



Central Washington University Microgrid

Information Technology & Administrative Management Master of Science



Florida International University



Overview

- Partnership between Florida International University and Florida Power & Light
- Designed for backup power to FIU's high-tech Engineering Center for 24 hrs

Project Goals

- Grid-connected and "island" mode for extreme weather
- Hand-on learning for FIU students & researchers

FIU Microgrid

KEY COMPONENTS

- Power Source: 1.4 MW solar array
- 4,400 solar panels
- Energy Storage: Large-scale 3MW battery system
- AI integrated
- FPL investment: 6.9 million
- FIU investment:??
- Lifespan: 10 years



Rutgers University

MICROGRID

- Second phase completed in 2013
- Total cost: \$40.8 mil
- 31,032 solar panels: 260W ea
- 8mW of electricity annually = \$1.2 mil
- Both phases: 63% of campus electricity
- 3rd party construction cost: 15 yr lease, then purchase for \$3.6 mil





Rutgers University

SOLAR CANOPY

Overview

- Partnership between Rutgers and Key Bank
- Designed to replace 10% of the electrical demand for the Livingston Campus reducing need for purchased power

Project Goals

- Generate power and revenue
- Produce cover for vehicles and increase safety with undermounted security lights and cameras
- 100% renewable energy by 2040

Key Components

- Power Source: 1.4 MW solar array
- 32-acre solar canopy
- Rutgers investment: Zero upfront
- Lifespan: 25-30 years
- Grid connected

Rutgers Solar Farm

Key Components

- Power Source: 7,000 ground-mounted photovoltaic modules panels
- 7-acre solar located in agriculture field
- Lifespan: 25-30 years
- Grid connected



Overview

- Partnership between Rutgers and New Jersey Board of Public Utilities
- Designed to replace 11% of the electrical demand for the Livingston Campus reducing need for purchased power
- Project Goals
- Solar array 1.4 megawatt
- generate power while still using agricultural land for animals and gardens
- Be 100% renewable energy by 2040



Florida International University Costs

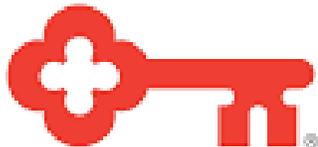


- Public-Private partnership with FIU and FPL beginning in 2010
- Solar project began in 2016
- \$7,000,000 Invested from Florida Power & Light Co.
- Five-year research grant faculty and students to analyze data for FPL
- Job channel for students to FPL



Rutgers University Costs

KeyBank



- \$40.8 million project
 - Federal tax incentives
 - New Jersey's Solar Renewable Energy Credits (SRECs)
- Projected to net Rutgers \$28 million over a 20-year period
- Reduce carbon emissions by approximately 1,200 tons per year
- Save Rutgers about \$220,000 in annually electrical costs

Micro-grid owners have a legal right to install and operate but there are limits on the structure and regulation of the micro-grid.

There are three points that allow microgrid installation and operation without tariff filings and oversight by the Washington state Utilities and Transportation Commission (UTC) or the federal energy regulatory commission (FERC).



To have the microgrid in what is called a “NON-UTILITY” Status:

- 1) The micro-grid owner must be the primary consumer of the electricity.
- 2) The micro-grid customers must be contiguous to the site where provided.
- 3) Services must be provided by contract agreements



Microgrid Regulation

The CWU microgrid will not be required to file a tariff for services in Washington state based on its design.

The United States electricity distribution and grid regulation is determined by each state commission.

Microgrids are self contained electricity grids using renewable energy or generators to create electricity then stored in batteries.

A tariff is information filed with the state that controls how an energy provider charges a customer for their energy use. Depending on the location of the microgrid each has different regulatory requirements.

A “behind the meter” microgrid does not use energy distribution assets.

- The CWU microgrid will be a multi-user microgrid and is expected to be “behind the meter”
- The CWU microgrid will not be connected to the local utility.
- The CWU microgrid will not be under state regulations.
- The CWU microgrid will not be required to file a state or federal tariff.



