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The potential of dynamic control algorithms to reduce OPEX in off-grid energy systems

15.10.20 | Jonathan Schulte

HOMER International
MICROGRID Conference | 8th Annual | #HIMC2020

Why are operational costs high in many African countries?

No skilled onsite labour

Poor infrastructure

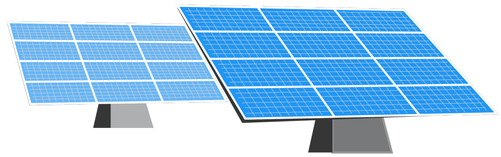
High temperatures

Low availability of equipment

- Rafiki Power

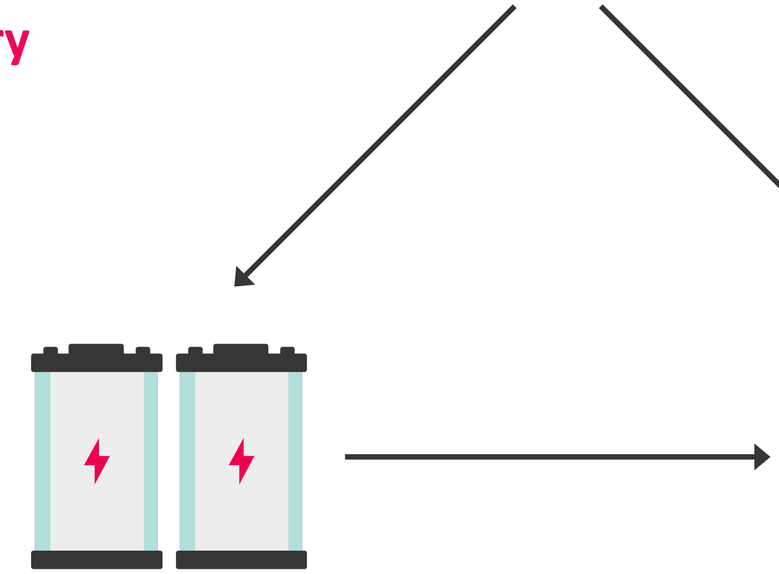
- Rafiki Power

Reduce operational costs



Lithium-Ion Battery

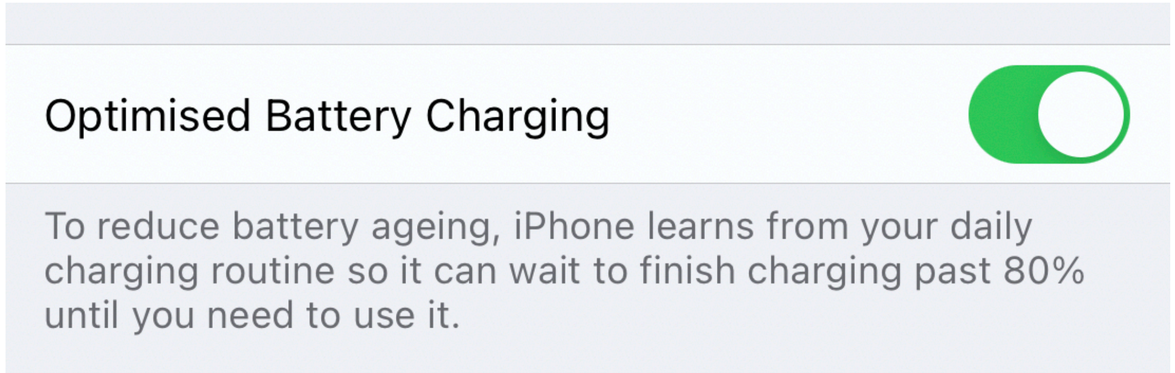
- **Cost driver:**
  Replacement
- **Decrease costs:**
  Increase lifetime



Load

- **Condition:**
  Prevent any additional power outages

How can the lifetime of a lithium-ion battery be increased?



Keep the **State of Charge** low

How can the Apple Battery Optimizer be applied to Off-Grid systems?

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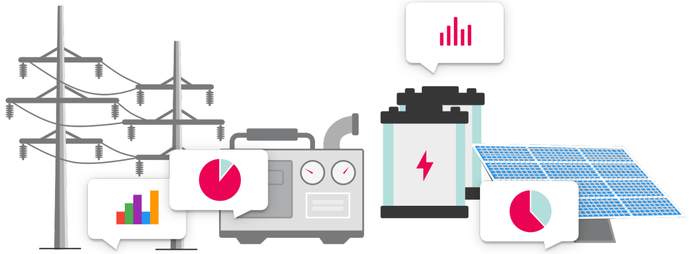
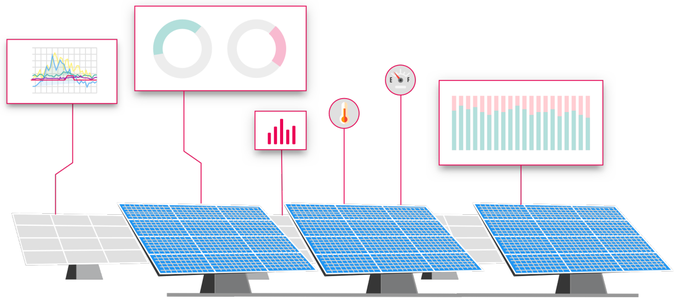
Remote monitoring and management platform for energy service companies

