Political, Financial and Technical Considerations of a Municipal, Multi-User Microgrid

IDEA Microgrid 2017

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Santa Monica City Yards Microgrid Presentation

Agenda

- Project Description and Background
- CY Opportunities and Challenges
  - Technical
  - Financial
  - Political
- Solutions Approach
- Project Resolution and Direction
- Q&A

Project Description & Background

The “City Yards” of Santa Monica, California currently houses

- City’s facilities maintenance,
- Custodial services,
- Street maintenance,
- Fleet maintenance,
- Traffic operations,
- Resource recovery and recycling,
- Water and wastewater operations,
- Hazardous waste storage
- Fire Department training area.

Santa Monica City Yards

- Established in 1940s
- 14.7 acres
- Partially sited over a closed landfill

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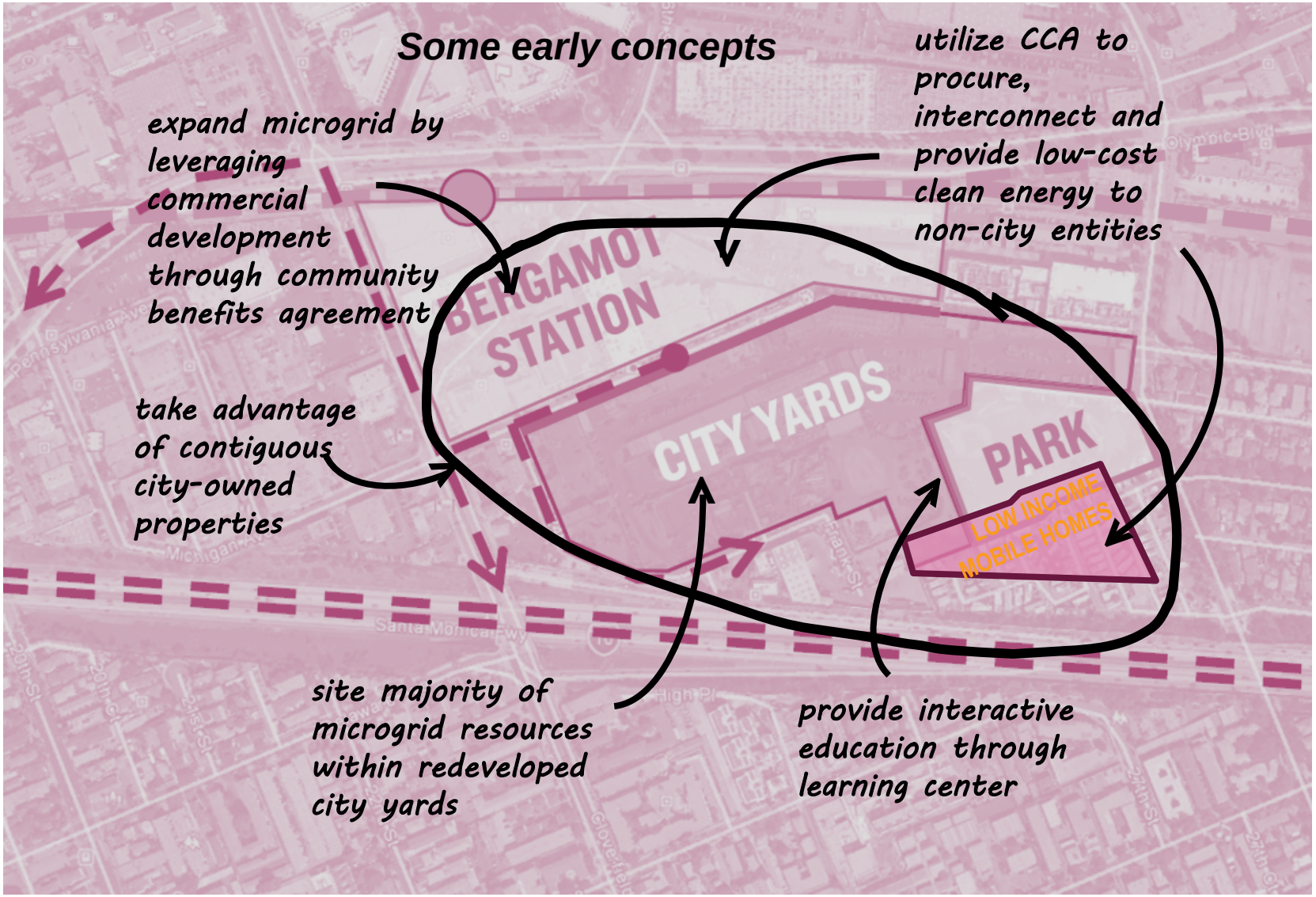
Project Description & Background



