



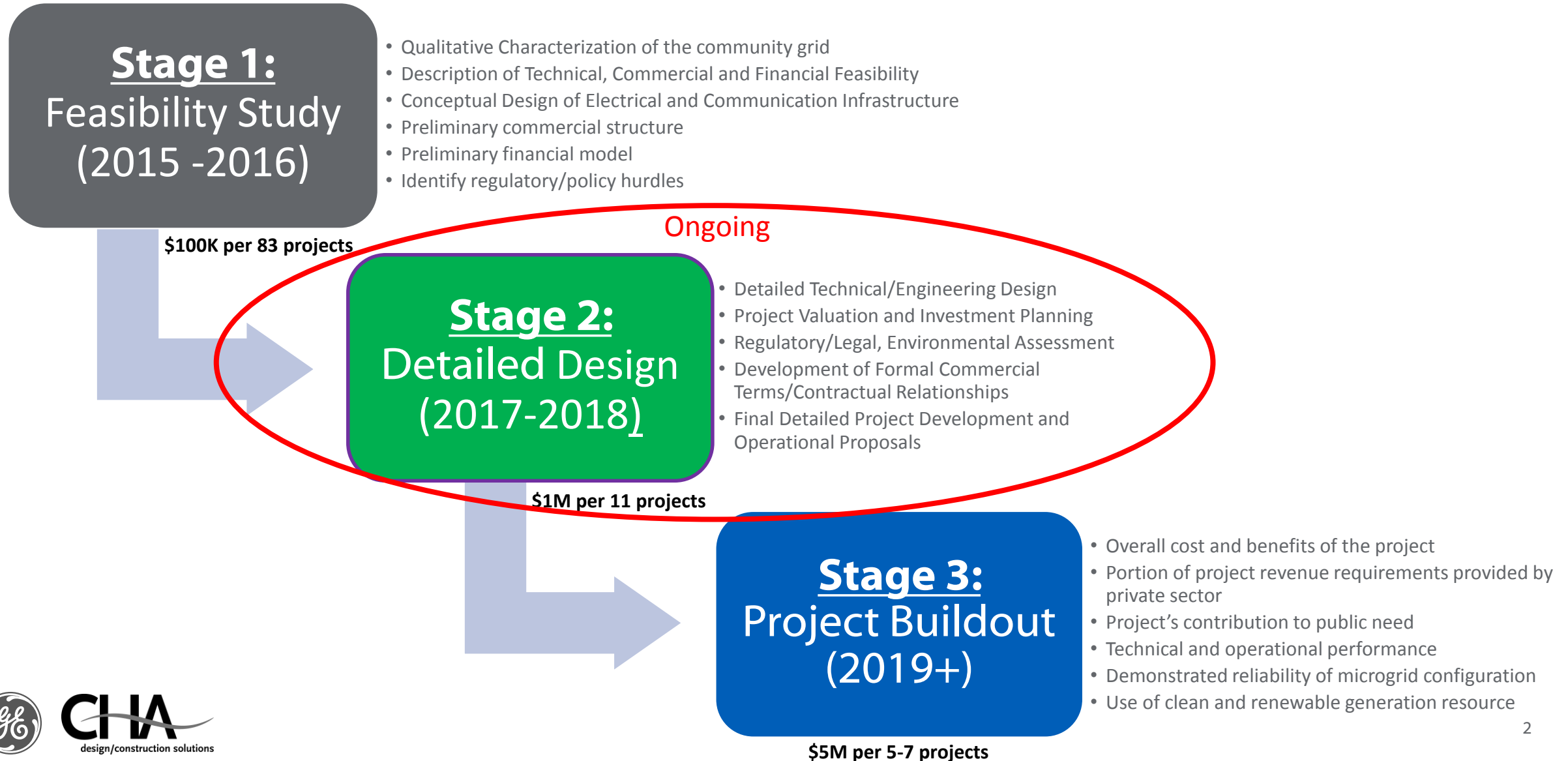
Overview of Syracuse Community Microgrid

