

# Willdan Group

## NY Prize Feasibility Studies

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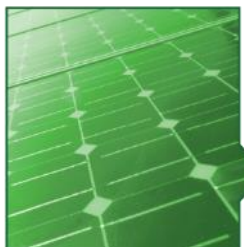
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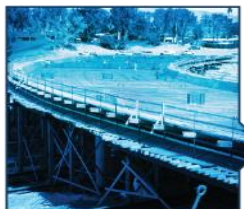
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# Willdan Group Profile



**Energy.** Energy and resource management for utilities, public agencies, institutions, and private enterprises.

**Highlighted Services.** Energy efficiency consulting; engineering; design/build; construction management; performance contracting; utility program implementation; generation and microgrids; and direct installation of energy-saving technologies.



**Engineering, Planning and Infrastructure.** Consulting engineering for municipalities, counties, state, and federal agencies.

**Highlighted Services.** Civil engineering; geotechnical and materials testing; city planning and engineering; and building safety and planning.

**Financial and Economic Consulting.** Financial consulting for cities, counties, and other public agencies.

**Highlighted Services.** Property Assessed Clean Energy (PACE); utility rate studies; utility valuation services; electric cost of service analysis; community choice aggregation; and community net metering



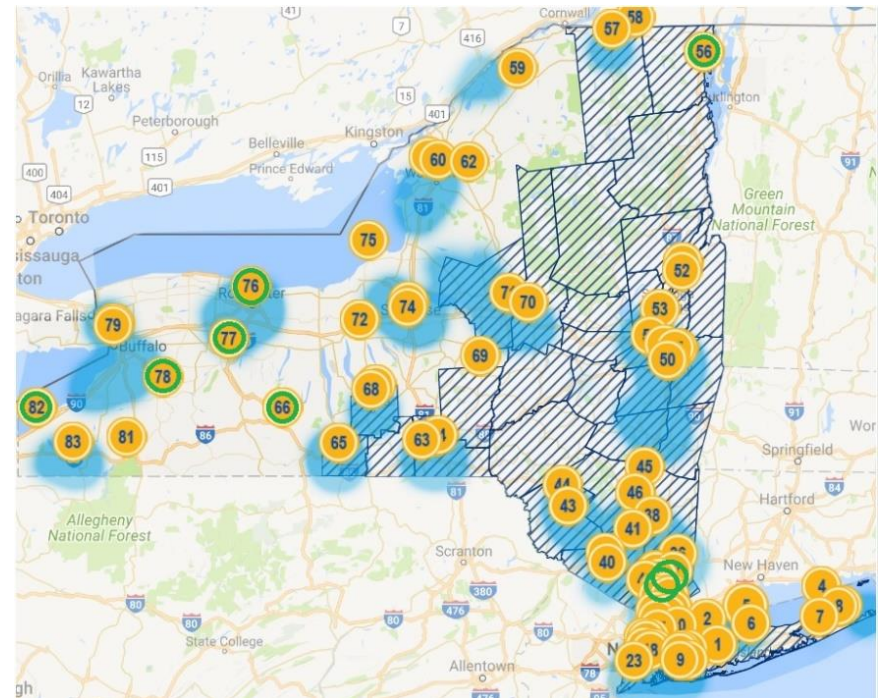
**National Preparedness and Interoperability.** Emergency management for cities, counties, and other agencies.

**Highlighted Services.** Communications, technology and interoperability service; emergency preparedness and response training and exercises; and emergency and hazard mitigation planning.



# NY Prize Overview

- 3 Phase project
  - Microgrid Feasibility Studies
  - Audit-grade Engineering Design and Business Planning
  - Project Build-out and Post-operational Monitoring
- Nine Communities with aggregated average load of 70MW (**Green Circles**)
  - **Municipal Electric:** Arcade, Bath, Westfield,
  - **IOUs:** Tarrytown, Sleepy Hollow, Rochester, and Wappingers falls
  - **SUNY Campuses:** Plattsburgh, Geneseo
- Residential, Commercial, and Industrial Customers
- Thermal loads with different sources



# NY Prize Overview (Cont.)

- Study Steps
  - Description of Microgrid Capabilities
  - Develop Preliminary Technical Design Costs and Configuration
  - Commercial and Financial Feasibility
  - Develop Information for Cost Benefit Analysis
- Study outputs
  - Tangible
    - Over \$4.7 million estimated savings through winter peak shaving
    - Annual rough savings of \$0.5 Million through Power Quality Improvements for Industrial Customers using solar and energy storage
    - Annual roughly of \$3 million new revenue streams across the communities
  - Non-Tangible
    - Power Reliability and Resilience improvement for first responders and critical services such as police, fire, healthcare, jail, ambulance, utility control centers.
    - Additional smart cities application capabilities such as additional community communication infrastructure