Project Description & Background

The California Energy Commission provided $1.5 million in EPIC funding to:

- **Demonstrate the feasibility** of innovative planning, permitting and financing approaches at the local and regional levels
- **Serve as models for local governments** that want to encourage sustainable development.
- **Provide energy savings** by achieving and maintaining zero net energy community status (accounting for behavior and increasing loads from vehicle and appliance electrification).
- **Support grid reliability and resiliency** by incorporating technologies such as energy storage.
- **Are financially attractive** from a market standpoint.
- **Provide affordable access to renewable energy generation**, energy efficiency upgrades, and water efficiency and reuse technologies that reduce electricity consumption for all electric ratepayers within the community.
- **Makes use of smart-grid technologies** throughout the community.

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City Yards Opportunities and Challenges

Technical

- City Yards Design Team and other Stakeholders have limited experience with Microgrids
- METRO light-rail and bus facility ~2 MW solar PV project
- CY Project still in Schematic Phase
- California Environmental Quality Act (CEQA) and Environmental Impact Study/Report (EIR) not complete

Financial

- Community Choice Aggregation (CCA) options and status
- Ownership and management options not well defined/understood
- Entitlement and contract negotiations for Bergamot Arts Center
- Several potential sources of capital, incl. grants

Political

- Adjacent to mobile home community, situated in lower-income neighborhood
- History of environmental injustice
- Community is weary of development in City

