Enabling Canadian Imports for Advancing Clean Energy Strategies for the U.S.
Considerations for Policymakers

PREPARED FOR
Canadian Electricity Association and Canadian Embassy Event

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Canadian Imports to the U.S.

Net Exports from Canada to the U.S., by Exporting Province

Sources: National Energy Board of Canada.

Notes: Net exports from Saskatchewan and Nova Scotia were less than 0.5 TWh in all years considered and not shown in the chart above.
Clean Power Plan Overview

The Clean Power Plan (CPP) is a U.S. Environmental Protection Agency (EPA) regulated promulgated under Clean Air Act (CAA) Section 111(d)

- **Sets maximum CO₂ emission rate** (lbs CO₂/MWh) for steam & natural gas combined cycle generation
- **Covers existing** fossil plants
- **Does not cover** existing simple cycle combustion turbines and new fossil plants (which are separately regulated under CAA Section 111(b), but have options for covering new gas combined cycle plants)
- The Clean Power Plan (CPP) was stayed by the Supreme Court; arguments were heard in September 2016 by the D.C. District Court

### CPP Milestone Dates

<table>
<thead>
<tr>
<th>Date</th>
<th>Event Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sept 6, 2016</td>
<td>Initial submission of state implementation plan (SIP) to the EPA, with option to request extension to 2018</td>
</tr>
<tr>
<td>Sept 6, 2018</td>
<td>Final SIP submission</td>
</tr>
<tr>
<td>2022-29</td>
<td>Three compliance periods with increasingly stringent interim standards</td>
</tr>
<tr>
<td>2030+</td>
<td>Final CPP standard</td>
</tr>
</tbody>
</table>
EPA’s Emissions Rate Standards for CPP

EPA set average rate standard for each state as a compliance option. Each state has a different target.

<table>
<thead>
<tr>
<th>Subcategory Rate</th>
<th>Rate Standards by Compliance Period</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2022-2024</td>
</tr>
<tr>
<td></td>
<td>(lbs/MWh)</td>
</tr>
<tr>
<td>Coal and Other Fossil Steam</td>
<td>1,671</td>
</tr>
<tr>
<td>Natural Gas Combined Cycle</td>
<td>877</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>State-Average Rate</th>
<th>Rate Standards by Compliance Period</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2022-2024</td>
</tr>
<tr>
<td></td>
<td>(lbs/MWh)</td>
</tr>
<tr>
<td>National Average</td>
<td>1,337</td>
</tr>
<tr>
<td>Range Across States</td>
<td>877-1,671</td>
</tr>
</tbody>
</table>
Brattle Report: Enabling Canadian Clean Energy Imports

- Under the CPP, EPA has confirmed that clean energy imports from Canada are a viable CO₂ mitigation option.
- CEA and a consortium of CEA members, commissioned a report that includes technical guidance for state policymakers on how to incorporate clean energy imports into their state implementation plans (SIPs).
- We offer insights into incorporating and accounting for clean Canadian imports and the overall recommendation of creating a level playing field for considering domestic and imported clean energy resources.
Policy Direction in the U.S.

- To enable clean energy imports and achieve environmental standards cost-effectively, we recommend that state plans and related state energy policies adopt a central principle of creating a level playing field for considering domestic and imported clean energy resources.

- Both rate- and mass-based plans can enable clean energy imports, and minimizing barriers to participation for imported clean energy will allow states and utilities to pursue the most cost-effective options.
  - **Mass-Based Plans** readily accommodate clean energy imports with few restrictions and enable all types of clean energy imports.
  - **Rate-Based Plans** can qualify clean energy imports to create emission rate credits (ERCs) if they are: renewable resources (including hydro, but not nuclear or energy efficiency), installed after 2012, contracted to a U.S. entity, and in a country that is physically interconnected to the U.S. grid. Broadly defined qualification criteria can avoid inadvertently excluding certain business models or resource types.
Example: Restructured State with Mass-Based Allowance Auctions

