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Community Resilience REV Demonstration Project
Potsdam, NY

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Project Manager

Location

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Community Resilience REV Project
Resiliency

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Community Resilience REV Project
New Utility Revenue Streams

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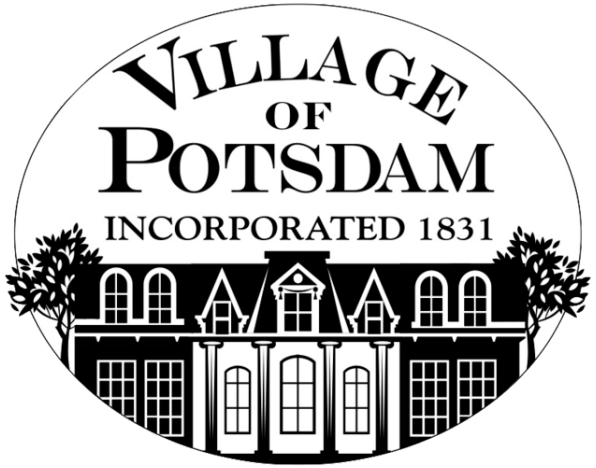
- Develop and test four utility services to support multi-customer microgrid development:
  - Underground wires & associated asset recovery model
  - Central procurement of distributed energy resources (DER)
  - Billing and financial settlement services
  - Microgrid control and operations services



Community Resilience REV Project
Previous/Ongoing Studies

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Potsdam Microgrid Programs

NYSERDA, Concept Feasibility

- Critical Services
- Additional Generation
- Economic Impact

NSF, Benefit to Community

- Human Factors Engineering
- Community Benefits
- Governance
- Smart Scheduler

DOD & GE investment

- Optimal Dispatch
- Renewable Integration
- Energy Storage Resources
- Fast Load Shed & Protection

DOE, Microgrid Controller Development

- Ancillary Services
- Day Ahead Bidding
- Performance Testing

NYREV, Detailed Design & Business Case

- Test New Services Offered by Utility
- Detailed Engineering Design
- Develop Financial Business Plan and Service Agreements

CU Clarkson University

GE GE Global Research

NG National Grid

Community Resilience REV Project Stakeholders

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- Clarkson University
- SUNY Potsdam
- Canton-Potsdam Hospital
- Village Government
- Community

Community Resilience REV Project
Critical Infrastructure

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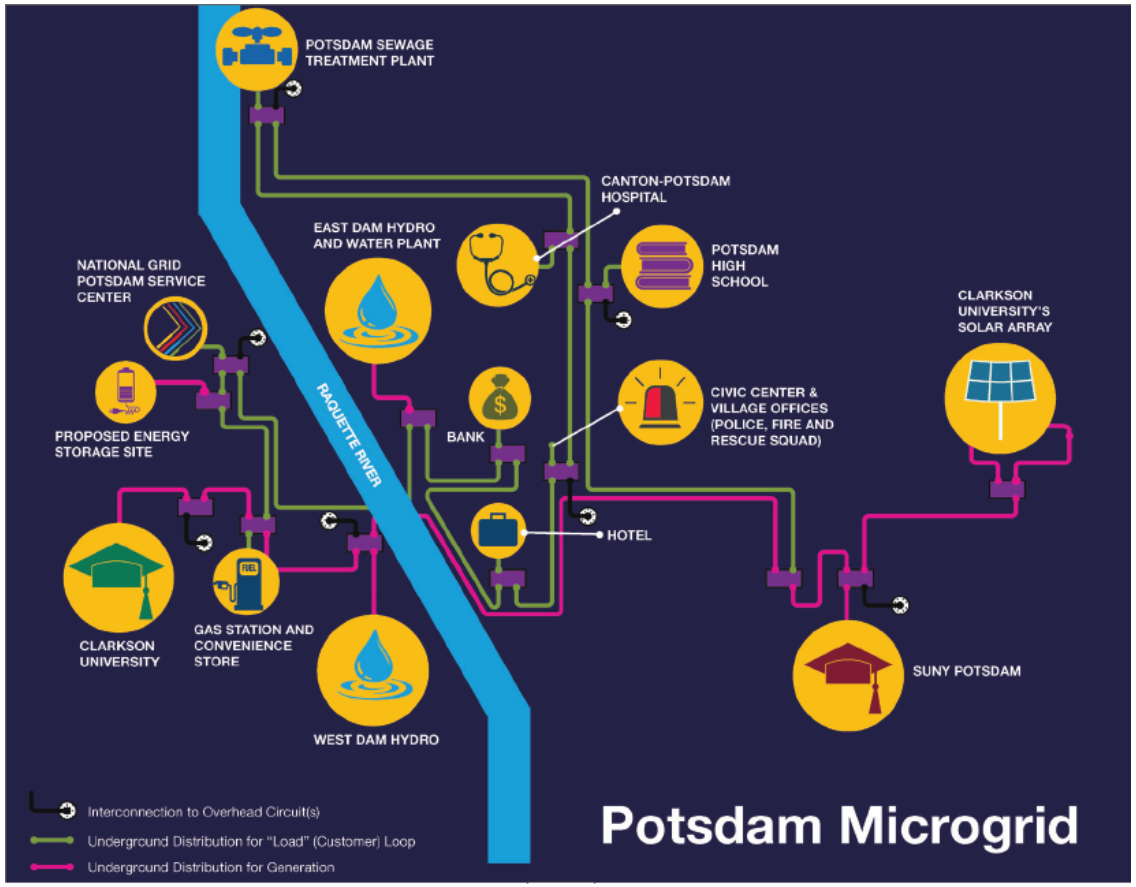
- Police Department
- Fire Department
- Rescue Squad
- Water Treatment Plant
- Wastewater Plant
- Hospital
- Utility Service Garage