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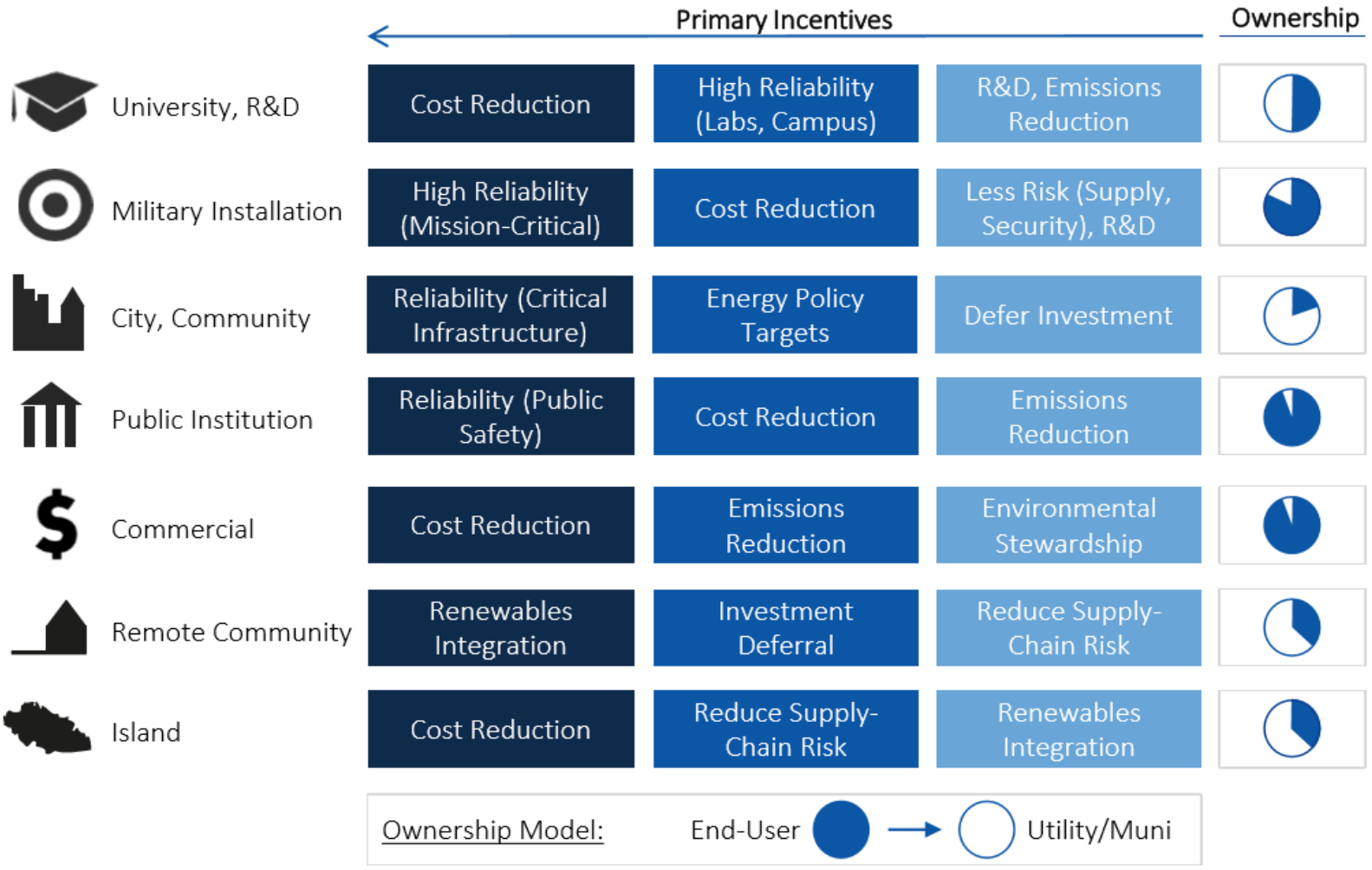
City Yards Opportunities and Challenges

Lots of Options/Choices for a Microgrid!



Source: GTM Research North American Microgrids 2014: The Evolution of Localized Energy Optimization

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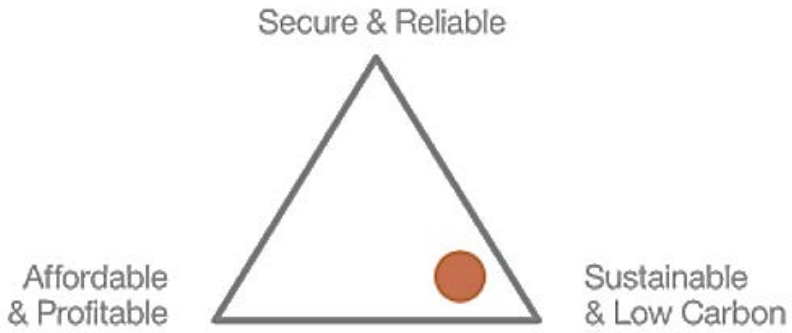
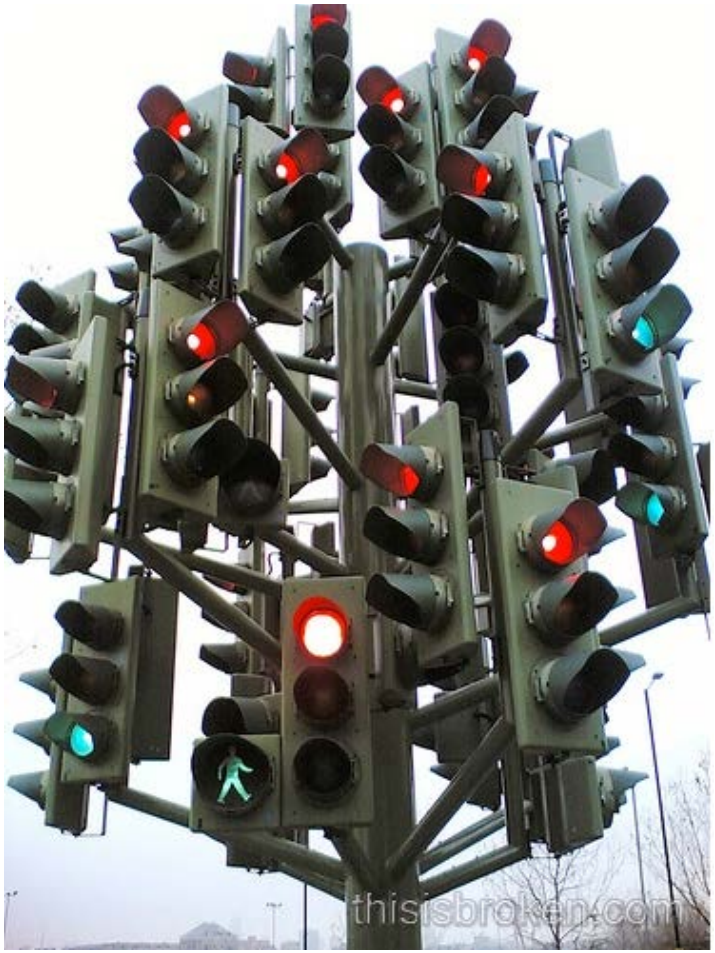
Opportunities and Challenges

