Interreg
Mediterranean

EUROPEAN UNION

StoRES

ETIP SNET South Eastern Europe Regional Workshop

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Zagreb Croatia

ETIP SNET

The objectives of the StoRES project

- Developing an optimal policy for the effective integration of photovoltaics (PV) and energy storage systems (ESS) via testing smart solutions in 5 MED islands and rural areas.
- Increase the PV penetration in the energy mix of islands and rural areas by integrating PV and ESS under an optimal market policy by removing the constraint of RES intermittency.
- The challenge is to achieve high PV penetration in their energy mix by contributing to the solution of market/ tariff issues without compromising technical and grid issues.
- It involves regions facing specific needs and challenges: islands with isolated networks, almost 100% fossil-fuel dependency and increasing energy demand; rural areas exhibiting weaker networks and higher environmental impact.

Two important complementary objectives of the project

- Evaluate the optimal size of storage system behind the meter that will maximise the economic benefit of the prosumer by capitalising the possibilities of a net billing dynamic time of use tariff.
- Evaluate the optimal size of the socialised storage that will complement the storage behind the meter and offer the local distribution capabilities for 100 % energy generation through local RES penetration by preserving the specified quality of supply (voltage profile, harmonics, thermal loading of equipment etc)

Residential Storage System

Strategy priority: "Accelerating Clean Energy Innovation"

Project objectives: fundamental changes in the energy mix in line with EU policy

- Transition to a low-carbon and climate-resilient economy: more decentralised, open system with the involvement of all society.
- Currently dominance of large companies, incumbents and large-scale, centralised technological projects.
- Future: the consumer to be at the centre of the energy system
  - ✓ Participating as producer and manager of decentralised energy networks;
  - ✓ acting as an investor, through decentralised platforms;
  - ✓ driving change through user innovation.

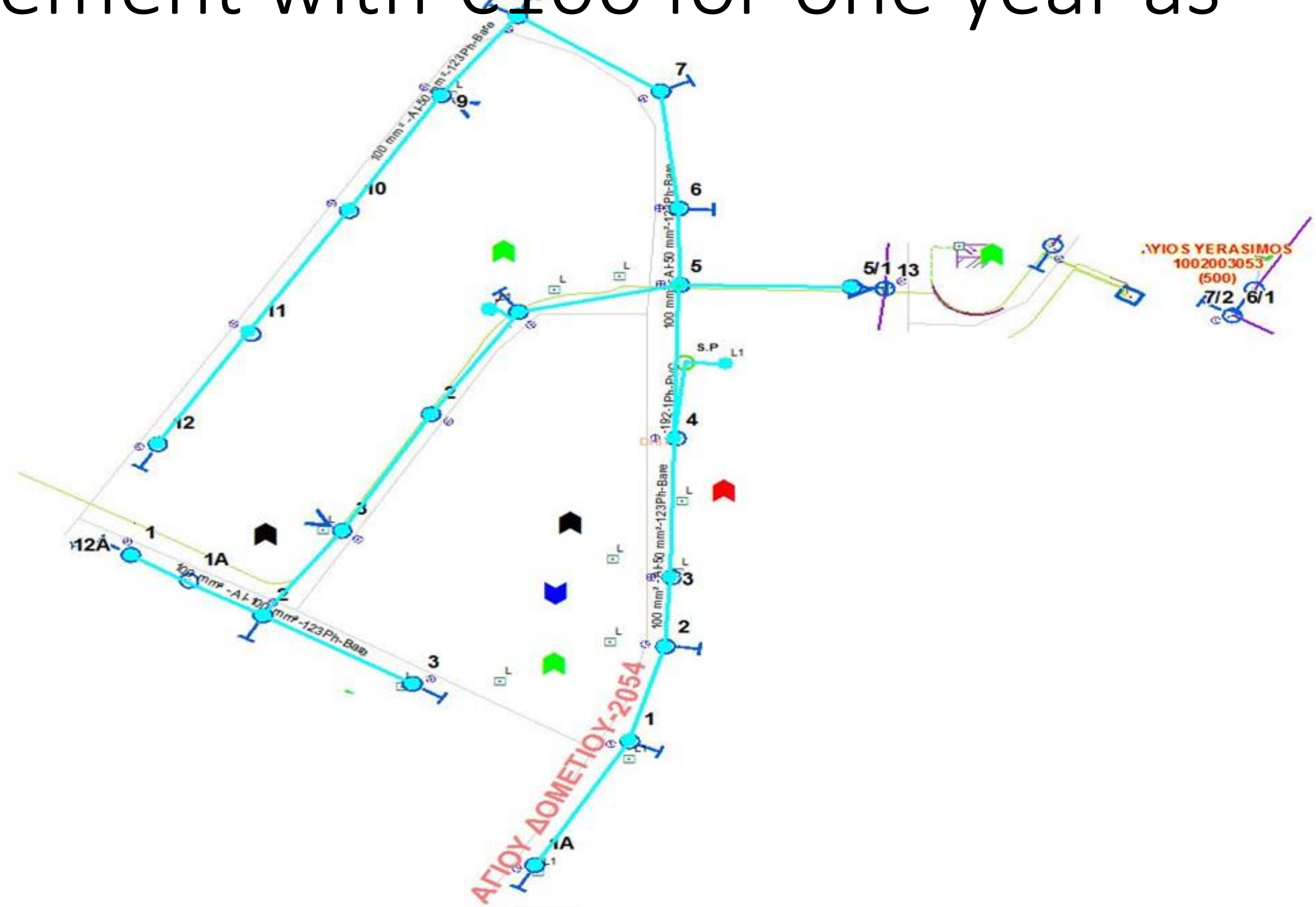
Careful selection of participants through expression of interest and selection of a specific pilot site all connected to the same substation and low voltage feeder
Formal agreement with €100 for one year as reward

