



AVEVA WORLD

ACCELERATE INDUSTRIAL INTELLIGENCE

21.05.2026

UKRENERGO: Managing the grid in extreme conditions with AVEVA PI System

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AVEVA

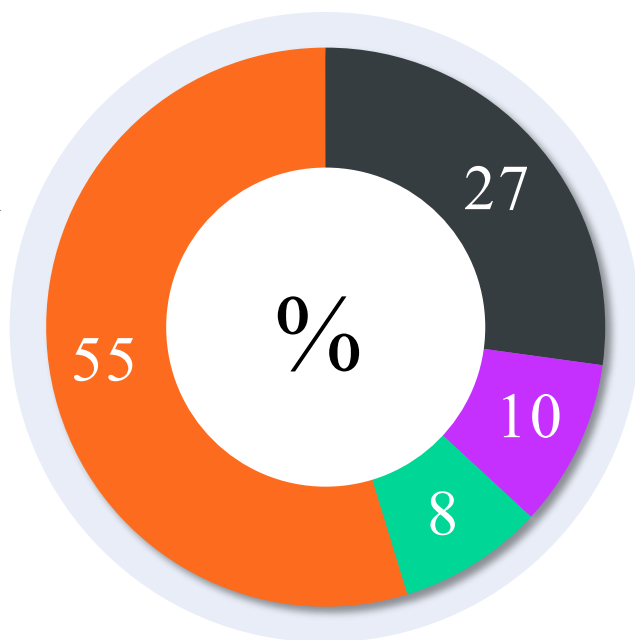
NPC UKRENERGO – COMPANY OVERVIEW



- a state-owned company, one of the largest transmission system operators in Europe
- operates synchronously with the power system of Continental Europe
- certified as a transmission system operator on 17 December 2021

Approximate energy mix of Ukraine 2023

-  Nuclear power plants
-  Thermal power plants, Combined heat & power plants
-  Hydro power plants and Pump-storage power plants
-  Renewables (PV, wind, bio)



20 000 km
total length of high-voltage lines

 **100.7 bln kWh**
Annual transmission volume
(in the conditions of war)



94 substations
220-750 kV
(in the controlled territory)

entsoe
ENTSO-E member

UKRENERGO strengthens grid resilience and operational visibility with AVEVA PI System

Challenge

- Different teams relied on different views of data, limiting shared understanding
- Difficulties connecting real-time conditions to broader operational and leadership context
- Operating from remote locations and shelters during attacks increased the need for consistent, trusted visibility
- Increasing grid complexity made it harder to maintain alignment during critical situations

Solution

- Expanded use of AVEVA™ PI System™ as the single operational data foundation to support real-time decisions across transmission operations during normal operations and high-pressure events.

Results

- Improved real-time visibility and situational awareness for operational teams
- Enabled a shared view of grid performance despite distributed and remote operations
- Provided clearer oversight through consistent data views across substation staff, regional and central dispatch teams, senior management, and government users
- Increased confidence and speed of operational decisions by maintaining consistent visibility during critical situations
- Strengthened organizational trust in real-time data





WINTER 2025-2026

As a result of the attacks, more than 50% of Ukraine's generating capacity was out of order or operated with restrictions.

In January and February 2026 Ukraine's power system was attacked with more than
**300 missiles, and
7000 drones**

Consequences of 4 X-101 missiles carrying two tons of explosives that hit one of the substations were seen from the distance of
25 km

There are substations that were attacked more than
30 times

During the war, the number of DDoS attacks increased tenfold. Not a single hacker attack penetrated Ukrenergo's cybersecurity perimeter

CONSEQUENCES OF ATTACKS

WE HAVE ATTACKS
BOTH TO GENERATION
AND TO SUBSTATIONS

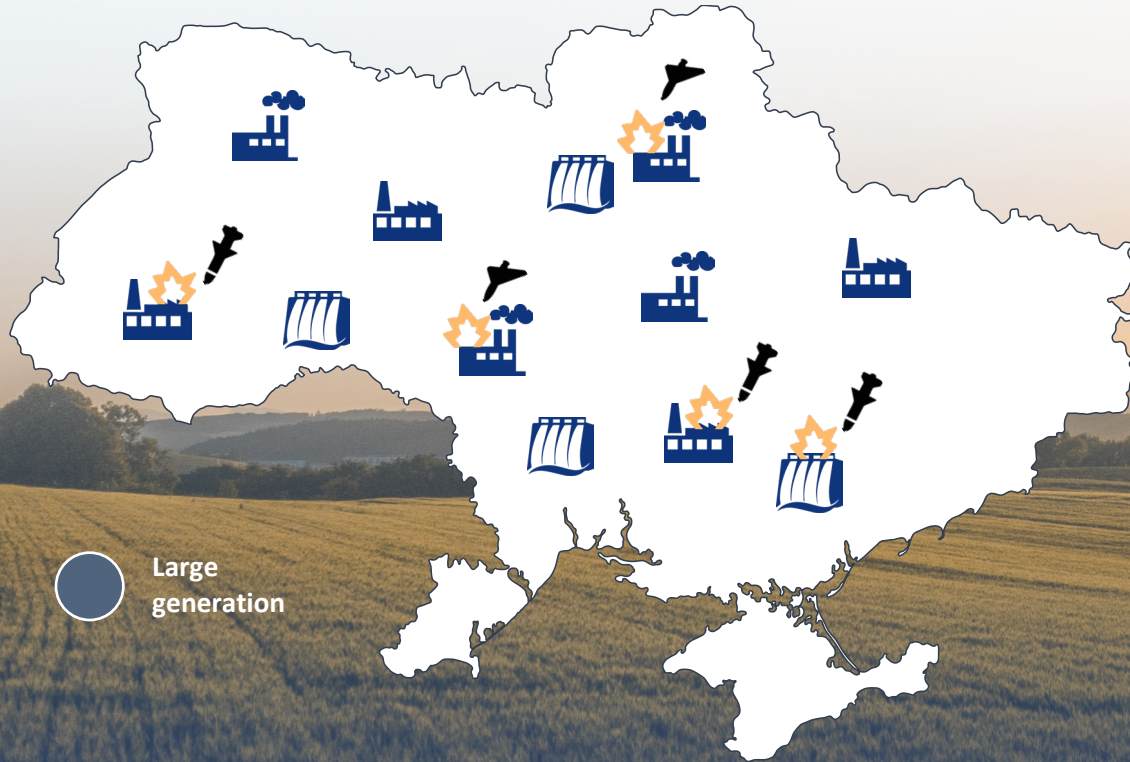


Due to destroying of traditional generation in Ukraine, We have a significant increase in small generation facilities, such as piston gas turbine plants, small solar power plants, wind power plants, big energy storage systems.

