Beyond PV Grid Parity

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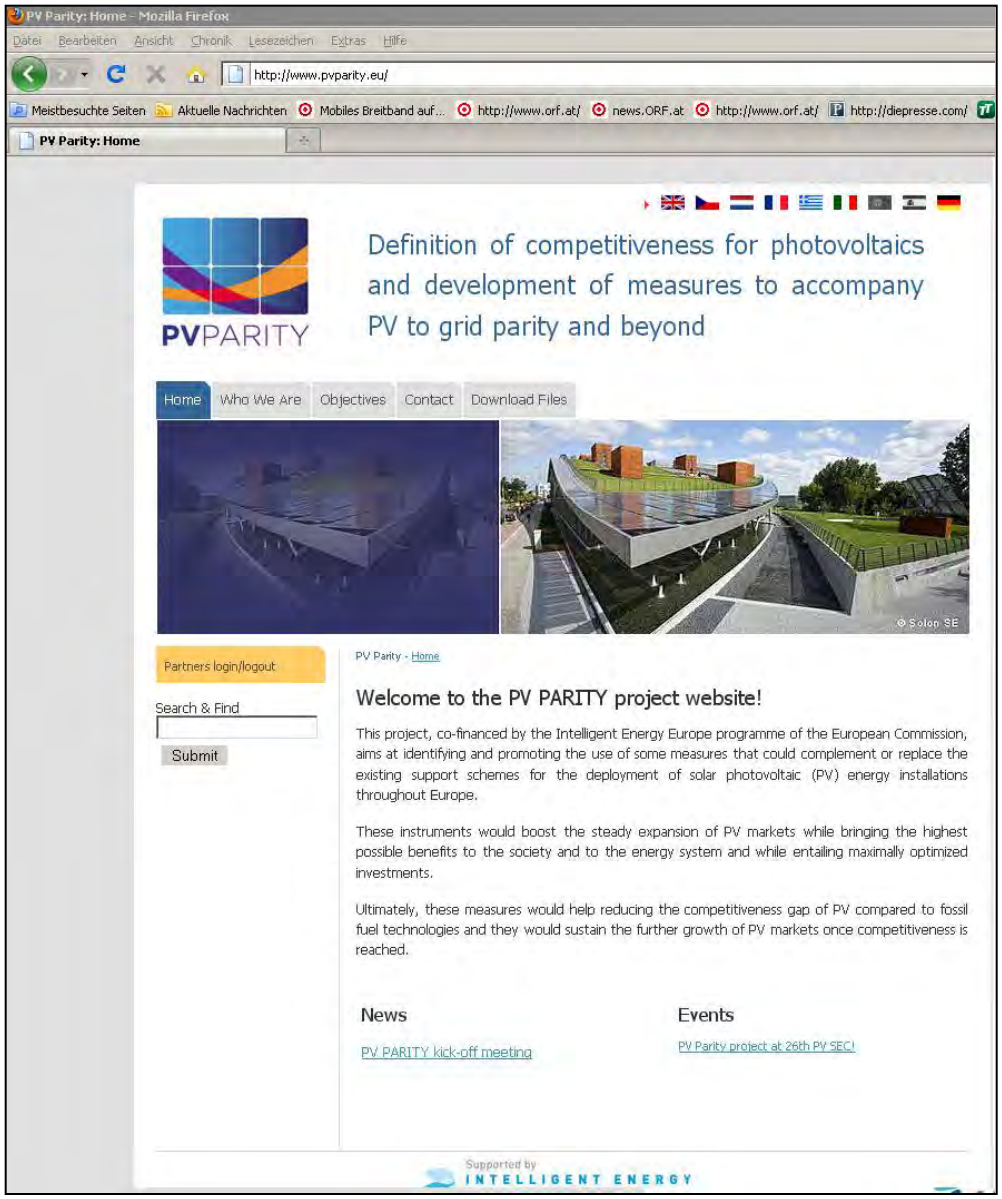
PV Parity: Home - Mozilla Firefox
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PV Parity: Home
PVPARITY
Definition of competitiveness for photovoltaics and development of measures to accompany PV to grid parity and beyond
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Welcome to the PV PARITY project website!
This project, co-financed by the Intelligent Energy Europe programme of the European Commission, aims at identifying and promoting the use of some measures that could complement or replace the existing support schemes for the deployment of solar photovoltaic (PV) energy installations throughout Europe.
These instruments would boost the steady expansion of PV markets while bringing the highest possible benefits to the society and to the energy system and while entailing maximally optimized investments.
Ultimately, these measures would help reducing the competitiveness gap of PV compared to fossil fuel technologies and they would sustain the further growth of PV markets once competitiveness is reached.
News
PV PARITY kick-off meeting
Events
PV Parity project at 26th PV SEC!
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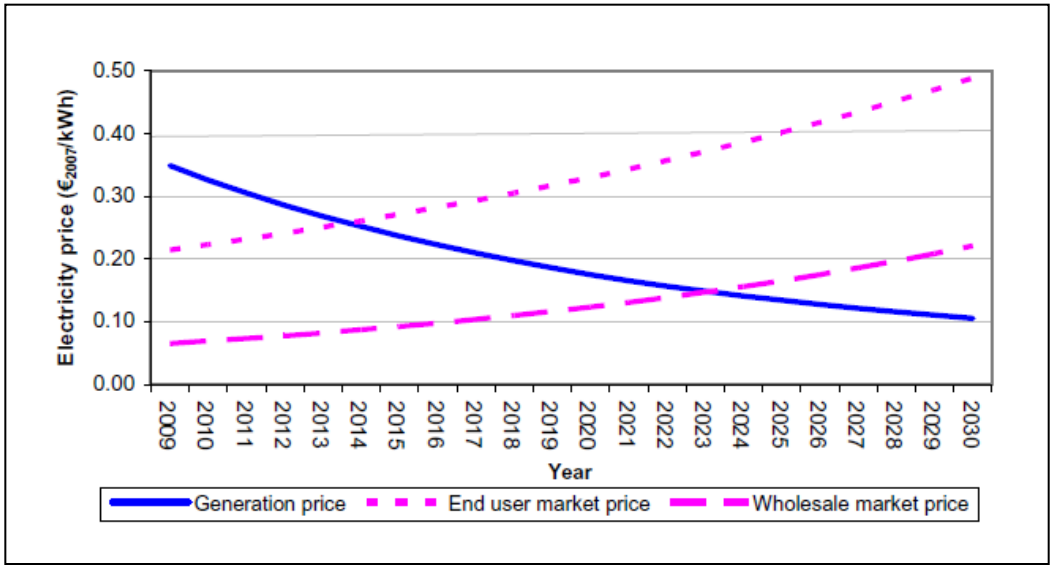
Main Types of PV Installations / Operation Modes (Technical Interpretation)

