

AVEVAWORLD

OCTOBER 2024

NPC UKRENERGO

Ensuring secure and reliable power with AVEVA PI System

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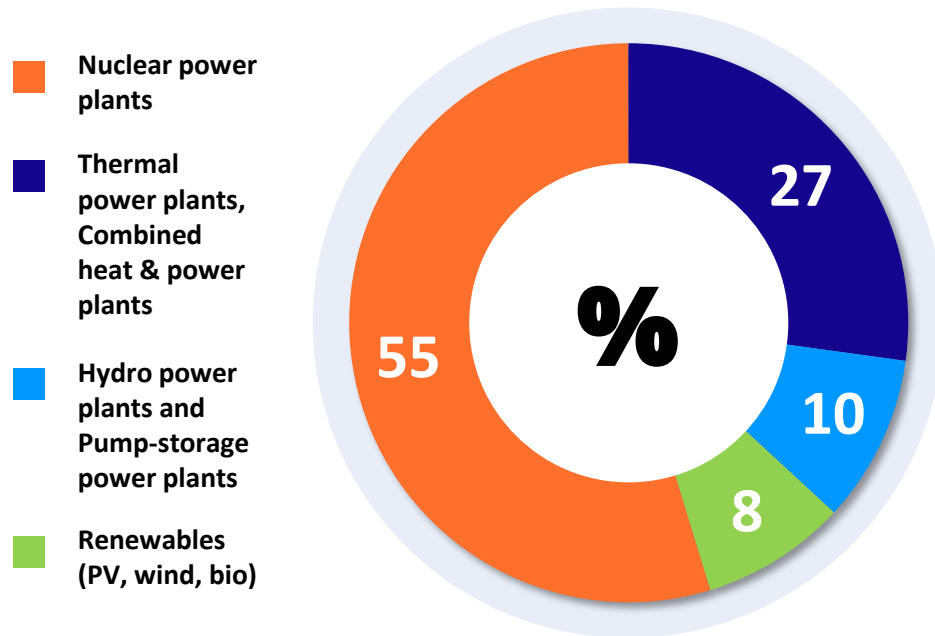
AVEVA

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



20 000 km
total length of high-voltage lines

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

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

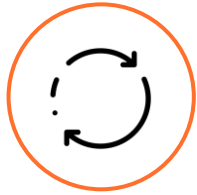
entsoe
ENTSO-E member

INTEGRATION OF THE POWER SYSTEM OF UKRAINE INTO THE "ENERGY EUROPEAN UNION"



16 March 2022

emergency integration of Ukrainian and European power systems



30 June 2022

renewed possibility of electricity trading with the EU



28 November 2022

transition of Ukraine's power system to continuous joint operation with the power grid of ENTSO-E Continental Europe



1 January 2024

Ukrenergo – full member of ENTSO-E



NPC UKRENERGO implements AVEVA PI System as a master point of real-time data

Challenge

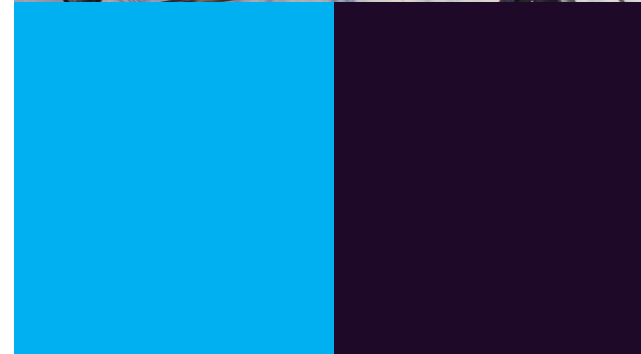
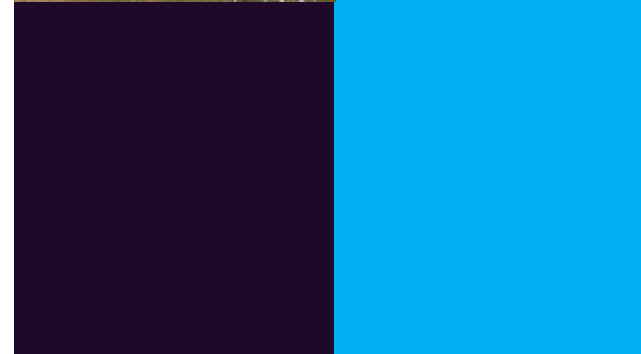
- Historically NPC UKRENERGO had a lot of legacy systems, which dispatchers and top management used to access to real-time data. Those systems were based on old technologies, were not safe and some of them were “Black boxes”
- After 24.02.2022 substations of UKRENERGO were attacked by drones and rockets several times. All alarm substation staff needed to be in shelters, and they had no visibility of what was happening outside
- Fast growth and changing of the grid

