Vectren Integrated Resource Plan (IRP) Stakeholder Meeting

Gary Vicinus – Meeting Facilitator
Vice President and Managing Director, Pace Global
April 7, 2016
## Agenda

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity Description</th>
<th>Presenter(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:00 p.m.</td>
<td>Sign-in/ refreshments</td>
<td></td>
</tr>
<tr>
<td>1:30 p.m.</td>
<td>Welcome</td>
<td>Carl Chapman, Vectren President and CEO</td>
</tr>
<tr>
<td>1:35 p.m.</td>
<td>Take attendance in person and on phone (give name and organization) Meeting Format and Ground Rules</td>
<td>Gary Vicinus, Pace Global – Managing Director of Consulting Practice</td>
</tr>
<tr>
<td>1:45 p.m.</td>
<td>Vectren IRP Process Overview and Discussion of Uncertainties</td>
<td>Gary Vicinus, Pace Global – Managing Director of Consulting Practice</td>
</tr>
<tr>
<td>2:45 p.m.</td>
<td>Break</td>
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<tr>
<td>2:55 p.m.</td>
<td>Sales and Demand Forecast Update</td>
<td>Matt Rice, Manager Market Research &amp; Analysis</td>
</tr>
<tr>
<td>3:05 p.m.</td>
<td>Customer-Owned Distributed Generation Forecast</td>
<td>Mike Russo, Itron – Forecast Analyst</td>
</tr>
<tr>
<td>3:20 p.m.</td>
<td>Resource Options – Generation Resource Alternatives</td>
<td>Mike Borgstadt, Burns &amp; McDonnell – Project Manager</td>
</tr>
<tr>
<td>3:35 p.m.</td>
<td>Resource Options – Generation Retrofit Alternatives</td>
<td>Scott Brown, Manager Generation Planning</td>
</tr>
<tr>
<td>3:45 p.m.</td>
<td>Resource Options – Energy Efficiency</td>
<td>Shawn Kelly, Director Energy Efficiency</td>
</tr>
<tr>
<td>4:00 p.m.</td>
<td>Stakeholder Questions, Feedback and Comments</td>
<td></td>
</tr>
<tr>
<td>4:30 p.m.</td>
<td>Adjourn</td>
<td></td>
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</tbody>
</table>
Meeting Guidelines

1. Please hold most questions until the end of the presentation (Clarifying questions about the slides are fine throughout). You may write questions on these topics or others using the cards at your table. We will collect them as we go and use to facilitate discussion.

2. For those on the webinar, we will open the (currently muted) phone lines for questions within the allotted time frame. You may also type in questions via the chat feature.

3. At the end of the presentation, we will open up the floor for “clarifying questions,” thoughts, ideas and suggestions.

4. There will be a parking lot for items to be addressed at a later time.

5. Additional questions and suggestions may be sent to IRP@vectren.com for a period of two weeks after this meeting.

6. We will address most verbal questions here. Please allow a few weeks for responses to written questions submitted to IRP@vectren.com or follow-up questions from this meeting.
Vectren’s IRP Process

- Vectren’s IRP process is designed to determine a preferred portfolio that best meets all objectives over a wide range of market futures to meet our customers’ future energy needs:
  - Objectives and Overview of Planning Process
  - Metrics
  - Key Inputs
  - Screening Process
  - Selection of Portfolios
  - Risk Assessment
  - Findings and Recommendations
Purpose and Guidelines for Vectren’s 2016 IRP

Vectren is seeking to develop its 2016 IRP to test what future portfolio best meets customers’ needs for reliable, low cost, environmentally acceptable power over a wide range of future market and regulatory conditions.

- The 2016 IRP will follow the IURC’s directive to assess options against a wide range of future market conditions and to perform a comprehensive risk assessment to ensure its recommended portfolio performs well against a wide range of futures.

- Vectren will conduct a thorough stakeholder process beginning today, to ensure it receives feedback from its stakeholders throughout the process.
  - There will be at least three stakeholder meetings: today, late July and late fall.