Ryan Voorhees – CHA Consulting, Inc

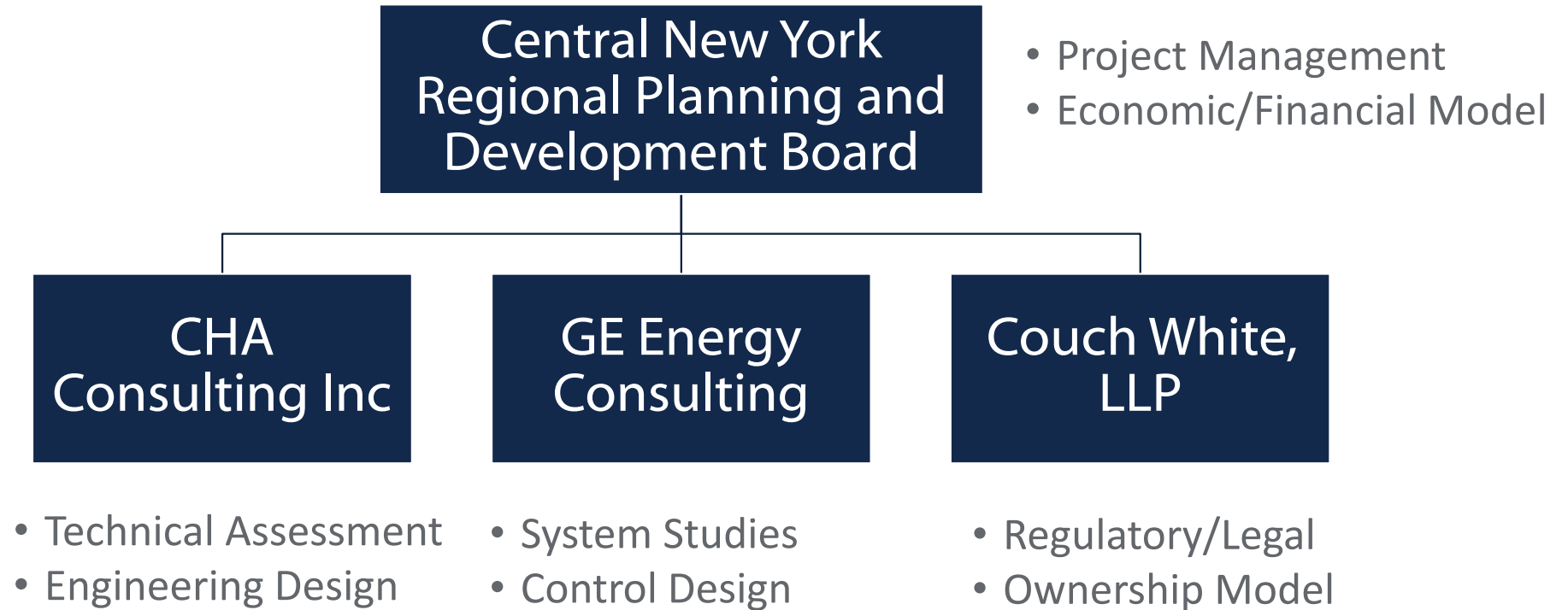
Lavelle Freeman - GE Energy Consulting

October 30, 2018

NY Prize Community Grid Competition



Project Team



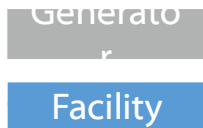
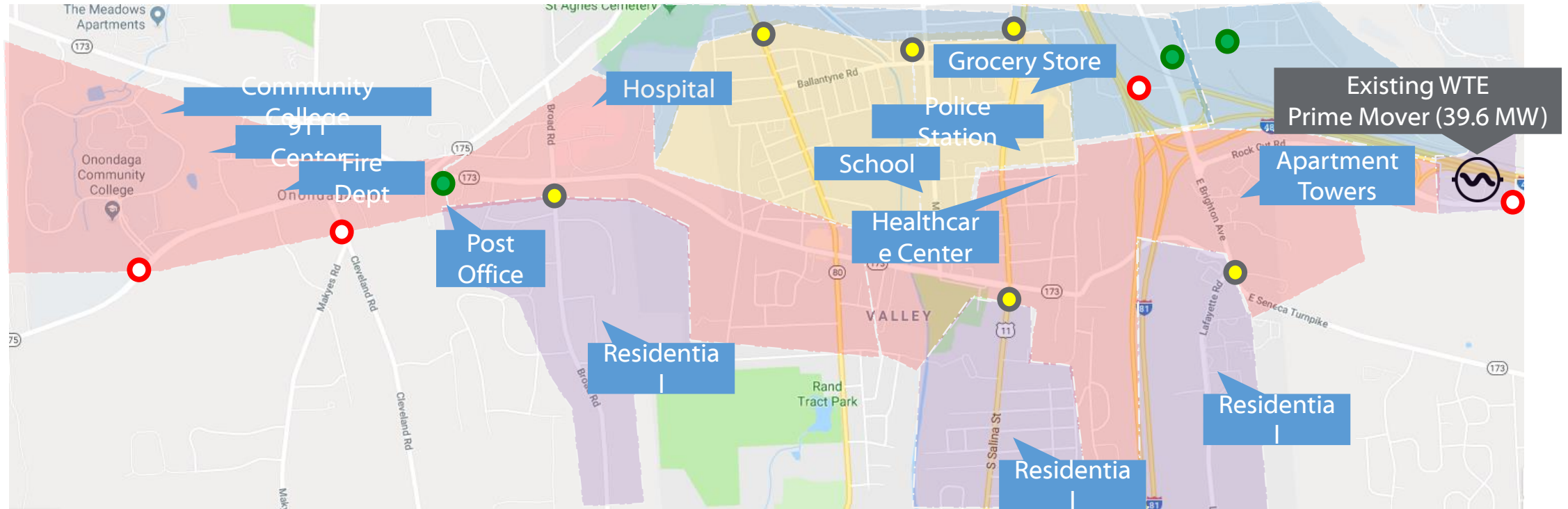
Layout and Design

Syracuse Microgrid Facilities

Facility Name	Facility/Customer Description
Onondaga Community College	Community College
SUNY Upstate University Hospital	Hospital
Van Duyn Center for Rehab and Nursing	Nursing home
Onondaga County Consolidated 911	911 Emergency Dispatch
Syracuse Community Police Department	Police
Onondaga Hill Fire Department	Fire Department
Betts Branch Onondaga Public Library	Library / Place of Refuge
Loretto Campus	Senior Housing
Various Apartment Buildings	Residential Dwellings
Betts Branch Onondaga Public Library	Library / Place of Refuge
Onondaga Middle School	School / Place of Refuge
St. Michaels Church	Place of worship / Place of Refuge
Mobile Gas Station	Fuel, food, ATM
Kinney Drugs	Drug Store, Food,
1,700 Residential & Small Commercial	Various
TOTAL Microgrid Load:	14.97 MW peak; 72,270 MWh



