Enabling Canadian Electricity Imports for Clean Power Plan Compliance

Technical Guidance for U.S. State Policymakers

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This report was prepared for a consortium of Canadian entities including the Canadian Electricity Association and its members, the Canadian Hydropower Association, the Canadian Wind Energy Association, the Government of Canada, and the Government of Québec (Québec Government Office in Washington). We thank the members of these organizations for their input and feedback. The report describes the regulatory framework for the integration of Canadian resources under the Clean Power Plan and associated environmental policies. The information described is based on the authors' interpretation as of the date of this report, although the regulation is still under review and is potentially subject to change.

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Table of Contents

Executive Summary

In August of 2015, the U.S. Environmental Protection Agency (EPA) finalized the first nationwide CO_2 regulation for existing electric generating units (EGUs). The EPA estimates that the Clean Power Plan (CPP) will achieve power sector CO_2 emission reductions of 32% below 2005 levels by 2030. The Supreme Court recently stayed the implementation of the CPP while the District of Columbia Circuit Court of Appeals reviews the legal challenges.[1] As a consequence, some states have paused their efforts to develop State Implementation Plans (SIPs) for complying with the CPP, while others are continuing to develop their SIPs or other CO_2 reduction policies.

Canada has an existing and growing fleet of non-emitting power generation, with 83% of Canadian electricity produced by non-emitting resources in 2015. A number of U.S. states have expressed interest in considering clean energy imports from Canada as a component of their CPP compliance plan or as a pathway to achieving other environmental objectives. The EPA allows clean energy imports to contribute to CPP compliance, subject to certain requirements. However, the EPA has provided limited guidance on the precise mechanisms for meeting those requirements. State regulators therefore have the challenge of designing policies that fill in the details within the EPA's guidelines and support related state energy and environmental objectives that are outside the EPA's scope.

This report is a technical guide to state policymakers on how to enable clean energy imports from Canada for CPP compliance. As a technical guide, we do not analyze the relative economics of clean energy imports compared to other CO_2 abatement options under the CPP. State regulators, utilities, and others will compare the costs and benefits of individual clean energy import opportunities relative to any alternatives they identify. Our aim is to explain how states can use clean energy imports on a level basis with these alternatives.

States may select either a mass-based or a rate-based standard for complying with the CPP. Clean Canadian imports can be accommodated under either standard, but the approaches are quite different. Under a *mass-based* standard, the total CO_2 emissions from all covered EGUs in a state must be below the emissions cap established by the EPA. Clean energy imports that reduce domestic energy production and associated emissions would naturally help meet the mass-based standard. Under the *rate-based* standard, each covered generator must reduce its emissions rate to below the EPA's established rate standard (measured in pounds of CO_2 per MWh of electricity produced). If an EGU's physical emissions exceed the rate standard, then it must procure emission rate credits (ERCs) to demonstrate compliance. Each ERC reflects 1 MWh of zero-emissions energy. An EGU must surrender enough ERCs to reduce its effective emissions rate down to the standard. Both domestic and imported clean energy resources can create ERCs.

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[1] See Stohr and Dlouhy (2016).

States have more flexibility with mass-based plans than with rate-based plans in using clean energy imports from Canada for CPP compliance. Accounting for clean energy imports is straightforward under a mass-based plan; imports simply need to displace domestic fossil-based generation and associated CO_2 emissions. The EPA does not impose any resource eligibility or measurement and verification (M&V) requirements for using clean energy imports under mass-based plans, and all clean Canadian imports can contribute to meeting the EPA goal.

Rate-based plans, however, offer less flexibility and must fulfill several EPA requirements for energy imports to create ERCs. Only renewables installed after 2012 are eligible to create international ERCs; international nuclear, energy efficiency, and existing renewables are not eligible.[2] To create ERCs, international generators must also be in a country that is physically interconnected with the U.S. grid and be contracted to sell energy to a U.S. entity. However, clean energy imports that are not qualified to create ERCs can reduce the CPP compliance burden in some cases if the physical energy imports displace in-state fossil generation and therefore reduce the need for ERCs.

Under *mass-based plans*, states that are well-positioned to use clean energy imports for CPP compliance may even exceed the EPA's standard in some cases. Over-complying entities can either adopt more ambitious CO_2 reduction goals, or sell the excess CO_2 allowances to others. Whether emissions allowances are sold by auction or allocated to utilities or customers, the net revenues collected from selling any excess CO_2 allowances could be used to offset customers' electricity bills, fund renewables or efficiency programs, or support other policy objectives.

