Grid Energy™

GEORGETOWN UNIVERSITY

ENERGY STORAGE & CAMPUS MICRO GRID PROJECT

A PROPOSAL FOR THE

DC PSC Town Hall on Modernizing the Energy Delivery System for Increased Sustainability (MEDSIS)

February 28th, 2017

MEDSIS

DC Public Services Commission

- Order No. 17912: Case No. 1130 on Modernizing the Energy Delivery System (MEDSIS)
- Order No. 18673: MEDSIS staff report
- Public comment period
- Townhall on proposed MEDSIS projects
- Pilot Projects eligible for MEDSIS grants: cogeneration systems, demand management, energy storage, fuel cells, microgrids, photovoltaic systems, voltage regulation, and district heating and cooling
- $21.5M MEDSIS Pilot Project Fund. projects estimated to receive final grant funding: 6

PUBLIC SERVICE COMMISSION
of the District of Columbia

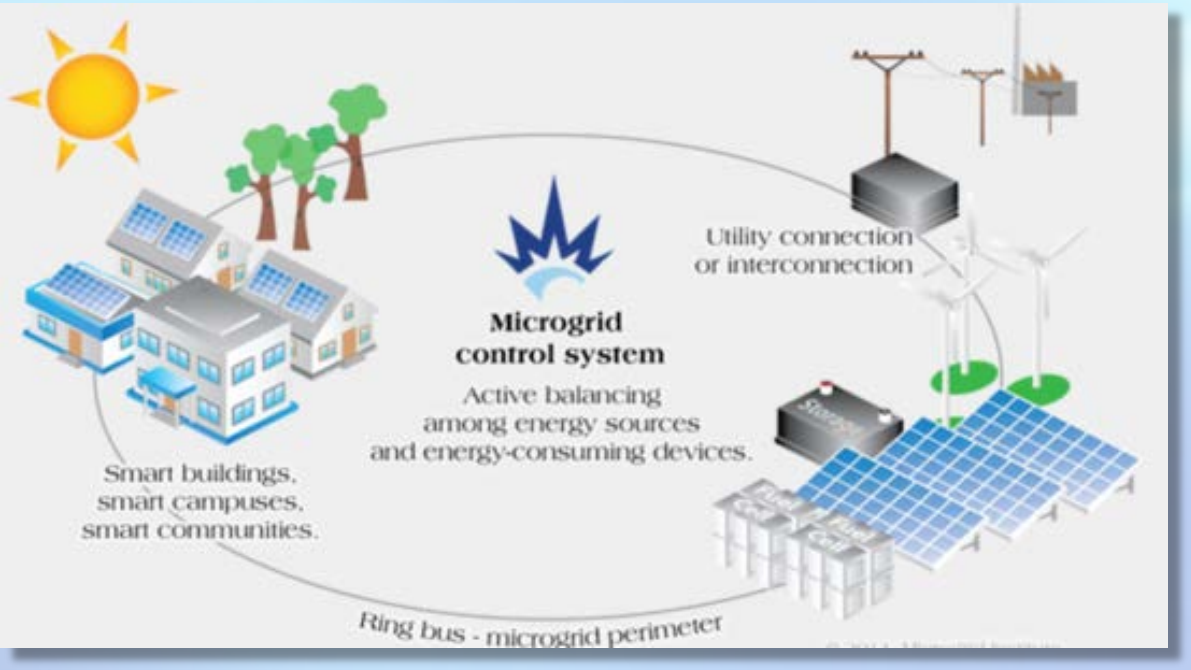
"…to identify technologies and policies that can modernize our energy delivery system for increased sustainability and will make our system more reliable, efficient, cost-effective and interactive."

