

17-21 JUNE 2019
EU SUSTAINABLE ENERGY WEEK
SHAPING EUROPE'S ENERGY FUTURE



#EUSEW19

Massive Wind Integration on the Faroe Islands



with Li-ion energy storage

The Faroe Power System

- SEV: vertically integrated utility

Target 2020: 75% renewables with hydro & wind

- New 12MW wind farm with ESS in 2015

Total wind capacity 18MW
 = 30% of total generation capacity
 = 18% of yearly energy consumption

- Long term vision

Two-fold increase of energy consumption by 2030
 Target: 100% renewables

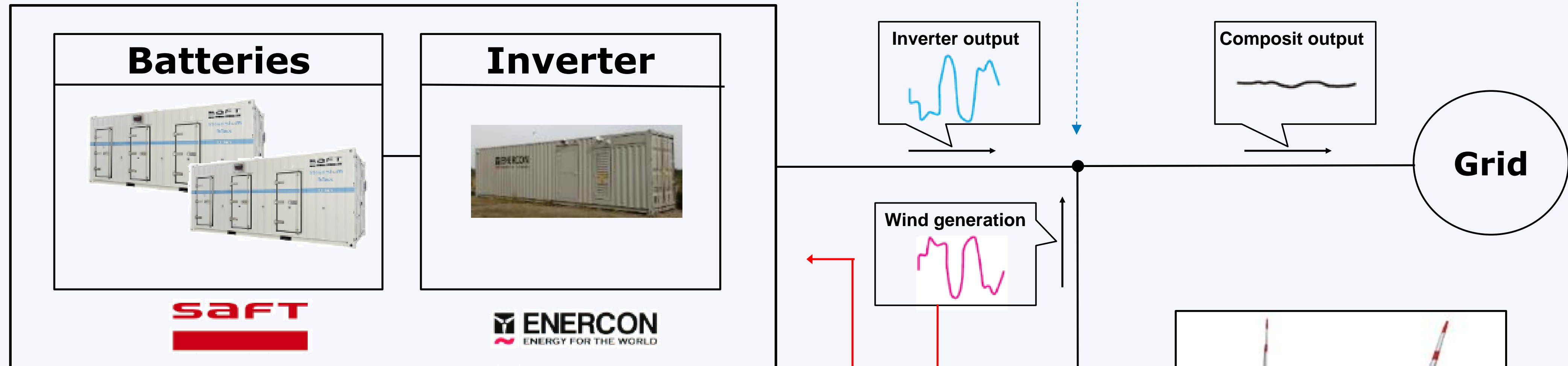


18 islands - 50 000 inhabitants, 300 GWh/year



Storage Need and Solution

Ramp control: max 1MW / min $\uparrow\downarrow$
at point of grid connection



2 Intensium Max 20P	
Energy	707 kWh
Continuous discharge power	2 400 kW
Continuous charge power	1 500 kW
Nominal voltage	623 V
Voltage range	525V – 700V

Enercon Smart Container	
Apparent power	2300 kVA
AC Voltage	LV: 400V MV: 20 kV
DC Power	2 400 kW
DC Voltage Range	345 – 705 V
DC Current	1000 A



