Renewable penetration levered by Efficient Low Voltage Distribution grids

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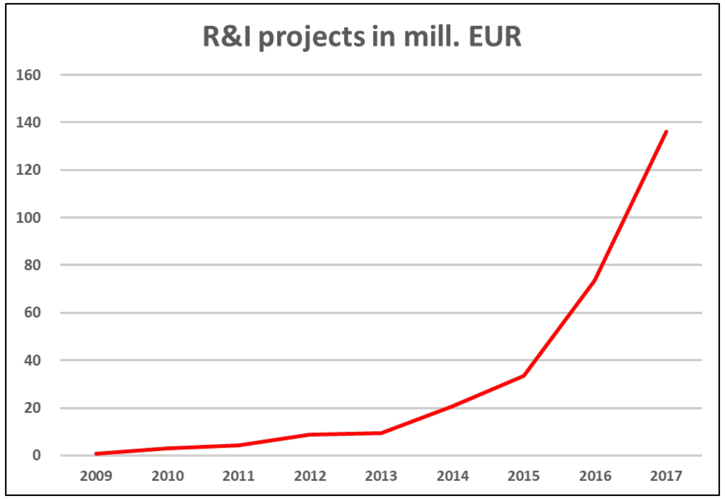
Content

1) What is the RESOLVD project?
2) Scope: accommodating renewables in the LV grid
3) Interesting cases for arctic regions

- Research organisation based in Halden, Norway
- Conducts applied research focused on impact and business development
- Focus areas: smart energy, smart cities & communities and applied artificial intelligence
- Has coordinated and participated in national and international projects since 2009.
- Legacy in carrying out projects on the topics of:
    - Integration of renewables
    - Smart distribution
    - Microgrids
    - Local energy markets
    - Energy flexibility
- NCE Smart Energy markets cluster: >70 members, including UiT

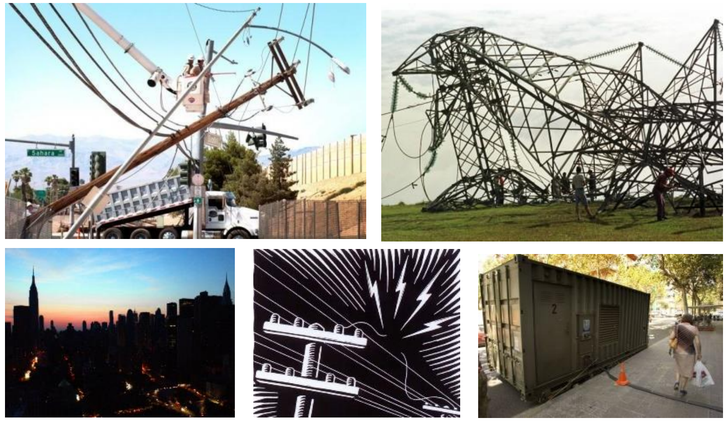


“Accommodating an increased presence of renewables in Low Voltage grids”

Challenge

High penetration of **distributed renewable generation** and **electric vehicles** are causing challenges to existing infrastructure

- ➢ limited renewable generation hosting capacity
- ➢ uncertainty of renewables
- ➢ balancing generation and demand
- ➢ limited grid monitoring capability