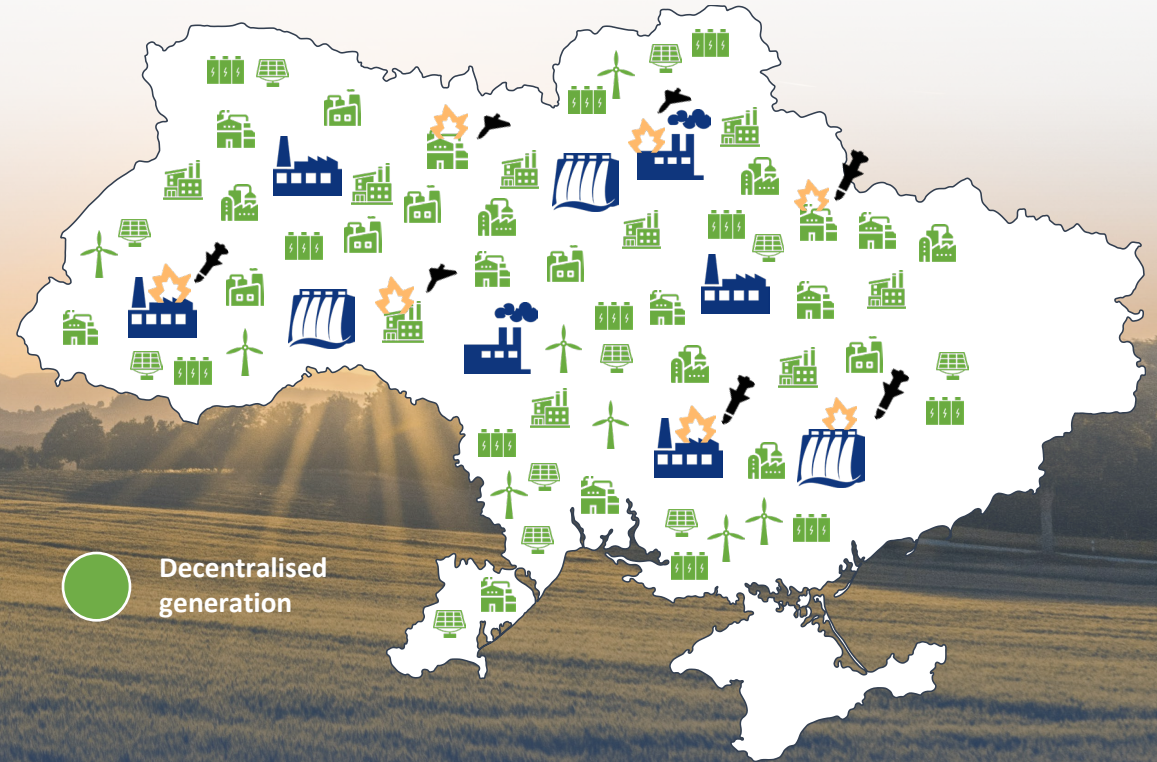


OUR PLANS TO PROTECT THE POWER SYSTEM

Conventional power system



Protected power system



Massive missile and drone attacks cause damage to **all big thermal and hydro power plants**



The same massive missile and drone attacks cause damage to **only a small part of decentralised power plants**

2025-2026

Rapid Transformation of the Power System Current & Planned Capacity

Expansion Gas turbines & CHP:

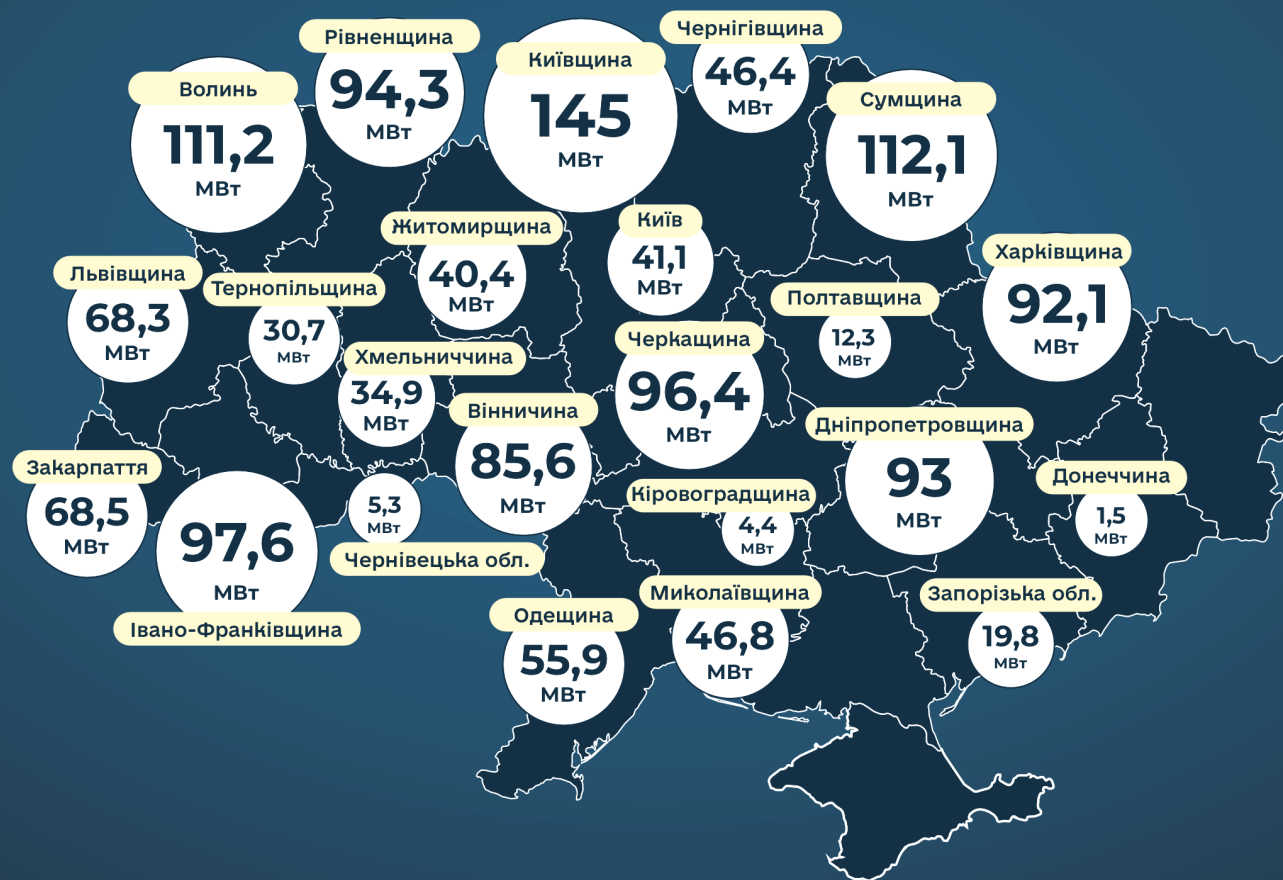
~1.4 GW in operation today → +1 GW planned in 2026

Battery Energy Storage Systems (BESS):
17 MW in 2024 → 600+ MW today → up to 1.4 GW already approved

Wind power:

+324 MW added in 2025

Розвиток розподіленої генерації в Україні



Managing the grid

5 levels of Grid management using PISystem

- To manage all the challenges posed by the conditions listed above, high-quality and relevant information is needed at all levels of decision-making.
- The abundance of changes, both due to the growth of the number of generation objects and the consequences of attacks, causes a big number of changes in information systems. We must react very quickly to them



