

Experiences from the

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# Stone Edge Farm Microgrid

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## Stone Edge Farm (SEF) Microgrid Project



### Controllable Elements

- Solar panels with Enphase inverters with soft-curtailment
- Aquion battery system
- Capstone gas turbine
- Simpliphi battery system
- Tesla battery system
- Hydrogen Electrolyzer with fueling station
- Hydrogen fuel-cells system
- Motor Load control
- Controllable distribution panels
- HVAC

### Capabilities

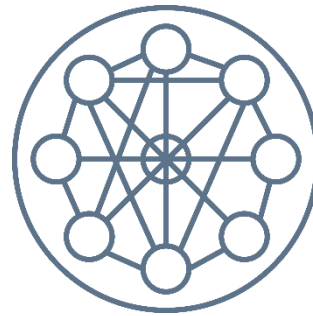
- Grid-tie mode:
  - Peak shaving and load shifting
  - Frequency and voltage response as a single entity
  - Decentralized optimization
- Island mode:
  - Decentralized power sharing
  - Master swapping
- Seamless islanding / reconnection capabilities
- Hydrogen production for a variety of uses



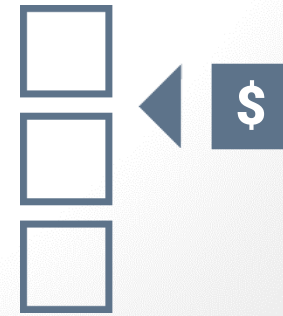
System integration is the **primary barrier** for Microgrid's adoption



**Non-Standardized  
Ecosystem**



**Complex Systems**

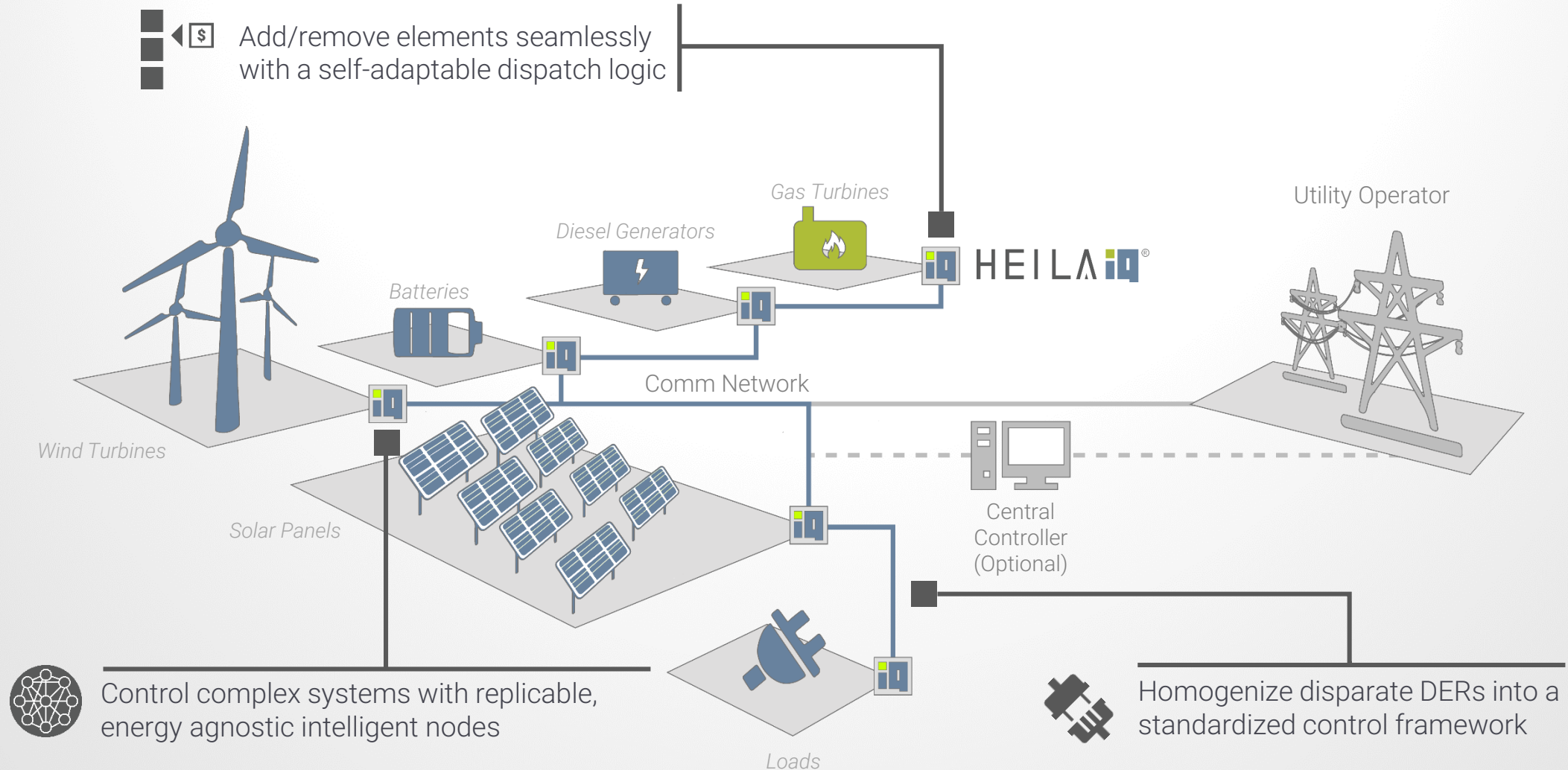


**Rigid Structure**

Current players rely on **customized** & **one-off** control systems, increasing the **time** & **cost** of integration



