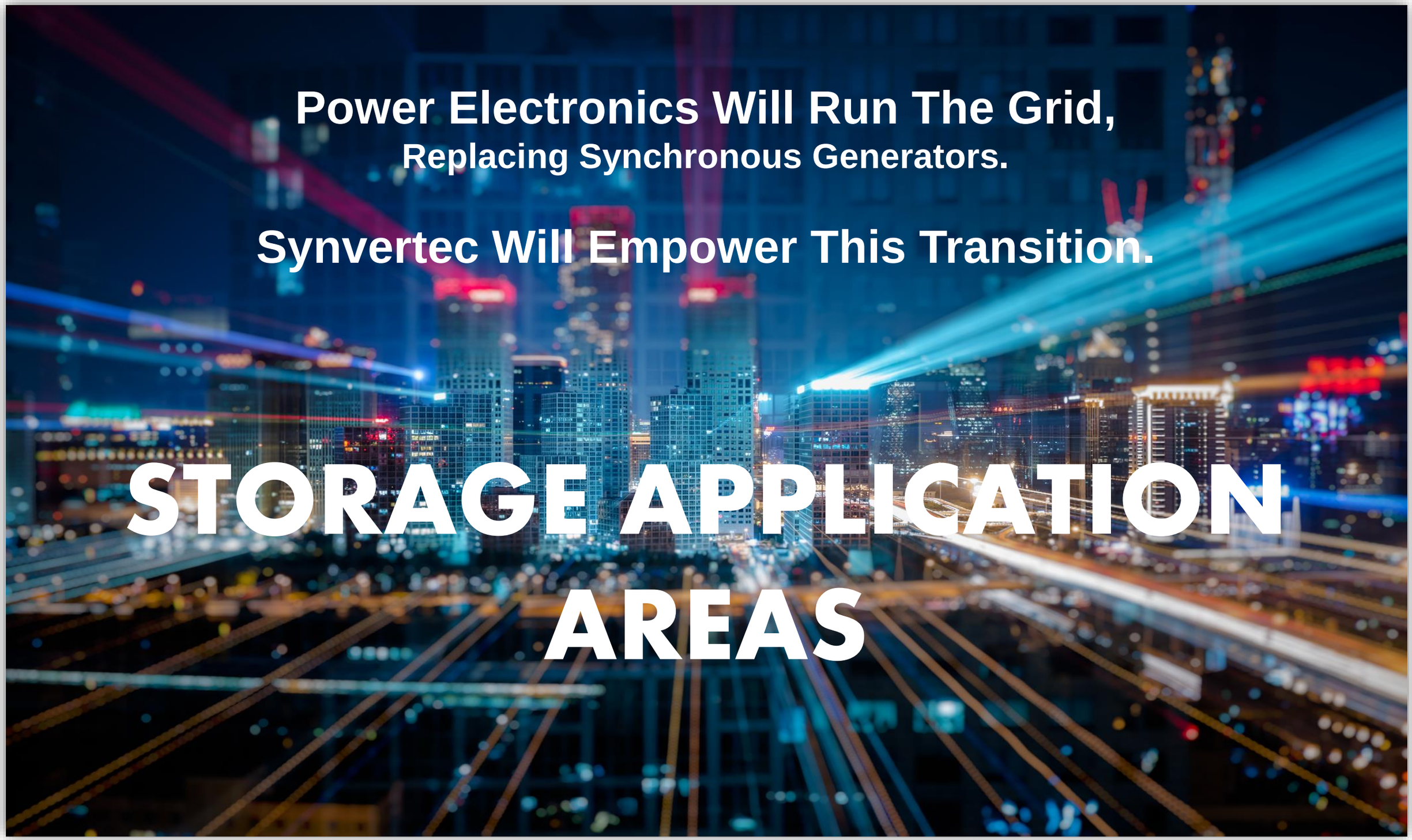


Nov. 2019 Eilat – Electricity Convention

By Ronny Izhak

SYNVERTEC For Better Grid Stability

Electricity & Energy 2019

Presentation Agenda

1. Major application areas for electricity storage
2. Applications:
    1. RE Intermittency mitigation & Mitigation ramp up
    2. Arbitrage
    3. Frequency regulation
    4. Voltage regulation grid congestion avoidance
    5. Electricity bill reduction
    6. Hybrid power plant
3. Components of a storage system
4. Scalability of battery-based energy storage system

