

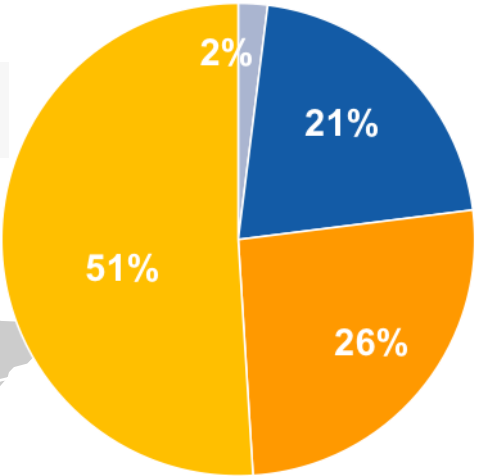
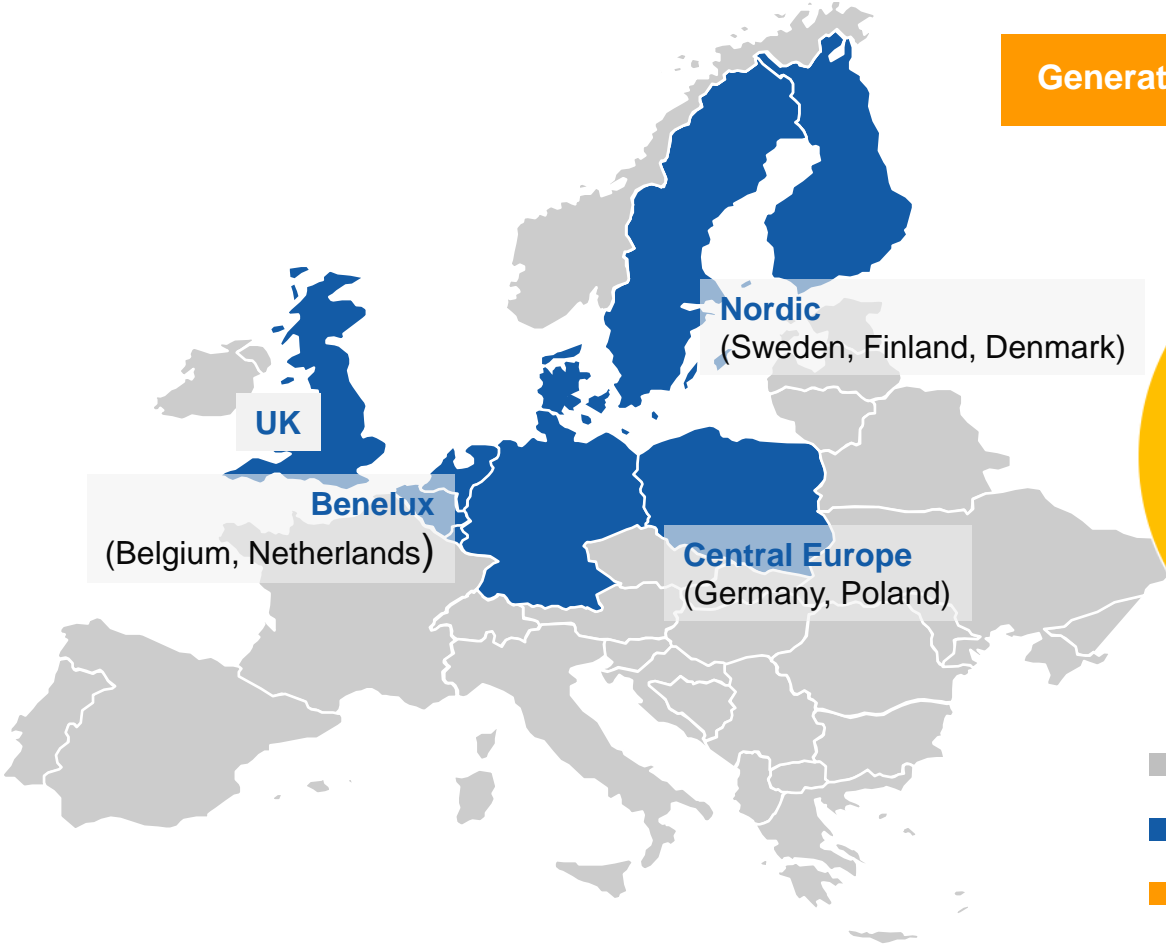