- PV generation can partially (or totally) compensate electricity consumption. Drivers for competitiveness are savings of the electricity bill and the earnings that PV generation generates.
- Installations where PV electricity compensates few or no electricity consumption at all. In this case, PV must compete with wholesale electricity prices.

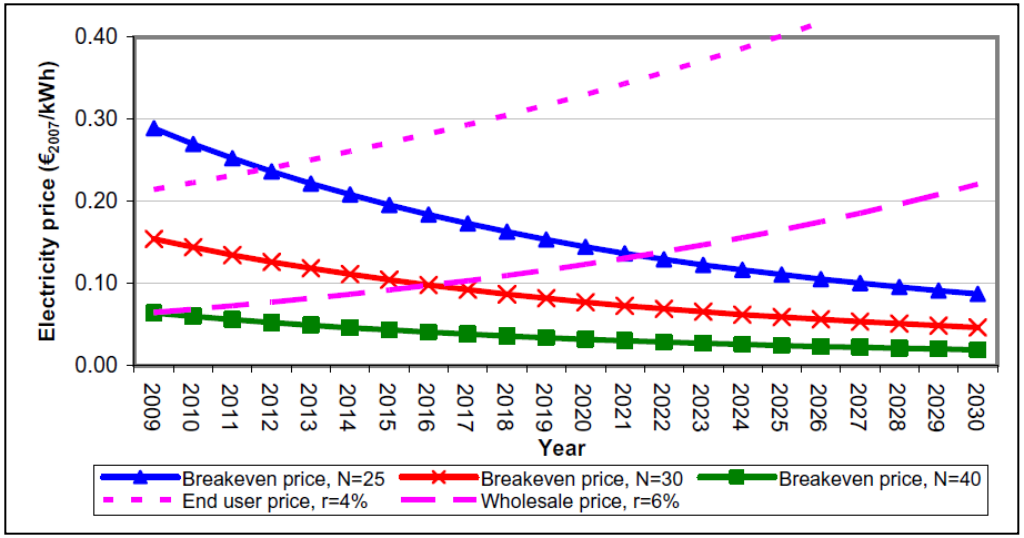


Source: Bahandri et al (2009)

„Static“ versus „Dynamic“ Definition of PV Grid Parity (Economical Interpretation)

Static: Comparison of LCOE of PV with retail/wholesale electricity price at a defined point in time in the future.

