INTERNATIONAL YOUTH FORUM 2018

ROSSETI

Project challenge:

Automation Level Improvement of Belarus Distribution Network

Country challenge-provider: Belarus

Challenges of Belarus distribution network

Low reliability

SAIDI: 33.6min/y/c, SAIFI: 0.45times/y/c

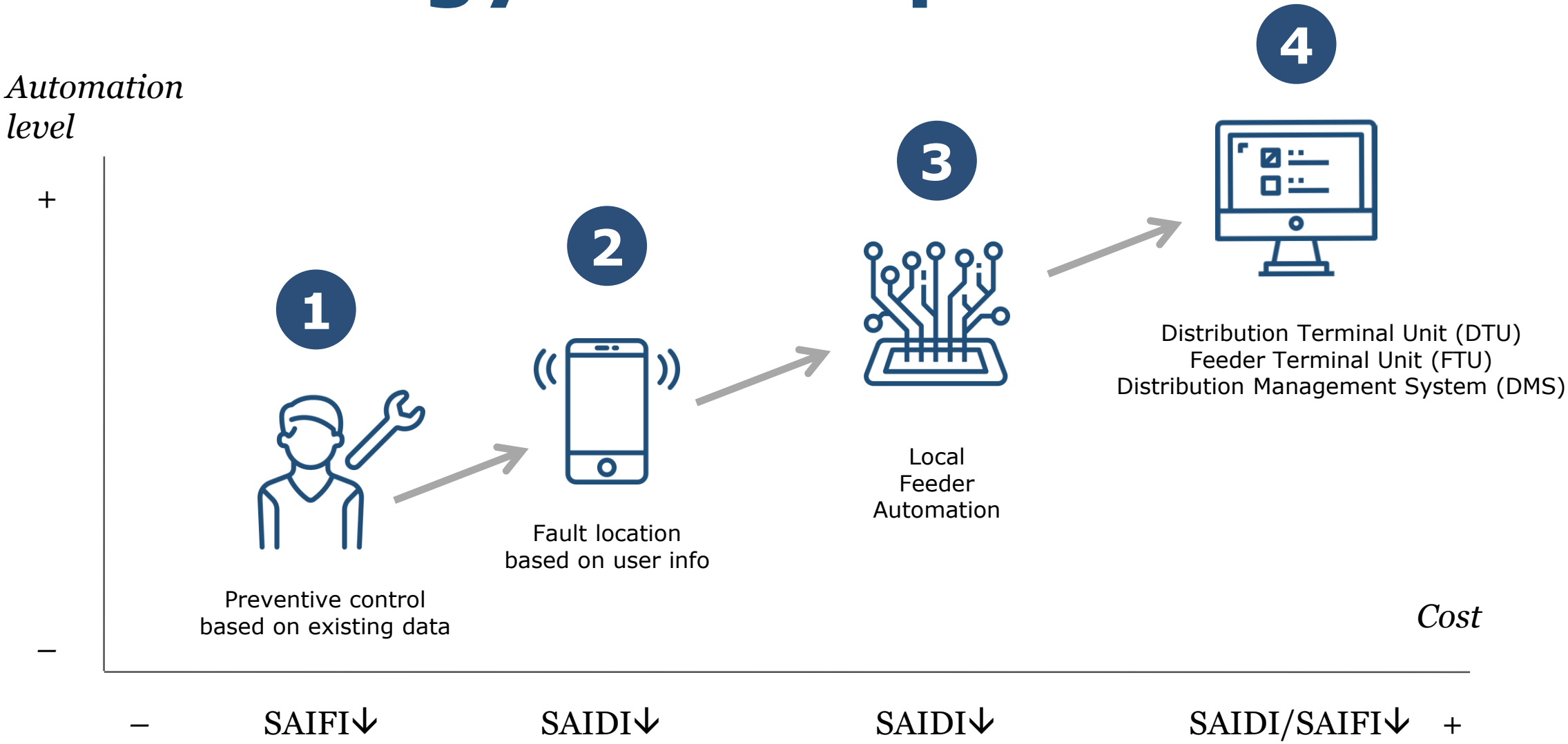
- Aging equipment: 52% (>30y)
- Low automation coverage: <10%

High OPEX (€25mln/y)

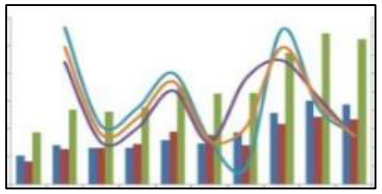
- High failure rate: 5.94/(100km·y)
- Manual line fault location