So, with lots of competing opportunities, challenges and perspectives:

How do we select the most appropriate features and criteria for the Multi-User Microgrid?





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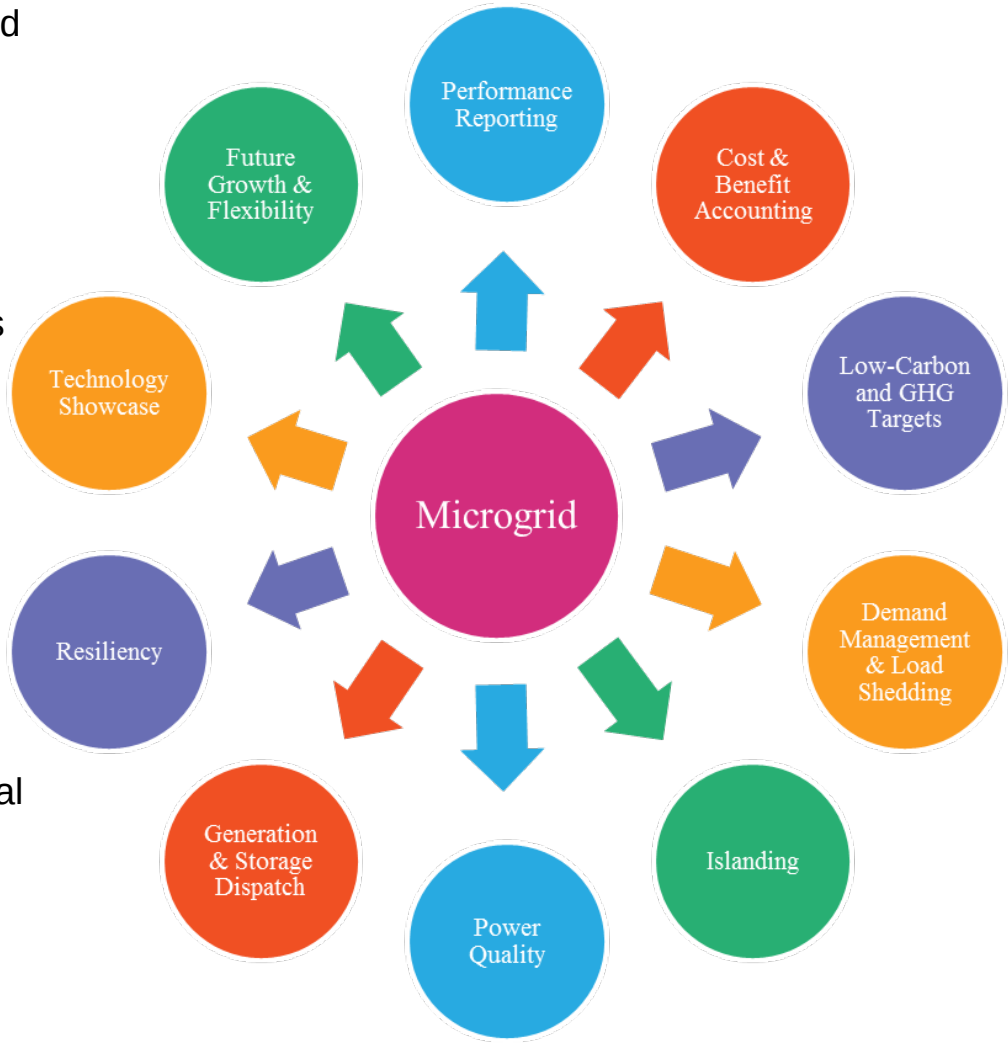
Solutions Approach