Major application areas for electricity storage

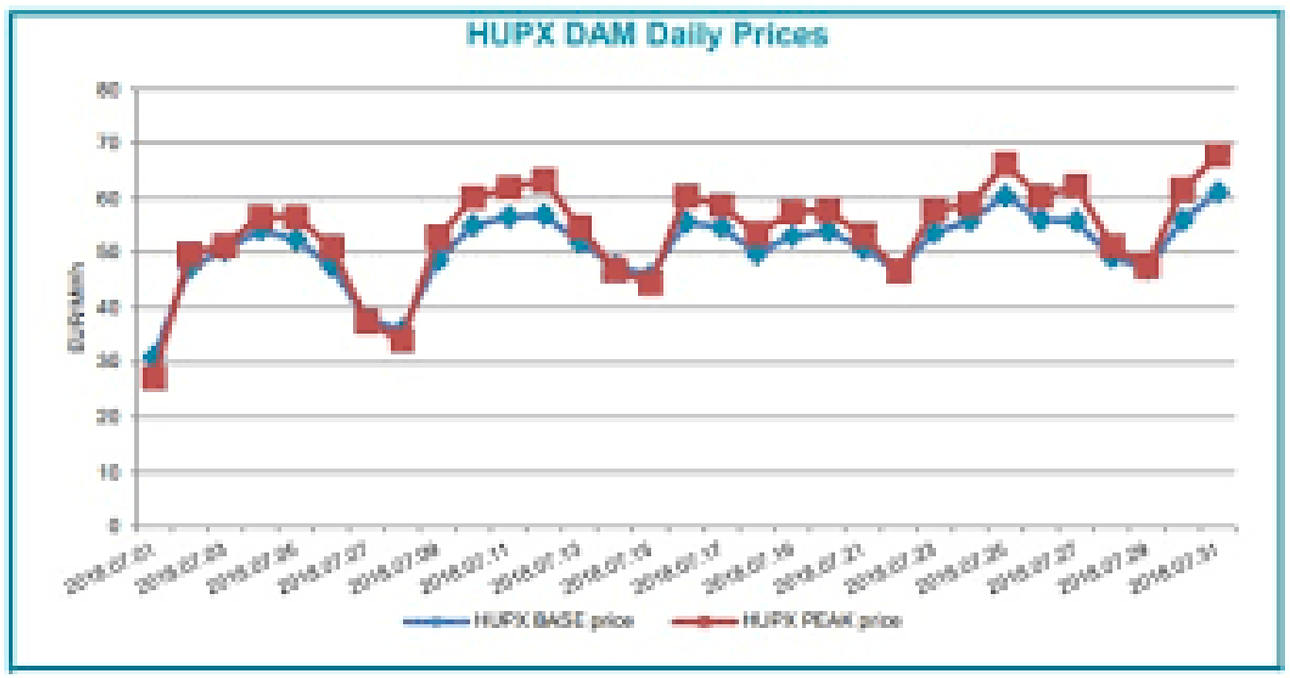
Application	Possible point of connection: Generation	Transmission and Distribution	Behind the meter	Off-grid
RE intermittency mitigation&ramp up	★			
Energy arbitrage	★	★	★	
Capacity	★	★	★	
Frequency regulation	★	★	★	
Voltage regulation	★	★	★	
Grid congestion avoidance	★	★	★	
Electricity bill reduction			★	
PV-self consumption			★	★
Hybrid power plants				★

RE Intermittency mitigation & Mitigation ramp up

- The storage system modifies the output profile of the RE plant to render it more adequate to the need of the off-taker.
- Coal fired power plants demand ramp up support

