

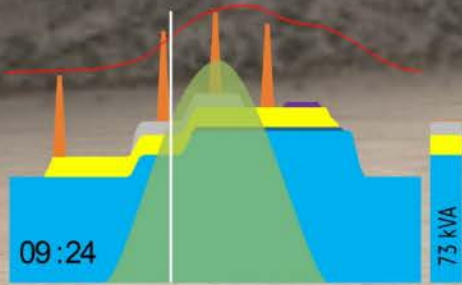


POWERBox - Hybrid energy systems

Einsatzmöglichkeiten für Solarenergie in der Tierhaltung

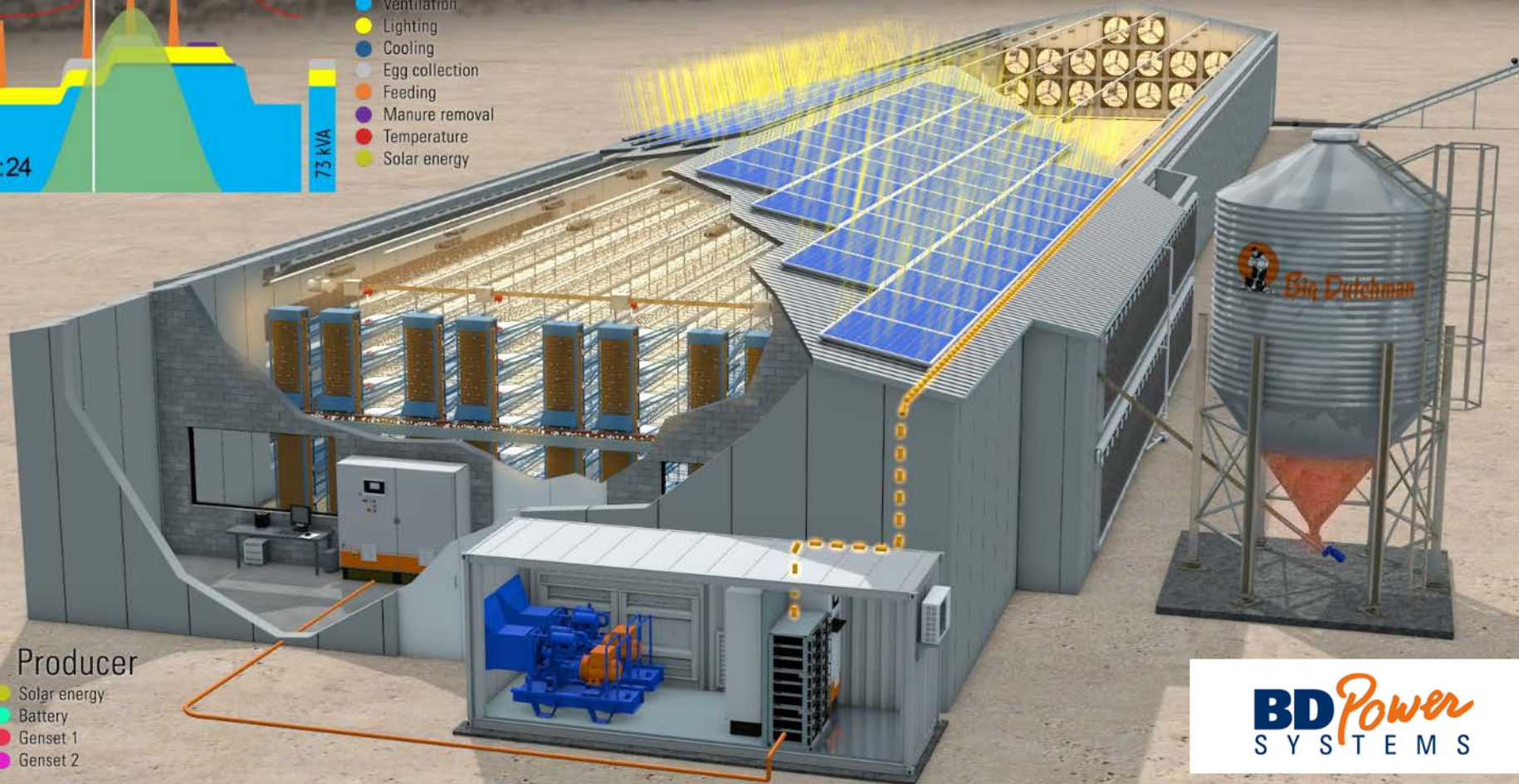
Michel Roman, BD PowerSystems GmbH





Consumer

- Ventilation
- Lighting
- Cooling
- Egg collection
- Feeding
- Manure removal
- Temperature
- Solar energy



Producer

- Solar energy
- Battery
- Genset 1
- Genset 2





Key facts



Size	Power in kVA	PV in kWp	Battery in kWh	Genset 1 in kVA	Genset 2 in kVA
1	20	25	20	25	15
2	40	50	40	50	30
3	60	75	60	75	60
4	100	125	100	150	75
5	200	250	200	250	150