Example most relevant for:
States that adopt allowance auctions, with individual generators showing compliance

Contracts for Clean Energy Imports
Such as Massachusetts 1,200 MW clean energy proposal, procured via competitive solicitation
- State agencies, utilities, or Load-Serving-Entities contract for clean energy imports, based on state policy such as CO₂ abatement goal, state RPS, or clean energy standard
- Imports may be procured via competitive solicitation, inviting offers from in-state and imported clean energy
- Funding may come from allowance auction revenues or ratepayers

CO₂ Allowance Auction
- State allocates CO₂ allowances in a centralized auction, collecting revenues
- In-state (and possibly other states’) generators purchase allowances

CO₂ Allowance Scarcity Increases Electric Energy Prices
- Allowance prices driven by marginal abatement costs, translating to higher wholesale energy prices
- Clean energy imports displace in-state fossil generation, thus reducing allowance prices, freeing up allowances for out-of-state sale, or enabling over-compliance

Fossil Generators Surrender CO₂ Allowances
- Fossil generators submit allowances covering all physical emissions
Example: Regulated State Exporting Emission Rate Credits

Example most relevant for:
States with vertically integrated utilities, located in RTO or non-RTO regions using rate-based compliance and interstate ERC trading

IRP Includes Clean Energy Imports
- The utility conducts resource planning under the oversight of the state commission
- In an analysis of least-cost CO₂ abatement options and/or through competitive solicitations, the utility identifies opportunities to comply or over-comply at low cost via a combination of coal retirements, energy efficiency, and contracts for clean energy imports
- Utility is aware that neighboring states have fewer abatement options and would be willing to purchase the excess ERCs
- Utility develops an IRP strategy to shift procurement toward clean sources for physical energy/capacity needs, and sell any excess ERCs as an offset to customer costs

ERCs Generated
- Eligible clean Canadian generator creates 1 ERC for each MWh generated
- ERCs are certified and tracked by a third-party vendor (as with REC systems)
- ERCs transferred to the contractual counterparty

Utility Manages ERC Needs
- Utility manages its pool of ERCs from clean imports, in-state sources, and efficiency programs
- ERC needs depend on fossil plants’ dispatch and multi-year strategy; some ERCs possibly banked for later use
- Excess ERCs are sold to other entities (creating a partial offset to CPP compliance costs)

Utility Surrenders ERCs
- The utility (on behalf of individual generators it owns) surrenders ERCs to the EPA sufficient to reduce fossil emission rate to the standard
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The views expressed in this presentation are strictly those of the presenter(s) and do not necessarily state or reflect the views of The Brattle Group.
Appendix A

I. Additional detail on Mass-Based Plans

II. Additional detail on Rate-Based Plans
I. Mass-Based Plans

Accounting for Clean Canadian Imports

Mass Approach
- Mass-based plans establish a maximum state CO₂ allowance budget
- In-state fossil generators must surrender one allowance for every ton of CO₂ emitted
- Meeting the standard simply means that the realized emissions are under the cap

Clean Energy Imports
- Clean energy imports can contribute toward meeting the standard by displacing in-state fossil generation and associated emissions
- Clean energy imports also can contribute toward over-compliance:
  - Meet a tighter state-driven mass budget for more CO₂ reductions, or
  - Free up CO₂ allowances for sale to other states (creating net revenue to the state)

Emissions Reduction Enabled By Clean Imports

[Diagram showing emissions reduction enabled by clean imports]
I. Mass-Based Plans

State Options and Considerations

State Implementation Plan

- Incorporating clean imports is relatively simple under mass-based plans
- The EPA did not specify resource qualification criteria (the only requirement is that emissions reductions need to be achieved)
- Any increase in Canadian energy imports (whether from existing or new sources) can displace U.S. fossil generation and emissions