Using clean energy imports from Canada in mass-based plans requires analyzing the potential interactions with wholesale electricity markets and states' energy planning approaches. For example, the mechanisms for enabling clean energy imports differ somewhat between states that rely on competitive retail suppliers versus vertically-integrated utilities for electricity supply planning. In states with retail competition, clean energy imports may be enabled as qualified under renewable portfolio standards (RPS) or competitive solicitations for clean power. In states with vertically-integrated utilities, clean energy imports can be enabled by ensuring that they are evaluated as part of the integrated resource planning processes.

States that engage in substantial wholesale energy trade with Canada may wish to ensure that higher U.S. energy prices under the CPP do not induce cross-border CO_2 leakage by increasing imports from CO_2-emitting generation. The EPA does not require states to address the possibility of cross-border leakage, although it does require states to address the possibility of leakage to new emitting gas-fired combined-cycle (CC) plants in the U.S. Many states may determine that cross-border CO_2 emissions leakage risk is minimal because the interconnected

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[2] In this report we adopt the EPA's convention of referring to "new" or "post-2012" plants as those constructed on or after January 1, 2013 and that are therefore eligible to create emission rate credits under rate-based plans; we refer to "existing" or "up-to-2012" plants as those constructed prior to January 1, 2013, see 80 Federal Register 64661.

Canadian provinces have low-emitting generation fleets and policies limiting overall CO_2 emissions from Canadian sources. However, if states choose to address out-of-state leakage in their SIPs, we discuss several options in this report including tracking and verification measures on contracted imports or border adjustment measures for economic imports.

Under *rate-based plans*, states must establish physical interconnection, contracting, and delivery requirements for imports. However, the EPA provides minimal guidance on how importers can demonstrate that they have met the requirements. We therefore describe a range of demonstration options, including physical transmission rights, E-Tag transmission usage schedules, transmission upgrades in connection with clean resource development, and wholesale electricity market settlements data. We recommend that states use existing renewable energy credit (REC) registries to provide the M&V functions needed to verify and track ERCs. This recommendation is consistent with the EPA's recommendation in the proposed Federal Implementation Plan (FIP).[3] The range of options we describe in the report are consistent with our understanding of the EPA's intent, which is to ensure that the clean energy creating ERCs is physically delivered to the U.S., thereby physically displacing CO_2-emitting generation in a rate-based plan.

Similar to the mass-based approach, some states may enable additional clean imports from Canada to exceed their rate-based standards and create excess ERCs. Like RECs, ERCs are issued to the generator producing the clean energy, and likely would be transferred to the utility or another entity that has contracted for the clean imports. Any excess ERCs can be sold to out-of-state entities to create revenues that could be used to offset the cost of CPP compliance.

Recommendations

Overall, under both rate-based and mass-based plans, we recommend that states adopt a central principle of ensuring that imported and domestic clean energy resources are treated on a level playing field. Applying uniform standards to all types of clean energy resources that can contribute to compliance will allow states to achieve their environmental goals the most cost-effectively. To ensure a level playing field, states can:

- Minimize barriers for clean energy imports from Canada to participate under existing or expanded RPS programs, qualify them to generate ERCs, allow them to earn CO_2 allowances under state-designed set-aside programs, or qualify them for other incentives programs for zero-emitting resources;[4]

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[3] See 80 Federal Register 64966.

[4] For states that select a mass-based approach that covers only existing electric generating units, the EPA has designated three set-asides that must be included to prevent leakage, see 80 Federal Register 64661. Canadian imports are unlikely to be eligible for these set-asides. However, states may opt to designate additional set-asides for zero-emitting generators.

- In rate-based plans, consider the full set of options that we describe for demonstrating ERC eligibility to enable the widest range of clean energy imports and to avoid prescribing only a limited subset of potential business models;
- Consider clean energy imports as a potential emissions abatement option in utilities' integrated resource planning processes, alongside other options such as energy efficiency, dispatch switching from coal to other lower-emitting generation, and in-state clean energy resources;
- Work with resource owners and system planners to proactively plan and develop the necessary transmission infrastructure to facilitate additional clean energy imports, as developing new resources and transmission infrastructure will take many years and require complex inter-jurisdictional coordination; and
- Structure competitive solicitations for clean energy resources to enable all types of resources to be used and developed.