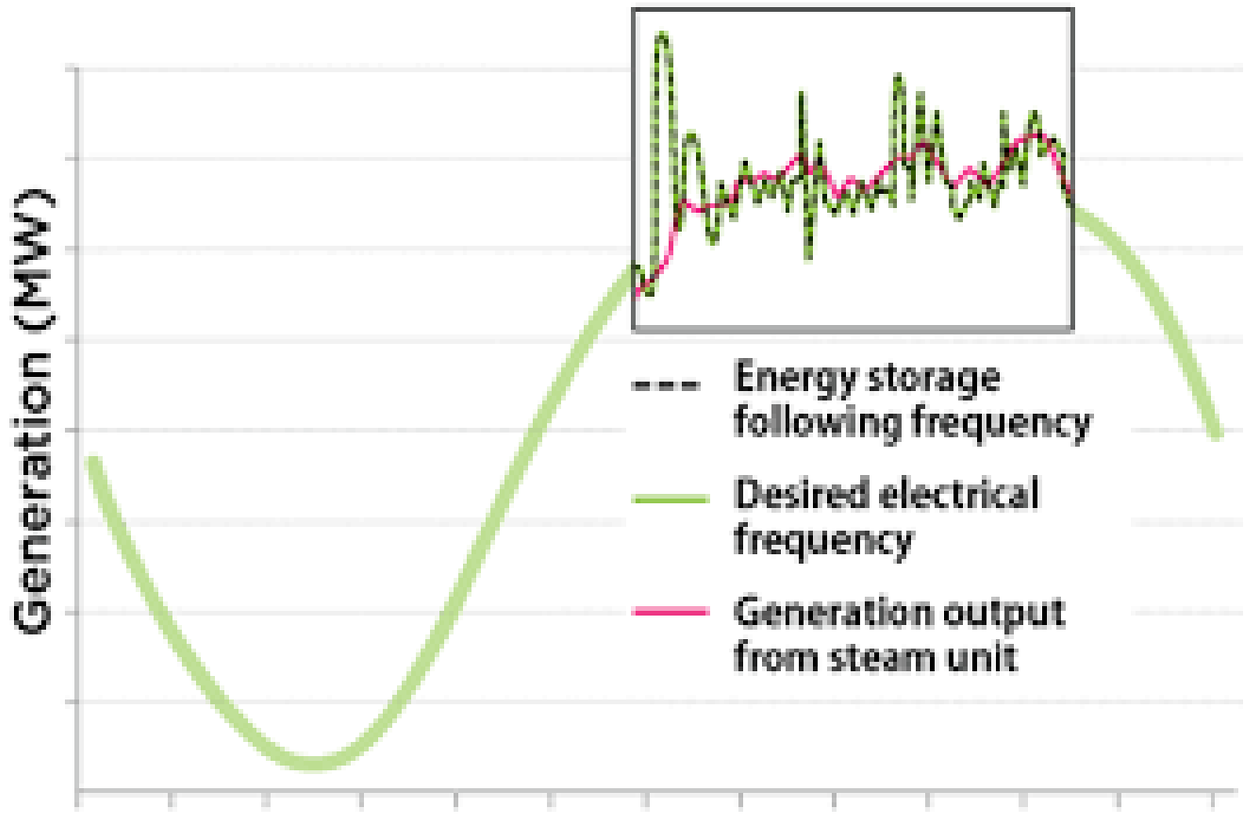
Arbitrage

The storage system charges when electricity prices are low and discharges when electricity prices are high.



Frequency regulation

The storage system reacts to frequency deviations (or signals sent by the grid operator) to bring back the grid frequency to its nominal value (50 Hz or 60 Hz).

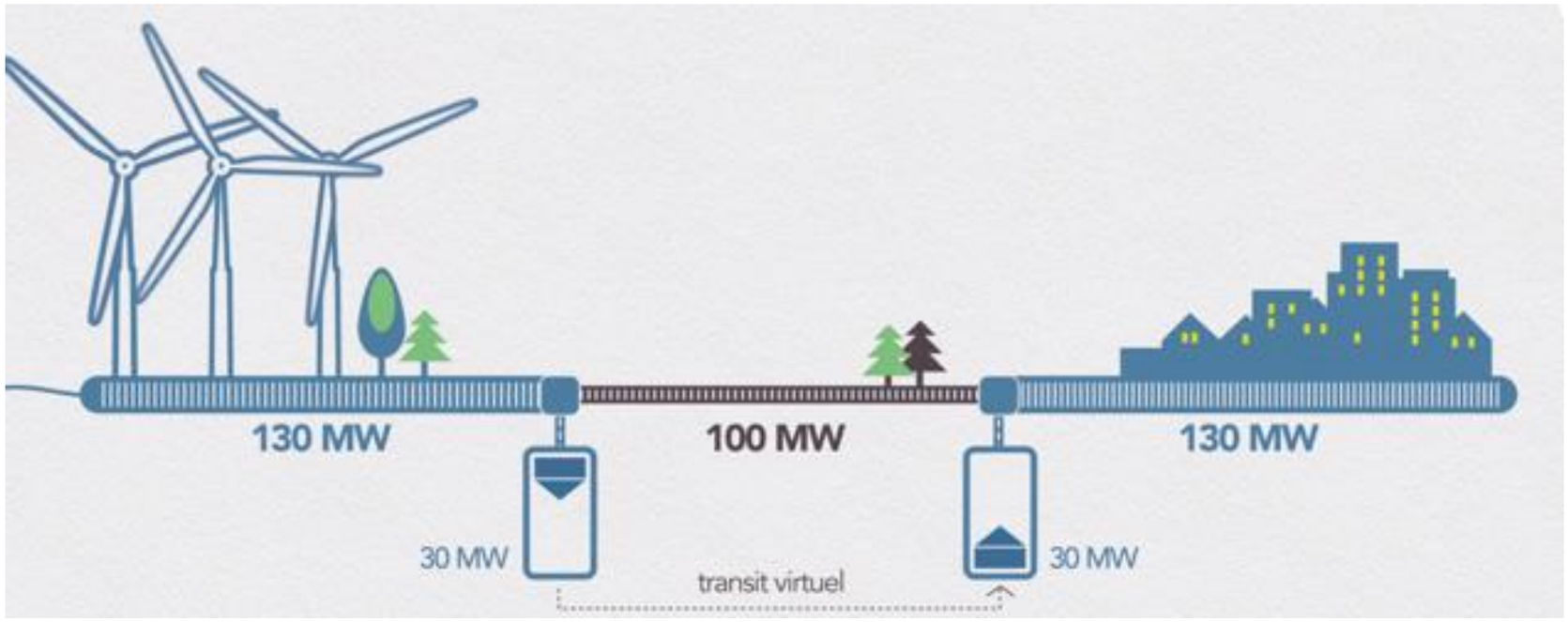


Voltage regulation

The storage system injects or withdraws reactive power to compensate voltage fluctuations.