# Adapting Smart Grids to Different Markets

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Gothenburg 2010-10-12

# Different Markets different challenges

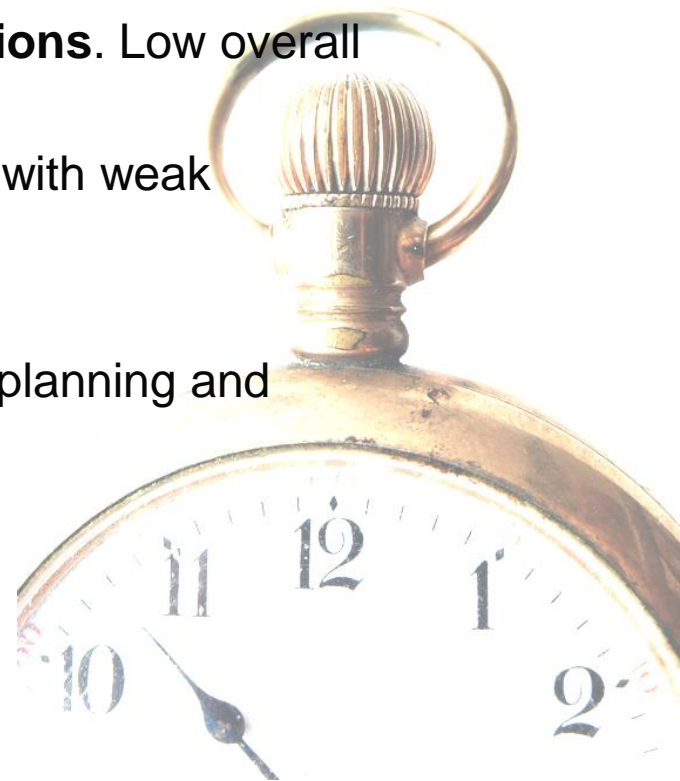
Generation 2009



- Other Renewable
- Hydro
- Nuclear
- Fossil

# The Electric Energy system of the 20th century

- The electric system was designed in the 20th century for fully controlled **centralized large-scale generation** and stochastic consumption assuming **unidirectional power flow**
- The Networks are **dimensioned for peak conditions**. Low overall utilisation.
- **Country/region specific** power system planning with weak interconnections
- Country/region specific **market rules**
- **No** considerable **changes in technology**/way of planning and designing the system for many decades
- **Limited observability**/information exchange



# Driving forces towards a new market

- A growing economy means a growing demand for energy
  - This of course includes electricity
- European goals on security of supply
  - Towards independence of “off Europe” primary fuels
- 20/20/20 to 2020 targets of Europe
  - 20% reduced CO<sub>2</sub> emission
  - 20% lowered energy consumption
  - 20% more renewable energy in the system
- Ageing network
  - Most of the European network assets are 30-50 years old
- Technology development
  - Novel technology mainly due to green field exploitations in e.g. China

# Major driver: integration of renewables

## Local solutions

- Storage
- Demand participation

*Flexibility in both production and demand  
Closer to the margins operation  
Information management  
Improved degree of grid utilisation*

Load follows Generation

## Interconnectivity

- Interconnectors
- Transmission
- Distribution

*Capacity  
Integration  
Super grids  
Shared resource for reserves/  
regulating power*

