PLAN.
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ETIP SNET
EUROPEAN TECHNOLOGY AND INNOVATION PLATFORM
SMART NETWORKS FOR ENERGY TRANSITION

# Parallel session 1
## Reliable, economic and efficient smart grid system

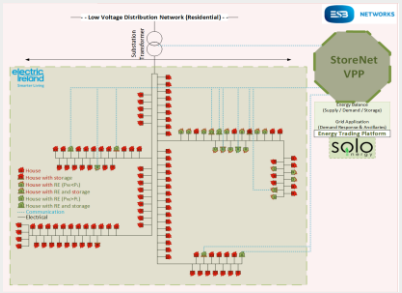
## StoreNet

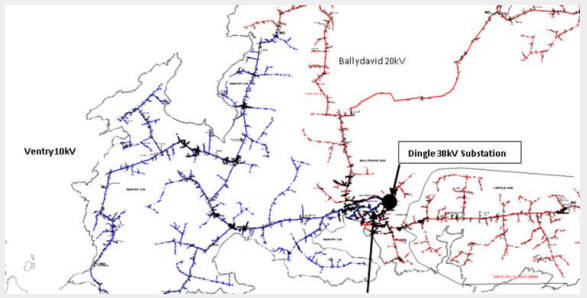
# Short presentation of the project

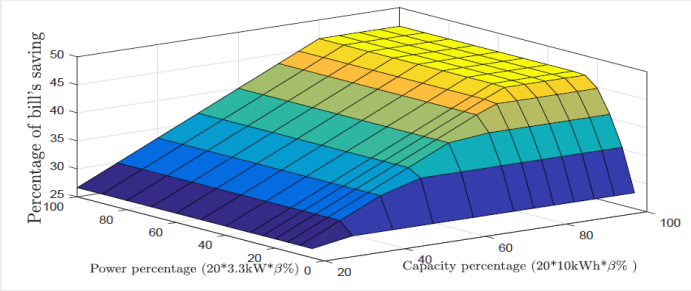
| | |
|---|---|
| Project Name | StoreNet |
| Consortium | ESB Networks, solo energy, electric Ireland, IERC International Energy Research Centre |
| Budget | • €1.12M |
| Overarching objectives | • **Design and demonstrate the viability of a virtual power plant (VPP)** as an aggregation platform of distributed energy storages to mitigate the peak demand and provide grid services.<br>• To grow the aggregator market in Ireland **through real-world testing of necessary hardware and software and policy analysis** for the support of that growth.<br>• To **develop a business model** that generates a revenue stream for active consumers/prosumers, aggregators and electricity suppliers |


First of its kind in Ireland.
The StoreNet VPP demonstration is located in the **Dingle peninsula in the southwest** of Ireland and controlled by the aggregator in **Cork, southeast** of Ireland.

- 20 homes currently host a 10kWhr/3.3kW peak Sonnen lithium-ion battery, smart meters with day/night tariffs.
- 7 of those homes also have installed rooftop 2.1kW Solar Photovoltaic (PV) panels



# Key exploitable results addressing energy system integration

- Recommend the technical specifications of the required integrated infrastructure

  VPP architecture – a cloud based platform, *FlexiGrid*, incorporates a Supervisory Control and Data Acquisition (SCADA) control system which communicates in real-time across a private IoT network to energy storage assets across the grid.