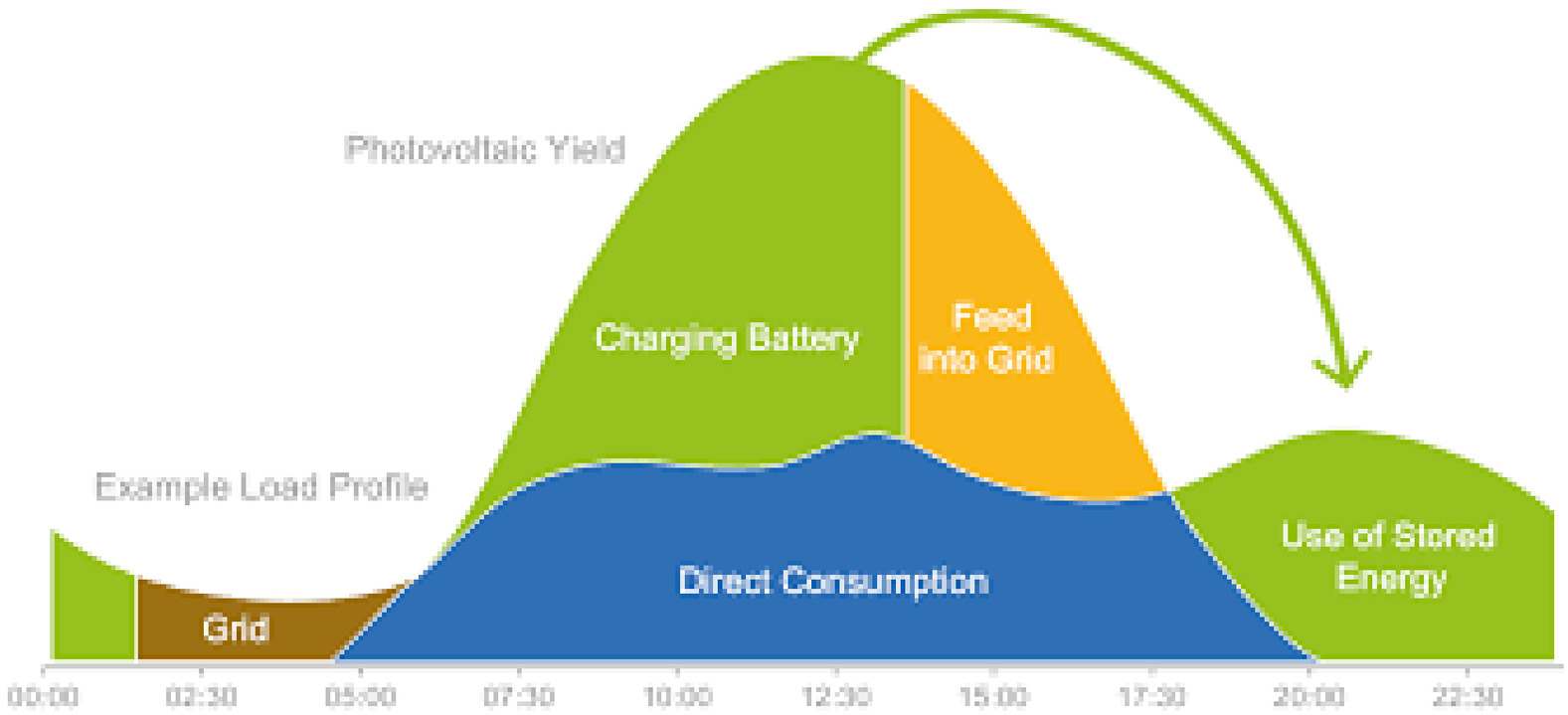
Grid congestion avoidance

The storage system charges (close to the area of consumption) when lines are not congested, and discharges when lines risk congestion – therefore avoiding investing in new equipment (such as feeders or substations).