IURC = Indiana Utility Regulatory Commission
### Vectren’s Approach Will Build on Traditional Approaches, Considering Multiple Objectives

<table>
<thead>
<tr>
<th>Traditional Approach</th>
<th>Vectren Approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>▪ Focuses on minimizing customer costs</td>
<td>▪ Focuses on the simultaneous evaluation of multiple objectives and tradeoffs</td>
</tr>
</tbody>
</table>
| ▪ Portfolio evaluation is one-dimensional | - Risk Mitigation  
- Customer Cost  
- Environmental Stewardship |

**Graphical Representation:**

- **Customer Cost**
  - Port. 1: Green
  - Port. 2: Blue
  - Port. 3: Yellow
  - Port. 4: Orange
  - Port. 5: Gray

- **Risk Mitigation**
  - Port. 1: Risk
  - Port. 2: Customer Cost
  - Port. 3: Environmental Stewardship

**Logos:**

- Vectren Energy Delivery
The Selected Portfolio Will Identify and Evaluate Tradeoffs on Key Metrics

- Environment
  - Emissions
  - Renewable Energy
- Cost
  - Low Reasonable Cost
- Risk
  - Reliability
  - Diversity

Examine Tradeoffs

Customer Perspective
1. Identify Objectives, Metrics, and Risk Perspectives
2. Establish 5-7 Scenarios (Possible Future States)
3. Analyze Resource Options for Each Scenario (Using STRATEGIST Software)
4. Select Portfolios for Risk Analysis (Include Diverse Mix)
5. Analyze Risks for Each Portfolio (Using Stochastics)
6. Select “Best” Portfolios

Define Base Case and Boundary Scenarios
Evaluate Resource Options (Screening Analysis)
Develop Mix of Portfolios from Screening Analysis and Judgment
Integrate the Financial Impact through Integrated Financial Modeling and Risk Analysis
Select the Best Portfolio(s) on the Basis of Commercial Reality, Balance of Objectives, and Perspective of Acceptable Risk
Objectives and Metrics

1. Balance Cost and Risk on Behalf of Customers
   - Net present value of revenue requirement $

2. Manage Risk to Customers
   - Reliance on market transactions; Variability of portfolio cost

3. Maintain Reliability
   - Frequency and total MWh of loss of load events

4. Enhance Environmental Stewardship
   - Emission reductions compared to targets; Renewable %

5. Diversify Generation Assets
   - % Share of generation output

MWh = Mega Watt Hour
Structured Screening Process to Address Issues Efficiently and Select Portfolios

**Screen feasible options for each “issue category”**

**Combine individual options into integrated portfolios**

**Perform quantitative scenario-based risk analysis**

**Identify top options that meet constraints and match objectives**

**Select Integrated Portfolio**

1. Meet planning constraints;
2. Rank by cost and environmental performance

**Collaborate with Vectren to construct portfolio options that meet constraints and incorporate various strategy options**

**Test each portfolio against external market risks and all key metrics (Full portfolio assessment)**

1 Distributed generation may not be controlled by the utility
Process for Addressing Uncertainty

- Fuel Prices
- Emission Prices
- Load
- Capital Costs
- Portfolio Options
- Plant Parameters
- Regional Footprint & Interconnections
- NPV of Customer Revenue Requirement
- Power Prices
- Portfolio Costs
- Generation

1 Stochastic modeling is for the purpose of estimating the probability of outcomes within a forecast to predict what conditions might be like under different situations.

\[
\text{NPV} = \text{Net Present Value}
\]
Step 2: Selection of Drivers, Portfolios and Futures (Stakeholder Input)
Purpose and Guidelines for Scenario Development

Vectren is seeking to develop a base case and 5-7 alternatives, internally consistent scenarios (potential futures), to test which portfolios are optimal over a wide range of future market and regulatory conditions. We would like to solicit your list of risk factors/drivers, options and scenarios.