Data-driven operational excellence

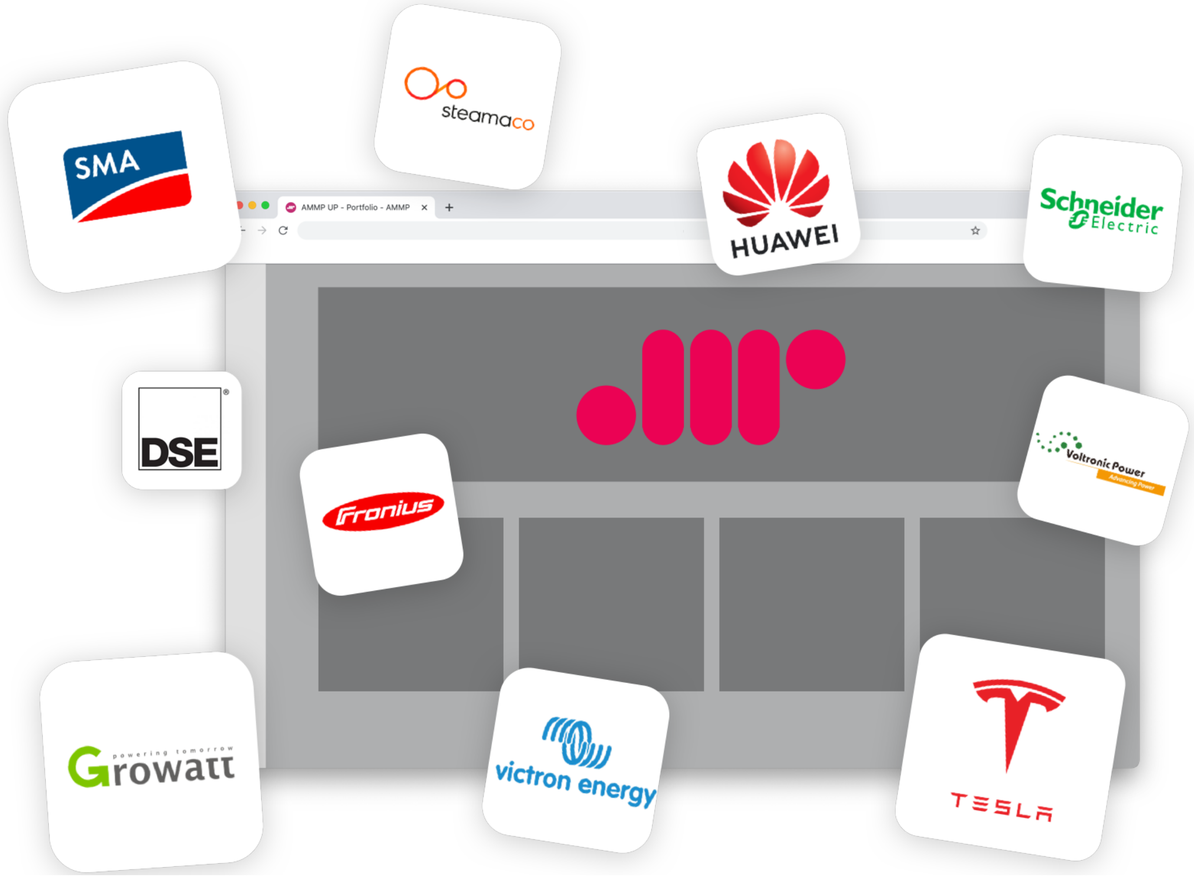


Data Acquisition



Analytics

Operational Intelligence



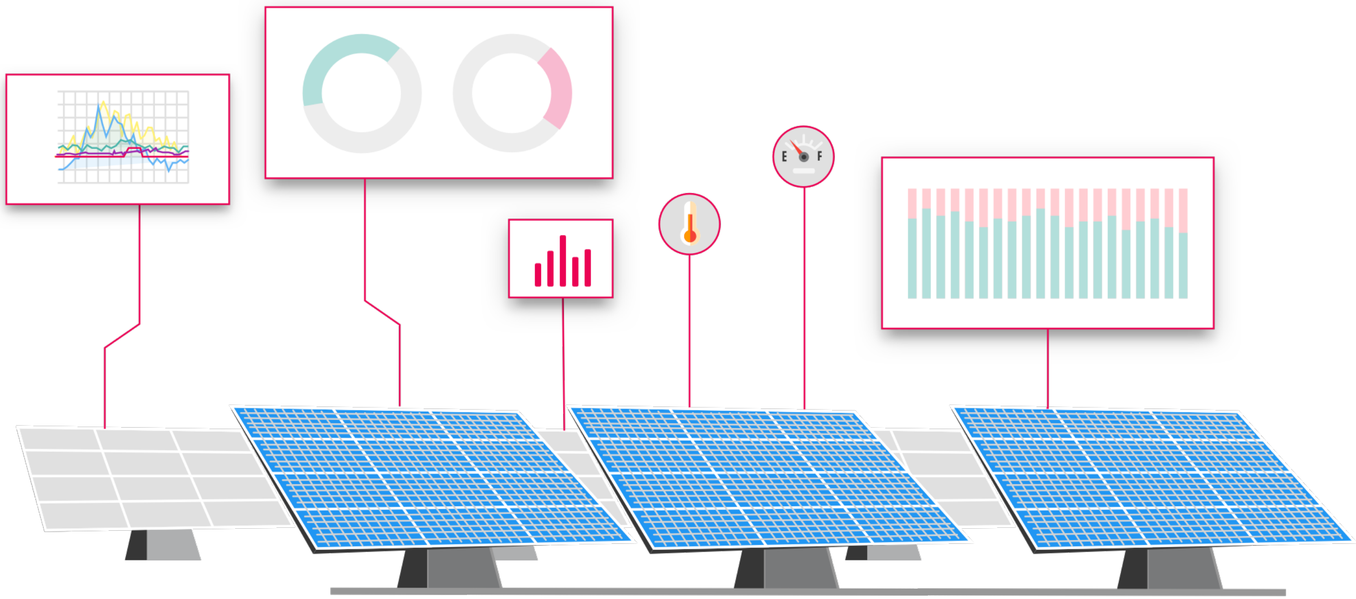
Limitless Integrations

Vendor and technology-agnostic. Process data from PV, battery inverters, diesel generators, smart meters, grid and meteorological sensors.

Digital Twin

Our smart ‘digital twin’ technology creates a digital model of your power systems. This way, we make sure to provide the right insights for each device, in real-time.