- Identifying the ICT mechanism for the stakeholders

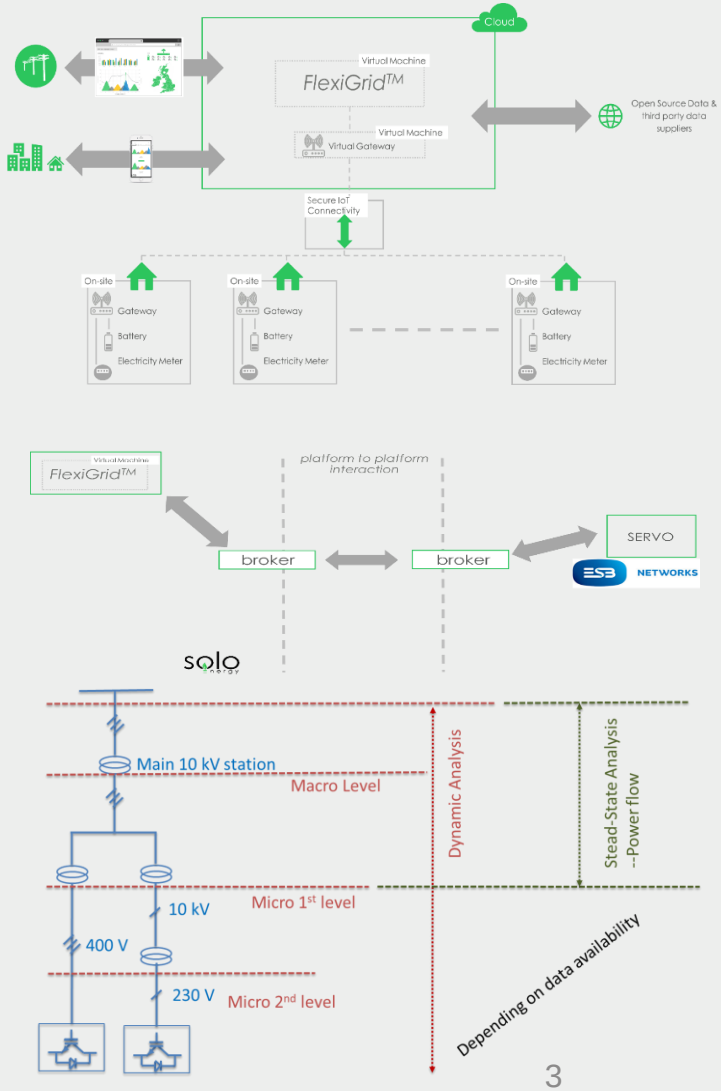
  Solo (FlexiGrid) and ESBN (SERVO) platform have been tested the interaction via an MQTT broker. Performance data exchange has successfully been performed by DSO and aggregator.

- LV Network is being analysed.

  (how the solution further provides grid services / stability improvement / high penetration of clean energy…)

- How the utility supplier gain benefits?

  10% to 15% Annual Utility Cost Saving !!!!

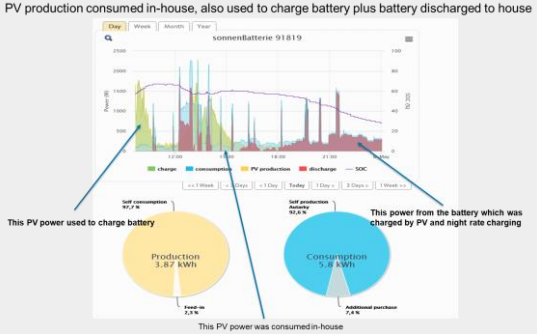


# Key exploitable results addressing energy system integration

- VPP optimisation

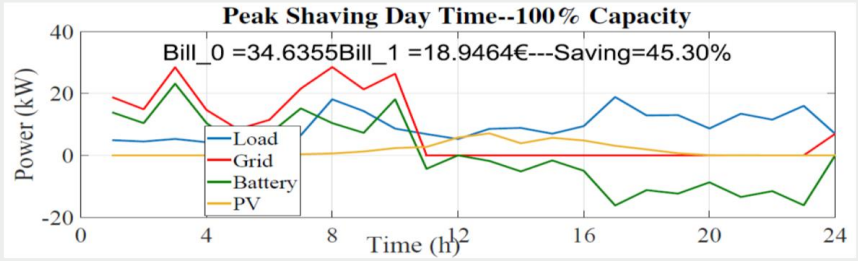
- Developing new control approach
  - Energy Arbitrage (EA)
  - Peak shaving during day time (PSDT)
  - Peak shaving (PS)
  - Load leveling (LL)

