Integration of Renewables into the Planning Process

Tom Ballinger
Office of Strategic Analysis and Governmental Affairs
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1) Overview of Integrated Resource Planning (IRP)

2) Alternative Renewable Portfolio Standard (RPS) Rollout Strategies
Overview of Integrated Resource Planning (IRP)
Overview of IRP

• An IRP process incorporates both conservation (demand-side) and generation (supply-side) resources to achieve a system that provides reliable service at the least cost.

  – Demand-side resources consist of conservation and customer-owned renewable resources.

  – Supply-side resources consist of purchased power from utilities and renewable generators as well as utility-owned generation.
Overview of IRP

**Generic Utility Planning Process**

- Assumptions
  - Existing Supply-Side Resources
  - Load Forecast (includes existing DSM)
- Reliability Analysis
- Magnitude & Timing of MW Need
- New Supply-Side Resources
- New DSM Resources
- Least Cost Revenue Requirement Analysis

**Commission Actions**

- Ten Year Site Plan Review
- DSM Goals & Programs
- Need Determinations
- Purchased Power Contract Approval
- Cost Recovery Clauses
- Territorial Agreements

**Integrated Resource Plan (IRP)**
IRP is Like a Three Legged Stool

- Both DSM and renewable generation are socially desirable alternatives to utility generation.

- Utilities should seek a balanced approach to DSM, renewables and utility generation.
Overview of IRP

• Peak Demand
  – Instantaneous measurement of load.
  – Determines TIMING and SIZE of new unit.

• Net Energy for Load (NEL)
  – Accumulation of demand over period of time.
  – Determines TYPE of new unit.
Overview of IRP

Daily Load Shapes for Summer and Winter

% of Daily Peak

Hour of the Day

Winter
Summer
Overview of IRP

• **Utility must plan to serve all customers.**
  – Even with slowing economy, new people arrive in Florida each day.

• **Utility must plan to serve total load.**
  – Average house size has increased approximately 30% since 1986.

• **Utility demand-side management programs can influence customer usage.**
  – The less customers require in kW and kWh, the less a utility will be required to build and operate.
Overview of IRP

• FEECA requires the PSC to adopt goals that will:

  1) conserve expensive resources, like petroleum fuels,

  2) reduce and control the growth rates of electricity consumption,

  3) reduce the growth rate of weather-sensitive peak demand, and

  4) encourage the development of demand-side renewable energy systems.

• Authorizes the PSC to require each utility to develop plans and implement cost-effective programs to meet goals.
Overview of IRP

• Once reliability need is identified, the next step is to select the most economic combination of resources to keep the lights on.

• Capital Costs + O & M Costs + Fuel Costs equals total cost over the life of resource.

• Utility selects a mix of resources that minimize total costs and meet reliability criteria:
  – Demand-side resources
  – Purchased Power (utility, cogen and renewables)
  – Utility generation
Overview of IRP

• Strategic considerations:
  – Fuel diversity
  – Economic development
  – Environmental impacts

• Typically addressed through sensitivity studies.
Overview of IRP

**GENERIC UTILITY PLANNING PROCESS**
- Assumptions
  - Existing Supply-Side Resources
  - Load Forecast (including existing DSM)
  - Reliability Analysis
  - Magnitude & Timing of MW Need
  - New Supply-Side Resources
  - New DSM Resources
  - Least Cost Revenue Requirement Analysis

**COMMISSION ACTIONS**
- Ten Year Site Plan Review
- DSM Goals & Programs
- Need Determinations
- Purchased Power Contract Approval
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Integrated Resource Plan (IRP)
Alternative Renewable Portfolio Standard (RPS) Rollout Strategies
Alternative RPS Rollout Strategies

- Case A – 20% RPS by 2020
- Case B – 20% RPS by 2030
- Case C – 20% RPS by 2041
- Case D – “Clean Energy Portfolio”
Alternative RPS Rollout Strategies

<table>
<thead>
<tr>
<th>2007 Existing Renewable Generation</th>
<th>Capacity (MW)</th>
<th>Generation (GWH)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class I (Solar and Wind)</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Class II (All others)</td>
<td>1,069</td>
<td>6,337</td>
</tr>
<tr>
<td>TOTAL</td>
<td>1,072</td>
<td>6,339</td>
</tr>
</tbody>
</table>

Retail Sales by 4 IOUs

- 175,751

% of Retail Sales

- 3.6%

- Many values provided based on calculations, not measured data.
- Values include firm sales, non-firm sales, and self-service generation.
Alternative RPS Rollout Strategies

• Levelized costs per RPS data request.

• Class I Resources
  – Solar PV – Rooftop (New Home Construction)
  – $196 / MWh

• Class II Resources
  – Florida Crystals – New Biomass Plant
  – $120 / MWh
## Alternative RPS Rollout Strategies

<table>
<thead>
<tr>
<th>100 % Solar</th>
<th>Case A</th>
<th>Case B</th>
<th>Case C</th>
</tr>
</thead>
<tbody>
<tr>
<td>RPS Value (GWh)</td>
<td>44,500</td>
<td>28,000</td>
<td>21,600</td>
</tr>
<tr>
<td>Required Capacity (MW)</td>
<td>26,000</td>
<td>16,500</td>
<td>12,760</td>
</tr>
<tr>
<td>Existing Capacity (MW)</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td># of Installations by 2020</td>
<td>5.8 Million</td>
<td>3.6 Million</td>
<td>2.8 Million</td>
</tr>
<tr>
<td>Estimated Cost ($Billion NPV)</td>
<td>$34.6</td>
<td>$24.2</td>
<td>$20.2</td>
</tr>
</tbody>
</table>