This technical guide is intended to inform state policymakers on how to broaden their ability to meet CPP compliance requirements and complementary environmental objectives by considering clean energy imports from Canada. It is developed to inform state air and environmental regulators, electricity regulators, and elected state officials as they design their SIPs and related energy policies.

I. Background and Motivation

In August of 2015, the U.S. Environmental Protection Agency (EPA) finalized the first nationwide CO_2 regulation for existing electric generating units (EGUs). The EPA estimates that the Clean Power Plan (CPP) will achieve CO_2 emissions reductions of 32% below 2005 levels by 2030. To comply with the CPP, each state must develop a State Implementation Plan (SIP) that lays out the state's approach to meeting EPA standards and the compliance mechanisms for generators under that approach. The timeline for developing these SIPs is currently uncertain because the Supreme Court has placed a stay on EPA's final rule while the legal challenges to the CPP are being reviewed.[5] If the original EPA timeline were maintained, states would be required to submit final plans by September 2018.[6]

States have a substantial amount of flexibility in how to implement the CPP. One of the most essential choices is between a mass-based versus a rate-based standard. Mass-based standards impose a cap on total tons of CO_2 emissions from affected generators. Rate-based standards impose a pounds per megawatt-hour (lbs/MWh) limit on the rate of CO_2 emissions from covered generators. Under either approach, states, utilities, and affected EGUs can pursue a wide range of CO_2 abatement strategies to comply with the CPP, including retiring coal plants, implementing coal-to-gas fuel switching, developing or contracting with clean energy resources, and investing in energy efficiency. States can support these approaches through the SIP that is filed with the EPA and through complementary policies under state oversight.

One CO_2 abatement opportunity is to pursue clean electricity imports from Canada. Canada has a large and growing fleet of zero-emitting generation resources, with approximately 83% of the total electricity produced by non-emitting resources as of 2015.[7] This low-emitting fleet results from a number of national and provincial policies to decarbonize the electricity sector, combined with Canada's large natural resource potential for hydroelectric, wind, and other renewable resources.

The U.S. currently imports approximately 68 TWh of electricity from Canada each year, and there are substantial opportunities to increase clean energy developments and imports in the future.[8] For example, at least 4,700 MW of new transmission projects across the U.S.-Canadian

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5 See Stohr and Dlouhy (2016).

6 Under the original timeline, states were required to submit an extension request for by September 6, 2016 for a plan submission extension until September 2018. States not requesting an extension were required to submit a final plan in September 2016, see 80 Federal Register 64661, §60.5760.

7 See Canadian Wind Energy Association (2016).

8 Energy imports are from the year 2015, see National Energy Board (2016).

border are proposed and in varying stages of development.[9] If all of those transmission projects move forward, the incremental capacity would be large enough to increase Canadian energy imports upwards of 48%, representing enough generation to offset 28 million tons of CO_2 emissions annually.[10]

Several U.S. states, utilities, and industry groups have expressed interest in pursuing Canadian clean energy imports as part of a strategy to meet CPP standards. States including Connecticut, Maine, Massachusetts, Michigan, Minnesota, New York, and Wisconsin are considering Canadian imports as an approach to fulfill CPP standards or other state-level environmental policy goals.[11] In its comments on the proposed Clean Power Plan, Minnesota noted the importance of allowing imported hydropower to replace retiring zero-emission generation and achieve CPP goals.[12]

Although the EPA has confirmed that Canadian imports may be used for compliance under the CPP, it provided limited guidance regarding how states should accommodate imports in their SIPs. Without sufficient guidelines or specifications, states may not include adequate detail to meet EPA expectations and could unintentionally forgo an opportunity to use clean imports to meet CPP goals.

We have been asked by a group of Canadian organizations to fill in the gaps of EPA guidance and offer a more detailed description of options for incorporating clean energy imports from Canada. While we cannot offer legal advice or guarantee that the options we describe below would necessarily be approved by the EPA, our aim is to offer solutions that meet our interpretation of the intent of the EPA rules while minimizing regulatory hurdles. We discuss these implementation options for enabling clean energy imports under mass-based and rate-based approaches, and describe practical examples of how Canadian resources may be incorporated into an overall state energy strategy.