State Policies to Pursue Imports

- The decision to pursue or enable clean energy imports as a cost-effective way to achieve the CO₂ reductions is primarily based on state-level policy and regulatory initiatives:
  - Renewable portfolio standards (RPS) or clean energy standards (CES)
  - Utilities’ integrated resource plans (IRPs)
- States may opt to impose measurement and verification (M&V) or anti-leakage provisions to ensure that CO₂ reductions are achieved
### I. Mass-Based Plans

#### State Options and Considerations

<table>
<thead>
<tr>
<th>Policy Element</th>
<th>Primary Options or Considerations</th>
</tr>
</thead>
</table>
| **Eligible Resource Types**                      | • Individual resources need not be verified by EPA and thus any Canadian resource can be used as long as the result is a physical reduction in in-state CO₂ emissions  
• Existing and new zero-emitting Canadian generation including hydro, wind, and nuclear could potentially contribute |
| **Measurement and Verification**                  | • No specific EPA requirements for SIP  
• States may opt to require M&V to confirm consistency with RPS or other state policy goals |
| **State Renewables Standards**                    | • States can initiate or expand an RPS that qualifies clean energy imports, but the RPS does not need to be submitted as part of the SIP  
• Competitive solicitations can procure cost-effective clean power options (including imports) that also may be eligible to meet RPS goals |
| **State Measures**                                | • Includes any portion of the SIP outside EPA jurisdiction that is enforced by the state; e.g., multi-sector cap-and-trade, energy efficiency programs, and RPS (see above)  
• Clean energy imports can be pursued through state measures such as RPS or as specific procurement initiatives |
| **Allowance Allocations and Set-Asides**         | • States may choose to allocate allowances to generators, to customers, to load-serving entities, or by auction  
• Allocations of allowances, set-aside or auction proceeds can help incentivize clean energy resources, including imports |
| **Covering New Combined-Cycles and Existing Combustion Turbines** | • States may opt to cover non-covered fossil generation types to ensure a uniform cost of emitting CO₂ (or adopt another method for mitigating leakage to new gas combined-cycles)  
• Not covering some CO₂-emitting supply types would disadvantage zero-emitting generation |
| **Preventing International CO₂ Leakage**         | • No EPA requirements for SIP  
• States may opt to impose measures to protect against international leakage to discourage fossil-based imports and/or track contracted clean imports |
| **Individual, Multi-State, or National Trading** | • States may trade allowances within the state or join regional/national trading programs  
• Multi-state trading enables larger market for CO₂ allowances; e.g., states or entities within states can sell excess allowances if over-compliance is enabled by substantial clean energy imports |
| **Transmission**                                  | • No EPA requirements for SIP on transmission or physical interconnectivity to enable imports  
• Major increases in clean energy imports may require transmission upgrades and allocation of the associated costs |
| **Integrated Resource Planning**                 | • No EPA requirements for SIP  
• States may direct utilities to consider clean energy imports as one option when developing a lowest-cost integrated resource plan that meets the CPP (along with efficiency, renewables, and other targets) |
I. Mass-Based Plans

Achieving CO₂ Reductions without Leakage

- Some states using mass-based plans may be concerned about achieving CPP compliance without inducing “leakage” to non-covered plants
  - Leakage could occur if higher energy prices caused by CO₂ emissions costs from covered plants create incentives for non-covered new gas combined-cycles (CCs), existing combustion turbines (CTs), or international fossil plants to produce more energy (and therefore emit more CO₂)
  - The EPA requires states to address leakage for new gas CCs only, but states may wish to take a more comprehensive approach

- Risk of leakage to Canadian fossil plants is low because of Canadian environmental policies and largely decarbonized grid
  - 83% of Canadian electricity came from zero-CO₂ resources in 2015

- For states where international leakage is a concern, options include:
  - Continuing trade with provinces or producers operating under a CO₂ emissions price
  - Working bilaterally with Canadian entities on options to integrate CO₂ or CO₂e markets or otherwise normalize CO₂ emissions costs
  - Considering a price adjustment for evaluating economic energy imports based on marginal embedded CO₂ emissions
  - Developing M&V mechanisms for clean energy imports, similar to those used under RPS or for verifying ERCs under rate-based plans
I. Mass-Based Plans

