la smart grid: l'evoluzione delle piattaforme ia a sostegno delle energie da fonte rinnovabile

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Elemize Technologies s.r.l.

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ELEMIZE TECHNOLOGIES®

Elemize® Technologies

WE UNLOCK CLEAN ENERGY INNER POTENTIAL THROUGH ADVANCED CONTROL AND AUTOMATION

Elemize Technologies Srl
Founded: Dec 2016
Seed founding: June 2017

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history

PATH

Elemize Technologies® was founded in december, 2016 in Rome, Italy. In January it was recognized as «innovative startup» under the Italian law.

In April, 2017, Elemize Technologies® successfully completed its seed stage investment round.
In July 2018, Elemize® successfully completed 4 pilot tests with some of the most important utilities in Europe.

Elemize® is currently looking for opportunities in Australia to speed up the commercial growth and strengthen its leadership in the control of distributed energies worldwide.

AWARDS

In few months since its constitution, Elemize Technologies® was awarded in several startup competitions in Italy:

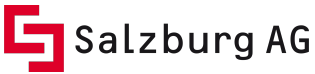
- Call for Disruption in Energy: winners
- Erg Re-Generation Challenge: third place
- Next Energy Program: finalists
- Wind Green Award: finalists
- Klimahouse Startup Award: finalists
- Salzburg AG innovation challenge
- Edison Pulse: winners

Moreover, Elemize® signed partnerships or received interest from some of the most important utilities in Europe.

la Repubblica.it · LA STAMPA · affaritaliani.it · WIRED · EconomyUp · QUALENERGIA · BUILD ENERGIA · green.it

2 years partnering with **industry leaders**

- **9 brands** of ESS controlled
- **3 VPPs** managed
- **4 pilot** tests completed



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the 21st **century utility**

RETAILING ELECTRICITY IS ENDING

Electricity retail market segment is neither growing nor profitable anymore. Energy retailers need to find new ways to grow.

AND CUSTOMER NEEDS ARE CHANGING

Electricity customers want higher transparency, more independence and lower costs. They also pay more and more attention to being green.

CHANGES IN BUSINESS MODELS

Energy communities, virtual aggregation and microgrids better address new customer needs and are increasingly profitable everywhere

AFFECT TECHNOLOGIES AND OPERATIONS

Addressing those business models requires not only a change in the legal/economic framework, but also in necessary technologies and operations

from providing **to managing**

Controlling DER's effectively can improve the competitiveness of the retail offer, unlock new business models and revenue streams.

76% of utility CEO's said that DER's integration and management is critical to their organization's future success"*

**Siemens,survey, 2017*

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unlock true **ess potential**

Elemize allows to exploit all possible revenue streams from any kind of Energy Storage Systems (ESS), regardless of the regulatory context.

DR PROGRAMS

Participate to demand response programs with any inverter

PROSUMERS

Apply peak shaving, load shifting or profit optimization strategies

VPPs

Optimize energy trading strategies for virtual power plants (VPP)

TRADING

Profit from offering balancing and other ancillary services

required **expertise**

ENERGY IOT

Elemize exploits IoT technologies to integrate and control distributed energy resources. We integrate energy data in a single platform and provide a centralized control interface for distributed inverters of different brands.

ENERGY ALGORITHMS

Elemize has strong data modeling competencies for the analysis and optimization of complex energy systems. From optimizing microgrids with Energy Storage Systems to automating analytics, Elemize has the numbers you need.

OPEN PLATFORM

Even though Elemize supplies and provides its own services, it also provides easy to use APIs to develop and connect any external SW or user interface. Leverage your data and customize your applications by using our infrastructure.