Microgrid Facility Layout

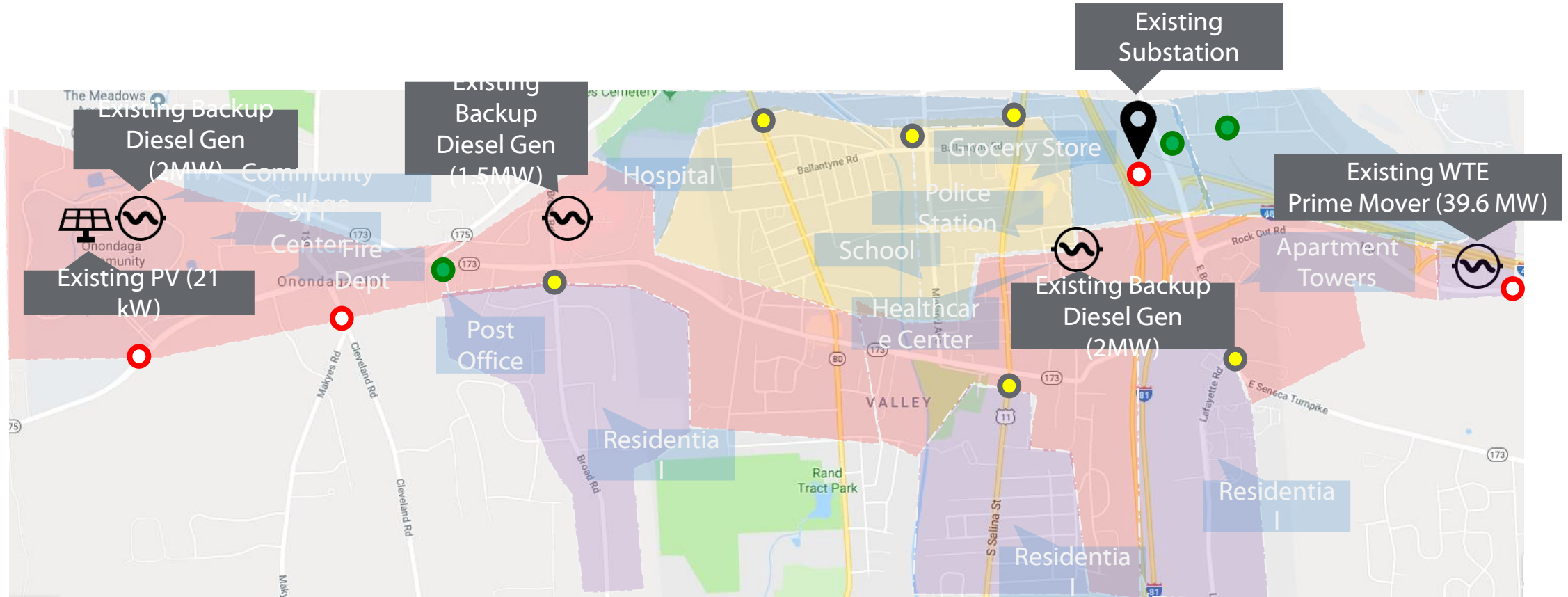


- Open Switch
- Load Shed Switch
- Closed Switch

- 4 miles across
- Consists of 4 utility-owned feeders
- New switching to divide feeders
- Localized load shedding