Example: Restructured State with Allowance Auctions

Example most relevant for: Regional Greenhouse Gas Initiative (RGGI) states and other states that adopt allowance auctions, with individual generators showing compliance

**CO₂ Allowance Auction**
- State allocates CO₂ allowances in a centralized auction, collecting revenues
- In-state (and possibly other states’) generators purchase allowances

**Contracts for Clean Energy Imports**
Such as Massachusetts 1,200 MW clean energy proposal, procured via competitive solicitation
- State agencies, utilities, or Load-Serving-Entities contract for clean energy imports, based on state policy such as CO₂ abatement goal, state RPS, or clean energy standard
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**CO₂ Allowance Scarcity Increases Electric Energy Prices**
- Allowance prices driven by marginal abatement costs, translating to higher wholesale energy prices
- Clean energy imports displace in-state fossil generation, thus reducing allowance prices, freeing up allowances for out-of-state sale, or enabling over-compliance

**Fossil Generators Surrender CO₂ Allowances**
- Fossil generators submit allowances covering all physical emissions
I. Mass-Based Plans

Example: Traditionally Regulated State with Planning

Example most relevant for:
States that allocate CO₂ allowances to utilities or load-serving entities, with utilities showing compliance (whether or not operating in an organized wholesale market)

Utility Resource Plans Include Clean Energy Imports
- Utility integrated resource plans (IRPs) developed under regulatory oversight include a plan to meet CO₂ mass cap
- Clean energy imports are evaluated on a level playing field with other CO₂ abatement options such as energy efficiency, domestic renewables, fuel switching, and allowance purchases
- The IRP is subject to state utility regulator approval, but no EPA approval or M&V

CO₂ Allowance Allocations
- State allocates CO₂ allowances to utilities, load-serving entities, or generators (usually the same entity in traditionally regulated states)
- States can allocate a set-aside to clean energy sources

Utilities Manage CO₂ Allowance Needs
- The utility IRPs set the plan for reducing emissions from covered generators
- Utilities with excess allowances sell them to monetize value; associated revenues can be used to offset customer bills
- Utilities or generators without sufficient allowances would purchase additional allowances needed

Covered Entities Surrender CO₂ Allowances
- Covered generators or the utilities that own them surrender CO₂ allowances covering all physical emissions
Appendix A

I. Mass-Based Plans

II. Rate-Based Plans
II. Rate-Based Plans

Accounting for Clean Canadian Energy Imports

Rate Approach
- Electric generating units (EGUs) must procure enough ERCs to meet the standard
- Each MWh of qualified zero-emitting generation or energy efficiency generates 1 ERC
- States may select one of two emissions standards (subcategory or state average)

Clean Energy Imports
- Clean Canadian energy imports can create ERCs
- Only post-2012 new renewables such as wind and hydro are eligible (Canadian efficiency, nuclear, and existing clean power as of 2012 are excluded)
- Entities in over-complying states can sell ERCs to out-of-state buyers if in a multi-state trading program
II. Rate-Based Plans

State Options and Considerations

State Implementation Plan

- Incorporating clean energy imports requires the importers to be qualified to create ERCs based on M&V requirements specified in the SIP and approved by EPA
- Existing RPS tracking systems can be used for ERCs
- States must determine their own approach to fulfilling EPA’s physical interconnection and contract requirements (subject to EPA approval)

State Policies to Pursue Clean Energy Imports

- Enabling clean energy imports on a level playing field with in-state CO₂ abatement options will create more opportunities for states and utilities to pursue the most cost-effective options
- States have more flexibility if M&V is broadly defined to enable many business models and options for non-contiguous states and provinces
- Precedent from state RPS M&V standards can be a starting point
## II. Rate-Based Plans
### State Options and Considerations

