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Providing New Energy Options through Microgrids

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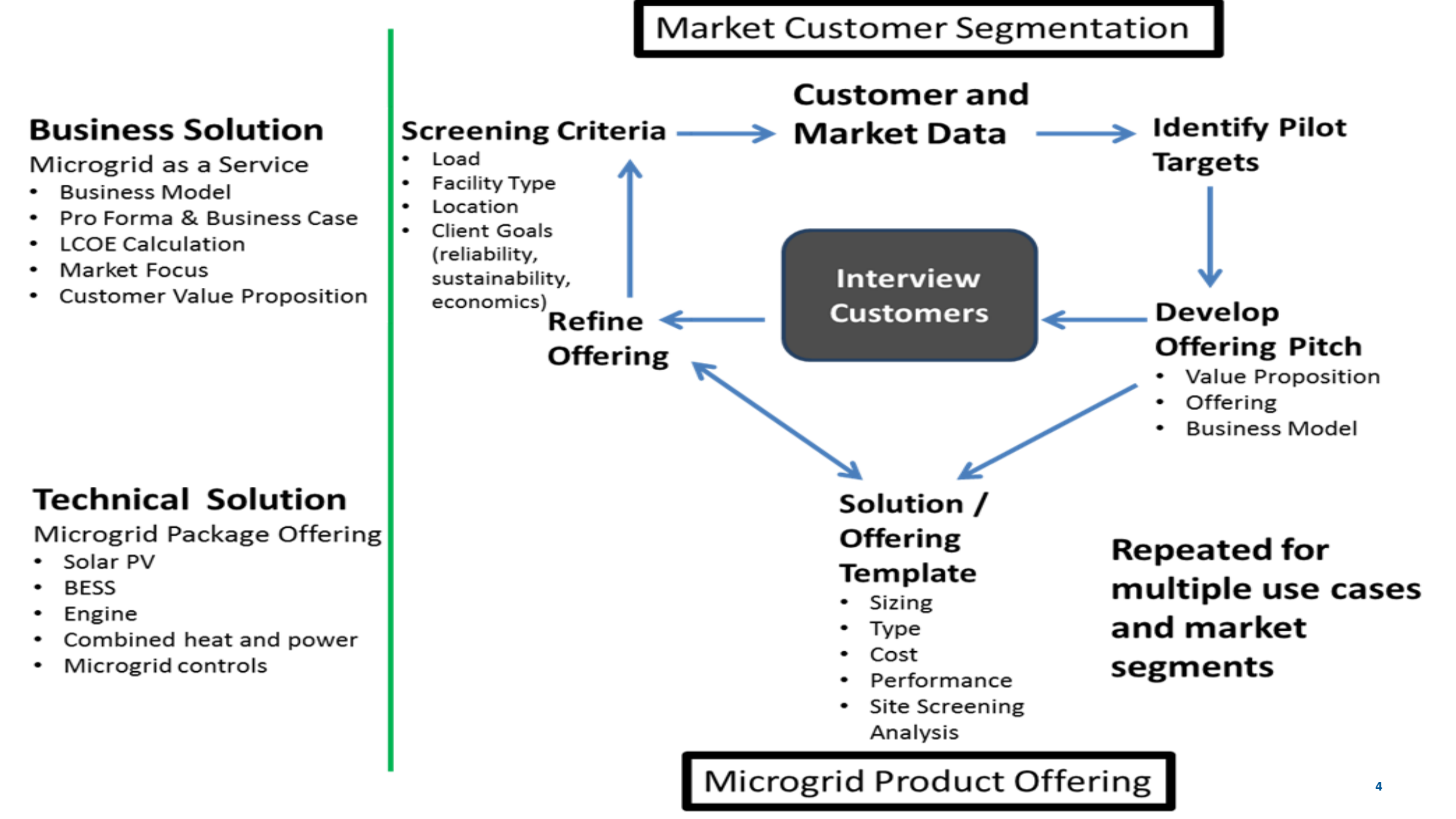
Agenda

- Introduction to the Microgrid Project – Phase I
- Market Customer Segmentation – Targets
- Proposed AEP Microgrid Product Offerings
- Customer Validation
- Next Steps – Phase II

Phase I – Introduction to the Microgrid Project


Market Customer Segmentation
Business Solution
Microgrid as a Service
• Business Model
• Pro Forma & Business Case
• LCOE Calculation
• Market Focus
• Customer Value Proposition
Screening Criteria
• Load
• Facility Type
• Location
• Client Goals (reliability, sustainability, economics)
Customer and Market Data
Identify Pilot Targets
Interview Customers
Refine Offering
Develop Offering Pitch
• Value Proposition
• Offering
• Business Model
Technical Solution
Microgrid Package Offering
• Solar PV
• BESS
• Engine
• Combined heat and power
• Microgrid controls
Solution / Offering Template
• Sizing
• Type
• Cost
• Performance
• Site Screening Analysis
Repeated for multiple use cases and market segments
Microgrid Product Offering