Cyprus

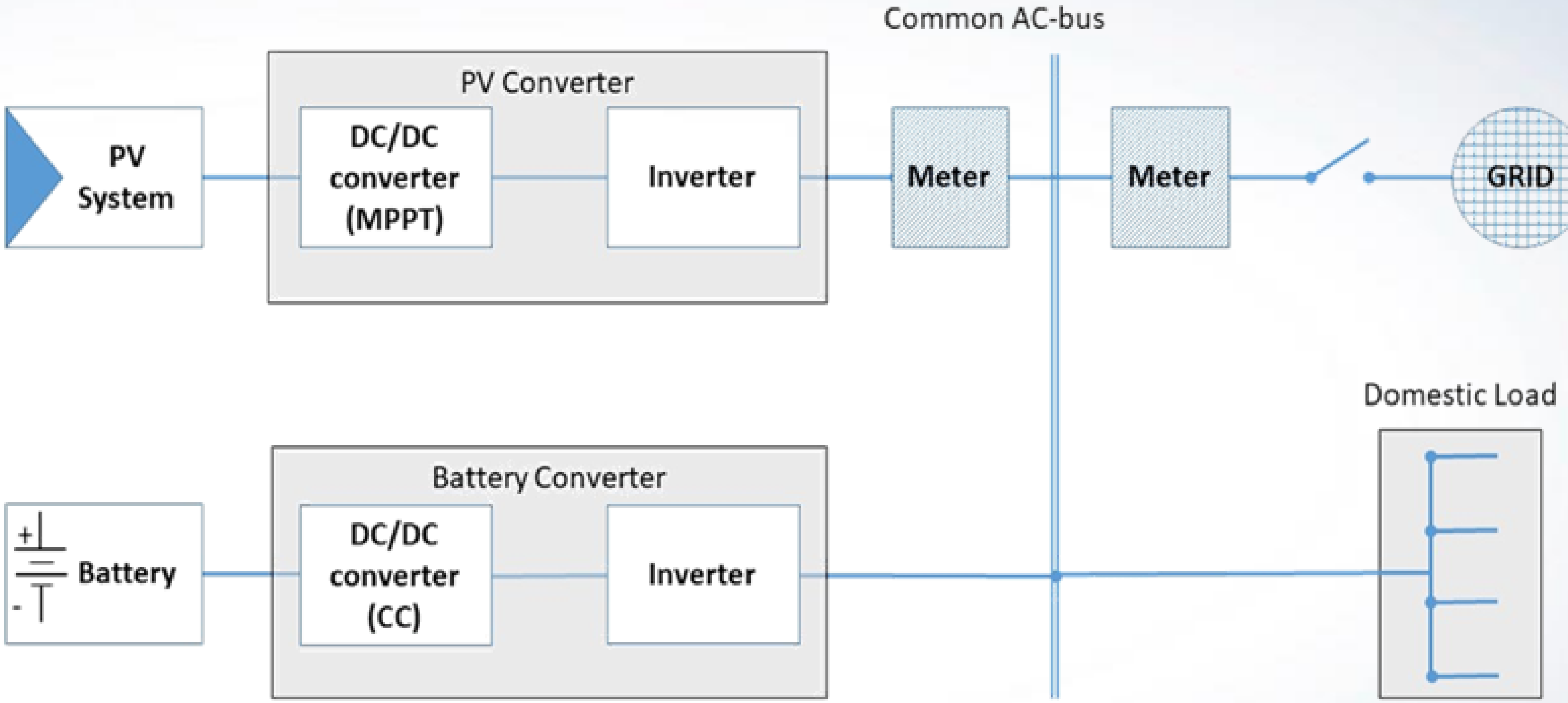
Ayios

Yerasimos

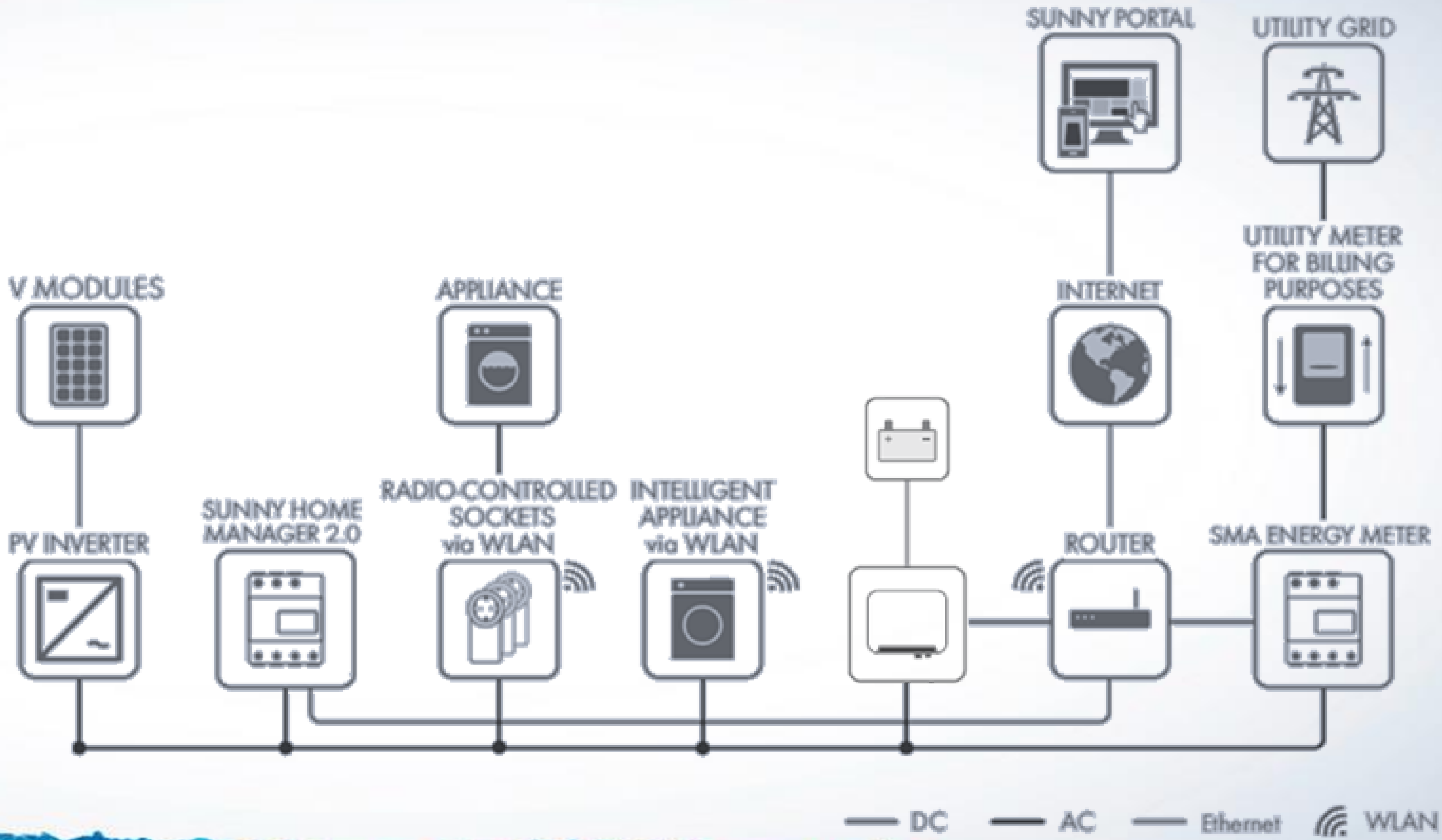
substation



AC-Coupling - Additional Meters



Actual System – Topology Option 2

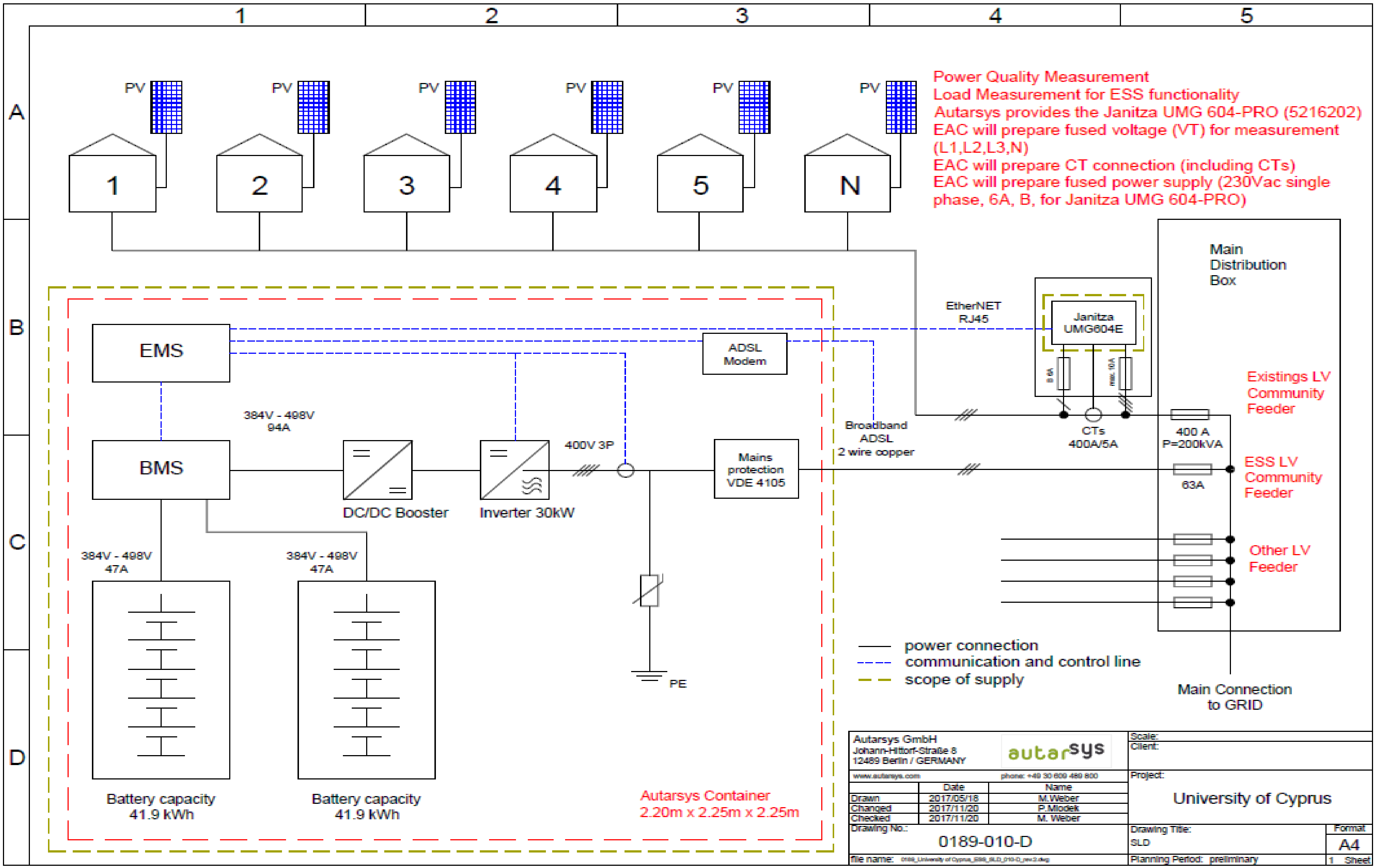


Energy management with smaller size of storage and more social storage

Social Storage has been installed and is being operated by the local DSO

- A storage system was installed at a distribution substation of the local DSO as the social storage of the StoRES project.
- Intentionally the social storage was erected on the same low voltage feeder as the fed prosumers to evaluate complementarities between the two systems and gather evidence for the innovative objectives described above.