Dynamic: Comparisions done over the lifetime of a PV project: the Net Present Value (NPV)* of LCOE of PV, savings of the electricity bill and earnings that PV generation are discounted and compared.



Source: Bahandri et al (2009)

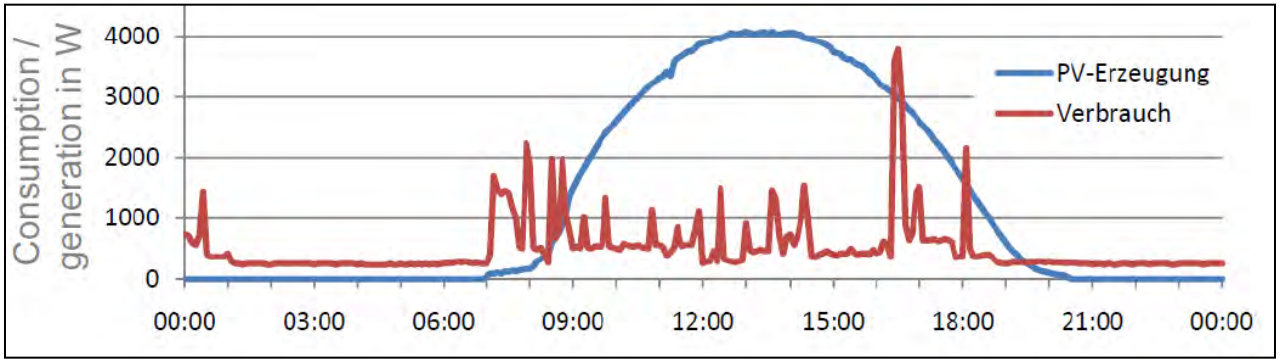
*Net Present Value (NPV): Current value of future cash flows discounted with a discount rate equivalent to the cost of financing the project (WACC)

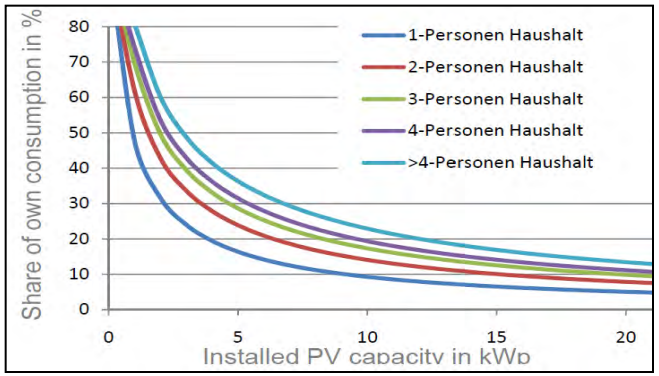
Vision/Challenge
From PV Grid Parity -> Advanced PV Grid Parity -> PV Equivalence (or: from annual based „net metering“ to 100% load following)

1. PV Grid Parity (Status Quo):

LCOE (Levelised Cost of Electricity Generation) of PV equal retail electricity price (excl./incl. taxes). The electricity grid is used as an infinite storage.