Customer Selection

1. SMALL:
   - Big Box Stores → Community Hubs
2. MEDIUM:
   - E-Clinics & Campuses → Schools
3. LARGE:
   - Commercial Complex & Multi-family

Microgrid Product Offerings

Rooftop Solar PV

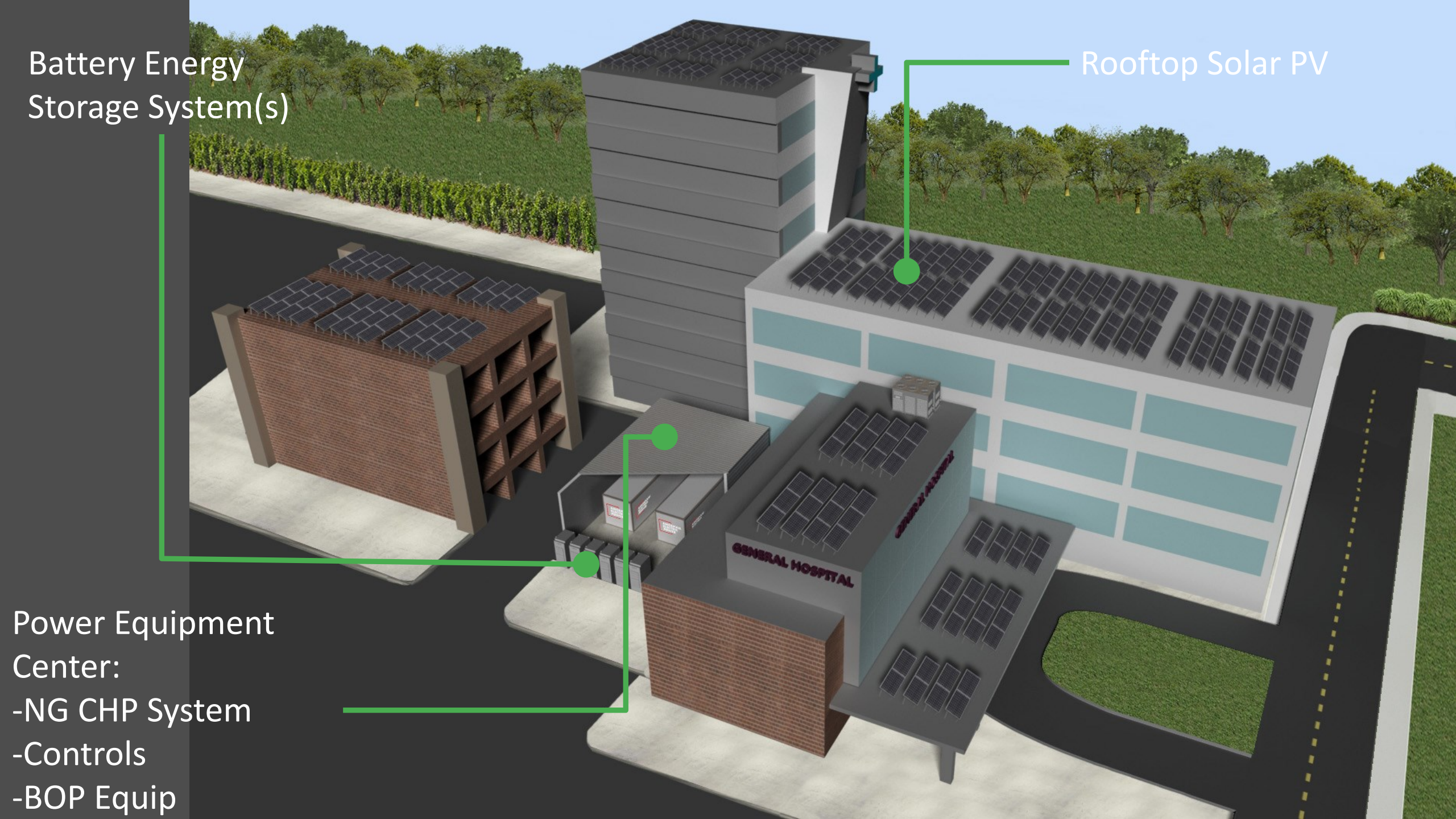
Battery Energy Storage System(s)