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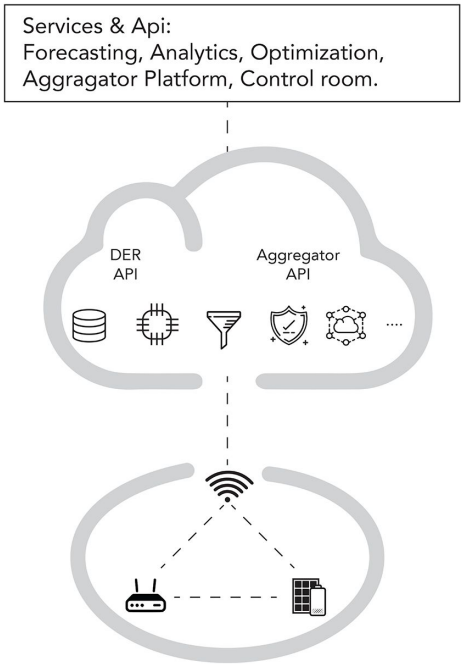
« It is a capital mistake to theorize before one has data. Insensibly, one begins to twist the facts to suit theories, instead of theories to suit facts. »

–**Sherlock Holmes**.

how to get the data - **simple view**



Business
Value

Open
Platform

DERs

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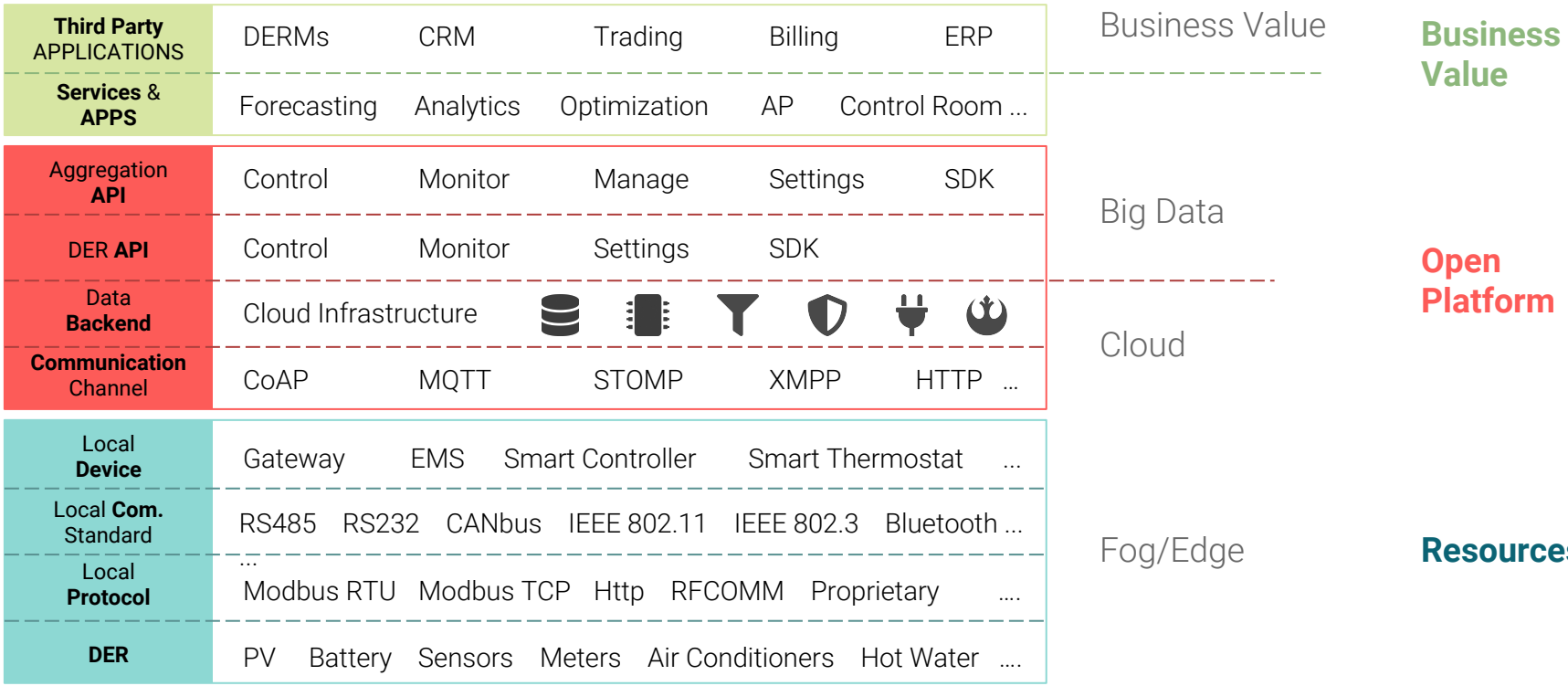
how to get the data - **complex view**