Community Resilience REV Project
Commercial Participants

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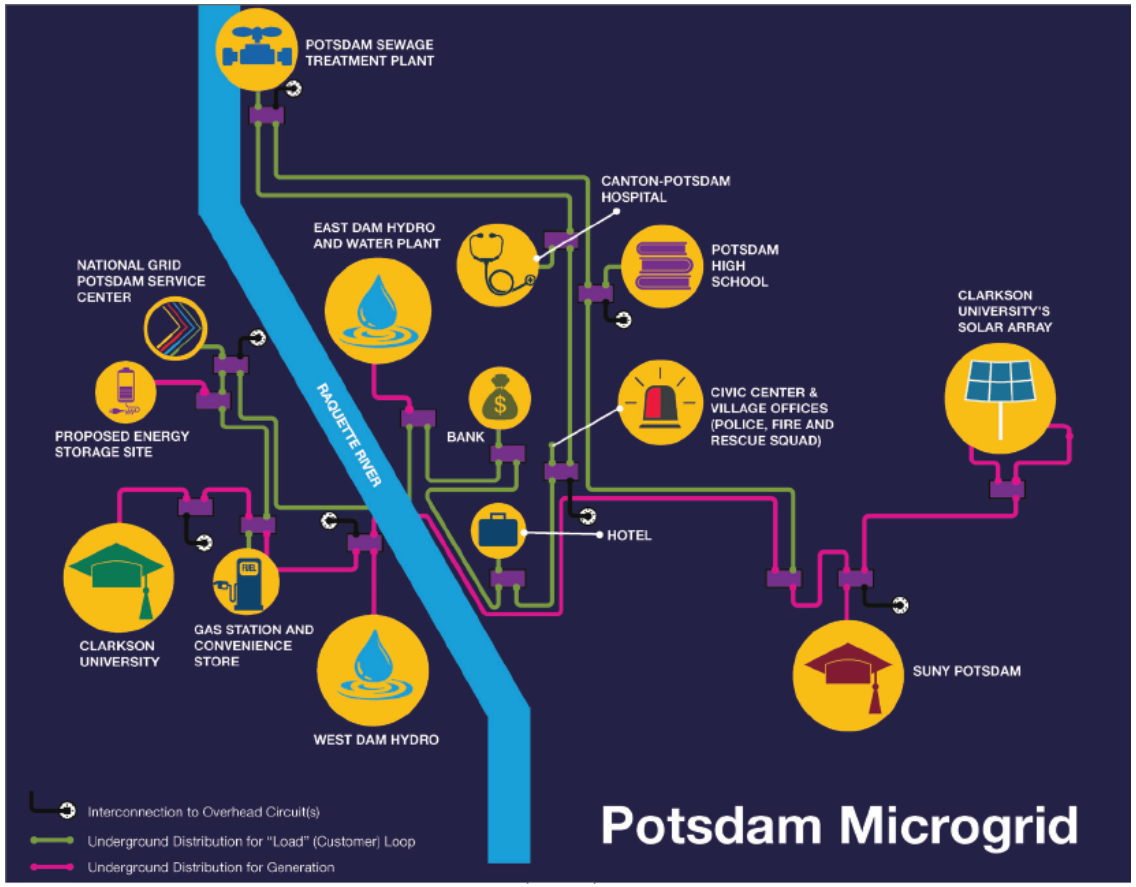
- Pharmacy
- Gas Station
- Grocery Store
- Bank
- Hotel
- Universities (2)