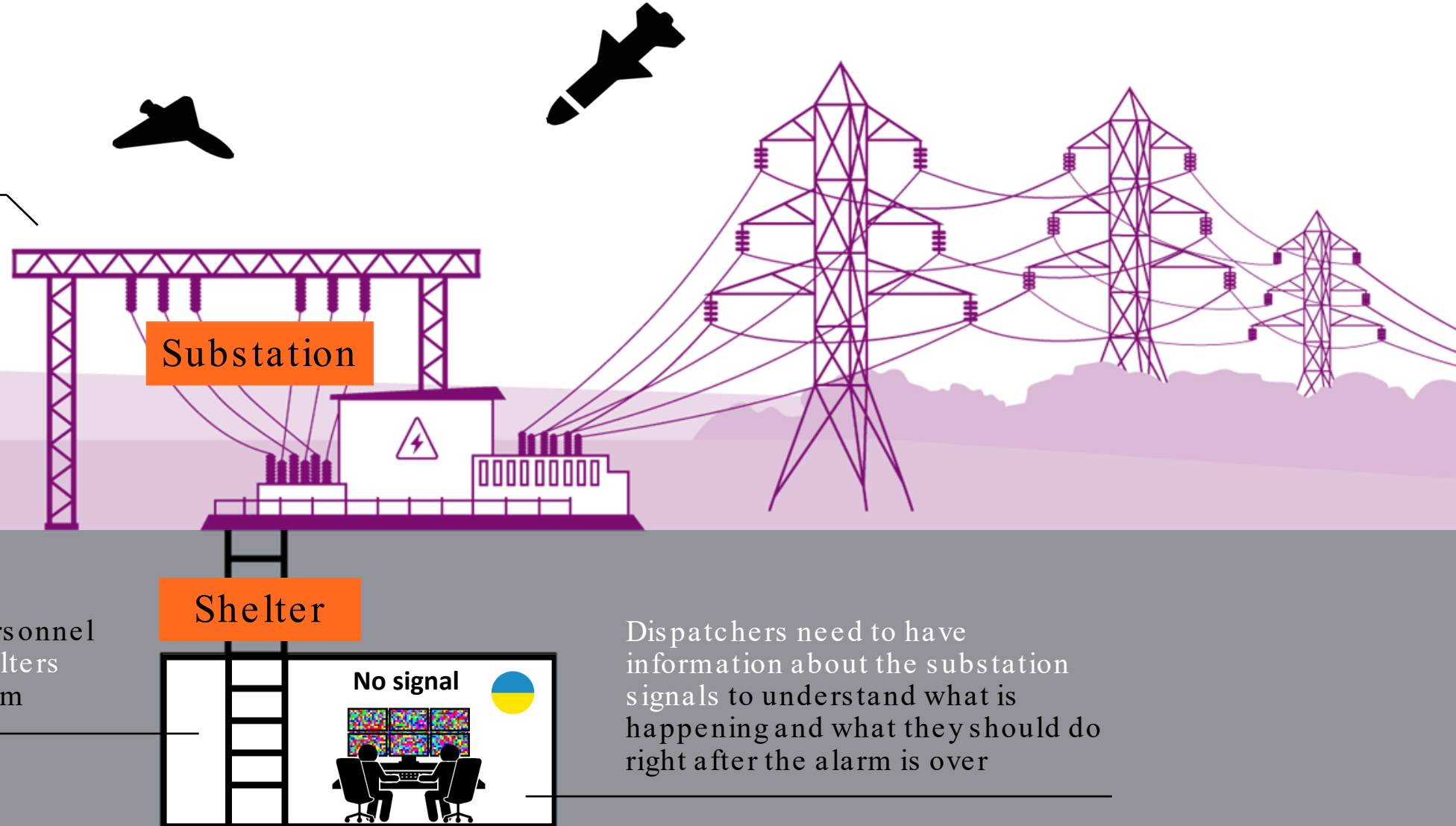


LEVEL 1:

Substations

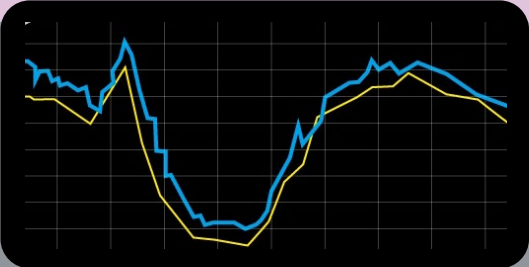
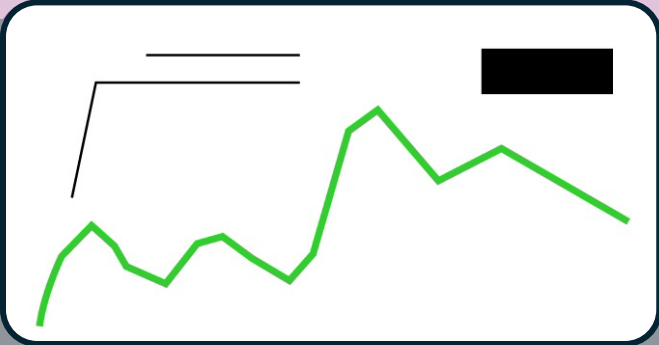
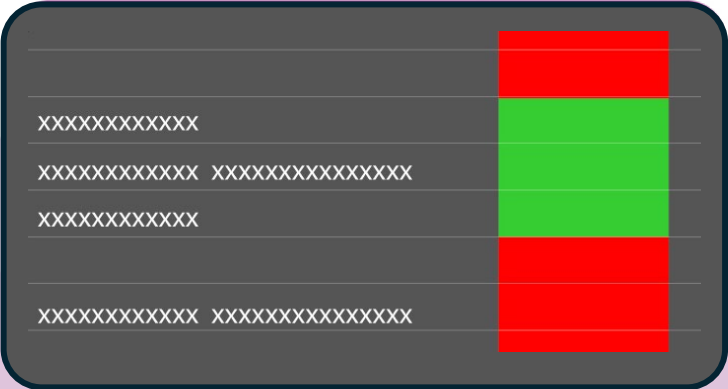
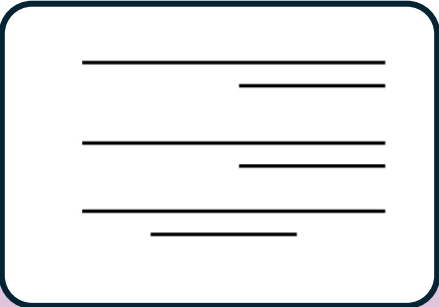
SUBSTATIONS

All our substations can be under attack at every alarm (up to 5-7 times a day in some regions)

