Comparability of Effort in International Climate Policy Architecture
Motivations for comparability

• Normative / ethical approaches for burden-sharing
• Compliance metrics
• Facilitative—supporting cooperation and future ambition
  – How might parties measure the effort of others?
  – “individuals tends to react to the positive actions of others with positive responses and the negative actions of others with negative responses” Ostrom (1998).

**does not need to be one measure or agreement**
Principles for metrics

• **Comprehensive**: captures the notion of “effort” in the widest possible sense. Similar countries ought to exhibit similar values in a “fair” agreement.

• **Measurable and replicable**: directly observable or based on transparent analysis.

• **Universal**: can be applied to efforts by a broad set of countries.
Families of effort metrics: Emissions (and other physical measures)

• Potential measures
  – Relative to base year or forecast level
  – Relative to population or economic activity, absolute or change over time
Emissions growth since 1990 (%)
Emissions growth since 2005 (%)
CO₂/GDP growth since 1990 (%)
Families of effort metrics:
Emissions (and other physical measures)

• Potential metrics
  – Relative to base year or forecast level
  – Relative to population or economic activity, absolute or change over time

• Pros/Cons
  – Reflects environmental outcome (+)
  – Generally measurable (+)
  – Choice of base year / index will re-rank (+/-)
  – Relative to forecast may be best notion of “effort” but less measurable (-)
Families of effort metrics: Prices

• Potential metrics
  – Carbon dioxide or energy
  – Taxes / carbon price or net price of energy
  – Absolute levels or change over time
## Energy Prices and Energy Taxes
(2010, change since 1997, for select OECD Countries)

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>United States</td>
<td>24.1</td>
<td>+72%</td>
<td>1.0</td>
<td>-2%</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>61.5</td>
<td>+29%</td>
<td>6.4</td>
<td>-30%</td>
</tr>
<tr>
<td>France</td>
<td>58.4</td>
<td>+28%</td>
<td>5.9</td>
<td>-34%</td>
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<tr>
<td>Germany</td>
<td>59.7</td>
<td>+51%</td>
<td>9.2</td>
<td>+29%</td>
</tr>
<tr>
<td>Japan</td>
<td>47.5</td>
<td>+34%</td>
<td>1.9</td>
<td>+12%</td>
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<tr>
<td>Canada</td>
<td>33.6</td>
<td>+77%</td>
<td>2.7</td>
<td>+86%</td>
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<tr>
<td>Australia</td>
<td>37.8</td>
<td>+67%</td>
<td>2.4</td>
<td>+9%</td>
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<tr>
<td>Mexico</td>
<td>24.0</td>
<td>+33%</td>
<td>0.6</td>
<td>-56%</td>
</tr>
</tbody>
</table>
Families of effort metrics: Prices

• Potential metrics
  – Carbon dioxide or energy
  – Taxes / carbon price or net price of energy
  – Absolute levels or change over time

• Pros/Cons
  – Carbon price reflects marginal effort (+)
  – Market prices are observable (+)
  – Reflect long-term investment incentives (+)
  – Exchange rates can be problematic (-)
  – Does not easily capture non-price policies (-)
Families of effort metrics: Costs

• Potential metrics
  – Absolute or relative to GDP
  – Estimate for actual policies or least cost alternative

• Pros/Cons
  – Most closely reflects “effort” (+)
  – Not observed; requires modeling (-)
  – Actual policy costs could reward costly but ineffective policies (-)
Developing multiple metrics to compare prospective emissions commitments

<table>
<thead>
<tr>
<th></th>
<th>US</th>
<th>EU</th>
<th>China</th>
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<tbody>
<tr>
<td><strong>Emissions</strong></td>
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<tr>
<td>Versus 1990</td>
<td>-13% (in 2025)</td>
<td>-40% (in 2030)</td>
<td>&lt;requires modeling&gt;</td>
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<tr>
<td>Versus 2005</td>
<td>-27% (in 2025)</td>
<td>-38% (in 2030)</td>
<td>&lt;requires modeling&gt;</td>
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<tr>
<td>Versus 2025</td>
<td>-21%*</td>
<td>&lt;requires modeling&gt;</td>
<td>&lt;requires modeling&gt;</td>
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<tr>
<td>Versus 2030</td>
<td>&lt;requires modeling&gt;</td>
<td>-39%*†</td>
<td>&lt;requires modeling&gt;</td>
</tr>
<tr>
<td>Δ (CO2/GDP) 2010-25</td>
<td>-4.2% per year*</td>
<td>&lt;requires modeling&gt;</td>
<td>&lt;requires modeling&gt;</td>
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<tr>
<td>Δ (CO2/GDP) 2010-30</td>
<td>&lt;requires modeling&gt;</td>
<td>-4.3% per year*†</td>
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<tr>
<td><strong>Price</strong></td>
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<tr>
<td>CO2 2025</td>
<td>&lt;requires modeling&gt;</td>
<td>&lt;requires modeling&gt;</td>
<td>&lt;requires modeling&gt;</td>
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<tr>
<td>Δ fossil energy 2010-25</td>
<td>&lt;requires modeling&gt;</td>
<td>&lt;requires modeling&gt;</td>
<td>&lt;requires modeling&gt;</td>
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<tr>
<td>Δ electricity 2010-25</td>
<td>&lt;requires modeling&gt;</td>
<td>&lt;requires modeling&gt;</td>
<td>&lt;requires modeling&gt;</td>
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<tr>
<td><strong>Cost</strong></td>
<td></td>
<td></td>
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<tr>
<td>$ policy cost v. BAU</td>
<td>&lt;requires modeling&gt;</td>
<td>&lt;requires modeling&gt;</td>
<td>&lt;requires modeling&gt;</td>
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<tr>
<td>$ cost / $ GDP</td>
<td>&lt;requires modeling&gt;</td>
<td>&lt;requires modeling&gt;</td>
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*Forecast based on US EIA International Energy Outlook 2013
†EU = OECD Europe
When do we measure effort?

• Prospectively (ex ante), when commitments are being made, in order to try to increase the ambition of current commitments.
  – Prospectively, emission commitments can be compared to historic levels or a forecast baseline (and possibly in relation to population or income).

• Retrospectively (ex post), after efforts are realized, in order to increase the ambition of the next iteration of commitments.
  – Retrospectively, emission outcomes can be compared to historic levels, previous forecasts, or a counterfactual outcome absent policies.
2010 actual emission levels relative to forecast (published in 2000)

RETROSPECTIVE ANALYSIS WILL REQUIRE MODELING
Summary of comparability metrics

Motivation is to facilitate cooperation and ambition

- Emissions (and other physical measures)
  
  Relative to base year or forecast level; relative to population or economic activity; absolute or changes

- Prices
  
  Carbon dioxide or energy; levels or changes

- Costs
  
  Actual policies or least-cost alternatives

No single metric satisfies all of our principles; the more comprehensive measures of effort require modeling and therefore tend to be less measurable / reliable / universal.