



Personal info:

- Hans van der Gulik, owner of Dynaf Group
- Active in energy production since 1993
- Active in Curacao since 1999
- 7 years experience in building CHP (natural gas engines with heat recovery)
- Actively installing Solar (PV) power since 2009
- Experimenting with battery storage since 2016
- EV Mobility as main innovation for 2019-2020

Facts

- 50 employees on 4 islands
- Total over 100MW on generators sold
- More than 700 service contracts
- 24/7 service organization
- Only supplier to offer all-in service and operational lease in our market
- Supplier of end to end power solutions from Solar to Generators to UPS systems



Service is our business

At Dynaf we realize that no product will perform in the long run without a good preventive maintenance program.

This is why we mainly focus on offering the best preventive maintenance a customer could ask. By performing good preventive maintenance we avoid downtime for our customers when they really need their equipment.

We think that we do our job right if our customers never have to think about their generator, Solar system, UPS or diesel engine, as it is always ready when needed.



Solar business

Started with solar installations in 2009



New office 2014



Target -> Off grid zero-emission in 2018

CO2 footprint of Dynaf in 2017 – 35 Metric Tons

Day consumption Mo-Fr -> 36.000 kWh/yr

Night and weekend consumption -> 11.000 kWh/yr

Total electrical consumption -> 47.000 kWh/yr

Electricity cost -> 28.000 ANG/yr

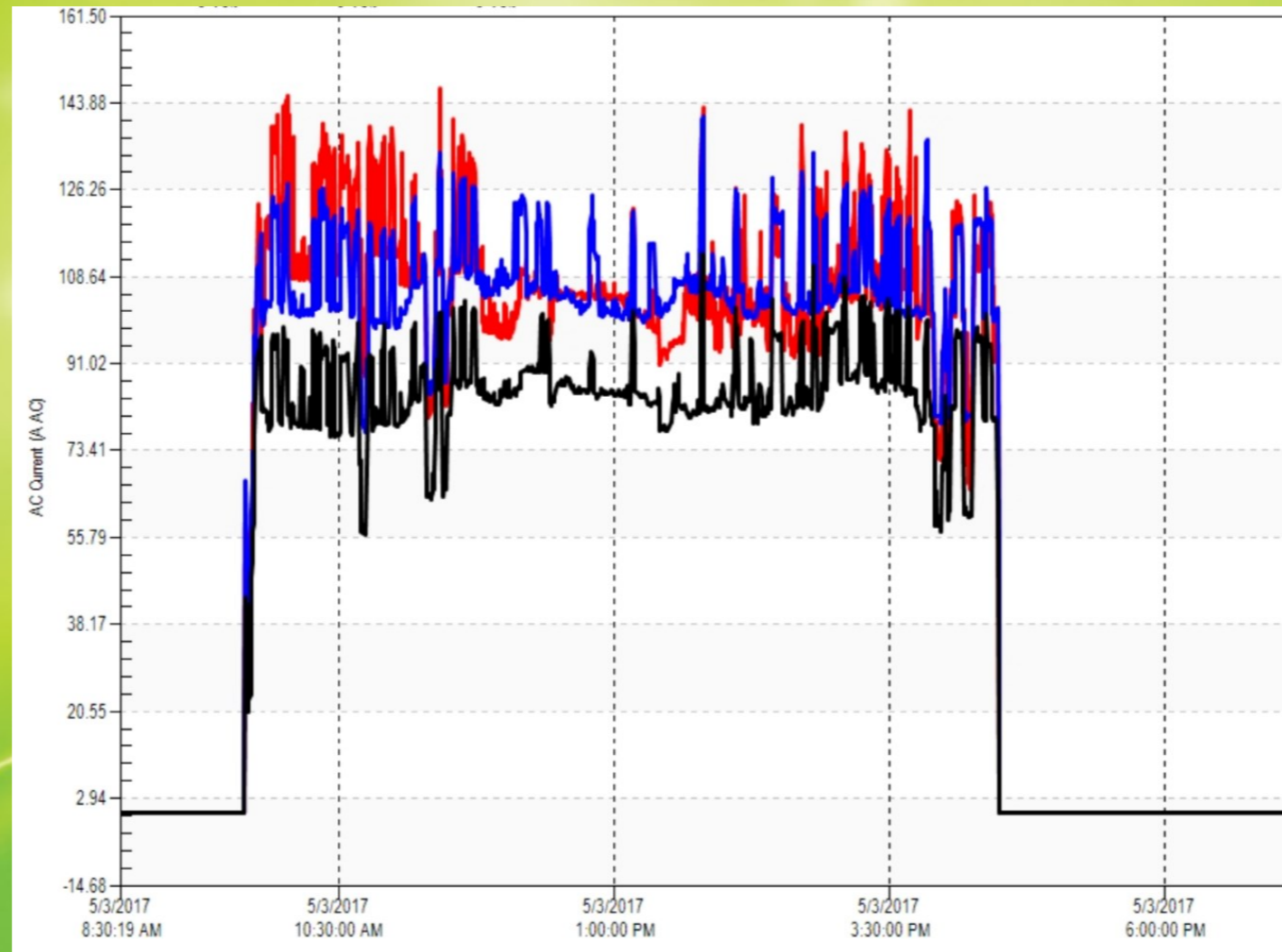
Start with energy efficient installation