- List Risk Factors
  - Environmental Regulations:
  - Technological Assumptions (Speed of technological growth and adoption):
  - Market Drivers:
Purpose and Guidelines for Portfolio Development

• Next we want to ensure we consider all of the relevant demand side and supply side options, which we will expose to the scenarios we develop around the key drivers:

  ▪ Stakeholder input into the consideration of options:
    ▪ Demand Side Resources (Energy efficiency and demand response):

    ▪ Distributed Energy Resources:

    ▪ Supply Side Resources (Generation options):
The Objective of this Analysis is to Find Portfolios that Perform Well Against a Range of Boundary Conditions.
Step 3: Vectren’s Base Case Assumptions
Vectren’s Base Case

- **Load**
  - Today, Matt Rice (Vectren) will review Vectren’s reference forecast as the Base Case
  - In addition, Customer-Owned Distributed Generation forecast will be discussed by Mike Russo from Itron

- **Technology Options**
  - Today, Mike Borgstadt (Burns & McDonnell) and Scott Brown (Vectren) will discuss technology choices, and Shawn Kelly (Vectren) will discuss Energy Efficiency
  - Other model inputs/major assumptions will be discussed in our next public meeting in July
Step 4: Selection of Portfolios
Purpose and Guidelines for Scenario Development

- From the Screening Analysis, Vectren will select a range of portfolios which capture least cost portfolios, diverse portfolios and renewable portfolios to ensure all relevant portfolios are considered. Then, a risk assessment is performed.

- **Guidelines for portfolio development:**
  - Screening assessment will determine least cost portfolios for each scenario (potential future)
  - Next, Vectren will select other portfolios that capture more diverse, green, or modular generation and/or achieve reliability objectives
  - From this group of portfolios, a risk assessment is performed

- **Graph will show selection of “best” portfolios for conducting risk assessment**
  1. Dispatch portfolio model will select least cost portfolios
  2. Selection of more diverse portfolios
  3. Other portfolios suggested by stakeholder process
Results of Technology Screening Assessment

NPV = Net Present Value
Step 5: Stochastic Risk Assessment
Incorporating Stochastic Risks into the Planning Process
Tests Portfolios against Wide Range of Outcomes

Objectives and Inputs

- Cost
- Diversity
- System Reliability
- Environmental Emphasis
- Renewable Energy
- IURC Requirements

Portfolio Options
- Renewables
- Gas and Coal
- Storage
- Energy Efficiency
- Demand Response
- Combined Heat & Power

Stochastic Inputs
- Gas Price
- Coal Price
- Energy Demand
- Capital Cost
- CO₂ Cost

Market Evaluation Process

- Probabilistic Simulations
- Power market simulations
- Sampling of inputs given observed volatilities and correlations

Decision Processes

- Probability Banded Outputs
  - Power Prices
  - Dispatch
  - Cost

Relative Portfolio Evaluation Across Range of Outcomes

Portfolio options are evaluated across the entire range of potential market outcomes and against the established resource planning objectives.

CO₂ = Carbon Dioxide
Step 6: Selection of Preferred Portfolio
Illustrative Results Presentation

- Portfolios above line are less desirable because of higher expected cost and risk
Illustrative Example: Scorecard Summary of Portfolio Options

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Cost</th>
<th>Risk</th>
<th>Environmental</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cost Metric 1</td>
<td>Cost Metric 2</td>
<td>Cost Rating Score</td>
</tr>
<tr>
<td>Portfolio 1</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Portfolio 2</td>
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<td></td>
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<td>Portfolio 3</td>
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<td>Portfolio 4</td>
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<td>Portfolio 5</td>
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<td>Portfolio 6</td>
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<td>Portfolio 7</td>
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<td>Portfolio 8</td>
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<tr>
<td>Portfolio 9</td>
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<tr>
<td>Portfolio 10</td>
<td></td>
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</tbody>
</table>

Score Rating:   Favorable   Neutral   Unfavorable

Illustrative

VECTREN Energy Delivery
Preferred Portfolio

- The preferred portfolio best meets objectives over a range of scenarios:
  - Volatility in demand and prices for both gas and power
  - Significant conservation measures
  - Consideration of alternative energy (solar, wind, cogen)
  - Environmental regulation changes
  - Pace of infrastructure replacement
  - Decarbonization commitments that ratchet over time
  - Local economic factors
Long-Term Energy and Demand Forecast

Presented by Matt Rice, Manager of Market Research & Analysis
2016 Vectren IRP Stakeholder Meeting
April 7, 2016
Forecast Summary