Solution

- Implemented AVEVA PI System to create a master storage for real-time data, to visualize the data in user-friendly format, enhance security and reporting

Results

- **Instead of a set of legacy systems now we have a single platform which covers dispatcher’s business needs.**
- **Created several screens for each substation to give opportunity for the staff to monitor the substation parameters in shelters in very short terms. People are in safe conditions, and they know what to do right after alarm finishes.**
- **Fast reaction to the changes of grid and integration of new facilities with PI System connectors**





BUSINESS CHALLENGES AFTER 24.02.2022



Longest work shift of the substation dispatcher - 66 days

**From October 2022
to March 2023**

Ukraine's power system
was attacked by more
than **1500 missiles
and drones**

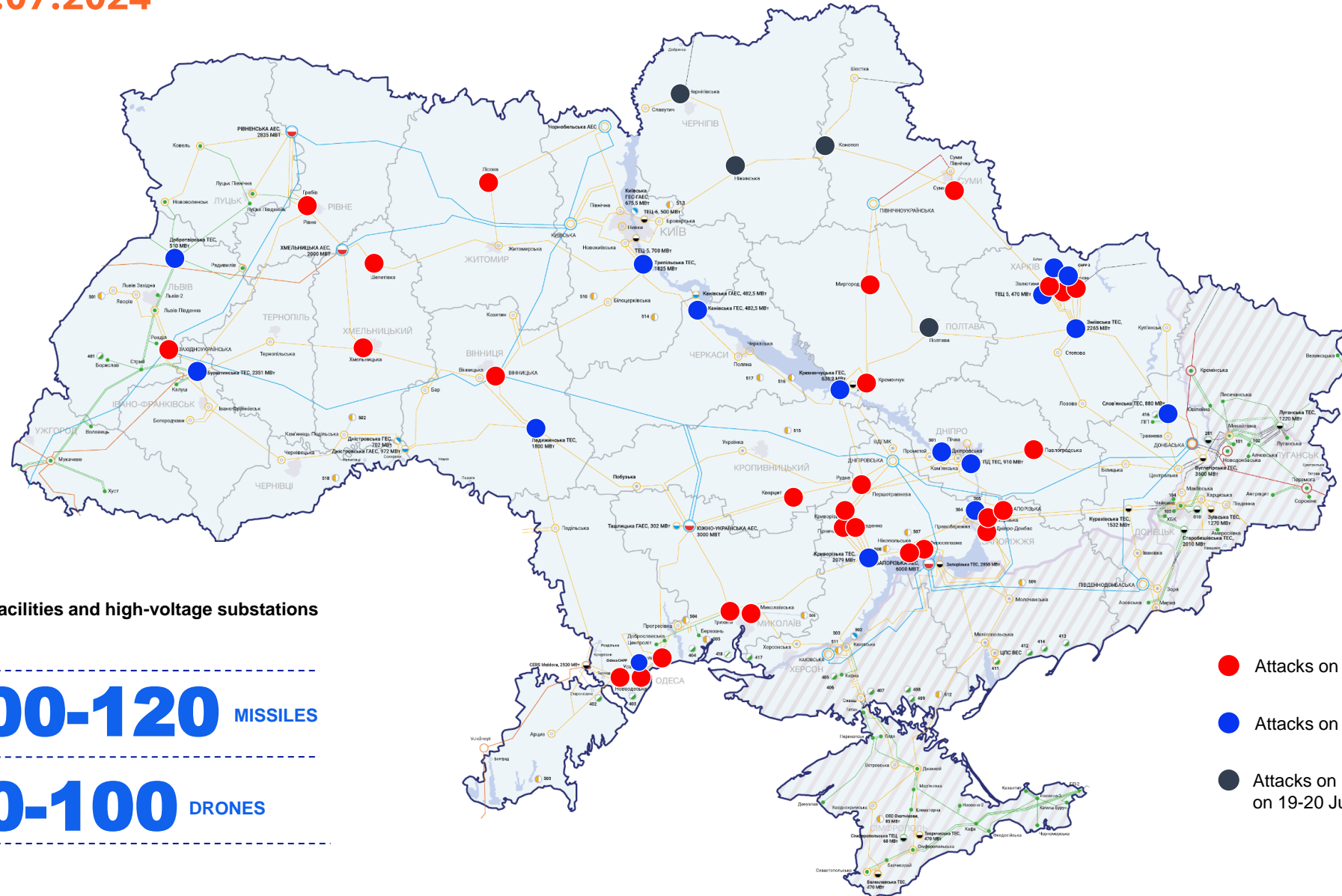
**One of
substations was
hit by missiles
and drones
24 times**