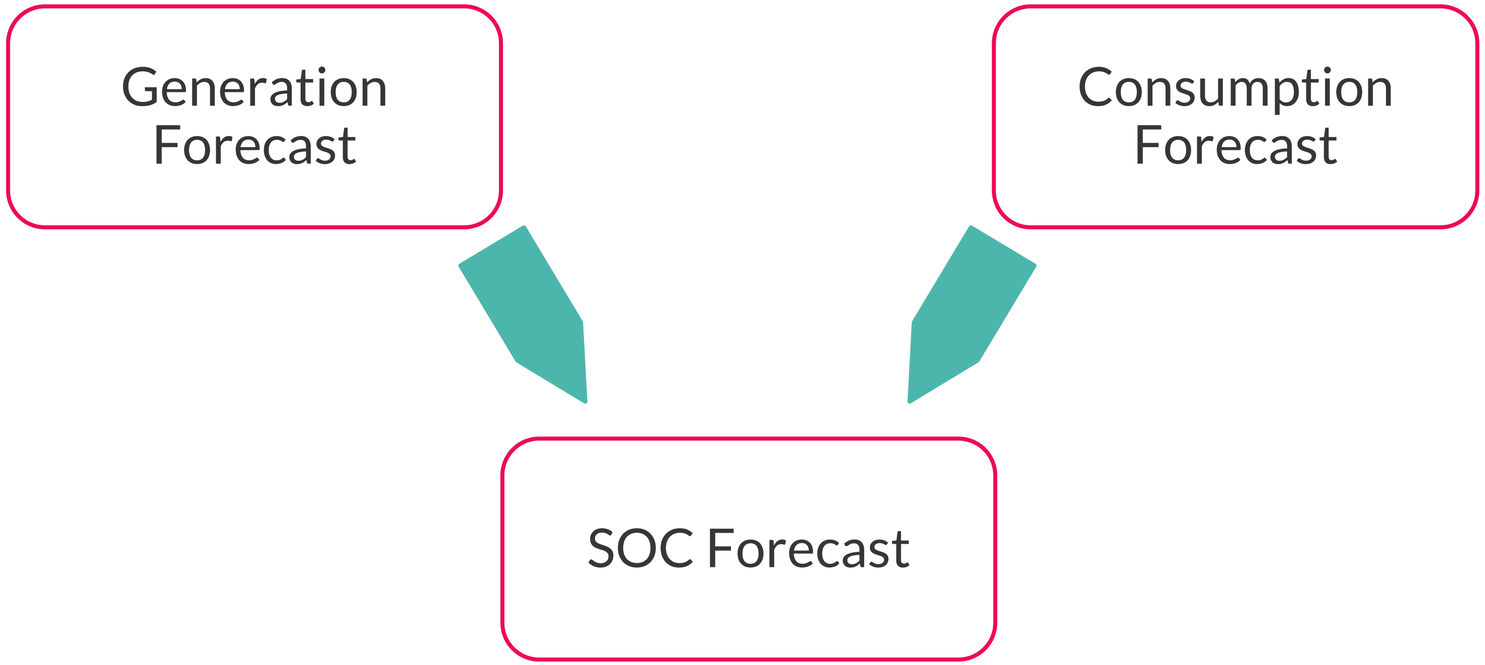
AMMP seamlessly aggregates data on an asset and portfolio level without comprising quality and reliability.



Monitoring 1000+ systems

How can the Apple Battery Optimizer be applied to Off-Grid systems?

Forecast



How can the Apple Battery Optimizer be applied to Off-Grid systems?

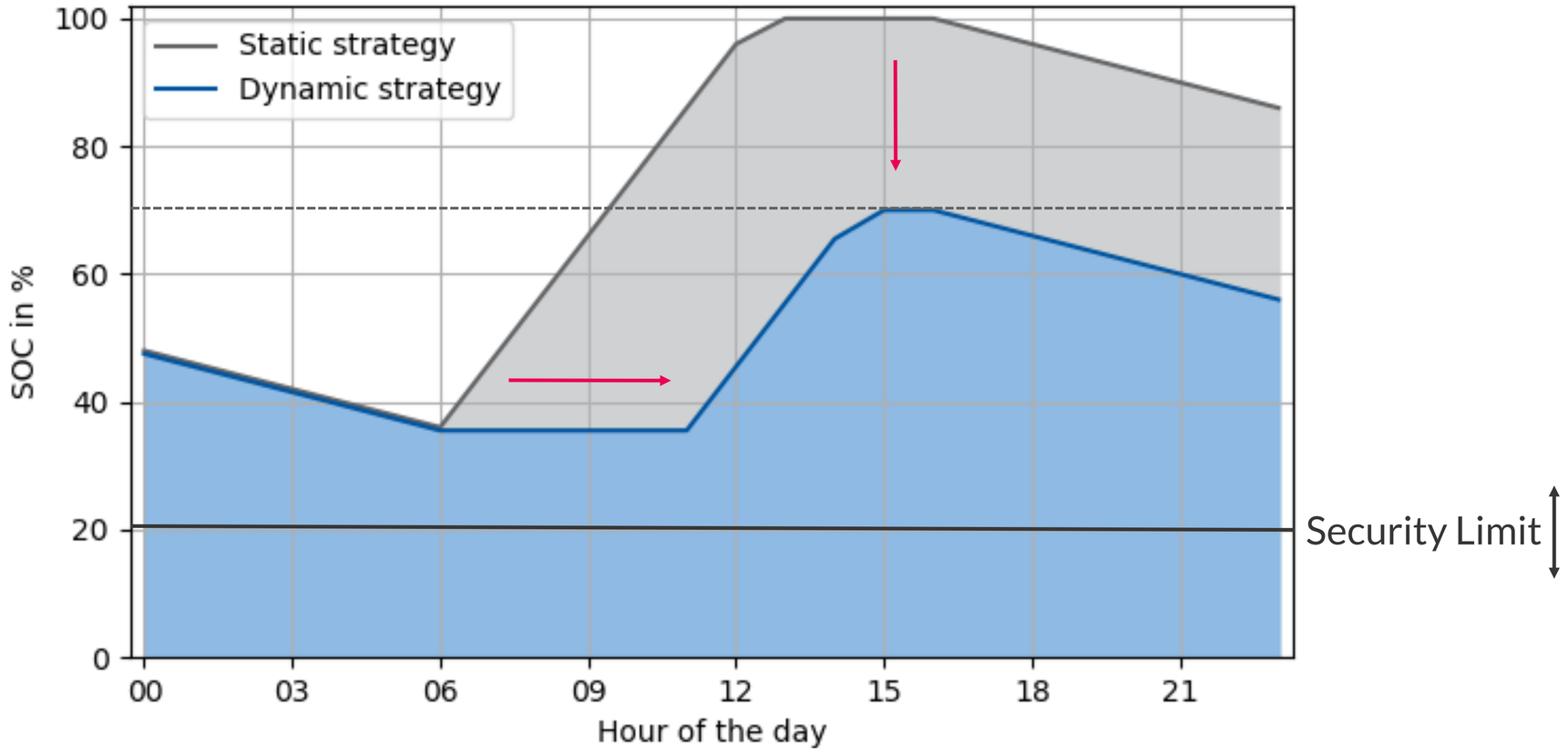
Proposed operation strategy

Goal

Reduce Battery SOC where possible

Condition

Avoid additional power outages



Results

System with **slightly undersized** battery

	Power outages	Average SOC	Full charged time
Static control	125h per year	70%	7h per day
Dynamic control	140h per year	65%	4h per day
Difference	**15h per year more**	**5% less**	**3h less**