HEILA **iq**<sup>®</sup> simplifies **integration** and **operation** of DER systems by using a **building-block approach**





# HEILA **iq**® a **Building-block** creator



1

## **Technology Agnostic**

Compatible with most industry standard protocols and interfaces, and capable of interfacing with any vendor

2

## **Open-Source**

Allow users to safely build new functionalities on top of its existing code.

3

## **Multi-energy**

Encapsulate the microgrid complexity behind sophisticated and robust algorithms by exploiting *analogies*

4

## **Cybersecure**

Separate asset control from communication channels, to provide a layer of security.

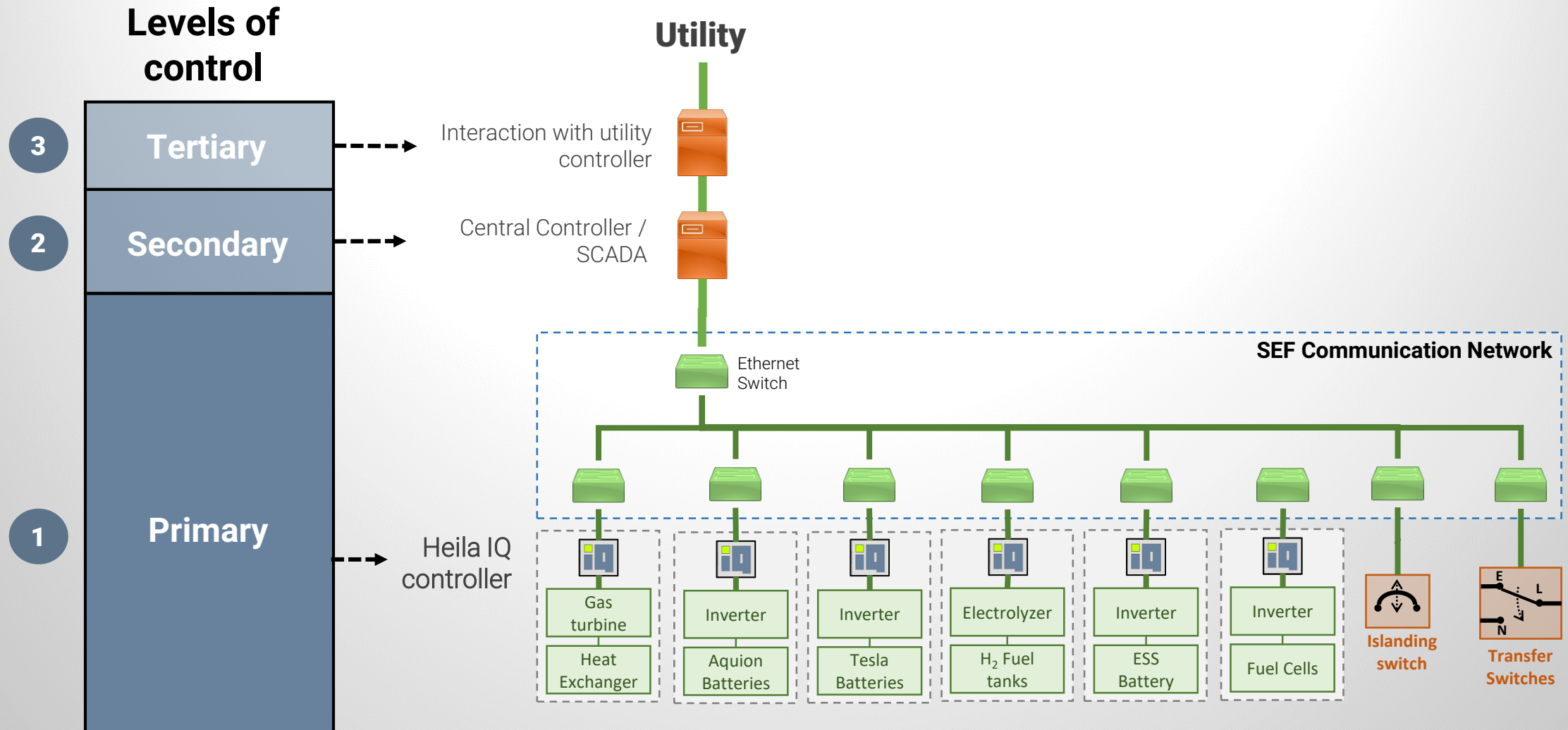
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## **“Selfish” operation**

Each asset tries to maximize its own profits, inside a well-designed game-theoretical framework

