Princeton Island Grid – Defining the Future of Energy with a Resilient, Carbon Neutral Campus

Xiaofan Wu, Siemens Technology
We are driving innovation in resilience and sustainability for the US energy systems

- Rocky Mountains: Autonomous blackstart with 25 parallel grid-forming inverters (lab test)
- Hawaii: Resilient operation with 100% renewable generation (real-time simulation)
- Galapagos: N-1 resilient operation with 100% renewable generation since 2018
- Princeton: Microgrid with zero-inertia islanding capability
- Wildpoldsried, Bavaria: Zero-inertia customer field test with 6 commercial parallel grid-forming inverters
- Naval Station Guantanamo Bay: N-1 resilient operation with high renewable integration

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Princeton Island Grid – a living lab to serve as a platform for researching and demonstrating new technology for commercial building and microgrid operation

**Research**
- Prime research partner for DOE, national labs, and universities
- Research hub for the Corporate Core Technology - Sustainable Energy and Infrastructure and innovative Siemens products

**Princeton Island Grid Living Lab**
- Microgrid
- Building

**Demonstration**
- Open demonstration site for testing and demonstration of Siemens products and technologies.
- Reduce CO₂ footprint as the Siemens US lighthouse project
The Princeton Island Grid contributes to Siemens CO\textsubscript{2} footprint to become carbon neutral by 2030

**Strategies for CO\textsubscript{2}-neutral Siemens**

- Drive Energy Efficiency Program
- Renewable Energy
- Reduce Fleet emissions
- Carbon Offsets Program

**Siemens Global CO\textsubscript{2}-reduction for CO\textsubscript{2}-neutral operations by 2030**

Annual CO\textsubscript{2} footprint in million metric tons

- 2014: 2.2
- 2019: 1.3
- 2020: 1.1

-50%
Princeton Island Grid – A living lab to drive innovation and sustainability

Components
- Siemens Building Management System DESIGO CC
- Siemens Microgrid Controller (MGC)
- Siemens Battery Storage System: 1MWh/500kW
- Photovoltaic System: 836 kWp
- Siemens VersiCharger for electric vehicles: 6x7.2kW

Research Focus
- Optimal Microgrid and Building Operation
- Internet of Things
- Performance Monitoring and Analytics
- Simulation and Digital Twins
- Cyber Security
Hybrid Distributed Energy System Testbed – hardware-in-the-loop simulation environment with software-defined inverters

**Platform**
- **Siemens TAPAS inverters**: software-defined, 300W@48V
- **Siemens MGC**: microgrid controller (based on SICAM)
- **OPAL-RT**: real-time power system simulator

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Princeton Demand Response Test

Test Start ~ 1hr 15 min Test Stop

PV Peak shaving 24kW DR threshold BESS discharge

Building Load BA Load reduction

Power Exchange Load Diesel Photovoltaic Storage
Princeton Island Grid Dashboard displays real-time data and microgrid operation in the lobby of the Princeton Office on a touch wall.
Princeton Island Grid – What does it look like?

Solar Panels

E-house (Batteries, inverters)

Transfer Switches (for islanding)

EV chargers
Contact

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