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**

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

CONSEQUENCES OF MISSILE AND DRONE ATTACKS

30.01 – 20.07.2024



Hits on generation facilities and high-voltage substations



100-120 MISSILES



90-100 DRONES

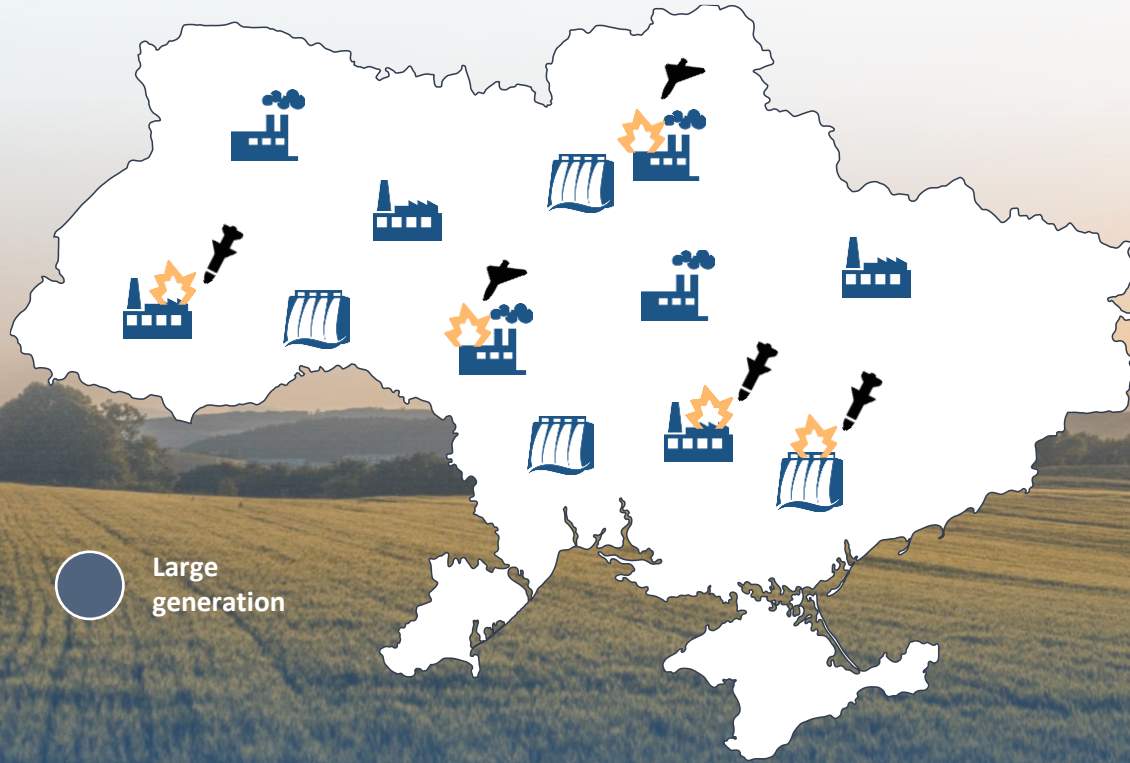
● Attacks on Ukrenergo substations

● Attacks on generation facilities

● Attacks on Ukrenergo substations on 19-20 July 2024

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**

CHALLENGES BEFORE PI SYSTEM



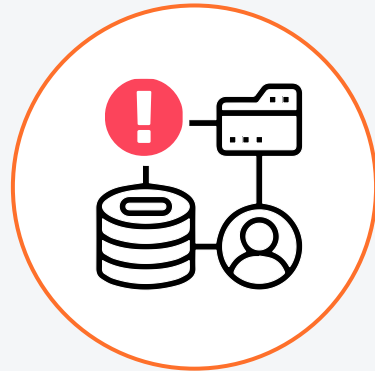
| Час | ОЭС Урала | Башкирэн | Кировэнь | Курганэнь | Оренб |
|-------|-----------|----------|----------|-----------|-------|
| 1 | 28796 | 3011 | 812 | 520 | 1 |
| 2 | 28818 | 3011 | 776 | 525 | 1 |
| 3 | 28842 | 3011 | 768 | 512 | 1 |
| 4 | 29160 | 3039 | 803 | 516 | 1 |
| 5 | 30017 | 3176 | 804 | 549 | 1 |
| 6 | 31047 | 3330 | 838 | 596 | 2 |
| 7 | 31714 | 3414 | 908 | 619 | 2 |
| 8 | 31934 | 3441 | 970 | 632 | 2 |
| 9 | 31801 | 3429 | 1050 | 629 | 2 |
| 10 | 31585 | 3378 | 1077 | 605 | 2 |
| 11 | 31117 | 3299 | 1074 | 607 | 1 |
| 12 | 31237 | 3285 | 1050 | 618 | 1 |
| 13 | 30996 | 3270 | 1011 | 603 | 1 |
| 14 | | | | | |
| 15 | | | | | |
| 16 | | | | | |
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| 23 | | | | | |
| 24 | | | | | |
| Сумма | 397061 | 42091 | 11957 | 7517 | 28 |
| Сред. | 30543 | 3238 | 920 | 578 | 1 |

DISPATCHER'S LEGACY SYSTEMS

- 120+ legacy systems which are used by dispatchers
- High supporting FTE
- Legacy of 1990th technologies
- No documentation, instructions and described algorithms
- Old model of the market

- No developers and expertise
- Complex integration model
- No dataflows description
- Different databases (supporting, license)
- Security
- Etc...