Dynaf office is equipped with:

- All energy efficient inverter airconditioning @ 25°C
- Automatic switching of airconditioning on timers
- Light in the office switched by activity sensors
- Roof built with 25 cm PolyStyrene core
- Double glass windows with sunshading

Typical office power usage

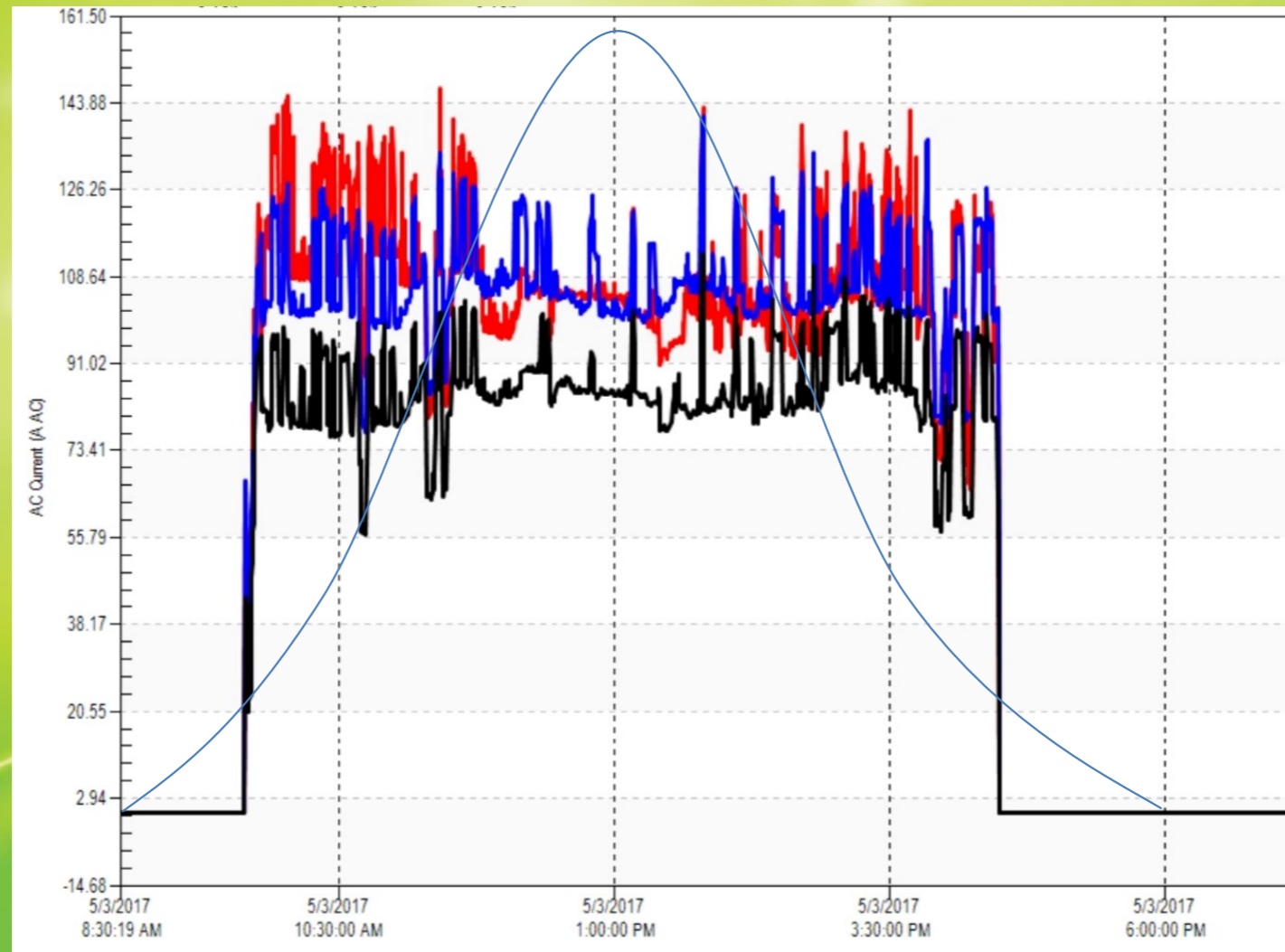
Load