Wind farm

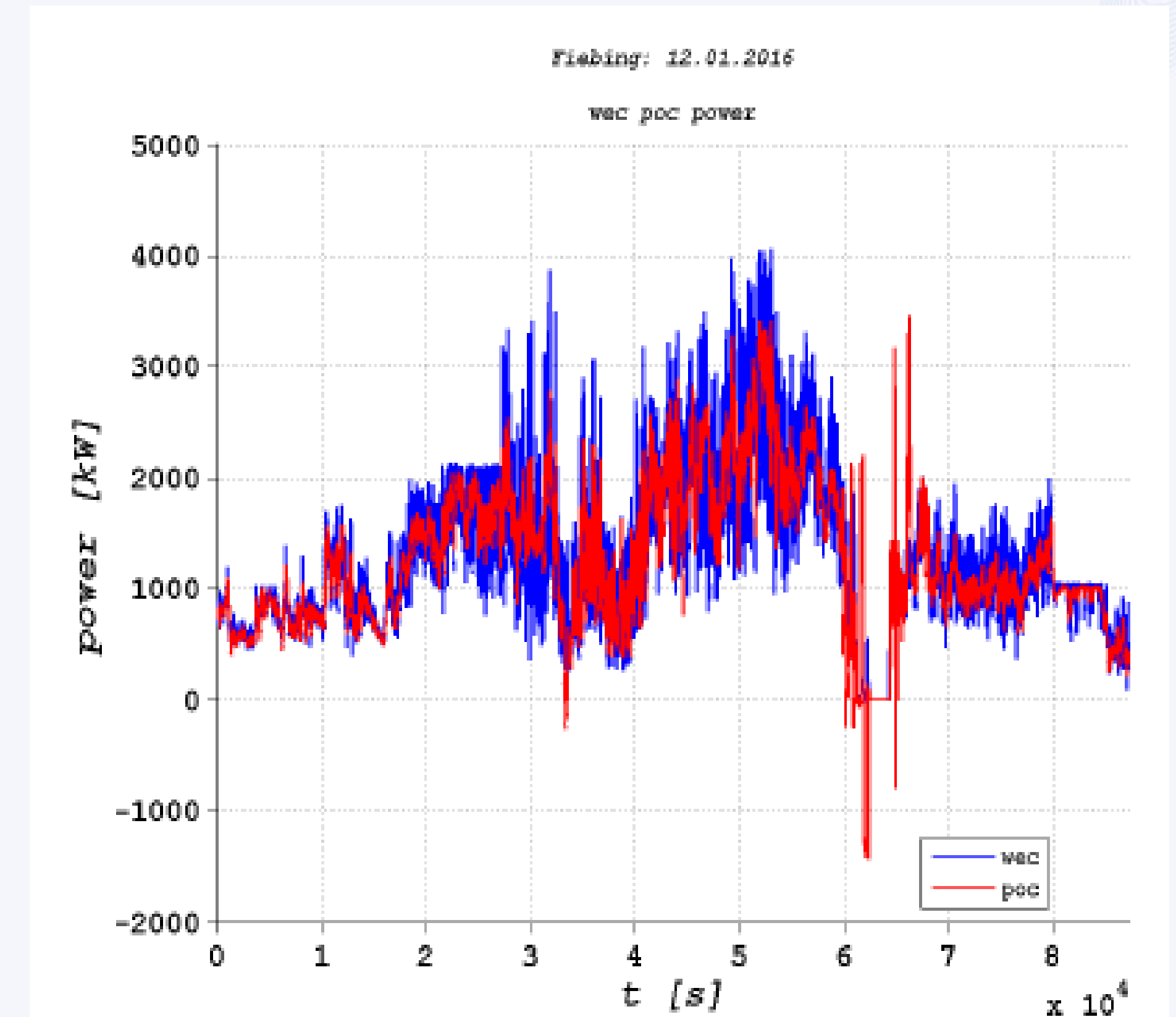
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