CWU Energy Regulation

Energy Storage Systems

Florida International: 3MW Battery Storage System

Rutgers: N/A

Best Option: Lithium-ion Battery

- Makes up 48% of energy storage worldwide (excluding PSH)
- Have the best cost, performance, calendar & cycle life, and technology maturity (Mongrid, 2019)
- Sustainable options such as second life electric vehicle batteries

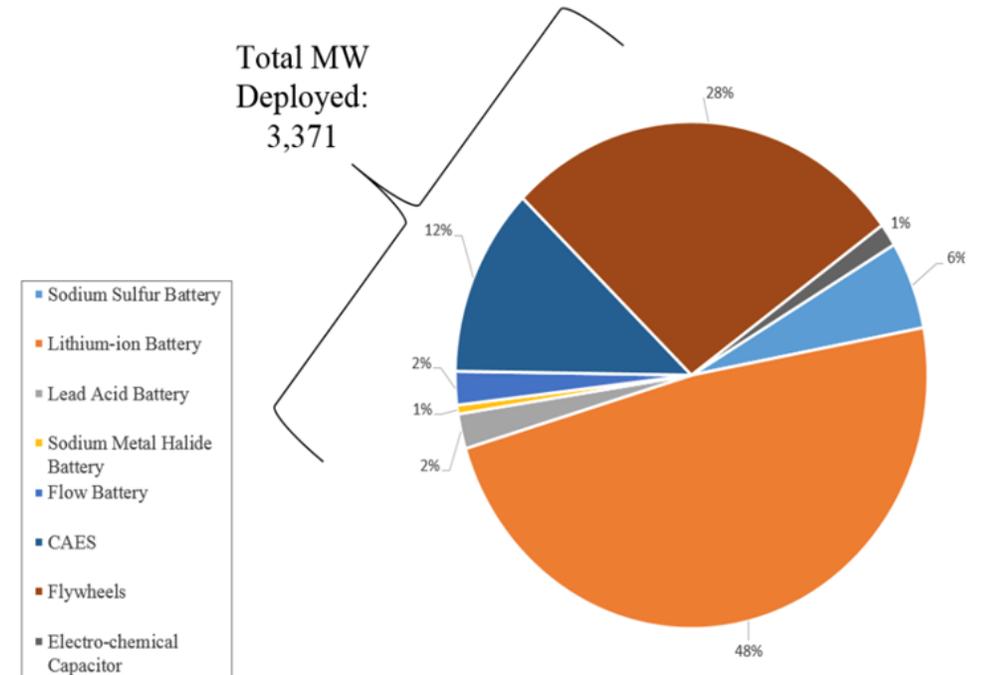


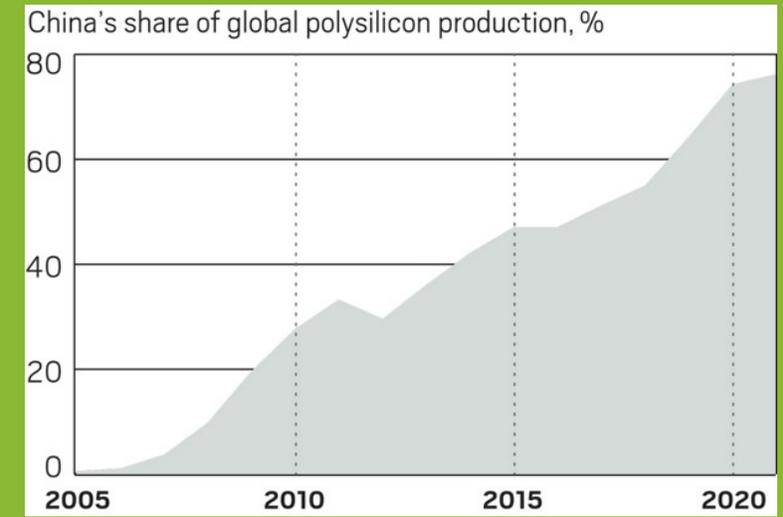
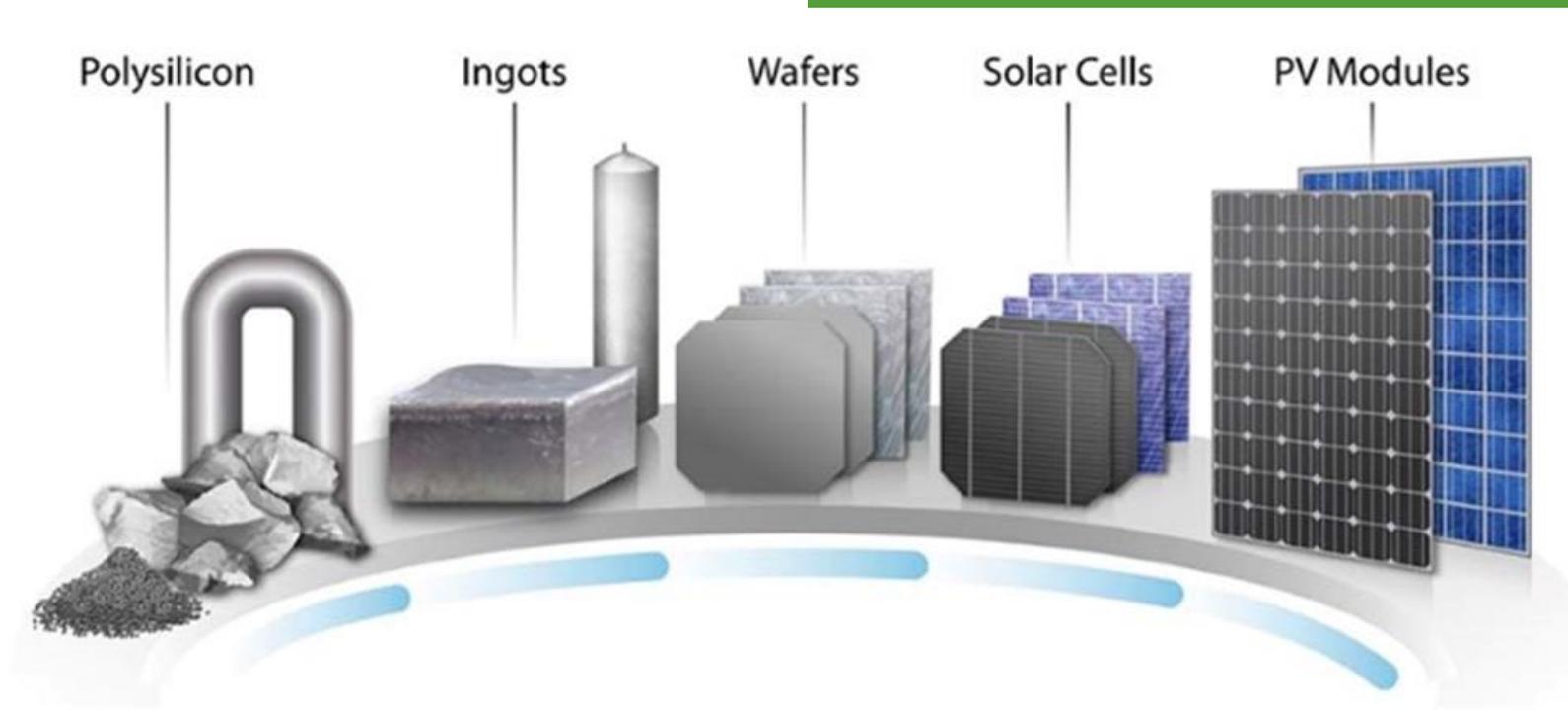
Figure 2.2. Breakdown of energy storage deployed internationally by technology type and excluding pumped storage hydro.

Second Life EV Batteries

- Electric vehicle batteries must be replaced after 10 - 15 years of use
- These batteries have “an enormous potential for reuse in stationary energy storage” (Engel, 2019)
- Second life EV batteries currently have a 30 to 70% cost advantage
- Repurpose Energy and B2U Storage Solutions are two leading companies who are repurposing EV batteries as storage systems

<https://www.youtube.com/watch?v=IMmH98KISEo>





Ethical Considerations

2022 DATA

- 88% polysilicon produced in China
- 50% polysilicon produced in the Xinjiang region
- 97% silicon wafers produced in China
- No US companies producing ingots or wafers