Community Resilience REV Project Generation

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- Existing:
  - Two 500 kW hydro dams
  - One 2 MW solar array
  - Two 1.4 MW CHP
  - Numerous <500 kW engines
- Renewables unreliable during storms
- CHPs cost effective for few hrs/yr
- Need add'l 3.2 MW(approx.)

Cost Estimate Summary

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- Full microgrid Cost Range Initial estimate:

$26M – $61M

  - Microgrid Scope revised; Construction cost range:

$15M - $21M

- How to pay for the Micro Grid?
- How to pay for operation of Microgrid?

Community Resilience REV Project
Area Geographic Location

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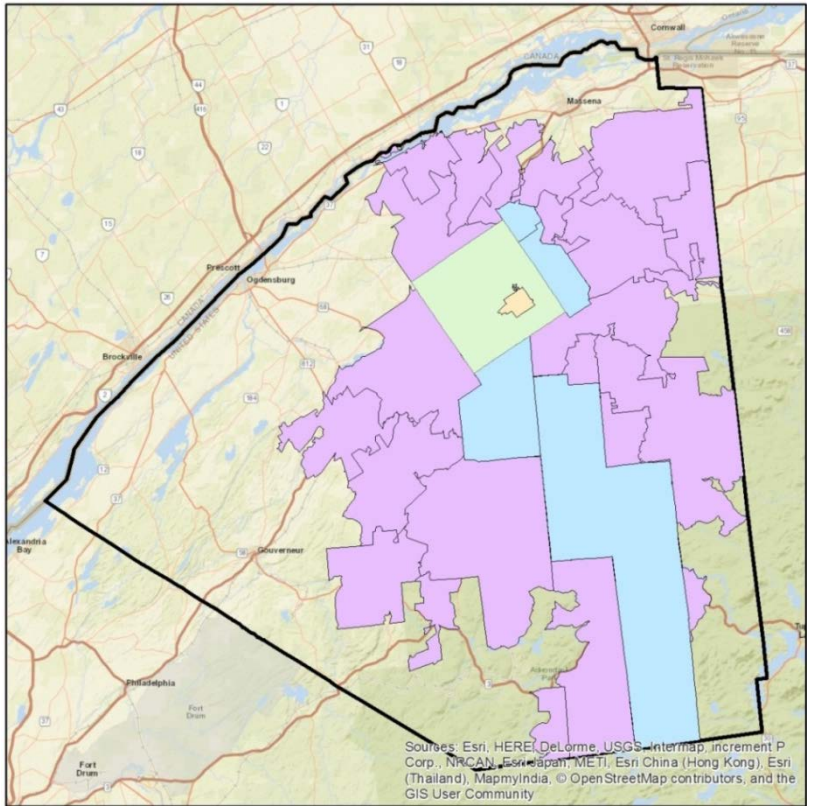
Municipality	Population	Area (mi^2)	Density (Persons/ mi^2)
Village of Potsdam	9,800	4.8	2,042
Town of Potsdam	16,000	103	155
St. Lawrence Co.	111,000	2,811	39



Community Resilience REV Project
Tiered Recovery

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- Shared community investment
- Based on level of benefit from the microgrid
- Current tariff provisions intended for beautification projects
- Can’t use rate-base approach

