Micro-Grids

BURNS McDONNELL

Background

- Draws on work for
  - California – CA-LEAP (California Energy Assurance Program – ARRA funded 200 communities)
  - Connecticut – Several post Sandy designs
  - Hawaii – Key facilities designs
  - DOE SPIDERS program (Micro-grids for military bases)
  - NIST – Community Resilience
  - IEEE PES – Work on designs for isolated communities, disaster recovery
  - FEMA – Work in new grid design for Puerto Rico
  - 50 years on industry experience

Who should be included?

- You have to decide….
  - Police
  - Fire
  - Emergency shelters
  - Water pumping stations
  - City vehicle garage
  - School buildings
  - Gas station(s)
  - Grocery store(s)
  - Hospital
  - Radio towers (PTT)
  - …
- One criteria is proximity
- Another is community needs

…And things will change
Electric transit
More solar installations
And more…

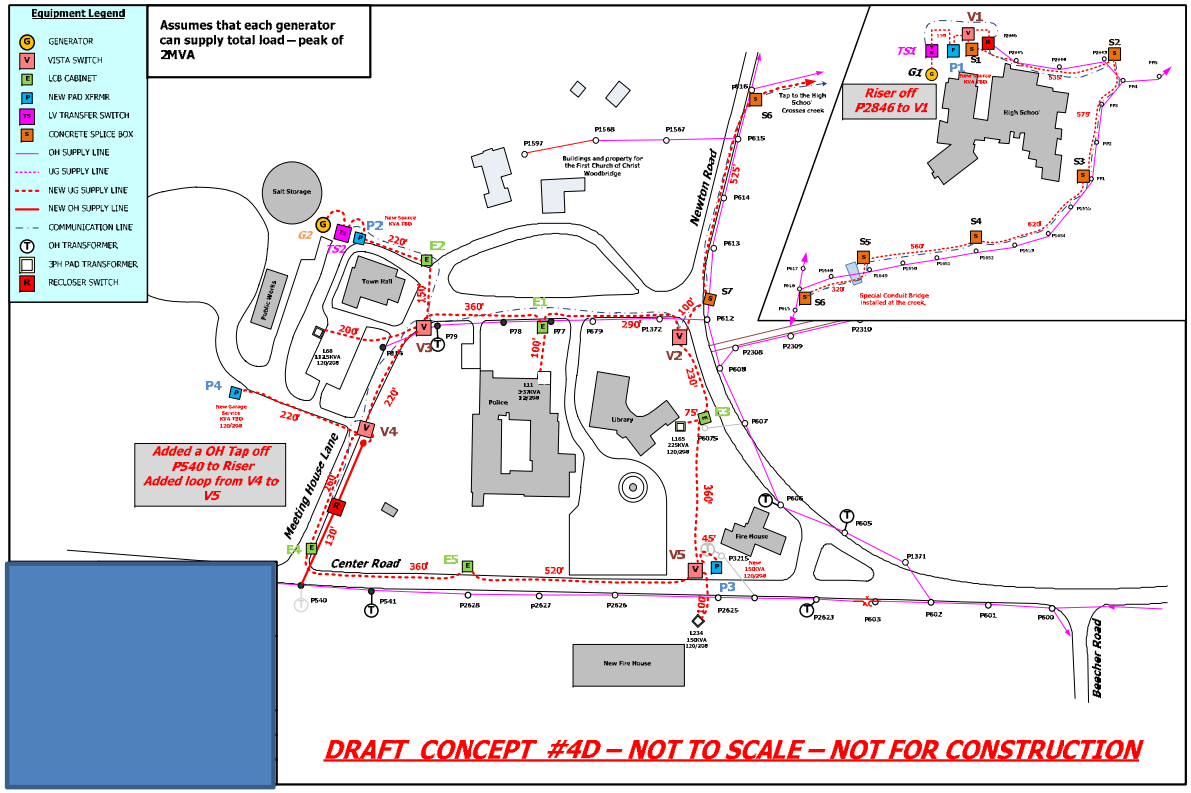
…also there is a difference
Between docking and
Connecting….

Different needs different answers

- Do you need generation permanently installed
- Can you use heat from CHP for heating/hot water/cleaning/etc.
- Do you trust the natural gas system
- Are you worried about preparation time
- Are the key buildings close to one another
- Do you already have enough emergency generation
- How resilient do you need it to be – what hazards
- What can you justify in spending – can you get grants
- Etc.

