Integrated Resource Plan
Electric System
Pre-Council December 16, 2013
Integrated Resource Plan
Electric System

• Integrated Resource Planning (IRP)
• Electric Integrated Resource Plan
• Staff Recommendations and Implementation Plan
• Projected Costs and Timing
What is an Integrated Resource Plan (IRP)?

1. Demand Forecast
2. Review of Supply Resources
3. Plan for Future Supply to Meet Future Needs
4. Integration of Projected Future Supply Cost into Demand Side Management Options
2008 Electric Integrated Resource Plan

Summary Recommendations

• Develop Additional DSM Programs
• Endorse Improved Building Codes
• Measure Effects of DSM Program
• Move Towards Time of Use and Demand Pricing Structures
• Investigate the Development of Reciprocating Engine Generation
• Pursue Financially Feasible Biomass Development
• Acquire Additional Sources of Wind Generation
• Pursue Transmission Projects to improve Import Capability
• Update the IRP in the 2013 Time Frame
Develop Additional DSM Programs

- Home Performance with Energy Star
- Enhanced Home Performance with Energy Star
- Commercial Lighting Rebate
- Commercial Heat Pump/Air Conditioner Rebate
- Revised Loan Requirements to Address Energy Efficiency Goals
- Addition of Solar Rebate Programs

Endorsed Improved Building Codes

- Water & Light Advisory Board Letter to Codes Commission
2008 Electric Integrated Resource Plan

Measure Effects of DSM Programs

### Residential

<table>
<thead>
<tr>
<th>Program</th>
<th>Cost</th>
<th>Benefit</th>
<th>Continue</th>
</tr>
</thead>
<tbody>
<tr>
<td>HomePerformance w/EnergyStar</td>
<td>$748,842</td>
<td>$858,345</td>
<td>Yes</td>
</tr>
<tr>
<td>AirConditioner/HeatPump Rebates</td>
<td>$206,730</td>
<td>$515,150</td>
<td>Yes</td>
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<tr>
<td>Online Energy Audit</td>
<td>$8,260</td>
<td>$266,957</td>
<td>Yes</td>
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<tr>
<td>Energy Audits</td>
<td>$0</td>
<td>$208,424</td>
<td>Yes</td>
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<tr>
<td>Tree Power</td>
<td>$15,240</td>
<td>$69,333</td>
<td>Yes</td>
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<tr>
<td>AirConditioner Exchange Program</td>
<td>$22,950</td>
<td>$79,858</td>
<td>Yes</td>
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</table>

### Commercial

<table>
<thead>
<tr>
<th>Program</th>
<th>Cost</th>
<th>Benefit</th>
<th>Continue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial Lighting Incentive</td>
<td>$312,397</td>
<td>$2,486,992</td>
<td>Yes</td>
</tr>
<tr>
<td>Commercial HVAC</td>
<td>$282,350</td>
<td>$71,867</td>
<td>No</td>
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</table>
Pursue Financially Feasible Biomass Development
  - Currently using Wood, Conducted Miscanthus Test Burn and Purchased Engineered Biomass Test Burn Fuel

Acquire Additional Sources of Wind Generation
  - Additions of Crystal Lake 20 MW Wind Contract
  - Issued RFP for Additional Renewable Energy Sources

Pursue Transmission Projects to Improve Import Capability
  - South Transmission Line Project

Update the IRP in the 2013 Time Frame
Integrated Resource Plan

Significant Changes Since 2008

Demand Projections

- Economic Downturn
- Demand Side Management (DSM) Performance

Supply Resources

- Cost/Forecast of Natural Gas
- Base Load Generation Changes
- Peaking Generation Changes

Market Conditions

- Energy Cost $/MWh, Capacity Cost $/MW
## Demand & Energy Forecast

<table>
<thead>
<tr>
<th>YEAR</th>
<th>Coincident Peak Demand (MW)</th>
<th>Total Energy (GWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2008 STUDY</td>
<td>2013 UPDATE</td>
</tr>
<tr>
<td>2008</td>
<td>278</td>
<td>257*</td>
</tr>
<tr>
<td>2009</td>
<td>284</td>
<td>250*</td>
</tr>
<tr>
<td>2010</td>
<td>289</td>
<td>265*</td>
</tr>
<tr>
<td>2011</td>
<td>295</td>
<td>277*</td>
</tr>
<tr>
<td>2012</td>
<td>300</td>
<td>272*</td>
</tr>
<tr>
<td>2013</td>
<td>306</td>
<td>285</td>
</tr>
<tr>
<td>2014</td>
<td>311</td>
<td>289</td>
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<tr>
<td>2015</td>
<td>317</td>
<td>294</td>
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<tr>
<td>2016</td>
<td>322</td>
<td>300</td>
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<tr>
<td>2017</td>
<td>328</td>
<td>306</td>
</tr>
<tr>
<td>2018</td>
<td>333</td>
<td>312</td>
</tr>
<tr>
<td>2019</td>
<td>339</td>
<td>318</td>
</tr>
<tr>
<td>2020</td>
<td>344</td>
<td>325</td>
</tr>
<tr>
<td>2021</td>
<td>350</td>
<td>332</td>
</tr>
<tr>
<td>2022</td>
<td>357</td>
<td>338</td>
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<tr>
<td>2023</td>
<td>364</td>
<td>345</td>
</tr>
<tr>
<td>2024</td>
<td>371</td>
<td>353</td>
</tr>
<tr>
<td>2025</td>
<td>378</td>
<td>360</td>
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<tr>
<td>2026</td>
<td>385</td>
<td>366</td>
</tr>
<tr>
<td>2027</td>
<td>392</td>
<td>373</td>
</tr>
<tr>
<td>2028</td>
<td>399</td>
<td>381</td>
</tr>
<tr>
<td><strong>Average Increase</strong></td>
<td><strong>1.8%</strong></td>
<td><strong>2.0%</strong></td>
</tr>
</tbody>
</table>