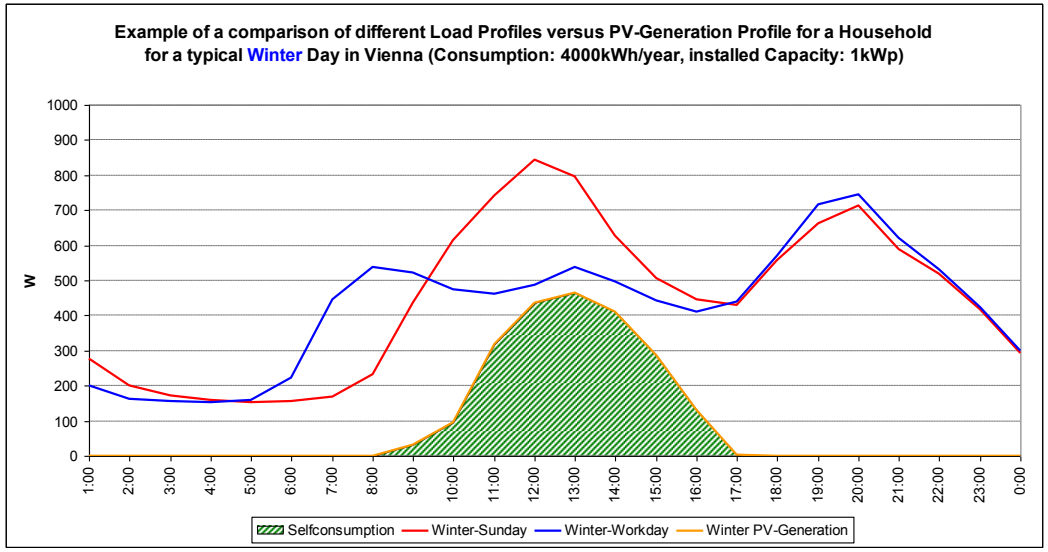
Household

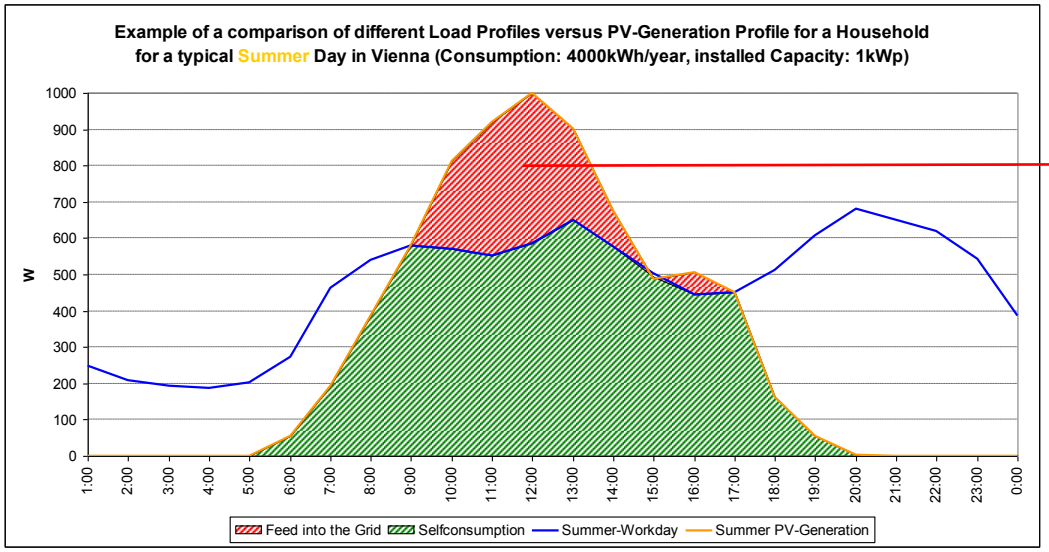




Source: SMA Solar Technologies (2010)