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9 Projects include the Great Northern Transmission Line, Lake Erie Connector, Champlain Hudson Power Express, New England Clean Power Link, and Northern Pass.

10 This is an order-of-magnitude calculation that assumes that all of the proposed transmission projects would be developed and utilized at an 80% capacity factor from Canada to the U.S. once operational, but may be a low number overall because it considers only transmission projects that are currently proposed but no additional potential projects that may be proposed in the future. The calculation assumes an average U.S. CO_2 emission rate of 1,144 lbs/MWh calculated from the Energy Information Administration data. See Energy Information Administration (2016a) and Energy Information Administration (2016b).

11 See Connecticut Department of Energy & Environmental Protection (2014), Massachusetts Department of Energy Resources (2014), Maine Department of Environmental Protection (2014), Minnesota Department of Commerce and Minnesota Pollution Control Agency (2014), and State of Wisconsin Department of Natural Resources and Public Service Commission of Wisconsin (2014).

12 See Minnesota Department of Commerce and Minnesota Pollution Control Agency (2014), p.5.

II. Using Canadian Clean Energy Imports under Mass-Based Plans

Accounting for clean energy imports from Canada is straightforward under a mass-based plan as clean energy imports simply displace domestic CO_2-emitting generation. Compliance under a mass-based plan requires only that physical emissions are below the EPA-approved emissions budget, but does not require that the state's SIP mandate the method for achieving those reductions. These reductions can come from any combination of CO_2 abatement measures including fuel switching, plant retirement, increased renewable portfolio standards (RPS), or clean energy imports. The EPA imposes minimal requirements within a mass-based SIP on how clean energy imports would be enabled and therefore provides more flexibility for compliance using clean energy imports than the rate-based approach discussed in Section III.

Although the mass-based plan provides flexibility, states that plan to consider clean Canadian imports as a major component of their compliance strategy will want to ensure that state energy policies and planning procedures adequately accommodate this option. We discuss here how imports would interact with components of the SIP, utility planning, and state clean energy policies.

A. Accounting for Imported Clean Energy Resources

Under a mass-based standard, the collective CO_2 emissions from all covered EGUs must be less than the cap established by the EPA.[13] The state is allowed to issue allowances for emissions up to the state-specific mass-based emission cap, and generators would show compliance by surrendering one allowance for each ton of CO_2 emitted. A mass-based approach that relies on CO_2 allowances for tracking compliance can remain agnostic about how emissions are reduced. As long as each generator affected by the policy is able to surrender the appropriate number of allowances, the state as a whole has shown compliance. Compliance can also be achieved by surrendering allowances in excess of the state's mass-based emission cap, but the additional allowances would need to be purchased from out-of-state entities.

In states with business-as-usual (BAU) CO_2 emissions higher than the mass cap, clean Canadian imports can displace local generation and the associated emissions. Figure 1 depicts an illustrative example of a case where Canadian imports are used to reduce in-state emissions to the required level (Case 1: Exact Compliance). Clean energy imports help to meet the required

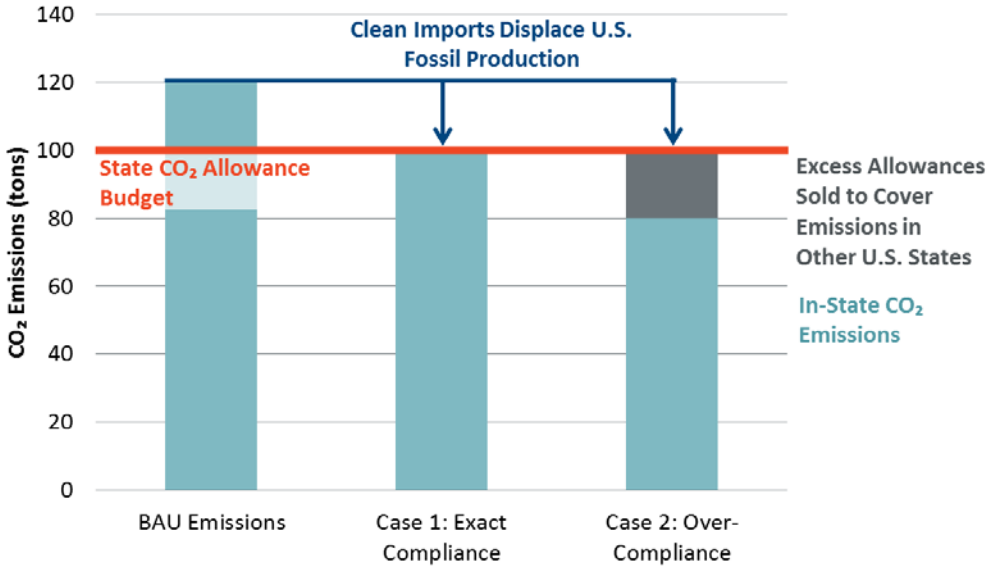
[13] The cap can cover only existing electric generating units affected by the Clean Power Plan or may be increased by an additional "new source complement" to cover new gas-fired combined-cycle generating plants. States would also have the option to propose a lower cap consistent with more ambitious CO_2 reductions goals or would include non-covered fossil units such as gas combustion turbines. See 80 Federal Register 64661, §60.5740.