Lower SOC vs more power outages

Results

System with **slightly oversized** battery

	Power outages	Average SOC	Full charged time
Static control	0h per year	90%	9h per day
Dynamic control	0h per year	75%	1h per day
Difference	**0h per year more**	**15% less**	**8h less**

Lower SOC and no additional outages

Summary

- Lower State of Charge (SOC) results in longer lifetime
- Forecasts enable an optimized State of Charge
- SOC can be hold at a lower level especially good for oversized batteries

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Thank you!

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Results

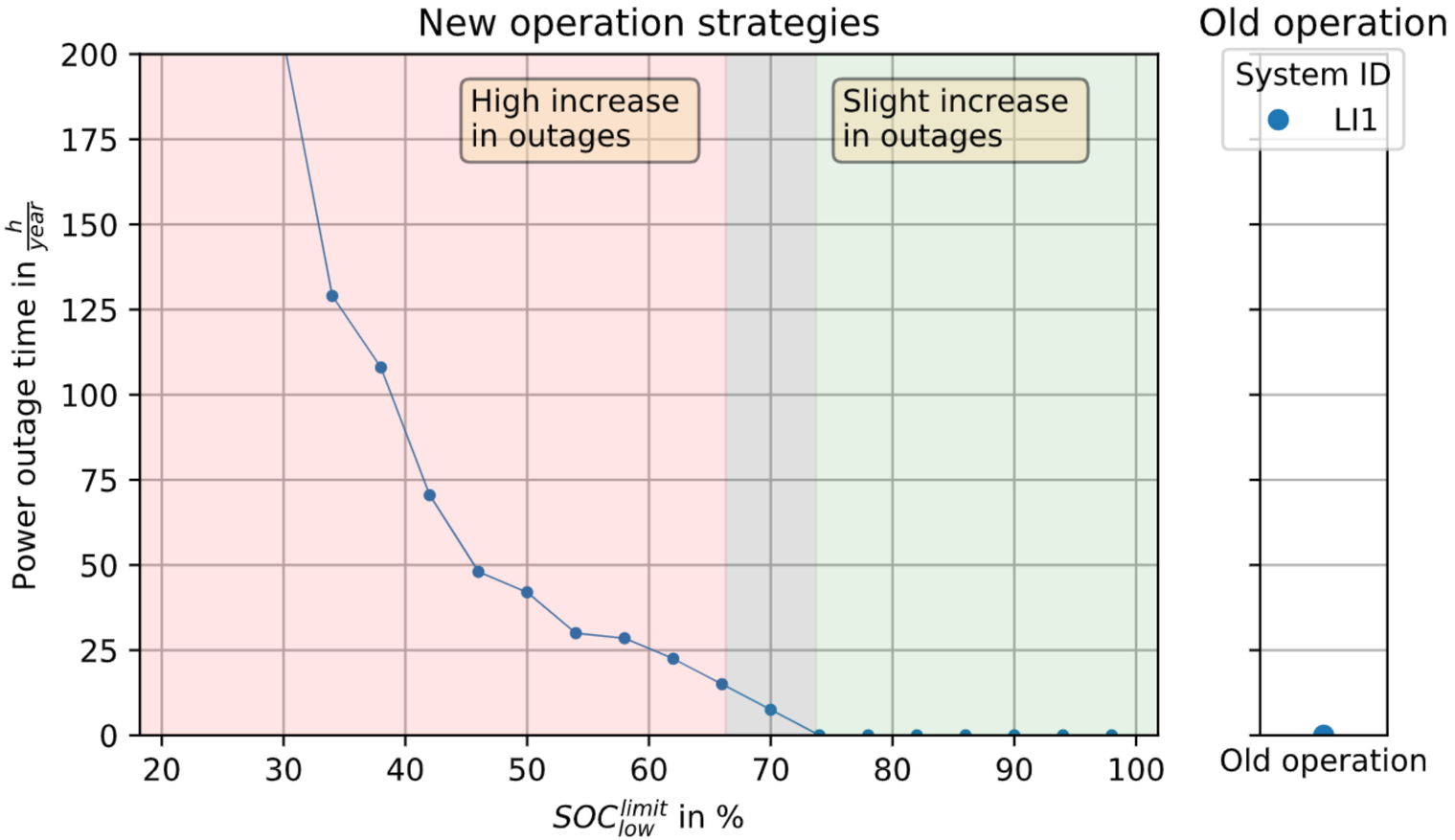
System with **normal sized** battery

	Power outages	Average SOC	Full charged time
Static control	25h per year	80%	8h per day
Dyanmic control	27h per year	70%	3h per day
Difference	**2h per year more**	**10% less**	**5h less**

