A Study of Increased Use of Renewable Energy Resources in Virginia

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Contributors

- **Executive Summary**
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- **App A: Existing and Future Renewable Resources in Virginia**

- **App B: Electricity Generation Costs and Measures**
  NREL – L. Bird and G. Porro
  Black & Veatch – R. Pletka and J. Abiecunas

- **App C: The Incentives and Impediments to Renewable Energy Systems in Virginia**
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- **App D: Economic Development Considerations**
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- Virginia Department of Mines, Minerals and Energy
- Virginia Department of Environmental Quality
- Virginia State Corporation Commission
- Energy Information Administration, U.S. Department of Energy
Objectives

- Review current renewable generation
- Look at prospects for future renewable development
- Compare costs for renewable with fossil fuels
- Review incentives and impediments to renewables
- Assess economic impacts of renewables in Virginia
- Discuss environmental compliance cost issues
- Provide recommendations and suggestions for future work
US Electrical Energy Breakdown

2003 US Electricity Generation

- Coal: 51.8%
- Nuclear: 19.9%
- Natural Gas: 16.7%
- Petroleum: 3.1%
- Hydro: 6.9%
- Geothermal: 16%
- Wind: 13%
- Biomass: 71%
- Renewables: 2.2%
- Others: Tidal, Wave, Ocean Thermal

Source: EIA 2004
Virginia Electrical Energy Breakdown

- Coal: 49.0%
- Nuclear: 33.6%
- Natural Gas: 5.8%
- Petroleum: 7.7%
- Hydro: 2.4%
- Other Renewables: 1.5%

Source: EIA
## Technical and Near-Term Development Potential

<table>
<thead>
<tr>
<th>Source</th>
<th>Technical Potential (MW)</th>
<th>Near-Term Potential (MW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Onshore wind</td>
<td>910 – 1,960</td>
<td>400</td>
</tr>
<tr>
<td>Offshore wind</td>
<td>1,300 – 32,000</td>
<td>0</td>
</tr>
<tr>
<td>Landfill gas</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>Biomass</td>
<td>760</td>
<td>300</td>
</tr>
<tr>
<td>Solar photovoltaic</td>
<td>11,700 – 13,000</td>
<td>&lt;1-2</td>
</tr>
<tr>
<td>Hydroelectric</td>
<td>N/A</td>
<td>200</td>
</tr>
<tr>
<td>Totals</td>
<td>14,700 – 47,750</td>
<td>930</td>
</tr>
</tbody>
</table>

Source: NREL

Source: Black & Veatch
Levelized Cost of Energy Comparison for New Power Plants

Source: Black & Veatch Estimate

0 5 10 15 20 25 30 35 40 45 50
Natural Gas Simple Cycle
Natural Gas Combined Cycle
Coal Gasification
Scrubbed Coal
Solar Photovoltaic
Landfill Gas
Wind
Biomass Cofiring
Biomass
Hydro

Levelized Cost of Electricity, cents/kWh

2004 Average Market Price Range

To 99

Source: Black & Veatch Estimate
Government Incentives For Renewable Development in Virginia

Federal
- Production tax credits (1-2 cents/kWh)
- Investment tax credits
- Tax credits for alcohol fuels
- Accelerated depreciation schedules

State
- Local option property tax exemption for solar
- Small wind incentives
- Solar manufacturing grants
- Net metering
- Streamlined certification of small projects
<table>
<thead>
<tr>
<th>State</th>
<th>Renewable Portfolio Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>CA</td>
<td>20% by 2017</td>
</tr>
<tr>
<td>NV</td>
<td>15% by 2013, 5% Solar</td>
</tr>
<tr>
<td>AZ</td>
<td>15% by 2025</td>
</tr>
<tr>
<td>CO</td>
<td>10% by 2015, 4% Solar</td>
</tr>
<tr>
<td>NM</td>
<td>10% by 2011</td>
</tr>
<tr>
<td>MT</td>
<td>15% by 2015</td>
</tr>
<tr>
<td>MN</td>
<td>Xcel 1125MW BY 2010, 125MW Biomass</td>
</tr>
<tr>
<td>WI</td>
<td>2.2% by 2011, 4% Solar</td>
</tr>
<tr>
<td>IL</td>
<td>Goal: 8% by 2013</td>
</tr>
<tr>
<td>TX</td>
<td>10,000 MW by 2025</td>
</tr>
<tr>
<td>HI</td>
<td>20% by 2020</td>
</tr>
<tr>
<td>IA</td>
<td>105 MW</td>
</tr>
<tr>
<td>NY</td>
<td>24% by 2013</td>
</tr>
<tr>
<td>PA</td>
<td>8/10% Tier I/II by 2020</td>
</tr>
<tr>
<td>DC</td>
<td>11% by 2022</td>
</tr>
<tr>
<td>VT</td>
<td>Goal: All New Gen, 10% cap</td>
</tr>
<tr>
<td>ME</td>
<td>30% by 2010</td>
</tr>
<tr>
<td>MA</td>
<td>4% By 2009, +1%/yr after</td>
</tr>
<tr>
<td>CT</td>
<td>10% By 2020</td>
</tr>
<tr>
<td>RI</td>
<td>15% By 2019</td>
</tr>
<tr>
<td>NJ</td>
<td>6.5% By 2010</td>
</tr>
<tr>
<td>DE</td>
<td>10% By 2019</td>
</tr>
<tr>
<td>MD</td>
<td>7.5% By 2019</td>
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<tr>
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</tr>
</tbody>
</table>
State Renewable Portfolio Standards
September 2005

