ENO Public IRP Meeting
Overview of IRP Process
October 2010
Objectives

- Describe Strategic Resource Planning (“SRP”) process:
- Summarize Key Assumptions and Changes Since 2009
- Summarize Key Findings and Conclusions
Agenda

- Overview of Planning Process
- Key Assumptions in 2009 SRP
- Resource Alternatives
- Portfolio Assessment
- Reference Planning Scenario
Planning Environment

Entergy’s evolving Strategic Resource Plan ("SRP") seeks to address the changing landscape for Integrated Resource Planning of recent years.
The SRP is a dynamic process for long-range planning that provides for a flexible approach to resource selection. The planning scenarios resulting from the SRP planning process provide guidance regarding long-term resource additions, but are not intended as static plans or predetermined schedule for resource additions. Actual portfolio decisions are made at the time of execution.
**Key IRP Planning Activities Since 2008**

<table>
<thead>
<tr>
<th>Year</th>
<th>Event/Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>2008 SRP</td>
</tr>
<tr>
<td></td>
<td>ENO Public IRP Meeting Nov ‘08</td>
</tr>
<tr>
<td></td>
<td>Final Document</td>
</tr>
<tr>
<td>2009</td>
<td>2009 SRP</td>
</tr>
<tr>
<td></td>
<td>Preparation</td>
</tr>
<tr>
<td>2009</td>
<td>Renewable RFI</td>
</tr>
<tr>
<td></td>
<td>Preparation</td>
</tr>
<tr>
<td>2009</td>
<td>2009 SRP Refresh (Sep ‘10)</td>
</tr>
<tr>
<td></td>
<td>Preparation</td>
</tr>
<tr>
<td>2009</td>
<td>Frontier</td>
</tr>
<tr>
<td>2009</td>
<td>Acadia Filing</td>
</tr>
<tr>
<td>2009</td>
<td>Selections</td>
</tr>
<tr>
<td>2009</td>
<td>2009 RFP</td>
</tr>
<tr>
<td>2009</td>
<td>Western RFP</td>
</tr>
<tr>
<td>2010</td>
<td>Procurement</td>
</tr>
<tr>
<td>2010</td>
<td>Includes NM6 Self-Supply</td>
</tr>
<tr>
<td>2010</td>
<td>2009 RFP</td>
</tr>
<tr>
<td>2010</td>
<td>Frontiers</td>
</tr>
<tr>
<td>2010</td>
<td>2009 RFP</td>
</tr>
<tr>
<td>2010</td>
<td>Preparation</td>
</tr>
</tbody>
</table>

**SRP PROCESS OVERVIEW**
Entergy System Planning Objectives

- Reliability
- Cost
- Risk Mitigation
2009 Carbon Intensity

In a carbon regulated world, the Entergy System in general and ENO in particular emit less CO$_2$ per MWh than most other regional utilities.

CO$_2$ Short Tons Per MWh (based on Customer Delivery)

- Entergy Regulated: 0.42
- Entergy Arkansas: 0.27
- Entergy New Orleans: 0.3
- Entergy Louisiana: 0.35
- Entergy GSU-La: 0.49
- Entergy Mississippi: 0.57
- Entergy Texas: 0.59
- FPL: 0.53
- Dominion: 0.56
- SCANA: 0.63
- Duke: 0.66
- Progress: 0.69
- Southern Co.: 0.78
- CLECO: 0.72 / 0.81
- AEP: 0.94

U.S. Avg. 0.70

**Sources**

- Non-Entergy data is sourced from Ventyx Velocity Suite and reflects regulated electric utility generation plus purchase power. The CO$_2$ rate for purchase power is estimated based on EPA's eGrid factor for the region to which the utility is associated.
- The Entergy System and Operating Company data is sourced from SPO's ISB and Ventyx Velocity Suite and includes all generation, system exchanges, and purchase power. EPA eGrid average intensity of Mississippi Valley used where emitting source cannot be confirmed.
- CLECO blue bar is based on current CLECO units and the orange bar includes the estimated impact of adding Rodemacher 3 pet coke unit which increases intensity from 0.72 to 0.81.
SRP PROCESS OVERVIEW

Analytical Framework in 2009 SRP

Develop Assumptions
- Develop input assumptions and sensitivities for key variables including:
  - Load
  - Fuel
  - Environmental Cost

Assess Resource Alternatives
- Assess cost and performance of available resource alternatives

Assess Portfolio Risk
- Assess performance of resources combinations across range of driver outcomes

Develop Target Portfolios
- Develop recommended target portfolios
ENR PUBLIC IRP MEETING

