Simulation Modeling for the Hawaii Renewable Portfolio Standard

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Base Modeling for RPS

- Goal of modeling:
  - Cost of meeting load with multiple portfolios
  - Incorporation of societal costs within model
  - Estimate of reliability contribution of different types of resources.
  - Ability to measure volatility caused by different resource selections
- Talk about WHAT to model, not HOW to model

Portfolio Cost Measurement Total Cost Basis

- Important to measure total (fixed and variable) cost of all portfolios.
- Dispatch (variable) cost is only one element of total cost.
- Other elements include direct investment cost, impact of utility generation investment on distribution cost, environmental costs, social costs and benefits.

Portfolio Measurement

The Value of Quick-Response Resources

- With a given portfolio, there will be an optimal dispatch of the system.
- Dispatch decisions are human, and will consider "expectations" of unit outages, not prescience of outages.
- Quick-response resources may allow more "courageous" system dispatch, and greater reliance on as-available generation.
- Demand-response resources can be very valuable in integrating as-available resources.

Incorporation of Social Costs

- Environmental impacts of generation are most obvious. \$10 - \$40 / tonne CO_2
- Local (Hawaii) labor content of DSM and renewable resources are also significant. Allow a 10% - 25% credit against cost for local labor content, based on multiplier and state revenue impact.

Reliability Contribution of Different Resource Types

- Measure Loss of Load Hours for "existing" portfolio.
- Measure LOLH for all alternative portfolios.
- Calculate capacity value of each resource type.
- Typical wind capacity credit is 20% - 30%
- Solar capacity credits will be measurable.

Volatility

- Reliance on fuel-dependent resources creates cost volatility.
- Customers value stability
- "Upside" risk is infinite; downside risk is not.
- National security issues
- Local reliability issues