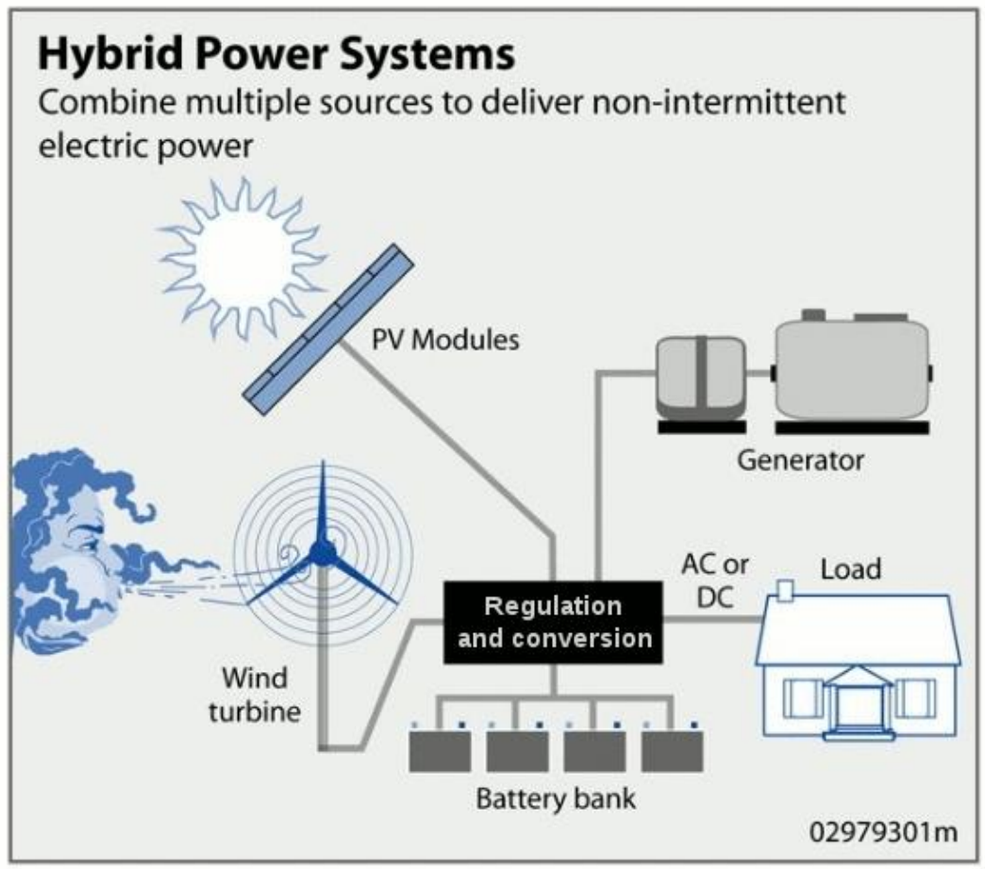
PV self-consumption

The storage system charges electricity produced by local PV during the day, and discharges at night. This allows residential consumers to maximize their self-consumption ratio.