Typical office power usage

Load

Solar



Dimensioning Solar storage and inverters

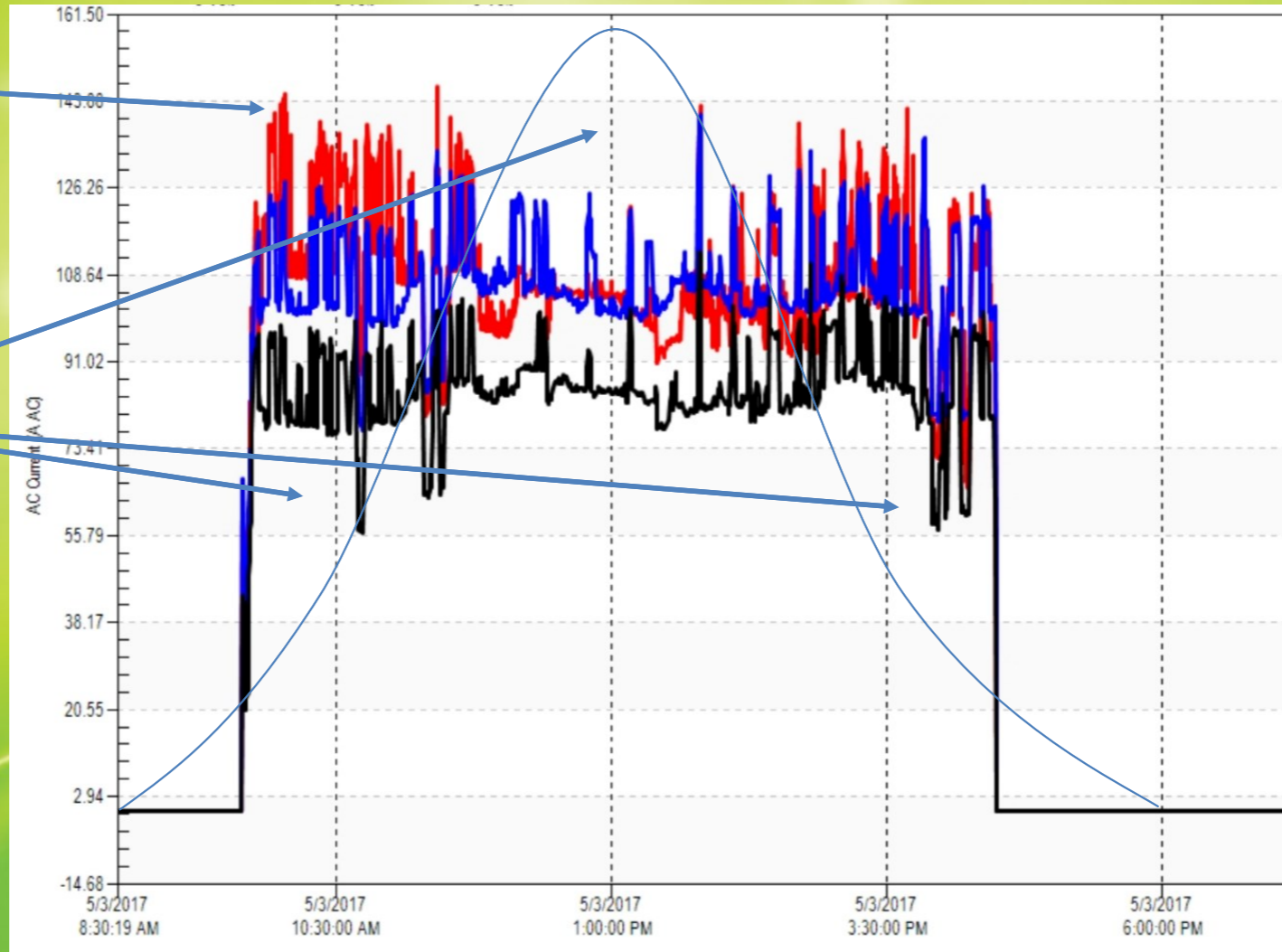
Design objective to consider:

- Max power demand (kW)
- Energy needed when Solar power is insufficient (kWh)
- Round trip efficiency of Storage
- Charge and discharge time
- Design Cycles of Storage (10 yr -> 4000 cycles)