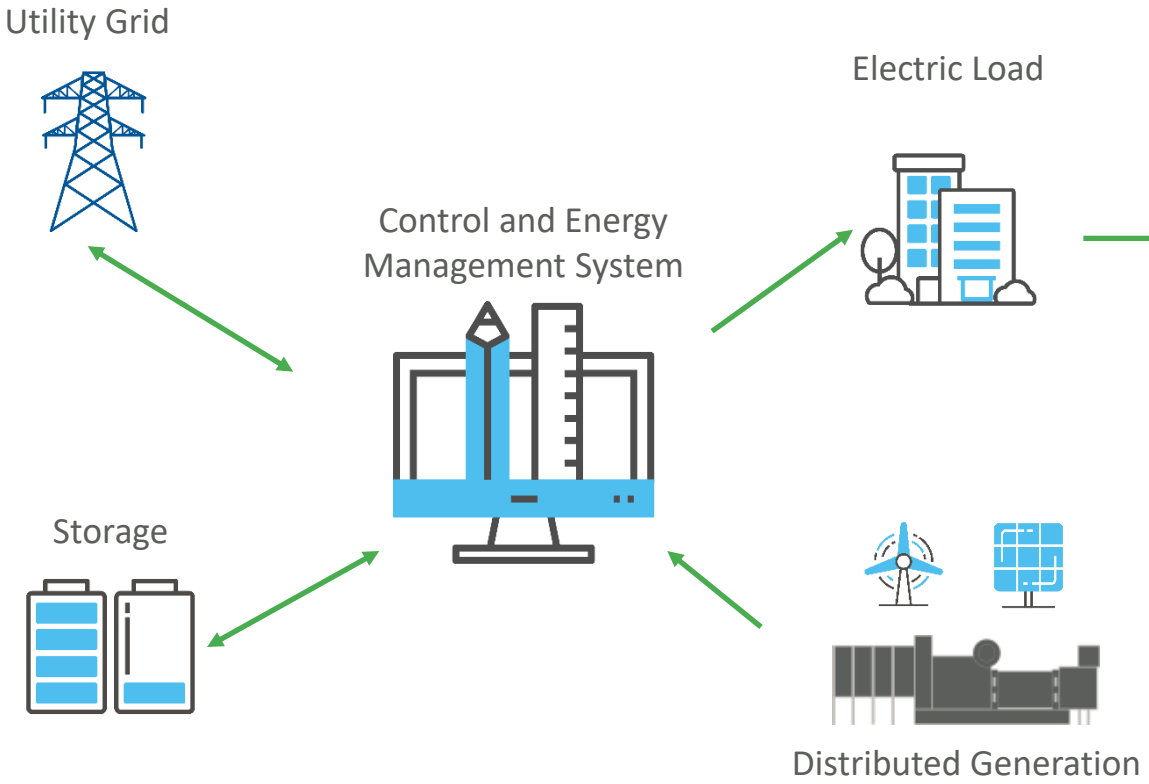
Power Equipment Center:
-NG Recip Engine
-Controls
-Heat Recovery

SMALL – Control Center

- Size
  - NG Generation – 600kW
  - PV – 300kW
  - BESS – 300kW/900kWh
- Cost
  - Engineering = $200k
  - Equipment = $1,200k
  - Installation = $400k
  - O&M = $0.025/kWh

Verify Costs


Battery Energy Storage System(s)
Rooftop Solar PV
Power Equipment Center:
-NG CHP System
-Controls
-BOP Equip
GENERAL HOSPITAL



Customer Validation

Customer Validation: Texas ERCOT Market

- Annual spend of $6M on 50MW with AEP – Avg. store size ≈ 45,000sf
- Has installed 10MW of solar and plans another 10MW this year
- Aggressive in managing outages due to their affect on business
- Calculated cost of outage = $25,000/MWh
- Looking at Power Outage "Insurance" over DG investment
  - Insurance from the bird, squirrel & the drunk hitting the pole
- Looking also at Battery Installation for load shaping
- Have a proven model with Enchanted Rock (Saved >$1 Million during Harvey across 9 stores)

Phase II – 30% Design: Q4 2017 – Q1 2018

- Select one or multiple HEB stores in AEP Territory and review load data
- Determine optimal NG Engine (or CHP), solar & BESS sizing
- Select strategic packaging partner to incorporate design and provide product cost (Quote)
- Estimate installation cost
- Estimate O&M costs (Quote)
- Refine business model given costs to generate, operate & maintain

Goal of Phase II: Actionable proposal to HEB to roll out one or more products in AEP service area.

The best microgrids solve multiple problems for the installation