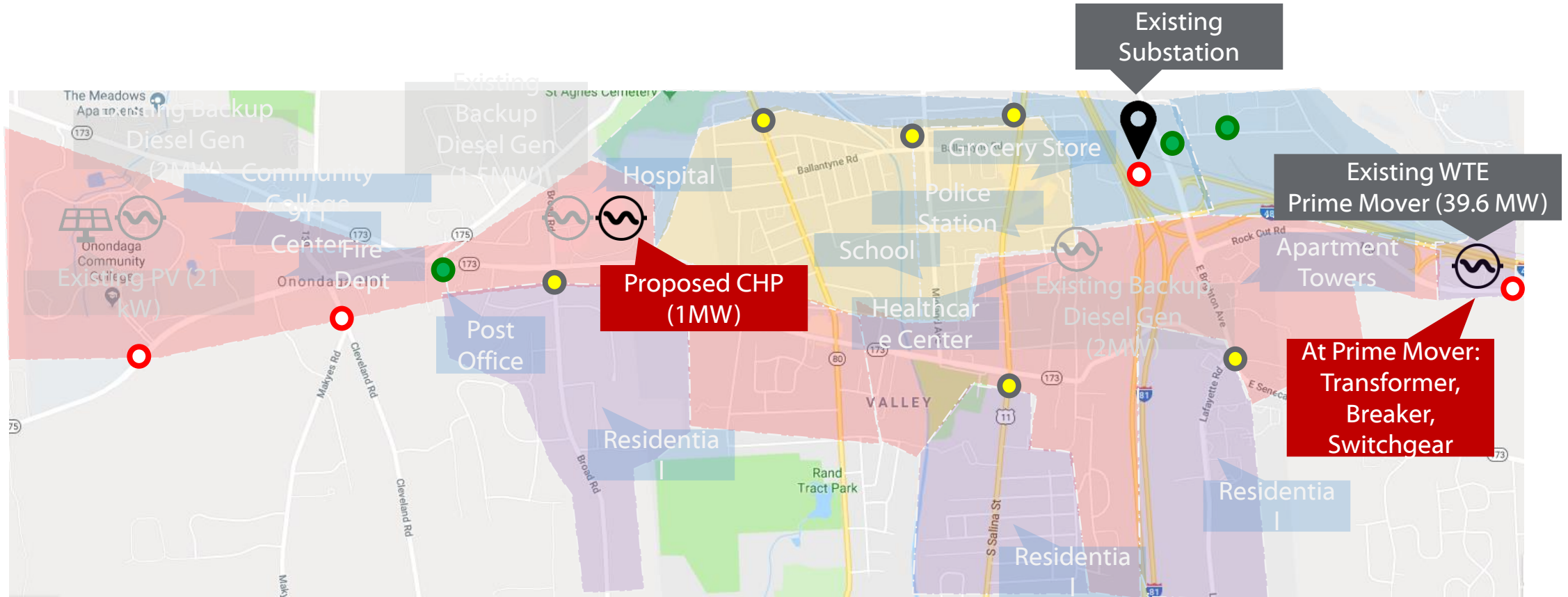


Microgrid Existing Distributed Generation



- Prime mover current feeds into transmission
- Step up transformer converts 13.8kV to 115kV
- Substation serves 2 of 4 feeders in microgrid

Microgrid New Equipment



When forming microgrid:

- Prime mover would feed into distribution at 13.2kV
- New transformer to convert 13.8kV to 13.2kV
- Proposed 1MW CHP at hospital



Resiliency

Microgrid would island in two cases

- Regional transmission failure
- Substation failure

Consideration with Prime Mover (OCRRA):

- Turbine maintenance
 - Minor 5-day outage every 3-4 years
 - Major 20-day outage every 7 years.
- Plant is not black start capable, but very rare all three boilers are cold.
- Potential natural gas pressure issues.
- Overhead distribution feeders



OCRRA Waste to Energy Facility

Upstate Community Hospital CHP

Current conditions

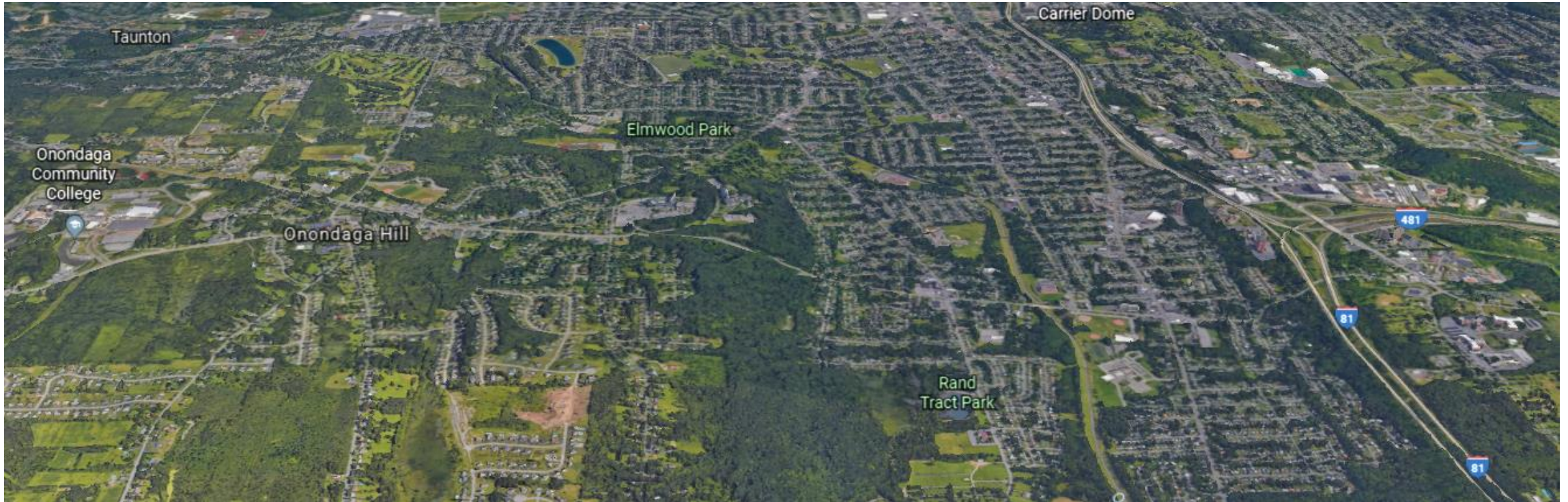
- Electricity fed by two separate 13.2kV feeders
- New, efficient chilled water plant operating at 2,400V
- Very little hot water load; steam is main heat load
- Site electrical load varies between 1MW and 2 MW

CHP Considerations

- Serves the hospital during both blue sky days and microgrid formation
- Reviewed RICE and microturbine equipment with focus on steam generation
- Optimum sizing around 1MW (sized to always import power)
- HRSG would baseload steam usage ~50% summer load, ~33% winter load
- Absorption chiller not cost-effective with new chiller plant

Operation and Control

Challenges with Forming Microgrid



- Microgrid critical facilities spread out over an area of ~4 square miles
- Facilities are normally served by 4 utility feeders from 2 distribution substations
- Over 1700 residential and small commercial loads (~7 MW) mixed in with critical facilities
- Primary generation source (WTE Plant) normally connected into the subtransmission system
- Multiple Points of Interconnection (POI) to the utility grid

