliency & Sustainability

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Impacts of Data Center Growth and Renewables

Nordics are leading the renewable electric growth



Rising Demand Pressures

AI and electrification are rapidly increasing power demand beyond traditional capacities.

Renewable Energy Complexity

Intermittent solar and wind supplies cause fluctuations that challenge grid stability.

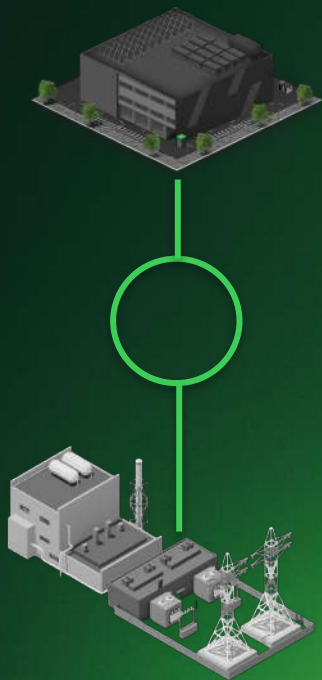
Data Centers Energy Impact

Data centers may consume up to 20% of global energy next decade, highlighting their major energy role.

Data Center Vulnerabilities

Data centers rely on uninterrupted power; outages cause critical operational risks.

Large data center facilities need to manage more than IT load. They must support the grid too.



Data centers can't be a problem

Fault Ride Through (FRT) is increasingly a requirement for data center grid connection

AI Load smoothing function is also becoming a requirement for compatibility with standby generation, onsite primary generation as well as stressed grids.

Data centers can also help

Grid interactive data centers is increasingly being looked at to improve grid reliability, by leveraging onsite energy resources and load flexibility.

Fast Frequency Response (FFR) takes a fundamental part of this goal

Nordic Grids are Leading the Pack

Nordic Transmission System Operators (TSOs) have created FFR services

Nordic energy markets are leading the share of renewables in the grid, with already more than **78%** sourced from renewables – compared to just **42%** in the United States, **71%** across Europe, and just **29%** in Asia

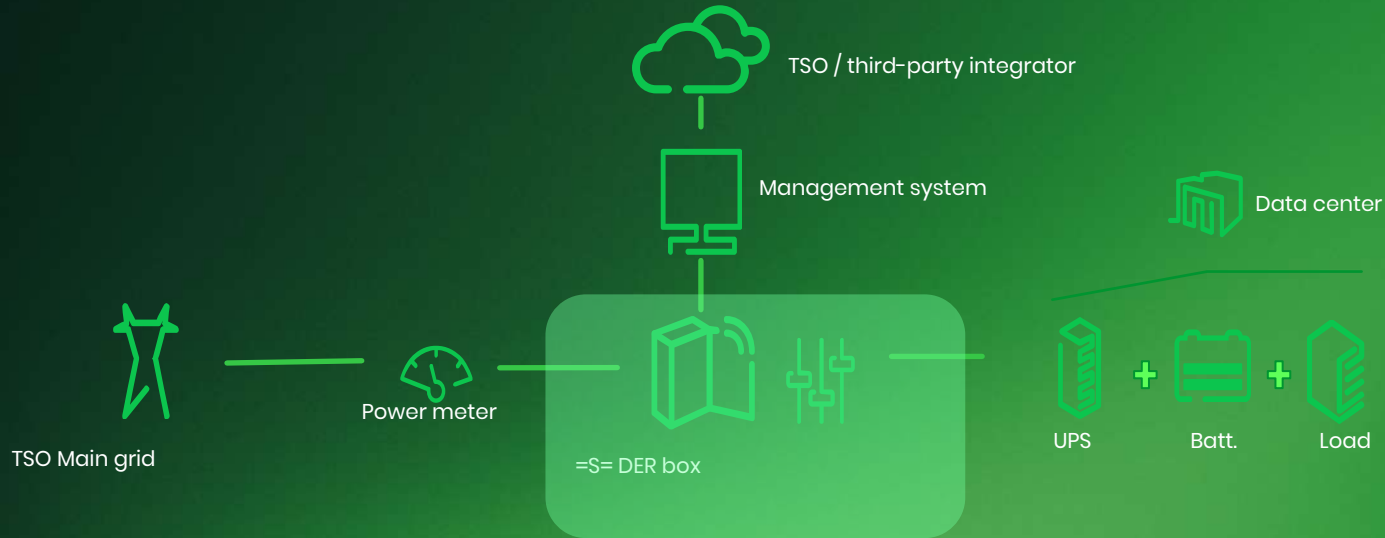
To support the growing renewable share, Nordic Transmission System Operators (TSO) have created services such as **Fast Frequency Reserve (FFR)**. FFR services in Nordic Power Systems are introduced in Denmark, Finland, Norway and Sweden.