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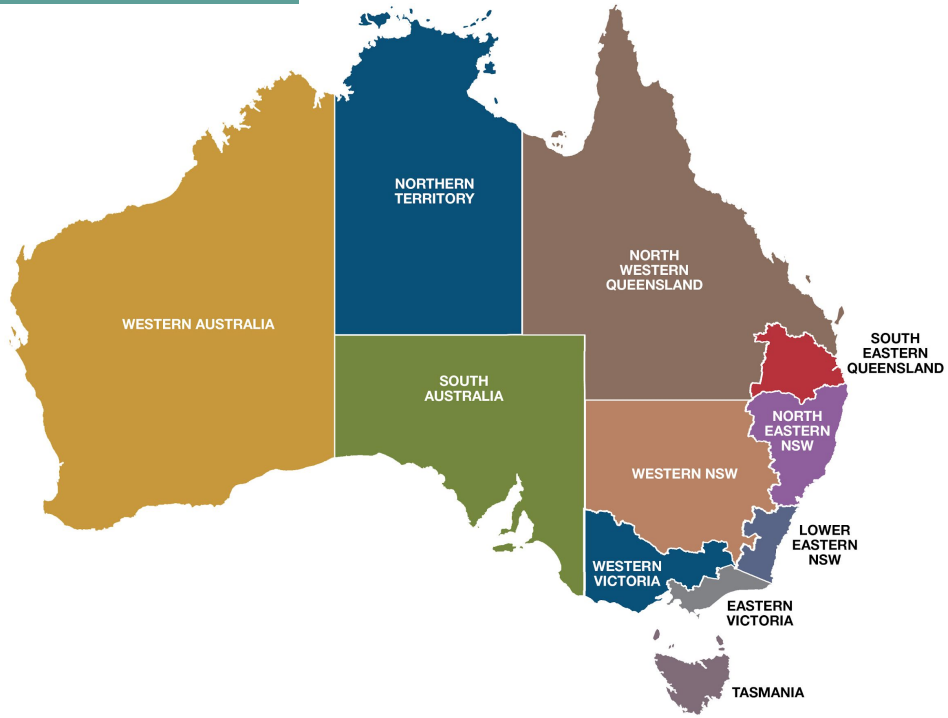
cloud infrastructure and **tools**

TODO domani

Aggregation (*still*) means
experiments

case study: **aggregation in australia**



Why?

- Very high volatility in energy prices
- Huge investments have been done in the last years in renewables (PV and energy storage) at residential level
- One of the most complicated energy grids worldwide.

This means, lot of opportunities!

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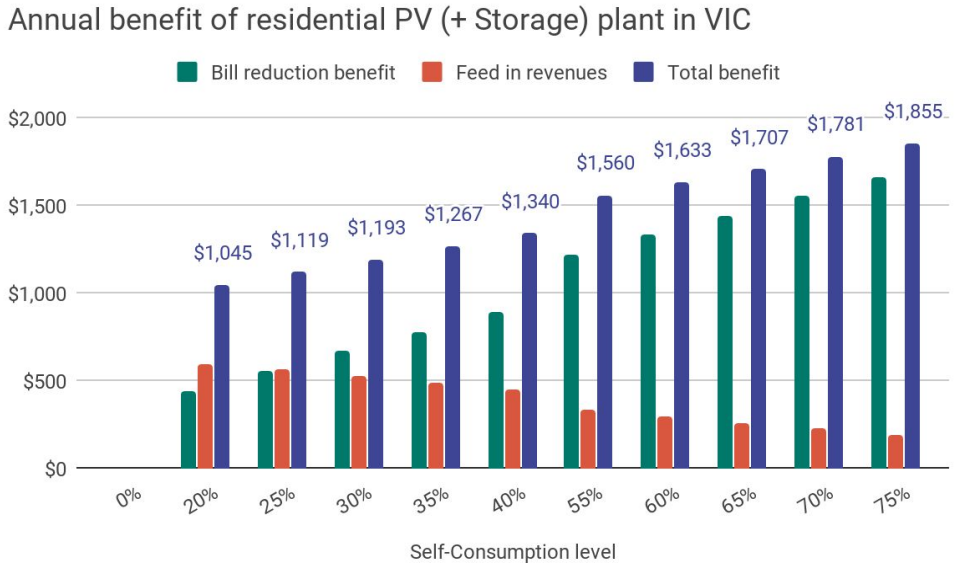
people know that consuming self-produced energy is **increasingly convenient**...