LEGISLATION

Uyghur Forced Labor Prevention Act

- Prevent companies from benefitting from forced labor

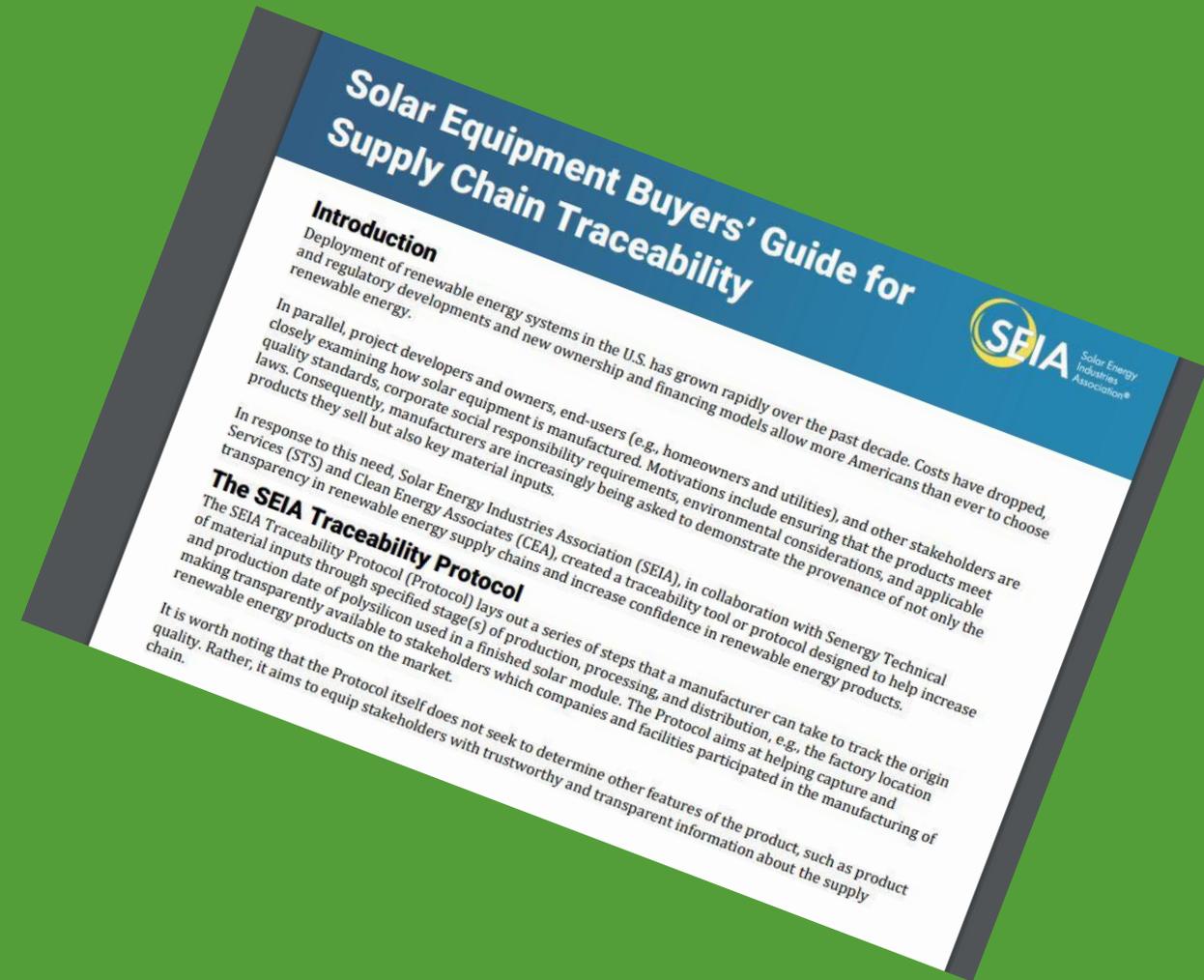
Inflation Reduction Act

- Incentivizes installation of solar panels
- Provides tax credits for production
- Provides tax credits for investment
- Provides tax credits for assembly

Questions to ask Suppliers

Solar Energy Industry Association (SEIA)

- Do you follow the SEIA Traceability Protocol? If not, why not?
- What steps do you take to ensure that you and your suppliers are in compliance with U.S. laws and regulations?
- Can you show where the product is manufactured and where the inputs come from? Can you explain where the module, cells, wafers, and polysilicon come from? Are they manufactured in locations where independent audits are allowed?
- Can you provide the most recent independent audit reports regarding your claims?