PROBLEMS WITH RENOVATION PROCESS



People have habits

Old-fashioned UIs

Integration in legacy systems (supporting some old integrations)

Changes in other systems at the same time

Old regulatory documents need to be updated

“Black boxes”

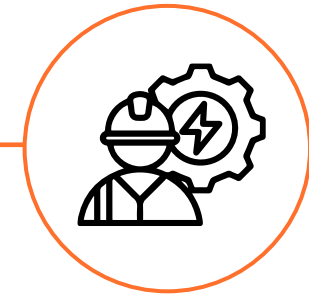
Users

Internal Users

Dispatchers

Top management

Substation staff



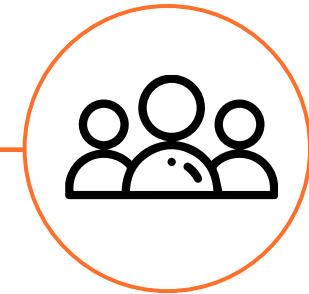
External Users

Market participants


Ministry of Energy


Regulator

ENTSO-E



SYSTEM REQUIREMENTS

 Single data source for online analytics and reporting

 High available data

 Historical data storing

 Modern technologies

 Integration

 **Security**

 Scalability

 Quick ready-to-use

SECURITY REQUIREMENTS

- ✓ 2-Factor Authentication
- ✓ Separation of data and visualization access in role model
- ✓ Correspondence to modern and supported security standards
- ✓ Ability to manage users and roles in one place
- ✓ Integration with Active Directory

PI SYSTEM IS A SOLUTION

PI System for us is:

- Lots of connectors to data sources
- Powerful storage for time-series data
- Flexible structuring and contextualization of data
- Realtime and post analytics
- Event frames
- Notifications
- User friendly and visualization
- Ability to customize visual components
- Possibility to users to create their own screens
- Access to the data and structure via Excel(Datalink/PI Builder)
- Flexible data access security model
- API and SDK to access the data from 3-d party systems
- Correspondence to modern security standards
- 2FA



OSIsoft[®]
is now part of AVEVA

PI PROJECT

- Project started in late 2020
- PI System licenses from January 2021
- Test environment and people training in mid 2021

START

- Replacement of outdated software products
- Standardization of technological software for user convenience and simplification of technical support
- Basic data for forecasting the operation of the UES of Ukraine and making management decisions at all levels of the dispatching hierarchy
- Ensuring security

MAIN PROJECT GOALS:

- Reacting to new challenges with quick ready-to-use

AFTER 24.02.2022 :

SOME NUMBERS

250+
users

1000+
screens

50
custom
symbols



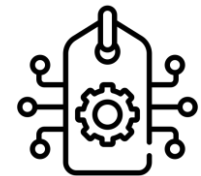
20+
modules
implemented



15 000+
calculations



50 000 +
calculated tags



200 000+
tags

EXTRA BENEFITS FROM PI SYSTEM



- Modern secured tool for collecting and visualizing information, which allows us to cover our business user's requests in very short terms