- Determine the general expectations (**Owners Project Requirements**) of the City Yards Microgrid system as determined through the Microgrid Owners/Users survey process and meeting(s)
- Define the **functional requirements** of the Microgrid, including any required operational limits and constraints
- Define the **non-functional requirements** and attributes of the Microgrid, such as desired economics and risk tolerance.
- Define the **desired transactional features**, including advanced metering, dashboards, financial optimization, and operational performance information that needs to be provided/available to the Microgrid operators, users, and SCE.

Focus on **Use Case Analysis** process to define OPR



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Use Case Analysis

Low-Carbon and GHG Features

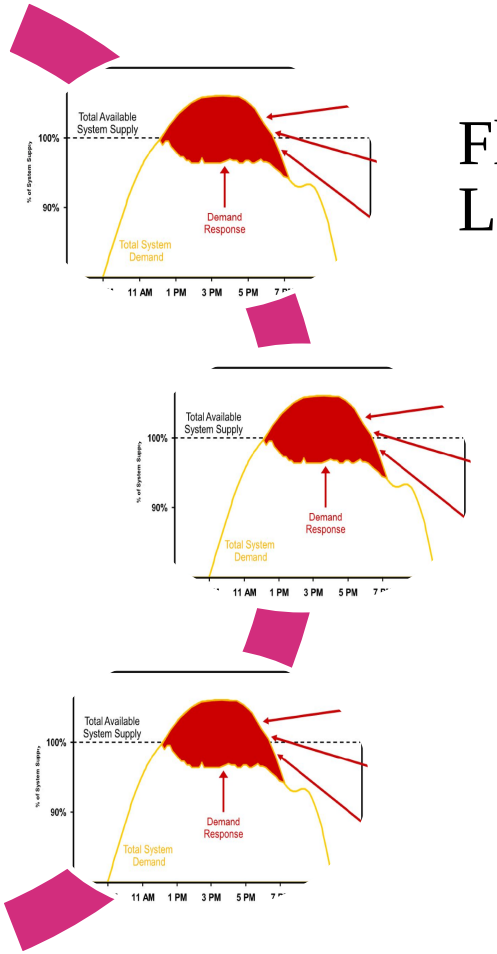
On-Site vs. Off-Site Renewables?

Make vs. Purchase?

ZNE, Low-Carbon, or Cost-Effective?