Agenda

- Overview of Planning Process
- Key Assumptions in 2009 SRP
- Resource Alternatives
- Portfolio Assessment
- Reference Planning Scenario
### Entergy System Configuration and Reserve Margins

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>6-Company System</strong></td>
<td>16.85%</td>
<td>18%</td>
<td>20%</td>
</tr>
<tr>
<td><strong>5-Company System</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>4-Company System</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>EAI Stand Alone</strong></td>
<td></td>
<td></td>
<td>20%</td>
</tr>
<tr>
<td><strong>EMI Stand Alone</strong></td>
<td></td>
<td></td>
<td>21%</td>
</tr>
</tbody>
</table>

* EAI and EMI stand-alone reserve margins are based on loss of the largest unit. LOLP calculation indicates that EAI and EMI stand-alone may require 26.1% and 45.5% reserve margins, respectively.
## SRP Assumptions

### Load Growth Cases

<table>
<thead>
<tr>
<th></th>
<th>Reference</th>
<th>High Load Factor</th>
<th>Low Growth</th>
<th>High Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Peak Load Growth</strong></td>
<td>1.1% (ENO 0.9%)</td>
<td>Flat (0%)</td>
<td>0.5%</td>
<td>2.0%</td>
</tr>
<tr>
<td><strong>Sales Growth</strong></td>
<td>1.0 – 1.2% (ENO 0.9%)</td>
<td>1.0 – 1.2% (ENO 0.9%)</td>
<td>0.5%</td>
<td>2.0%</td>
</tr>
<tr>
<td><strong>Load Factor</strong></td>
<td>~66% (ENO ~61%)</td>
<td>Varies 65% to 81% (ENO 61% to 70%)</td>
<td>65% (ENO 61%)</td>
<td>65% (ENO 61%)</td>
</tr>
</tbody>
</table>

Metrics apply to overall Entergy Utility System unless otherwise noted.
SRP ASSUMPTIONS

Carbon

The SRP considers the uncertainty pertaining to potential carbon legislation. Resource alternatives were assessed across a range of carbon costs based on the current Entergy Point-of-View. Sensitivities ranged from no-carbon cost to a stringent “80% Reduction” Case.

<table>
<thead>
<tr>
<th>CO₂ COST</th>
<th>CASE DESCRIPTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>($/Ton)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2009</th>
<th>2014</th>
<th>2019</th>
<th>2024</th>
<th>2029</th>
<th>2034</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>50</td>
<td>100</td>
<td>150</td>
<td>200</td>
<td>250</td>
</tr>
</tbody>
</table>

1. Levelized Costs are based on the 20-year planning period (2009 – 2028). Resource analysis will assess life-cycle economics extending beyond the planning period.

**Base**
- ETR Strawman – 80% reduction in 2000 CO₂ levels by 2050. CO₂ costs capped at $50 per ton in 2020.
- Levelized Cost\(^1\) = $23/ton

**No-Carbon**
- No supply cost attributed to CO₂ emissions.

**30%**
- 30% reduction in 2000 CO₂ levels by 2050.
- 30% offsets allowed.
- Levelized Cost\(^1\) = $9/ton.

**80%**
- 80% reduction in 2000 CO₂ levels by 2050.
- 15% Offsets allowed.
- Levelized Cost\(^1\) = $41/ton.
SRP ASSUMPTIONS

Natural Gas Prices

LONG-TERM GAS ASSUMPTIONS

<table>
<thead>
<tr>
<th>Year</th>
<th>Reference</th>
<th>Low</th>
<th>High</th>
<th>Expected</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>6.04</td>
<td>5.49</td>
<td>7.59</td>
<td>6.04</td>
</tr>
<tr>
<td>2015</td>
<td>8.89</td>
<td>5.73</td>
<td>14.61</td>
<td>8.51</td>
</tr>
<tr>
<td>2020</td>
<td>10.06</td>
<td>6.88</td>
<td>18.39</td>
<td>9.94</td>
</tr>
<tr>
<td>2025</td>
<td>11.39</td>
<td>8.25</td>
<td>22.12</td>
<td>11.52</td>
</tr>
</tbody>
</table>
Current Assumptions

**Load**
Reference load forecast is about 3% higher than 2009 SRP. Peak load growth increased from 1.1% to 1.2% per year. Updated forecast is well bounded by 2009 SRP sensitivity cases.

**Carbon**
Long-term carbon prices remain uncertain. Lack of progress regarding federal energy policy implies, at a minimum, slower carbon price path than assumed in 2009 SRP. Current planning assumptions reflect delayed implementation of carbon legislation.