- We do not need any developers or overqualified staff to improve changes

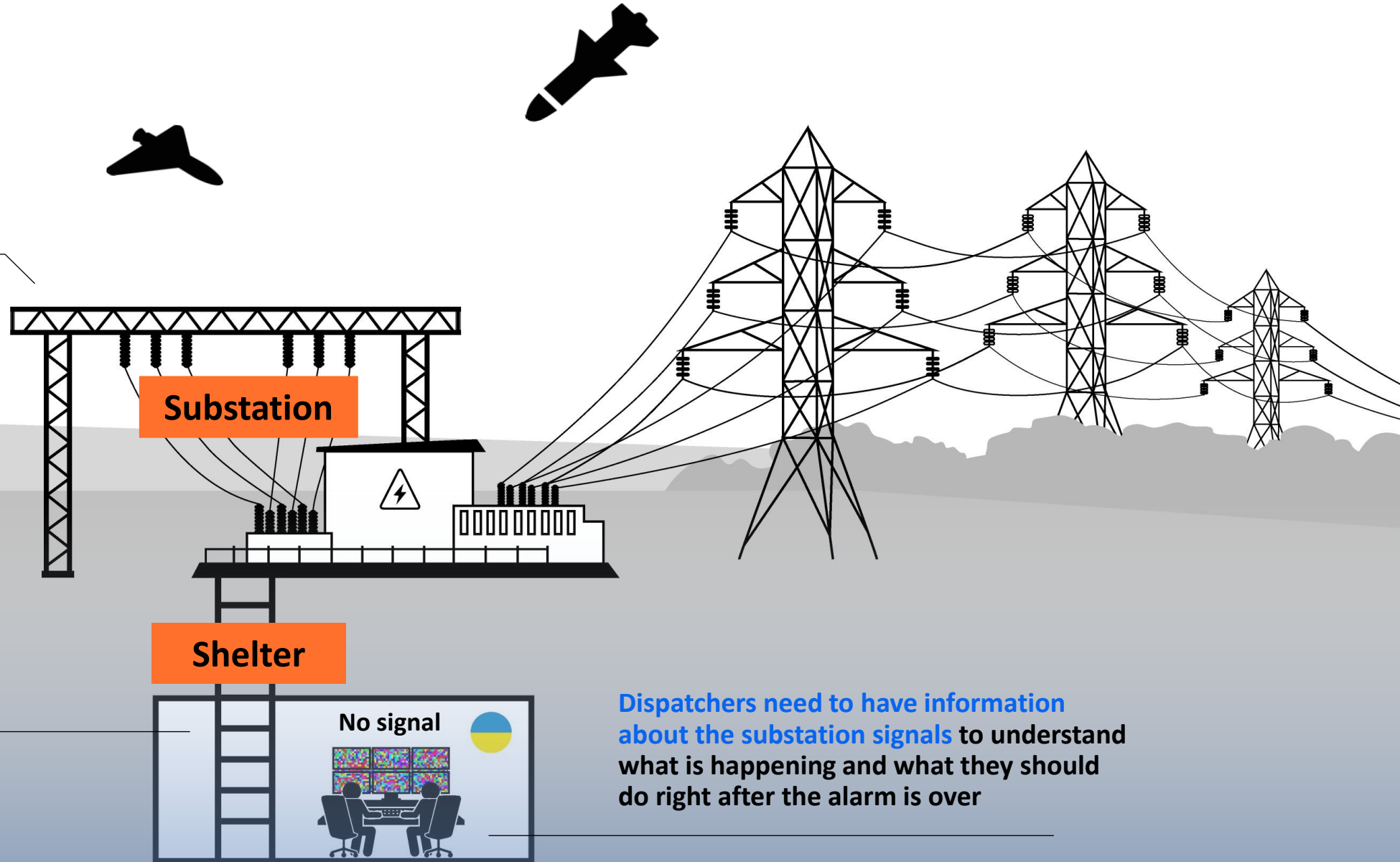


- As a result, our users changed their