Tiered Recovery Model

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Benefit	Tier	Tier Participants	Tier Basis	Account Quantity
DIRECT	Tier 1a	Clarkson University, SUNY Potsdam, Village Government	Connected Generating	5
	Tier 1b	Hotel, Hospital, Bank, Rescue Squad (EMS), Grocery Store, Drug Store, Gas Station, High School	Load-Only Critical Commercial and Muni	10
INDIRECT	Tier 2	Village of Potsdam Border	Police	2,528
	Tier 3	Town of Potsdam Border	Fire	3,393
	Tier 4	Villages of Potsdam & Norwood; Towns of Potsdam, Pierrepont, Colton, Stockholm (portion), Norfolk (portion)	Rescue Squad	3,603
	Tier 5	27 Zip codes	Hospital	14,148
			Total:	**23,687**

Community Resilience REV Project
Tiered Recovery

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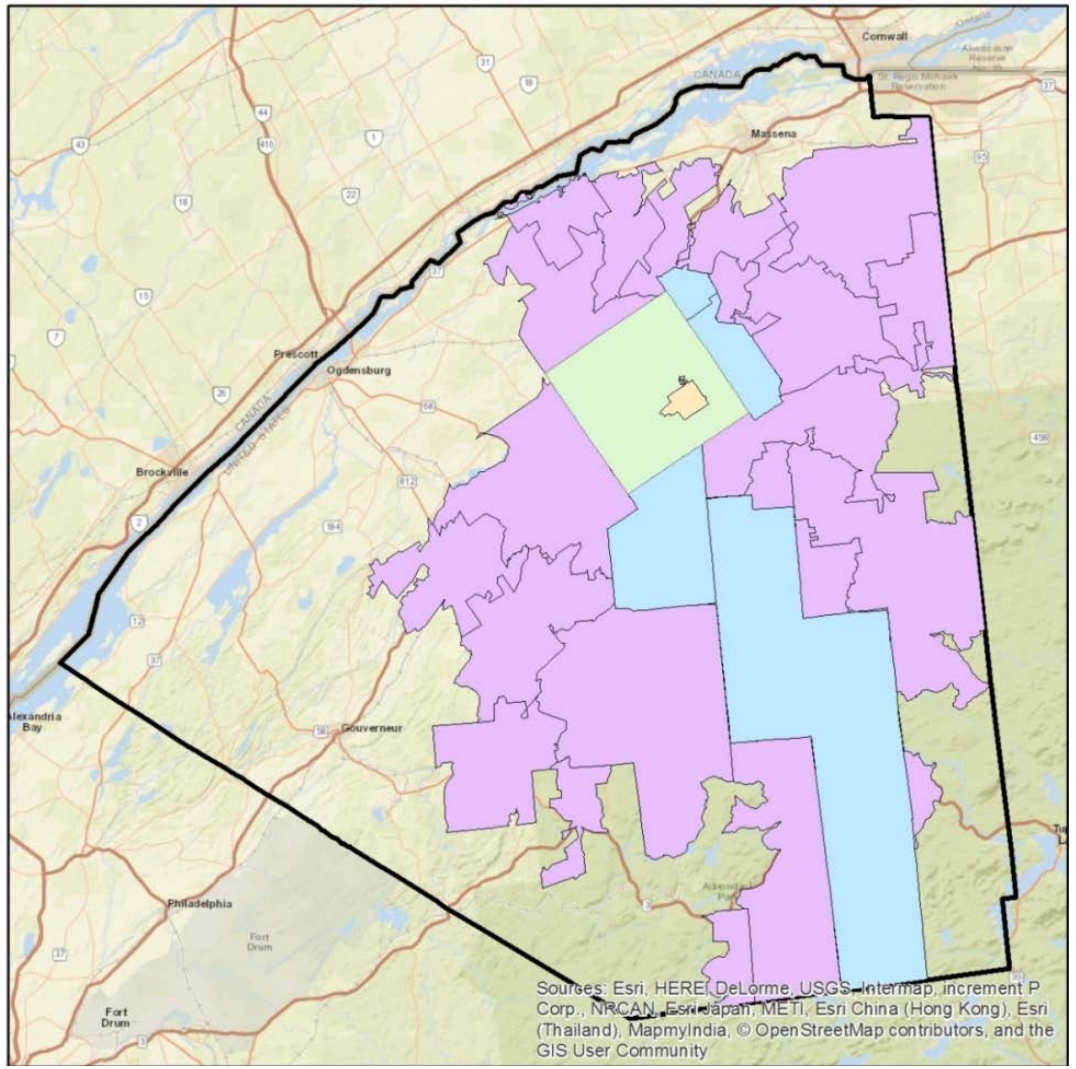
Legend