emissions reductions, but do not need to be explicitly identified in the mass-based SIP as the means of achieving reductions.

A state could use Canadian imports to over-comply relative to the EPA standard and reduce emissions to below the cap. A strategy to over-comply creates "headroom" and provides additional flexibility to meet state policy goals. An over-complying state could choose to issue fewer allowances and therefore achieve greater CO_2 reductions. The state could also choose to issue fewer allowances only if the price of allowances is low, which would indicate that the marginal cost of achieving additional CO_2 reductions is low. Both the Regional Greenhouse Gas Initiative (RGGI) and California's CO_2 allowance auctions incorporate such mechanisms for adjusting the quantity of allowances issued, depending on the price of those allowances.[14] A state could bank allowances from over-compliance and retain the option to issue those allowances at a later time if prices are high.

If the state is a member of an inter-state CO_2 allowance trading group, excess allowances can be sold to out-of-state fossil generators (Case 2: Over-Compliance). These sales would generate net revenues to the state if sold via centralized auction. Alternatively, if sold via bilateral transactions, the net revenues can be provided to customers' load serving entities (LSEs). Such revenues can be used to fund customer rate offsets, clean energy programs, energy efficiency, or other state policy goals as discussed further in Section II.D.1 below.

Figure 1
Illustrative Business-As-Usual and Compliance Scenarios



[14] Both the Regional Greenhouse Gas Initiative and the California auction systems include a reservation price (*i.e.*, a price floor) below which no additional allowances would be issued, and both systems include an increasing supply curve such that additional allowances will be released if prices are high. These mechanisms provide price stability and enable the quantity of CO_2 reductions to be adjusted, along with the cost of achieving those reductions. See Regional Greenhouse Gas Initiative (2016).

B. State Options and Considerations

States will likely wish to develop a comprehensive strategy to meet the CPP standards and other state energy policy goals. Such a strategy would be supported by the EPA-approved SIP, and by a complementary set of state policies. Table 1 briefly summarizes a number of key elements that states will need to consider in a comprehensive CPP compliance strategy, including a description of how imports would be considered (if applicable).

One advantage of a mass-based plan for states wishing to enable clean energy imports from Canada is that the EPA imposes minimal requirements on how those imports can be accommodated. The EPA does not impose eligibility requirements on imports; all existing and new Canadian imports may contribute to meeting the goal. Further, unlike with a rate-based plan, the EPA does not require a mass-based SIP to specify measurement and verification (M&V) standards to use imports. As long as the imports physically displace in-state generation and emissions, they will contribute to meeting the CPP standard. Therefore, a state that intends to rely on clean energy imports as a major component of its CPP compliance strategy will likely need to develop state-level policies to ensure that those imports can materialize under the right economic conditions. Issues for states to consider include:

- Ensuring that CO_2 reduction goals are achieved by confirming that any clean energy imports that the state or its utilities procure under CPP-related initiatives are physically delivered, and that the wholesale energy prices that can be expected under a mass-based implementation plan do not result in economically-driven CO_2 leakage to non-covered plants (see Section II.C); and
- Ensuring that clean energy imports are adequately considered within the design of state-level policies. This could include allowing the clean energy imports to qualify under the state's RPS, enabling their participation in clean energy solicitations, or considering utility contracts with clean imports as part of their resource plans (see Section II.D).

In the following sections, we more fully discuss how states can pursue a comprehensive CPP strategy under a mass-based approach that includes clean energy imports from Canada.