6	300	375	300	375	225

Pilot project: Organic Layer Farm / Australia



Challenges for farm expansions in Australia

- | High costs for electricity
- | High costs for additional grid connections
- | Local utilities have limited power capacities for additional consumers
- | Coal fired power plants are shutting down due to their age

Advantages of the PowerBox solution

- | Independence
- | Secure power supply
- | Cheap and green solar power
- | Farm growth
- | Marketing opportunities

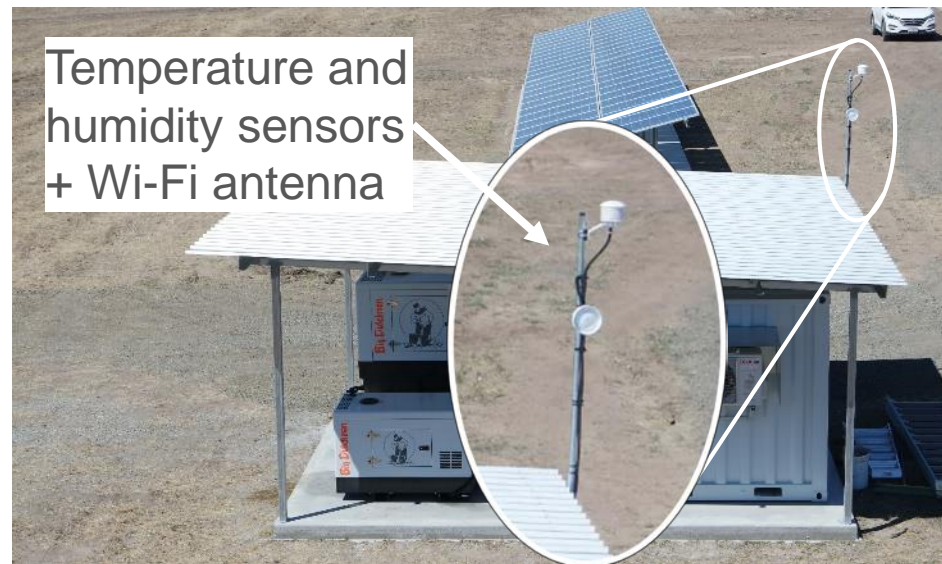
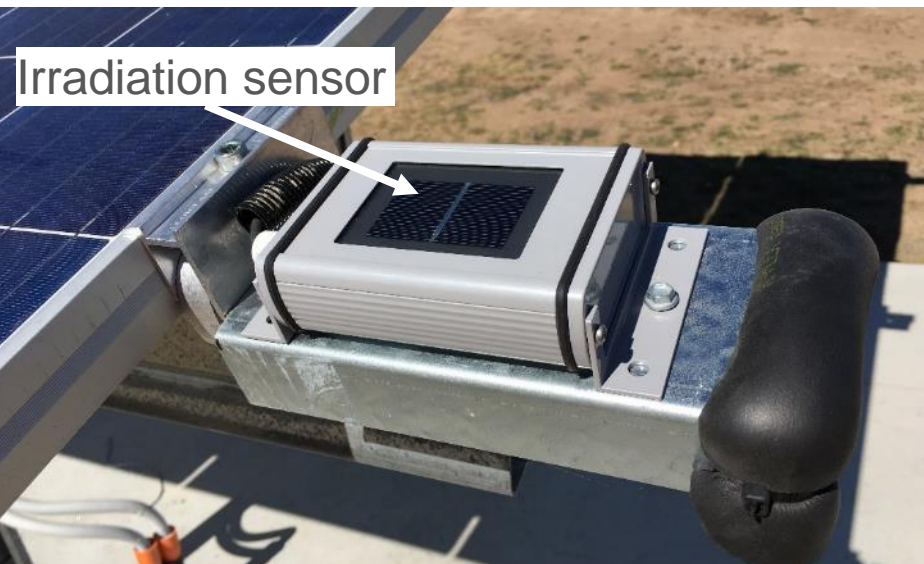
PowerBox Pilot – Key figures