- Village_of_Potsdam_tier2
- Town_of_Potsdam_tier3
- EMS_tier4
- Hospital_Tier5
- St. Lawrence county



Tiered Recovery Model

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	Service Territory by Tier					
	Police Department	Wastewater Treatment	Water Treatment	Fire Department	Rescue Squad	Hospital
Tier 1	✓	✓	✓	✓	✓	✓
Tier 2	✓	✓	✓	✓	✓	✓
Tier 3				✓	✓	✓
Tier 4					✓	✓
Tier 5						✓

Cost Estimate Summary

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- Price yields unacceptable bill impact
- Option: Use STAGED roll-out approach
- Theory: Proving microgrid value makes future expansion cost acceptable.
- Stage 1: Capture services of high importance to customers
- Incremental costs may attract outside financial resources

Stages of Multi-Phase Roll-Out Approach

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Stage	Start/Finish Point	Load & Generation Connections
1A	Clarkson PCC (feeder 51) to Civic Center	Clarkson University, Drug Store, Gas Station, Hotel, Bank, Grocery Store, Civic Center/Rescue – Fire and Police, West Hydro
1B	Maple Street to East Dam Hydro	Stage 1 + East Hydro, Water Treatment Plant
2	Civic Center to Hospital	Stage 1 + High School and Canton-Potsdam Hospital
3	Hospital to Wastewater Plant	Stage 2 + Wastewater Treatment Plant
4	Civic Center to SUNY	Stage 3 + SUNY Potsdam
5	SUNY to PV (overhead)	Stage 4 + PV
6	Clarkson PCC to NG Service Center	Stage 5 + NG Service Center

Potsdam Microgrid: Staged Roll Out Map

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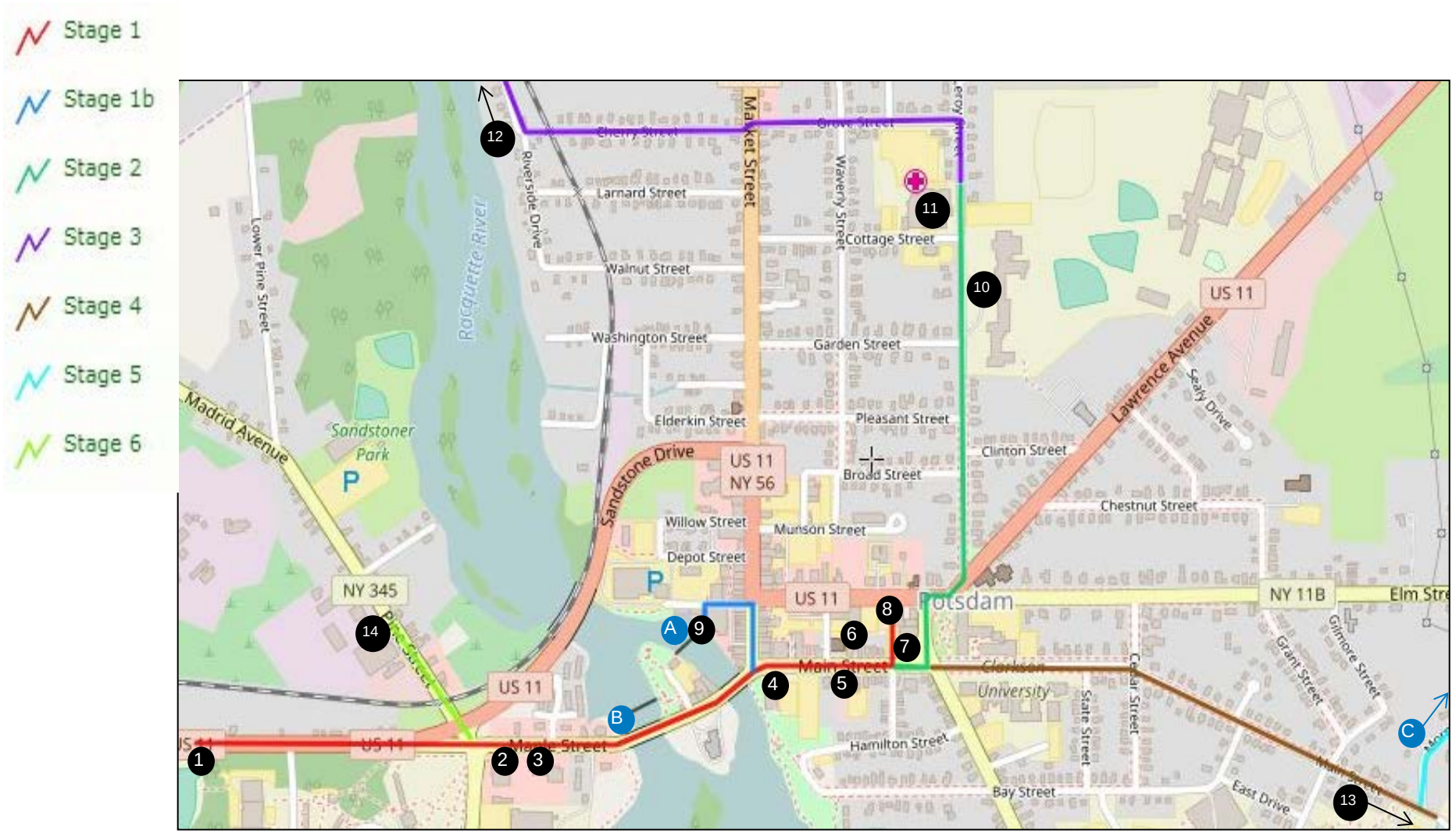