Community Partnerships

FLORIDA INTERNATIONAL UNIVERSITY

- Carnegie Foundation classification of a Community Engaged University since 2010
- FIU Center for Community Impact and Public Purpose engages campus and greater community
- Partnered with Florida Power & Light Company to develop an AI-based microgrid to protect power reliability and clean energy production

RUTGERS UNIVERSITY

- Key Bank (Solar Canopy project)
- NJ Public Board of Utilities Clean Energy Program
- NJ Green Building Manual a collaborative project by The Rutgers Center for Green Building (RCGB)

CWU Community Partnerships

- Central Communication Agency - CWU's Student Public Relations Firm
- SLICE - Student Leadership, Involvement, and Community Engagement
- Community Partnerships with City and Local Power companies - City of Ellensburg, Puget Sound Energy (PSE), and Public Utility District (PUD)



Selling Power

FLORIDA INTERNATIONAL UNIVERSITY

- No public information available.
- We reached out directly for additional information:

Arif Sarwat <asarwat@fiu.edu>

To: Key Tran

Cc: Elizabeth Calzadilla <ecalzadi@fiu.edu>; Tariq Mohd <tmohd@fiu.edu>



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Key,

We are locked with Mykolaiv efforts at the moment. We can connect with you in the second or third week of August.

Let me know more about yourself and your advisor.

Regards

Arif Sarwat, Ph.D., Eminent Scholar Chaired Professor and Director of FPL-FIU Solar Facility and Energy, Power & Sustainability (EPS);

Selling Power

- 40,000 high-efficiency solar panel canopy structures over two large surface parking areas on the Livingston Campus
- Contract with a third part under Power Purchase Agreement (PPA)
- The project will utilize federal tax incentives and New Jersey's Solar Renewable Energy Credits (SRECs)
- The project is expected to net them \$28 million over a 20-year period, exceeding all costs

RUTGERS UNIVERSITY



Selling Power

RUTGERS UNIVERSITY

- Additional contributions for “town centered/community” microgrid:
 - "Development of Local Government Resilient Microgrids"

Development of Local Government Resilient Microgrids

Prepared for the
New Jersey Board of Public Utilities
with support from the U.S. Department of Energy

JULY 2021

Prepared by:

Marc H. Pfeiffer, MPA, Author and Principal Investigator
Bloustein Local Government Research Center, Rutgers University; and
Center for Building Knowledge, New Jersey Institute of Technology

Key to Table Abbreviations

Status

Plan-C = Completed planning

Fin-C = Completed financing

UC = Under Construction

DES = Design Phase

Ops = Operational

Participant Types:

P = All public

PR = Private

P-M = All public, multiple agencies

P-NP = Public and non-profit

P-PS = Public and Private Sector

Technical Type (Generation Supply Source)

B = Black-start

HEG = Hydroelectric Generation

NG = Natural Gas Generator

CHP = CHP

I = Islandable

SG = Steam Generator

DG = Diesel Generator

ICE = Internal Combustion Engine

SOL-ST = Solar+Storage

FC = Fuel Cell

NFC = Natural Gas Fuel Cell

TH = Thermal System

WP = Wind Power

SOL = Solar

WWT = Wastewater Treatment Plant

Table of Benchmark Project Details

TC Microgrid Project Place/Name	State	Status	Participant Types	Technical Type	Confirmed Status
New York					
Huntington	NY	Fin-C	P-PS	FC, CHP, SOL-ST, TH, WWT, NG	Stage 3 app I process; TC type; no update
Rockville Center Village	NY	Plan-C	P-M	NG, SOL	Utility owned supplemental powers but abandoned
Village of Freeport	NY	DES	P-PS	NG, SOL-ST, WP	Looking for completion in June 2021 using alternative (NY state GOSR) funding via Governor's office)
East Bronx	NY	DES	P-PS	CHP, SOL, DG	Healthcare microgrid; TC type; no update
Binghamton City	NY	DES	P-PS	ICE, SOL, CHP, HEG, NG	Stage 2 study completed; TC type
Syracuse City	NY	DES	P-PS	NG, CHP, DG, TH	TC type; Special purpose partnership between utility and asset owner

Selling Power

CONTINGENCY

Parking Canopy



CONTINGENCY

NORTH FIELD



THANK YOU

QUESTIONS?