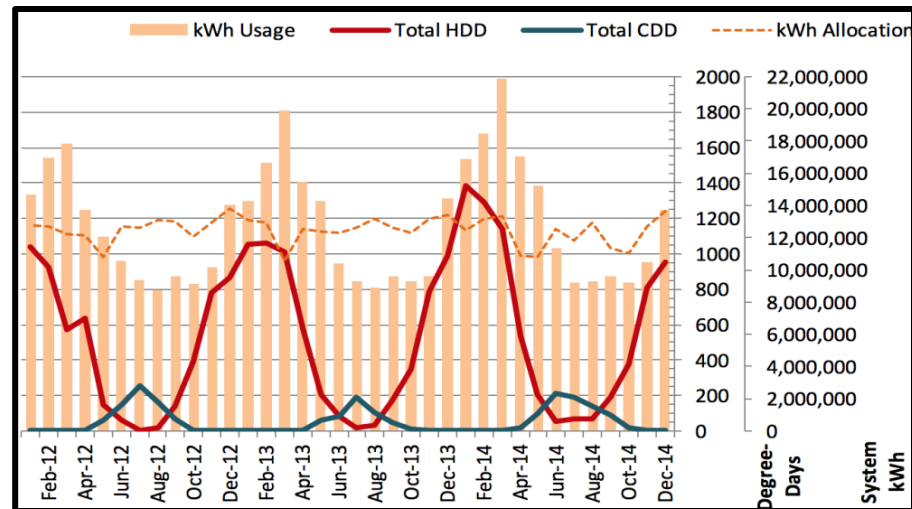
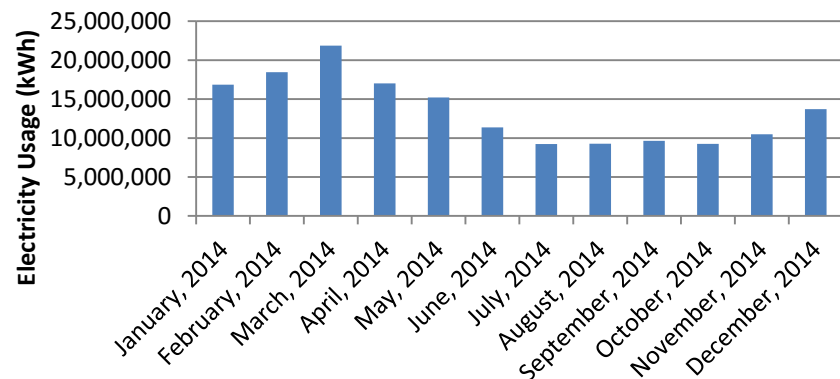
# Summary of Willdan Projects

Utility	Utilities	Existing Systems	Major issues
Arcade Bath, and Bath	Municipal	<ul style="list-style-type: none"> <li>Residential Electric Heat</li> <li>Critical facilities</li> </ul>	<ul style="list-style-type: none"> <li>Resiliency</li> <li>Exceeds NYPA allocation</li> <li>Over head lines</li> <li>Power Quality</li> </ul>
Rochester, Sleepy Hollow, Terry town, and Wappingers falls	Investor Owned (IOUs)	<ul style="list-style-type: none"> <li>Critical facilities</li> </ul>	<ul style="list-style-type: none"> <li>Resiliency</li> <li>Reliability</li> <li>Cost Saving</li> <li>Overhead lines</li> </ul>
Plattsburgh, and Geneseo	Campus	<ul style="list-style-type: none"> <li>State University of New York Campus</li> <li>Critical facilities</li> <li>Central Heat Plant</li> </ul>	<ul style="list-style-type: none"> <li>Resiliency</li> <li>Reliability</li> </ul>

# Arcade

- Cost liability from exceeding NYPA kW and kWh allocation
  - 25MW and 12,453 MWh limits
  - Over-allocation charge of \$2M in 2014
  - Largely due to winter residential electric heaters
- Arcade's radial path distribution system is 50+ years old, exposing the community to risk due to outages and equipment failures.
- Industrial park experiences power quality issues