Assumptions:

- 5kW PV plant
- 1.500 kWh/kW/Year
- 10kWh Battery capacity
- 8000kWh yearly consumption
- Energy cost: $0.3/kWh
- Feed-in tariff: $0.07/kWh

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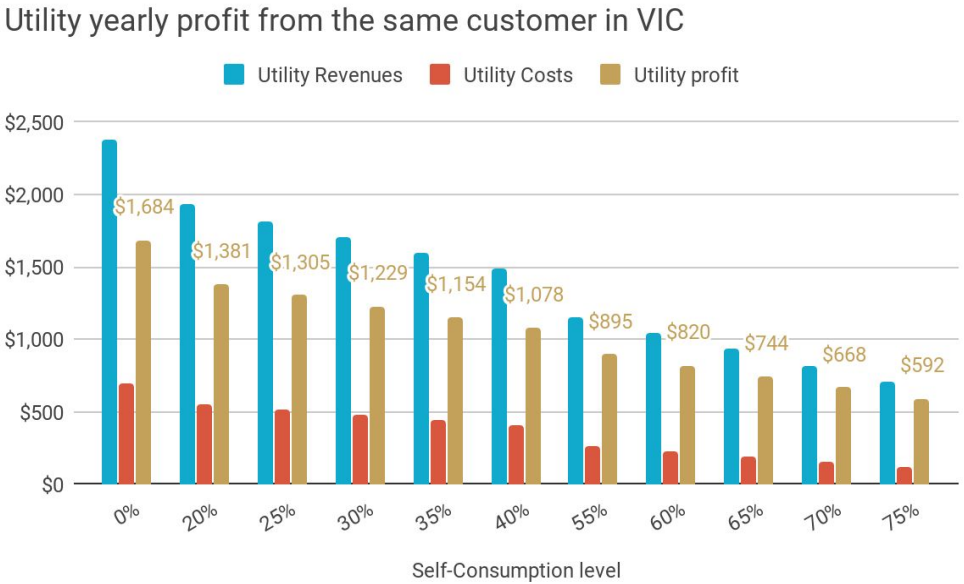
...while for energy retailers
this represents a huge threat...



Assumptions:

- 5kW PV plant
- 1.500 kWh/kW/Year
- 10kWh Battery capacity
- 8000kWh yearly consumption
- Utility OPEX = wholesale prices
- Energy revenues: $0.3/kWh