Community Resilience REV Project Governance Models

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- Business Models
  - DER Provider
  - DER as ESCO
  - Municipal Utility District
  - Community Utility District
  - Hybrid Utility

- Things to Consider
  - Insurance
  - Legal
  - Taxes
  - Regulation
  - Local Board
  - Utility Role
  - Aggregate Generation
  - Aggregate Demand

Community Resilience REV Project
Business Models

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Distribution

DER

Controller

Proposed Governance/Business Model

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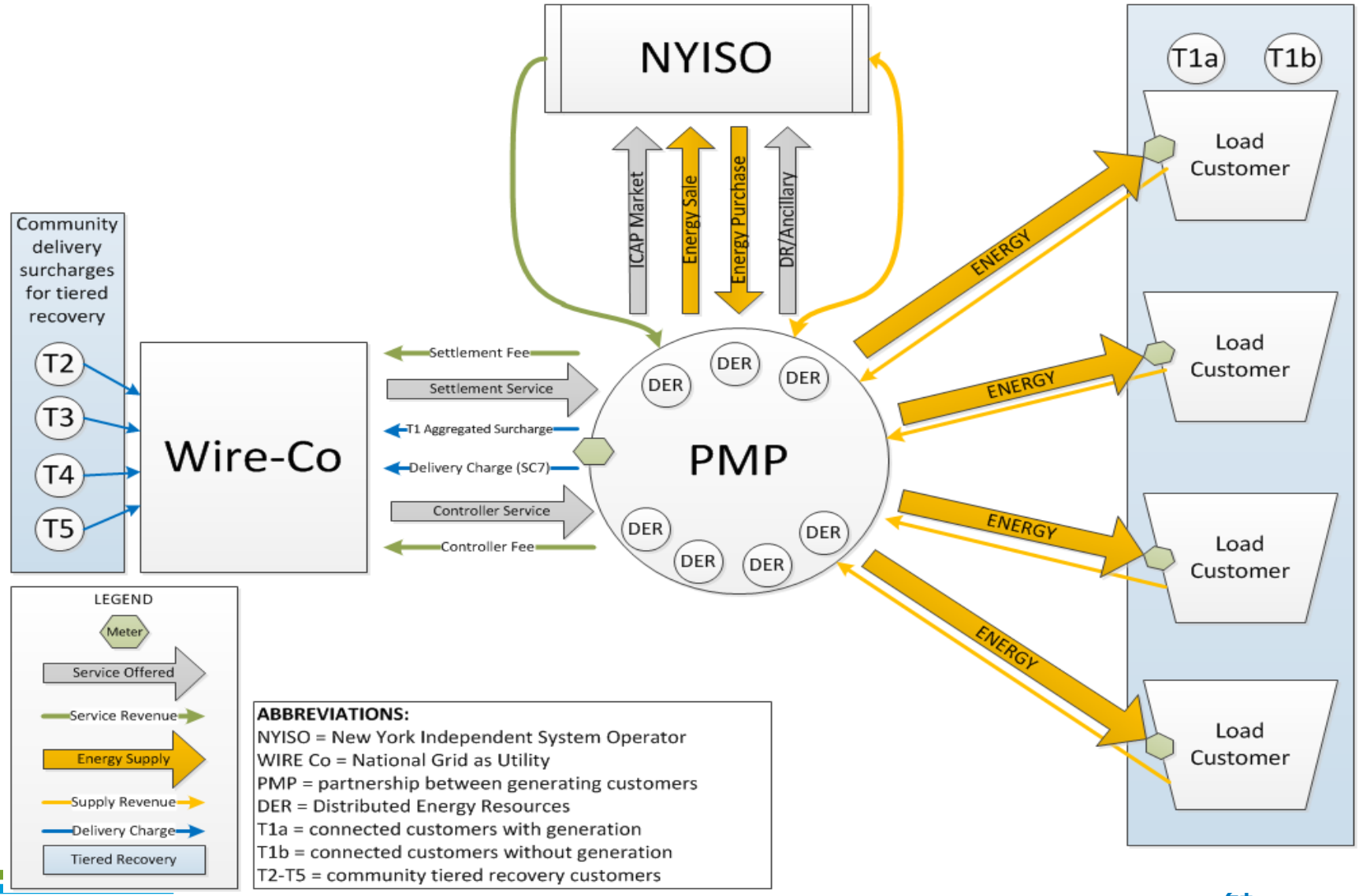