About the RESOLVD Project

H2020 R&I action project under grant agreement 773715

Budget: 3.8 Million Euros, 100% funded by EC

7 Partners:

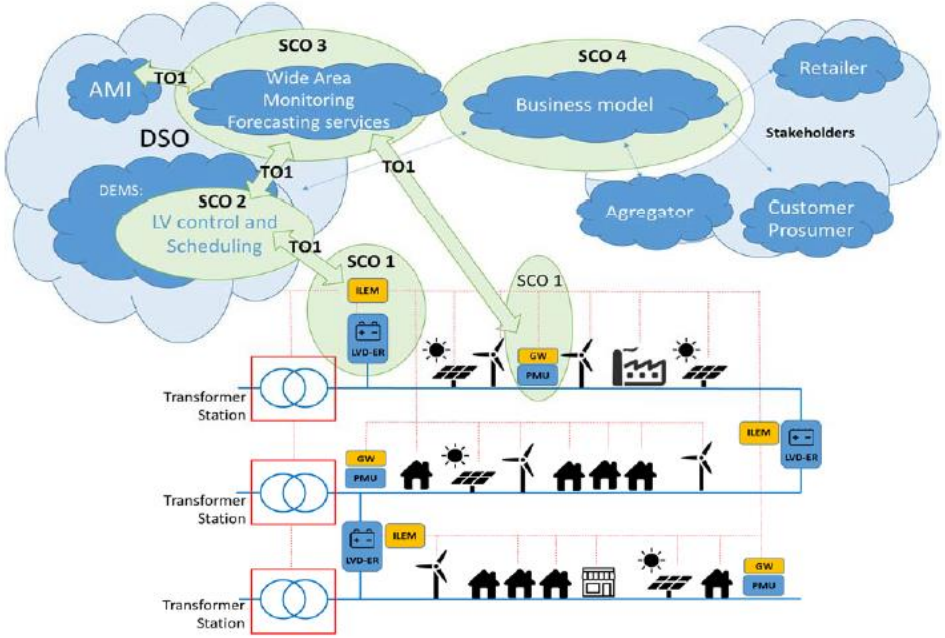
- Universitat de Girona (Coordinator, ES)
- Universitat Politécnica de Catalunya (ES)
- Intracom Telecom (GR)
- Joanneum Research (AU)
- Smart Innovation Norway (NO)
- ComSensus (SI)
- Estabanell Distribució (ES)

Renewable penetration levered by Efficient Low Voltage Distribution grids

Scope

“Improve efficiency and the hosting capacity of distribution networks in a context of highly distributed renewable generation in low voltage distribution grids”

- **Enhancing efficiency and hosting capacity** of the LV grid by leveraging connected and flexible distributed assets (power electronics and storage)
- **Enhanced observability of LV grid** with wide area monitoring capabilities and early detection of sudden variations in both demand and generation
- **Critical event forecasting** (congestion, over/under voltage)
- **Resilient and efficient operation of the LV grid**, providing:
  - Fault detection and self-healing
  - Controlled islanding capabilities
  - Voltage control functionality
  - Power quality management
  - Detection of non-technical losses (i.e. fraud)
- **Improved cybersecurity** through threat-based modelling



RESOLVD Innovative Outcomes

- **Decision Support Toolkit (DST)**

  Analytics components that enable loss reduction, critical event prevention, self-healing.

- **Wide Area Monitoring System (WAMS)**

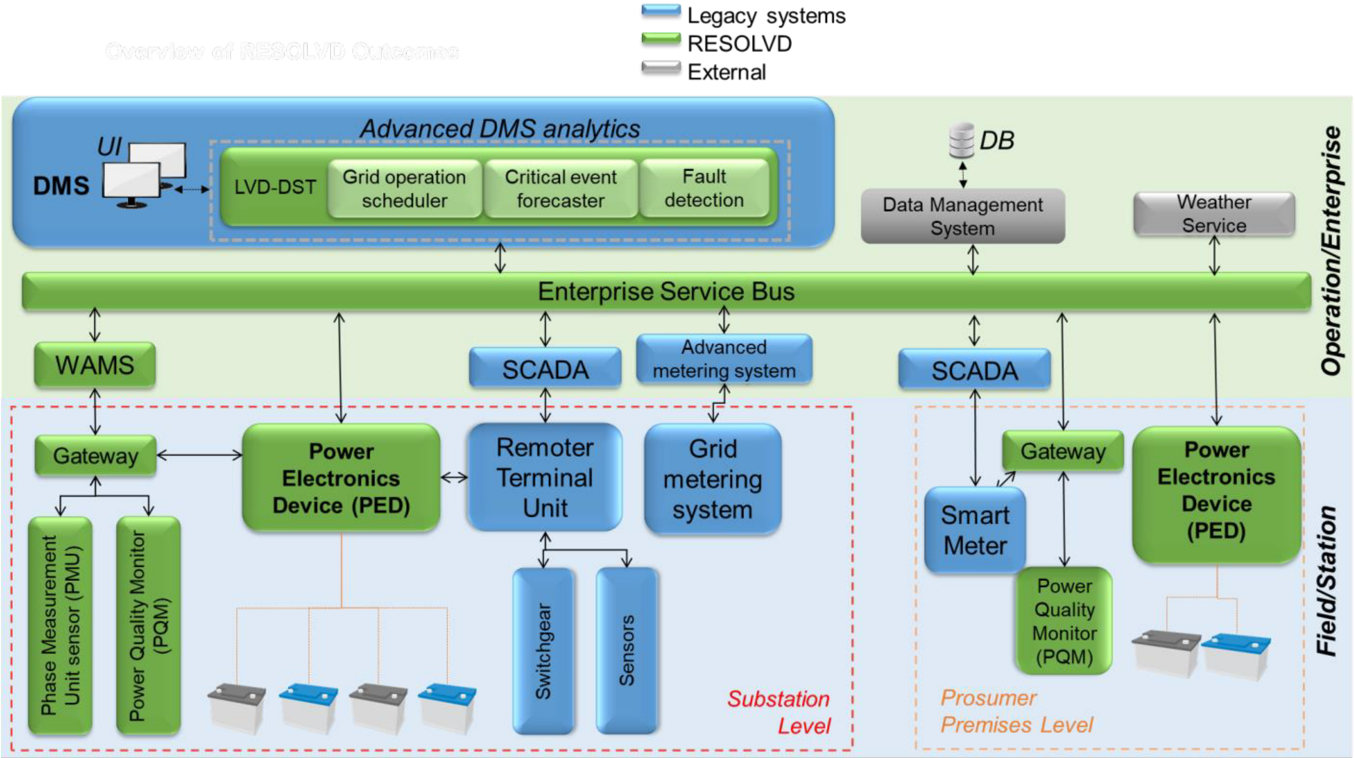
  Improved monitoring and edge computing capability