- Expect demand to remain relatively flat through the forecast period (Compound Annual Growth Rate (CAGR) is 0.1%)\(^1\)
  - A large customer’s adoption of customer-owned generation in 2017
- Moderate growth (Compound Annual Growth Rate is 0.5% beyond 2017)
  - Slow long-term population growth (0.2% annual growth) & moderate income growth (1.6% annual growth)
  - Strong end-use efficiency gains reflecting new and existing Federal codes and standards
    - Air conditioning, heating, lighting, refrigeration, cooking, etc. are all becoming more efficient over time
  - Residential and general service adoption of rooftop solar

\(^1\) Future energy efficiency programs are not included in the sales and demand forecast and will be considered a resource option
Usage Trend Example

Average Household Refrigerator Energy Use, Volume, and Price Over Time

Energy Use (kWh per year)

Refrigerator Volume (cubic feet)

Price (2014$)

Sources: Association of Home Appliance Manufacturers (AHAM) for energy consumption and volume; U.S. Census Bureau for price.

kWh = Kilo Watt Hour
Bottom-Up Forecast Approach

- **Energy, Customers, & Price**
  - Source: Vectren

- **Economic Drivers**
  - Source: Moody's Economy.com

- **Appliance Saturation and Efficiency**
  - Source: Energy Information Administration and Vectren

- **System Hourly Load**
  - Source: Vectren

- **Customer Energy Forecast**

- **System Energy and Peak Forecast**

- **Long-term, 30-Year Average Weather**
  - Source: DTN¹

- **Customer Owned Generation Forecast**
  - Source: Itron

- **10-Year Avg. Peak-Day Weather**
  - Source: DTN¹

¹ Formerly Data Transmission Network, now known as DTN
Residential Forecast Model

AC Saturation
  Central AC
  Room AC
AC Efficiency
Home Insulation
Home Size (Sq. Ft.)
Income
Household Size
Price

Heating Saturation
  Traditional Resistance Furnace
  Heat Pump
Heating Efficiency
Home Insulation
Home Size (Sq. Ft.)
Income
Household Size
Price

Saturation Levels
  Water Heat
  Appliances
  Lighting
  Plug Loads
  Appliance Efficiency
  Income
  Household Size
  Price

Cooling
Degree Days

Heating
Degree Days

Billing
Days

Other Use
Commercial Forecast Model

- Cooling Intensity (kWh/sqft)
- Commercial Output
- Commercial Employment
- Population
- Energy Price

- Heating Intensity (kWh/sqft)
- Commercial Output
- Commercial Employment
- Population
- Energy Price

- Other Equipment Intensity (kWh/sqft)
  - Lighting
  - Office equipment
  - Ventilation
  - ...
- Commercial Output
- Commercial Employment
- Population
- Energy Price

- Cooling Degree Days
- Heating Degree Days
- Billing Days
- Other Use

- Cooling
- Heating
- Other Use

32
Industrial Forecast

- The industrial (large customer) forecast is a two step approach
  - The first 5 years is based on Vectren’s internal forecast
  - The long term growth rate is developed using the econometric model framework
Peak Demand Forecast

- Peak demand is driven by heating, cooling, and base load requirements derived from the customer class forecasts.

- Cooling Load Requirements
  - Residential
  - General Service
  - Large Customer

- Heating Load Requirements
  - Residential
  - General Service

- Base Load Requirements
  - Residential
  - General Service
  - Large Customer
  - Street Lighting

- Peak-Day Temperature
- Peak-Day Temperature
- Peak Day Cooling
- Peak Day Heating
- Peak Day Base Load

---

Diagrams showing the relationship between peak-day temperature and peak day cooling, heating, and base load.
Energy and Demand Forecast\(^1\)
Includes customer-owned generation forecast

Energy 2016-2036 CAGR: $-0.1\%$
Peak Demand 2016-2036 CAGR: $0.1\%$

Energy 2017-2036 CAGR: $0.5\%$
Peak Demand 2017-2036 CAGR: $0.5\%$

Forecast adjusted for expected large customer load additions and losses

\(^1\) Future energy efficiency programs are not included in the sales and demand forecast and will be considered a resource option

CAGR = Compound Annual Growth Rate
MWh = Mega Watt Hour
MW = Mega Watt
Questions?
Customer-Owned Distributed Generation Forecast