NO financial support

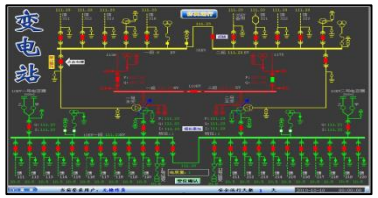
Technology roadmap



Scenario 1: Preventive control based on existing data

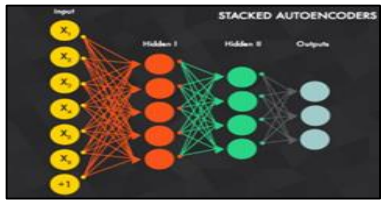


Historical fault info



Monitoring data

Equipment info



Equipment risk assessment

Load forecast
Weather forecast

Preventive control

Condition-based maintenance

Reduce the load of equipment at high risk

- Ageing equipment
- High failure rate

→ Reduce the failure rate

Scenario 2: Fault location based on user information

GIS

Outage info with GPS

БЕЛЭНЕРГО

Fault location
Customer service

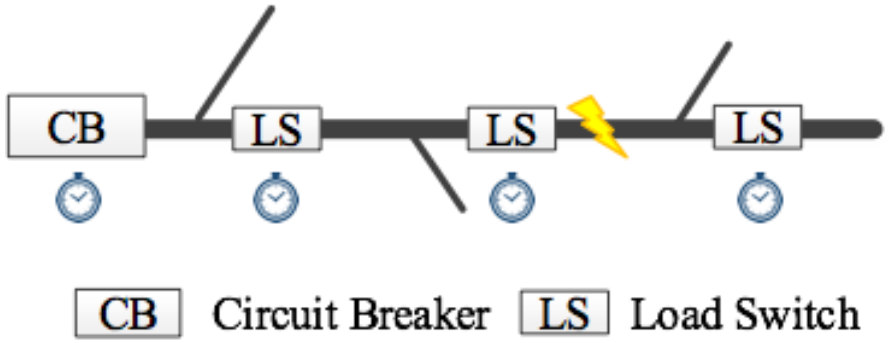
Motivation mechanism

Priority of recovery
Game credits
Price reduction

- Manual line fault location
- Low smart meter coverage

Automatic fault location
SAIDI↓

Scenario 3: Local feeder automation



Local feeder automation

To restore the highest amount of customers based on the cooperation of delay between the breaker and load switch