- **Power Electronic Device (PED)**

  Integrates different battery technologies and manages their dynamic energy flows to improve local and grid level performance

- **Risk-based cybersecurity modelling**

  Methodology applied to electricity distribution that covers all stages of design, development, implementation and operation



Status in the RESOLVD project

- RESOLVD project nearing completion (End February 2021)
- Final piloting stages underway
- Smart Innovation Norway leading work package setting plans for exploitation of project results

Relevant case: 1) Improving grid observability in LV networks

Challenge

- Lack of real-time information about LV grid asset performance
- Limited awareness which reduces capability for grid operators to react to network disturbances

RESOLVD solutions

- Forecasting of critical events (congestions and voltage deviations)
- Demand and generation forecasting
- Fault detection
- Can be integrated in legacy systems or via an enterprise service bus

Opportunities for exploitation

- Grid operators: development of a test pilot to trial RESOLVD solutions
- Technology providers: licensing analytics components developed by academic partners

Relevant case: 2) Improving grid stability in small or isolated networks

Challenge

- Particular challenge in small networks with ensuring stability
- Barrier to integration of distributed renewables (e.g. rooftop PV feeding into the grid)

RESOLVD solutions

- Forecasting and observability capabilities mentioned in previous case 1)
- Functionalities for operation of the LV grid:
  - Fault detection and self-healing
  - Controlled islanding capabilities
  - Voltage control functionality
  - Power quality management
  - Detection of non-technical losses (i.e. fraud)
- Integrated hardware capable of measuring and actuating grid assets

Opportunities for exploitation

- Grid operators: development of a test pilot to trial RESOLVD solutions
- Technology providers: licensing analytics components developed by academic partners

Relevant case: 3) Integration of different storage technologies

Challenge

- Many different uses for new installed storage solutions: power balancing, backup power, self consumption…
- Mix of many different storage technologies: chemistries, designed for max power/energy, mobile batteries (EVs)…
- Complex dynamic energy flow management … especially when different technologies are used

RESOLVD solutions

- A power electronic solution that integrates multiple battery types and manages their dynamic energy and power flows.

Opportunities for exploitation

- Grid operators: utilising technology to mitigate grid instabilities where infrastructure is weak
- Large prosumers: companies investing in storage can strengthen their business case
- Technology providers: licensing analytics components developed by academic partners

Closing thoughts and questions for discussion

- Many aspects need to be considered to accommodate the increase of renewables and eMobility in the LV grid
- RESOLVD has a wide scope, with solutions that can provide value to multiple stake holders other than DSOs.
- How are grid operators and infrastructure owners in the arctic regions dealing with these challenges?
- Are the outcomes developed in the RESOLVD project relevant to your business?

Thank you!

Get involved! [Join the Stakeholder Innovation Group]

Any questions? bryan.pellerin@smartinnovationnorway.com