**Natural Gas**
Emergence of shale gas has altered long-term expectations for natural gas prices (lower) and supply (increased).
Agenda

- Overview of Planning Process
- Key Assumptions in 2009 SRP
- Resource Alternatives
- Portfolio Assessment
- Reference Planning Scenario
RESOURCES ALTERNATIVES

Process Considers Full Range of Alternatives

Alternatives

- Demand-side Management
- Conventional Generation
- Renewable Generation
- Existing Resources

Portfolio Design

- Reliability
- Cost
- Risk Mitigation
### ENO Requirements and Capability (2010)

**Forecasted Firm Load Plus 10% Reserve Margin (MW)**

<table>
<thead>
<tr>
<th></th>
<th>Base Load</th>
<th>Core LF</th>
<th>Seasonal LF</th>
<th>Peaking</th>
<th>Reserve</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capability</td>
<td>459</td>
<td>0</td>
<td>748</td>
<td>0</td>
<td>0</td>
<td>1,207</td>
</tr>
<tr>
<td>Requirement</td>
<td>445</td>
<td>160</td>
<td>114</td>
<td>247</td>
<td>97</td>
<td>1,063</td>
</tr>
<tr>
<td>Difference</td>
<td>14 (160)</td>
<td>634</td>
<td>(247)</td>
<td>(97)</td>
<td></td>
<td>144</td>
</tr>
</tbody>
</table>

**Key Assumptions**
- This analysis compares owned and long-term contracted resources to forecasted firm load. *Excludes limited term purchases.*
- Load Forecast is FEA102. Unit ratings are based on 2010 summer ratings.
 RESOURCE ALTERNATIVES

Current Conventional Resource Alternatives
2009 SRP Refresh (Sept. 2010)

Assumes Base Load operation. Capacity factor 85%, Nuclear Capacity Factor 90%
Based on 2009 SRP Refresh Assumptions
PC = Pulverized Coal; CFB = Circulating Fluidized Bed (Coal); IGCC = Integrated Gasification Combined Cycle (Coal)
RESOURCES ALTERNATIVES

Longer-term Conventional Resource Alternatives
2009 SRP Refresh (Sept. 2010)

Levelized Nominal Cost $/MWh Over Useful Life
Base Year 2020

Assumes Base Load operation. Capacity factor 85%, Nuclear Capacity Factor 90%
Based on 2009 SRP Refresh Assumptions
PC = Pulverized Coal; CFB = Circulating Fluidized Bed (Coal); IGCC = Integrated Gasification Combined Cycle (Coal)
RESOURCE ALTERNATIVES

Renewable Generation Alternatives
2009 SRP Refresh (Sept. 2010)

Levelized Nominal Cost $/MWh Over Useful Life, Base Year 2010

Assumptions
• Off-System Wind assumes $500/kW generic off-system transmission adder.
• Resources are assumed to be located in or close to the Entergy utility service area. Off-System wind is assumed to be located in SPP.
• Costs reflect available investment tax credit but not potential REC value.
• Wind and Solar costs include flexible cost and backup capacity cost.
RESOURCE ALTERNATIVES

Wind and New-build CCGT Cost
30-Year Levelized Nominal Cost $/MWh (2010 – 2039); Load following CCGT

Assumptions
- Off-system on-shore wind based on $2,000/ kW installed cost plus transmission cost as noted and 39% capacity factor. Includes flexible cost and backup capacity cost.
- 5% capacity value attributed to wind (planning reserves).
- Investment Tax Credit (ITC) applies to wind installed capital.
- CCGT operates at 65% capacity factor, with no transmission cost adder. Gas prices shown are real 2009$.

CCGT with $8 gas & Strawman CO2
CCGT with $7 gas & Strawman CO2
CCGT with $5 gas & no CO2
RESOURCES ALTERNATIVES

Solar and New-build CCGT Cost
30-Year Levelized Nominal Cost $/MWh (2010 – 2039); Load following CCGT

Assumptions
- Solar PV based on $5,000/kW installed cost and 16% capacity factor. Includes flexible cost and backup capacity cost. No transmission cost adder.
- 10% capacity value attributed to solar (planning reserves).
- ITC applies to solar installed capital.
- CCGT operates at 65% capacity factor, with no transmission cost adder. Gas prices shown are real 2009$.