Microgrid Operation

Normal (“Blue Sky”) Conditions

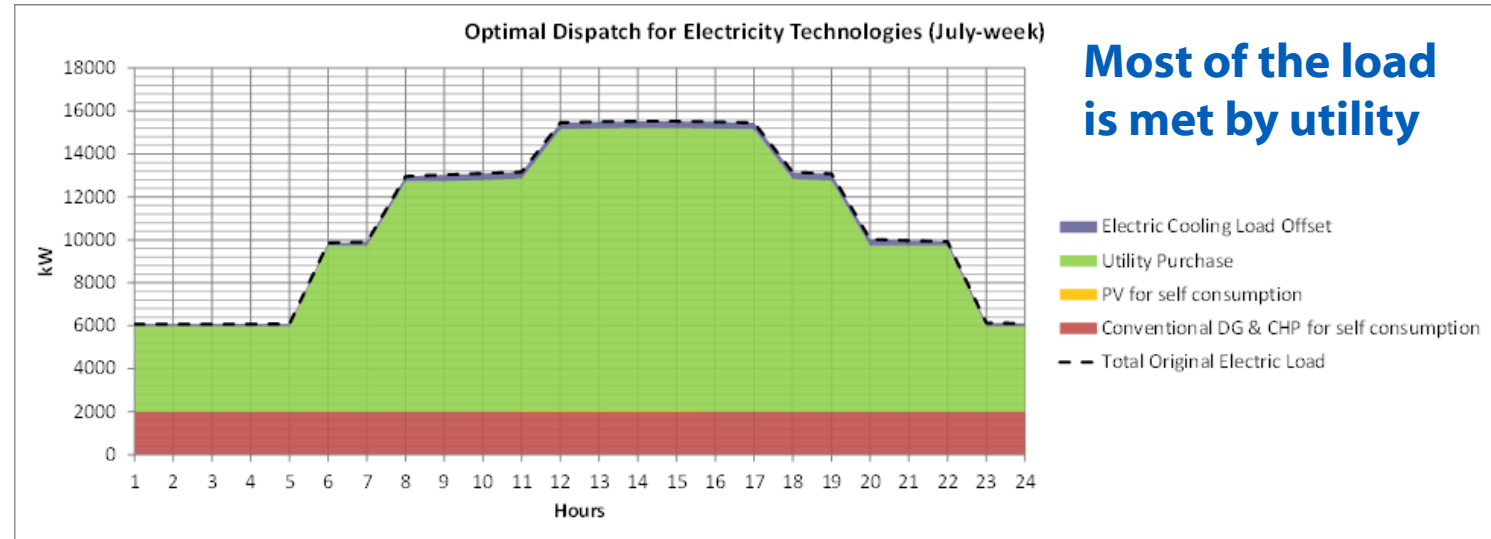
- OCRRA is connected via the existing 115-kV line to the National Grid transmission system
- OCRRA can sell to the utility or into available NYISO markets; UUHCC will operate to provide its own needs
- Microgrid customers have the current supply options that are available to them

Emergency (“Island”) Conditions

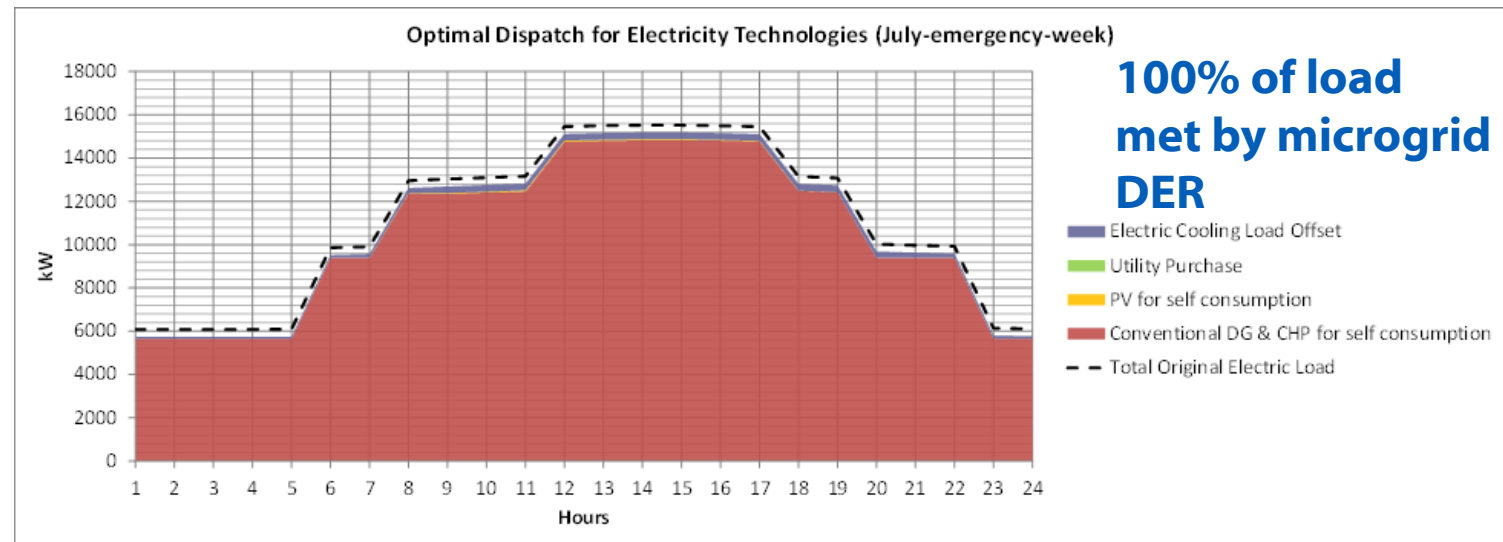
- Medium voltage system is reconfigured to allow OCRRA to directly supply microgrid customers
- OCRRA provides electricity to National Grid for delivery to the microgrid customers at a price
- National Grid or a special purpose entity (“SPE”) is responsible for administering Microgrid operations

