

Hybridization of Redox Flow Batteries

sustainable | cost effective | highly flexible



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Technology Centre of Energy – A research institution of the Landshut University of Applied Sciences



Battery experts at Landshut University of Applied Sciences under the scientific leadership of Prof. Dr. Karl-Heinz Pettinger



10 years of active battery research - Process-oriented and industry-related research on lithium-ion and redox-flow batteries.



30 battery-related research projects - From cell to the system: semi automated cell production, system optimization, battery management,...



Project partners from approx. 20 countries - Strong scientific and industrial networking, e.g. through research platforms.



25 active scientists working in 700m² office and 1.000m² laboratory space.



Herausgeber / vydavatel:
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Kartografie / kartografova:
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HyFlow Key Facts



Key Facts:

- 11 Partner
- 7 countries
- Project duration: 36 month
- Project start: 01.11.2020

Highlights:

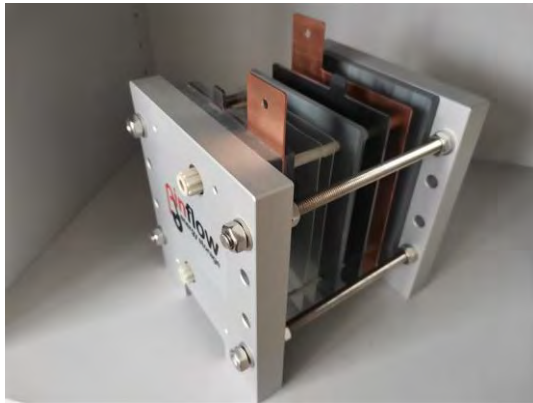
- Operating along the entire component portfolio and supply chain.
- Combining interdisciplinary knowledge and experience of eleven partners.
- Supported by industrial partners



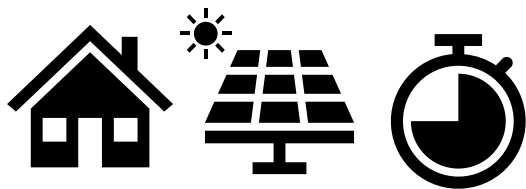
Next Generation Energy Storage – HESS



Eco Friendly, High Power & Energy, High Efficiency and Long Lifetime Energy Storage



Redox Flow Battery



Hybrid Energy
Storage System



Supercapacitor





Develop **high-power vanadium redox flow batteries**



Develop **green aqueous based supercapacitors** with increased cell voltage



Develop **advanced component management** systems for HESS



Develop **discrete and optimized simulation models** for each of the HESS components



Demonstrate of an **adaptable EMS** for **different applications**



Improve **ecological sustainability** of the HESS

Application Level 1: Lab-scale demonstrator: New developed components including highly advanced and flexible management systems





Photo from ICT

Application Level 2:

Industry-scale demonstrator: Hybridize an existing 300kW VRFB system with and SC and fast-response algorithms for momentary reserve

5 OR
MORE
BUSINESS
MODELS
ARE
POSSIBLE
FOR THE
SAME
BATTERY-
SYSTEM



PRIMARY TASK:

IDENTIFICATION
OF USERS
TARGETS
(BUSINESS AND
TECHNICAL)

Grafik 6

Hybridization: The Best of Two Worlds



Device A:

High Energy

Medium Power

300 Wh/kg

500 W/kg

Device B:

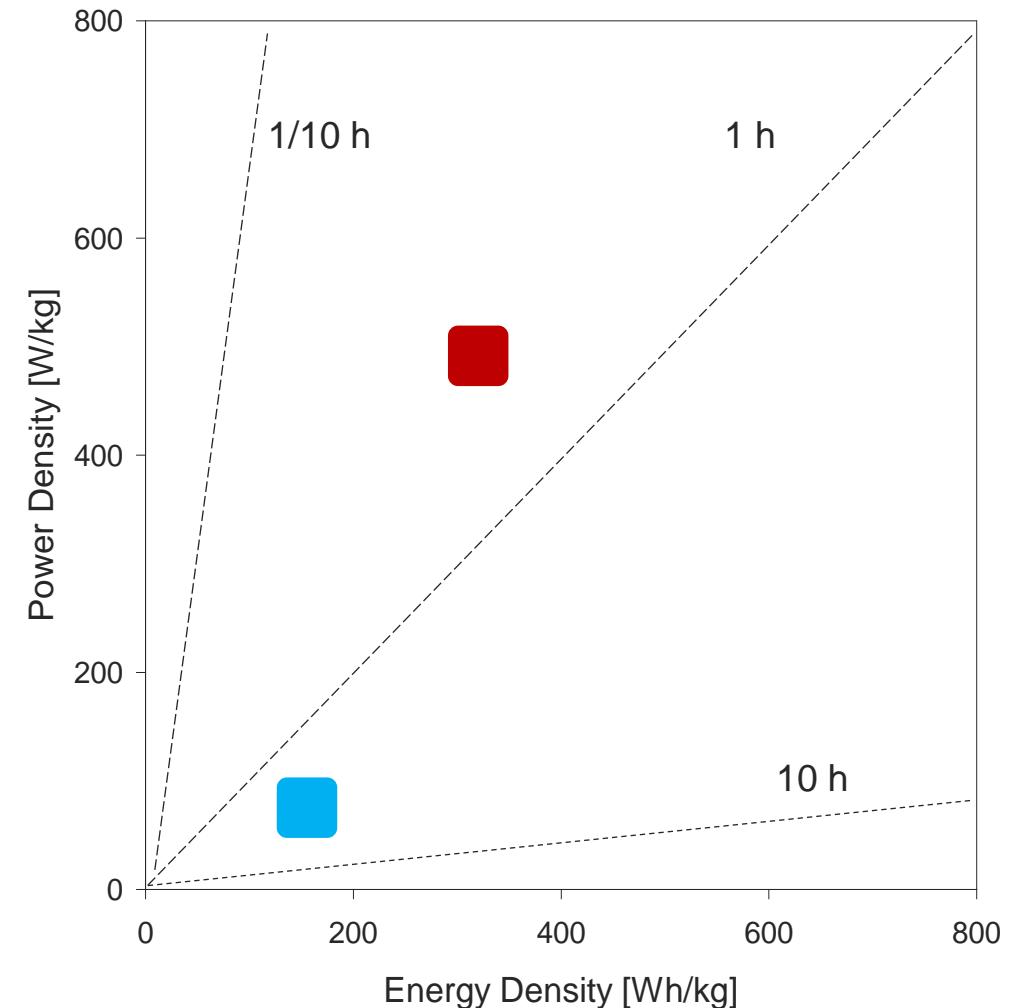
Medium/Low Energy

Low Power

150 Wh/kg

80 W/kg

Information concerning typical charge/discharge-times of a component is provided by the Ragone-plot (linear axes !!!)



Use Case 1:

Hybridisation in Industry, Graphite Production

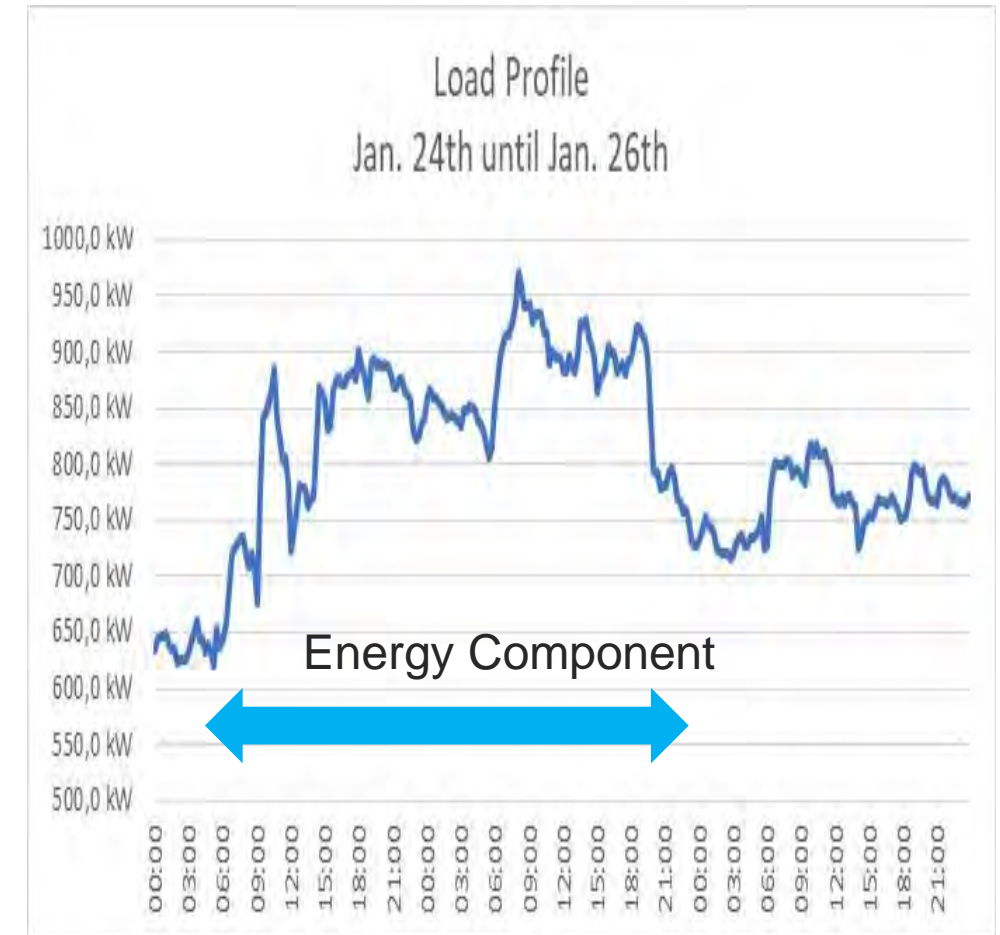
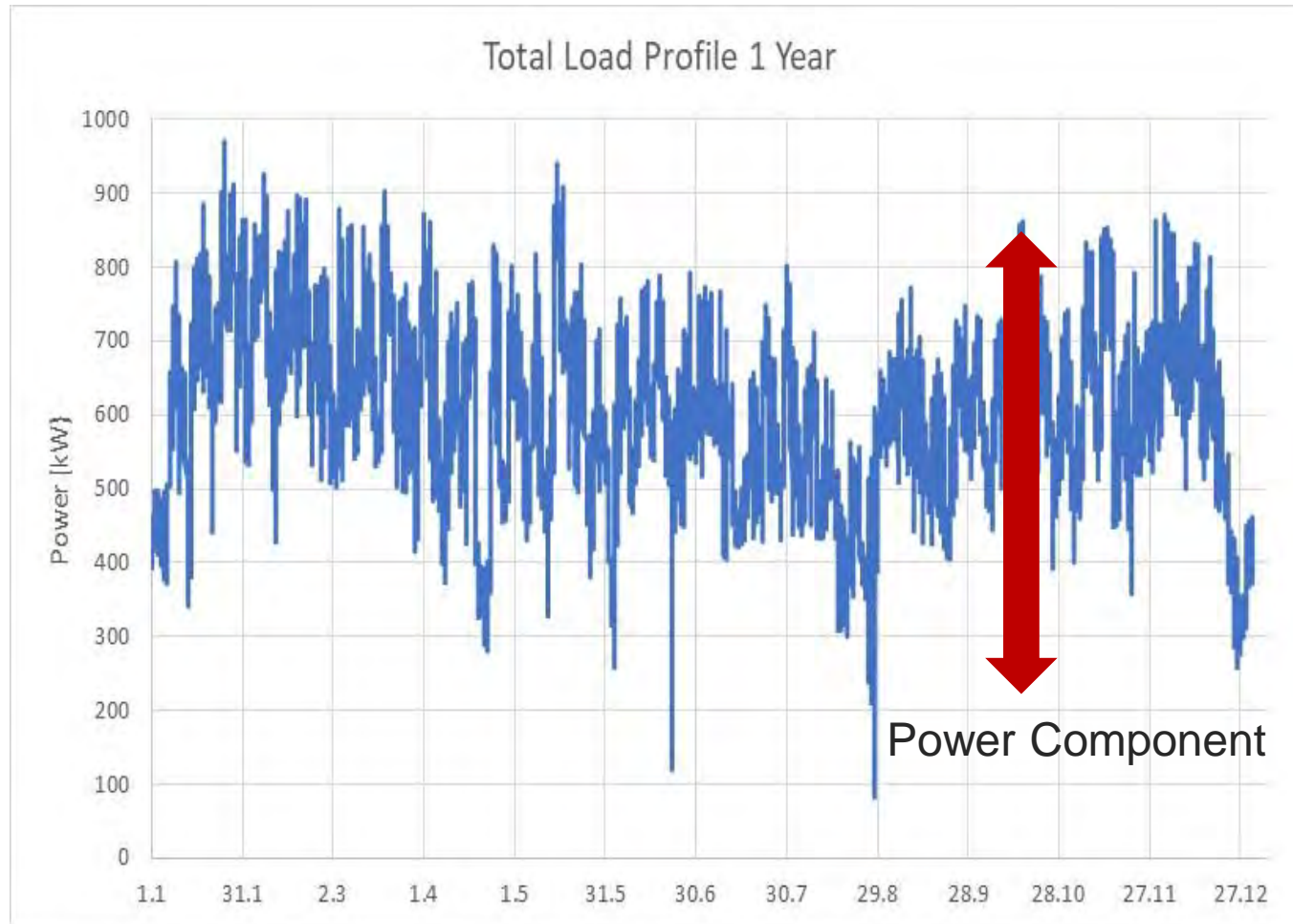