CCGT with $8 gas & Strawman CO2
CCGT with $7 gas & Strawman CO2
CCGT with $5 gas & no CO2
The Challenge of Intermittency

<table>
<thead>
<tr>
<th>The Challenge</th>
<th>The Implications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Both wind and solar are intermittent generating resources. They produce energy only when the wind blows or the sun shines. Output frequently occurs during times when it is least needed, that is during “off-peak” periods. This is particularly true of wind which tends to blow more at night and more in off-season (spring or winter)</td>
<td>Intermittency increases the effective cost of these resources relative to other generation alternatives in two ways</td>
</tr>
</tbody>
</table>

1. Planning Reserves – Uncertainty as to availability at peak means that these resources do not count as conventional generation toward reserve margins

2. Operational Integration – Uncertainty regarding energy output requires System Operator to commit additional flexible capability to respond to changing output levels
### The Challenge of Intermittency

#### Wind Example

<table>
<thead>
<tr>
<th>The Challenge</th>
<th>The Implications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1 Uncertain Availability</strong></td>
<td>- Essentially 100% back up is needed for reliability.</td>
</tr>
<tr>
<td>Wind resources experience periods of low output</td>
<td></td>
</tr>
<tr>
<td>even if resources are dispersed across broad</td>
<td></td>
</tr>
<tr>
<td>geographic regions.</td>
<td></td>
</tr>
<tr>
<td>- Low output levels can continue for extended</td>
<td></td>
</tr>
<tr>
<td>periods</td>
<td></td>
</tr>
<tr>
<td><strong>2 Ramping Concerns</strong></td>
<td>- Increased need for regulation / load-following</td>
</tr>
<tr>
<td>Wind output is inversely correlated to load</td>
<td>(i.e. flexible capability).</td>
</tr>
<tr>
<td>resulting in ramping challenges</td>
<td></td>
</tr>
<tr>
<td>- Hour-to-hour wind output varies greatly</td>
<td></td>
</tr>
<tr>
<td>- Rapid decline in output during day as load</td>
<td></td>
</tr>
<tr>
<td>increases</td>
<td></td>
</tr>
<tr>
<td>- Rapid increase in output in evening</td>
<td></td>
</tr>
</tbody>
</table>

**Increased Cost**

$
Correlation of Wind Output and Load
Representative Pattern for One Summer Week
Solar PV Intermittency During Peak Hours

Entergy Area Typical Solar PV Output During Peak Load
(Highest Ten Percent of Load Hours)

[Graph showing the relationship between load (MW) and solar PV output (%)]
## RESOURCE ALTERNATIVES

### CCGT – Wind Equivalency

**The Challenge of Scale**

To produce the equivalent amount of energy as a single 500 MW base load CCGT would require 400 wind turbines.

### Assumptions
- CCGT operates at 80% capacity factor.
- Wind turbines are 2.5 MWs each and operate at 40% capacity factor.
- Turbines require spacing of 5 times blade diameter.

### Deployed over more than 120 square miles of land

Note: CCGT footprint is about 20 acres or 0.03 sq miles.

### Capital Requirement

<table>
<thead>
<tr>
<th>CCGT Footprint</th>
<th>Wind Turbine Footprint</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital Requirement $≈$ $600 Million</td>
<td>Capital Requirement $&gt;$ $2 Billion</td>
</tr>
</tbody>
</table>

A single 500 MW CCGT =

Deployed over more than 120 square miles of land

- Assumptions
  - CCGT operates at 80% capacity factor.
  - Wind turbines are 2.5 MWs each and operate at 40% capacity factor.
  - Turbines require spacing of 5 times blade diameter.

Capital Requirement $>$ $2 Billion
ENO PUBLIC IRP MEETING

**Content**

- Overview of Planning Process
- Key Assumptions in 2009 SRP
- Resource Alternatives
- **Portfolio Assessment**
- Reference Planning Scenario
PORTFOLIO ASSESSMENT

Purpose and Methodology

Purpose

- Assess implications on total supply cost of alternative portfolio strategies considering uncertainties including natural gas prices, CO₂ legislation, and RPS.

Methodology

- Developed 8 conceptual portfolio scenarios:
  - Gas Centric
  - Green Gold
  - Deep Green
  - Max Green
  - Nuclear Reaction
  - Solid Foundation
  - Nuclear Green
  - Solid Green
- Assessed 20-year total supply cost for each scenario
- Probability analysis considering 3,000 iterations of gas and CO₂ outcomes for each scenario
PORTFOLIO ASSESSMENT

Portfolio Composition
System (6-CO) Level Analysis

- Gas Centric: 7,500
- Green Gold: 6,000
- Deep Green: 4,500
- Max Green: 8,000
- Nuclear Reaction: 2,000
- Solid Foundation: 2,000
- Nuclear Green: 2,000
- Solid Green: 2,000

Categories:
- CCGT/CT
- Renewable Generation
- Nuclear
- New Coal
PORTFOLIO ASSESSMENT

Total Supply Cost / Risk
System (6-CO) Level Analysis

Net Present Value of Expected Total Supply Cost ($Billions)

Expected Supply Cost

$100
$99
$98
$97
$96
$95
± $20
± $21
± $22
± $23
± $24

Measure of One Standard Deviation From Expected Supply Cost (66% Probability.)