Microgrid Dispatch in Normal and Emergency Mode

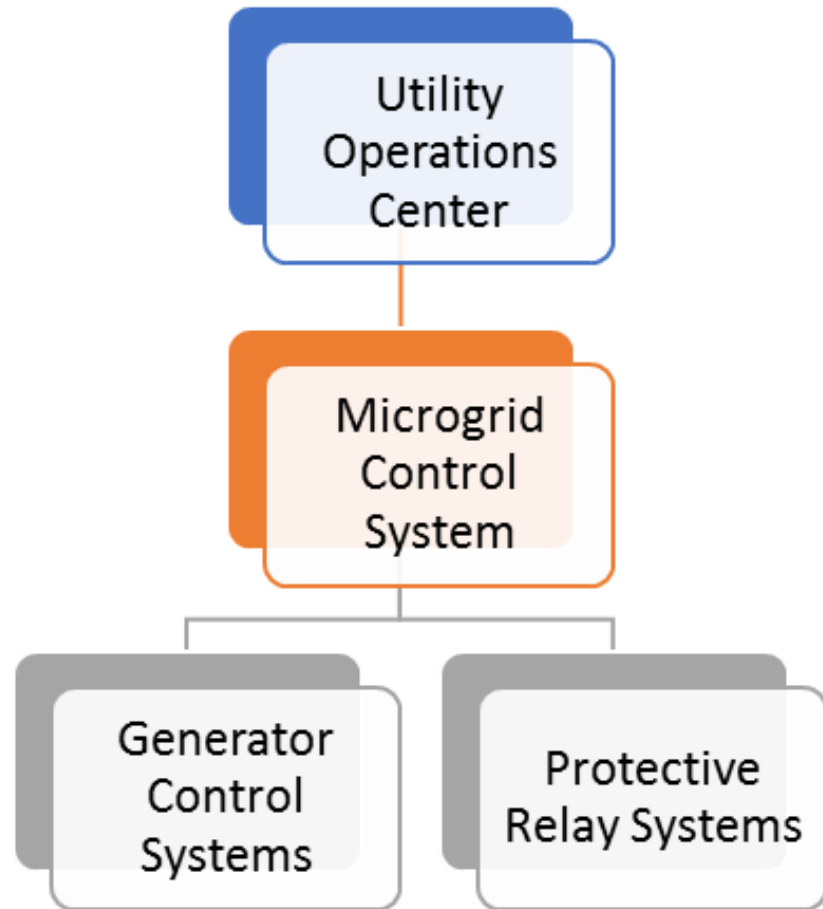
Microgrid Dispatch to Meet Electrical Load – Normal Weekday



Microgrid Dispatch to Meet Electrical Load – Emergency Weekday



Microgrid Control Hierarchy



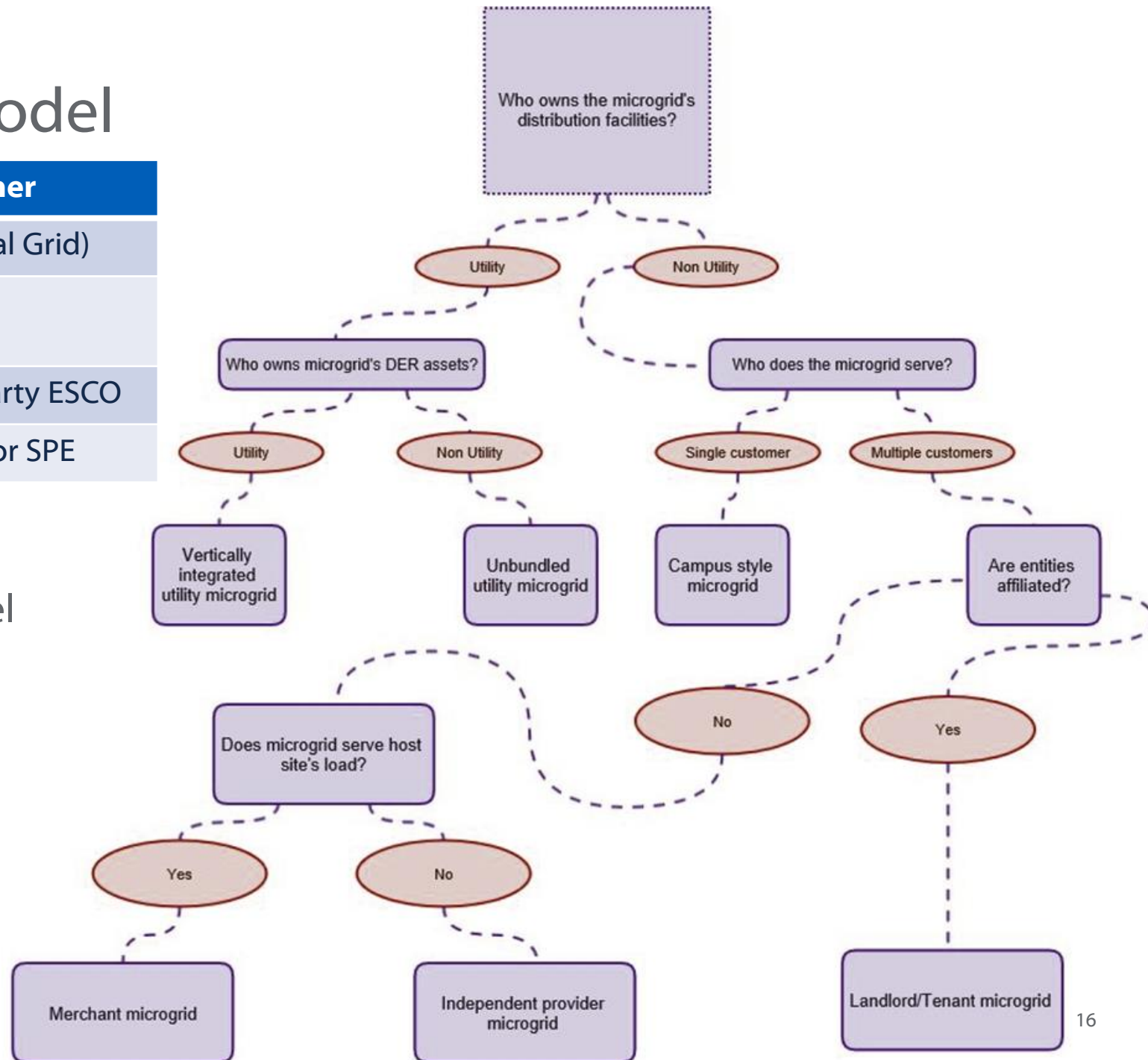
Control hierarchy governs operation, transition to island mode, and operation in island mode