- | Construction in August 2017
- | 15 kVA nominal power output
- | 1st step - Implementation
 - | Supply of a 5,000 hen organic layer house
 - | Testing of the system and its sizing
- | 2nd step - Optimization
 - | Improvement of operation strategies
 - | Connection of an additional rearing house
 - | Increase of battery capacity





PowerBox Pilot – Components



Operation strategy

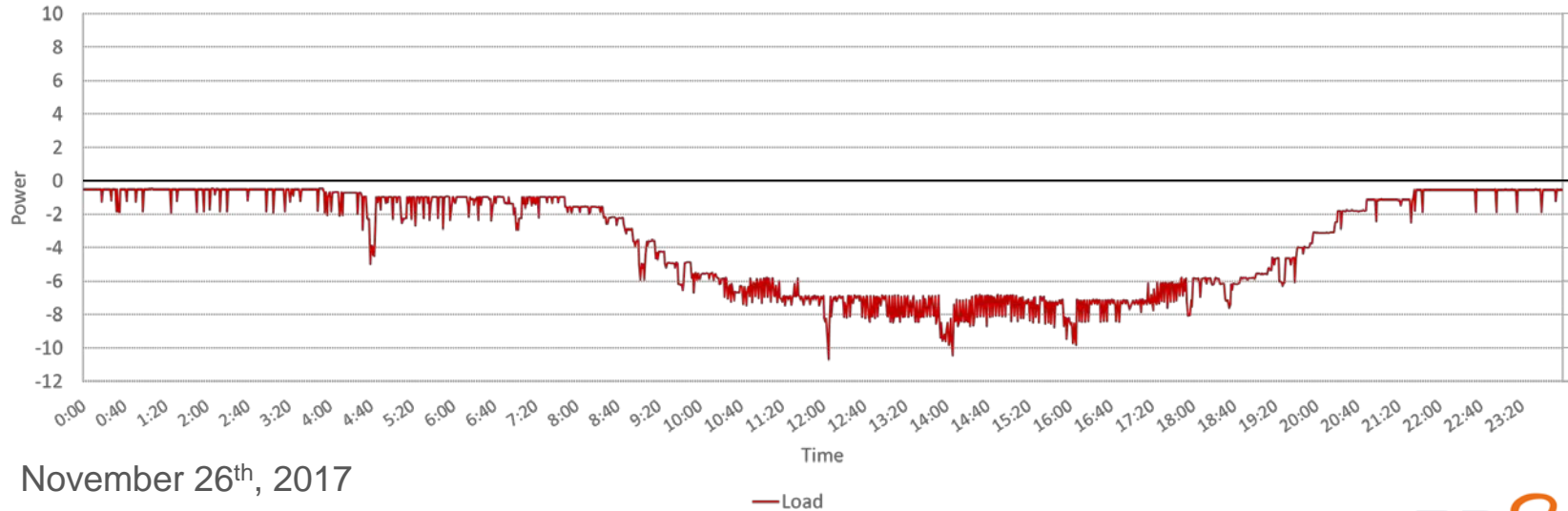
| Daytime

- | Direct use of solar energy
- | Charging of batteries with surplus solar energy
- | Buffering of peak demands with batteries
- | Activation of gensets in case of insufficient irradiation/cloudy days