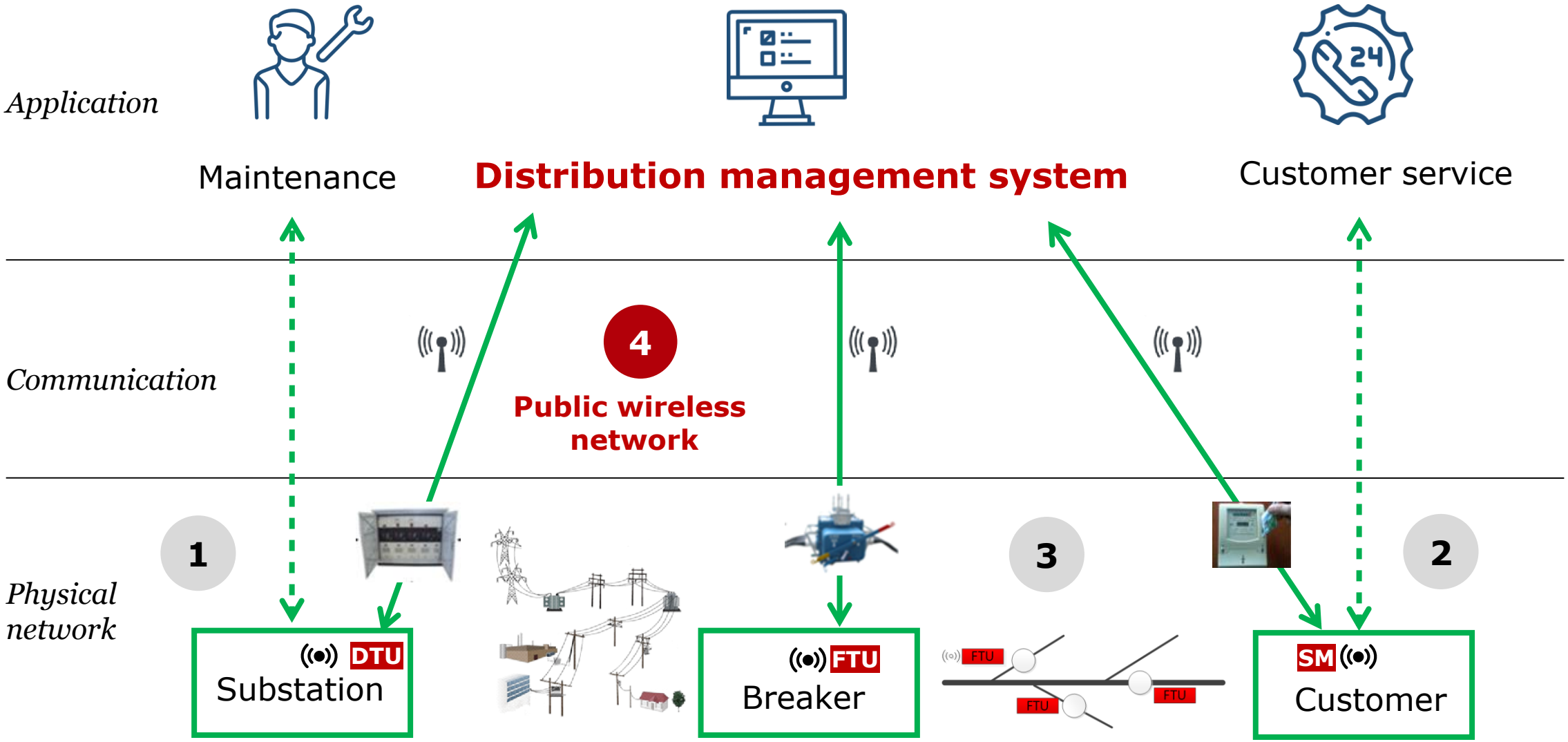
Feature: no communication/cheap
Application scope: long and higher fault rate line, high rating load

