The Clean Economy and Sustainable Economic Growth for the South

Georgia Tech Clean Energy Seminar Series
January 25, 2012

Marilyn Brown
In collaboration with Paul Baer, Ben Deitchman, and Gyungwon Kim
Presentation overview

• An overview of the “green jobs” debate and study methods
• Review of previous Georgia Tech work on employment (demonstration of I/O methods)
  – Energy Efficiency in the South
  – Renewable Energy in the South
• Current research:
  Combined Heat and Power
Methodology for Job impact Analysis: Hybrid NEMS-Input/Output Model

• Goal: Examine expected employment impacts from clean energy investments

• Clean energy policies and investments are first modeled in Georgia Tech’s National Energy Modeling System (GT-NEMS)

• NEMS outputs (capacity changes, supply changes, energy bill changes) then drive input-output multipliers to estimate employment
Input/Output Coefficients for Energy Efficiency

Input/Output Coefficients for Renewable Energy

- Jobs Coefficients
- GSP Coefficients

<table>
<thead>
<tr>
<th>Category</th>
<th>Jobs Coefficients (Value-added/$)</th>
<th>GSP Coefficients ($/MM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction and RE Equipment</td>
<td>16.97</td>
<td>$1.00</td>
</tr>
<tr>
<td>Electricity</td>
<td>5.63</td>
<td>$1.08</td>
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<tr>
<td>Natural Gas</td>
<td>8.43</td>
<td>$0.98</td>
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<tr>
<td>All Others</td>
<td>13.86</td>
<td>$1.10</td>
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</tbody>
</table>
# Methodology -- Scenario Analysis

## Energy Efficiency (EE) Scenario

<table>
<thead>
<tr>
<th>A Portfolio of Energy Efficiency Policies</th>
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<tbody>
<tr>
<td><strong>Residential Buildings</strong></td>
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<tr>
<td>• Appliance Incentives and Standards</td>
</tr>
<tr>
<td>• Residential Retrofit and Equipment Standards</td>
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<tr>
<td>• Expanded Weatherization Assistance Program</td>
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<td>• Building Codes with Third Party Verification</td>
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<tr>
<td><strong>Commercial Buildings</strong></td>
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<tr>
<td>• Aggressive Commercial Appliance Standards</td>
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<tr>
<td>• Commercial Retrofit Incentives</td>
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<tr>
<td><strong>Industry</strong></td>
</tr>
<tr>
<td>• Industrial Process Improvement:</td>
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<tr>
<td>• Assessments of Plant Utility Upgrades</td>
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<tr>
<td>• Combined Heat and Power Incentives</td>
</tr>
</tbody>
</table>
Methodology -- Scenario Analysis
Renewable Energy (RE) Scenario

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<tbody>
<tr>
<td>Resource Updates</td>
<td><img src="image1.png" alt="Wind" /></td>
<td><img src="image2.png" alt="Biopower" /></td>
<td><img src="image3.png" alt="Municipal Waste" /></td>
<td><img src="image4.png" alt="Hydro" /></td>
<td><img src="image5.png" alt="Solar PV - Com &amp; Res" /></td>
<td><img src="image6.png" alt="Solar PV - Utility" /></td>
<td><img src="image7.png" alt="Solar Water Heating" /></td>
<td><img src="image8.png" alt="Heat Pump Water Heating" /></td>
<td><img src="image9.png" alt="Combined Heat and Power" /></td>
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<tr>
<td>Tax Credit Extended</td>
<td><img src="image1.png" alt="Wind" /></td>
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<td><img src="image3.png" alt="Municipal Waste" /></td>
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<tr>
<td>Technology Improved</td>
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<td>Revised Costs</td>
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Results: Increased Employment from EE and RE Investments

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<tr>
<th>Study</th>
<th>Additional Jobs in 2020</th>
<th>Additional Jobs in 2030</th>
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<tbody>
<tr>
<td>Energy Efficiency in the South*</td>
<td>380,000</td>
<td>520,000</td>
</tr>
<tr>
<td>Renewable Energy in the South**</td>
<td>46,300</td>
<td>152,900</td>
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Results: Details on Renewable Resources

- Net Number of Job Creation

- Construction and RE Equipment
- Conventional Electricity
- Natural Gas
- All others

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<td>2030</td>
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Number of Jobs

- Results:
Current Research: Industrial Combined Heat and Power

- **Regulatory barriers**
  - Input-based emissions standards, the Sarbanes-Oxley Act of 2002, utility monopoly power, and grid access difficulties

- **Financial barriers**
  - Access to credit and project competition within firm
  - Purchase power agreements

- **Information and workforce barriers**
  - Workforce engineering know-how

How would more widespread use of CHP impact employment?
Categories of “Accounts”

1. CHP Installation
   - Program and administration costs
   - Public financial incentives to stimulate overall productive investment
   - Productive investment from private sectors

2. Operation and Management: Non-fuel

3. Operation and Management: Fuel
   - Change in natural gas demand
   - Change in coal and petroleum demand

4. Changes in Electricity demand and supply
   - Change in industrial electricity demand purchased from utility
   - Sales to the grid

5. Change in energy bill in residential and commercial sectors
First-Order Impacts

Total Industrial CHP Capacity

- 2010 CHP Assumption
- 2011 High Efficiency/Lower Costs

Industrial Natural Gas Consumption

- 2010 CHP Assumption
- 2011 High Efficiency/Lower Costs

Industrial Purchased Electricity Consumption

- 2010 CHP Assumption
- 2011 High Efficiency/Lower Costs

Industrial Sales to the Grid

- 2010 CHP Assumption
- 2011 High Efficiency/Lower Costs
Second-Order Impacts

Residential Natural Gas Prices

Commercial Electricity Prices

Commercial Electricity Consumption

Commercial Electricity Bills

- $2.4 billion
Estimated Green Jobs Impact

- Construction and CHP Equipment
- Operation & Maintenance -Non Fuel
- Electricity purchases
- Natural Gas
- Coal & Petroleum
- Other- Program expenses
- Other- Energy Bill Savings, Res and Com
- Other - reduced Industry costs/increased profits
CONCLUSIONS

• The energy-efficiency gap in the U.S. sector is large
• If key barriers could be removed, energy consumers could invest in efficiency, enabling job growth
• Leaner industry has double dividends for jobs—maintaining domestic manufacturing and generating green jobs.
Contact Information

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