| Nighttime

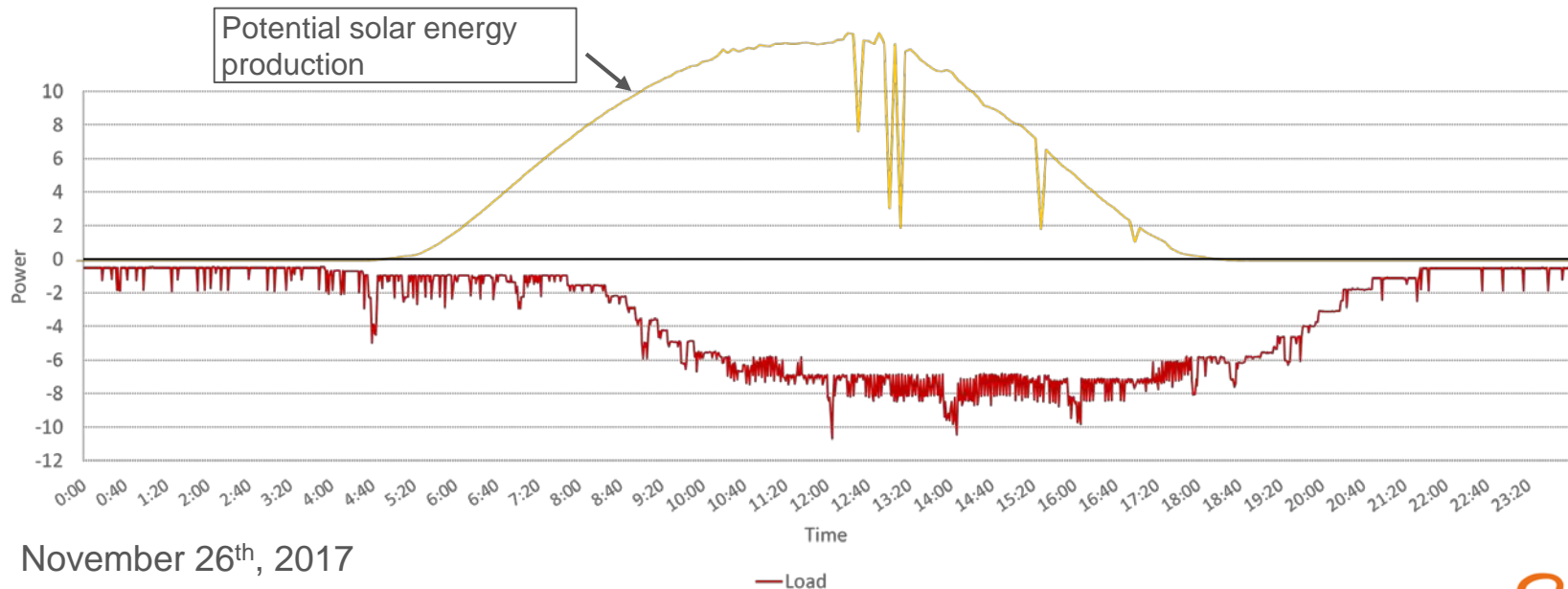
- | Use of stored solar energy from batteries
- | Supply of exceeding demand with diesel gensets (directly and via batteries)