Lower SOC and very few outages

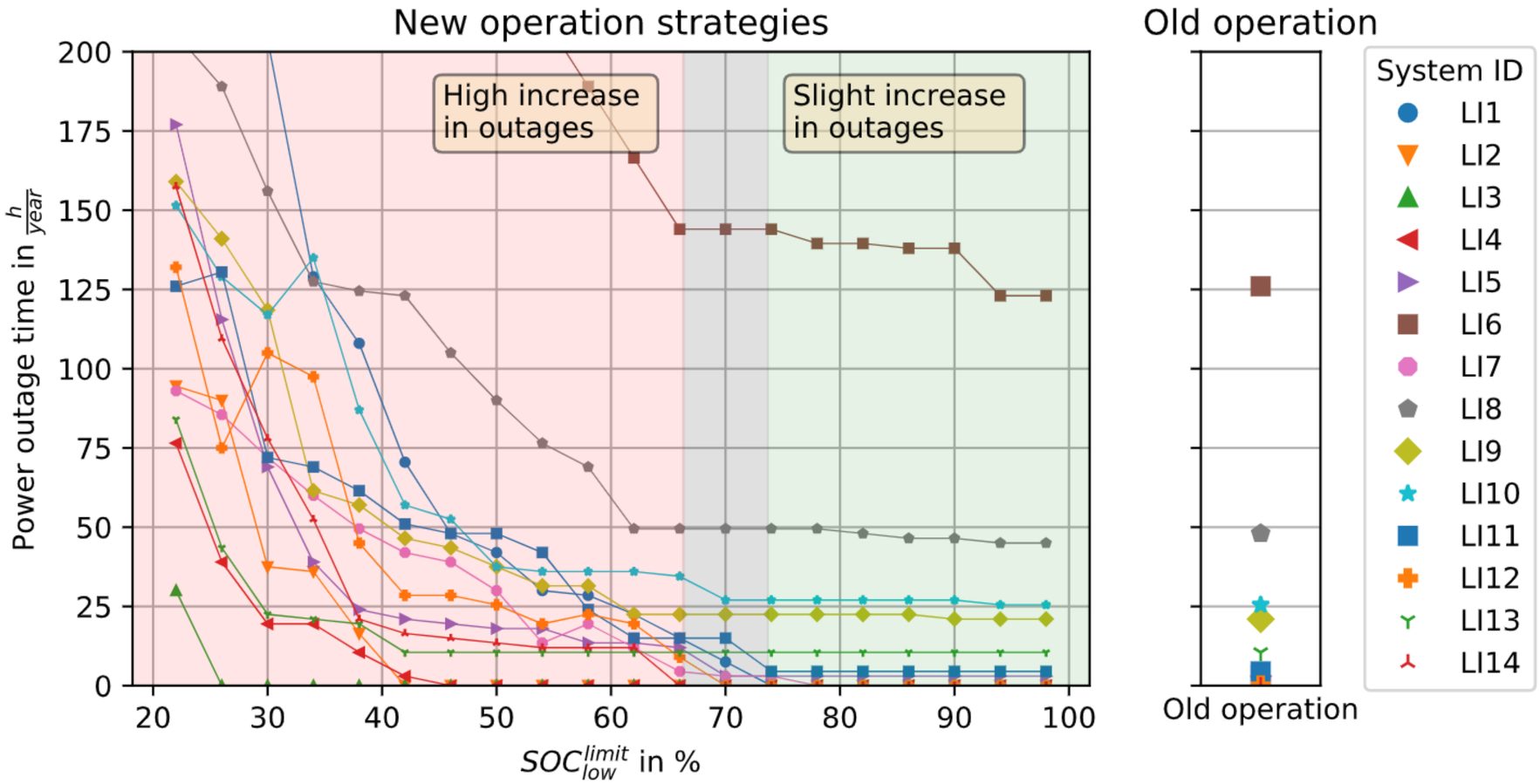
Results

Additional power outages



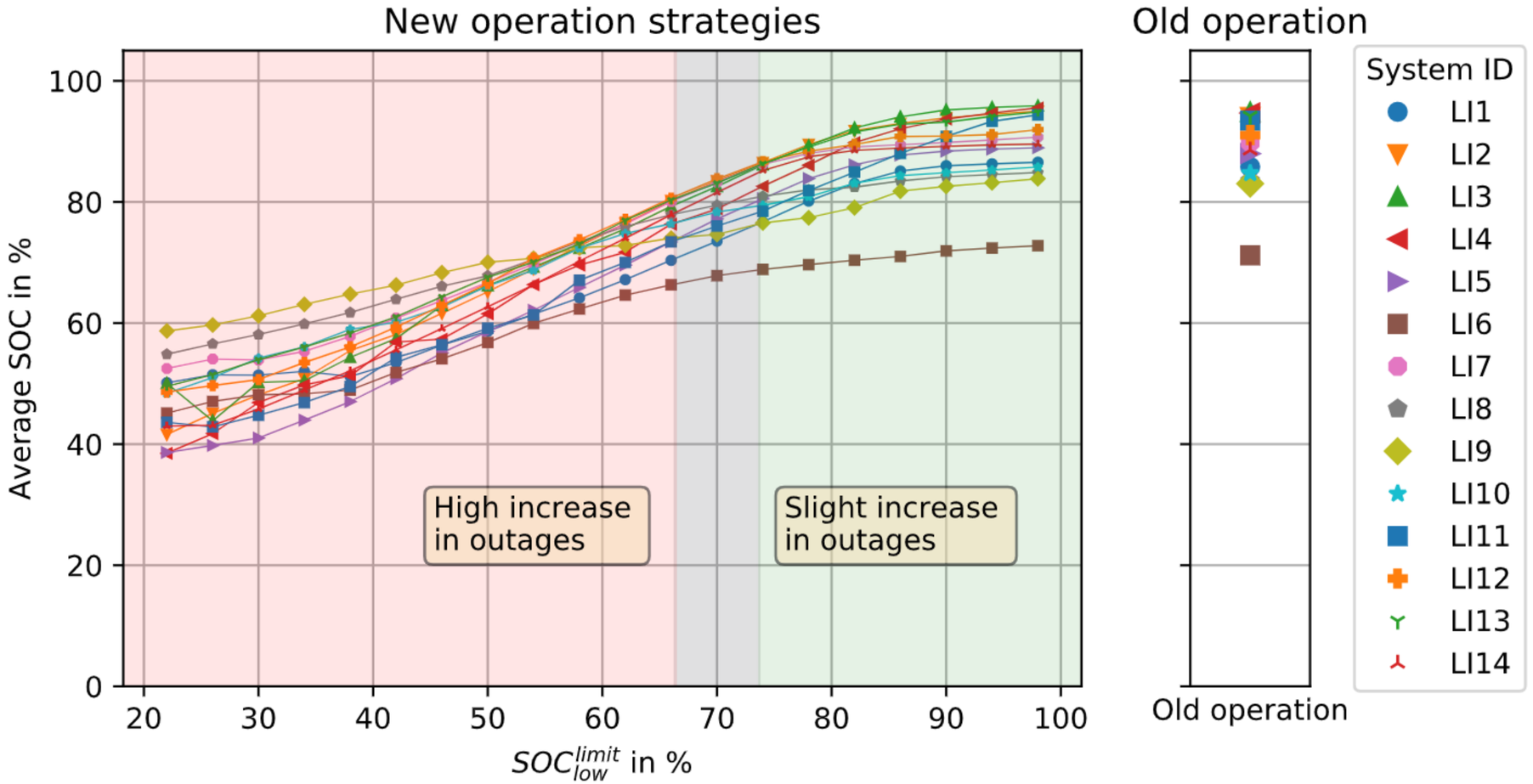
Results

Additional power outages