States with RPS Requirements

VT Goal: All New Generation until 2012, 10% total cap

ME: 30%

NY: 24% by 2013

PA: 8% Tier I, 10% Tier II by 2020

CT: 10% By 2020

NJ: 6.5% By 2008

DE: 10% By 2019

MD: 7.5% By 2019

DC: 11% By 2022

RI: 15% By 2020

MA: 4% By 2009, +1%/yr after

VT Goal: All New Generation, 10% cap

NJ: 6.5% By 2008

CT: 10% By 2020

MD: 7.5% By 2019

DC: 11% By 2022

VT Goal: All New Generation until 2012, 10% total cap

ME: 30%
The PJM GATS Program

- PJM Generation Attributes Tracking System (GATS) allows tracking of electricity characteristics
- Like a “nutrition label” for electricity
- GATS enables states to:
  - Track environmental and emissions attributes
  - Monitor compliance with green power requirements
  - Help renewable generators obtain additional value for their renewable resources
- GATS certificates can be sold to those who must comply with state renewable standards, thus adding value to renewable generation
Economic Impacts

- In addition to the environment, renewables impact electricity rates, fuel prices, and jobs

- Direct and indirect impacts:
  - **Direct impacts** - money directly spent on materials, equipment, and labor
  - **Indirect impacts** – “spillover” effects from spending in the affected region

- Fair evaluation should include comparison to equivalent fossil fuel development

- Similar study for Pennsylvania showed potential significant net economic advantages for renewables
Employment Impacts from Renewable Technologies (PA)

- **Landfill Gas**
- **Hydro**
- **Solar**
- **Biomass Cofiring**
- **Wind**
- **Coal**
- **Gas Comb. Cycle**
- **Gas Simple Cycle**

**Employment Impact, Job-years/MW**

- **Renewable Energy**
- **Fossil Fuels**

- **20-year Operations Phase**
- **Construction Phase**
Environmental Compliance Costs

- Virginia participates in the EPA NO\(_X\) SIP Call and Acid Rain Programs to control NO\(_X\) and SO\(_2\)
- Clean Air Interstate Rule – Establishes permanent reduction caps on precursor emissions
- Renewable energy *might* reduce the cost of complying with CAIR, if coal-fired generation is retired and replaced by cheaper renewable energy
Conclusions

- **Objective**: initial assessment of renewables including current status, potential, costs, and incentives and impediments

- **Potential**:
  - NREL: over 15,000 MW based on resources available in Virginia, ignoring economic viability of developing these resources
  - Black & Veatch: 930 MW economically viable in the near-term (5-15 years)

- **Costs**: Hydro, biomass co-firing, wind and landfill gas cost competitive with fossil-fueled alternatives

- **PJM GATS**: Virginia utilities’ participation in PJM opens renewables energy markets. GATS certificates enable tracking of generation and compliance with state RPS programs

- **Most significant incentives**: federal production tax credit and state RPS programs

- **Most significant impediments**: intermittent nature of some renewables and uncertainty due to variability of federal policies
Recommendations

- Significant work is still needed to characterize renewables development potential in the state.
- Areas warranting further study include:
  - Resource assessment
  - Development costs estimates
  - Economic impacts analysis
  - Compliance costs and impacts
  - Best Public Policy alternatives
- Such in-depth analysis will provide valuable and accurate information to lawmakers, utilities, and community stakeholders.