Measured load curve and performance

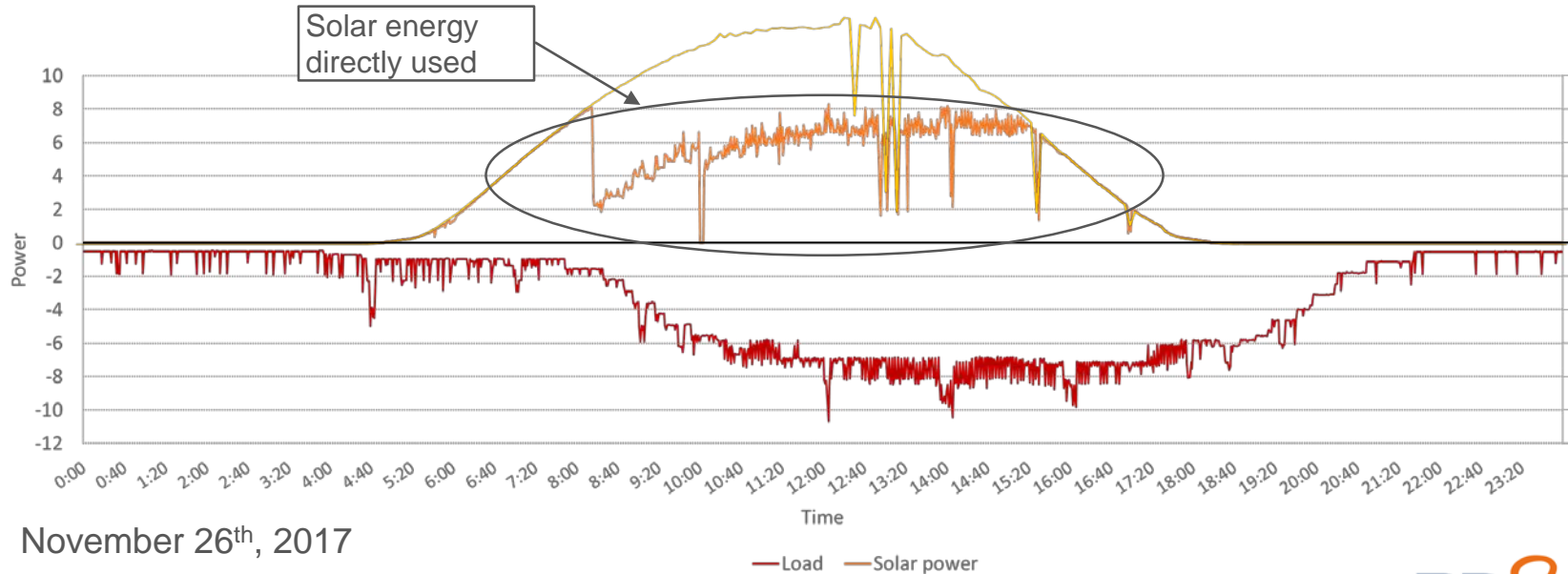


November 26th, 2017

Measured load curve and performance

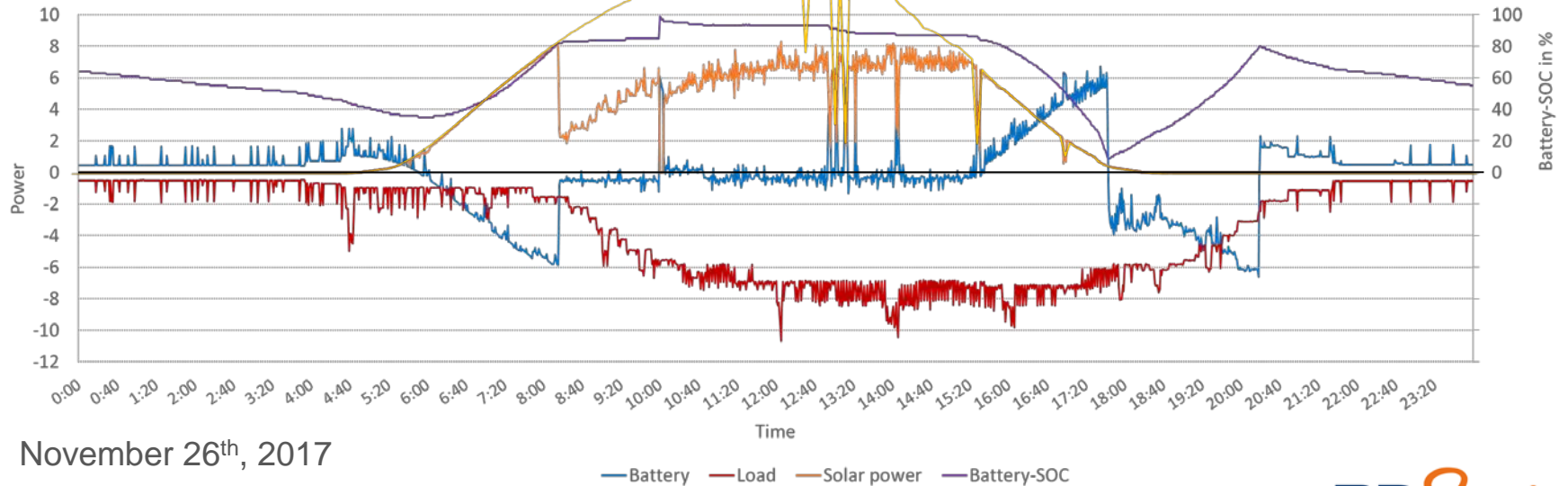