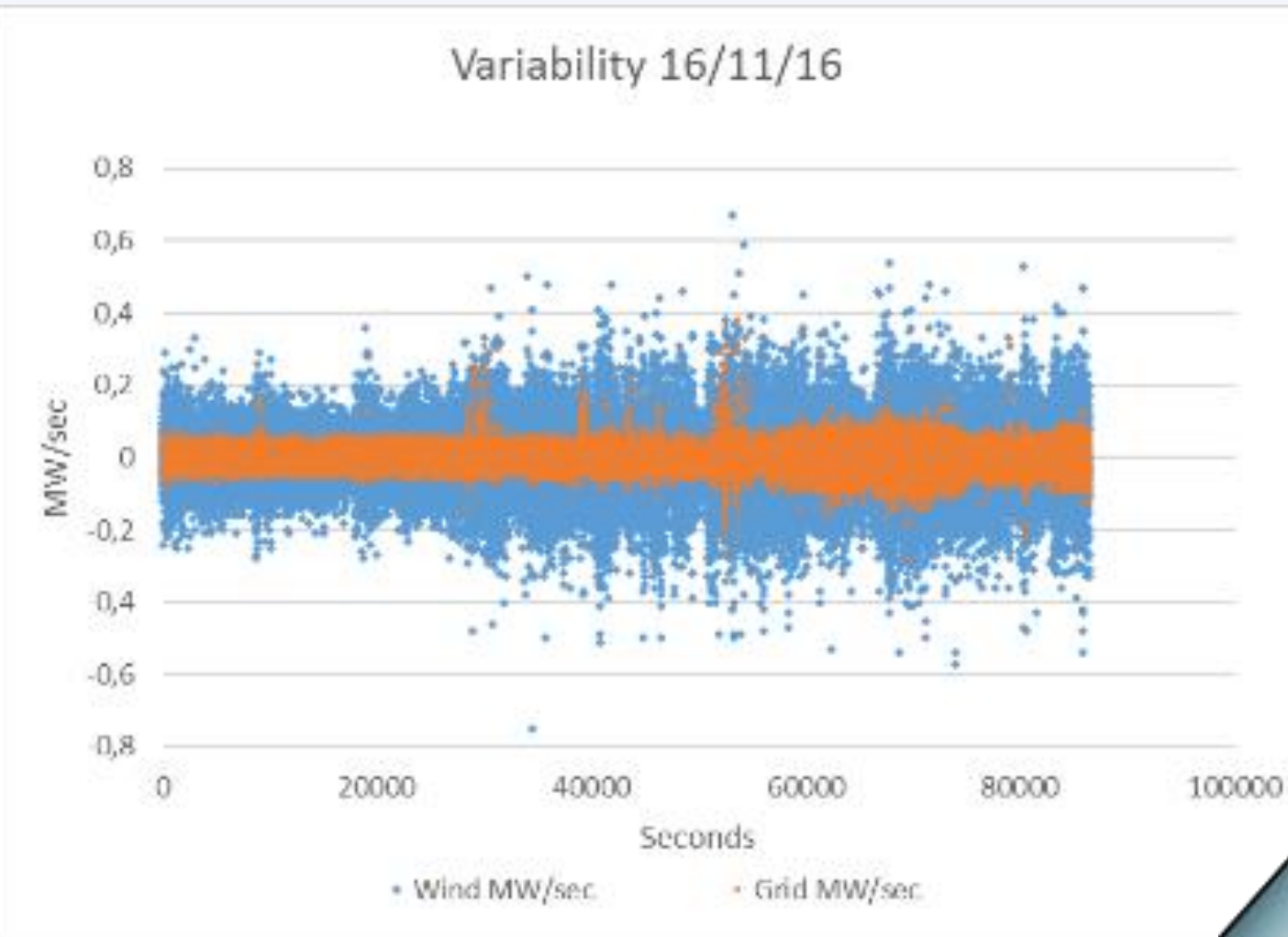
Performance Simulation