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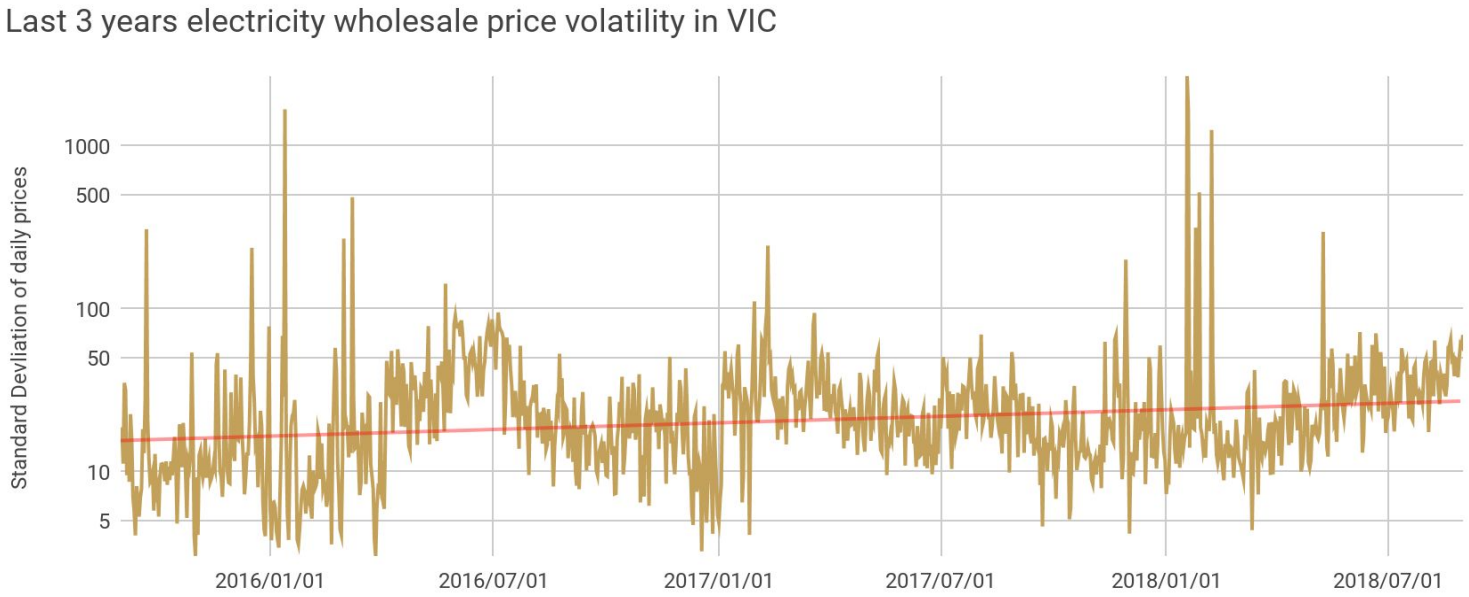
the potential of **wholesale** electricity market **arbitrage** has almost **doubled** in the last 3 years...



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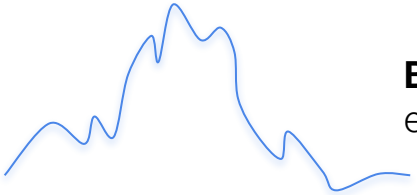
how to **approach it**

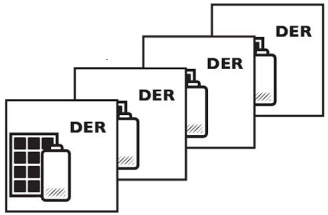
Single household

Aggregate



Baseline generation and energy reserve

DER selection for the service



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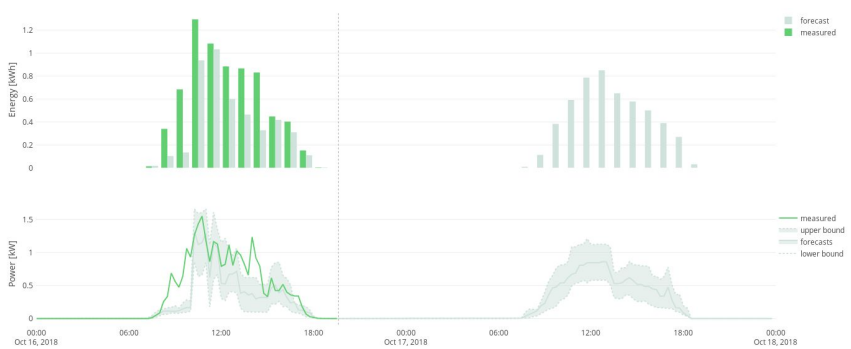
single **household**

Production forecasting



Consumption forecasting

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single **household**

DE-OPTIMIZATION COSTS:

- When applying an external command (e.g., from a retailer) the self-strategy gets interrupted
- Stored energy might be used by a retailer for trading but the user must be remunerated
- If we need 1kW for 1 hour, each household will have a different “cost” of supplying it. It is important to consider:
    - storage data (SoC and SoH)
    - forecasts