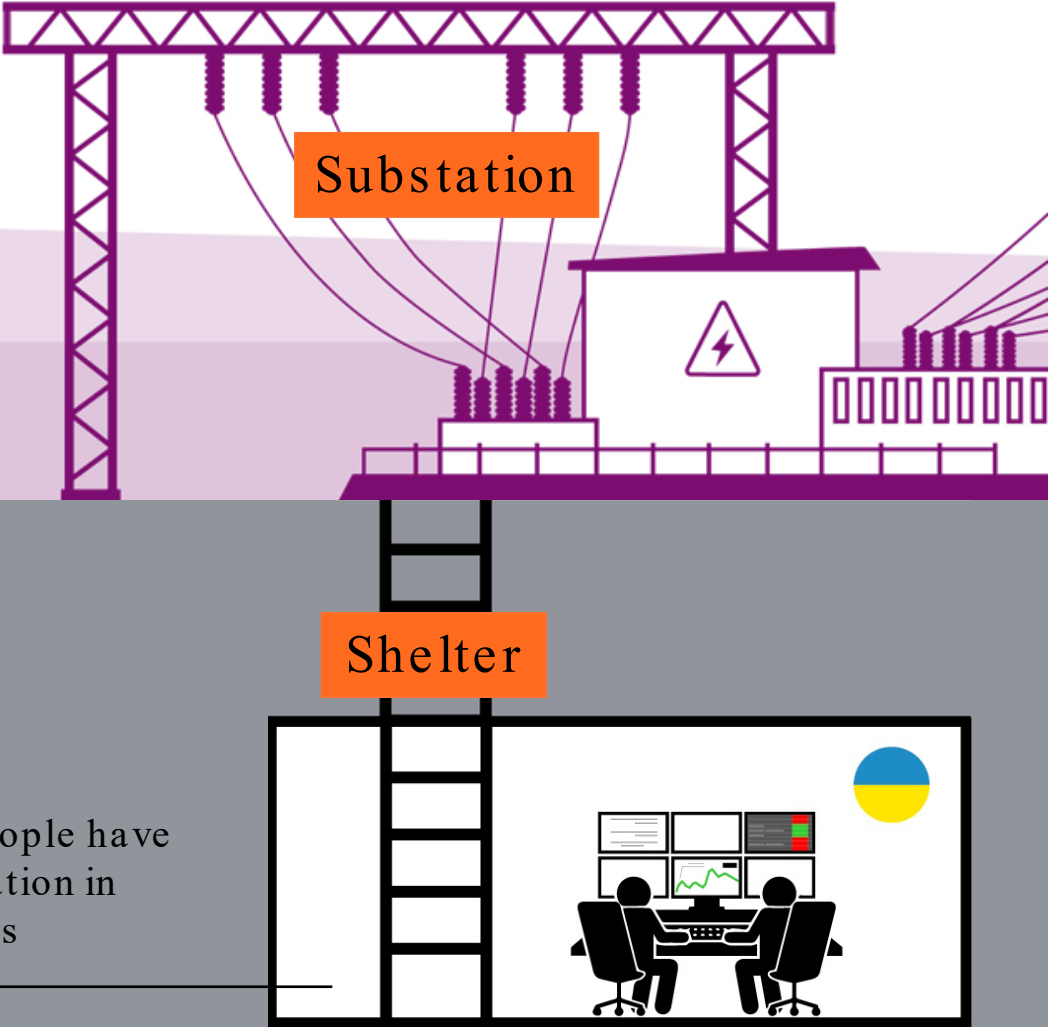


SUBSTATIONS

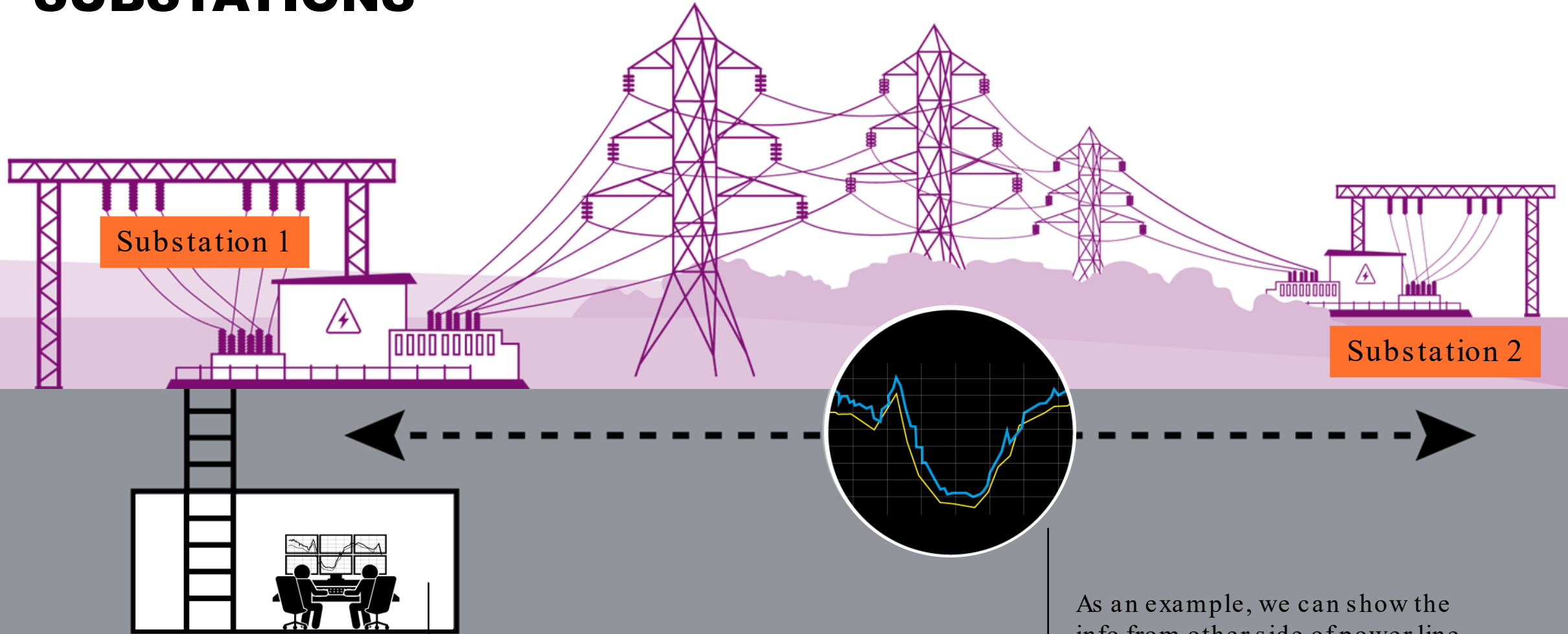
We created a set of
dashboards to monitor
substations and power lines



As a result, people have
online information in
safe conditions



SUBSTATIONS



As an extra bonus **dispatchers can receive data** not only from their substations, but also from the other sources

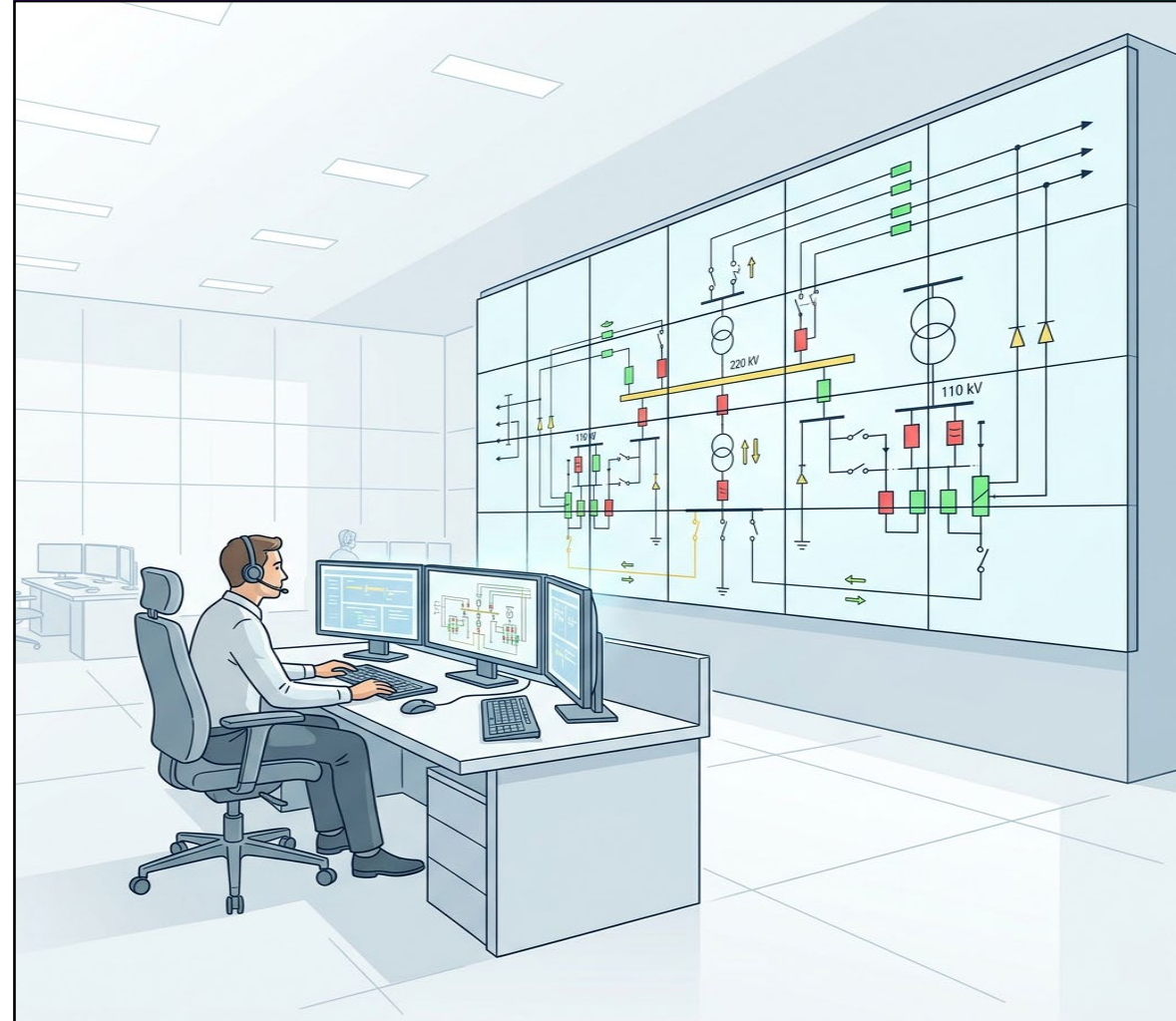
As an example, we can show the info from other side of power line, and if telemetry devices at a substation are damaged, users can understand the status of the line and other equipment

LEVEL 2:

Regional
Dispatching
Service

REGIONAL DISPATCHING SERVICE VIDEOWALLS

- **PI Vision videowalls** used in regional dispatching centers
- **Unified visualization** of operational data from multiple sources
- Data aggregated from **substations**, **legacy regional SCADA**, and **main SCADA system**
- Single operational view to support **situational awareness and decision-making**



SUBSTATION STATUS DASHBOARD

Назва ПС	Назва АТ	Фактичне навантаження, %	P, МВт	Стан АТ
Підстанція №1	Лінійний трансформатор	0	0	A
	Лінійний трансформатор	0	0	A
	Лінійний трансформатор	0	0	P
	Сума		0	
Підстанція №2	Лінійний трансформатор	15,55	31	H
	Лінійний трансформатор	15,35	31	H
	Лінійний трансформатор	12,54	50	H
	Лінійний трансформатор	12,64	51	H
	Сума		163	
Підстанція №3	Лінійний трансформатор	0	0	A
	Лінійний трансформатор	53,96	108	H
	Лінійний трансформатор	0	0	A
	Лінійний трансформатор	0	0	A
	Сума		108	
Підстанція №4	Лінійний трансформатор	60,98	146	H
Підстанція №5	Лінійний трансформатор	0	0	A
	Лінійний трансформатор	41,62	83	H
	Сума		83	
Підстанція №6	Лінійний трансформатор	17,93	43	H
	Лінійний трансформатор	47,11	94	H
	Лінійний трансформатор	48,50	97	H
	Сума		234	

Export to Excel

Умовні позначення:

H

- нормальний стан

A

- стан відключення, P=0

P

- поточний ремонт

P

- середній ремонт

P

- капітальний ремонт

P

- аварійний ремонт

P

- холодний резерв

To control the substation at the regional level our dispatchers need to have relevant information from multiply systems with aggregating and calculating of the data and correct visualising