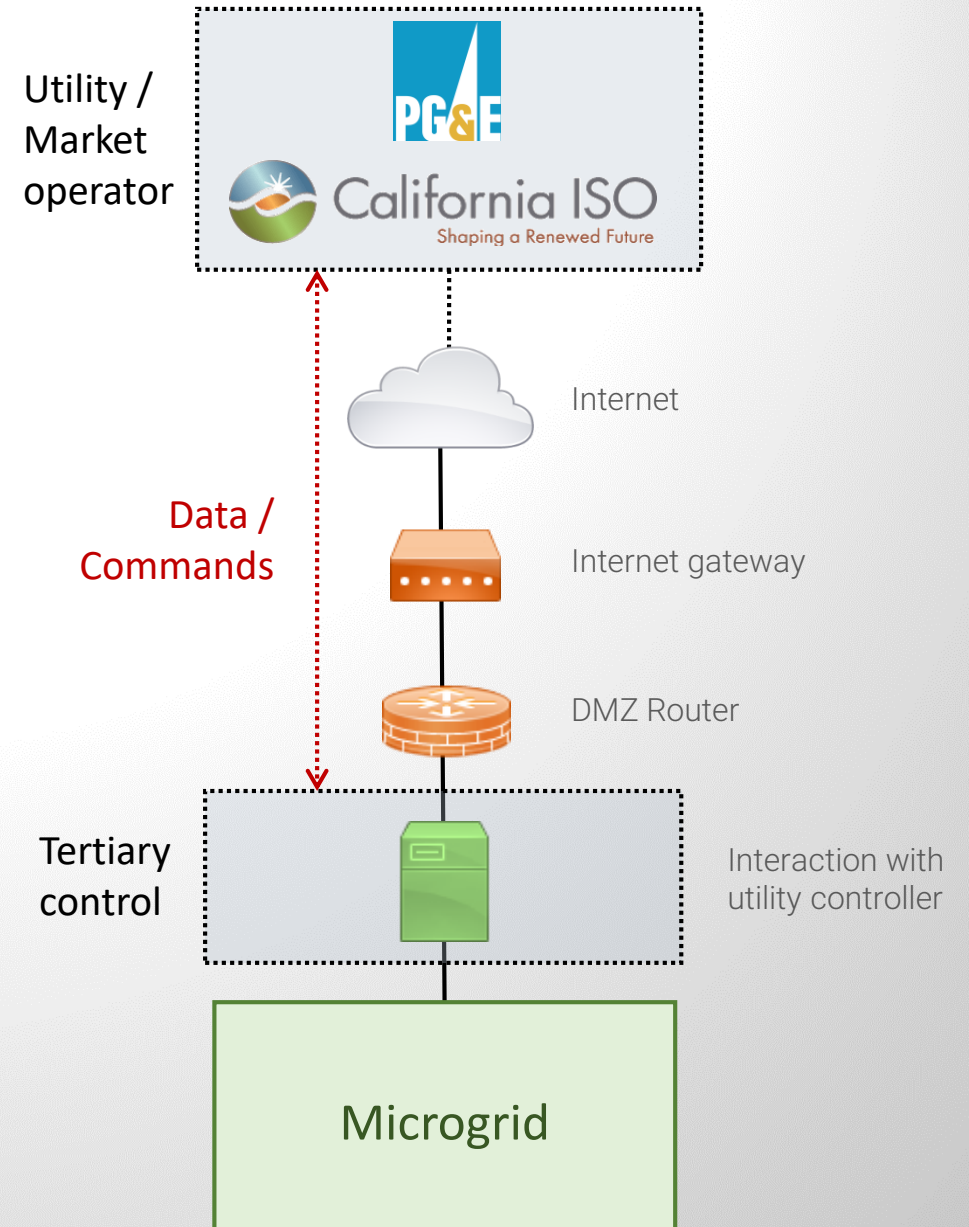
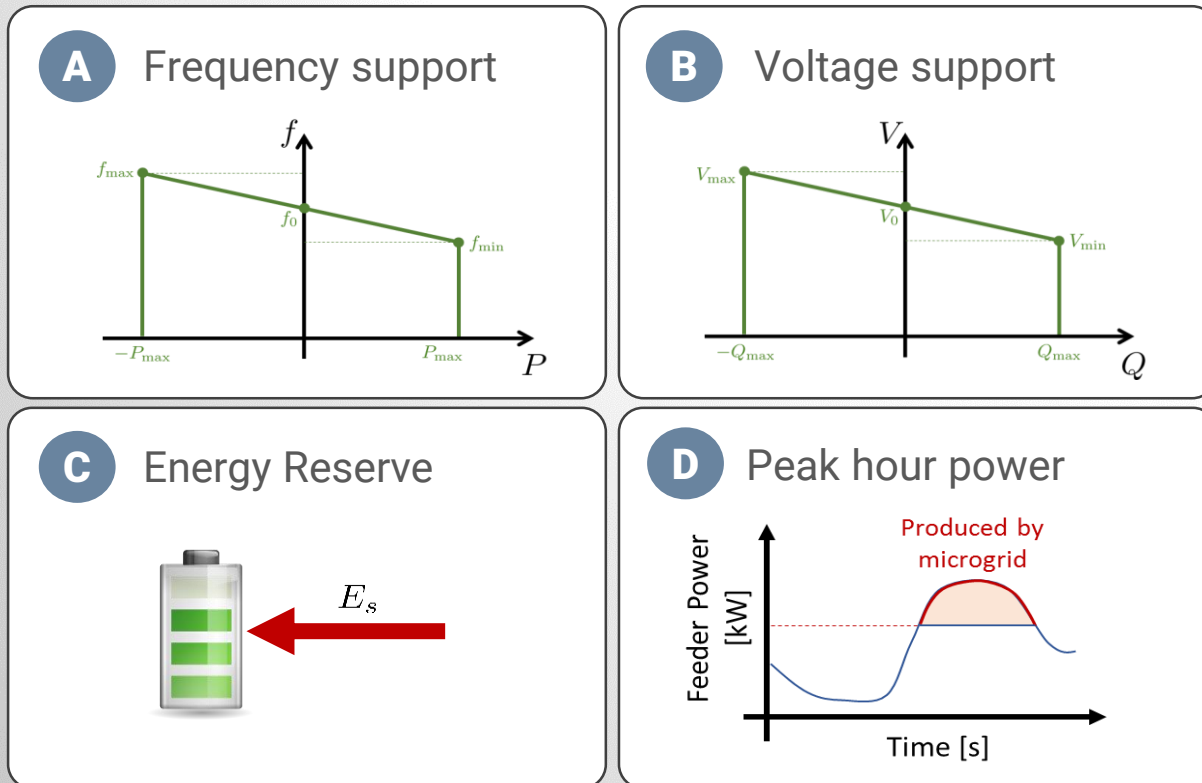