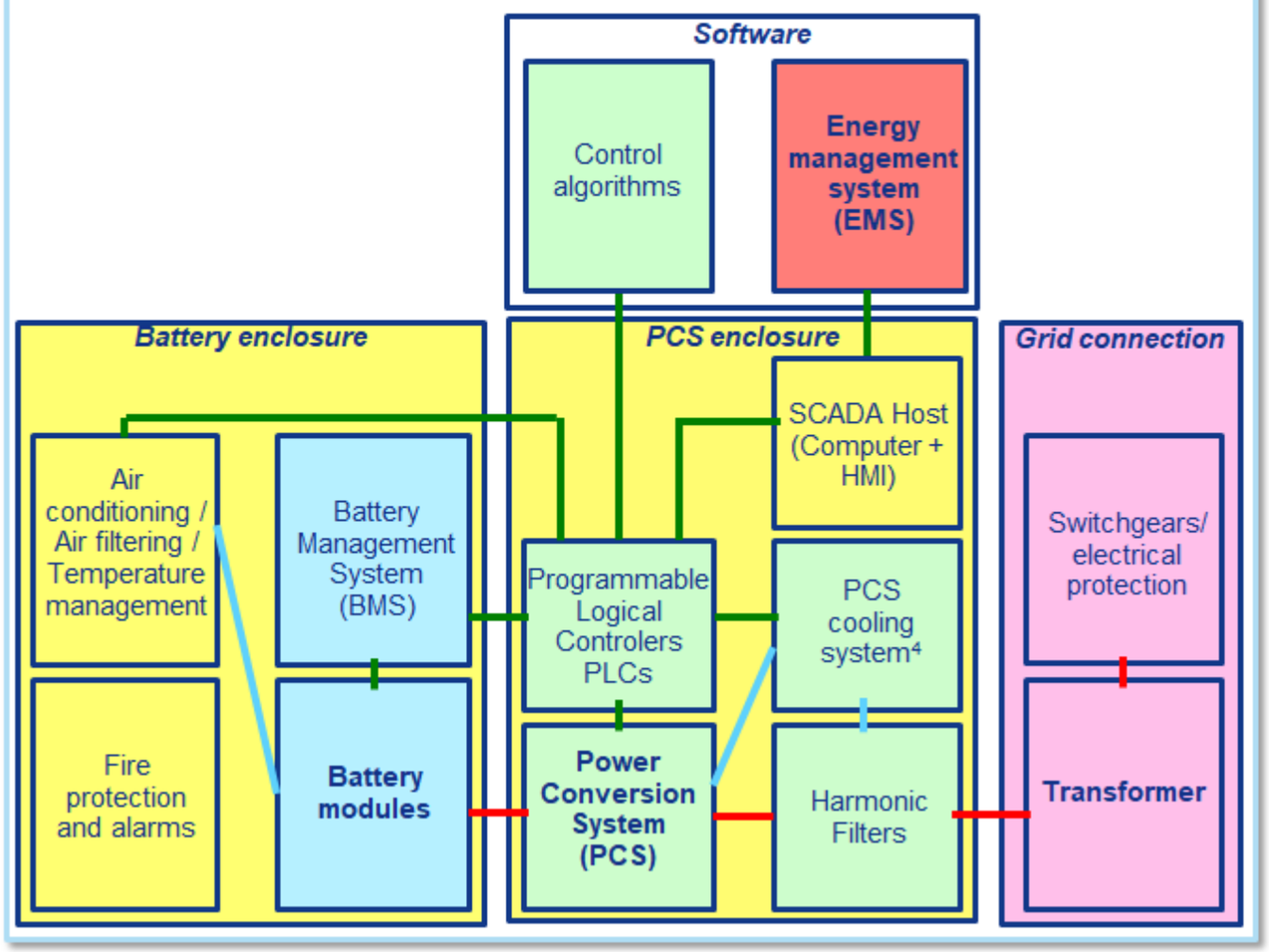
Hybrid power plant

The storage system is installed together with a thermal power plant (often coupled to a PV power plant) to maximize the efficiency of the thermal power plant, thus reducing the amount of fuel consumed and increasing PV penetration