- A Substation Manager / controller responds to pre-programmed operational objectives utilising all the available resources on the specific feeder for evaluating useful responses that will assist the DSO in drafting policy recommendations for:
  - Sizing of social storage in managing distribution grid resources
  - Smart substation needs for delivering the required intelligence for optimal use of resources

Connection to the Substation – Electrical Diagram



Barriers to storage deployment

- Storage is not covered in Grid Rules and Market Rules in Cyprus and hence no clear policy on who invests and under what terms.
- The prevailing tariffs do not support investments in storage for domestic prosumers even though the grid needs it.
- Charging / discharging cycle is costly and domestic tariffs do not cover this cost hence, no incentive to invest in storage.
- No clear policy on ancillary services that can be provided by storage on the grid and hence DSOs and TSOs are not incentivised to take appropriate investment decisions in support of the system.
- The Regulator refused to give any incentive to the project for encouraging the prosumers to participate and actively contribute.

Project results

- Size of Systems used:
  - ✓ 3 kWp PV
  - ✓ 9.3 / 2.5 kWh / kW Storage system
  - ✓ 50 / 30 kWh / kW of social storage system
- Self consumption of participating prosumers prior to installation of storage was recorded to be: 33%
- Self consumption of participating prosumers after installation of storage is increased to: 76%
- Tariff systems evaluated: Net metering and net billing
- Annual cost of use of systems for prosumers that produce equally the energy they consume:
  - Net metering: €186 per annum
  - Net billing with time of use tariff: €125 per annum
  - Flat tariff for consumers without PV / storage: €1,098 with current tariff in Cyprus

Discussion of Project results

- As tariffs stand installation of PV systems for covering energy needs through the net metering tariff is the most economical leading to a pay back period of less than 6 years
- Introducing net billing with the current structure gives an annual additional saving of only €61 which does not pay back the investment of a storage system
- The savings achieved per kWh are currently €6.4 cent calling for storage cost below €400 per kWh to be recoverable.
- A system of 9.3 kWh of storage is increasing self consumption of a 3 kWp PV system to 76% which is a very good figure to manage systems behind the meters and avoid night peaks that are causing high cost to the grid.