*actual numbers
Projected Demand Forecast Reduction by DSM Program

Demand Forecast

Year


MWs

250 260 270 280 290 300 310 320 330 340 350

Demand Forecast
Demand Forecast less Potential DSM Savings
Projected Energy Forecast Reduction by DSM Program

Energy Forecast

Year

MWhs


Energy Forecast

Energy Forecast less Potential DSM Savings

Projected Energy Forecast Reduction by DSM Program
## Columbia Generation Resources

<table>
<thead>
<tr>
<th>UNIT</th>
<th>DESCRIPTION</th>
<th>CAPACITY</th>
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</thead>
<tbody>
<tr>
<td>Bluegrass Ridge</td>
<td>Wind</td>
<td>6.3</td>
</tr>
<tr>
<td>Crystal Lake</td>
<td>Wind</td>
<td>10.5</td>
</tr>
<tr>
<td>Columbia &amp; Ameresco</td>
<td>Landfill Gas</td>
<td>5.0</td>
</tr>
<tr>
<td>Distributed Generators</td>
<td>Diesel</td>
<td>12.5</td>
</tr>
<tr>
<td>Columbia Energy Center</td>
<td>Combustion Turbine</td>
<td>144.0</td>
</tr>
<tr>
<td>CWL Turbine 5</td>
<td>Coal-fired Steam</td>
<td>16.5</td>
</tr>
<tr>
<td>CWL Turbine 6</td>
<td>Combustion Turbine</td>
<td>12.5</td>
</tr>
<tr>
<td>CWL Turbine 7</td>
<td>Coal-fired Steam</td>
<td>22.0</td>
</tr>
<tr>
<td>CWL Turbine 8</td>
<td>Gas-fired Steam</td>
<td>35.0</td>
</tr>
<tr>
<td>Iatan II</td>
<td>Coal-fired Steam</td>
<td>20.0</td>
</tr>
<tr>
<td>Nearman Creek</td>
<td>Coal-fired Steam</td>
<td>20.0</td>
</tr>
<tr>
<td>Prairie State</td>
<td>Coal-fired Steam</td>
<td>50.0</td>
</tr>
<tr>
<td>Sikeston</td>
<td>Coal-fired Steam</td>
<td>66.0</td>
</tr>
</tbody>
</table>

**TOTAL Nameplate MW** 420.3

**TOTAL MW w/ wind credit adjustment** 408.2
Current CWL Balance of Loads & Resources: 2011-2027

Capacity Surplus/(Deficit)


MW

Columbia Energy Center (CEC)
CWLD.PlantD5
Iatan 2 [4]
Ameresco (Jefferson City Landfill)
Nearman Creek
CWLD.PlantD7
CWLD.PlantD8
Prairie State 1&2
Sikeston
Diesel Engine
System Peak
System Peak + 14% Reserves

Columbia Landfill Gas
Integrated Resource Plan
2013 Update: Summary

• Continue Existing DSM programs
• Improve Building Codes
• Addition of DSM Programs Beyond 2008 IRP Not Recommended
• Supply Side Expansion Limited to Natural Gas and Renewable Sources
• Analyze Expansion of CEC to Combined Cycle
• Review Rate Structure to Address Net Metered Generation Sources
Performance of Demand Side Management

- Total Resource Cost (TRC)
  - Utility Benefit/Cost Ratio Greater Than or Equal to One
- Market Influence on TRC
  - Capacity
  - Energy
- Avoiding the Whipsaw Effect
Staff Recommendations & Implementation Plan

- Purpose
- Demand Side
- Supply Side
- Integration Issues
Customer Outreach Program: $150,000
• Use a Customer Outreach Program to Populate an Appliance Load Model of our Existing Community Energy Loads

Distribution System Model: $150,000
• Design Future Improvements & Expansions

New energy efficiency programs: $150,000/yr
• Based on Findings of Research Noted Above
• Additional Outreach/Education/Marketing plan

Energy Efficiency Tracking Software: $95,000 + $32,000/yr
Integrated Resource Plan Implementation: Demand Side

- Efficiency Score Marketing & Outreach: $20,000
- Score on Real Estate Listings (MLS)
- List on City GIS System
- Fully Integrate with Rental & Low-income Sectors
- Use Scores on MidMoHousing.com
Develop Efficiency Incentives to Support New Construction: $100,000

- Residential
- Multi-family
- Commercial
- Industrial
New financing programs

- Home Energy Affordability Loan (HEAL): $100,000
- RFP for Property Assessed Clean Energy (PACE) for Boone County: $80,000
- Pay As You Save (PAYS): $100,000
- Photovoltaic Loans: $250,000
Integrated Resource Plan
Implementation: Demand Side

Load Modifying Resources

• Revise Load Management

• Equipment for Regional Demand Response Programs: $160,000

• Market Potential for Demand Response Programs: $30,000
Electric Supply

- Develop West Ash Community Solar site: $500,000
- Water & Light Solar Projects: $200,000
- Biomass Test Burn: $375,000
- Biomass Combined Heat & Power Study: $20,000
Municipal Power Plant

- Recommendations for Solid Fuel Units
- Continue Using Gas Turbine #6
- Upgrades to Turbine #8: $2,500,000
- Air & Water Compliance Strategies
- Financial Model of Plant’s Operating Upgrade & System Costs
- Additional Landfill Gas Generator: $1,600,000
- Feasibility Study for Reciprocating Natural Engines at Power Plant: $60,000