Typical office power usage

Max Power

Energy storage



Choice in storage type

Battery	Cost	Lifespan	Depth of Discharge
Lead Acid			
Lithium			
Saltwater			

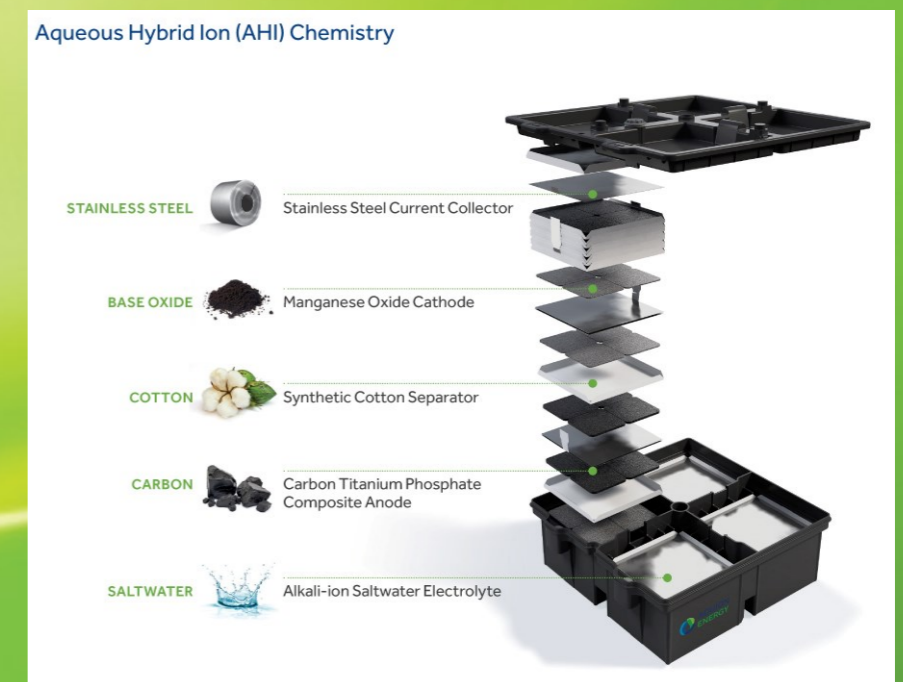
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Dynaf's storage experience

Aquion Salt Water Battery



- Environmentally friendly ++
- High temperature performance +
- Low energy density --
- Operation voltages uncommon -
- New product, financial unstable supplier --
- Low efficiency < 70%



Dynaf built 5 installations with Aquion, none with desirable results

Dynaf's storage experience

Rolls Surette Lead Acid batteries

- Low cost/kWh +
- High efficiency > 85% +
- Proven track record +
- Stable voltages at discharge +
- Recyclable at end of life (99%) +
- Requires maintenance –

Dynaf built 10+ installations with Lead Acid batteries, all with desirable results



Lithium storage




Dynaf has no field experience with Lithium storage

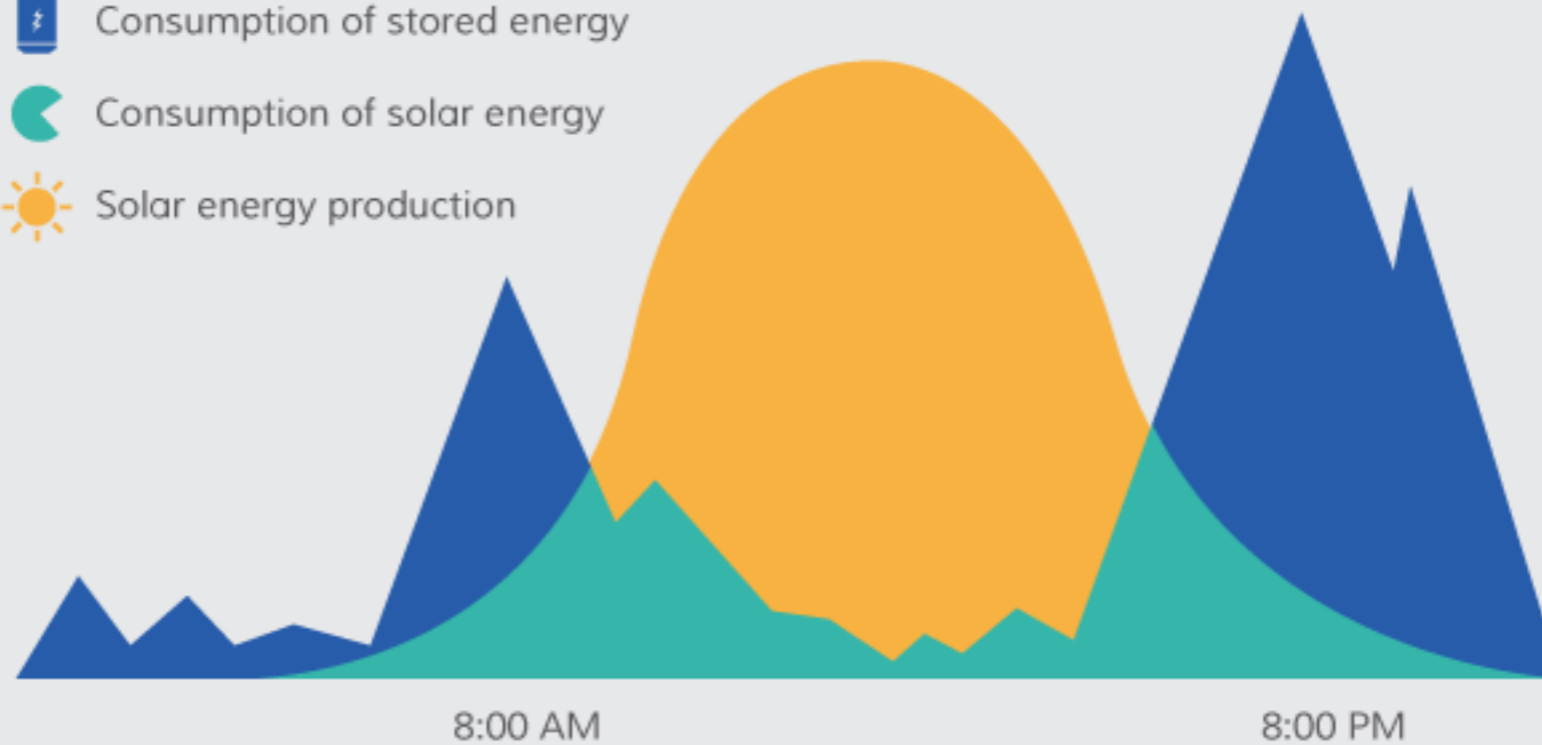
Main reasons:

- Lithium batteries are often integrated with inverters -> Curacao grid is non standard
- Price (high)
- Need to cool the batteries -> specialized control needed.
- Not yet economically recyclable

Typical home power usage

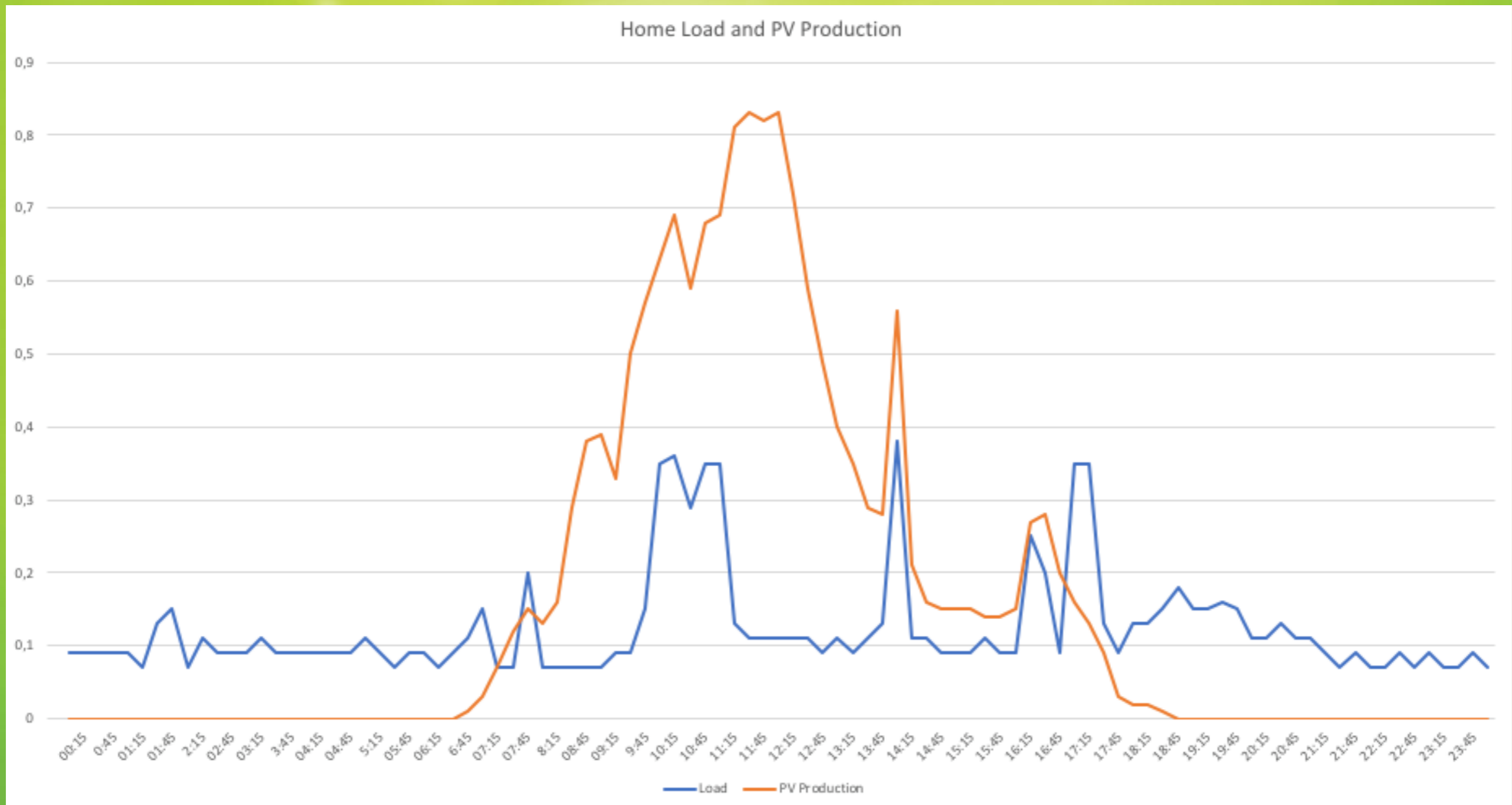
Typical day with a solar battery system

-  Consumption of stored energy
-  Consumption of solar energy
-  Solar energy production