Use Case Analysis

Demand Management and Load Shedding



Flexibility of Loads

Prioritization of Loads

Differential Pricing for Load Type

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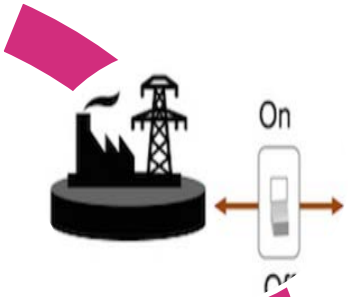
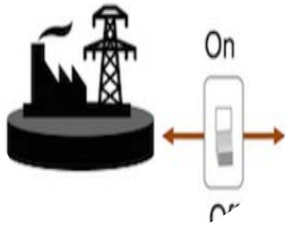
Use Case Analysis

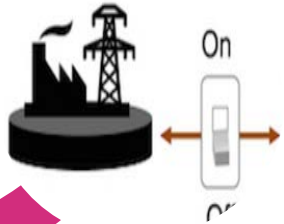
Islanding Capability



Economic vs. Reliability Based



Automatic vs. Manual



Export vs. Import only

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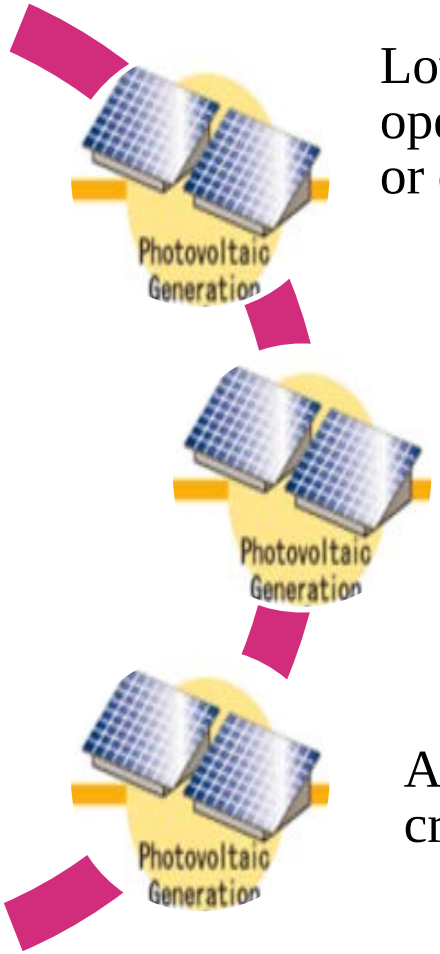
Use Case Analysis

Economic Dispatch



Lowest annual operating expenses or energy costs?

Additional revenue opportunities (e.g., car charging)?

Any investment criteria or ROI?

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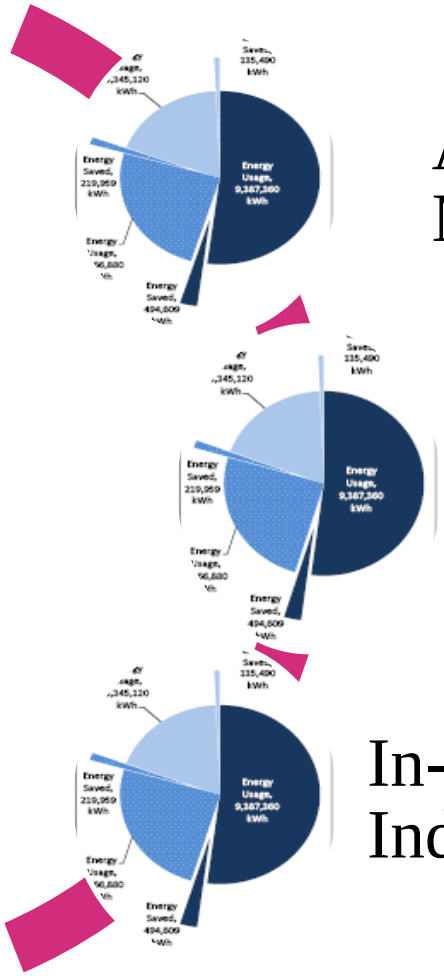
Use Case Analysis

User Cost & Benefit Accounting



Automated or Manual Tracking

Settlement Procedures

In-House or Independent

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Use Case Analysis

Resiliency

Frequency & Duration of Outages (hrs. vs days)

Blackstart capability?

Fuel diversity desired?

How many “nines”?