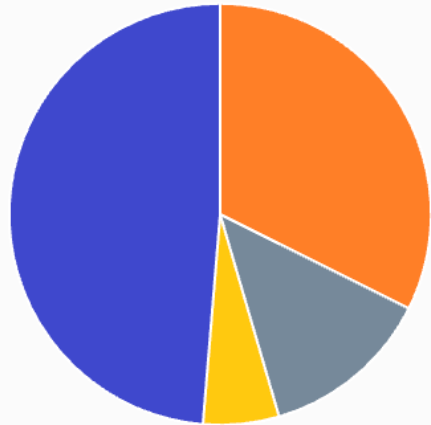
SUBSTATION STATUS DASHBOARD

Our Regional dispatching services use PI also for their specific tasks which they couldn't do in their old SCADA systems

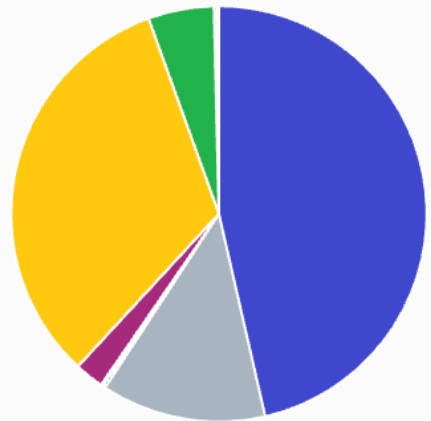


Назва	Графік	Факт	А	Відключення	А	час. дата	Мін. показник відк. за добу	Макс. показник відк. за добу	Час відк. за добу	P	Q U	P	Q1	Q2	Q3	Q4	Q5	U1	U2	U3
750		746.1	☒	-	☒	-	-0.67437	0.088107	-	P 1.5,6,9,15	0	300	0	300	0	300	300			
340		347.3	☒	-	☒	-	0	6.4	12год 57хв	P 13,14										
121		118.6	☒	-0.2	☒	14.29 24.04	-0.43853	1.4	14год 34хв	P 1,2			20	20				342.99	37.901	
121		119.7	☒	-	☒	-	-0.681784	2.4	7год 40хв									346.37		
750		747.99	☒	-	☒	-	-525.18	0	-	ТТ 6	0	0								
340		349.9	☒	-	☒	-	-1.1377	1.1	14год 4хв	TE 330	1736.4	706.7								
121		121.1	☒	-	☒	-	-1.0207	0	8год 19хв	РАЕС	1736.4	706.7								
121		118.43	☒	-0.4	☒	14.00 24.04	-84.112	0	14год 34хв									342.43	0	
121		119.67	☒	-	☒	-	-84.112	0	10год 42хв									344	0	
121		120.35	☒	-	☒	-	-0.25299	0	11год 47хв											
121		122.6	☒	-	☒	-	-2.0683	1	14год 1хв				0	0				0	0	
121		117.96	☒	-0.9	☒	14.03 24.04	-5.9171	2.1	14год 34хв	P 1,2								0.15	0.39167	38.5
121		120.23	☒	-	☒	-	-28.964	0	11год 24хв									0	238	
121		122.8	☒	-	☒	-	-0.022254	1.1	14год 0хв	P 1,2			0	20						
233		237.74	☒	-	☒	-	-40.98	2.5	14год 33хв											
121		117.16	☒	-2	☒	7.40 24.04	-4.5294	1.1	14год 34хв											
121		119.13	☒	-	☒	-	-0.38373	0	14год 27хв									342.74	235.1	
121		119.73	☒	-	☒	-	-1.4423	0	-									342.44		
121		120.24	☒	-	☒	-	-0.067705	0.5	10год 5хв											
121		119.86	☒	-	☒	-	-0.12454	0	-											
121		118.53	☒	-0.3	☒	14.04 24.04	-1.3431	0	14год 34хв									234.87	36.629	
400		0	☒	-380	☒	15.23 13.04	-140.28	0	14год 34хв	ТТ 330	246.85	65								
340		346.77	☒	2.1	☒	14.11 24.04	0	11.5	14год 34хв	ТТ 220	126	18.15								
233		238	☒	-	☒	-	0	0	-											
121		121.33	☒	-	☒	-	-0.096855	2.1	8год 59хв											
121		118.69	☒	-0.2	☒	14.00 24.04	-1.3431	0	14год 34хв									233.25	38.947	
121		115.89	☒	-3.1	☒	6.08 24.04	-3.9332	0	14год 34хв										36.3	
121		120.33	☒	-	☒	-	-84.112	1.5	12год 57хв									38.2		
121		117.1	☒	-1.5	☒	13.15 24.04	-3.6454	0	14год 34хв	P 3,4			0	90				235.72	411.5	
121		121	☒	-	☒	-	0	0	-											

Споживання областей



Споживання ОСР

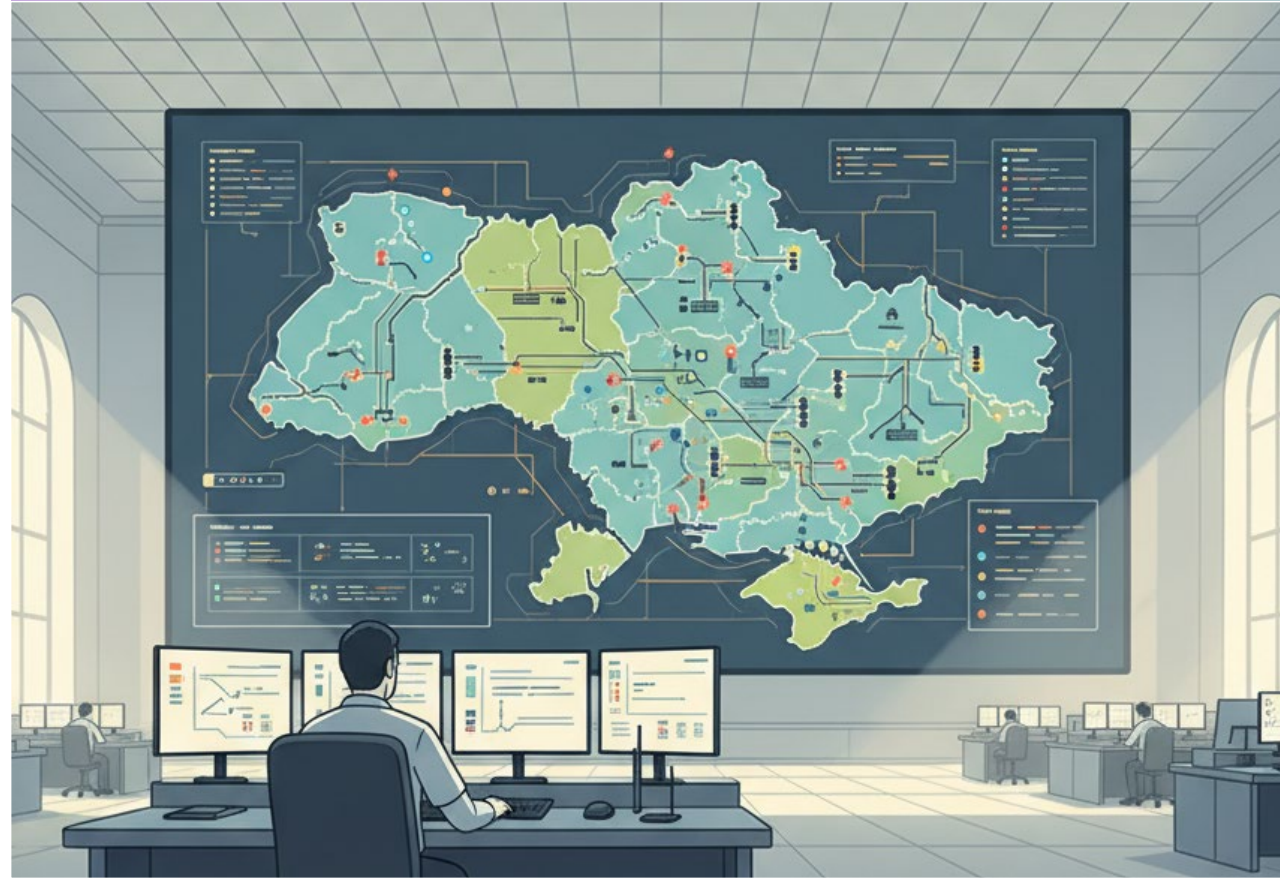


LEVEL 3:

Central
Dispatching
Service

CENTRAL DISPATCHING SERVICE VIDEOWALL

- **PI Vision videowalls** used in central dispatching center
- **Custom notation of visualization** to control the
- Higher level of data aggregation. from **dozens of different data sources**
- Single operational view to support **situational awareness and decision-making**



CENTRAL DISPATCHING SERVICE SHELTER VIDEOWALL



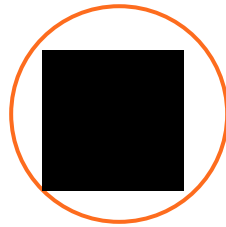
Videowalls in shelters contain similar information as the main videowall, but the data is displayed with adaptation to the equipment and size of the videowall, as well as taking into account the color rendering and light in the room.