- Graphite Producer
- Mining and Refining



Pictures with courtesy of
Graphit Kropfmühl GmbH

Use Case 1: Hybridisation in Industry, Graphite Production



Use Case 1: Hybridisation in Industry, Graphite Production

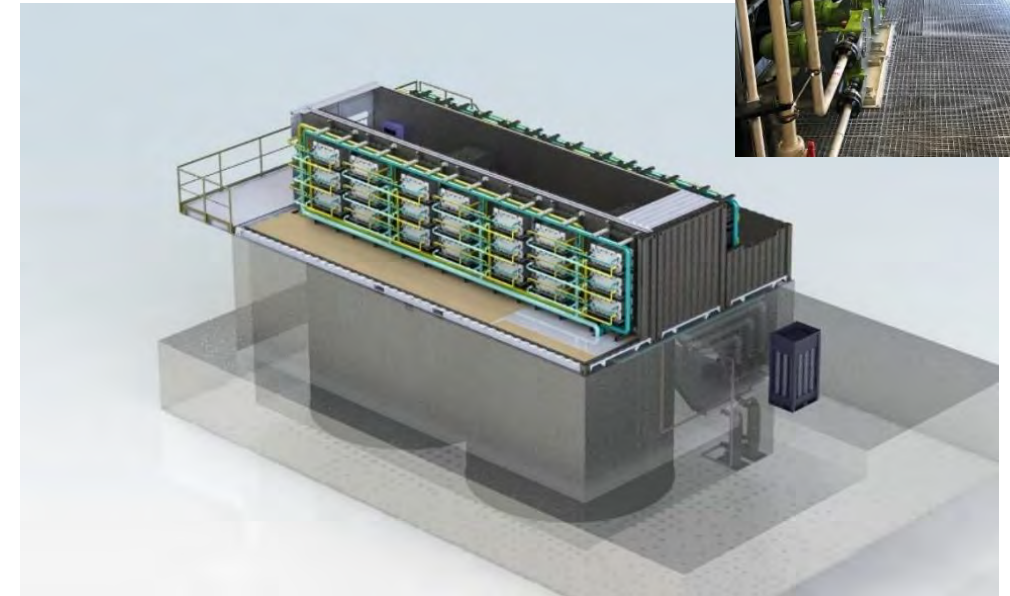
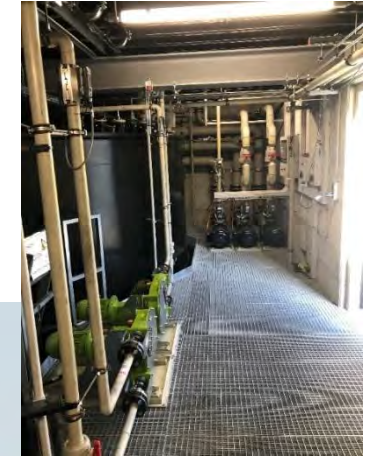


LIB:

400 kW / 450 kWh

VRFB:

300 kW / 3000 kWh (in Rampup-Phase 1500 kWh)