Table 1
Policy Issues and Options for States Pursuing Mass-Based CPP Compliance

Policy Element	Primary Options and Considerations
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 CO_2 emissions • Existing and new zero-emitting Canadian generation including hydro, wind, and nuclear could potentially contribute
Measurement and Verification	• No EPA requirements for SIP • States may opt to require M&V to confirm consistency with RPS or other state policy goals
Interaction with 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 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 emission allocation methodologies including allocation to generators, allocation to customers, or allocation by auction • Allocations of allowance set-asides or auction proceeds can help incentivize clean power, including clean energy imports
Covering New Gas Combined Cycles and Existing Combustion Turbines	• States may opt to cover non-covered fossil generation types to ensure a uniform cost of emitting CO_2 (or adopt another method for mitigating leakage to new gas combined cycles) • Not covering some CO_2-emitting supply types would disadvantage zero-emitting generation
Preventing International CO_2 Leakage	• No EPA requirements for SIP • States interconnected to provinces with material leakage risk may opt to pursue measures that discourage fossil-based imports 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 CO_2 allowance; *e.g.*, states or entities within states can sell excess allowances if over-compliance is enabled by substantial clean energy imports
Transmission	• No EPA SIP requirements 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 options)

C. Ensuring that CO_2 Reductions are Achieved without Leakage

States complying with CPP mass-based standards may consider the possibility of CO_2 "leakage" to non-covered units. Wholesale energy prices should be expected to rise under mass-based plans as the cost of generating power from covered EGUs increases with the price of CO_2 allowances. Such cost increase creates an economic incentive to shift production to lower- and zero-emitting generation, in line with the policy goal of the CPP. However, the increase in wholesale power prices also can create an economic incentive to shift power production to CO_2 emitting generation that is not covered by the CPP, including possibly new gas combined-cycles (CCs), gas combustion turbines (CTs), small fossil units, and international fossil plants.[15] Such leakage could allow entities to comply with CPP standards but not accomplish the intended level of physical CO_2 reductions. This could occur in some cases because such leakage would make shifting production to non-covered fossil plants appear relatively more economically attractive than investing in energy efficiency or zero-emitting generation.

While the EPA does not require that states address all types of leakage, it does require that states address domestic leakage to new gas CCs through SIP provisions. The EPA has offered two options for preventing leakage to new CCs: (1) covering those units under a new source complement so that they are treated on an equal basis with existing units, or (2) using an output-based CO_2 allowance allocations approach that provides additional dispatch incentives for existing gas-fired CCs to partially offset the incentive to induce leakage to new CCs.[16] States can develop alternative approaches to mitigating this type of leakage with EPA approval. Depending on the leakage mitigation approach selected, domestic zero-emission generation and clean energy imports may be disadvantaged relative to new gas CCs and any other non-covered fossil generators.

In concept, the same price increases could induce shifting of CO_2 emissions to Canada, if increasing U.S. wholesale electricity prices attracted economically-driven imports from international fossil generators. However, as a practical matter, the potential for emission leakage from Canadian provinces that are the most highly interconnected with U.S. states is small because of their low-emitting fleets and existing carbon reduction policies.[17] Overall, in 2015, the percentage of power generated from zero-emitting resources was over 97% in British Columbia, 99% in Manitoba, 96% in Newfoundland and Labrador, 94% in Ontario, and 99% in

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15 This is not an exhaustive list of all potential types of leakage that could occur, but focuses only on the potential for leakage to non-covered fossil generation plants.

16 See 80 Federal Register 64661, section VIII.J.2 and §60.5815.

17 The marginal (as opposed to average) emissions rate of the interconnected province is the metric that determines the embedded emissions associated with incremental imports from Canada. Even a province with a low average emissions rate can contribute to leakage if the incremental energy production comes from a fossil plant.