CENTRAL DISPATCHING SERVICE APPS`

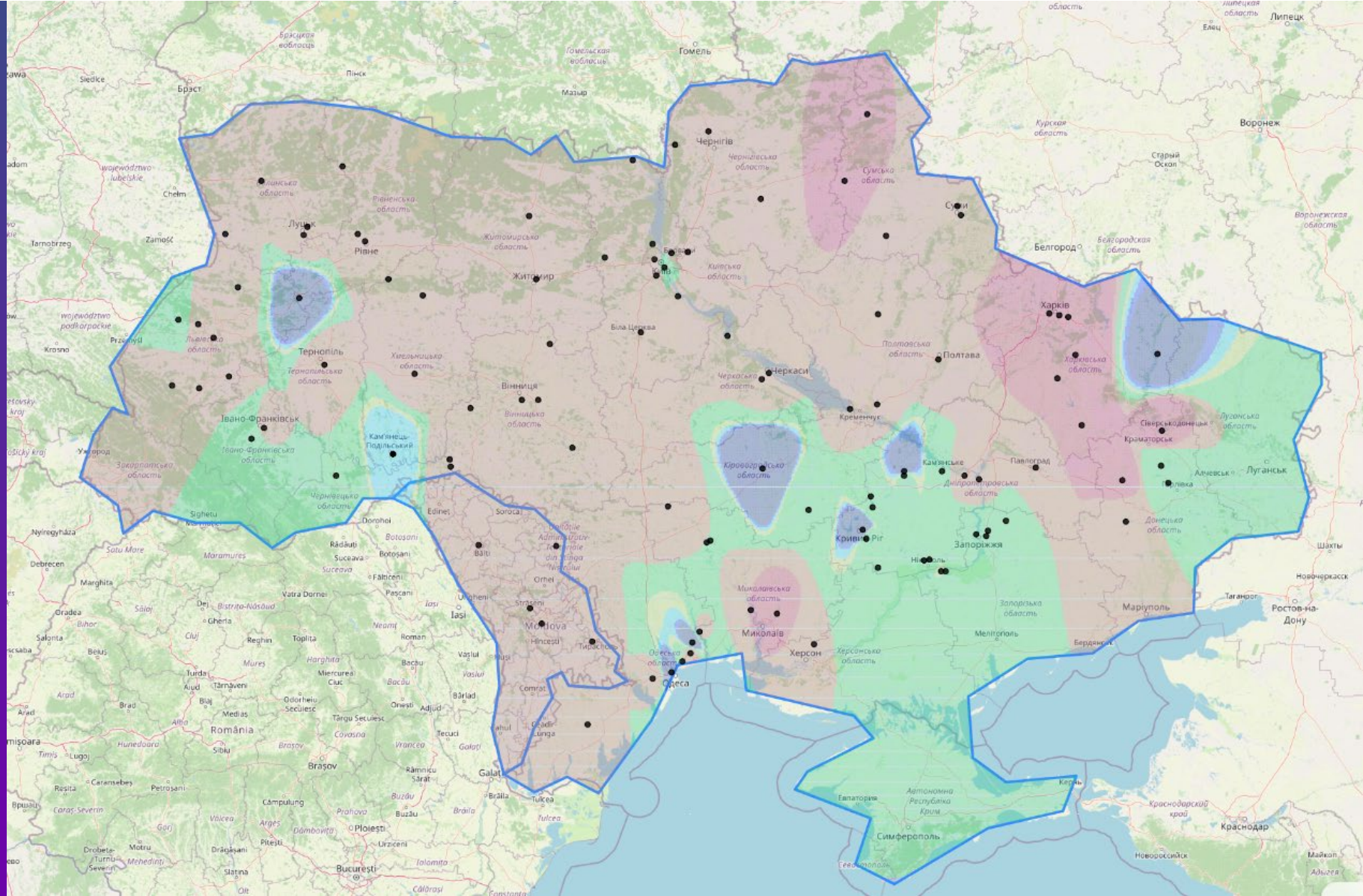


Over 20 modular solutions within the PI System, enabling central dispatching service to maintain comprehensive visibility and control of the power system — supporting both real-time operational dispatching and commercial dispatch functions



PI System is connected to more than 20 different data sources. The data is used to consolidate and calculate all the parameters, that allow us to cover all the business needs