Manual recovery

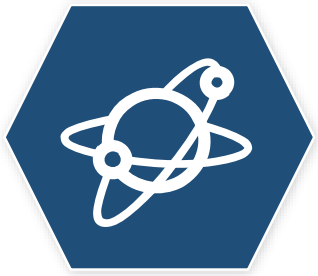
↓

Self-healing
SAIDI / OPEX ↓

Scenario 4: DMS



Task forces



R&D Group

Developing technologies

- APP based fault locating
- Preventive control algorithm

Manufacturers

Mature technologies

- DTU
- FTU
- SCADA
- Wireless communication

Finance Group

Financial issues

- Funds management
- Financing

Participators and business model

БЕЛЭНЕРГО

Grid company

Saved OPEX + Increased tariff →

← Devices and services

enel

SIEMENS

国家电网 STATE GRID

Schneider Electric

Increased tariff ↑

Service ↓

Electricity Consumers

Equipment manufacturers

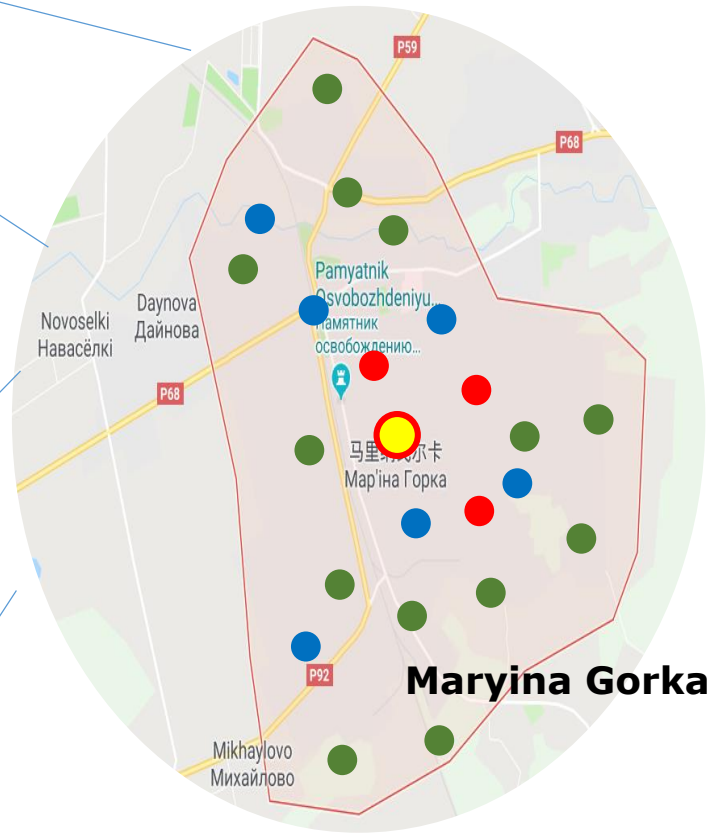
Pilot project in Maryina Gorka

Location
60 km south of Minsk

Power consumption
188 GWh/y

No. of 10kV lines
210

Expected goals
SAIDI(avg.) : 108→58min