## Proposed **Control Architecture** for microgrids



## Microgrids controlled as a **single entity**

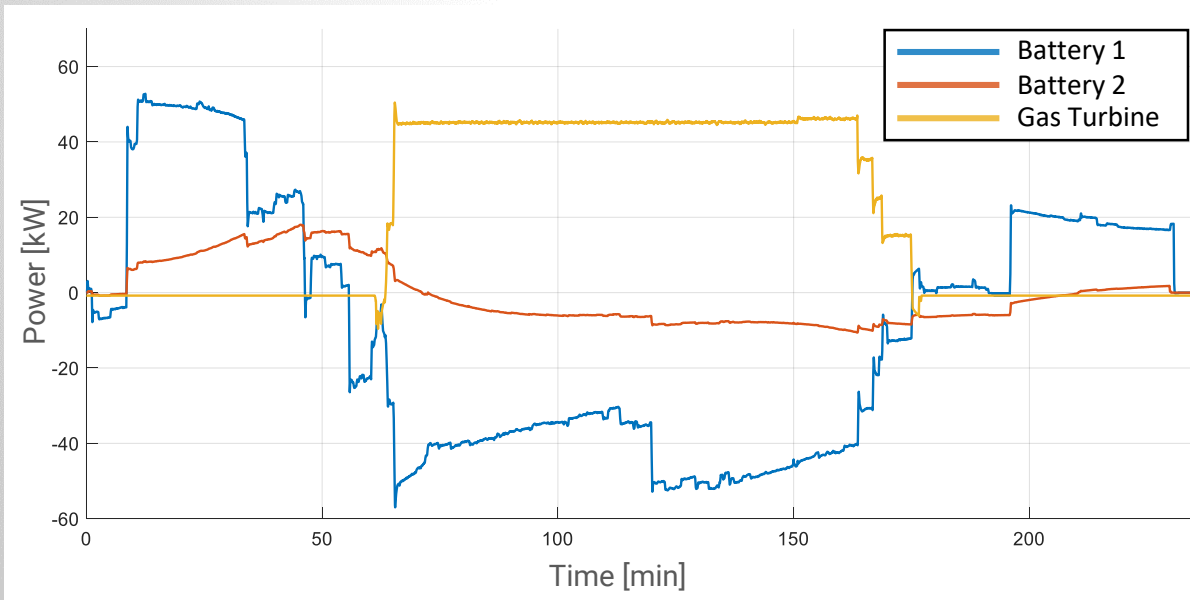
- ✓ Achieve system-level goals
- ✓ Use microgrids as resources for the utility:



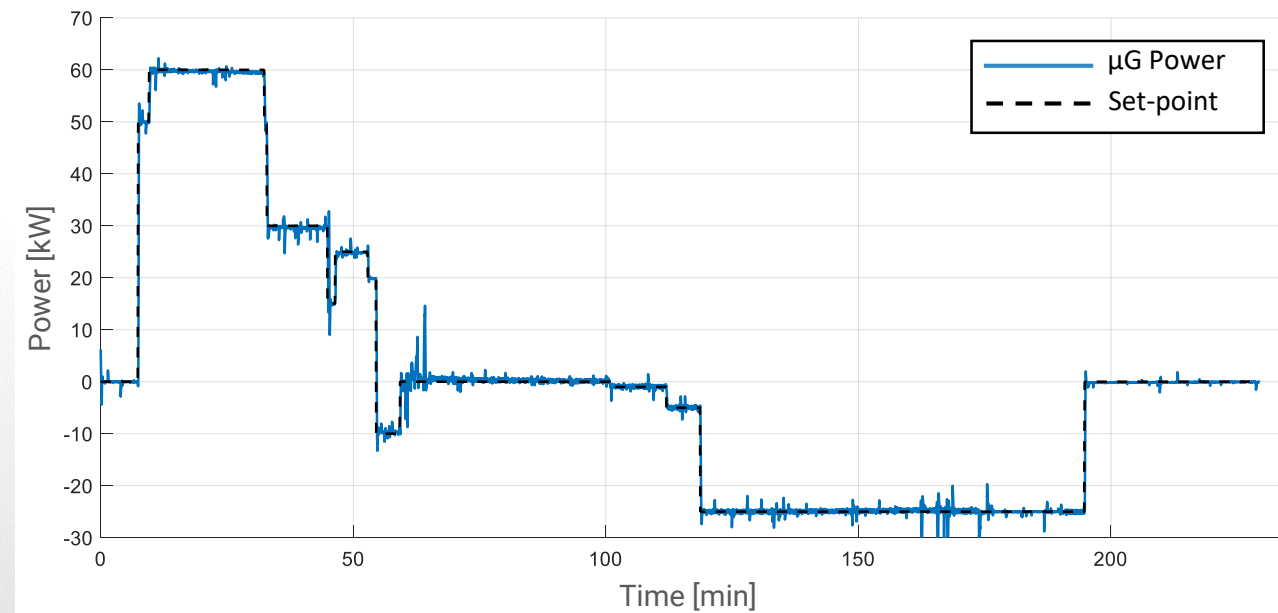


## Use Case 1: Game-theoretical optimization

Assets make their own decisions about their operation...