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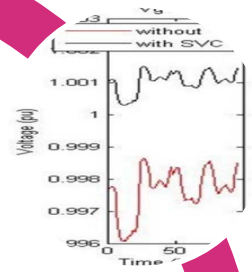
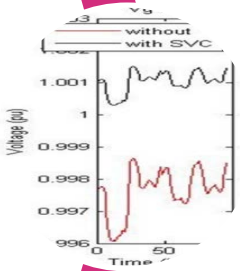
Use Case Analysis

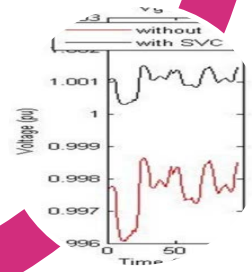
Power Quality



Tolerances and Criteria



Sensitive Equipment?



Ride-Thru Capability

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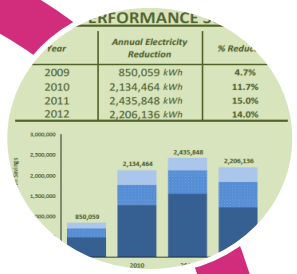
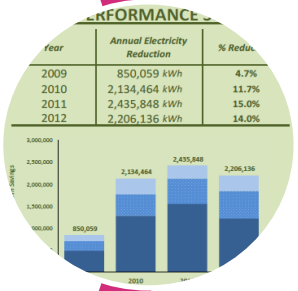
Use Case Analysis

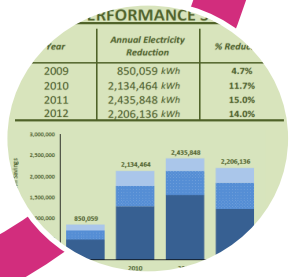
Performance Reporting



Command/Control only or Broadcast for Education/P.R.



Graphic or Data Based



Real-Time or Historic

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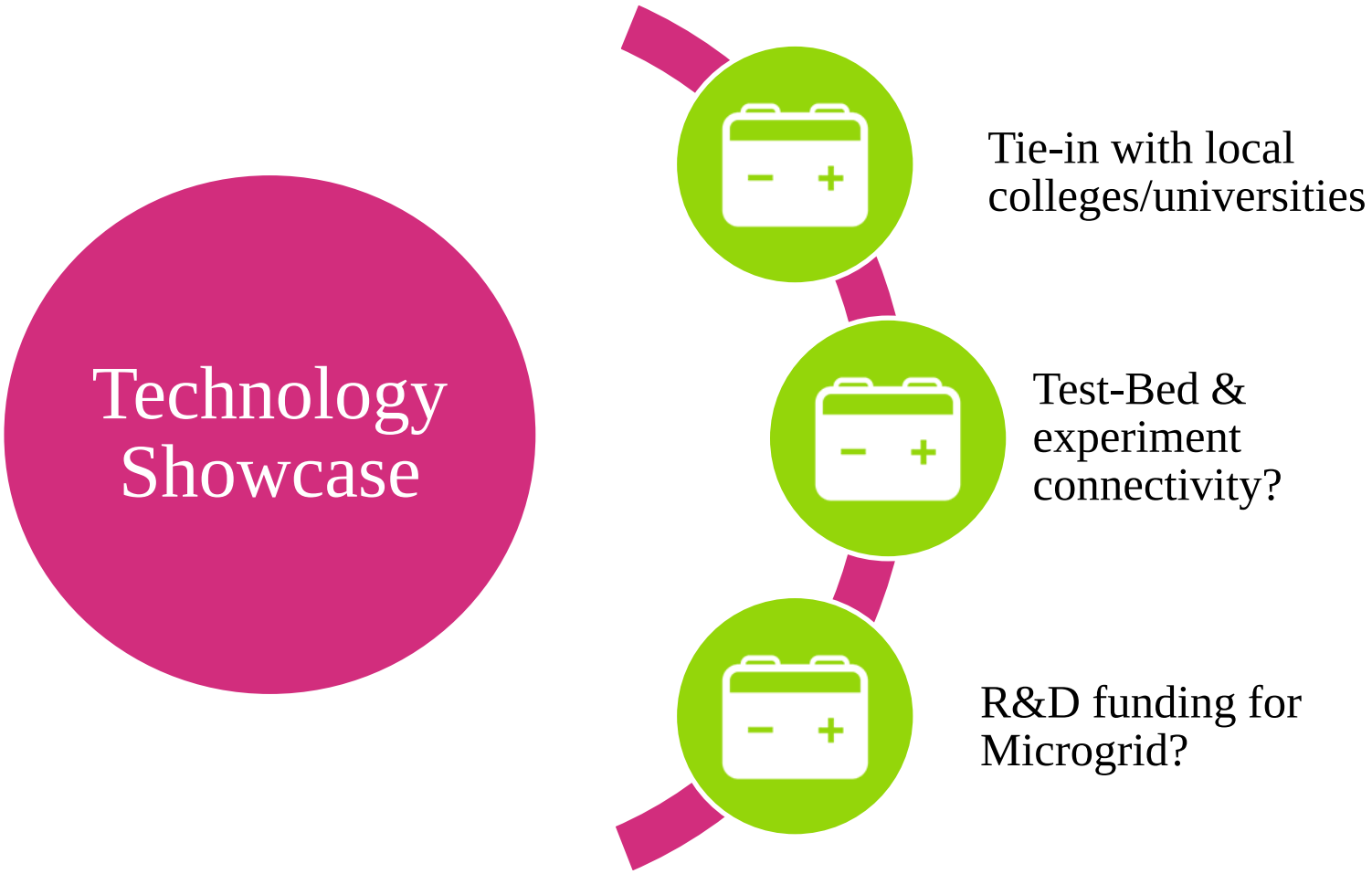
Use Case Analysis