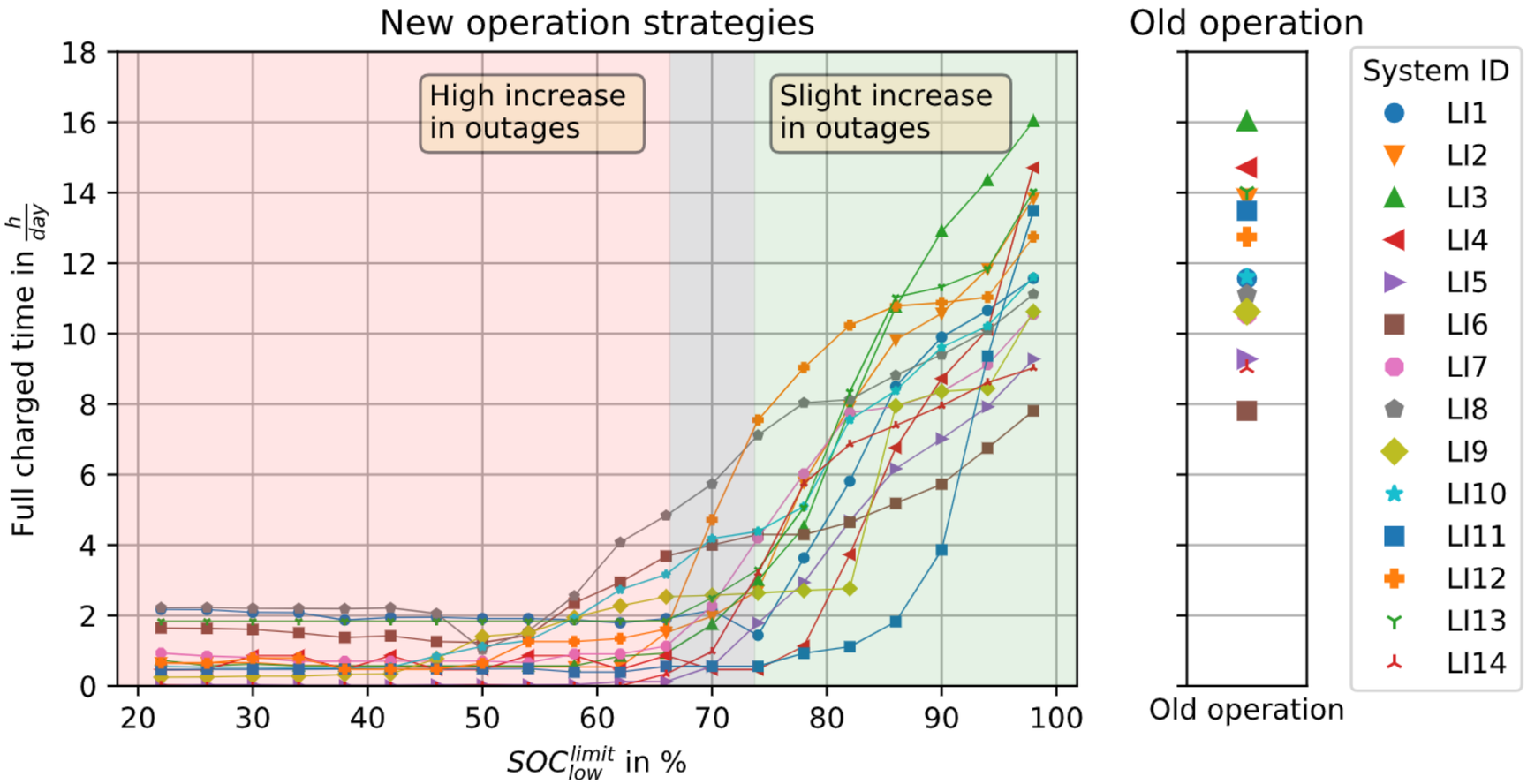
Results

Average SoC

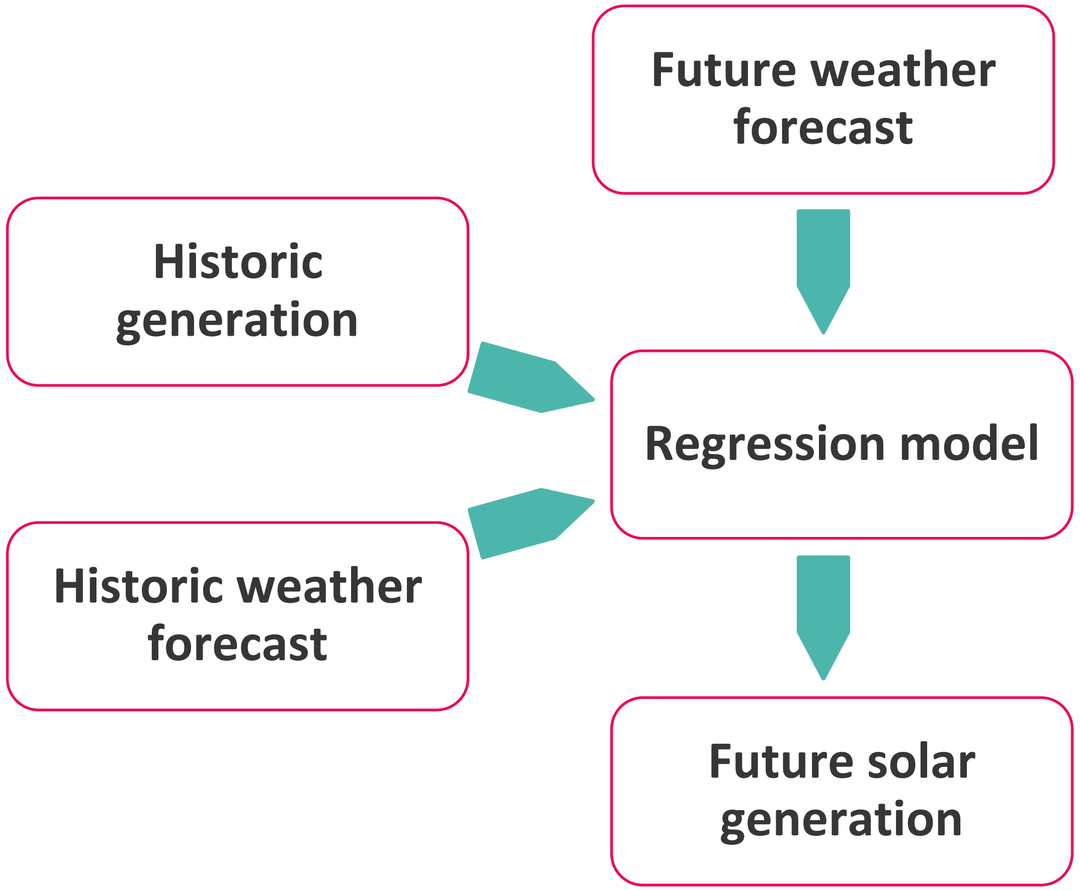


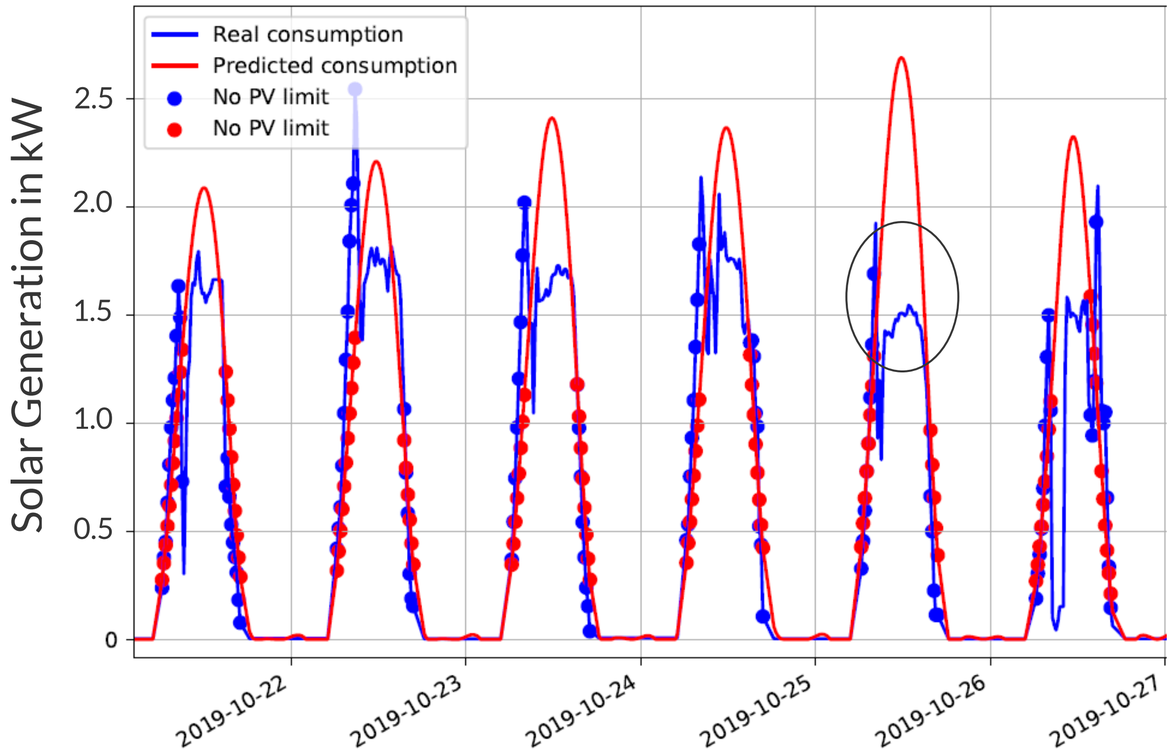
Results

Full charged time



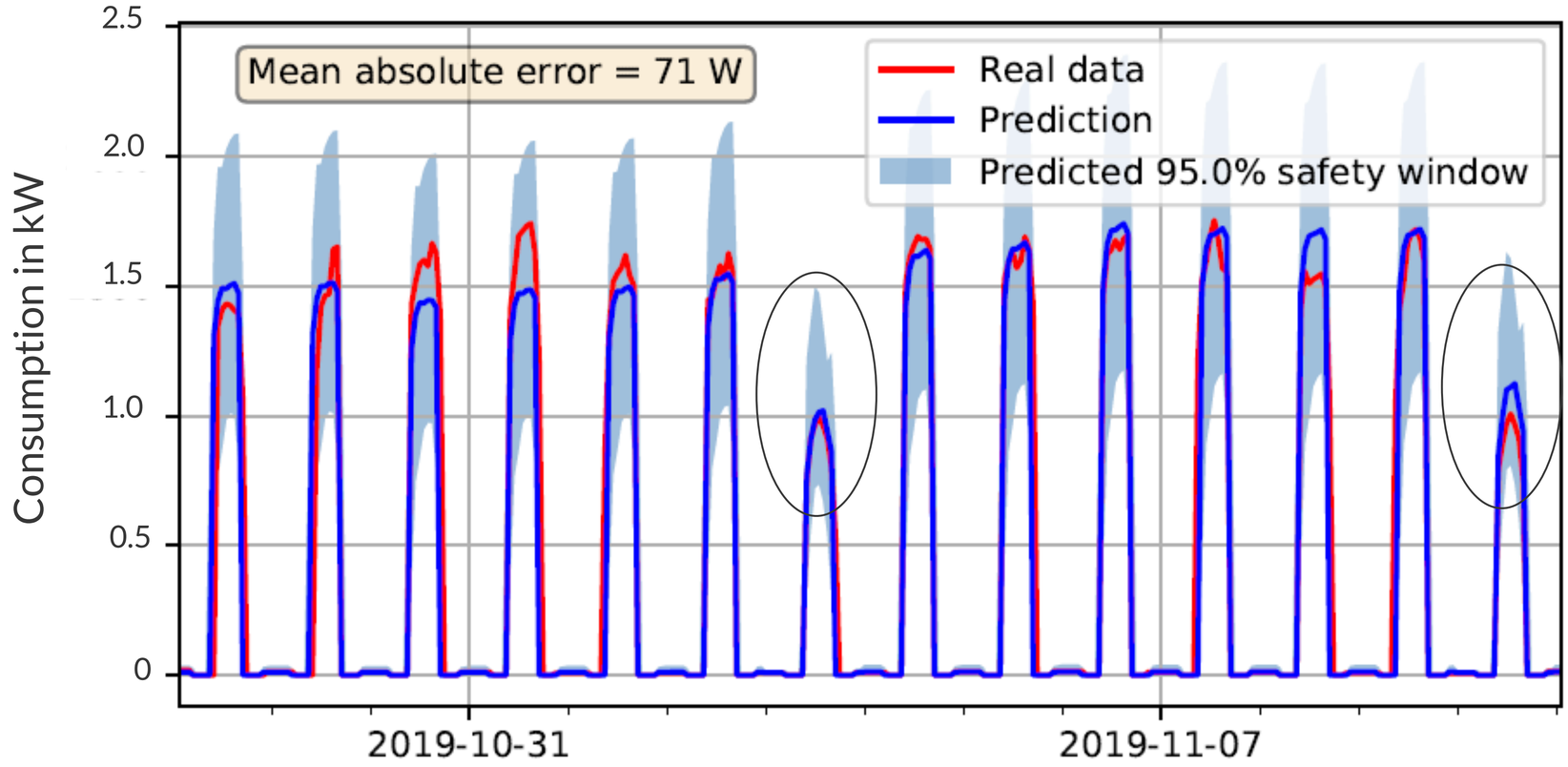