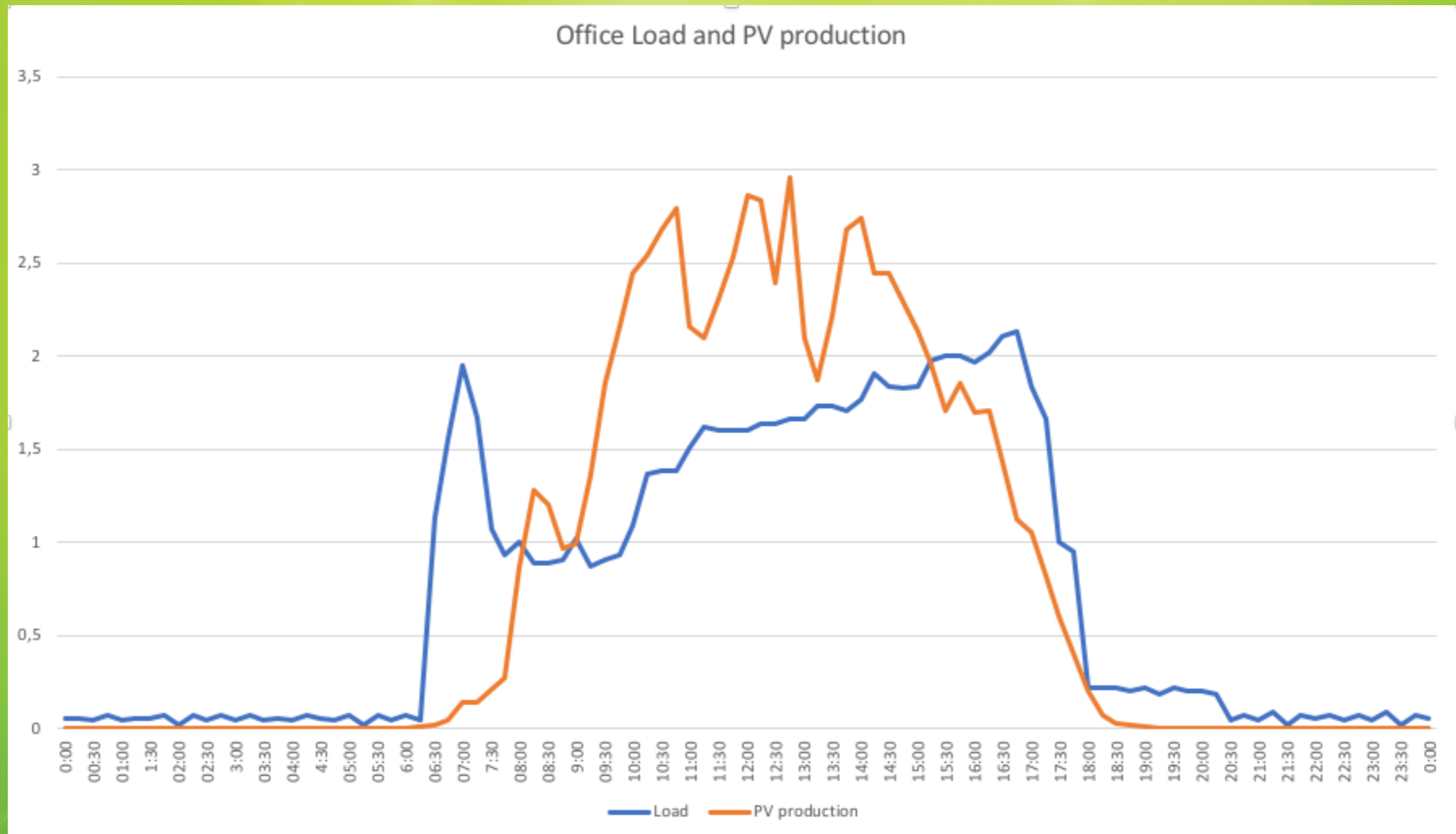


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Actual home power usage on Curacao