- Utility might have ultimate supervisory control over microgrid operation
- Microgrid central controller (MGCC) operates (functionally) below utility operations to monitor and dispatch (but perhaps not in this case)
- Generation control systems responsible for primary voltage/frequency regulation
- Protective relay systems perform autonomously, decoupled from control systems

Microgrid Ownership Model

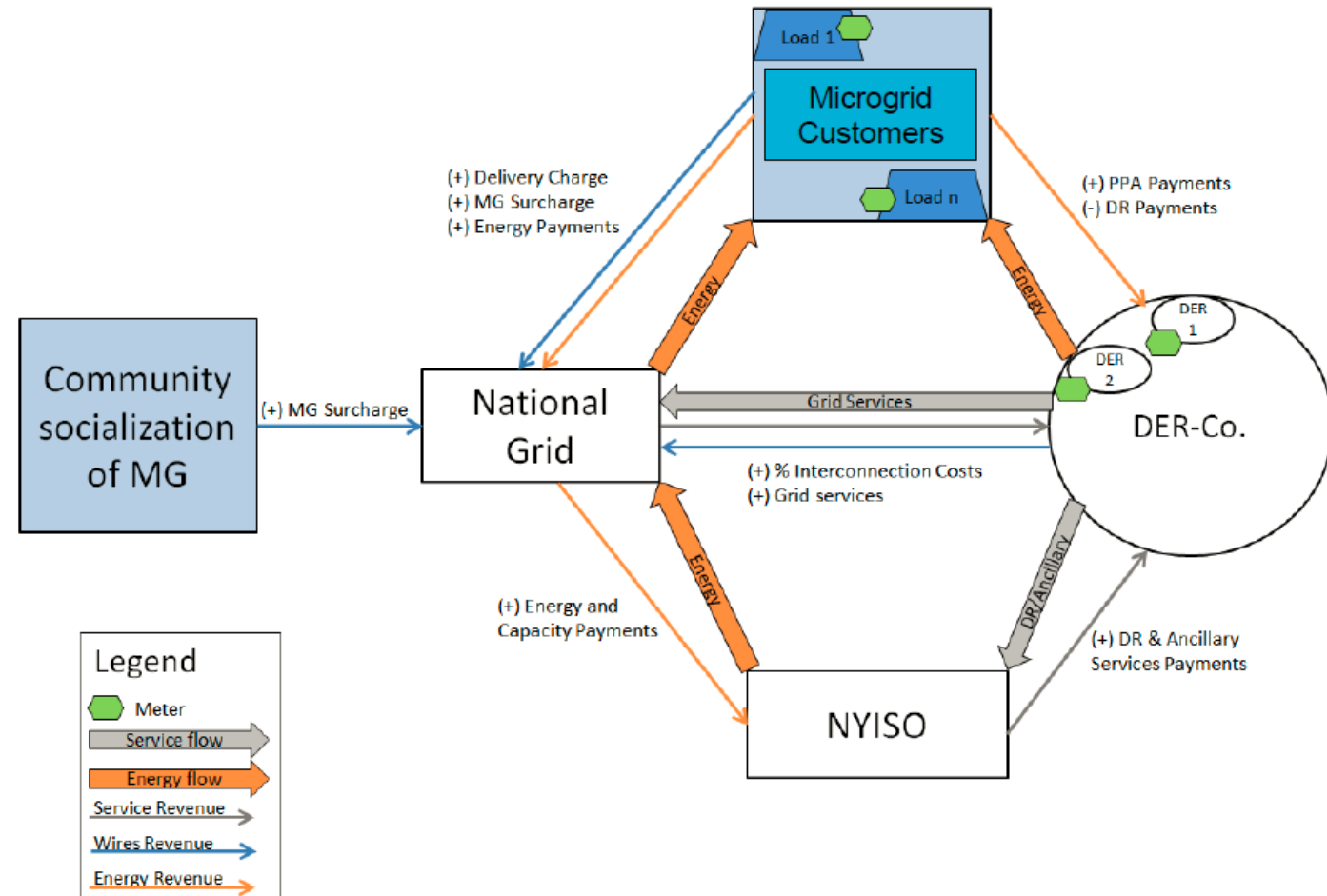
System Component	Potential Owner
Distribution Assets	Utility (National Grid)
Primary Distributed Energy Resource	OCRRA
Secondary DER (CHP System)	Hospital/3 rd Party ESCO
Microgrid Controller	National Grid or SPE

Eventual structure of the ownership model depends on, among other things, assets deployed, existing contracts, regulatory rules, recovery on assets, ...