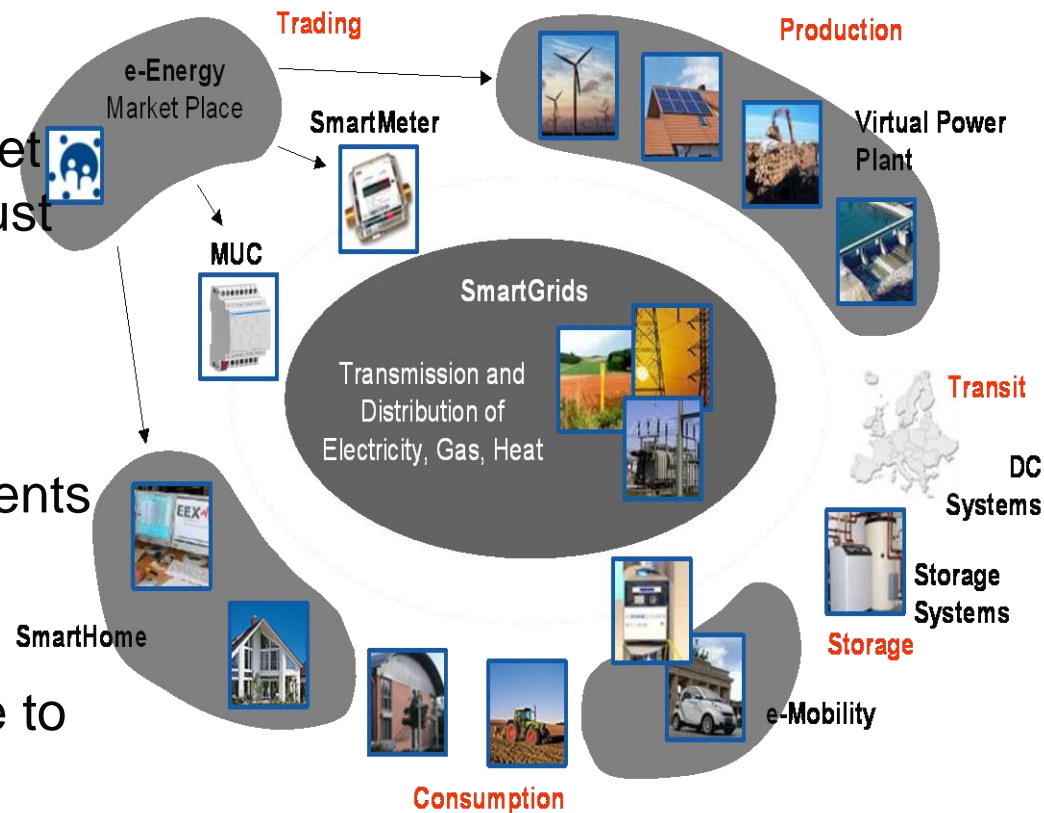
Generation follows Load

*"A Smarter Grid"*

*"Old School"*

# In Europe we expect a market solution

- The Smart Grid is more than a technical solution
- In Europe the de regulated market is established, a "Smart Grid" must adhere to this
- New actors are expected on a Smart Grid market
- Market rules that allows investments in SG technology
- It will be the customers that have to pay (as usual) However it will be less than in case of "business as usual"



# The Smart Grid need to be adopted to different markets

In 2030 the Smart Grid is the technical arena where our goals are realised

To meet EU's climate commitments by optimal use of sustainable energy sources in electricity generation