Other EU countries and some states in US are also coming out with new mandatory regulations before committing utility connection to datacenters .

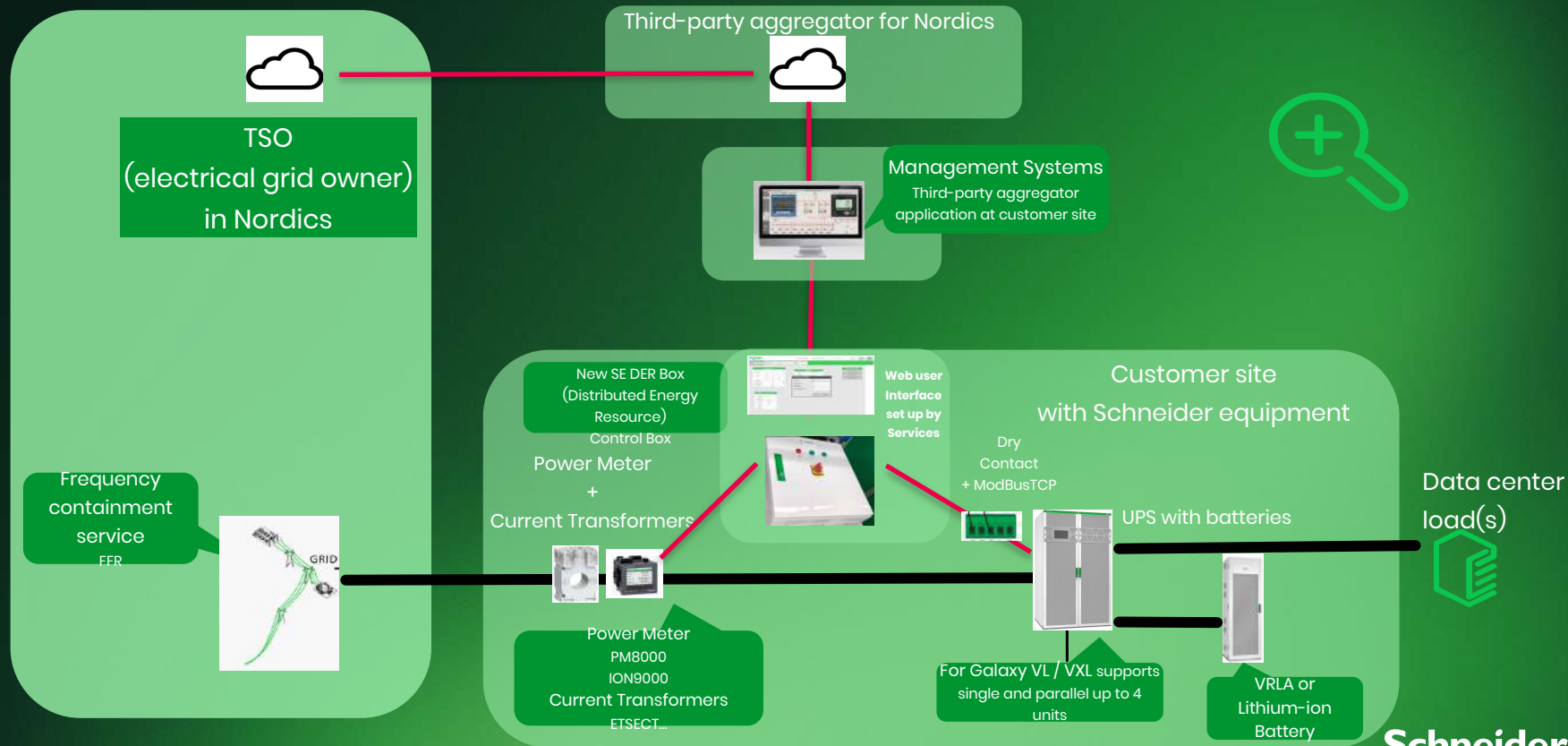


Frequency support: not a usual business structure

Three kinds of actors are already at business for years, cascading incentive € to each other **to support the grid**: TSOs (country grids) → third-party aggregators → customers with significant « power assets » like large **UPS + batteries present in data centers**



Frequency support: not a usual business structure



Schneider Electric's Grid Interactive Solution for UPS

Enabling data centers to participate for FFR markets in Nordics

Advanced UPS technology

- Galaxy VL and VXL UPS models enables data centers to participate for FFR markets in Nordics

Stability source

- Activates when frequency gets below threshold, disconnects the load from the grid to help manage energy fluctuations and to help the grid to recover to its nominal value

Sustainability commitment

- Adoption of this technology reflects data center's push for decarbonization and green energy; enables customers to participate in programs or incentives

Collaborative ecosystem

- While the core mission of the UPS will remain data center uptime, utilizing the Galaxy UPS with FFR enables data centers to also support grid resiliency proactively



Features at a Glance

✓ High reliability performance

- Patented Hybrid Topology provides full protection
- Internal Redundancy, Fault Tolerance, speed and Ease Serviceability