Self-Consumption versus feed into the Grid: Winter versus Summer Day





Feed-into the grid…

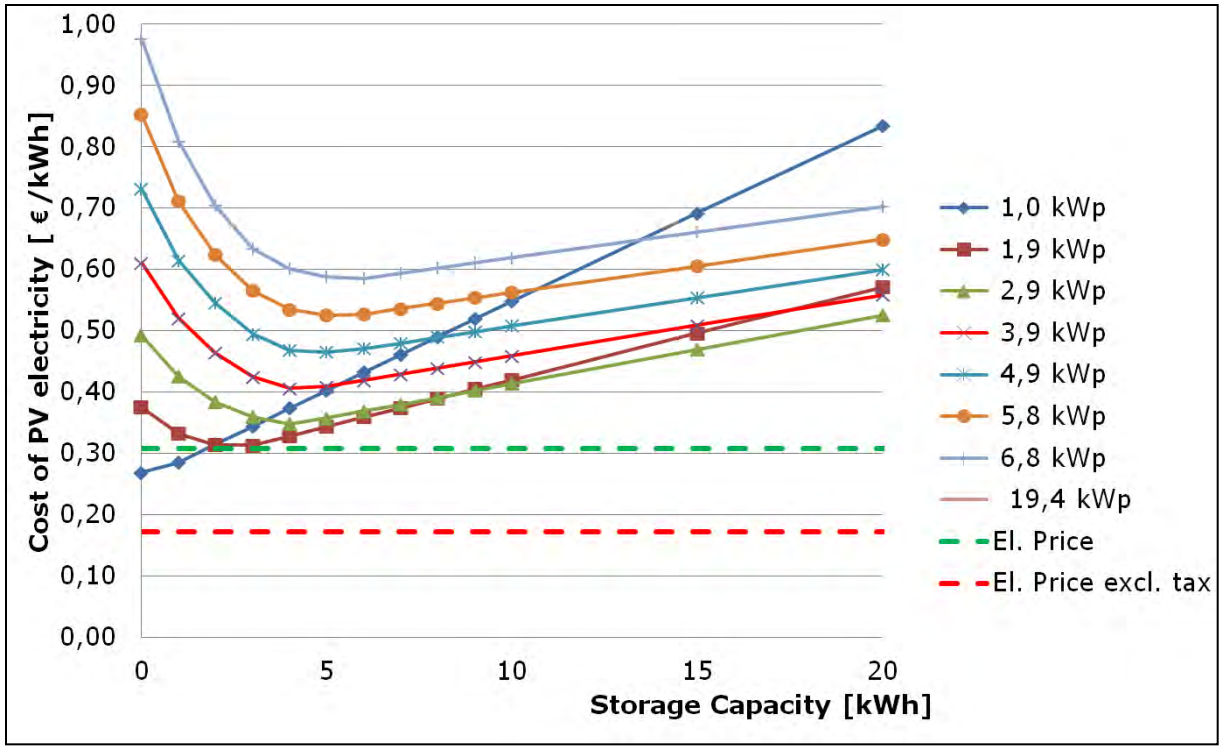
…but also possible:

- Stored (internal, external)
- Heat pump for hot water
- Cooling/Ventilation
- E-Bikes, E-Vehicles

2. Advanced PV Grid Parity:

Levelised Cost of Electricity Generation of PV equal retail electricity price (excl./incl. taxes) if a day-night storage is installed:

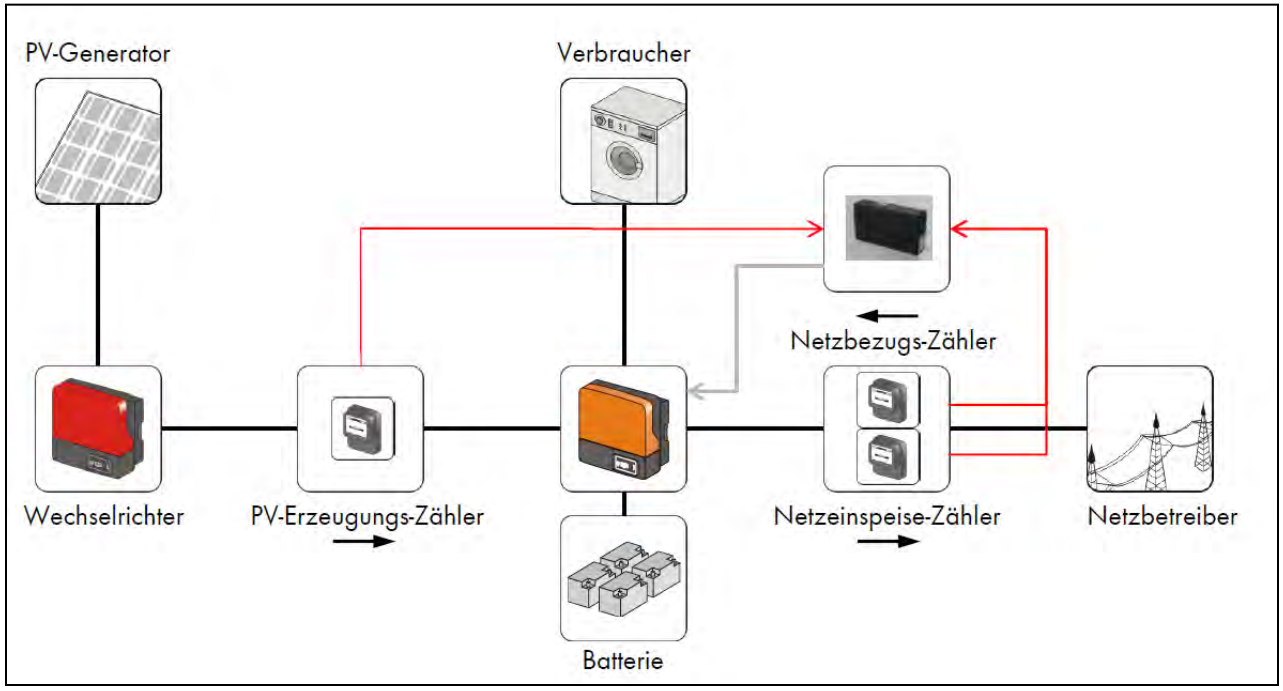
- No feed-in, excess PV electricity shed
- Feed-in at wholesale electricity market prices