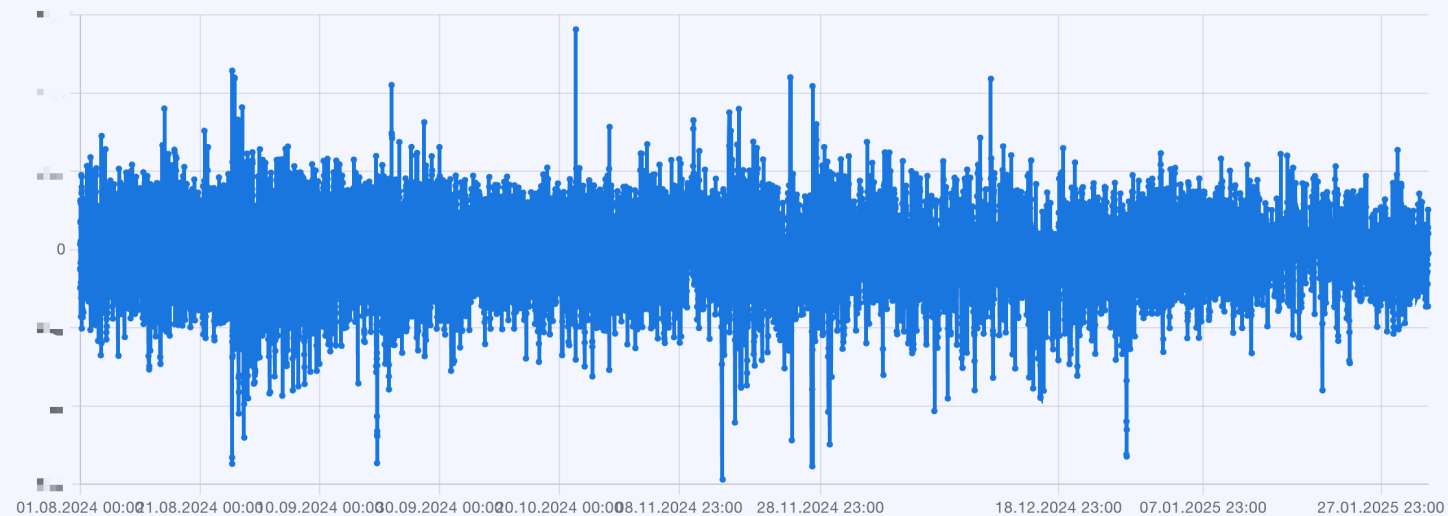
EXAMPLE OF CUSTOM APPLICATIONS



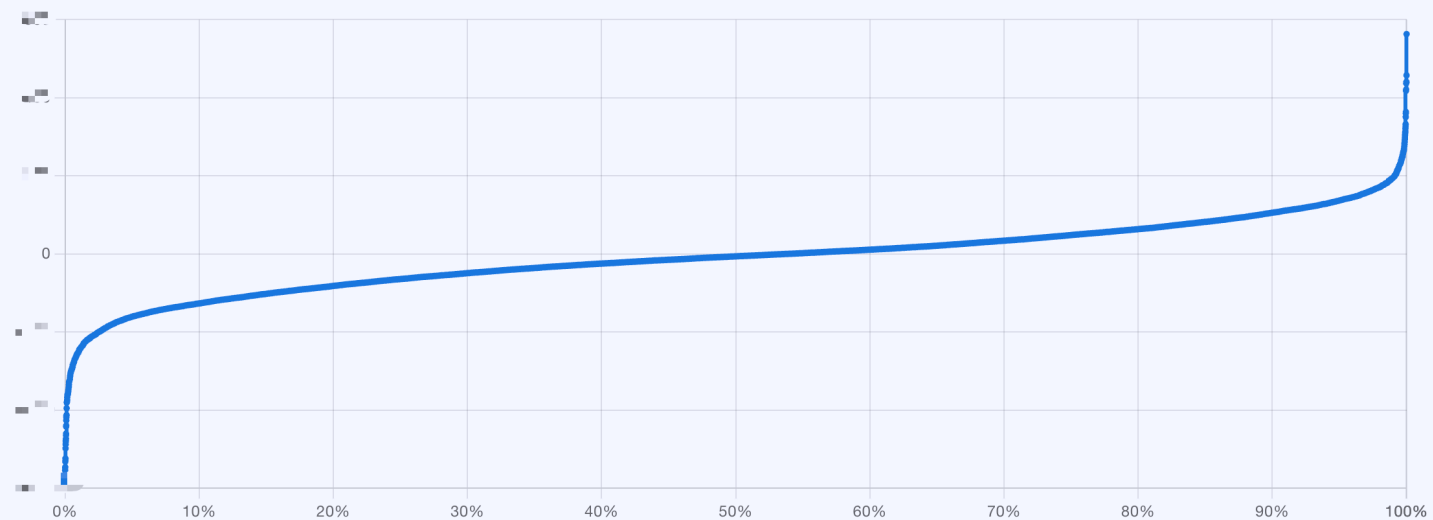
EXAMPLE OF CUSTOM APPLICATIONS



Imbalance of UAMD



Total Distribution of imbalance of UAMD



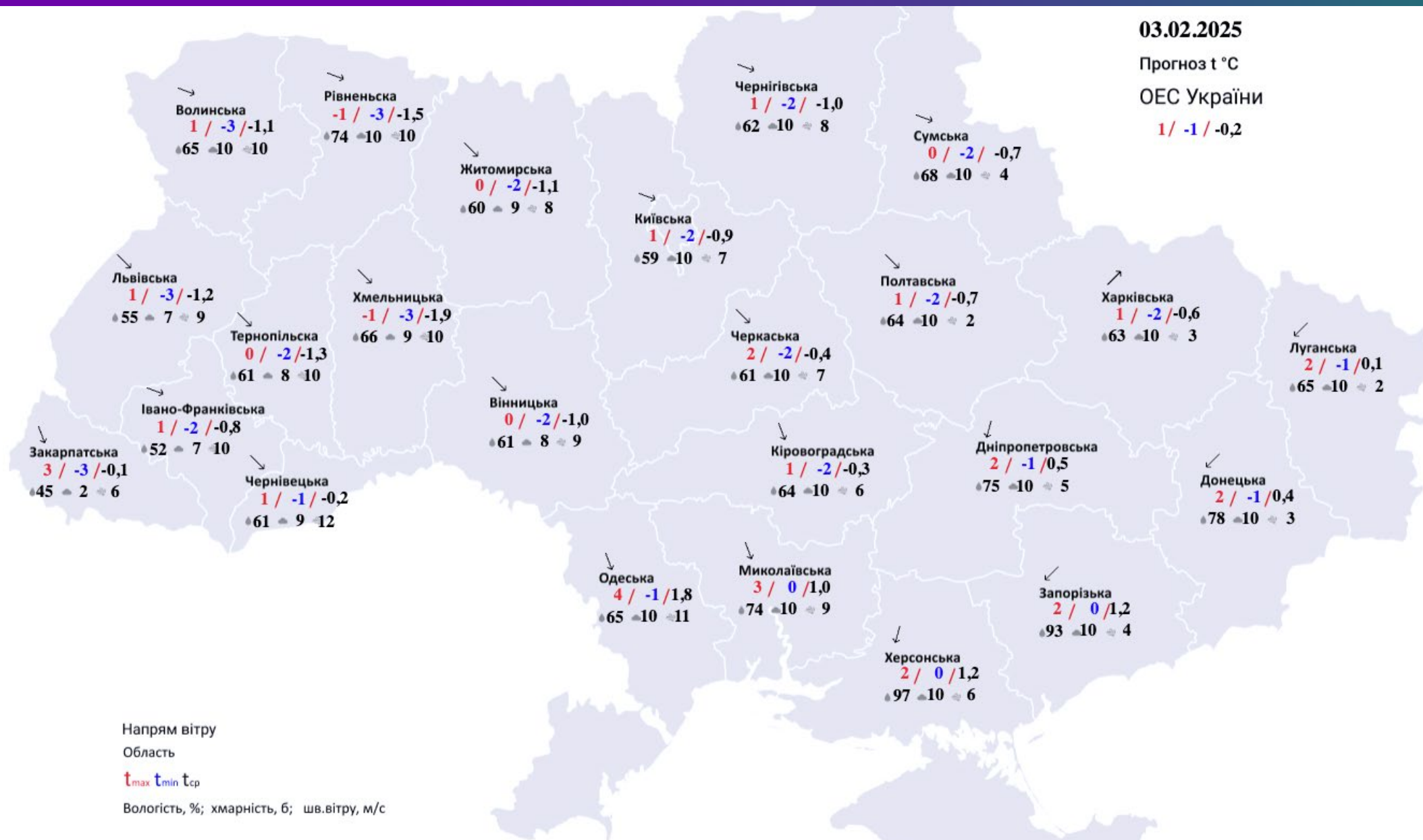
PI VISION EXAMPLES

03.02.2025

Прогноз t °C

ОЕС України

1 / -1 / -0,2

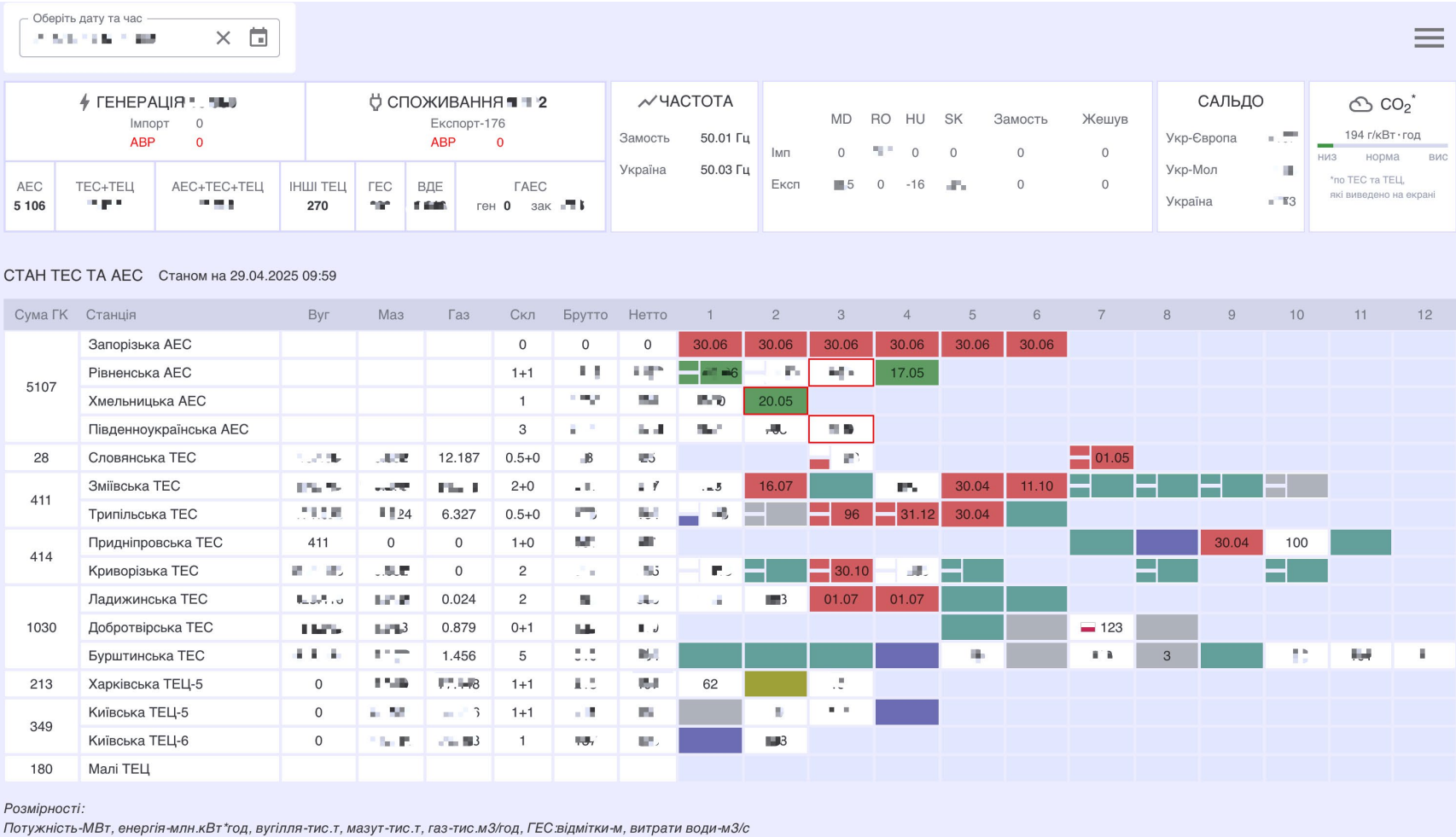


LEVEL 4:

Top
management

MANAGEMENT WEB APPLICATION

- 24/7 accessibility
- Online data
- Secured
- Adapted to mobile phones
- All data from PISystem



MANAGEMENT DASHBOARD

Contains all relevant information adapted for TV 55-65 inches



LEVEL 5:

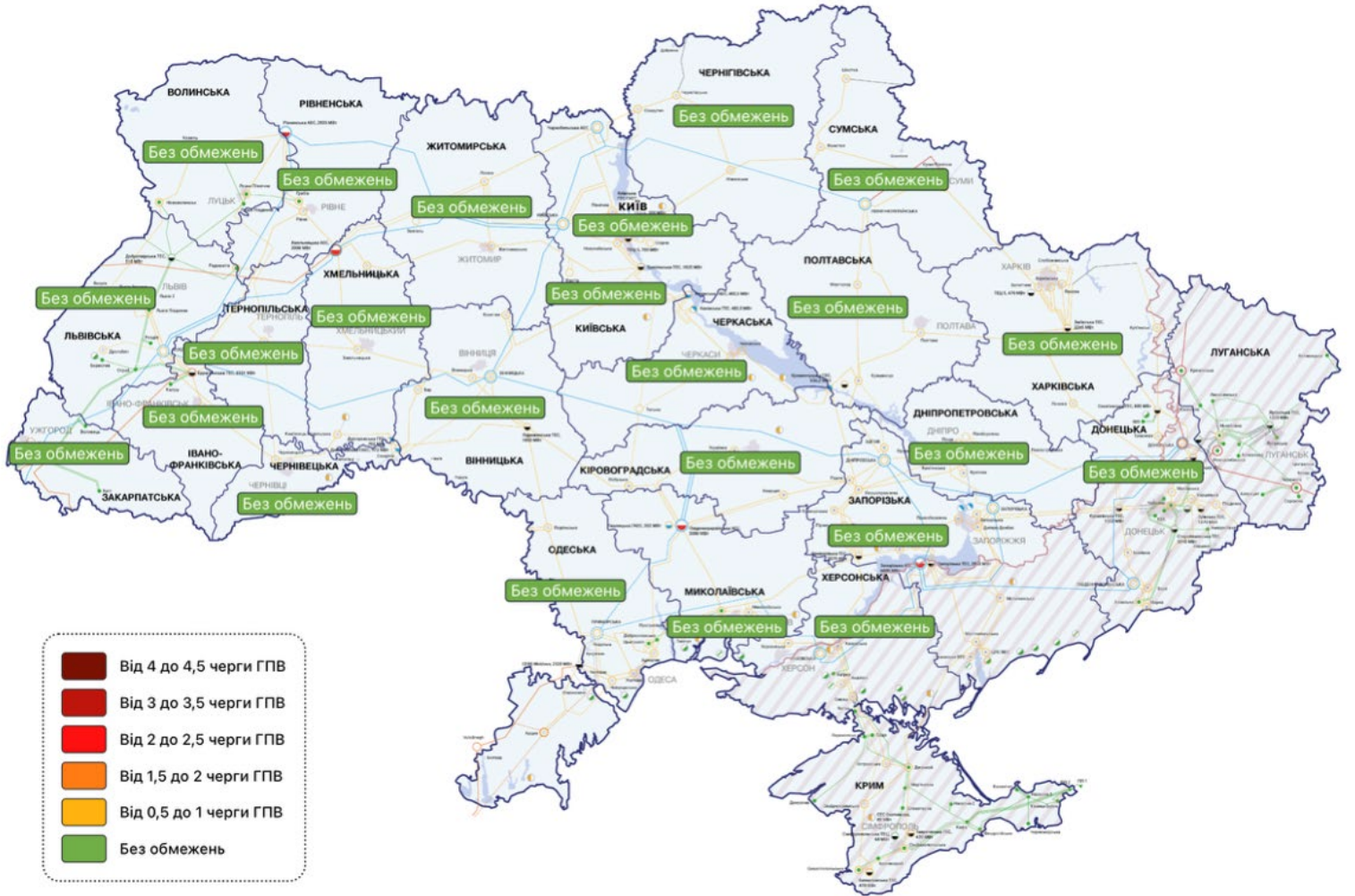
Government

SPECIAL DASHBOARDS FOR GOVERNMENT



- 24/7 accessibility
- Online data
- Help to control situation in the country

ОБМЕЖЕННЯ В ОЕС УКРАЇНИ СТАНОМ НА 1



Conclusions

PI SYSTEM AS A

Unified Operational Data Backbone

Ukrenergo's PISystem integrates data from substations, SCADA, legacy platforms, and external systems into one reliable source.

Modular Purpose-Built Solutions

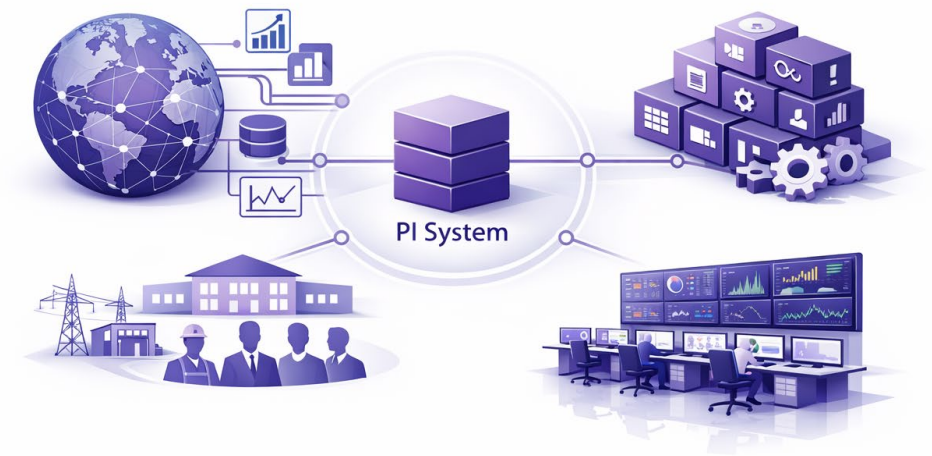
Over 25 PISystem modules support dispatching, analysis, monitoring, and management tailored to user roles.

Multi-layered Decision Support

The architecture enables aligned decision-making from substation staff to top management and government authorities.

Advanced Visualization Tools

PI Vision videowalls, dashboards, special screens, and alarms transform complex data into actionable insights.



FROM CRISIS RESPONSE TO LONG-TERM RESILIENCE

Real-Time Crisis Management

PI System enables decision-making during extreme conditions like attacks and power disruptions, ensuring continuous situational awareness.

Supporting Power System Transformation

The platform supports the process of decentralization, battery storage deployment, flexible gas generation, and renewable energy growth, managing increased complexity.

Executive Visibility and Strategic Planning

Real-time system visibility enables executive governance, crisis communication, and strategic decision-making for long-term resilience.

Cultural Shift and User Adoption

Adoption of digital tools fosters user confidence, faster adaptation, and acceptance of organizational change.



Thank you!