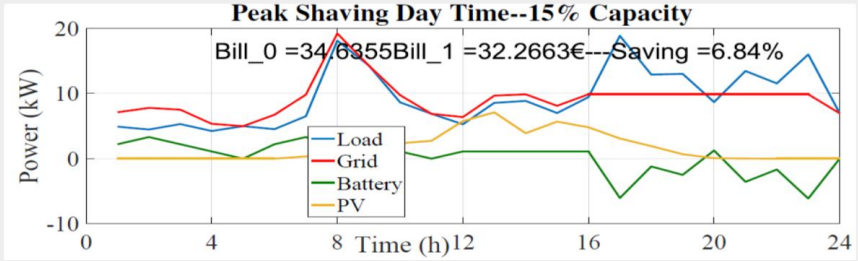
PV production consumed in-house, also used to charge battery plus battery discharged to house



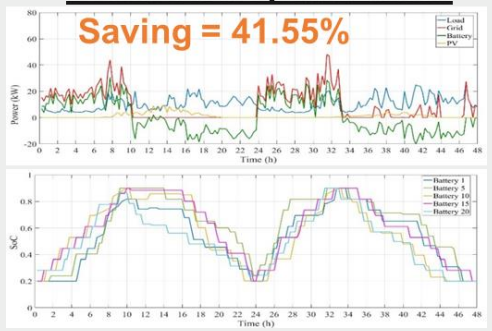

**Individual house optimization**


**Peak shaving during day time (PSDT)- -**
**20* 3.3kW Batteries - -100% capacity =20*10kWh - -15% capacity =20*1.5kWh**




**Combined optimization**



# Lessons learned and barriers to innovation deployment

- ✓ How to maximise the utilization of energy storage technology even when there is separate regulation for storage installation in LV network (has to follow under the microgeneration regulation)?
- ✓ Whole system integration
- ✓ How to motivate passive consumer to become energy active consumer?
- ✓ Doing research with high TRL and developing solution for multi-stakeholders benefit
- ✓ Developing innovative business case for the benefits/value proposition of all involved stakeholders (Aggregator, DSO, Utility supplier, Consumer)

# Lessons learned and barriers to innovation deployment

- ✓ No separate regulation for storage installation
- ✓ Funding mechanism
- ✓ Purchasing equipment
- ✓ Hardware and software standard and reliability
- ✓ ICT solution (internet connectivity)
- ✓ Consumer engagement (especially in remote/village areas)
- ✓ Introducing local ambassador (to motivate the community participants for the demonstration of the solution)
- ✓ Secure data sharing mechanism

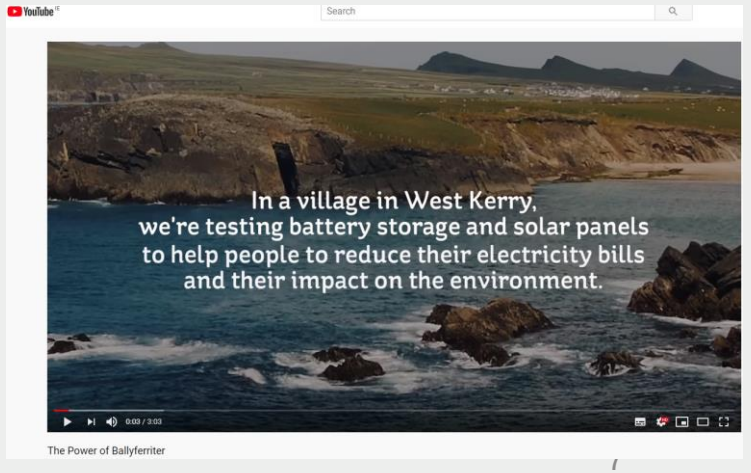
# Deployment prospects of the most promising solutions

- The project serves as a proof of concept for delivery of grid services from residential assets (energy storage). We see it as an important demonstration to facilitate the development of a marketplace for such services in Ireland.
- It presents a real-world demonstration and verification of the functionality of VPP software solution, FlexiGrid.
- It is highly energy efficient and intelligent solution
- Highly prospective
- Highly Replicable