SAIFI(avg.) : 1.3→1
OPEX : €100k→50k

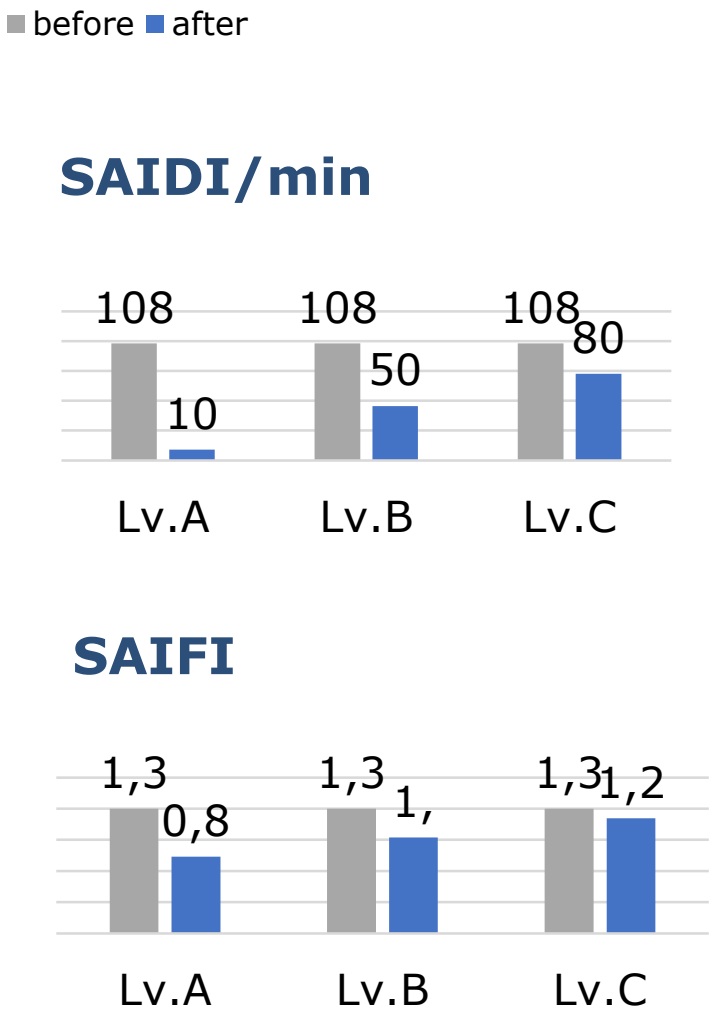


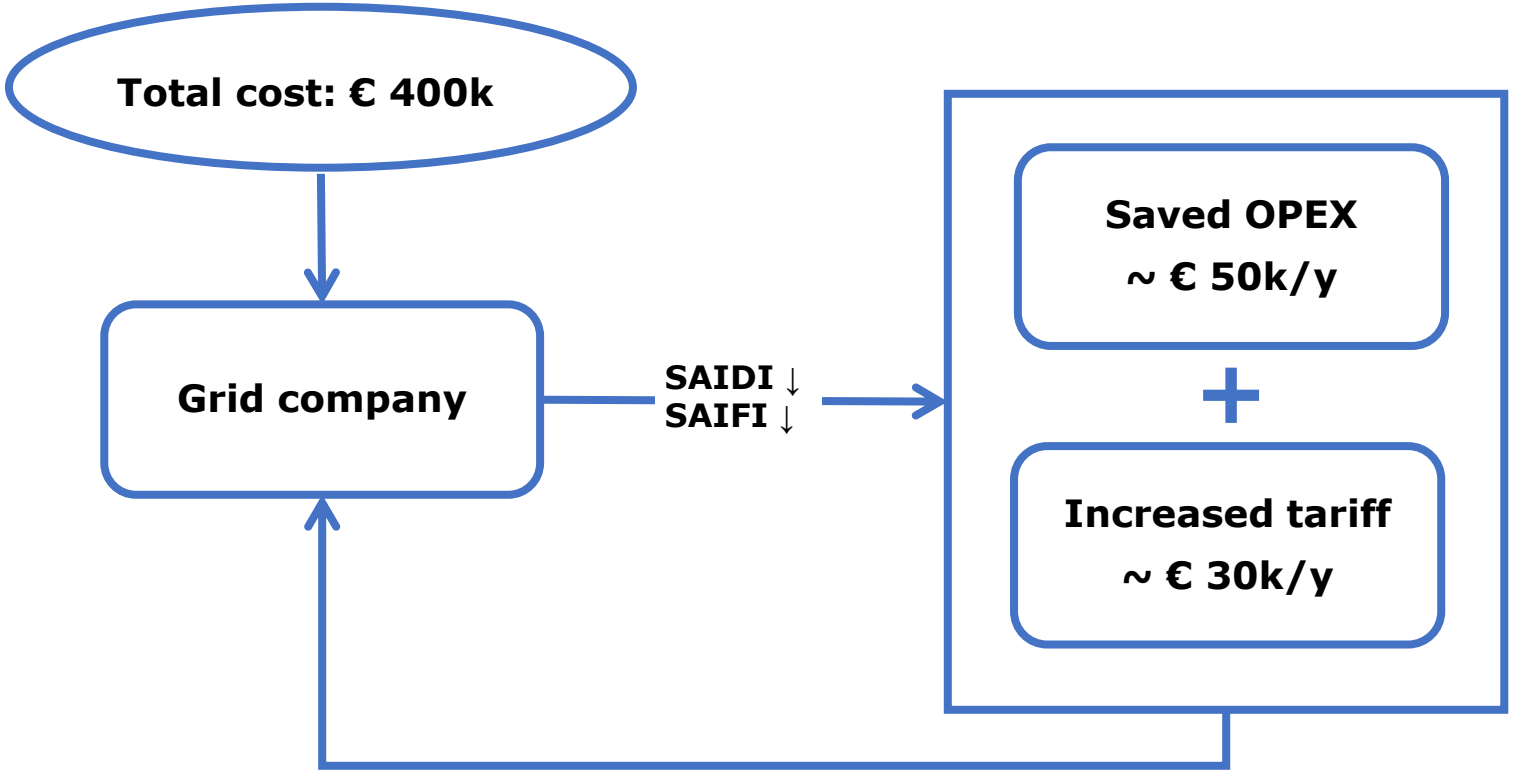
Data center
Lv.A user
Lv.B user
Lv.C user

Solution and cost

User	Device	Cost /€
1 Data center	DMS(include preventive control), €300k/set	300k
11 Lv.A users	FTU, €5500 /set	60.5k
132 Lv.B users	Local feeder automation, €300/ set	39.6k
~44000 Lv.C users	Fault location based on user information, Free	Free
Total cost		**400k**

Pilot project in Maryina Gorka





ROI: 20%, 5 years

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Appendix

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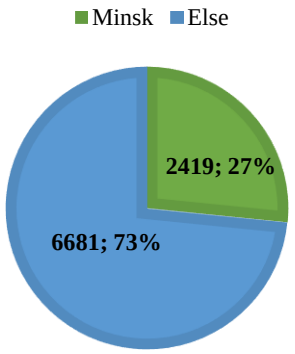
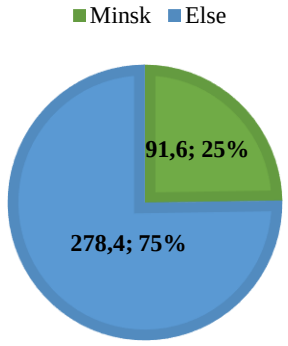
Overall Background

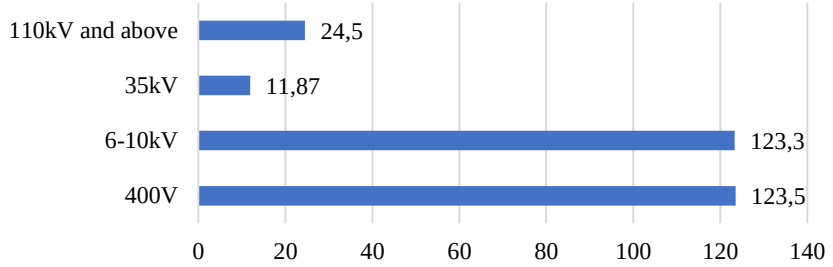
INSTALLED CAPACITY (MW)