<table>
<thead>
<tr>
<th>Policy Element</th>
<th>Primary Options or Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ERC Eligible Resource Types</strong></td>
<td>• New renewable resources (including hydroelectric) installed after 2012 and uprates to existing renewable resources (no existing plants, nuclear, or efficiency)</td>
</tr>
</tbody>
</table>
| **Emissions Standard Type** | • States must select a subcategory or state-average emissions standard (or propose an equivalent alternative such as multi-state averaging)  
  • Subcategory approach is trade-ready, thus enabling ERC export without multi-state plan coordination |
| **Measurement and Verification** | • Must establish EPA-approved qualification criteria to enable clean energy imports  
  • Must meet EPA’s M&V requirements for physical interconnection and contracting  
  • EPA guidance is limited; precedent from state RPS qualification criteria may be useful (though not guaranteed for EPA approval) |
| **Interaction with State Renewables Standards** | • RPS does not need to be submitted as part of the SIP, but higher RPS targets may be a major component of a state’s strategy  
  • States may opt to align RPS eligibility to ensure consistency with ERC eligibility post-2012 |
| **Preventing CO₂ Leakage** | • EPA-mandated eligibility and M&V requirements are intended to address leakage potential; no additional requirements are necessary for SIP |
| **Individual, Multi-State, or Federal Implementation Plan (Trade-Ready) Approach** | • Subcategory rate approach is trade-ready and needs only EPA M&V approval for ERC registry (no need for multi-state coordination)  
  • State average rate approach is not trade-ready |
| **Transmission** | • SIP must include rules on how imports demonstrate physical interconnection  
  • Major clean import projects may require physical transmission upgrades to enable delivery (also true under mass-based) |
| **Integrated Resource Planning** | • Integrated resource planning processes do not need to be part of SIP  
  • States may direct utilities to consider clean energy imports within the integrated resource planning process on a level playing field with efficiency, fuel switching, in-state renewables, and other abatement opportunities to meet CPP requirements |
| **Power Purchase Agreements** | • States will need to define eligible delivery contract types in the SIP, defining the options broadly enough to ensure that all viable business models are enabled (requires substantial forethought regarding potential contractual arrangements) |
## II. Rate-Based Plans
### Incorporating Imports in State Implementation Plans

<table>
<thead>
<tr>
<th>Requirement</th>
<th>EPA’s Existing Guidance</th>
<th>Possible Demonstration Approaches*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Qualifying Resource Types</strong></td>
<td>• New renewable generation or uprates installed after January 1, 2013</td>
<td>• See M&amp;V below</td>
</tr>
<tr>
<td><strong>Physical Interconnection</strong></td>
<td>• “…the country generating the ERCs must be connected to the U.S. grid.”</td>
<td>• Demonstration of physical transmission system upgrade completed in connection with particular resources</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Firm or non-firm point-to-point transmission rights</td>
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<tr>
<td></td>
<td></td>
<td>• E-Tag schedules for after-the-fact demonstration</td>
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<tr>
<td></td>
<td></td>
<td>• Regional Transmission Organization (RTO) demonstrated delivery into footprint for “network access”</td>
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<tr>
<td></td>
<td></td>
<td>• Any other method of demonstrating both: (a) sufficient transmission to support incremental imports, and (b) a delivery point in a rate-based state</td>
</tr>
<tr>
<td><strong>Contracted Assets</strong></td>
<td>• “…there must be a power purchase agreement or other contract for delivery of the power with an entity in the U.S.”</td>
<td>• Short- or long-term contracts to sell energy (or bundled energy and ERCs) to a U.S. entity, with a contract that specifies physical energy delivery</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Settlement of energy sales to a qualified U.S. RTO or market delivery point</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Any other method demonstrating both: (a) a U.S. entity counterparty; and (b) physical delivery into a rate-based state</td>
</tr>
<tr>
<td><strong>Measurement and Verification</strong></td>
<td>• Independent verification of generation unit eligibility and M&amp;V, including ex-post documentation of clean energy generation</td>
<td>• Registration and creation of ERCs through existing REC M&amp;V organizations (proposed in FIP)</td>
</tr>
<tr>
<td></td>
<td>• Registration of eligible resources with an ERC tracking system</td>
<td>• Tracking ERC holdings and transfers through EPA Allowance Tracking and Compliance System (proposed in FIP); can use third party for this function</td>
</tr>
</tbody>
</table>