National Grid as “Wire-Co.”

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- All responsibilities and financial activities that National Grid would assume are categorized as the “Wire Company (Wire-Co).”

REVENUES

+ Payments from community for distribution in multi-tiered surcharge design (based on kWh)

+ Payments from microgrid entity for standard SC7 distribution service (based on kWh / kW)

+ Payments from microgrid entity for microgrid controller (MaaS fee)

+ Payment from microgrid entity for metering, billing, and settlements (service fee)

COSTS

- Distribution equipment and installation

- Protection equipment and installation

- Controller equipment and installation

- Metering, billing, and settlement

- Various taxes

- Operations and maintenance

Potsdam Microgrid Partnership (PMP)

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- All responsibilities and financial activities that the newly formed microgrid partnership will assume are categorized as the "Potsdam Microgrid Partnership (PMP)."

REVENUES

+ Payments from customers for energy sales (based on kWh)

+ Revenues from NYISO market participation (energy, capacity, and ancillary services)

+ Payments from NYISO or National Grid from participation in DR programs

COSTS

- DER equipment and installation

- DER fuel

- DER fixed operations and maintenance (FOM)

- DER variable operations and maintenance (VOM)

- DER emission related

- Cost of power purchase

- Payments to Wire-Co. for distribution, controller, and metering/billing/settlement services

Project Challenges

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- Prevailing Population density → Low bill impact acceptability
- Large Geographic footprint → High underground construction cost
- Low electricity and high gas prices in area → Limited revenue
- Market changes: Value of DER, NYSIO DER Roadmap not firm

Key Findings/Decisions to Date (Slide 1 of 2)

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- DER needs during ‘island mode’ may be reduced significantly via:
  - Implementing EE
  - Instituting an effective D/R program

- Renewable DERs can’t be included due to unreliability during weather events

- Existing non-renewable DER is insufficient to meet remaining load; new DER source required

Key Findings/Decisions to Date (Slide 2 of 2)

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- Most financially-viable new DER source is likely a fuel cell
- Participant changes may increase or decrease DER needs
- Microgrid governance is complicated; numerous aspects affect the selection
- Project costs indicate a staged construction approach will earn greatest community acceptance

Next Steps

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- Develop precise cost estimates
- Complete formal pricing proposal
- Obtain key stakeholder agreement on Governance Model
- Monitor:
  - NY Prize
  - NYS PSC Value of DER
  - NYISO DER Roadmap

Questions?