attitude to implementation of changes

ONE CASE WHEN PI SYSTEM HELPED US

ONE OF CASES

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

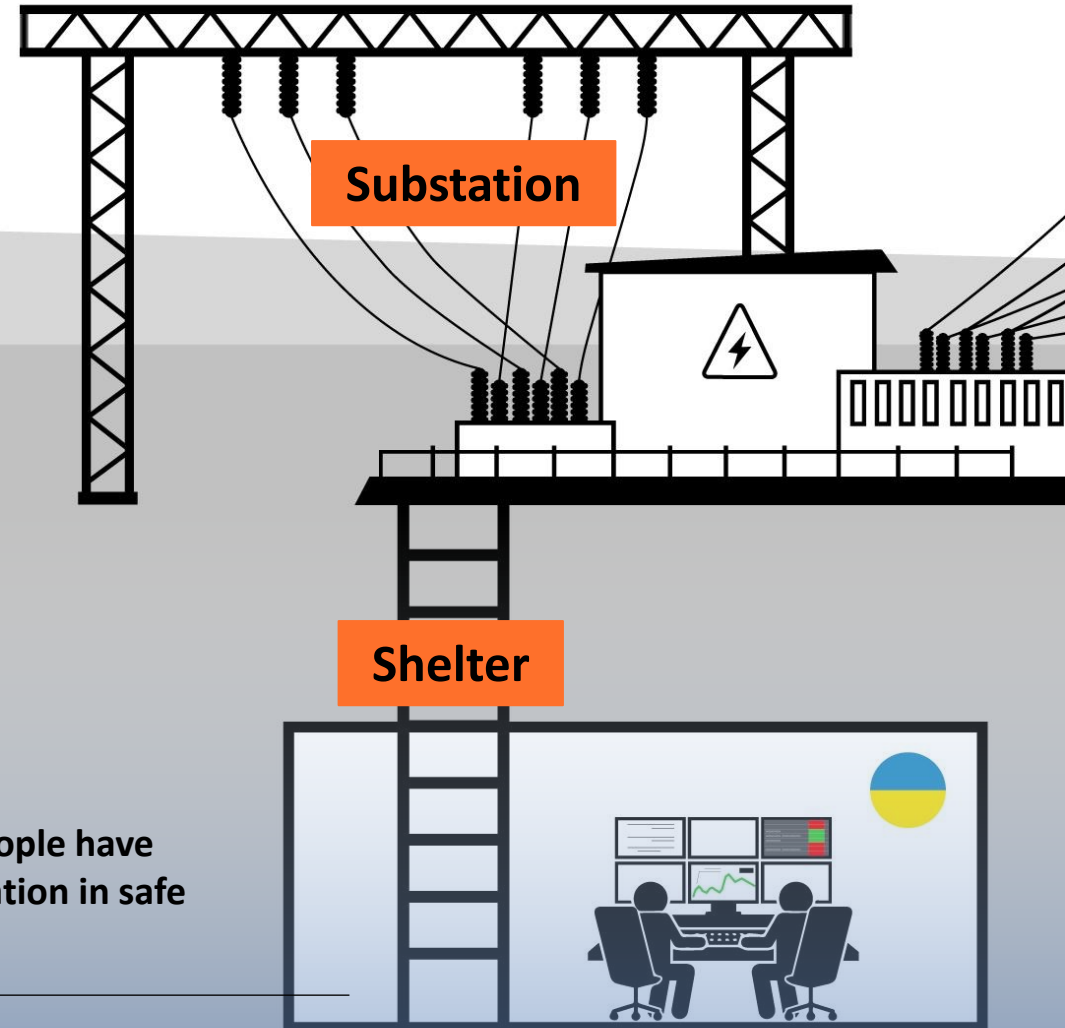
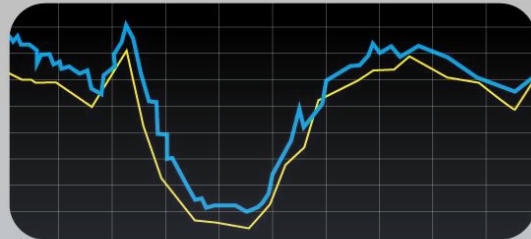
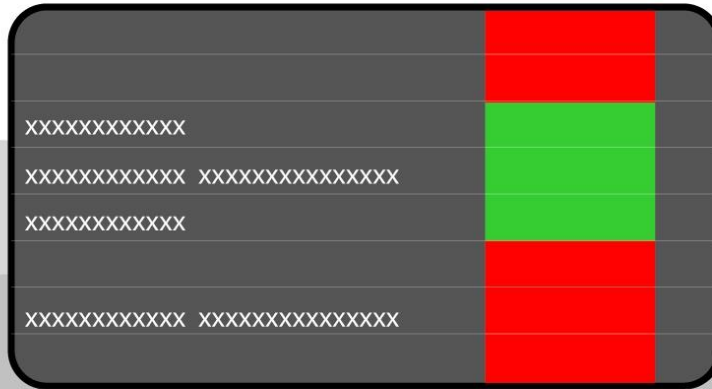
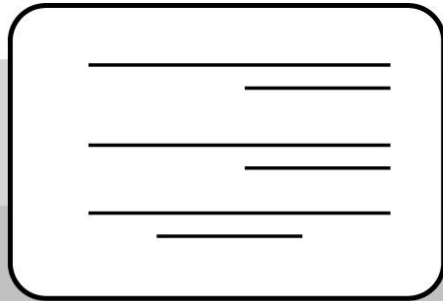