Components of a storage system

Typical EPC tranches of a storage construction project

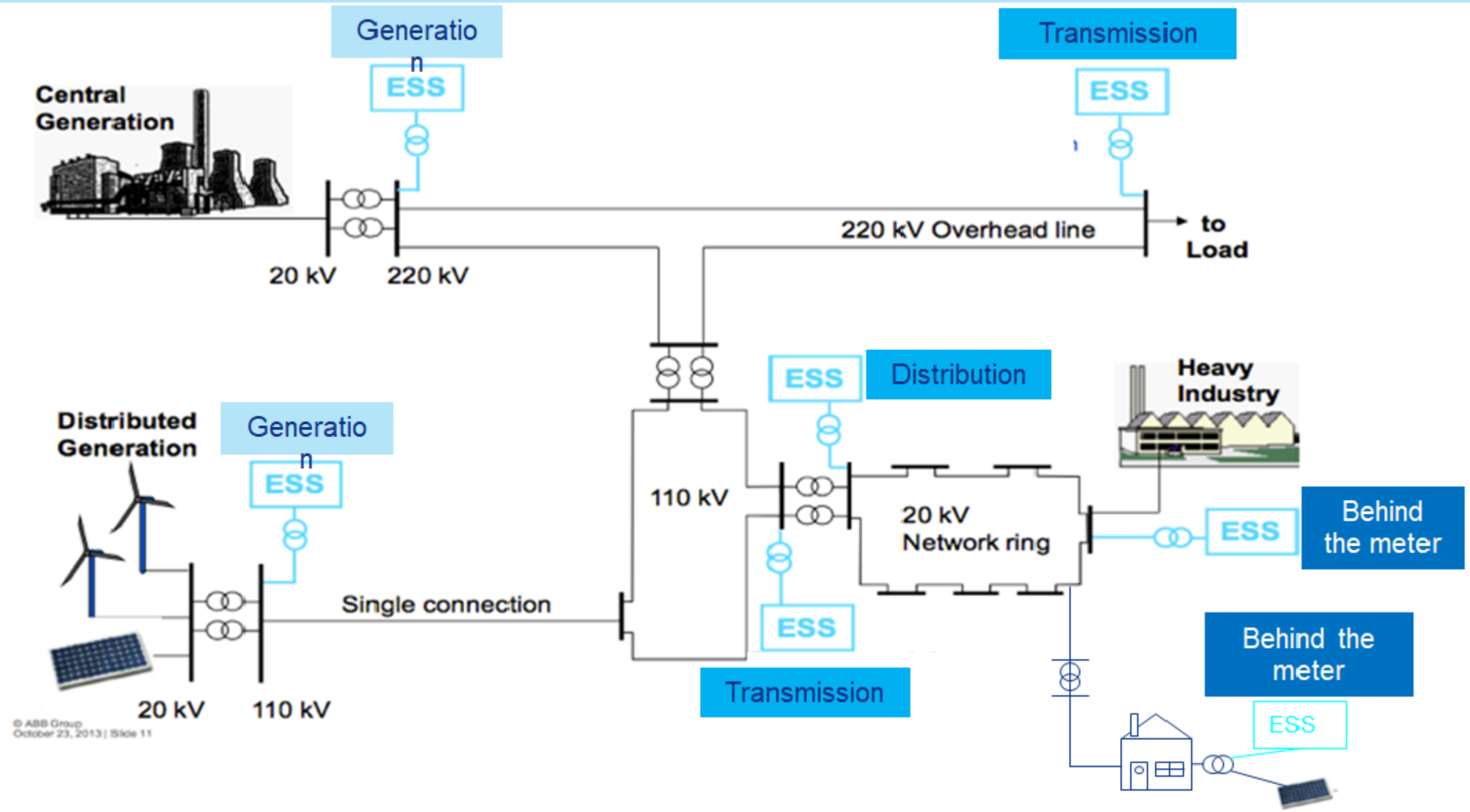


Legend:

- Electrical engineering contractor
- EMS vendor's scope
- System Integrator's scope
- PCS vendor's scope
- Battery vendor's scope
- Data transmission
- Power transmission
- Heat exchange

Battery-based energy storage is scalable and can be installed at any location in the electric grid

Storage is able to meet several grid applications at different voltage levels



SYNVERTEC For Better Grid Stability

The environment

Today’s grid control & management are based on the electrical behaviour of synchronous generators.
Intensified trends dictate that ‘Power Electronics’ will run the grid in the not-so-far future.

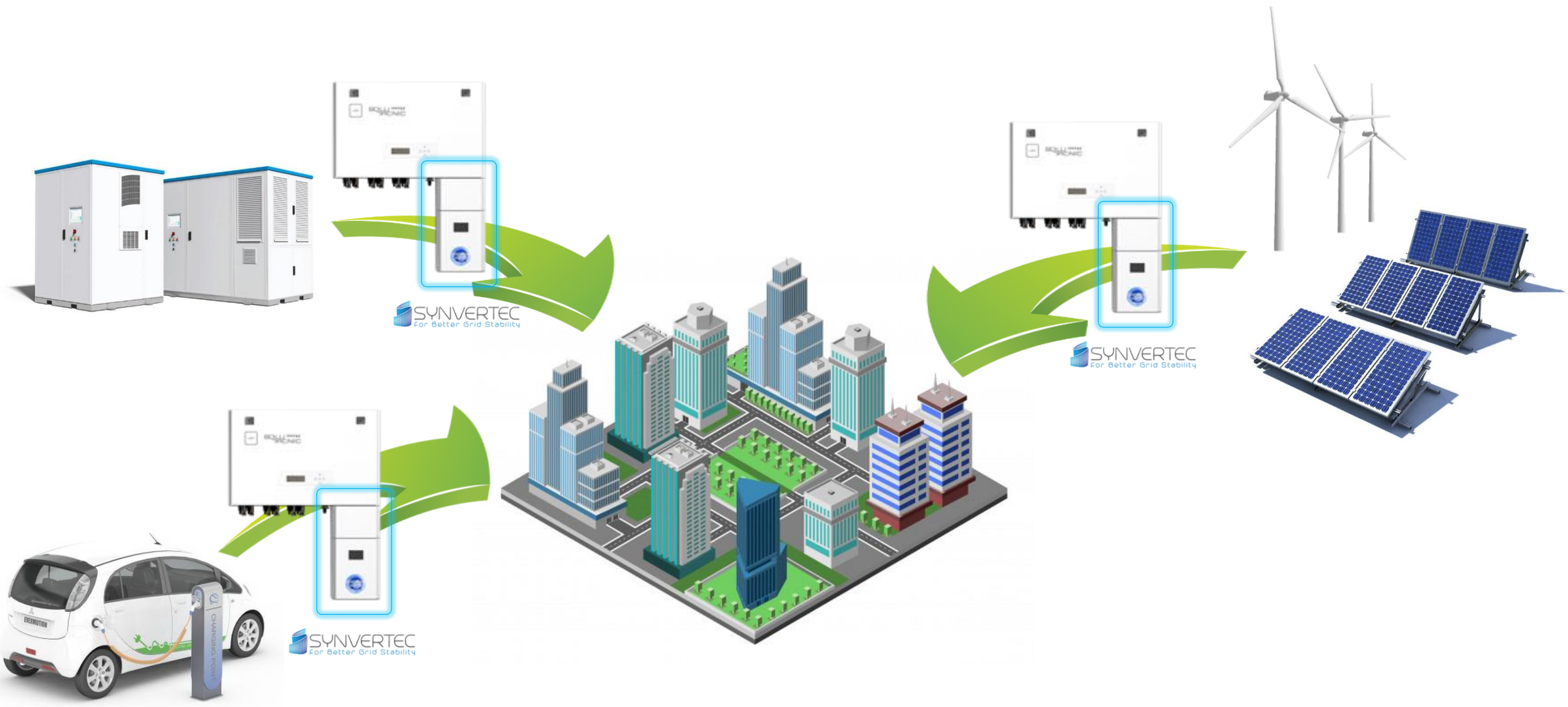
Feeding the grid with clean & versatile sources of energy via conventional Power Electronic Inverters (PEI), will jeopardize grid stability.