**Electricity Usage 2014**



# Arcade



# Arcade

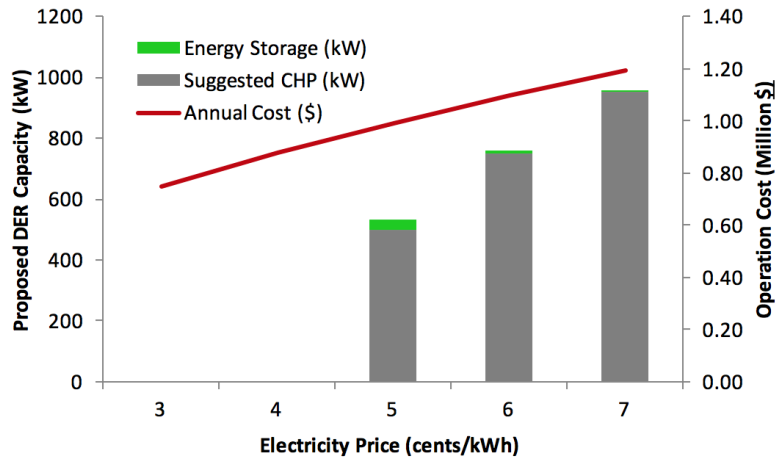


Figure 2.3.1 Sensitivity Analysis Results for Electricity Price

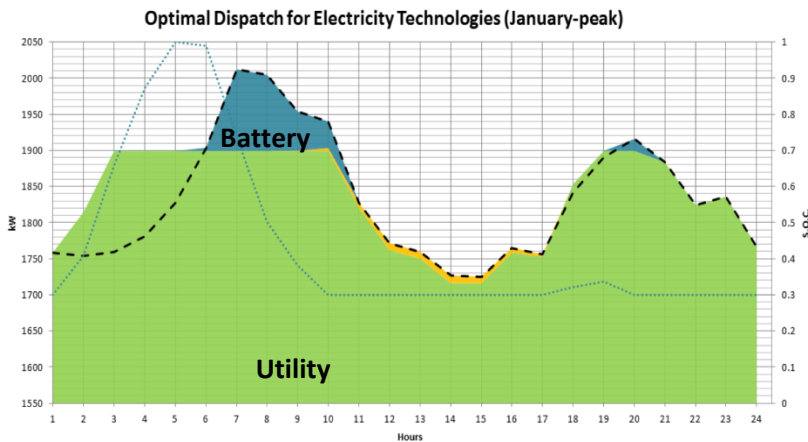


Figure 2.3.2 Energy Dispatch in January Peak for API with Battery and Solar

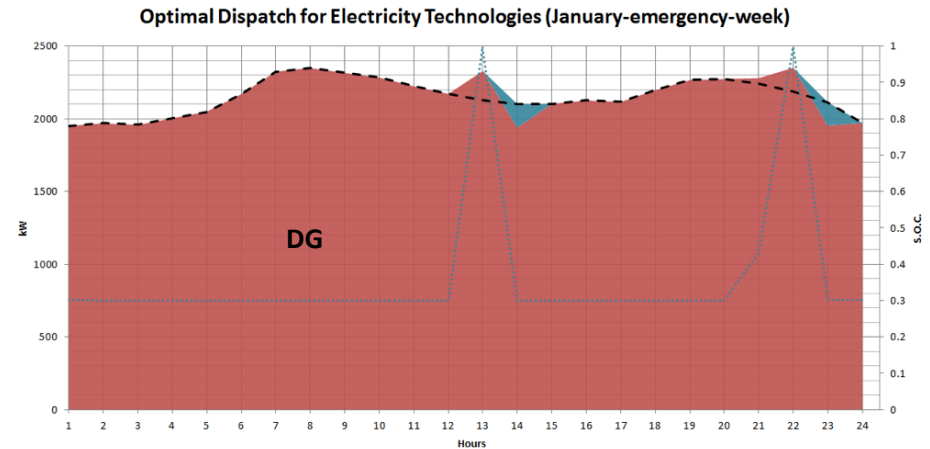


Figure 2.4.6-1 Optimal Dispatch in Islanding Mode

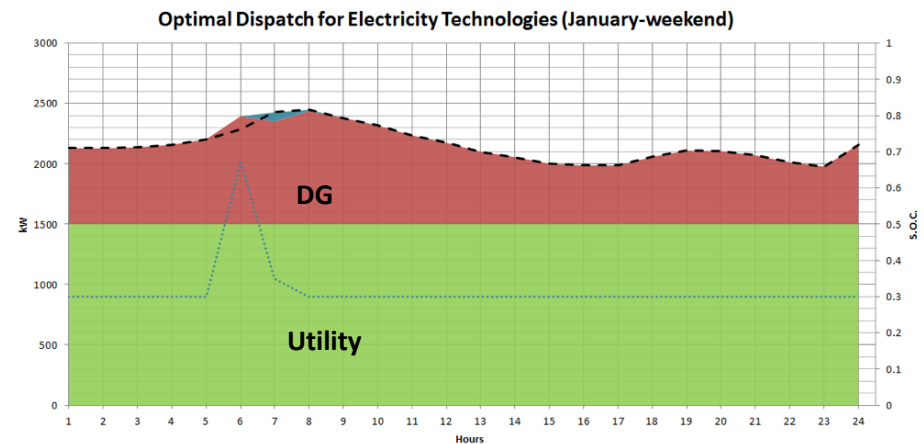
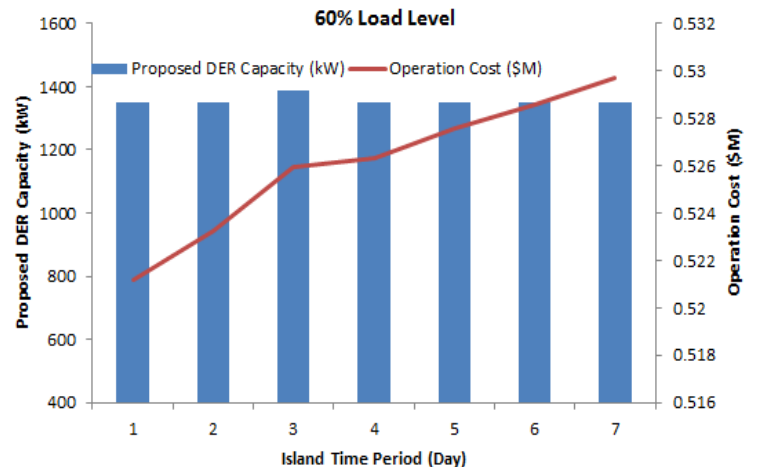
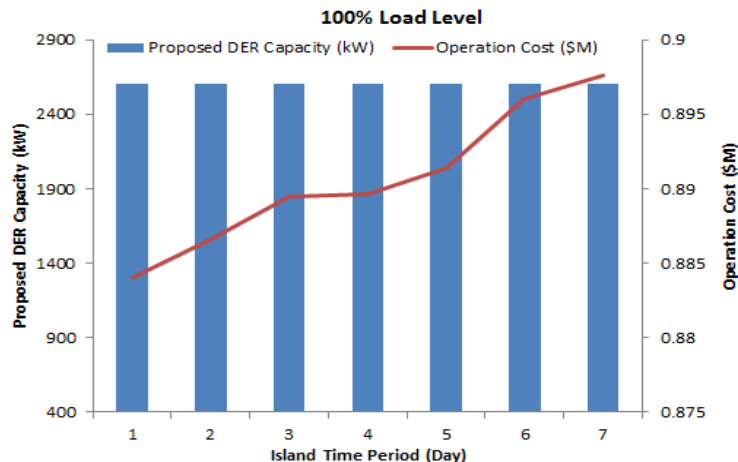


Figure 2.4.6-1 Optimal Dispatch in Grid-Connected Mode

# Arcade Investment cost option for greater Resilience

- Microgrid installation for communities can be considered in stages or steps.
- Greater investment leads to greater resilience based on:
  - The percentage of system served
  - The number of days the system can remain in islanded mode.
  - How fast the system can be recovered
- This enables the communities to incrementally invest annually according to their budget.