Presented by Michael Russo, Forecast Analyst, Itron Inc.
2016 Vectren IRP Stakeholder Meeting
April 7, 2016
Solar System Cost Assumption

- Cost projections based on the Department of Energy’s Sun Shot solar goals
Residential System Payback

- Vectren specific residential solar system payback; incorporates declining solar cost projections, federal tax incentives, and Vectren electric rates
Residential Solar Saturation Model

- Solar saturation is modeled as a function of system payback; incorporates declining solar costs, federal incentives, and Vectren electric rates
Residential Solar Customer Forecast

Residential Saturation Forecast

Residential Customer Forecast

Residential Solar Customer Forecast
Commercial Solar Customer Forecast

- Limited adoption of commercial systems
  - Physical and ownership constraints
- Relationship between commercial and residential adoption maintained through the forecast period
Total Solar Capacity

- Capacity forecast is the product of the solar customer forecast and a system size of 7.8 kW for residential systems and 17 kW for commercial system (based on Vectren average)

MW = Mega Watt
kW = Kilo Watt
Solar Generation Forecast (MWh)

Solar Shape

Capacity Forecast

Generation Forecast

1 Source: Evansville solar shape from National Renewable Energy Laboratory (NREL), a laboratory of the U.S. Department of Energy

MWh = Mega Watt Hour
MW = Mega Watt
kW = Kilo Watt
Impact on Summer Peak Demand

- Demand impacts based on a 0.32 peak demand impact factor – derived by combining the solar generation hourly load forecast with Vectren’s system hourly load forecast.

1 MW of PV capacity reduces peak demand by 320 kW
51.1 MW of Capacity by 2036 translates into 16.2 MW peak demand impact
Questions?
2016 IRP
Technology Assessment
Generation Resource Alternatives

Presented by Mike Borgstadt, Project Manager – Burns and McDonnell
2016 Vectren IRP Stakeholder Meeting
April 7, 2016
Overview

- Burns & McDonnell produced a Generation Technology Assessment that looks at a wide range of generation resources to place into the Strategist model.
- The model will create 10 and 20 year forecasts for the generation portfolios.
- The Strategist model will consider what to deploy and when to meet customer energy requirements based on customer costs.
  - Capital Costs
  - Fuel Costs
  - Operations & Maintenance Costs
  - Environmental Compliance Costs
Generation Technology Assessment

Burns & McDonnell’s Generation Technology Assessment Report includes the following types of resources:

**Generation Resource Options (33):**
- Simple Cycle Gas Turbine Technology (4)
- Combined Cycles Gas Turbine Technology (5)
- Combined Heat and Power Turbine Technology (sited at customer facility) (4)
- Coal (2) – (Pulverized coal with carbon capture 500MW & 750MW)
- Integrated Gasification Combined Cycle (1)
- Wind (4)
- Solar Photovoltaic (5)
- Hydro (1)
- Wood (1)
- Landfill Gas (1)
- Battery (4)
- Compressed Air (1)

MW = Mega Watt
**Generation Technology Assessment**

Examples of candidates for gas fired generation:

<table>
<thead>
<tr>
<th>Gas Simple Cycle (Peaking Units)</th>
<th>Example 1</th>
<th>Example 2</th>
<th>Example 3</th>
<th>Example 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Combustion Turbine Type</td>
<td>LM6000</td>
<td>LMS100</td>
<td>E-Class</td>
<td>F-Class</td>
</tr>
<tr>
<td>Size (MW)</td>
<td>43.4 MW</td>
<td>99.5 MW</td>
<td>90.1 MW</td>
<td>219.8 MW</td>
</tr>
<tr>
<td>Fuel Efficiency (At Full Load)</td>
<td>37.0%</td>
<td>38.6%</td>
<td>30.2%</td>
<td>35.0%</td>
</tr>
<tr>
<td>Total Project Costs (2015 $/kW)</td>
<td>$1,880</td>
<td>$1,485</td>
<td>$1,230</td>
<td>$650</td>
</tr>
</tbody>
</table>

Examples of candidates for combined cycle generation:

<table>
<thead>
<tr>
<th>Gas Combined Cycle (Base / Intermediate Load Units)</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Combustion Turbine Type</td>
<td>1x1 F-Class¹</td>
</tr>
<tr>
<td>Size (MW)</td>
<td>317.5 MW</td>
</tr>
<tr>
<td>Fuel Efficiency (At Full Load)</td>
<td>51.6%</td>
</tr>
<tr>
<td>Total Project Costs (2015 $/kW)</td>
<td>$1,190</td>
</tr>
</tbody>
</table>

¹ 1x1 Combined Cycle Plant is one combustion turbine with heat recovery steam generator and one steam turbine utilizing the unused exhaust heat from the combustion turbine.

kW = Kilowatt  
MW = Mega Watt
Generation Technology Assessment

Example of a candidate for combined heat and power gas generation:

<table>
<thead>
<tr>
<th>Gas Combined Heat and Power¹</th>
<th>10 MW Combustion Turbine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net Plant Electrical Output (MW)</td>
<td>10.3 MW</td>
</tr>
<tr>
<td>Fired Plant Steam Output (pph)</td>
<td>117,500</td>
</tr>
<tr>
<td>Turbine Cycle Efficiency</td>
<td>27.9%</td>
</tr>
<tr>
<td>Overall Plant Efficiency</td>
<td>68.8%</td>
</tr>
<tr>
<td>Total Project Costs (2015 $/kW)</td>
<td>$3,874</td>
</tr>
</tbody>
</table>

¹ Utility owned and sited at a customer facility

MW = Mega Watt
pph = Pounds per hour
KW = Kilo Watt
Generation Technology Assessment

Examples of candidates for renewable energy and energy storage:

<table>
<thead>
<tr>
<th>Renewable Generation &amp; Storage Technologies</th>
<th>Solar Photovoltaic Cells</th>
<th>Indiana Wind Energy</th>
<th>Lithium Ion Battery Storage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base Load Net Output (kW)</td>
<td>Base Load Net Output (kW)</td>
<td>9 MW (Scalable Option)</td>
<td>50 MW (Scalable Option)</td>
</tr>
<tr>
<td>Capacity Factor (Energy output (MWh) 24/7 – 365)</td>
<td>Intermittent 19%</td>
<td>Intermittent 33%</td>
<td>Varies based on market application</td>
</tr>
<tr>
<td>Total Project Costs (2015 $/KW)¹</td>
<td>$2,490</td>
<td>$1,940</td>
<td>$3,050</td>
</tr>
<tr>
<td>Peak Planning Capacity (MW credit towards planning reserve margin)</td>
<td>38%</td>
<td>10%</td>
<td>100%</td>
</tr>
</tbody>
</table>

- Solar & battery storage are forecasted at decreasing costs (on a real dollars basis) to be built in the future

¹Total Project Costs (2015 $/kW) may change based on economies of scale. The Technology Assessment contains unique costs for the different scales of the projects.

MWh = Mega Watt Hour
MW = Mega Watt
kW = Kilo Watt
Questions?
2016 IRP
Technology Assessment
Supplemental Studies
Generation Retrofit Alternatives

Presented by Scott Brown, Manager of Generation Planning
2016 Vectren IRP Stakeholder Meeting
April 7, 2016
Retrofit Studies Overview

- As previously stated the Burns & McDonnell Technology Assessment looks at a wide range of generation resources that could be built

- Vectren additionally has studied several retrofit projects that could utilize existing generation assets in new ways…
Retrofit Studies Overview

- Retrofits were studied considering various factors:
  - Feasibility (Will it physically fit in the space)
  - Estimated cost to build / retrofit
  - Expected performance
    - MWs of capacity
    - Efficiency
    - CO$_2$ emissions
    - NO$_x$ emissions
    - SO$_2$ emissions
    - Mercury
  - Expected costs to operate and maintain
  - Costs and feasibility to deliver the needed fuel

MW = Mega Watt  
CO$_2$ = Carbon Dioxide  
SO$_2$ = Sulfur Dioxide  
No$_x$ = Nitrogen Oxide
Potential retrofit projects that were studied:

- Conversion of the existing AB Brown gas turbine peaking units into a combined cycle unit
  - Achieve higher efficiency gas generation
  - Adds a small increment of generating capacity

- Co-firing up to 33% natural gas on the AB Brown Coal and FB Culley Coal Units
  - Reduces CO₂ and other emissions
  - Minimizes gas infrastructure build costs

