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# Alternative Energy

# Transmission Considerations

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- Wind (on shore) has a 13% capacity factor
- Solar has a 38% capacity factor
- Conventional generation –gas is the generation with best cost / benefit today.
- Approximately 80% of the generation in que evaporates
- When distribution networks have a penetration of distributed generation between 15-20% it challenges the distribution network



# Dominion's Alternative Energy

- Largest fuel cell project in North America is under construction in Bridgeport, Connecticut
- 15 Megawatts



# Off Shore Wind

- Successful bidder in a 2013 federal auction of commercial lease blocks off the Virginia coast
- Area has the potential to support up to 2000 megawatts of wind power
- Pursuing a demonstration project for offshore wind



# Onshore Wind



- NedPower Mt. Storm, West Virginia
  - 132 wind turbines
  - 264 MW
- Fowler Ridge 1 – Benton County, Indiana
  - 162 wind turbines
  - 301.3 MW

# Solar Power

- Azalea Solar Power facility – Augusta, Ga.
  - 7.7 MW
- Indianapolis Solar Power projects
  - 3 Projects on 289 acres
  - 28.6 MW
- Somers Solar Center
  - 90 acres
  - 5 MW



# Biomass – Using waste wood products

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- Pittsylvania
  - 83 MW
- Altavista, Hopewell & Southampton
  - 51 MW in 2013
  - 153 MW by 2014
- Virginia City Hybrid Energy Center
  - 117 MW

# Engineering Challenges with Alternate Energy Systems

- Capacity may not be available when needed
  - Storage needed or conventional generation still required to meet demand
- Solar generation does not have capacity to generate current required for protective relays to operate properly on distribution networks if significant penetration occurs
- New sources may impact underfrequency relaying's ability to operate correctly when systems are under dynamic stress which can impact system stability
- Some of the new conversion devices create harmonic distortion to network
- Significant distributed generation sources on the distribution network create overvoltage conditions if not controlled







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