Content

- Overview of Planning Process
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REFERENCE PLANNING SCENARIO

Reference Planning Scenario Criteria

The SRP includes a Reference Planning Scenario describing a portfolio strategy to meet customer needs for the next twenty years. The Reference Planning Scenario meets the following criteria:

- Balances the supply objectives of reliability, cost, and risk mitigation;
- Accomplishes these planning objectives while considering utilization of natural resources and effects on the environment;
- Results in sufficient capacity to meet reliability requirements for the ELL, EGSL, ETI, and ENOI System, EAI stand-alone, and EMI stand-alone throughout the twenty year planning horizon.
- Addresses reliability needs within all planning regions.
- Outlines a disciplined approach to resource additions while allowing the flexibility to respond to changing circumstances.
- Meets bulk of reliability needs through long-term resources (owned or power purchase contracts).
- Addresses fuel diversity through the addition of renewable generation while monitoring economics of other stable priced generation alternatives.
Strategic Recommendations

2009 SRP Recommendations

- **CCGT Focus**
  - Focus on gas-fired CCGT capacity as basic building block of the portfolio.

- **Renewables**
  - Pursue reasonable levels of economically attractive renewable generation.

- **New Nuclear**
  - Continue to monitor the economics of new nuclear. Maintain readiness of new nuclear through spending levels consistent with results of ongoing assessment.

- **Transmission**
  - Continue development of long term integrated planning efforts with TBU to identify portfolio solutions that best balance planning objectives. Results of 717 planning efforts may result in adjustment to timing and location of resource needs.

- **DSM / EE**
  - Pursue cost effective DSM subject to appropriate regulatory approvals

2009 SRP Refresh (Sept. 2010)

- **CCGT Focus**
  - Current expectations for long-term natural gas prices and supply reinforce this strategy.

- **Renewables**
  - Current expectations for long-term natural gas prices and lack of progress on federal environmental policy suggest reduced economic outlook for renewable generation.

- **New Nuclear**
  - Remains valid.

- **Transmission**
  - On-going efforts with TBU.

- **DSM / EE**
  - Remains valid.
**REFERENCES PLANNING SCENARIO**

**ENO Capacity Assumptions**
Reference Planning Scenario 2009 SRP Refresh (September 2010)

### Additions

<table>
<thead>
<tr>
<th>Additions</th>
<th>Year</th>
<th>Capacity (MW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nuclear Uprate</td>
<td>2012</td>
<td>31</td>
</tr>
<tr>
<td>Nuclear Uprate</td>
<td>2015</td>
<td>13</td>
</tr>
<tr>
<td>Ninemile 6 CCGT</td>
<td>2015</td>
<td>120</td>
</tr>
<tr>
<td>Renewable Resource</td>
<td>2018</td>
<td>50</td>
</tr>
<tr>
<td>CCGT</td>
<td>2027</td>
<td>600</td>
</tr>
<tr>
<td>Renewable Resource</td>
<td>2028</td>
<td>50</td>
</tr>
<tr>
<td><strong>Total Additions</strong></td>
<td></td>
<td><strong>864</strong></td>
</tr>
</tbody>
</table>

### Deactivations and Contract Expirations

<table>
<thead>
<tr>
<th>Deactivations and Contract Expirations</th>
<th>Year</th>
<th>Capacity (MW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limited-Term Contract</td>
<td>2011</td>
<td>7</td>
</tr>
<tr>
<td>Michoud 2</td>
<td>2022</td>
<td>233</td>
</tr>
<tr>
<td>Michoud 3</td>
<td>2027</td>
<td>515</td>
</tr>
<tr>
<td><strong>Total Deactivations</strong></td>
<td></td>
<td><strong>755</strong></td>
</tr>
</tbody>
</table>
REFERENCE PLANNING SCENARIO

ENO Reference Planning Scenario

Source: 2009 SRP Refresh (Sept. 2010)
REFERENCE PLANNING SCENARIO

ELL Reference Planning Scenario

Source: 2009 SRP Refresh (Sept. 2010). *Includes 91 MW of legacy hydro