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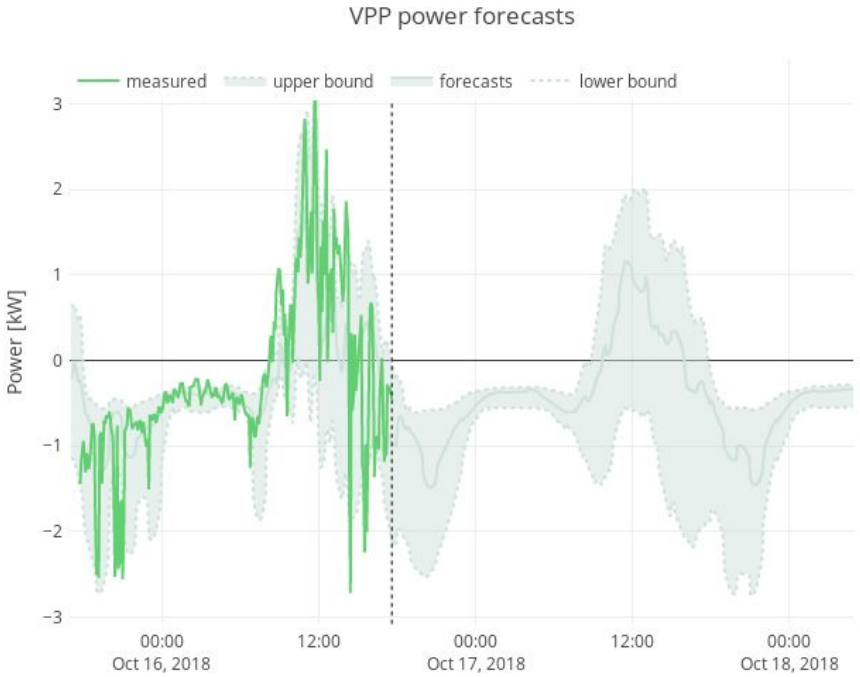
aggregate



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baseline generation and **energy reserve**

THE FIRST OPPORTUNITY IS CLEAR:

- A baseline for the aggregate can be generated and provided to the Distribution Network Service Provider (DNSP) or to the Transmission System Operator (TSO).

- The energy reserve can be used to provide trading services.
  - Retailers/Traders/Aggregators can benefit from arbitrage.
  - Customers can benefit from better tariffs from the retailer.

QUESTIONS:

- What about the distribution and transmission operators?

- Once a service has been required by an Aggregator, how are the DERs selected by the Aggregation Platform?

der **selection**

SoC

Forecasts

SoH

DER limitations

DER behavior and characteristics

User will

LV network

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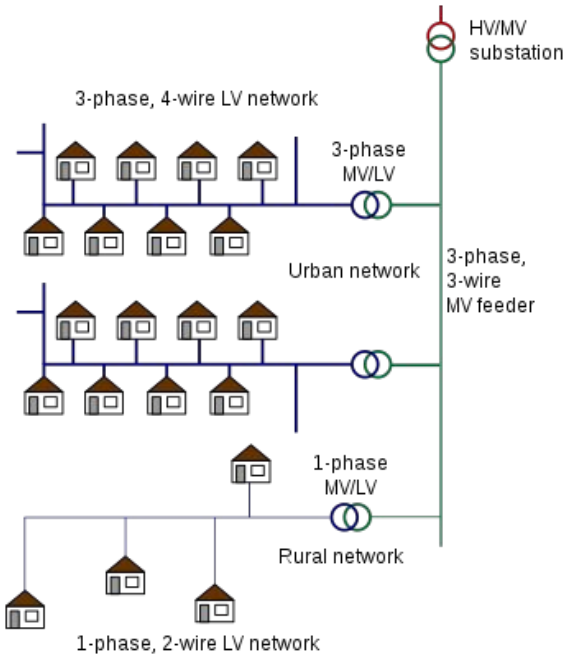
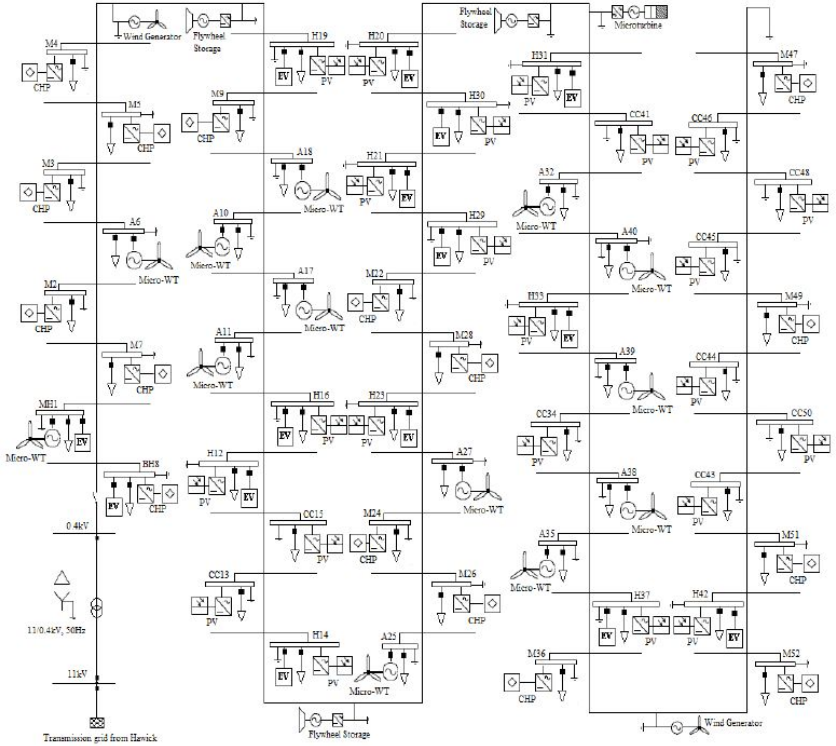
LV network