Measured load curve and performance



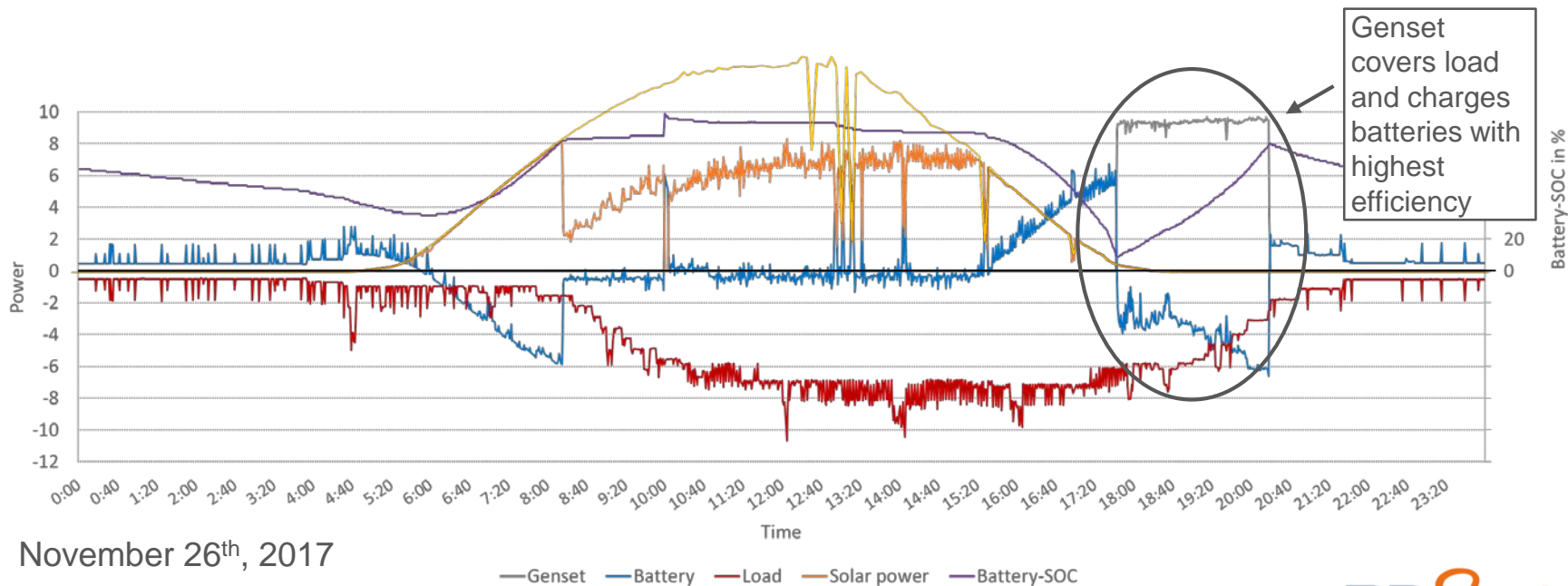
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Measured load curve and performance