	PV System
Lifetime	20
Solar Yield	900 kWh/kWp
Investment cost	2450 €/kWh
Sizes	1-19,4 kWp
	Lead Acid Battery
Lifetime	10
Efficiency	85%
Investment cost	250€/kWh
Volumes	1-20 kWh

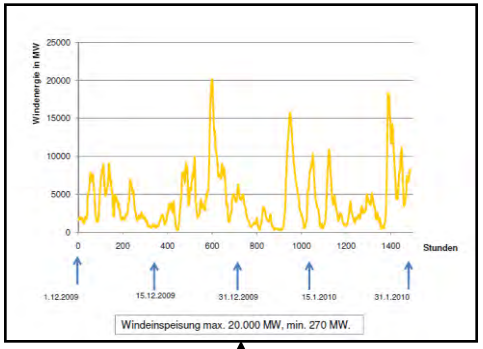
Source: Henkel (2011)

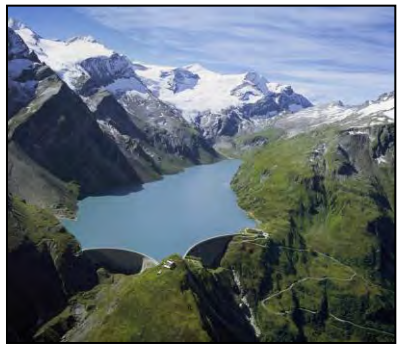
Integration of Battery-Storage into Internal Household Grid ?



Source: SMA Solar Technology AG

Bulk/Aggregated-Storage also on LV/MW Level in the Future !
(or: PV also contributing to balance variability of wind on transmission level) !