Pictures with courtesy of

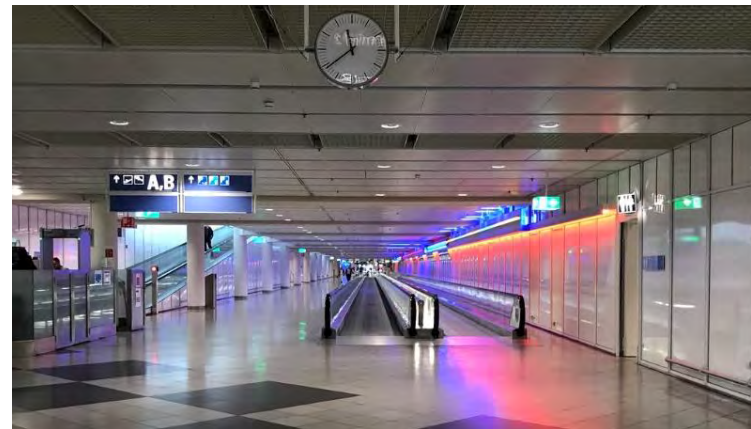


Use Case 2

Electricity Load of an Airport, Germany

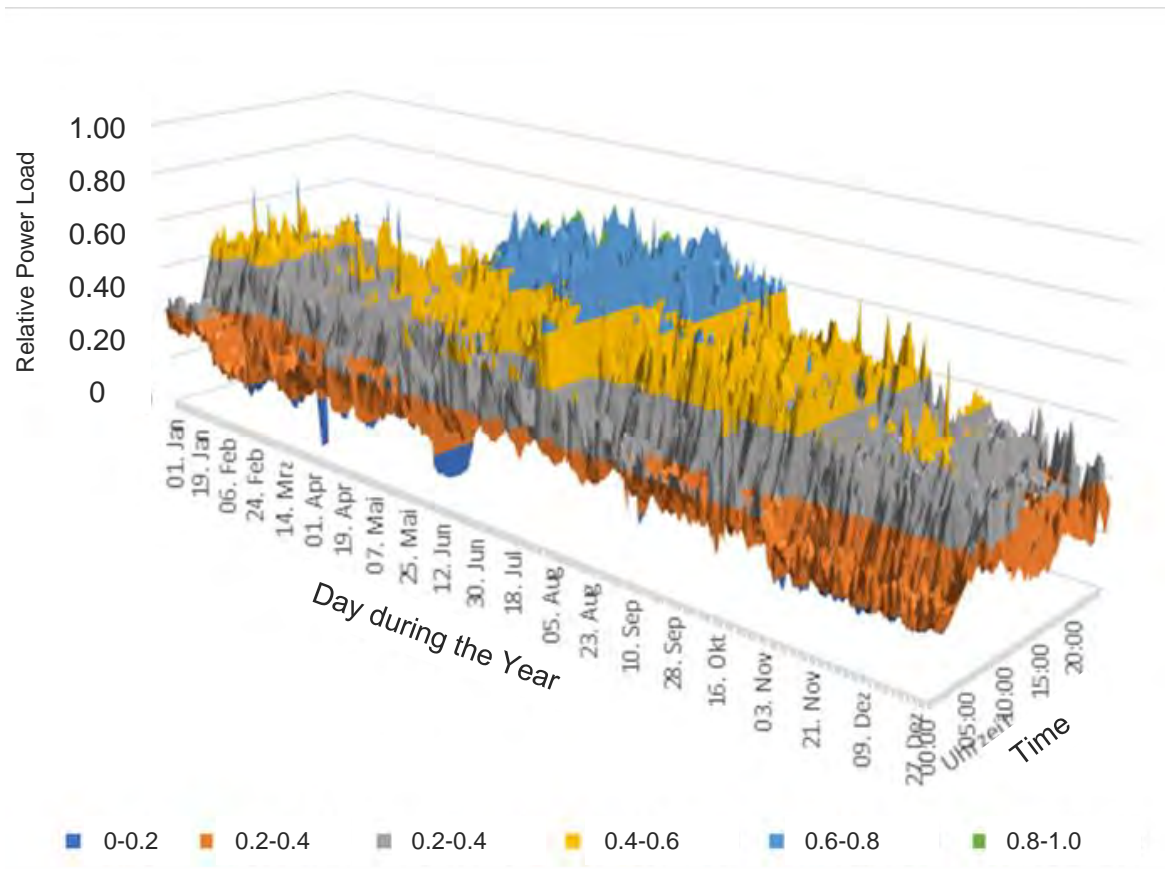


- Airport
- Transport & Travel
- CHP 23.6 MW_{el}
(Combined Heat and Power Station)