✓ Ultra-high efficiency

- Double conversion mode – up to 97.5% efficiency leads to savings on Electricity bills at every load level
- eConversion mode – 99% efficiency, faster ROI
- ECO mode – 99% efficiency

✓ Compact design

- Smallest footprint
- High density design
- Front access to components

✓ Modular, scalable, Live Swap redundant design

- System scales using 125 kW power modules
- Power modules can be added after initial

✓ Unity power factor unconditionally

- kVA= kW even at 40°C; right-size protection to your real IT needs

✓ Global voltage coverage

- 380/400/415V 3-phase 4W+G , 50/60 hz

✓ Robust Bypass

- *"Configure the bypass path as you want!"*
 - Best short circuit rating I_{cw} =100kA
 - 110% overload continuous
- *Improved selectivity/coordination*
 - NO fuse in bypass
 - NO breaker in bypass (provision available)

✓ Backfeed

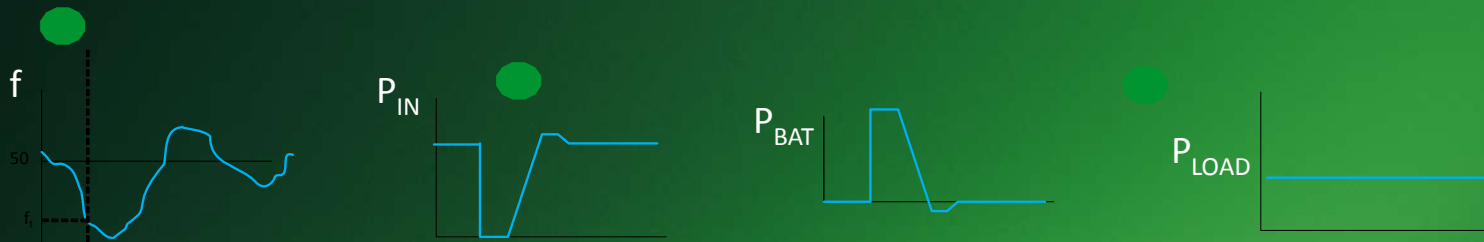
- Three ways to implement mandatory Backfeed protection
 - Upstream installation of CB with shunt trip connected to UPS
 - Installation of Bypass Backfeed kit
 - Installation of MBC

✓ Flexible

Why FFR: to stabilize grid frequency due to larger proportion of the grid with Energy renewables

Frequency support

FFR (Nordics) Static mode



FFR (Nordics) Static mode: general statement

Trigger from TSO / third-party aggregator level: Event based; activates when frequency gets below threshold of 50Hz → in this case, disconnect the load from the grid, which will help the grid to recover to its nominal value