- Conversion of the existing coal boilers at AB Brown and FB Culley to burn 100% natural gas
  - Eliminates issues associated with burning coal
  - Does not compete well with other 100% gas generation from an operational perspective

CO₂ = Carbon Dioxide
Retrofit Studies Overview

Potential retrofit projects that were studied:

- “Re-Powering¹” existing coal units into gas fired combined cycle units
  - Reduces build costs compared to building a new Combined Cycle Unit
  - Retains many systems from the former coal unit
    - Steam Turbine and Condenser
    - Electric Generator, Step-up Transformer and Switchyard connections
    - Circulating Water System and Cooling Towers

¹ Repowering consists of reusing the existing steam turbine, electric generator, circulating water system, step-up transformer and switchyard connections from an existing coal unit. The boiler is replaced by using the waste heat from gas turbines via heat recovery steam generators. The gas turbines also drive electric generators.
Questions?
Energy Efficiency Modeling Discussion

Presented by Shawn Kelly, Director of Energy Efficiency
2016 Vectren IRP Stakeholder Meeting
April 7, 2016
Brief Overview of Vectren Energy Efficiency and Demand Response

- Energy Efficiency is using less energy without impacting level of service
- Vectren’s culture has and will continue to fully embrace Energy Efficiency
- Energy Efficiency Programs since 2010 have saved nearly 700 million kWh
  - Enough to power nearly 60,000 homes for one year
- 2015 programs achieved almost 41 million kWh of annual savings
- Vectren offers a variety of residential and business programs¹
- Successful collaborative oversight board approach with the CAC and OUCC
- Approved 2016 and 2017 plan
  - 74 million kWh of energy savings (16.1 MW of demand savings)
  - Over 1% of eligible sales (non-industrial opt out sales)
- Demand Response
  - 19.3 MW in 2016 from approximately 34,000 Summer Cycler switches
  - 56 MW in 2016 in interruptible contracts

¹ Joint with gas energy efficiency programs where possible to be more cost effective

kWh = Kilowatt hour
CAC = Citizens Action Coalition
OUCC = Office of Utility Consumer Counselor
MW = Mega Watt
Major Energy Efficiency Modeling Assumptions

- Energy Efficiency savings amounts in 2016-2017 will be based on Energy Efficiency plan approved in Cause No. 44645. Included as an existing resource in our dispatch portfolio model.

- No minimum level of Energy Efficiency embedded into our sales and demand forecast (IRP will select amount of EE).

- The forecast has not been adjusted for Energy Efficiency already captured in the history (we will monitor going forward).

- Energy Efficiency blocks will include both residential and commercial savings, which allows flexibility in future years to determine the proper mix.

- Levelized Energy Efficiency costs over the measure life.
Major Energy Efficiency Modeling Assumptions Cont.

- The model will select up to 8 blocks at 0.25% of eligible sales for a total of 2% of eligible sales\(^1\) annually

- If the model selects peaks and valleys of Energy Efficiency, we will re-evaluate as year-to-year inconsistencies in programs is undesirable

- 80% net to gross ratio, which is consistent with our most recent evaluation

- Current plan costs used as the base cost for block pricing
  - Escalated in real dollars based on penetration model. The prices increase from block 1 up to block 8 and increases over time

- 50% load factor to convert energy to demand, consistent with the current plan

\(^1\) 2% is slightly higher than Vectren’s most recent market potential study at the high achievable level
Questions?
Stakeholder Questions, Feedback, and Comments

Gary Vicinus – Meeting Facilitator
Vice President and Managing Director, Pace Global
April 7, 2016
Vectren’s Next Steps

- Additional questions and suggestions may be sent to IRP@vectren.com for a period of two weeks after this meeting

- At the next stakeholder meeting in July, Vectren will discuss and get stakeholder input on:
  - its inputs for the 5-7 scenarios;
  - the results of our initial Strategist runs;
  - the resulting construction of the portfolios;
  - the risk assessment assumptions; and
  - gather input to build a stakeholder portfolio

- At the third and final stakeholder meeting in late fall, Vectren will discuss and get comments on:
  - the results of the risk analysis, and
  - the preferred portfolio