Maximizing Trade-Offs Among Social, Environmental, and Economic Benefits

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CO₂ Emissions Track Urban Development

CO₂ emission (1751–2006)
Source: ORNL Climate Change Science Institute
National carbon footprints illustrate the need for alternative development pathways.

Why the Concern With Local Initiatives? What’s New Here?

• Most of the activity driving energy consumption occurs in metro areas

• Successful energy management must create city-level behavioral changes

• Comprehensive inter-jurisdictional comparisons have not been possible from prior efforts
Cities offer the potential for improving energy and carbon efficiency

Percentage of national activity in 100 largest metro areas, 2005

- National total
- GDP: 76%
- Population: 65%
- Carbon emissions: 56%
- Land area: 12%

The Mississippi River roughly divides the country into high and low CO$_2$-emitting metropolitan areas (2005).

Fuel mix and electricity prices are important determinants of CO\textsubscript{2} emissions

• The fuel mix used to generate electricity matters in residential footprints

• Lower electricity prices are correlated with larger residential footprints

• Areas with lower residential building carbon footprints tend to be located in mild climates with low heating and cooling requirements

Electricity Use is Growing in Dominance in Commercial Buildings

Extension of Analysis to 2010 Led by Matt Cox (Georgia Tech)

- The reliance on electricity is increasing relative to the direct use of natural gas in commercial buildings.

- While CO₂ emissions per $ GDP are declining on average, the importance of managing electricity consumption as a means to manage CO₂ emissions is increasing.

Figure A.3 Energy and Carbon Intensity in Commercial Buildings, 2000-2010
Commercial energy intensity (measured in energy consumption per GDP), by building type and overall, allow for similar comparisons as in the residential sector (measure in energy consumption per capita).

Total energy intensities range from 0.4 kBtu/\$-2005 (Bridgeport CT, 2010) to 6.1 kBtu/\$-2005 (Durham NC, 2000).

Commercial Buildings Energy Intensity of Metro Areas is Variable: 2000-2010

Most Improved MSAs

Least Improved MSAs
Policies are Needed to Deliver Energy & Carbon Efficiency

U.S. Supply Curve for Electricity Efficiency Resources

Alternative Notions of the Energy-Efficiency Gap

The market failure and public interest rationales for public policy intervention

You Can’t Manage what you Can’t Measure

Smart meters with fiber optics:
- Can interface with in-home or in-office displays of online consumption data
- Enables dynamic pricing

Commercial building benchmarking:
- Mandated disclosure and benchmarking efforts in the US can reduce discount rates anywhere from 3 to 22 percent
- While Europe has used mandated disclosure and benchmarking programs for many years
- Mandated disclosure programs require utilities to submit energy data on all tenants in a standard format to a widely used database, EPA’s Portfolio Manager.
Cost-Effectiveness of Benchmarking

- Benchmarking could produce significant energy and emissions benefits to the nation, the vast majority of which would occur in urban areas.
- Smart combinations of benchmarking with other policies could yield positive synergistic effects.
- Spillovers could also be large, as the policy would enable other actions.

**Table 2. Benefit–cost analysis of commercial sector benchmarking** (billion 2009–$).

<table>
<thead>
<tr>
<th>Year</th>
<th>Energy expenditure savings</th>
<th>Value of avoided CO$_2$</th>
<th>Value of avoided criteria pollutants</th>
<th>Lower equipment outlays</th>
<th>Total benefits</th>
<th>Compliance costs</th>
<th>Total costs</th>
<th>Net social benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>2020</td>
<td>6.3–2.8</td>
<td>-0.4–0.1</td>
<td>1.4–3.4</td>
<td>6.4–5.4</td>
<td>13.7–11.7</td>
<td>0.1</td>
<td>0.1</td>
<td>61.4–63.7</td>
</tr>
<tr>
<td>2035</td>
<td>28.3–22.0</td>
<td>0.6–1.6</td>
<td>3.1–7.3</td>
<td>18.0–21.7</td>
<td>50.0–52.6</td>
<td>0.1</td>
<td>0.1</td>
<td>61.4–63.7</td>
</tr>
<tr>
<td>Total</td>
<td>39.7–31.7</td>
<td>0.9–2.3</td>
<td>3.0–8.2</td>
<td>18.0–21.7</td>
<td>61.5–63.8</td>
<td>0.1</td>
<td>0.1</td>
<td></td>
</tr>
</tbody>
</table>

Grounds for Optimism

• Carbon emissions are just beginning to be priced – “market signals” will spur innovation.
• Most of the 2050 physical plant is not yet built – with growth comes opportunity.
• States and localities are moving ahead.
• And grass roots action is available to all.