-DC PSC Case 1130

Microgrids

Contributions to local resilience and sustainability

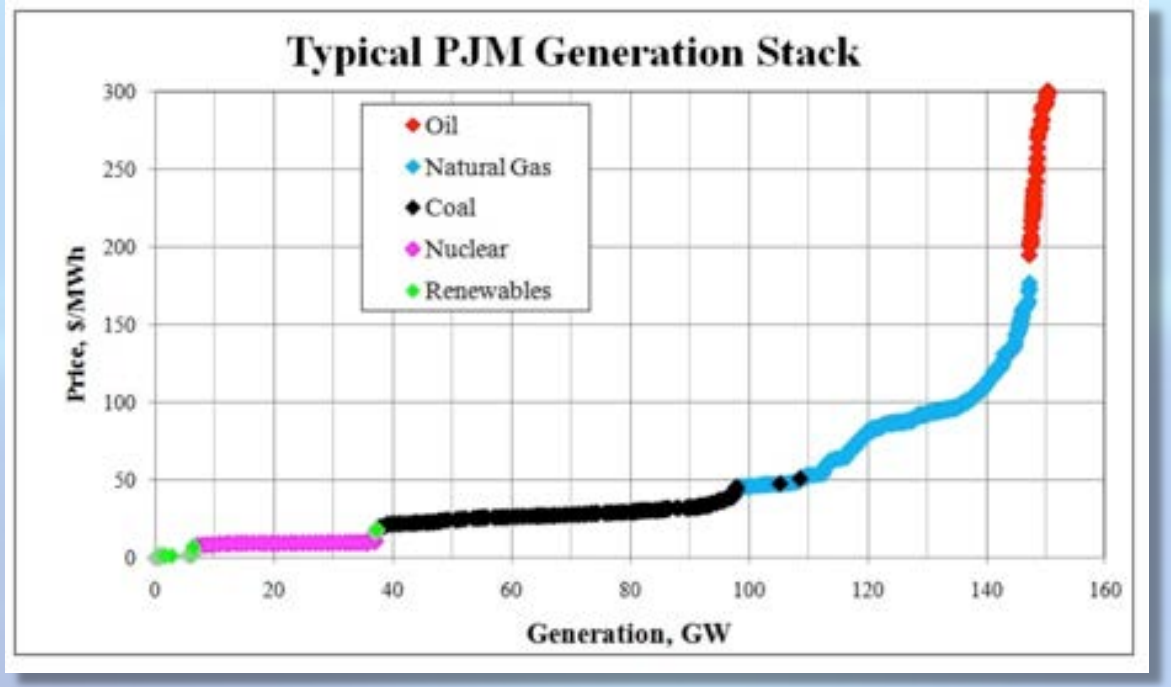
- Facilitate two way voltage flows
- Utility scale & Behind the Meter
- Aggregation and dispatch
- Reduce CHG
- Reduce transmission losses
- Reduce peak generation
- Reduce congestion, increase resilience



Sustainability

Microgrids

- ✓ Contribute to reduction in run-times of inefficient peaker plants
- ✓ Contribute to reduction in overall upward pressure on average LMP
- ✓ Contribute to reduction of use of dirty fuel types in emergency peaker plants
- ✓ Increase resilience of DC grid



Microgrid Initiatives

Georgetown University

- Energy storage
  - Resilience
  - Grid support (PJM Frequency Regulation & any new T&D initiatives under MEDSIS and FERC NOPR on Energy Storage)
- Automated medium voltage switching (BTM)
  - Load balancing
  - Critical infrastructure support/hospital expansion
  - Continuity of operations/Community disaster relief
- On-site generation
  - Solar
  - CHP
  - Fuel Cells
- Building Management Systems
  - Peak load management
  - Utility demand management
  - Frequency regulation

Energy Storage & Automated Switching

Microgrid: Phase One

- Dated proprietary medium voltage network and mechanical switching behind the meter
- Power quality and voltage support above standard utility parameters
- Solid state switching & Automated feeder switching
- Safety/security/reliability
- Software platform controlled
- Foundation for larger microgrid

Energy Storage Phases 1A & 1B

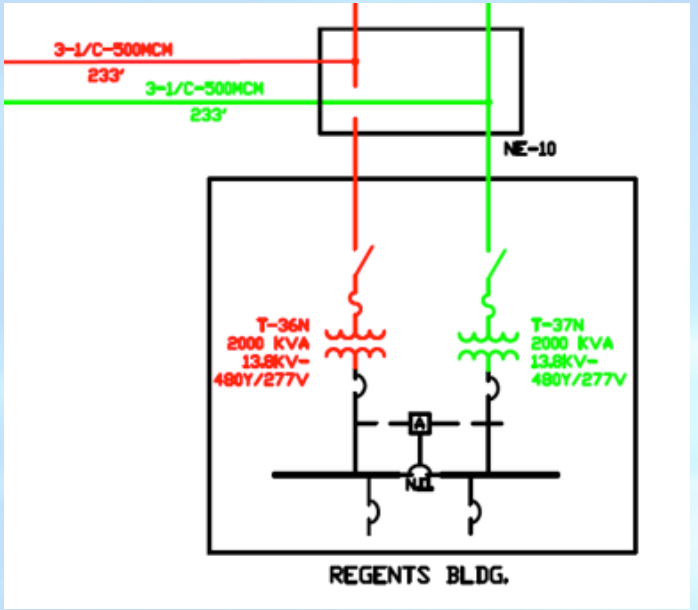
Microgrid Phase One

- Phase IA: Regents Hall
  - 2MW
  - (in implementation)
- Phase IB: Hariri, Leavey, Boiler Plant
  - Additional 6MW
  - Business school/global data network support
  - Hospital support infrastructure/hotel
  - Reduce oil run times on existing conventional boilers
  - Facilitate automated load balancing