- Compliance of 1MW /min ramp rate > 99%
- AC roundtrip efficiency including PCS & auxiliaries 86.2%
- Total efficiency losses of wind energy generated 0,22%
- Avge daily energy throughput of BESS 261%
- Capacity loss after 20 years operation 21%

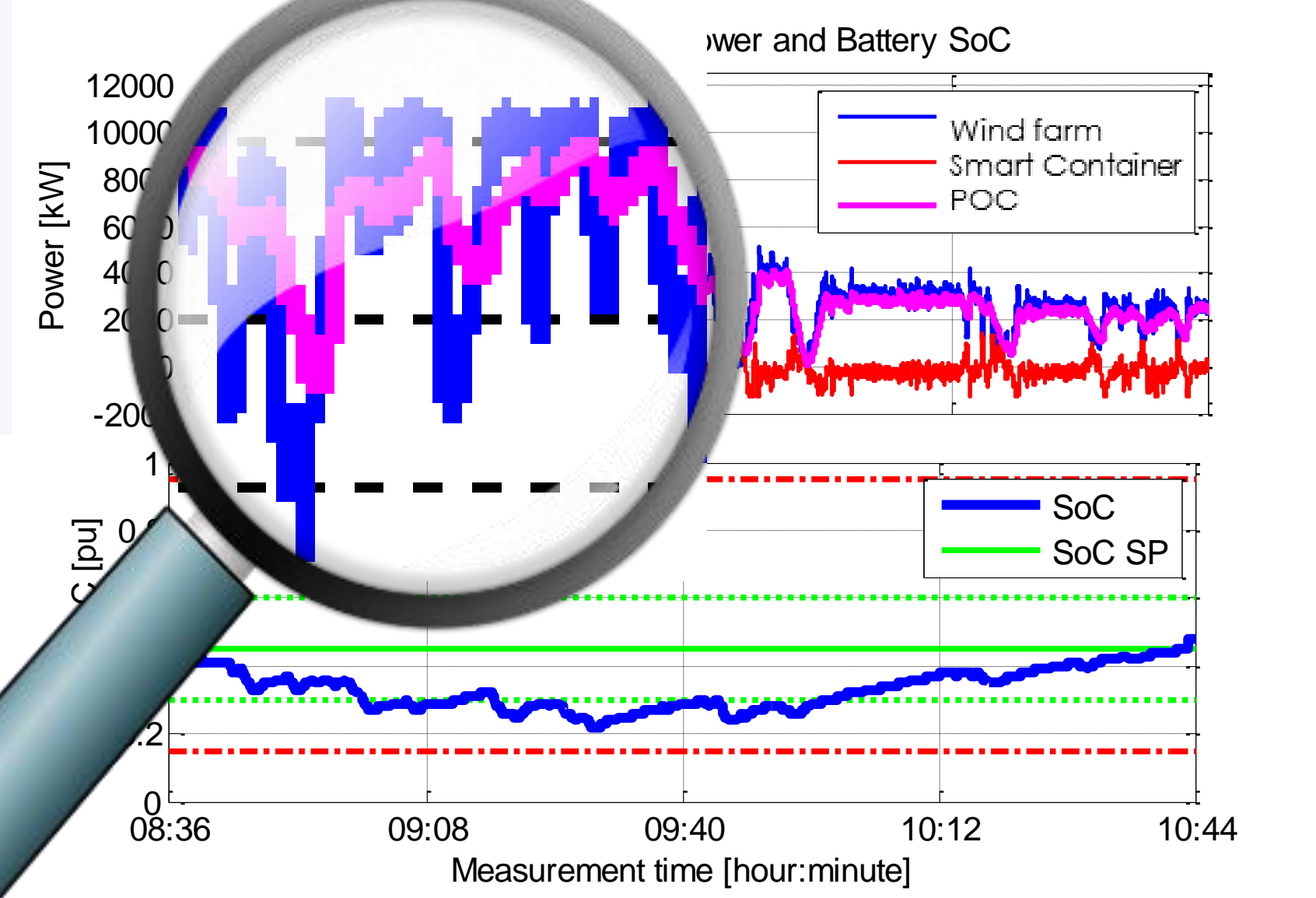




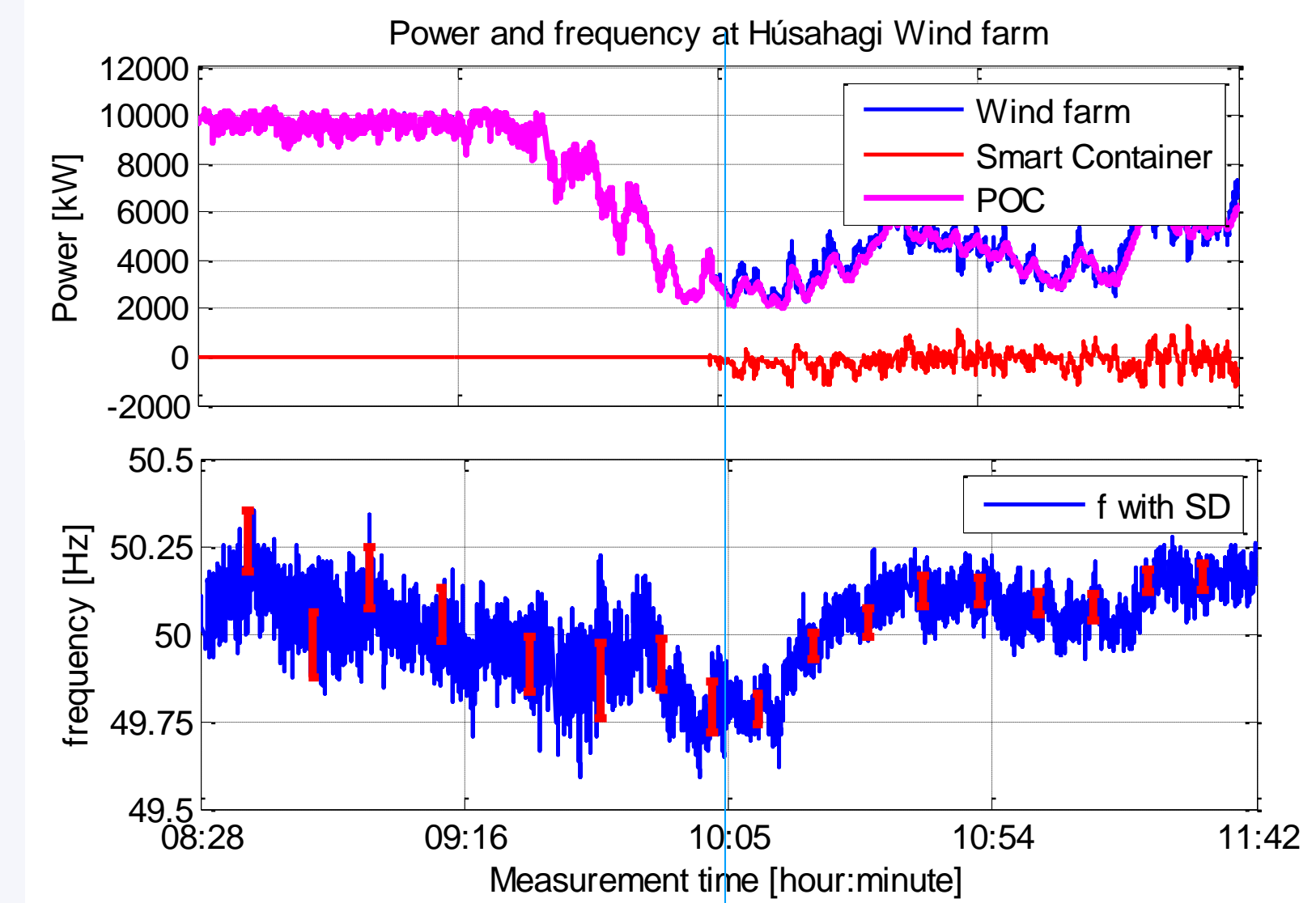
Results



Reduced variability at point of connection (POC)



**Evolution of power flows
State of charge Control**



without ESS **with ESS**
Reduced standard deviation (I) of frequency

Curtailment decreased from ~30% below 10% → lower diesel consumption

Conclusion: a compelling use case



- Operation of island grid with up to 80% wind penetration is possible
- Curtailment reduced by 2/3
 - ➔ 5 GWh additional wind generation / year
 - ➔ 1000 t of fuel saved / year
- A small ESS to reduce Capex
Managing short term variability needs power, but only little energy

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