picture source: Diversity modelling for electrical power system simulation - Scientific Figure on ResearchGate.



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LV network **hosting capacity**

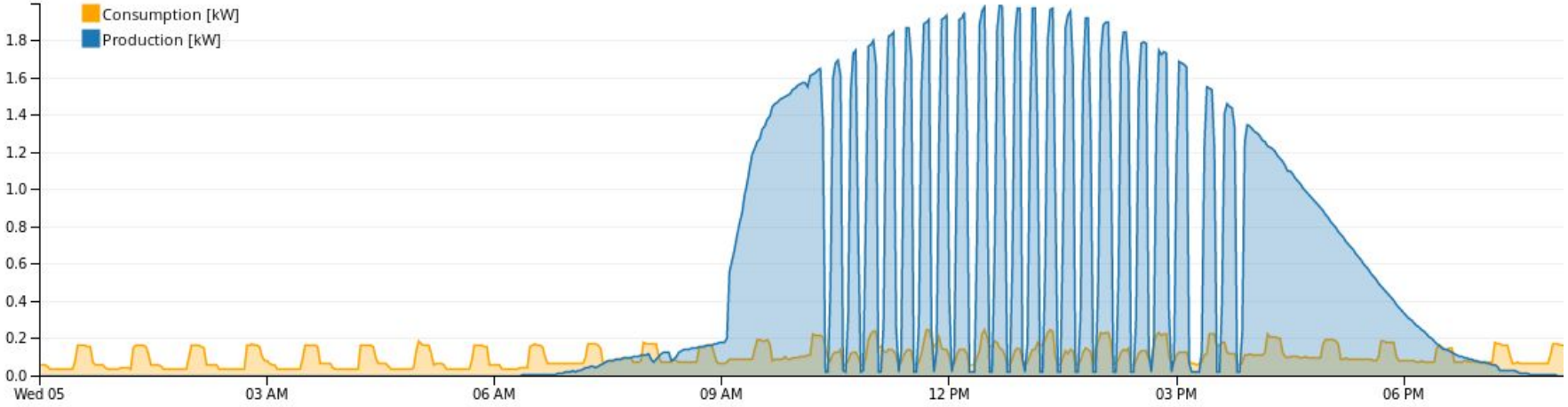
Voltage constraints:

- Network was designed to distribute energy in one direction.
- voltage drops progressively from the substation to the customer.
- Solar and battery inverters must raise local voltage in order to feed energy ‘upstream’ back into the grid.
- System swings from high voltage at times of high generation and low demand to low voltage at times of low generation and high load.
- Customers equipment can be damaged and inverters will trip off.

