

— A TECHNICAL ANSWER TO A POLITICAL PROBLEM

# The grid is the constraint. *Risk* is the key to unlocking it.

Generation is being built faster than the network can absorb it. New lines take a decade. But the IEA finds that 1,200–1,600 GW could be unlocked worldwide on infrastructure that **already exists** — no new corridors required. The barrier is not steel and copper. It is the decision framework we use to operate the grid.

**2,500 GW**IN CONNECTION QUEUES  
GLOBALLY**+50%**GRID INVESTMENT NEEDED  
TO KEEP PACE**1,200–1,600  
GW**UNLOCKABLE ON EXISTING  
INFRASTRUCTURE**€43.5B**ANNUAL EUROPEAN SYSTEM  
VALUE AT STAKE

## The seventy-year-old rule.

For decades, grids have run to a single criterion: **N-1** — survive the loss of any one component. It was a sound heuristic for the 1950s, built for predictable load and dispatchable generation.

That world is gone. Weather-driven renewables, ageing assets, and sudden new loads from electrification and data centres have made the grid a system of **probabilities**. A binary pass/fail test cannot tell a margin that is genuinely needed from one held in reserve out of habit — so networks run far below their real capability while renewable capacity waits in the queue.

## The *missing piece*.

*No single technology can relieve system-wide congestion — the gains of grid-enhancing technologies are only realised alongside calculated, risk-based approaches to operation, backed by robust forecasting.*

— IEA, ELECTRICITY 2026, P.67 (PARAPHRASED)

Two independent, authoritative conclusions point the same way. The missing piece is not more hardware. It is a way to measure and act on risk in real time — Probabilistic Risk Assessment as the integrating layer.

— THE FRAMEWORK — THREE LAYERS, IN ORDER

LAYER 01 · DECISION

**Technical Rigour**

PRA and Dynamic Security Assessment as the foundation — expected unserved energy measured across every credible state, in real time. Without this layer, the gains below cannot be realised safely.

LAYER 02 · PHYSICAL

**Implementation**

Grid-enhancing technologies — dynamic line rating, topology optimisation, power-flow control — deployed and risk-gated. Physical headroom governed by the risk layer, not static assumptions.

LAYER 03 · POLICY

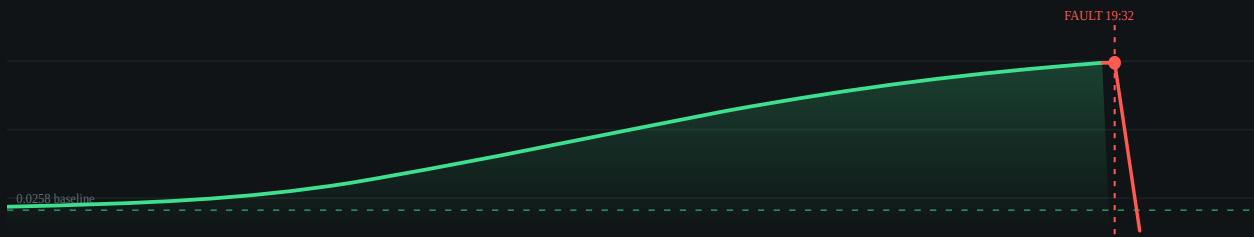
**Policy & Flexibility**

Conditional connection and demand-side flexibility as operating principles. Large flexible loads connect under interruptible terms — turning consumers into security assets.

— THE PROOF — WHY THIS IS NOT THEORETICAL

● LIVE EENS — SYSTEM RISK (MWH/H)

MØRE REGION, NORWAY · 5–6 DEC 2014



The risk signal climbed steadily for **19 hours, fully visible**, before a fault cascaded to a blackout affecting 150,000 people. With a probabilistic framework in the control room, the trajectory would have triggered reserve alerts and preventive switching long before 19:32. The signal was there. The decision framework was not.

**What we are asking of decision-makers.**

- Recognise risk-based operation as enabling infrastructure. Treat real-time probabilistic assessment as a prerequisite layer — the way the IEA frames it — not an optional add-on.
- Make the regulatory space for conditional connection. Allow interruptible terms for large flexible loads so capacity can be offered against quantified risk rather than worst-case assumption.
- Reward transparency. Favour open, auditable risk metrics (EENS, CENS) over proprietary black boxes, so operators, boards and regulators read from the same number.

— THE EVIDENCE BASE

WP1

**Unlocking Grid Capacity Through Risk-Based Operation**

The three-layer framework · published 2026

WP2

**From N-1 to Virtual N-1**

Conditional connection · +10–20% capacity · draft

IEA

**Electricity 2026**

The underlying global research

2025

**RGI Prize for Technological Innovation**

Awarded for the Promaps real-time risk approach