Substation personnel
must be in shelters
during the alarm

Dispatchers need to have information
about the substation signals to understand
what is happening and what they should
do right after the alarm is over

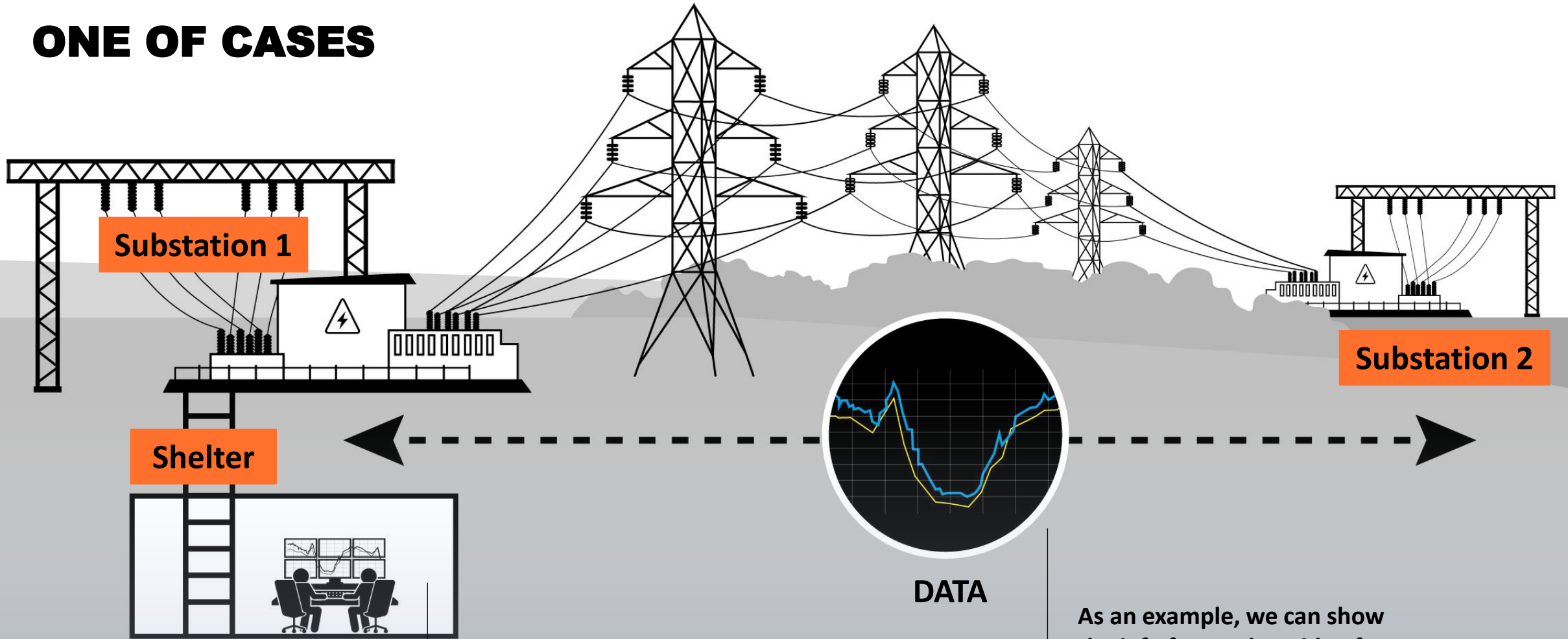
ONE OF CASES

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



As a result, people have online information in safe conditions

ONE OF CASES



Substation 1

Substation 2

Shelter

DATA

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

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