Getting to Diesel-Off

Technical requirements

Dr. Marc Mueller-Stoffels
Director, Power Systems Integration Program
Alaska Center for Energy and Power
Why Diesel-Off?

- Increase renewable power utilization
- Minimize carbon footprint
- Hedge against fuel price volatility
- Reduce diesel O&M
Services provided by diesels

• ‘Form the grid’
  – Provide Voltage and Frequency reference
• Inertia
  – Can ride through minor disturbances
• Provide spinning reserve capacity
  – Backstops drops in renewable power
  – Backstops increases in demand
• Fault current/clearing
  – Clear transient faults
  – Drive sufficient current to trip breakers
• Firm power source
Forming the grid

• Requires:
  – Synchronous generator (a.k.a. diesel generator)
  – Synchronous condenser
  – Voltage-source inverter

• Important because:
  – No grid, no power...
  – ... even if the sun is out, or the wind is blowing
Inertia

- Heavy spinning masses do not stop suddenly on disturbances (synchronous generator/condenser)
  - Can stabilize system and help ride through smaller issues

- Simulated inertia (inverters):
  - Adjust filtering circuits
  - Slow down reaction to disturbances (programming)
Spinning reserve capacity

• Requires:
  – Firm power source/sink
    • Energy storage system (boost power)
    • Demand management (reduce demand)
    • Best to combine

• Important, because:
  – Supply and demand have to match at any moment
  – Sudden drop in supply collapses the grid if not covered
Fault current/clearing

• Requires:
  – Capacity to overload equipment to either burn off transient faults, or trip circuit breakers

• If not available:
  – Hard to know fault location
  – Faults can hit back into sensitive equipment

• Alternatives:
  – Tripping breakers on under-voltage or under-frequency (requires smarter breakers and additional equipment)
Diesel alternatives (non-fossil)

- Hydropower
- Voltage-source inverters with energy storage
- Synchronous condensers
- Supporting equipment:
  - Secondary load controllers
  - Demand management
  - Advanced controls
  - Advanced system protection
Thank you!

Dr. Marc Mueller-Stoffels
Director, Power Systems Integration Program
Alaska Center for Energy and Power
Institute of Northern Engineering
University of Alaska Fairbanks
mmuellerstoffels@alaska.edu
(907) 687 0259
http://acep.uaf.edu

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