# Arcade Investment cost option for greater Resilience

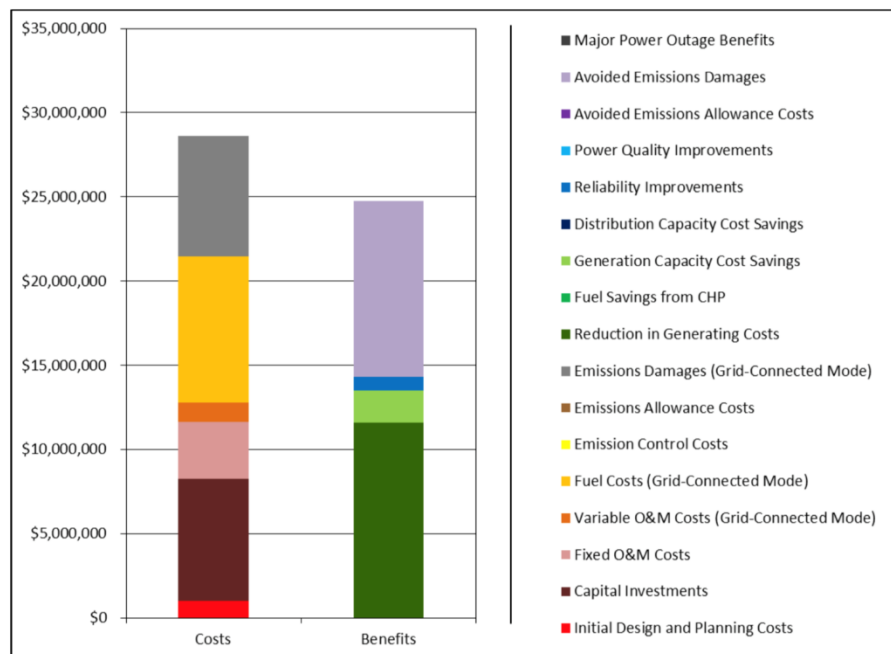
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Table 2.4.4 Serving Critical Loads with Islanding in Peak Load Season (January)

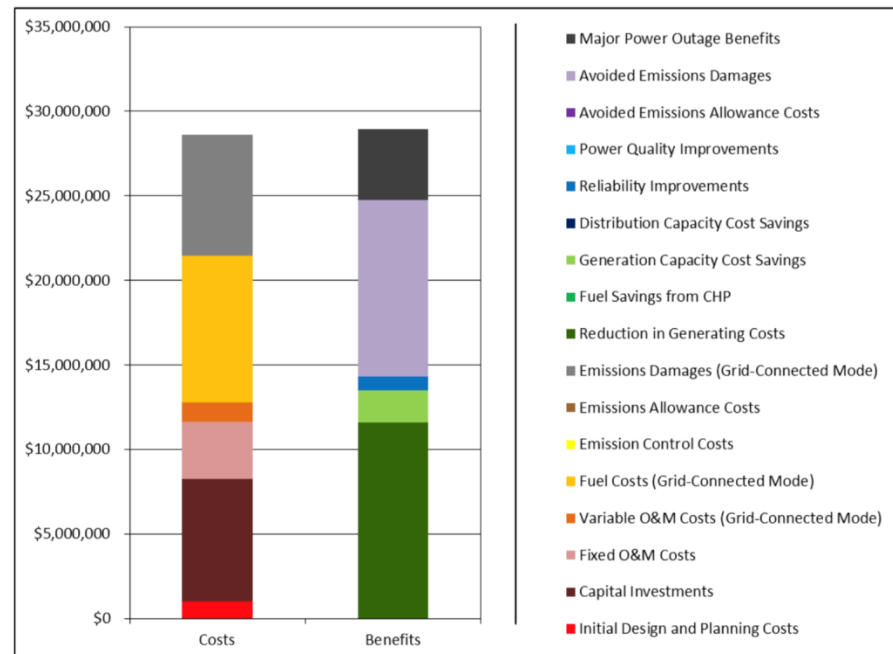
Islanding Days	Load Curtailment (%)	Resilience Weight (%)*	Proposed DER Capacity(kW)	Operation Cost (K\$)	Investment Cost (K\$)
7	0-40%	100% - 89.41%	1,350-2,607	529.7 - 897.6	1,621 – 2,923.6
6	0-40%	86.76% - 76.18%	1,350-2,607	528.5 – 896	1,621 – 2,923.6
5	0-40%	73.53% - 62.94%	1,350-2,607	527.6 – 891.4	1,621 – 2,923.6
4	0-40%	49.71% - 73.53%	1,350-2,607	526.3 – 889.6	1,621 – 2,923.6
3	0-40%	47.06% - 36.47%	1,389-2,607	525.9 – 889.5	1,556.6 – 2,923.6
2	0-40%	33.82% - 23.24%	1,350-2,607	523.2 – 886.6	1,621 – 2,923.6
1	0-40%	20.59% - 10%	1,350-2,607	521.2 – 884.0	1,621 – 2,923.6

# Cost and Benefits Analysis

- As part of NYSERDA's NY Prize community microgrid competition, the Village of Arcade has proposed development of a microgrid that would enhance the resiliency