Power: Predefined power, sequence and duration (5-30 seconds)

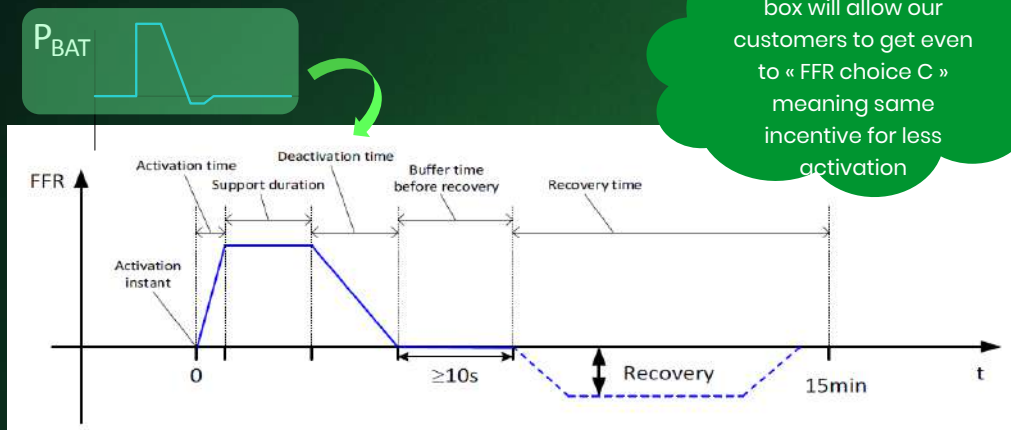
UPS activation: 2-5 times per year

Battery impact: None significant; such low demand (2-5 times) per year and duration (5-30 s) of activation will not impact customer batteries, whether VRLA or Lithium-ion

Customer's load continues to be **100% protected during this period of activation** as they are powered by the batteries

Static mode: Detail statement

- FFR can be obtained by removing load from the grid (UPS transfer to battery operation / forced battery mode), reducing the load on the input
- It is a static service, meaning it activates at a predefined threshold and performs a predefined sequence



All FFR choices by new DER Box	Activation level (Hz)	Maximum activation time(s)
A	49.7	1.30
or B	49.6	1.00
or C	49.5	0.70

All FFR choices covered by new DER Box	Support duration(s)	Deactivation Time(s)
1	5	5 second ramp
or 2	30	No requirement

Grid Interactive Solution – FFR

Strengthen Grid Stability by enabling good grid citizens



Use existing UPS and Batteries to deliver fast and controlled grid support for TSOs.
Unlock fast, distributed reserve capacity from existing critical infrastructure assets.

Why it is important for TSOs

-  Access fast distributed flexibility from datacenters and critical facilities
-  Strengthen frequency stability with automated reserve response
-  Expand ancillary-service capacity without dedicated new assets
-  Support a more resilient, efficient, low-carbon grid

How it works



Fast, controllable activation of distributed reserve capacity when the grid needs it most.

Strategic Value for TSOs

-  Lower grid and flexibility investments
-  Enable higher renewable energy penetration
-  Improve energy system resilience
-  Expand reserve capacity without new grid investments

 Mobilize distributed flexibility from existing UPS infrastructure to strengthen grid stability and resilience

Grid Interactive Solution – FFR

Unlock New Grid Revenue Without Compromising Critical Power Protection

 Use existing UPS and Batteries to support grid stability, improve asset utilization, and unlock new revenue streams — without compromising uptime.

Why customers care

-  Earn revenue from battery assets
-  Improve ROI on existing UPS investments
-  Participate in grid services while maintaining protection for critical loads
-  Accelerate sustainability and decarbonization goals

How it works



Unlock grid-service revenue with automated event-driven battery response

Why our offer is strong

-  Built on proven UPS architectures already protecting critical operations
-  Automated response meets fast FFR requirements
-  Critical load protection always take priority
-  Optimized for lithium-ion battery deployments



Turn idle battery capacity into recurring grid-service revenue without compromising mission-critical uptime



Advancing Energy Tech