**Note:** For comparison purposes, all values are as of 2020.

Case A – 20% RPS by 2020, Case B – 20% RPS by 2030, and Case C – 20% RPS by 2041.
# Alternative RPS Rollout Strategies

<table>
<thead>
<tr>
<th>100 % Biomass</th>
<th>Case A</th>
<th>Case B</th>
<th>Case C</th>
</tr>
</thead>
<tbody>
<tr>
<td>RPS Value (GWh)</td>
<td>44,500</td>
<td>28,000</td>
<td>21,600</td>
</tr>
<tr>
<td>Required Capacity (MW)</td>
<td>6,350</td>
<td>4,000</td>
<td>3,100</td>
</tr>
<tr>
<td>Existing Capacity (MW)</td>
<td>1,069</td>
<td>1,069</td>
<td>1,069</td>
</tr>
<tr>
<td># of Installations by 2020</td>
<td>66</td>
<td>37</td>
<td>25</td>
</tr>
<tr>
<td>Estimated Cost ($Billion NPV)</td>
<td>$21.2</td>
<td>$14.8</td>
<td>$12.4</td>
</tr>
</tbody>
</table>

**Note:** For comparison purposes, all values are as of 2020.

Case A – 20% RPS by 2020, Case B – 20% RPS by 2030, and Case C – 20% RPS by 2041.
Alternative RPS Rollout Strategies

<table>
<thead>
<tr>
<th>25% Solar/ 75% Biomass</th>
<th>Case A</th>
<th>Case B</th>
<th>Case C</th>
</tr>
</thead>
<tbody>
<tr>
<td>RPS Value (GWh)</td>
<td>44,500</td>
<td>28,000</td>
<td>21,600</td>
</tr>
<tr>
<td>Required Solar Capacity (MW)</td>
<td>5,770</td>
<td>3,630</td>
<td>2,800</td>
</tr>
<tr>
<td>Existing Solar Capacity (MW)</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td># of Solar Installations by 2020</td>
<td>1.4 Million</td>
<td>0.9 Million</td>
<td>0.7 Million</td>
</tr>
<tr>
<td>Required Biomass Capacity (MW)</td>
<td>4,760</td>
<td>3,000</td>
<td>2,300</td>
</tr>
<tr>
<td>Existing Biomass Capacity (MW)</td>
<td>1,069</td>
<td>1,069</td>
<td>1,069</td>
</tr>
<tr>
<td># of Biomass Installations by 2020</td>
<td>46</td>
<td>24</td>
<td>15</td>
</tr>
<tr>
<td>Estimated Cost ($Billion NPV)</td>
<td>$24.5</td>
<td>$17.2</td>
<td>$14.3</td>
</tr>
</tbody>
</table>

Note: For comparison purposes, all values are as of 2020.
Case A – 20% RPS by 2020, Case B – 20% RPS by 2030, and Case C – 20% RPS by 2041.
# Alternative RPS Rollout Strategies

## Estimates of % Revenue Cap Required

<table>
<thead>
<tr>
<th>Year</th>
<th>Case A</th>
<th></th>
<th>Case B</th>
<th></th>
<th>Case C</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>All Solar</td>
<td>All Biomass</td>
<td>25/75 Split</td>
<td>All Solar</td>
<td>All Biomass</td>
<td>25/75 Split</td>
</tr>
<tr>
<td>2008</td>
<td>4%</td>
<td>1.5%</td>
<td>2%</td>
<td>4%</td>
<td>1.5%</td>
<td>2%</td>
</tr>
<tr>
<td>2020</td>
<td>21%</td>
<td>6.5%</td>
<td>10%</td>
<td>13%</td>
<td>4%</td>
<td>6%</td>
</tr>
</tbody>
</table>

Note: Case A – 20% RPS by 2020, Case B – 20% RPS by 2030, and Case C – 20% RPS by 2041.
“Clean Energy Portfolio”

366.82, F.S.
Promotes conservation, demand-side renewable energy systems, and investments in generator efficiency improvements.

366.92, F.S.
Promotes larger renewable projects. Preference for solar and wind.

366.93, F.S.
Promotes investment in nuclear and IGCC generation.

Clean Energy Portfolio
“Clean Energy Portfolio”

| % Generation by Resource Type in 2017 |
|-------------------------------|----------------|-------------|--------------|
|                              | DSM | Renewable | Nuclear | TOTAL       |
| FPL                          | 3.8 | 0.9       | 16.8     | 21.5        |
| PEF                          | 2.2 | 3.4       | 34.6     | 40.2        |
| TECO                         | 2.6 | 2.0       | 0.0      | 4.6         |
| GULF                         | 5.0 | 0.3       | 0.0      | 5.3         |
| TOTAL                        | 3.4 | 1.6       | 18.2     | 23.1        |

- Based on 2008 TYSP data.
- Includes only firm renewable purchases.
- Does not include RPS, new DSM goals, or FPL’s nuclear units.

Note: Generator efficiency improvements measured by changes in system heat rates. FPL projects that recent approvals of Riviera and Canaveral projects will improve system heat rate by 3-4%. Similar data not available for other utilities.