TRL: 5 to 8

- The real impact of StoreNet: The Power of Ballyferriter

  https://youtu.be/bRAUngMPmos



# Needs for future R&I activities coming out of the project

- Consumers interest on DSM participation
- How to improve the grid services (not only in the DSO level, decarbonize the LV network but also for DS3 services)
- Impact on Power quality (minimizing harmonics) due to high penetration of small scales renewables, PE converters, non-linear smart loads.
- Participation in peer-to-peer energy trading, energy market, from local to national/regional market

# ETIP SNET Roadmap 2030

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StoreNet

| Research Area (RA) | Research Sub-Area (RSA) |
|---|---|
| 1. CONSUMER AND PROSUMER FOCUS | 1. Social campaigns and social studies to involve local authorities and their citizens |
| | 2. Adaptive consumer/user behaviour |
| | 3. Consumer/End-user visualisation and control |
| | 4. Societal acceptance of Energy transmission and distribution, storage (for visibility, perceived dangers, costs, etc.) |
| 2. SYSTEM ECONOMICS | 1. Business models |
| | 2. Wholesale and retail MARKET DESIGN (incl. Grid; Cross-border; incl. Ancillary service; incl. Stochastics) |
| | 3. Market governance |
| 3. DIGITAL APPLICATIONS | 1. Protocols (IEC, CIM, etc. Information models) |
| | 2. ICT (incl. Smart Meter; AMR, AMM, smart devices, etc) |
| | 3. Standardisation and interoperability |
| | 4. Data Management (Big Data; IoT) |
| | 5. Cybersecurity (contingencies; catastrophes, vulnerabilities; failures; risks) and privacy |
| | 6. Communication / Automation /Computer/ Control architecture (incl. platforms) |
| 4. PLANNING - HOLISTIC ARCHITECTURES | 1. Energy system Architectures/design / Long-term planning (incl. Tools) |
| | 2. Medium and short-term operational Planning (incl. Tools) |
| 5. FLEXIBILITY ENABLERS AND SYSTEM FLEXIBILITY | 1. Household- and industry-related device flexibility |
| | 2. Electricity Grid-connected device flexibility (thermal, wind; PV generators; inside grids (FACTS/FACDS); heat and power; storage; gas grids (PtG, GtP); water grids (PtW), VtG/EV; transport (railway, trams, trolleybus, etc.)) |
| | 3. Optimal aggregation of flexibilities incl. for congestion handling; for inertia substitution (RES; AD by DSO/TSO; PtX; XtP; CHP; PtG; PtL) |
| 6. SYSTEM OPERATION | 1. System and stability analyses & optimisation (Electricity) |
| | 2. Forecast, Monitoring/Observability, State Estimation (also for EV) (Electricity) |
| | 3. System Control (active, reactive power; voltage; frequency; preventive/curative (normal(/abnormal); restoration; short-circuit currents; islanding capabilites; by inverters) |
| | 4. Operation (incl. Training; EMS/Platforms; self-healing; Stability; coordination among control centers) |
| | 5. Topology (incl. Switching) optimisation and coordination |
| | 6. Fault-related optimisation and coordination |
| 7. ASSETS AND MATERIALS | 1. Higher capacity/ efficiency/ environment-friendly / environmentally non-stressed energy system devices |
| | 2. Lifecycles, lifespan and costs, ageing |
| | 3. Maintenance (failure detection; maintenance operation) |

Table 1: Functionalities for the integrated Energy System 2030

| |
|---|
| F1 Cooperation between system operators |
| F2 Cross-sector integration |
| F3 Integrating the subsidiarity principle - The customer at the center, at the heart of the integrated energy system |
| F4 Pan-European wholesale markets |
| F5 Integrating local markets enabling citizen involvement |
| F6 Integrating digitalisation services (including data privacy, cybersecurity) |
| F7 Upgraded electricity networks, integrated components and systems |
| F8 Energy System Business (incl. models, regulatory) |
| F9 Simulation tools for electricity and energy systems (SW) |
| F10 Integrating flexibility in generation, demand, conversion and storage technologies |
| F11 Integrating efficient heating and cooling for buildings and industries |
| F12 Integrating efficient carbon-neutral liquid fuels & electricity for transport |

# For more information

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