Environmentally and economically rational use of electricity in society










Electricity as the reliable and available energy carrier

A transition towards sustainable road transport

To take action on future business opportunities

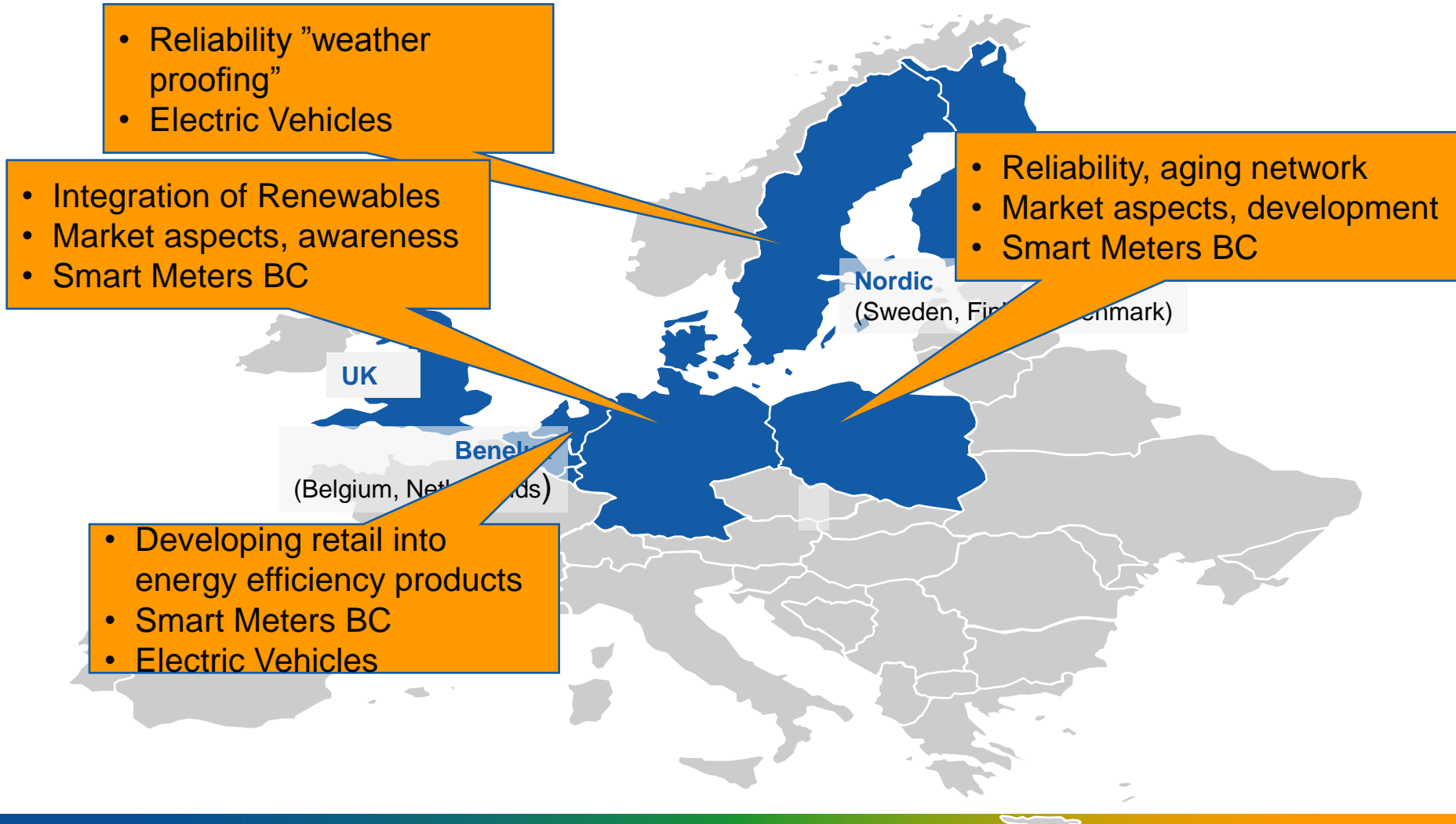


# The benefits of the smart grid will mainly arise outside the DSO!

	Effect	Economic up/downside	Argument
Distribution	Smart Grid Investments		Heavy Investments in new technology
	Reduced network losses		DSP expects to shave peaks rather than lower the base load. Hence, DSP will reduce network losses but not substantially.
Generation	Less wear in hydro plants (long term horizon)		Smoother demand curves enables smoother run of hydro power plants.
	Increased water efficiency		Smoother demand profile enables better hydro planning and control
	Reduced income from high-price hours and balancing		Responsive demand reduces amount of high-price hours. Reduced balance income, see below.
Sales and Services	Reduced balance costs		Aggregator bids increases volume on balance market. Also, smoother demand curve and better forecasting reduces need for balance power.
	Reduced price-volume risk		Better forecasting combined with less/lower price peaks reduces exposure to price-volume risk
Aggregator	Income from load reduction bids		The aggregator's income from the balance market
	Agreed compensation to participants		Agreed compensation to DSP participants

