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# *Microgrids as a Resiliency Resource*

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# Uses of Microgrids

- Improved resiliency can be broken into three phases:
  - Prevention: best practices in advance to “harden” the system
  - Survivability: the ability of the system to react to real-time events
  - Recovery: the ability to rapidly restore end-use load after disruptive events
  
- Microgrids have the ability to improve the survivability of distribution systems, and to support recovery.
  
- As part of the Department of Energy (DOE) Office of Electricity Delivery and Energy Reliability (OE) microgrid program, microgrids are being examined as a resiliency resource.
  
- There are three scenarios that will be examined:
  - Customer resource
  - Community resource
  - Black start resource

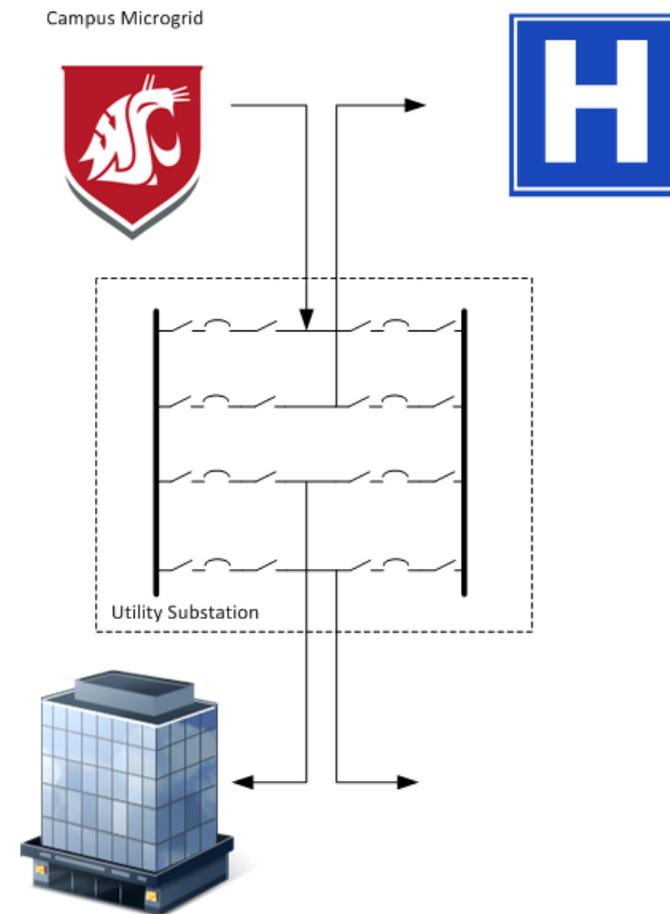
# Microgrids as a Customer Resource

- Small microgrids can be formed by a single customer to supply local loads. This assumes that the customer has sufficient assets to meet the generation/load balance.
- These microgrids can contain one or more generators and may include renewable resources.
- The inclusion of renewables will increase the run-time of the on-site fuel sources can support.
- During an extreme event these customers can supply their own electrical needs until utility power is restored.



# Microgrids as a Community Resource

- Larger microgrids can be formed across multiple customers to share resources and increase reliability.
- The WSU campus has significant stores of diesel fuel because of its dual use for heating. (250,000 gallons) This would allow for the existing DG to run for a prolonged periods of time.
- Currently the project is examining the feasibility of forming a microgrid with the WSU generation assets and portions of the Avista utility system.
- This would allow interconnection of the city hospital and the town hall, which is where the emergency operations center is located.
- During an extreme event these customers can supply their own electrical needs until utility power is restored. These customer loads would generally be loads that benefit the local community.



# Microgrids as a Black Start Resource



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- Microgrids generally do not have the capacity to actively participate in the restoration of the transmission system.
- Microgrids with sufficient generation can support restoration by providing black-start support to larger generating units.
- This could involve energizing large portions of de-energized lines to reach the generation unit(s). This may include sub-transmission lines and their transformers.
- The current work is focusing on the dynamic stability issues associated with charging larger transformers and high voltage lines.
- This type of procedure would need to be directed by the utility as part of a larger restoration plan.



# Concluding Comments

- The DOE OE microgrids program has shown that microgrids have the potential to be a central component in resiliency strategies.
  
- This project is examining their potential at three levels:
  - Customer resource
  - Community resource
  - Black start resource
  
- Work is continuing to validate the viability of using microgrids as community and black start resources.

# Questions or Comments?

