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Selected Experience with Renewable Electricity Displacement Calculations in Canada

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Presentation Outline

1. Electricity and the environment
2. Importance of Emissions Reductions
3. Renewable Energy and Electricity Markets
4. Experience with Displacement Reductions
5. Some Lessons Learned

Electricity and the Environment

- Electricity has substantial impacts on the environment--land, water and air; some quantifiable, some intangible
- Impact from generation sources highly variable not only because of technology & fuel, but also due to locale & implementation (location, existing environmental loadings/sensitivities, mitigation measures, etc.--importance of environmental assessment)
- Early use of Integrated Resource Planning
- Move towards competitive electricity markets

Importance of Emissions Reductions

- Recognition of environmental and health effects of air quality, and effects of climate change => emissions dominate environmental costs
- Trans-boundary implications
- Tools/instruments for addressing, e.g.:
  - fiscal incentives
  - emission caps and permit trading
  - renewable portfolio standards
  - market instruments (e.g. green power markets)

Renewable Energy and Electricity Markets

- Displacement calculations vital for policy making (e.g. RPS, emissions trading, fiscal incentives) and market decisions (e.g. green power)
- Marginality versus System Average
- Timescales--short vs. long; current (or *post facto*) vs. future (or for planning)
- Spatial scale--GHGs vs. other air contaminants

=> differing data requirements

Full Environmental (Net-)Cost Accounting in Green Power

market cost of conventional electricity

Quantify Air Emissions Reductions

Externality Valuation

Establish full price of conventional electricity

Assume low-impact renewable environmental cost < non-air conventional electricity environmental costs

Assume air emissions are dominant environmental cost

If price of green power:
< full price > full price

Buy green power

Don't buy

Externality valuation: typical Canadian values of ~**3 cents/kWh** for GHGs, NOx, SOx and TPM (from 1998 study by Acres International: "Estimated Environmental Benefits of Green Power Purchases for Federal Facilities")

Ensure environmental benefits are sustained

Examples

- Wind Power Production Incentive and *Climate Change Plan for Canada*
  - Energy 2020 model => marginal technology-type / emission rate by province
- Federal green power procurement:
  - annual system average
  - hourly systems averages in Greenhouse Gas Emission Reductions Trading (GERT) Pilot => first Registered Emissions Reductions
  - utility dispatch models or dispatch records

Examples (continued)

- Pilot Emissions Removals, Reductions and Learnings (PERRL) Initiative
  - Integrated Planning Model (IPM) forecast marginal emissions intensities by province for 2003-2007
- Ontario's NO and SO_2 Emissions Trading Code-- Renewable Energy Allowance Set-Aside
  - marginal displacement, but modified by sharing of fixed set-aside (1 kt/year for NO, 4 kt/year for SO_2)
- Kyoto Clean Development Mechanism / Joint Implementation
  - marginal estimation based on seasonal load curves

Some Lessons Learned

- How the benefits calculation is used is important
- Must have rigour in avoiding double-counting / overlap / leakage
- Simple is better (trade-off on “accuracy”)
- Overarching solution is better (trade-off on “accuracy”)

The End

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