## Business Case: Aggregator of distributed generation

# Adapting to different markets, some examples



# Hourly consumption feedback to network customers in Finland

Min förbrukning → Inloggad som: Anna X → Logga ut

MIN FÖRBRUKNING: TESTVERSION

VATTENFALL

Min anläggning → Mina uppgifter → Hjälp

- Förbrukning
- Meddelanden
- Energiloggen
- Lägg till pris
- Uppgifter om min anläggning
- Fråga energexperterna

## Min anläggning: Rålsvägen 2

### Översikt



% förändring av din förbrukning jämfört med samma period föregående år  
\* Senaste 7 dagarna

Jämfört med samma period föregående år har din förbrukning\* förändrats med: **-25,2 %**

Förändringen motsvarar: **-95 kWh eller -122 kr\*\***

Tillgänglighet till el\*: **100,0 %**

\*\* Baseras på uppgifter du väljer under → Lägg till pris

Gå till Förbrukning

Förbrukning hittills innevarande månad: **595 kWh eller 875 kr\*\***

Förbrukning föregående månad: **1 087 kWh eller 1 634 kr\*\***

Beräknad årsförbrukning: **17 135 kWh**

Beräknad årskostnad: **24 903 kr\*\***

### Meddelanden

Gå till Meddelanden

Tid	Beskrivning
2009-10-15	Din förbrukning underskred angivet tröskelvärdet på 25%

Du har 1 nyinkomna meddelanden sedan senaste inloggning. Gå till "Meddelanden" för att se samtliga.

Om Meddelanden

### Kontakt

- Kontakta Vattenfall
- Fråga energexperterna

### Mer information

- Frågor & svar
- Energilexikon
- Om Min förbrukning

### Slå av TV:n

Visste du att en modern TV kan ha en elanvändning på 0,2-0,4 kWh/timme

www.vattenfall.se

Vattenfall AB | SE-162 87 Stockholm

Min förbrukning → Inloggad som: Anna X → Logga ut

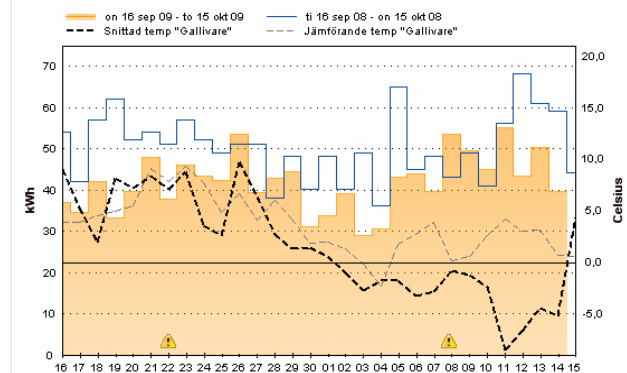
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## Förbrukning: Råsläggarvägen 24



Tidskalan i tjänsten Min förbrukning följer vintertid. För mer information läs mer i Frågor och svar.

Välj startdatum: 2009-09-16

Visa som:  Diagram  Tabell

Visa i:  kWh  kronor

Visa tidsintervall:  Dygnet  Veckan  Månaden  Året

Visa upplösning:  Timma  Dygn  Månad

Visa även:  Meddelanden  Yttertemperatur

Jämför med:

Exportera data till Excel | Spara | Visa statistik

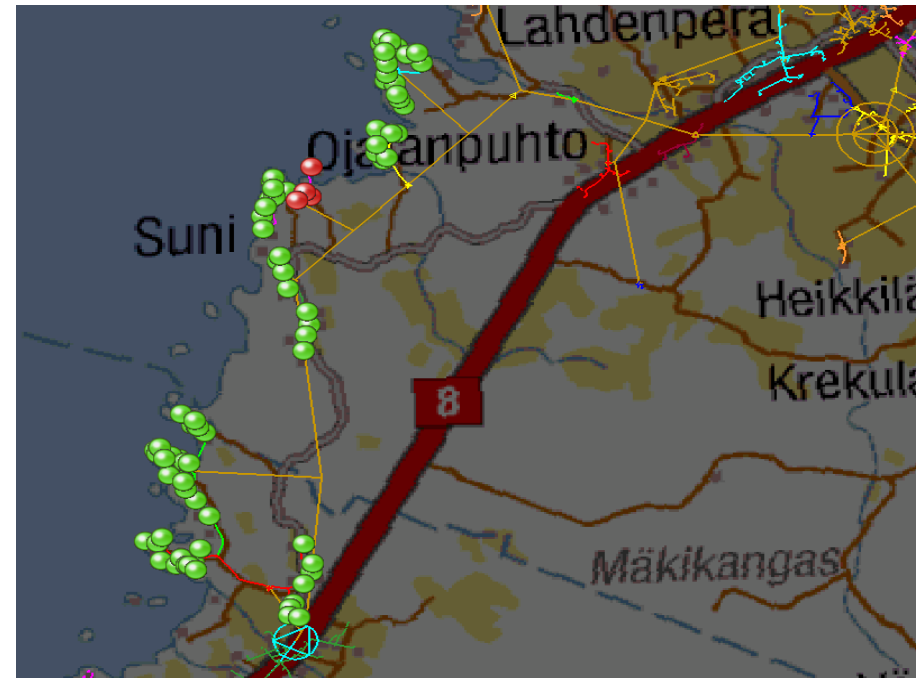
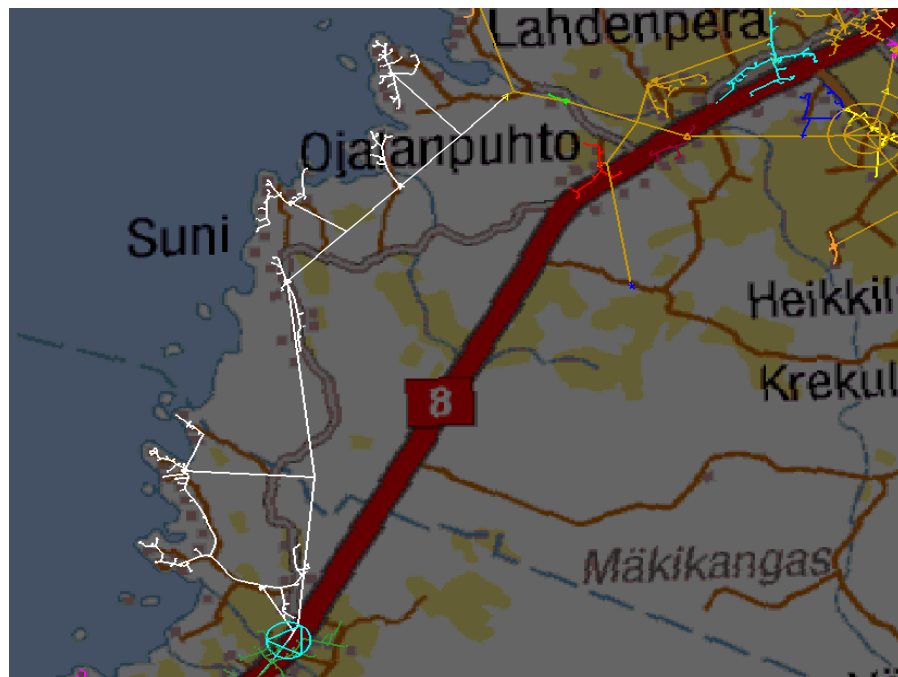
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# Integration of Smart Meter data in distribution management system

## Fast localisation of faults in Low Voltage network

- High degree of automation in previously "blind spot"
- Comes as added benefit when introducing Smart Meters



View from Distribution Management System