Phase IA: Regent Hall

Energy Storage

- Sensitive research and development center
- Maintain facility competiveness
- Safety/security/laboratory emissions control



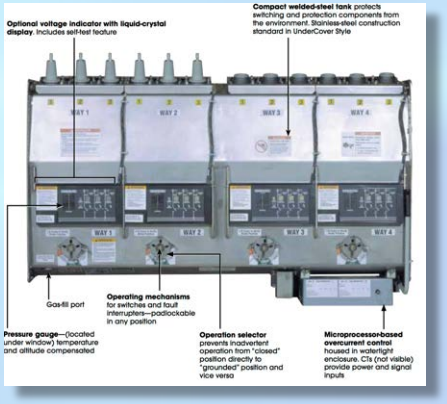
- 2012
- $100m, 154,000-square-foot, state-of-the-art facility 3 classrooms
- Biology, physics, chemistry
- 12 teaching labs
- 3+ floors of research labs
- 4 conference rooms
- 6 student lounges
- 1 cafe

Technical Solution

Phase IA: Energy Storage

- Four 2MW capacity, 1.6 MW rated With IM+20M container
  - Project Life: 10 years
  - Estimated battery life: 15-25 years, depending on operational duty cycles
- S&C automated Vista switches
- ABB inverter.
- Viridity software platform/PJM
- External container, pad mounted, wall surface cabling.
- Three separate enclosures with SRC/UPS located next to bus

- ‘Smart” industrial scale inverters
- Capable of advanced communication protocols
- Manufactured in Wisconsin.



- 100 year old French battery company. Extensive experience in PJM FR. Extensive operating experience with Viridity and ABB.
- Manufactured in Jacksonville, Florida at factory established with collaborative funding from US Department of Energy

Sustainability

Phase IA: Energy Storage Regents Hall

Phase I/Regent Hall Energy Storage Solution would reduce GHG & other airborne pollutants by 1.2 million pounds/Year.

Environmental Impact (per EPA)											
lbs of CO2/MWH	1,800.00	1,800.00	1,800.00	1,800.00	1,800.00	1,800.00	1,800.00	1,800.00	1,800.00	1,800.00	
lbs of Nox/MWH	49.62	49.62	49.62	49.62	49.62	49.62	49.62	49.62	49.62	49.62	
lbs of SOx/MWH	10,848.87	10,848.87	10,848.87	10,848.87	10,848.87	10,848.87	10,848.87	10,848.87	10,848.87	10,848.87	
lbs/benzene/MWH	26.48	26.48	26.48	26.48	26.48	26.48	26.48	26.48	26.48	26.48	
lbs/Toluene/MWH	9.59	9.59	9.59	9.59	9.59	9.59	9.59	9.59	9.59	9.59	
lbs/Xylenes/MWH	6.59	6.59	6.59	6.59	6.59	6.59	6.59	6.59	6.59	6.59	
lbs/Propylene/MWH	9.52	9.52	9.52	9.52	9.52	9.52	9.52	9.52	9.52	9.52	
lbs/Formaldehyde/MWH	26.92	26.92	26.92	26.92	26.92	26.92	26.92	26.92	26.92	26.92	
lbs/Acetaldehyde/MWH	8.60	8.60	8.60	8.60	8.60	8.60	8.60	8.60	8.60	8.60	
lbs/Acrolein/MWH	26.89	26.89	26.89	26.89	26.89	26.89	26.89	26.89	26.89	26.89	
Avoided MWH from Peak Shaving	*10*	*10*	*10*	*10*	*10*	*10*	*10*	*10*	*10*	*10*	
NET IMPACT	***128,131***	***128,131***	***128,131***	***128,131***	***128,131***	***128,131***	***128,131***	***128,131***	***128,131***	***128,131***	**1,281,307**

(Total lbs Avoided GHG & Other Airborne Pollutants)

http://www.epa.gov/ttnchie1/ap42/ch03/final/c03s04.pdf

Timeline

Microgrid: Phase 1A&B

- Phase IA: 2 MW in Regents Hall in Q2 2017
- Phase IB: 6 MW in remaining buildings in 2018-2019

MEDSIS Pilot Proposal

Microgrid Energy Storage: Phase 1B

- Additional three buildings and additional 6 MW of energy storage
- Expansion of ‘critical load feeder’ & automated load balancing
- Local distribution support services
  - Reactive power
  - Congestion relief
- Total Cost: $6m