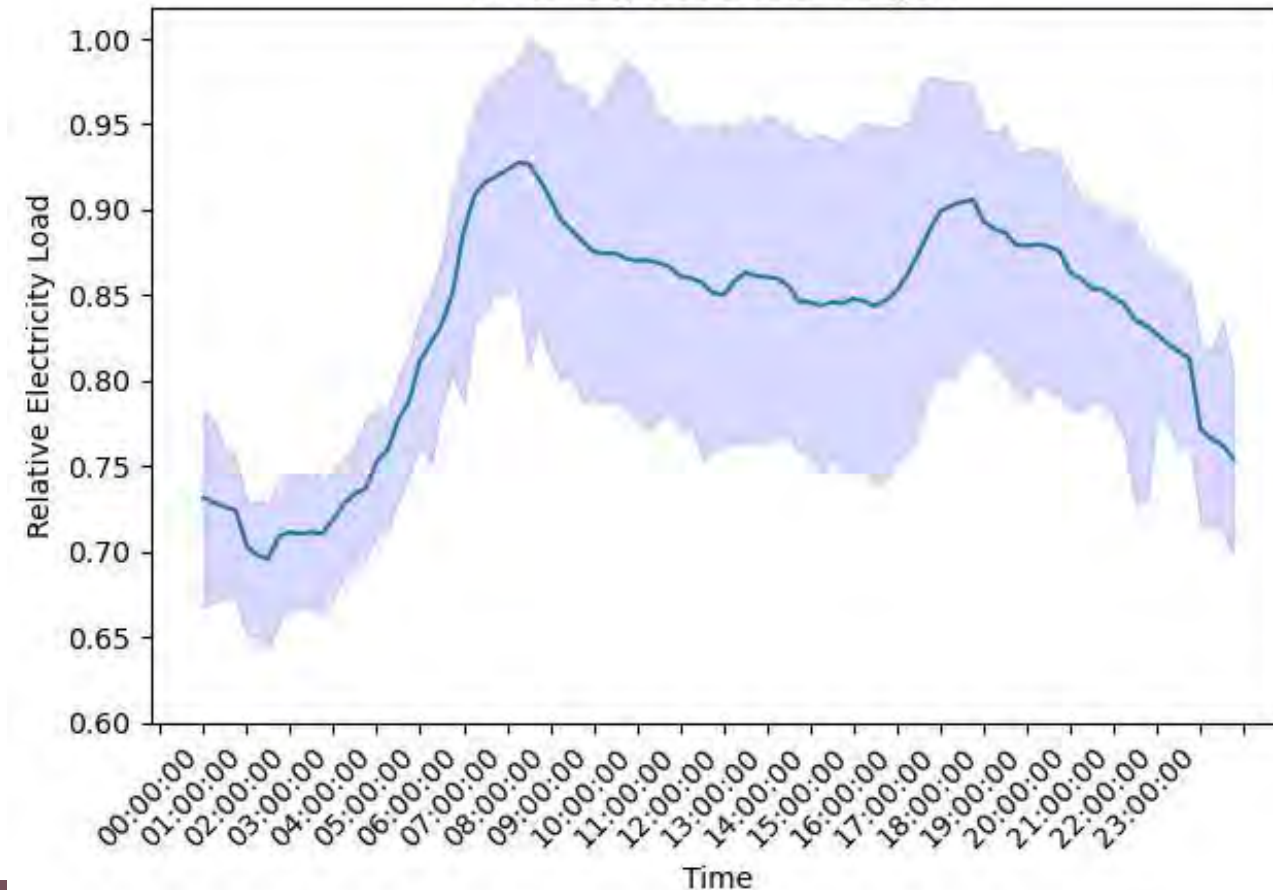
Use Case 2

Electricity Load of an Airport, Germany



1.00 = 27 MW

Electricity Load of an Airport



Thank you for your attention!



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Visit our project homepage



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