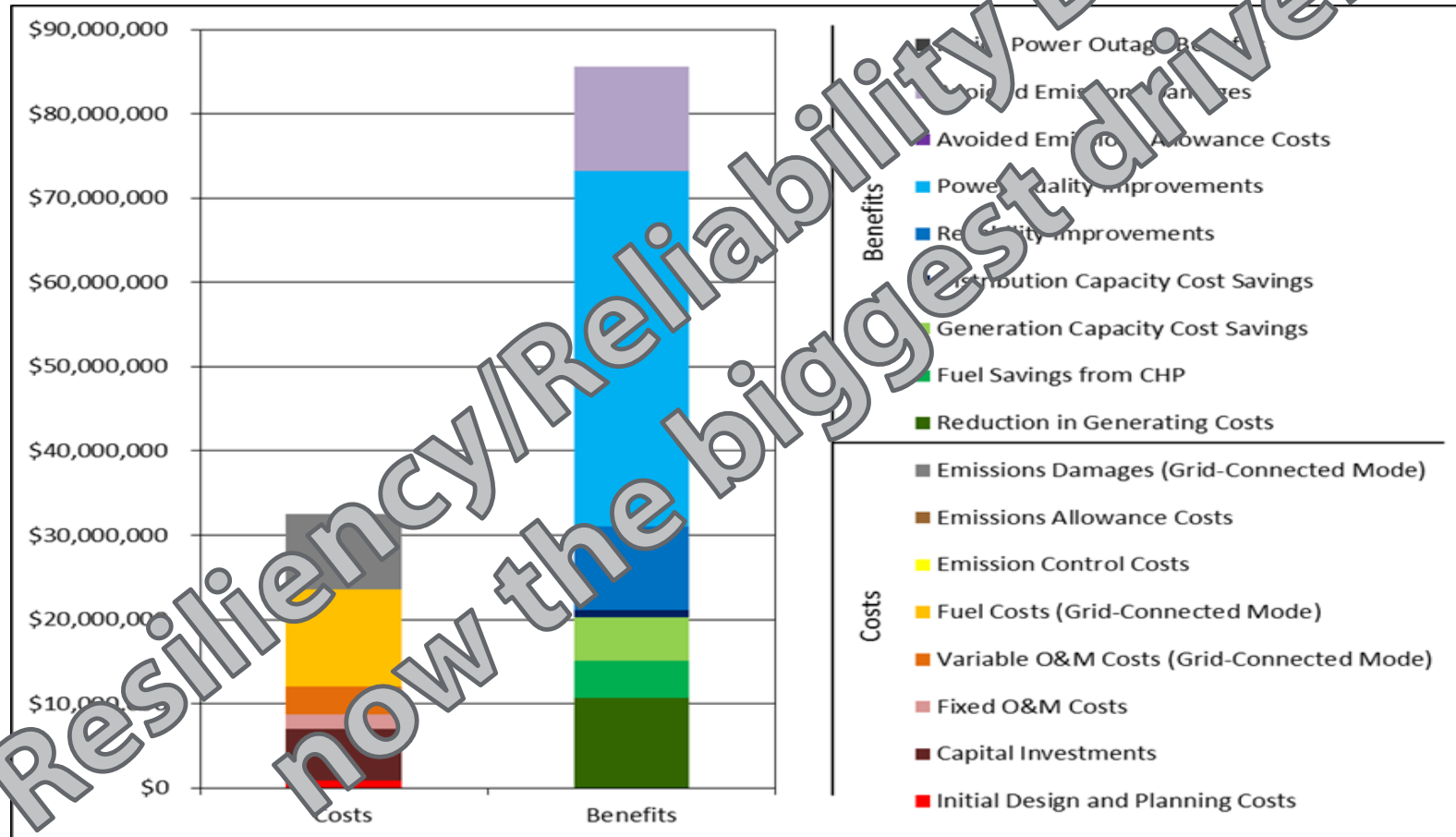
Proposed National Grid Hybrid Ownership Model

- National Grid owns and operates all traditional (existing and new) microgrid electric distribution assets
- OCRRA and Community Hospital owns and operates DER assets
- National Grid is responsible for grid and island modes of operation
- DER owners might participate in NYISO markets, and provide grid support services to National Grid



Syracuse Microgrid Preliminary BCA (from Stage 1)

ECONOMIC MEASURE	ASSUMED AVERAGE DURATION OF MAJOR POWER OUTAGES	
	SCENARIO 1: 0 DAYS/YEAR	SCENARIO 2
Net Benefits - Present Value	\$53,200,000	Not Evaluated
Benefit-Cost Ratio	2.6	Not Evaluated
Internal Rate of Return	222%	Not Evaluated



Possible Sources of Funding

- NYSDERDA New York Prize Stage 3 grant
- NY Green Bank low interest loans
- Governor's Office of Storm Recovery (GOSR)
- Private bank financing
- Investor financing
- National Grid hybrid-ownership model

Key Challenges/Barriers

- Existing contractual agreements for energy produced by WTE plant
- Supplier agreements and regulations regarding service to residential customers
- Cost recovery for distribution investments/assets
- NYISO qualification requirements for DER/Microgrid
- NY REV DER pricing, and movements in wholesale electricity market pricing (and natural gas prices)
- Air quality and environmental regulations
- Interconnection agreements
- Ownership structure/SPE