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Use Case Analysis

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Solutions Approach

Example Microgrid Scorecard

Goal		Rank
Prioritization of areas to be served by micro-grid		
City Yards		
Arts District		
Bergamot Transit Village		
Maintenance Yard		
Mixed Use Creative		
Creative Sector		
Expo Station		
Mountain View Mobile Home		
Economics		-
Capital cost of energy systems and distribution infrastructure ($)		
Payback period of energy systems and distribution infrastructure (years)		
Reduced cost of electricity for customers ($/kWh)		
Increased electricity rate flexibility (e.g. dynamic pricing)?		
Reduced cost of maintenance		
Reduced cost of operations (e.g. staffing, fuel price)		
Grants, third-party financing, tax-credit equity		
Reliability		
Robust metering and monitoring of data from system and customer		
Power quality		
Reduced frequency of short term interruptions (<5 min)		
Reduced frequency and duration of long term outages (>5 min)		
Resilience		-
Ability to operate autonomously (islanding)		
Black start capability		
Ability to operate during city-wide blackout from 0-4 hours		
Ability to operate during city-wide blackout from 5-8 hours		
Ability to operate during city-wide blackout from 2-10 days (major event)		
Environment / Sustainability		-
GHG emissions reduction		
Percentage of fuel mix from renewables		

The Final Vote!

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Project Resolution and Direction

Summary

- Focus first on the needs and desired outcomes of the Microgrid --- rather than the design challenges or preferred technologies
- Don’t address equipment, suppliers/vendors, performance, or costs of the Microgrid until the Owner’s Values, and ranking of those, are known
- Conduct a Use Case Analysis and Scorecard to determine the Owner’s Project Requirements (OPR)
- Then use the OPR to determine and choose among the multiple options available, and to define the operating criteria

Questions?

City Yards Opportunities and Challenges

Potential Benefits for Santa Monica City Yards Project

1. Reduced CO2/GHG emissions
2. Increased integration and penetration of renewable sources
3. Improved power quality and reliability for customers
4. Improved resilience, flexibility and autonomy of infrastructure
5. Cost reductions compared to conventional grid power (SCE)
6. Enhanced customer participation through demand side management
7. Integration of smart grid technologies
8. Identify appropriate Business Models for ownership/operation

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