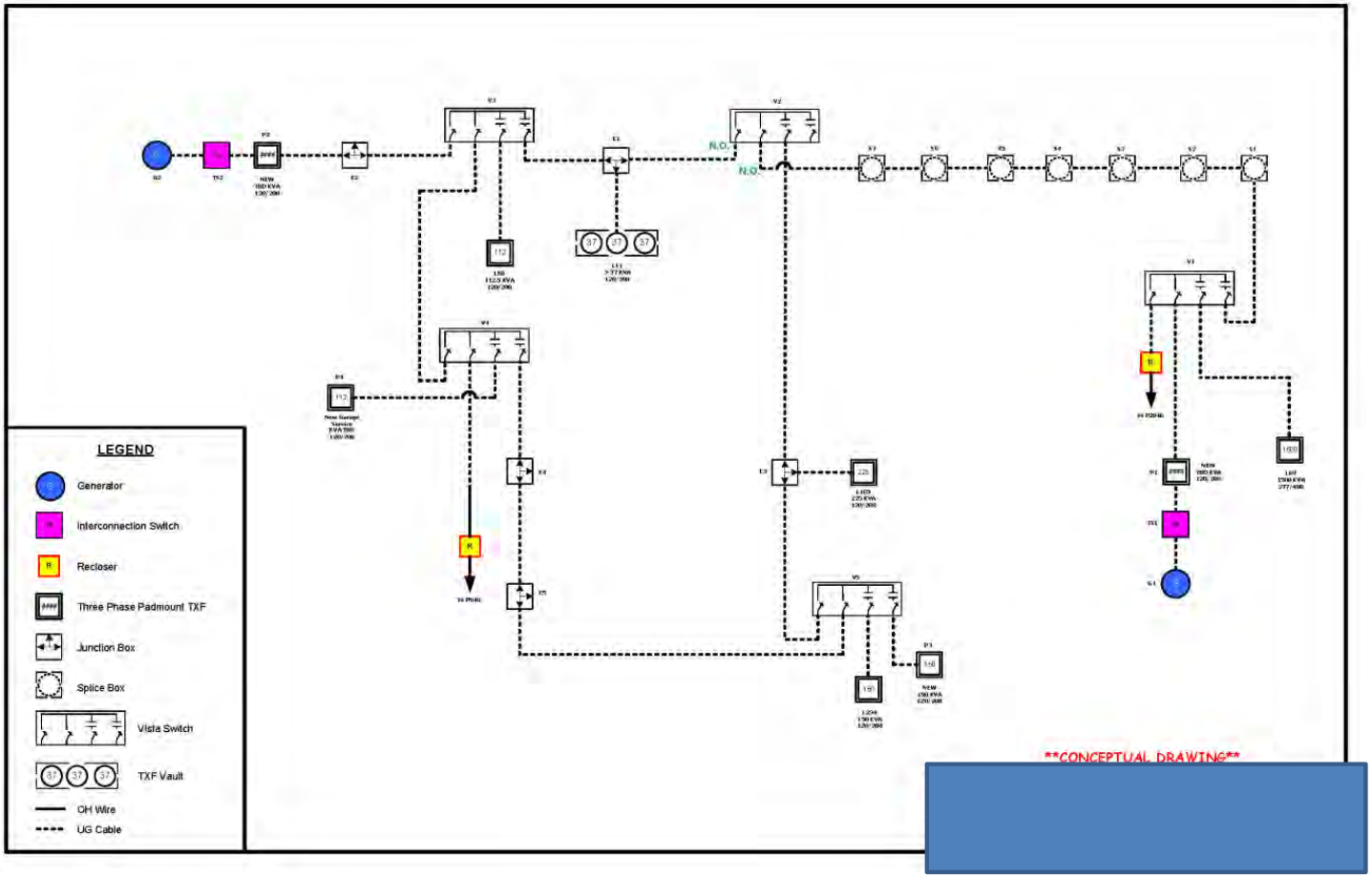
- Knowing your answers makes a difference

Example



Critical Facility	Peak Load (kW)
High School	1,016.40
New Fire Station	64.32
Police	122.88
Public Library	131.04
Old Fire House	78.72
Town Hall	112.5
New Public Works Garage	100
Pumping Station	14.77
Grade School	351.36
Pumping Station	15.24

…or to look at it differently



Choices in Micro-grid design

Infrastructure	Individual back up generation	Provide for Peak Demand	Provide for Reduced Demand
Complete	• Generators with fuel at each location • May include solar and batteries • Transfer trip switch is installed • Location has to manage all loads • Maintenance per location	• Generators and fuel for the expected peak demand • May include solar and batteries • Transformers and switch gear • Load management is minimal • Central maintenance	• Generators and fuel • Solar and batteries • Demand response and control system • Transformers • Load management scheme is known • Central maintenance
Make Ready	• IEEE Quick generator connects installed • Transfer trip installed • Generators are known to be available	• Pads and quick connects • Transformers and switch gear • Generator(s) are known to be available	• Pad & quick • Transformers • Generators • DR & Controls • Load management scheme

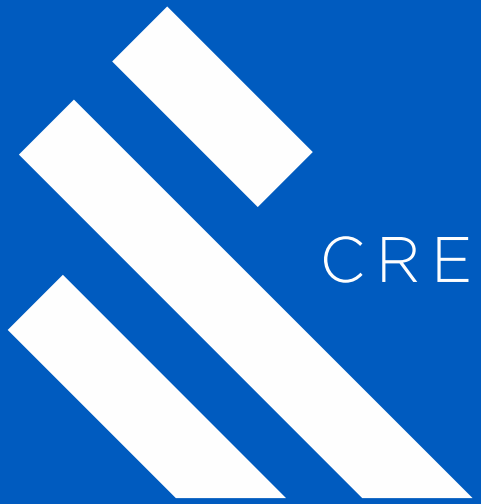
Lessons Learned

- Avoid single points of failure in the design
- Hide as much as you can from sight
- Have a testing schedule – keep it
- Make sure you consider environmental issues
- Shelter plug load will be crazy
- Load during an emergency is very different than on a normal day
- FEMA has generators – they don’t do a good job of deploying them

- Know what you want, design, model, test and repeat until you get a reasonable answer – models are cheaper than transformers – but they don’t supply power

Questions ?

dahouseman@burnsmcd.com



CREATE AMAZING.