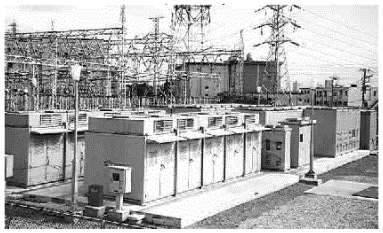




Extra-High and High Voltage Grid Level

Bulk/Aggregated Storage on LV/MW Level

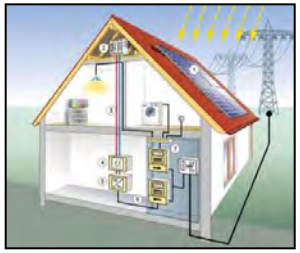
Turlough Hill, Ireland

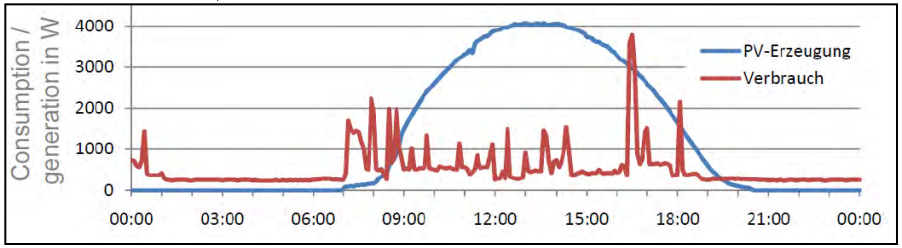


Tsunashima 6 MW Sodium-Sulphur Battery

Goldisthal, Germany

Medium and Low Voltage Grid Level

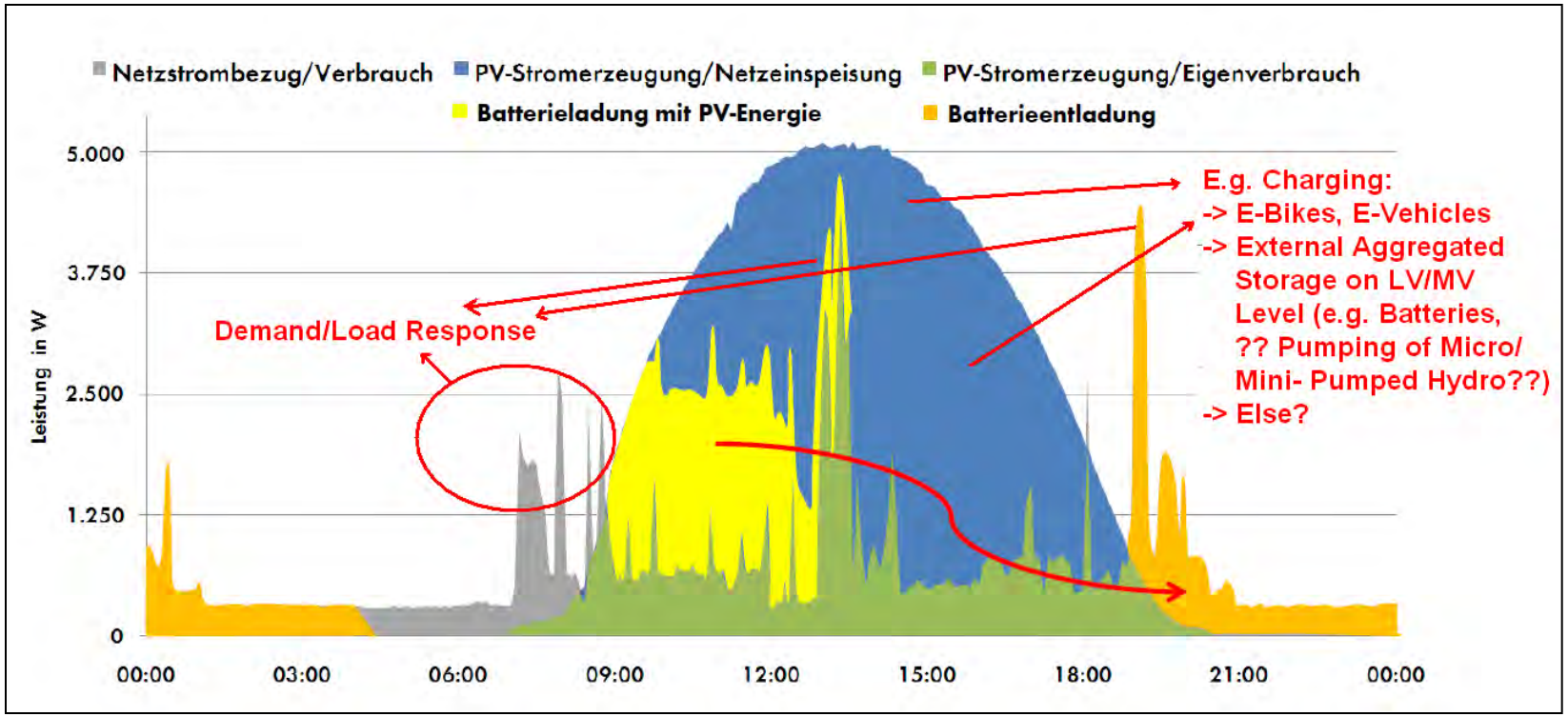




Customer Internal Grid

3. PV Equivalence (100% load following):

The PV system can produce exactly the profile needed by the customer (e.g. household, commercial, tertiary customer). Neither unwanted feed-in nor consumption of grid electricity is necessary (with the exception of e.g. charging of external storage on LV/MW level). PV systems, storage and demand/load response technologies work together perfectly -> „Smart Grids“



Source: Adapted from SMA Solar Technology AG

Utility Size Definitions in the Context of PV

Generation value competitiveness: Dynamic LCOE comparison of PV and e.g. CCGT

Gas-parity (static, dynamic): mainly relevant for existing CCGT plants (decrease of FLH)

Fuel-parity (static, dynamic): mainly relevant for existing diesel generators in islands solutions (also decrease of FLH)

Conclusions

„PV Equivalence“ will come!

The only question is: When?