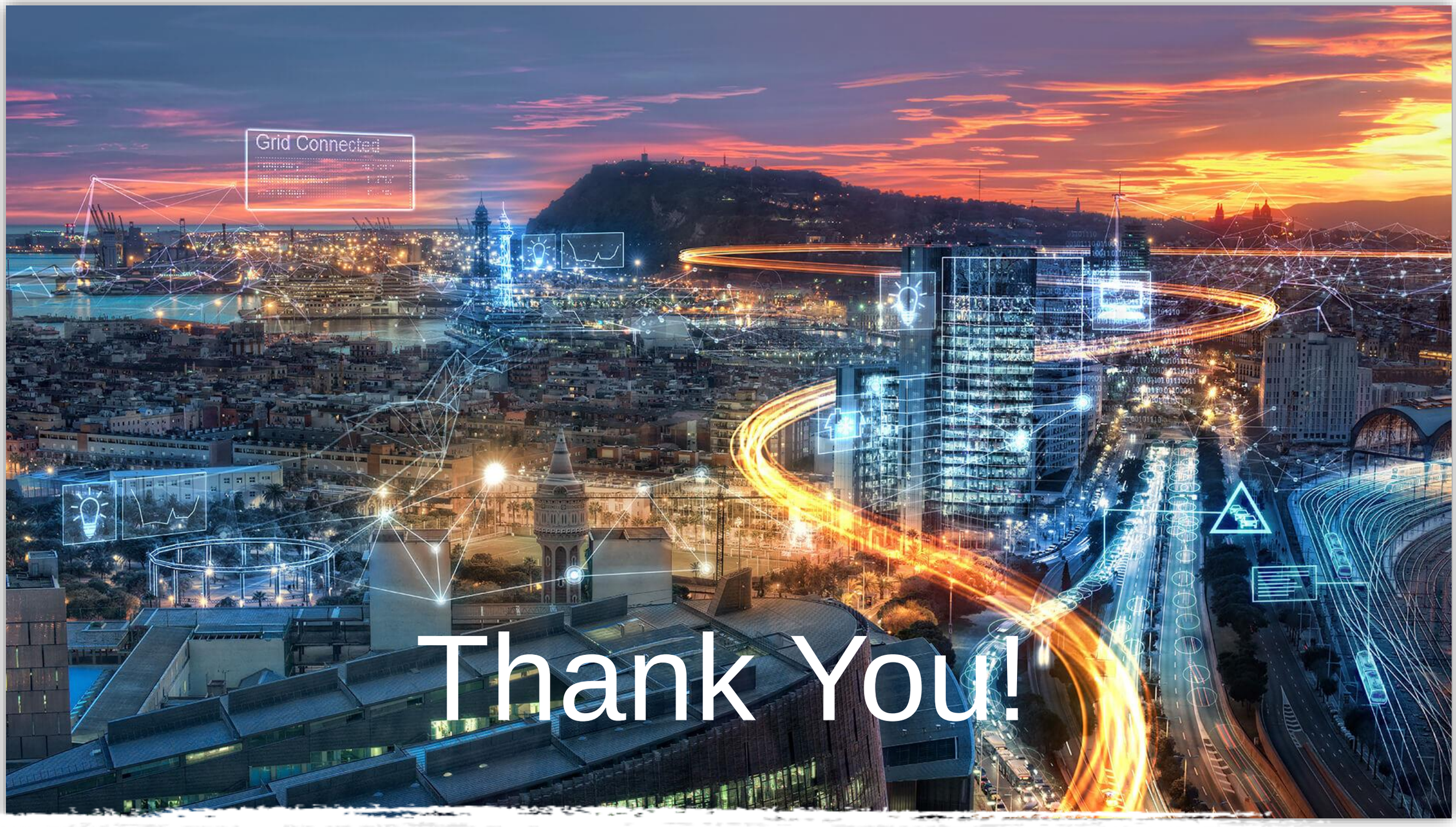
As a result, mass penetration of modern and clean energy sources is currently unfeasible.

The replacement of synchronous generators (power plants) with power electronics is unavoidable

The Synvertec Solution

Integrating our “Magic Box” (a synchronous power generation device) with electronic inverters **will revolutionize electrical grid stability & robustness,** thus intensifying the penetration of renewables, energy storage, EV2Grid, etc.





Thank You!

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