How can the Apple Battery Optimizer be applied to Off-Grid systems?



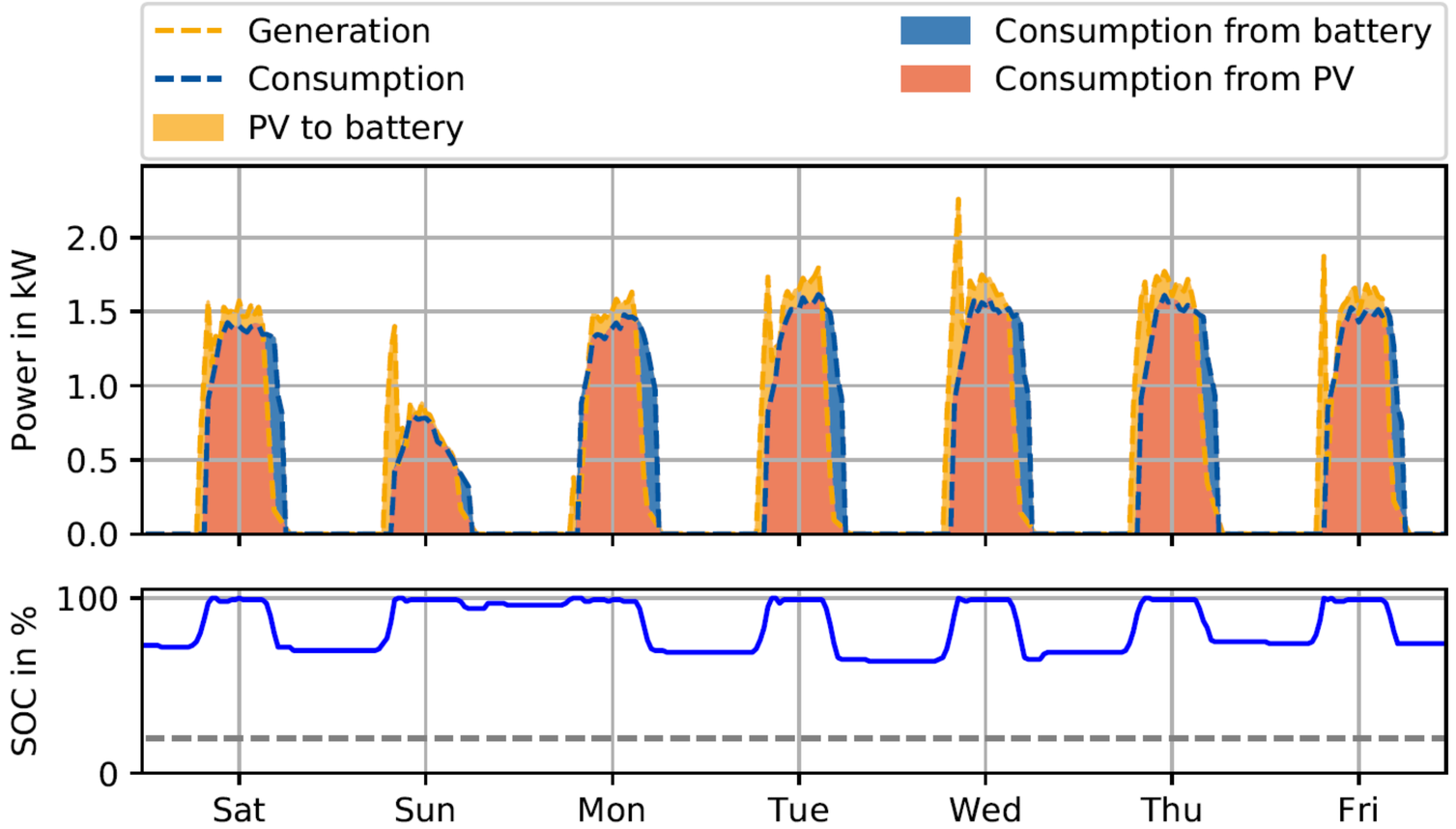


Consumption forecast

Historical data → **Weekday clustering** → **Forecast**



Example system operation (1 of 14 systems)



Key system information	
System Type	Off-grid with Battery
PV capacity	9.75 kWp
Battery capacity	10 kWh
Battery chemistry	Lithium (LFP)
Application	Local market shops
Location	Nigeria