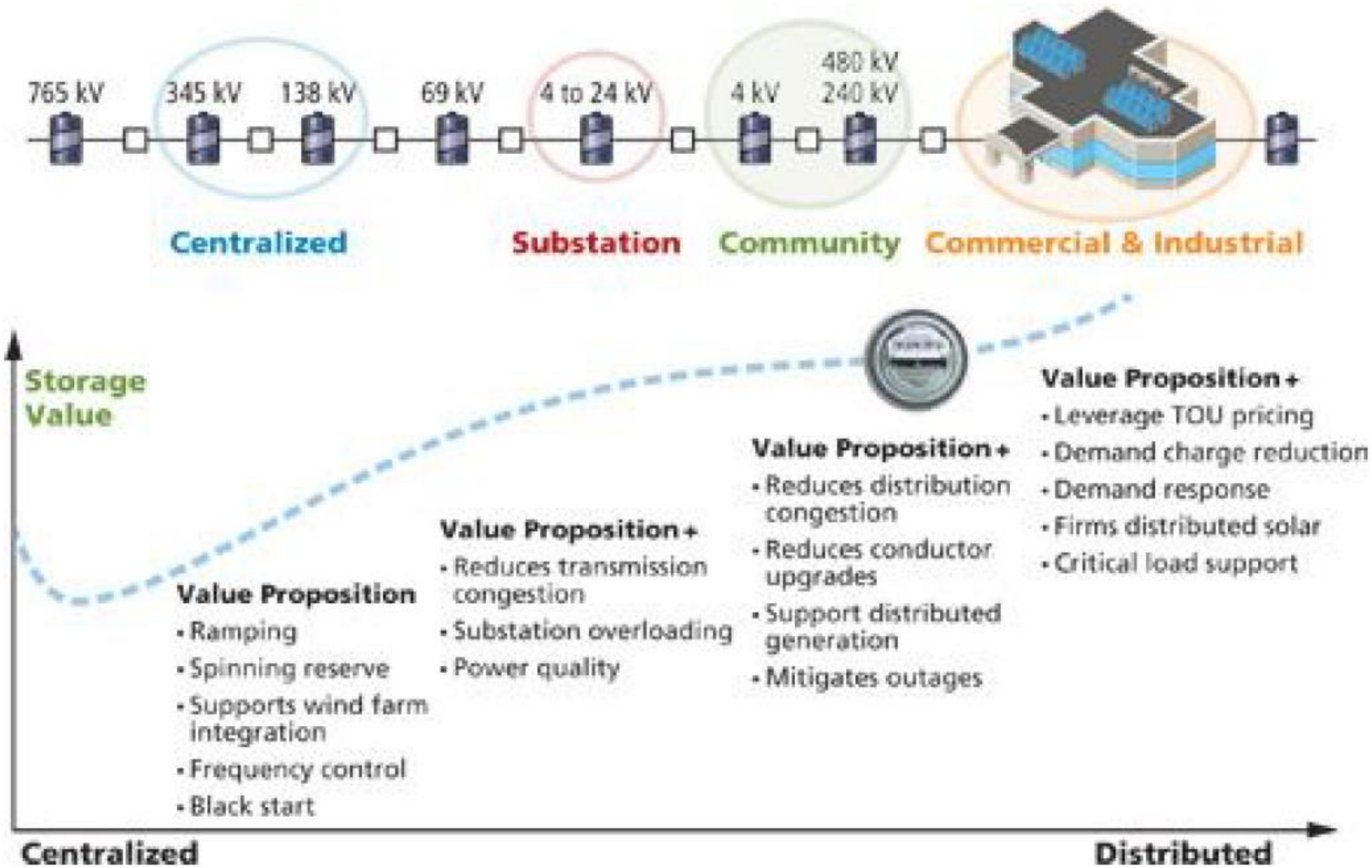
Discussion of Project results

- Optimal size of storage behind the meter to satisfy the peak demand after sunset is 2.2 kWh per kWp of installed PV capacity.
- This will reduce marginally the self consumption to 73%
- The social storage system is capable of handling all additional needs of prosumers for their daily load in managing grid congestion.
- It is evident that **future policies should identify the right combined tariff system** that is cost reflective taking into consideration all system benefits: line congestion, quality of supply in harmonic content, voltage profile (future will include frequency support, etc, reduced system losses, peak shaving, etc

Distributed Energy Storage is vital

Community value proposition:

- Reduces distribution congestion
- Reduces conductor upgrades
- Supports Distributed generation
- Mitigates outages
- Supports quality of supply and voltage profile



Lessons learned: Where is storage best sited

- Energy storage can solve many problems all along the energy supply chain: T&D deferral, demand response, power quality & reliability, frequency control, and mitigation of solar and wind energy intermittency. Because of this, the desired end goal influences where an energy storage technology is best placed.
- Energy storage's value increases as approaches the edge of the grid and the customer's load, with economic benefits accruing to both the utility and the end user.

Lessons learned: Innovation in policy and aggregated services

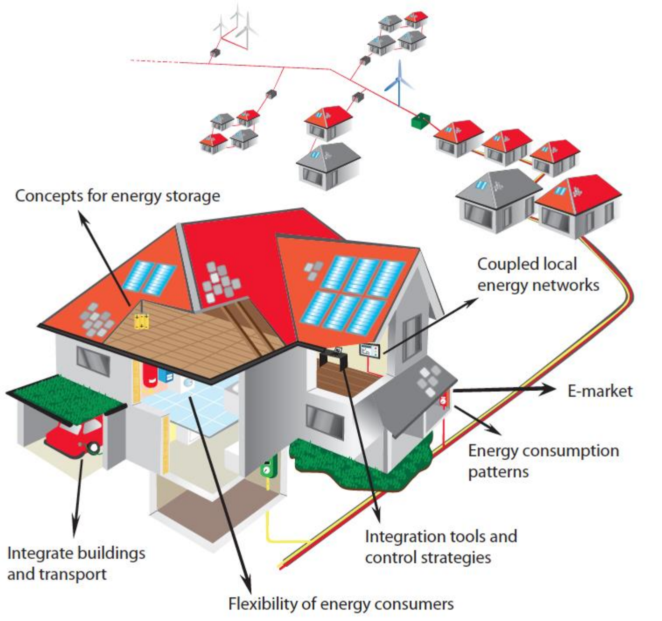
- Optimal balance between socialised storage and private behind the meter.
- Storage behind the meter is not rewarded with current tariff systems and requires a cost reflective assessment of the services it offers through aggregated solutions for system use.
- Quality of supply needs storage behind the meter and with carefully selected tariff systems complemented with aggregated services optimality is achieved with socialised storage.
- Self consumption with the benefits that it offers can easily rise beyond 70% which is evaluated as optimal in the energy mix.
- Lowering the cost of storage systems is key and hence solutions that lower cost such as DC connectivity with one inverter etc is a must.

Needs for the future: The Winter Package and the StoRES project

- From the above it is clear that the new enabling policies are not yet approved even though the identified solutions are technology ready to adapt to these near future requirements.

- The consortium has delivered on this innovative approach

- Policy adaption (grid rules, market rules, regulation etc) is needed that can move the low carbon objectives closer to reality and the end user at the centre of all grid activity as visioned by the EU.



The consortium of the StoRES project

Interreg
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OBČINA
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raee
RhônAlpEnergie Environnement

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Thank you!

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