Without Power Outage (-0.1% IRR)



1.2 Days Per Year Without Power (6.2% IRR)

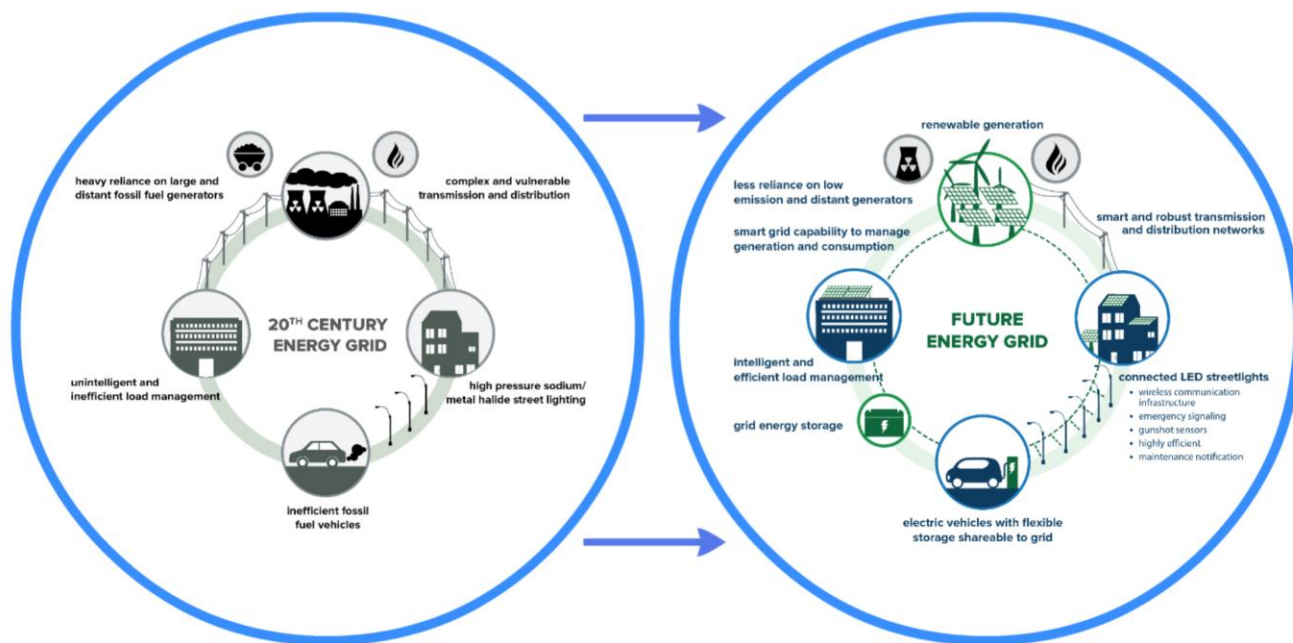
# Conclusion

- The community microgrid would be powered by three new CHP units:
  - 1.25 MW system at Pioneer High
  - 600 kW system at Arcade Elementary
  - 500 kW system at the sewage plant
- The proposed microgrid indicates that the CHP systems together would produce approximately 19,740 MWh of electricity per year, roughly 1.6 times the amount required to meet the average annual demand of the facilities; this energy can be used to supply other less critical Arcade customers
- During a major outage, the CHP systems would supply approximately 80 percent of average electricity use at the facilities served by the microgrid
- The benefits of the proposed project would equal or exceed its costs if proposed microgrid serves to avoid an average of 1.2 days per year without power.

# Conclusion

- In addition to providing resiliency for critical loads, the community microgrid could provide economic and reliability benefits to nearly 10,000 residential customers as well as maintaining power for public street lighting and security lighting
- The proposed microgrid identified a potentially viable solar + battery storage project as part of a public private partnership between the Village and two industrial companies located there. Siting one 250 kW battery system paired with 50 kW of solar at each industrial plant, operated by the Village Electric Department, could provide the industrial facilities with much-needed power quality and reliability
- Willdan's full Nine NY Prize reports are available at :  
<http://www.nyserda.ny.gov/All-Programs/Programs/NY-Prize/Feasibility-Studies>

# Willdan's Smart Cities Vision



- Energy Master Planning
- Microgrid Analysis and Design
- Grid standardization
- Distributed Energy Resources
- Water
- Smart Street Lighting
- Visualization and Analytics
- Smart Transportation
- Cyber and Physical Security

# Thank you

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