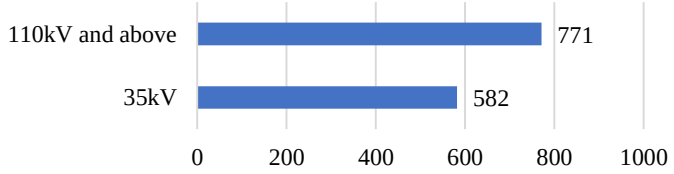
ANNUAL ELECTRICITY LOAD (HUNDRED MILLION KWH)



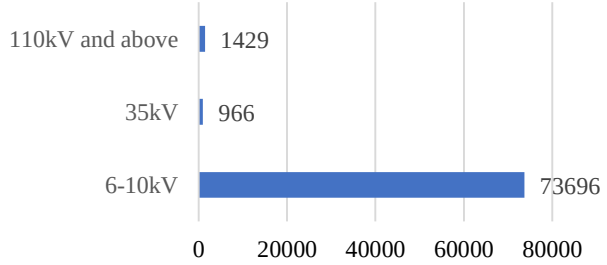
LINES (THOUSAND KM)



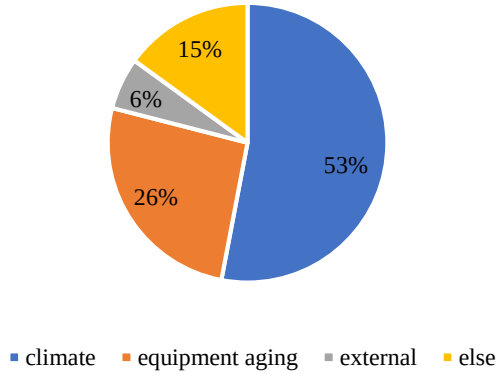
SUBSTATIONS



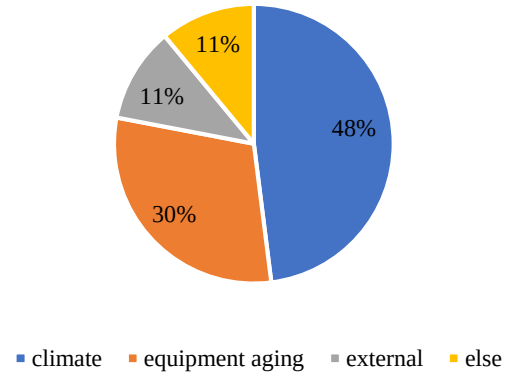
MAIN TRANSFORMERS



EQUIPMENT OUTAGE IN SUBSTATION (10kV AND BELOW)



LINES TRIP (10kV AND BELOW)



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Challenges of Belarus

Technical → Organizational → Entrepreneur

Present Situation

Low Reliability（6-35kV）

- Aging Equipment: 52% (＞30y)
- Low automation coverage: <10% (10kV)

High OPEX

- High failure rate: 5.94/100(km·y)
- Manual line fault location

Objective

High Reliability

- SAIDI: 33.6→16min/y/c
- SAIFI: 0.45→0.3times/y/c

Low OPEX: 25→12mln €/y

Low investment

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Electricity Price

- **1. Electric energy in apartment houses (apartments) equipped in according to the established procedure by electric plates:**

1.1. one-rate tariff – 0.0517 €/kWh

1.2. differentiated tariff for temporary periods:

minimum loads (from 10 pm to 5 pm) – 0.03618 €/kWh

maximum loads (from 5 pm to 10 pm) – 0.1033 €/kWh

- **2. Electric energy for needs heating and hot water supply with connected power of equipment more than 5 kW:**

the period of minimum loads (from 11 pm to 6 am) – 0.04254 €/kWh

Other periods of the day – 0.07901 €/kWh

- **3. Electric energy except for specified in items 1 and 2:**

3.1. one-rate tariff – 0.06077 €/kWh

3.2. differentiated tariff for temporary periods:

minimum loads (from 10 pm to 5 pm) – 0.04254 €/kWh

maximum loads (from 5 pm to 10 pm) – 0.1215 €/kWh