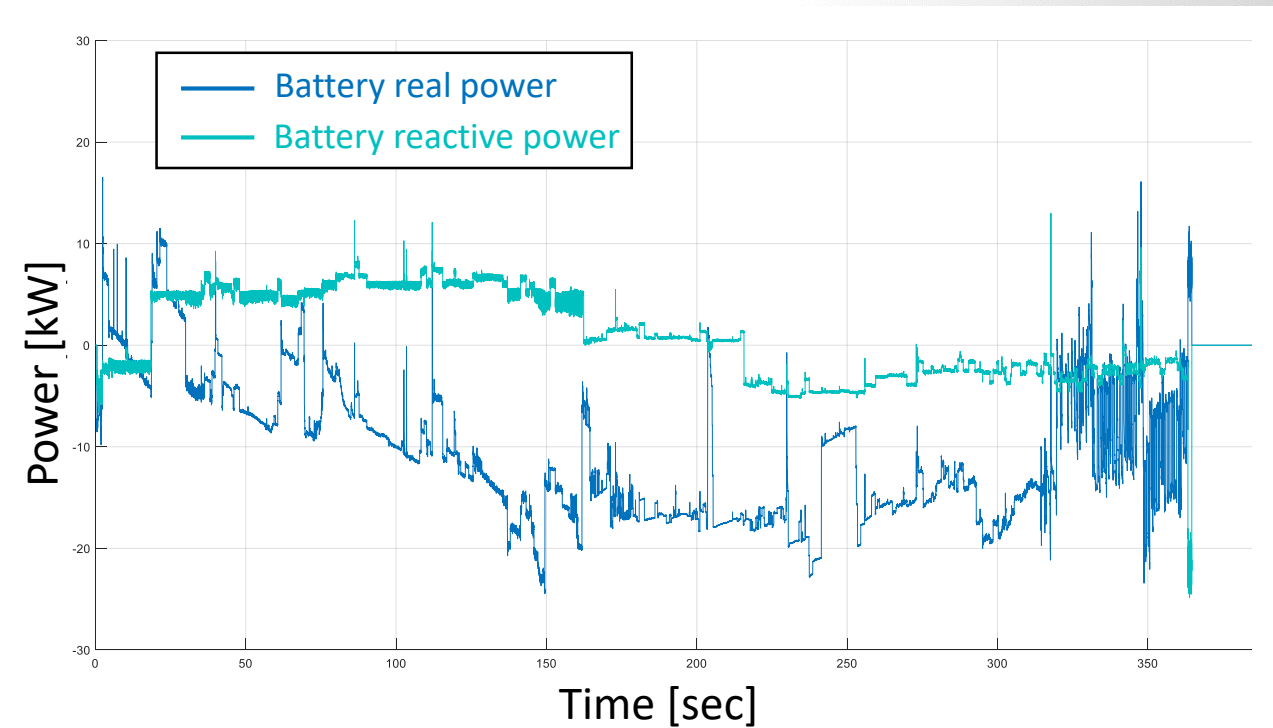
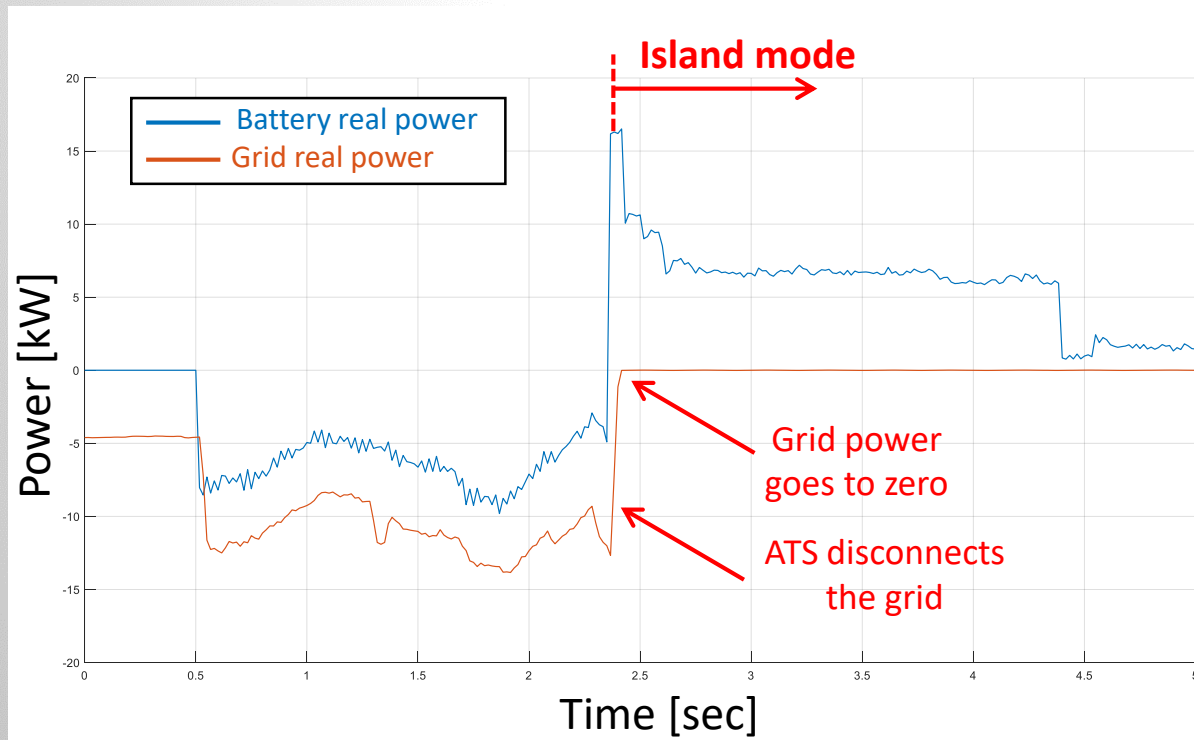
... to control and optimize the microgrid as a single entity.