Thermal constraints:

- The transformers and wires that make up the network are limited in the amount of current they can carry before they overheat.
- Fuses and other devices that operate when the limits are exceeded can disconnect groups of customers.
- As PV penetration grows in a local area, reverse current in the middle of the day (‘peak generation’) can overload in the reverse direction (not designed for it).

LV network **over-voltage**



A practical example from Montalto di Castro (VT), Italy.

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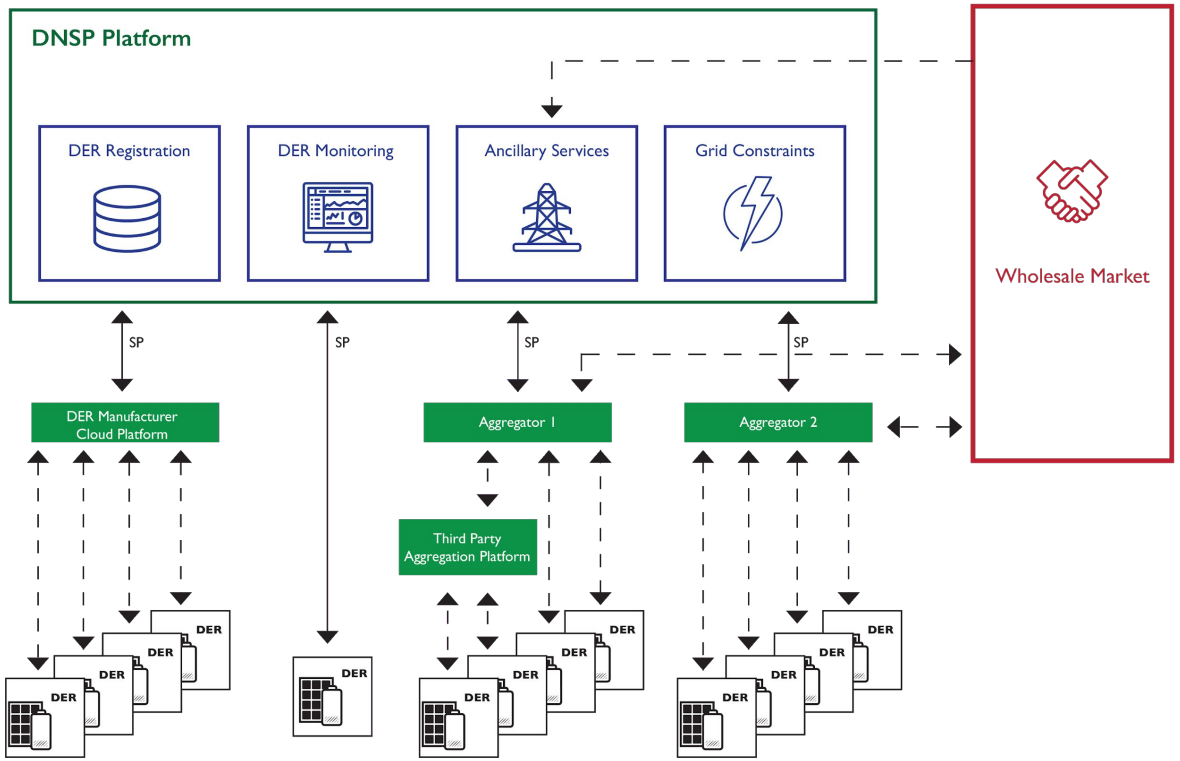
dnsp platform - **new architecture**



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dnsp platform **- new opportunities for ai**

Lot of LV network data will be provided to DNSP from each DER:

- Forecasts and data analysis are needed to coordinate ancillary services.
- Predictive maintenance could thrive.
- Location (grid-wise) of the data will become increasingly important and will drastically enhance complexity of both ancillary services, trading logics and dnsp strategies and constraints.

From an Aggregator (and aggregation platform) point of view:

- Ancillary services will become increasingly profitable.
- DER selection logics will become even more complex.
  - based on local grid parameters, some DERs might be preferable.
  - based on DNSP grid constraints, some DERs might be limited in their operations.
- Smart inverter providing voltage and frequency regulation controls (e.g., volt-var response) can increase the number of operations that can be scheduled, configured and remunerated and that must be weighted and compared with alternative behaviors.