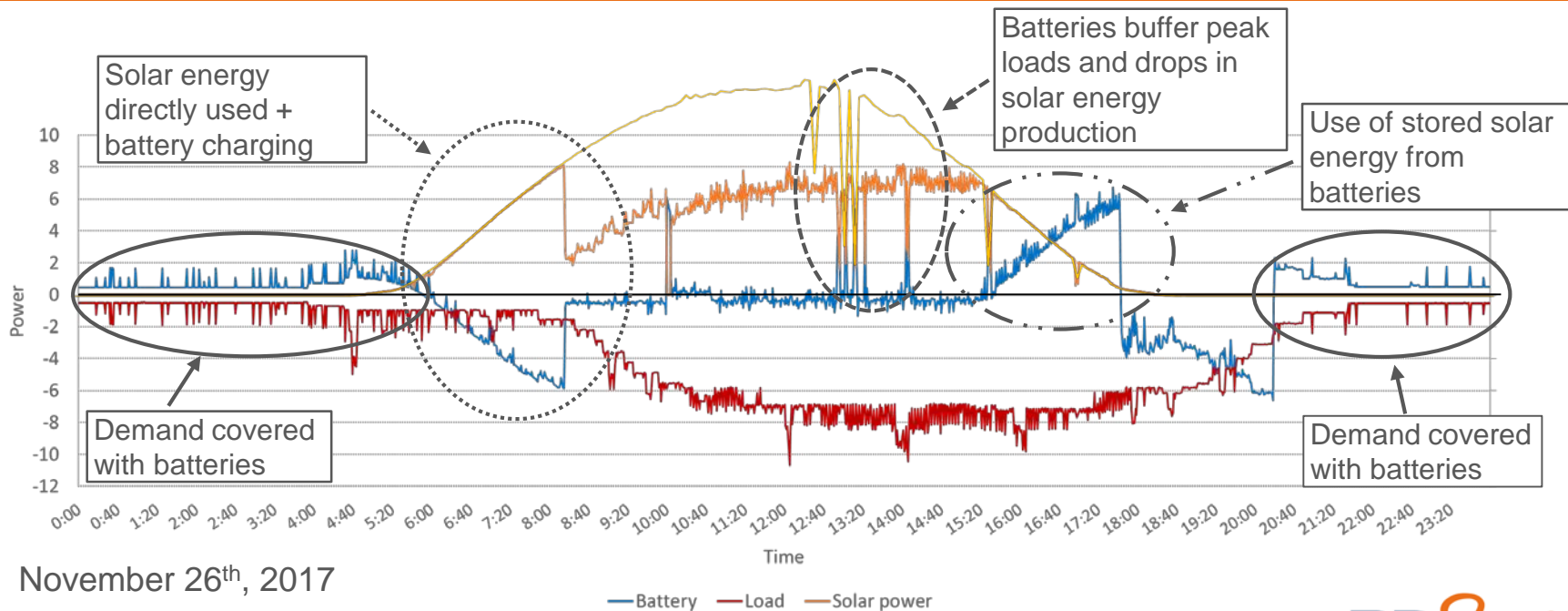
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Measured load curve and performance



November 26th, 2017

Measured load curve and performance



November 26th, 2017

PowerBox Pilot – First results

- | Up to 83.3% of electricity demand covered with solar energy
 - | 55.9% direct use
 - | 26.4% indirect use via batteries
- | Electricity from gensets only 16.7%





Thank you
for your attention.