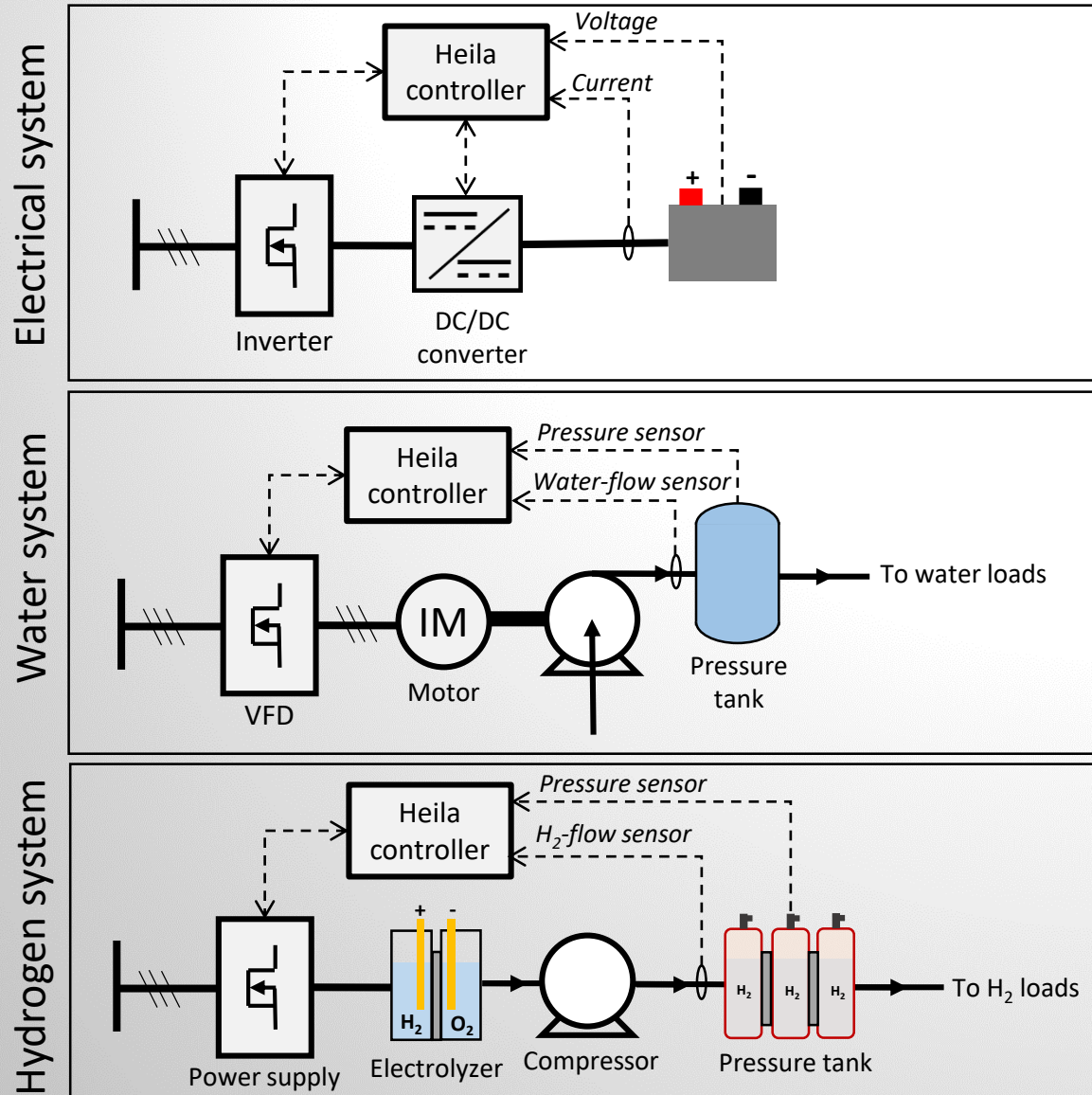
## Use Case 2: Planned Islanding

Example of an islanding process and subsequent operation

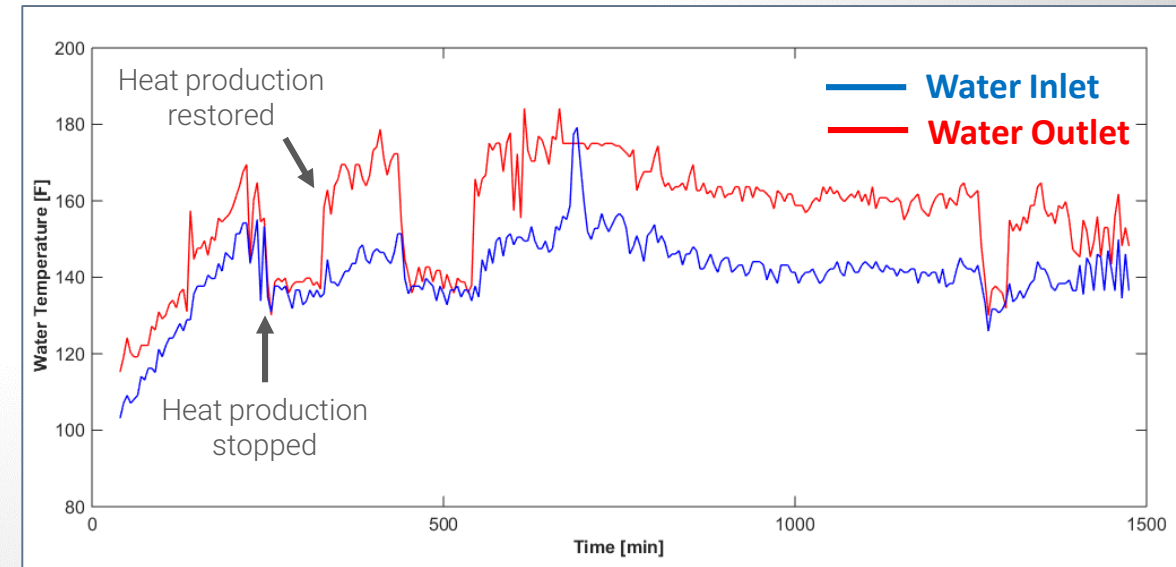




## Use Case 3: Integration of variety of energy types



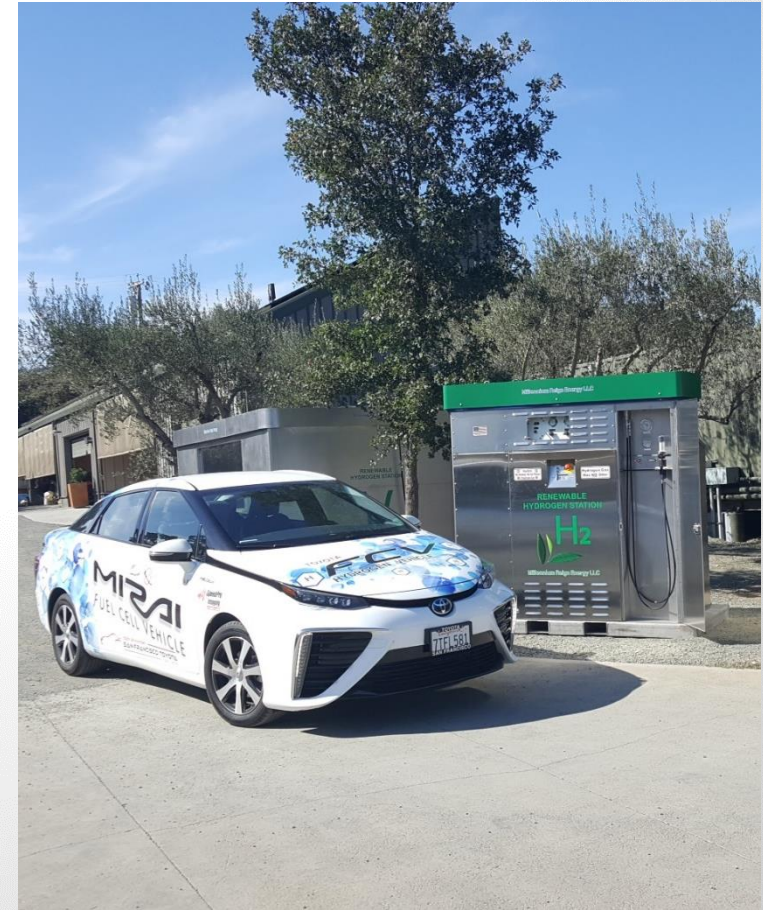
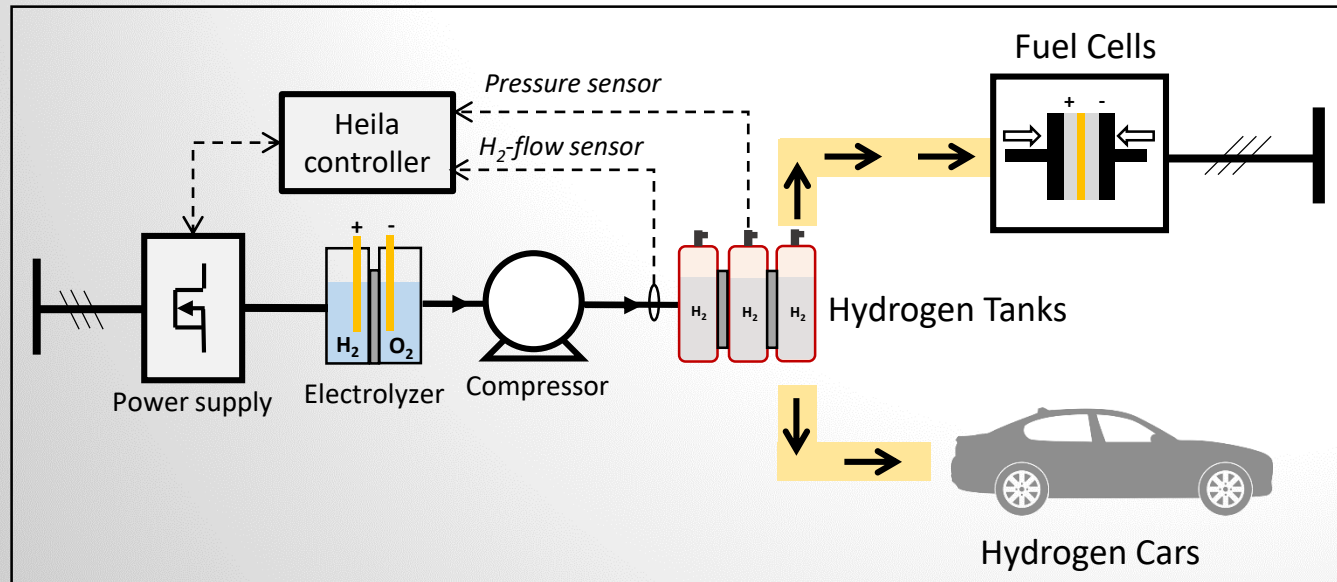
### CHP System Control





## Use Case 4: Hydrogen Production

### Simplified Hydrogen System



Car fueling with locally produced hydrogen



# HEILA kept microgrid operational for 10 days even as 2017 California Wildfires caused outages



FROM LEFT TO RIGHT: NHAT V. MEYER (BAY AREA NEWS GROUP), JOSE CARLOS FAJARDO (BAY AREA NEWS GROUP), MICHAEL MACOR (THE CHRONICLE).

## In the News

*“Microgrid Kept Power On Even as the California Wildfires Caused Outages”*

[Microgrid Knowledge](#)



## Project 1

**Customer:** Private Owner

**End User:** Vineyard

**Location:** Sonoma, CA



### Highlights:

- Single site hybrid (DC-AC) microgrid
- Behind the meter deployment
- **Islanded under normal operation**
- 100% renewable under normal operation

## Project 2

**Customer:** Utility Cooperative, DOE

**End User:** Residential Community

**Location:** Basalt, CO



### Highlights:

- **Multi-site aggregate DER system**
- Behind the meter deployment
- PCC at ~0 under normal operation
- 100% renewable under normal operation

## Project 3

**Customer:** Utility Company, DOD

**End User:** Air Force Base

**Location:** Albuquerque, NM



### Highlights:

- Single site hybrid (DC-AC) microgrid
- **In-front of the meter deployment**
- Mission critical system
- Mixed of renewable and fuel-based DERs



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