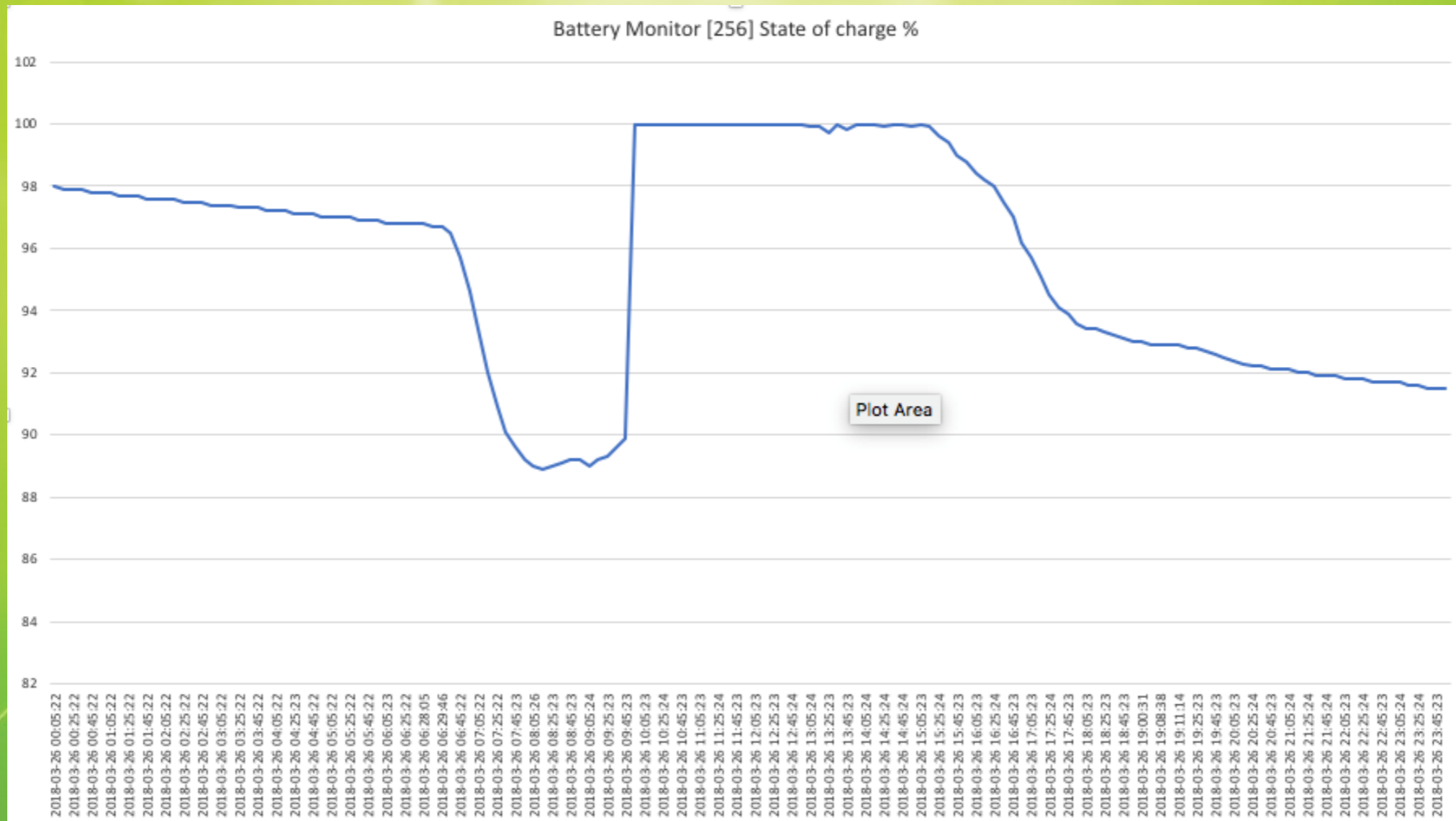


Actual office use and PV production

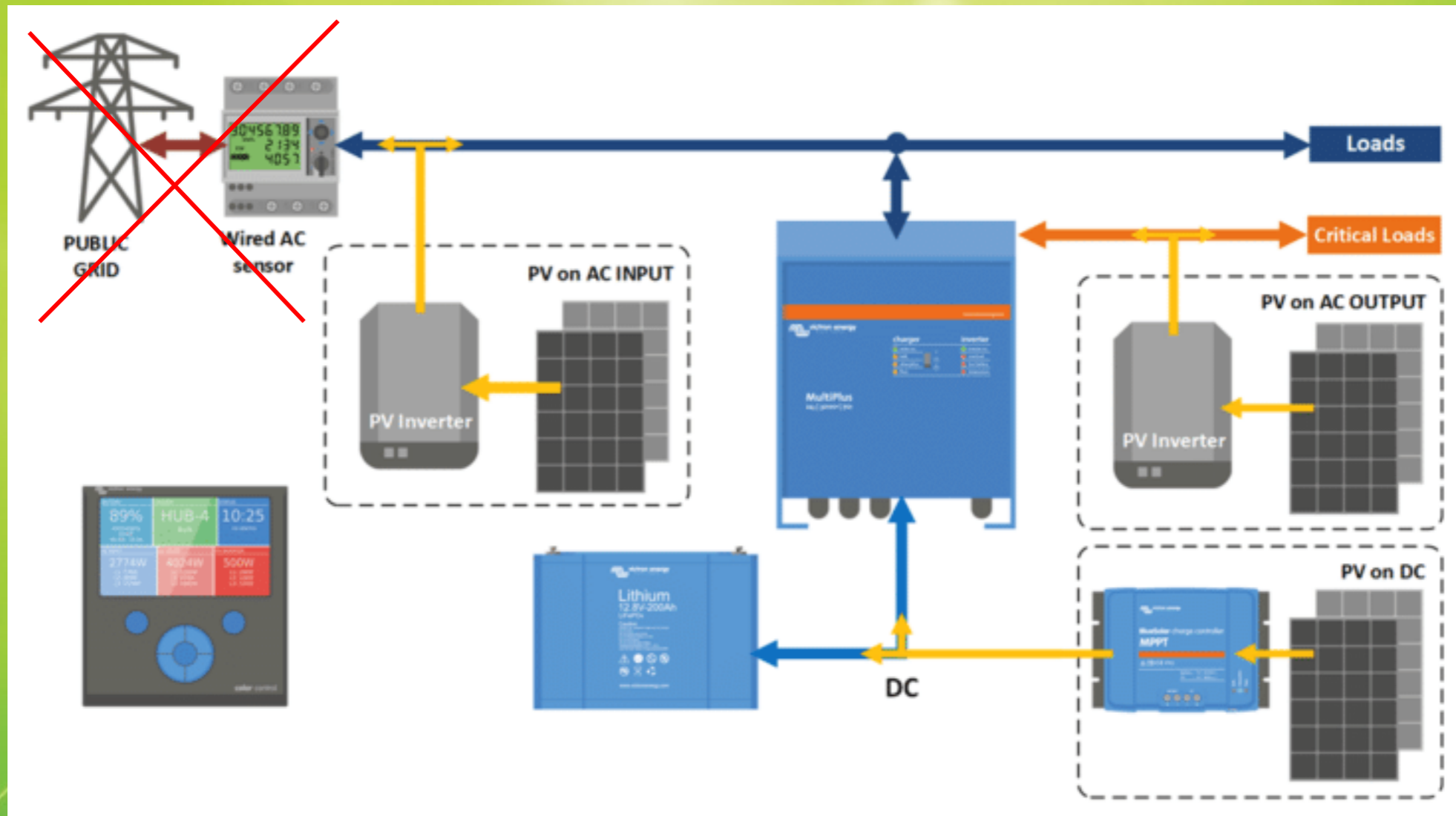


Actual storage deployment

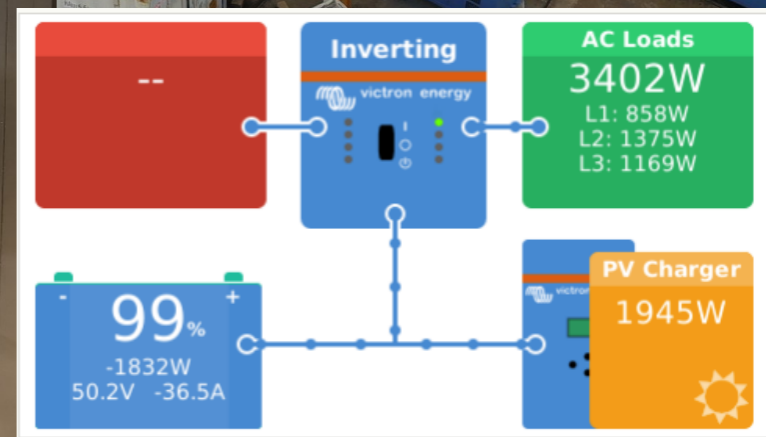
State of charge during a typical office day



Typical Solar/Storage setup



Dynaf Solar/Storage setup



Dynaf Solar/Storage setup

Brief description:

- 3x Victron Quattro inverter producing 380/220V 50Hz
- 1x Victron Quattro inverter producing 110V 60Hz
- 150 Solar panels (36 kWp)
- 4x Victron Bluepower PV Chargers of 100A 48VDC
- 3x SMA 6kW inverter feeding in at 220VAC
- 24x Rolls 2YS61P Battery (2017Ah @ 10Hr-48VDC)

Installation cost ANG 195.000, ROI 7 yr (no interest).



GROEN



Private home loads

Home is equipped with:

- All LED lighting
- Dishwasher, Washing Machine and heat pump Dryer
- Induction Cooking
- 3 kW EV Car charger
- Water pumps for irrigation, rainwater system and basement septic tank
- Normal use: fans at night and sporadic inverter airconditioning



Normal average usage

kWh usage without EV charging averages at 15 kWh/day

EV Charging adds 10-15 kWh/day

I have chosen a battery bank of 42kWh @ 50% DOD

Normal AQ cost without EV would be ANG 285 / month

AQ cost including EV would be ANG 570 / month



Private home setup

Brief description:

- Victron Quattro inverter producing 380/220V 50Hz
- Victron Quattro inverter producing 110V 60Hz
- 30 Solar panels (7,5 kWp)
- 2x Victron Bluepower PV Chargers of 100A 48VDC
- 24x Rolls 2KS33P Battery (1635Ah @ 10Hr-48VDC)

Installation cost ANG 60.000, ROI 8,5 yr (no interest).



Case study: 100 kWp Business direct use



Case study: 100 kWp Business direct use

Multiple installations of 100 kWp on hardware and supermarket stores

Investment 2019:	ANG 200.000
Average production:	160 MWh yearly
Avoided Aqualectra cost:	ANG 92.000/yr
Grid connection fee:	ANG 19.200/yr
Maintenance:	ANG 5.000/yr
ROI:	2,9 yr



What's next to reduce Oil dependency?