*Possible demonstration approaches; not explicitly discussed by EPA and not a legal interpretation*
II. Rate-Based Plans

Qualification in Existing State RPS Programs

RPS Requirements as Precedent

- Deliverability and contracting requirements exist in many state RPS programs
- Forms a useful precedent for SIP (but cannot guarantee EPA approval)

Examples: Deliverability Requirements

- **Massachusetts**: generators in an adjacent control areas must document that energy was delivered into ISO New England market using E-Tags and settlements data
- **California**: allows for both bundled energy + RECs and unbundled tradable RECs (TREC). A maximum of 10% TREC may be used for compliance after 2017
- **Minnesota**: All renewable assets must be registered with Midwest or Michigan renewables tracking system

<table>
<thead>
<tr>
<th>States Accepting Renewables from Canada</th>
<th>Generator Province</th>
</tr>
</thead>
<tbody>
<tr>
<td>California¹</td>
<td>Alberta, British Columbia</td>
</tr>
<tr>
<td>Oregon, Washington²</td>
<td>British Columbia</td>
</tr>
<tr>
<td>New England² (Connecticut, Massachusetts, Maine, New Hampshire, Rhode Island)</td>
<td>Labrador, New Brunswick, Newfoundland, Nova Scotia, Prince Edward Island, Québec</td>
</tr>
<tr>
<td>New York³</td>
<td>Ontario, Québec</td>
</tr>
<tr>
<td>Minnesota⁴</td>
<td>Manitoba, Ontario, Saskatchewan</td>
</tr>
<tr>
<td>Wisconsin</td>
<td>Manitoba, Saskatchewan</td>
</tr>
</tbody>
</table>

Notes:
1. These include unbundled Tradable RECs (TRECS)
2. Includes delivery requirement
3. New York is currently redesigning its Clean Energy Standard
4. Requires registration with M-RETS or MIRECS
5. Additional states with few or no geographic eligibility requirements include CO, IL, MO, NC, ND, and SD

Sources: CESA; DSIRE database
II. Rate-Based Plans

Tracking ERCs within Existing REC Systems

- North American Renewables Registry supports a number of REC tracking systems
- Canadian resources are already registered in some tracking systems
- APX is planning to add CPP-specific support

Renewable Energy Certificate Tracking Systems in North America

🌟 Stars denote provinces where renewables may register in one of the U.S. tracking systems if eligibility requirements are met, but does not indicate that all renewables in the province will meet the eligibility requirements of all states in that tracking system. Not all possible combinations are shown.

II. Rate-Based Plans

Example: Regulated State Exporting ERCs

Example most relevant for:
*States with vertically integrated utilities, located in RTO or non-RTO regions using rate-based compliance and interstate ERC trading*

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About The Brattle Group

The Brattle Group provides consulting and expert testimony in economics, finance, and regulation to corporations, law firms, and governmental agencies worldwide.

We combine in-depth industry experience and rigorous analyses to help clients answer complex economic and financial questions in litigation and regulation, develop strategies for changing markets, and make critical business decisions.

Our services to the electric power industry include:

- Climate Change Policy and Planning
- Cost of Capital
- Demand Forecasting Methodology
- Demand Response and Energy Efficiency
- Electricity Market Modeling
- Energy Asset Valuation
- Energy Contract Litigation
- Environmental Compliance
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- Incentive Regulation
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