Québec.[18] Across all of Canada, 83% of electricity was generated from zero-emission resources. A subset of provinces have implemented, or will implement, a CO_2 emissions pricing regime; these programs include Québec's existing carbon market, Ontario's proposed carbon market, Alberta's planned carbon fee, and British Columbia's existing carbon tax. Overall, these and other policies, such as the national mandate to phase out all coal plants without carbon capture and sequestration (CCS), mitigate the likelihood that U.S. policies could result in increased CO_2 emissions within Canada.[19]

However, a subset of U.S. states may be concerned about the possibility of international leakage or may wish to ensure that fossil generators in both countries are on an equal footing. For states that wish to achieve CPP compliance and demonstrate that there is no leakage to non-affected EGUs, the following options could be considered:

- Continuing unrestricted energy trade with any province or Canadian producer that incorporates a cost or price for emitting CO_2 above some threshold (even if that price is not exactly the same as the price of emitting CO_2 in the U.S.).
- Working bilaterally with Canadian provinces or producers to develop approaches to normalize CO_2 emissions costs over time.[20]
- Imposing a price adjustment for evaluating economic imports, with the adjustment tied to the emission intensity of the marginal resource in the exporting region and the difference in CO_2 emission costs between the two regions.[21] We caveat this option by noting that we have not evaluated what options might be allowed under the North American Free Trade Agreement.
- Tracking and verifying clean energy imports on a unit level to ensure that contracted clean energy imports are physically delivered to the state. The M&V mechanisms would be largely similar to those within states' current RPS requirements and those required by the EPA under rate-based SIPs. We provide a detailed discussion of potential delivery and M&V approaches in Sections III.C and III.D below in relation to rate-based plans.

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18 See Statistics Canada (2015).

19 See Ontario Office of the Premier (2015), British Columbia Ministry of Finance (2016), Alberta Government (2016), and Government of Québec (2016).

20 For example, different regions may examine options for linking their carbon markets. California and Québec have CO_2e markets that are currently linked through the Western Climate Initiative. Ontario has announced in April 2015 that it would be joining the Western Climate Initiative, and Manitoba signed an agreement in December 2015 to link its carbon market as well. See Ontario Office of the Premier (2015) and Canadian Broadcasting Corporation News (2015).

21 This is similar to the "first jurisdictional deliverer" concept in the Western Climate Initiative where the entity importing energy into a covered jurisdiction (*i.e.*, into Québec or California), will be subject to compliance obligations on any emissions deemed to be embedded in the imported energy.

D. Incorporating Imports into the State's Clean Energy Portfolio

Many states may identify clean energy imports from Canada as a viable option for meeting CPP or other state-level policy objectives. But even if clean energy imports are a competitive CO_2 abatement opportunity, it does not mean that those imports will materialize absent state policy measures to facilitate them. We describe here the mechanisms that a state could pursue to enable and fund clean energy imports, either within the SIP or through other state policy mechanisms. These options vary depending on the regulatory structure of the state, including whether or not the state relies on traditional utility planning. After describing the range of funding mechanisms that could enable clean energy imports, we provide two concrete examples describing how those clean energy imports contribute to meeting the mass-based allowance standards in restructured and traditionally-regulated states.

1. State Policy Options for Enabling Clean Energy Imports

States that wish to enable clean energy imports from Canada as a compliance option to help meet CPP mass-based standards have a number of enabling and funding options available. We summarize these options in Table 2 below. None of these enabling and funding mechanisms is unique to clean energy imports; instead, these mechanisms can apply equally to all clean energy and energy efficiency targets. We recommend that these options for meeting clean energy goals be incorporated on a level playing field so that all cost-effective CO_2 abatement opportunities can be utilized.

Table 2
Options for Enabling Clean Energy Imports on a Level Basis with Other CO_2 Abatement Options

Option	Description
Economically-Driven Clean Energy Imports	• Some clean energy imports may be driven on an economic basis via wholesale energy market signals, driven by energy prices reflecting a CO_2 price • No additional state policies are necessary
Renewable Portfolio Standard	• Some states may introduce or expand an RPS, requiring that utilities or LSEs procure at least a minimum fraction of their energy needs from clean energy sources • Clean energy imports are qualified on a level basis with in-state resources as long as they meet eligibility and verification criteria • Many states already enable clean energy imports to qualify under an existing RPS[22]
CO_2 Allowance Allocations or Set-Asides for Clean Energy Producers	• Whether CO_2 allowances are distributed via auction or direct allocation, a state could allocate a portion of those allowances to entities that produce clean generation or invest in energy efficiency, including clean energy imports • Clean energy generators do not use allowances for compliance; however, allocating allowances to them amounts to a monetary incentive to produce clean power because the allowances can be sold bilaterally at market value
Clean Energy Fund Created from CO_2 Auction Revenues	• States that auction CO_2 allowances will collect revenues from auction proceeds • A portion of those revenues can be directed into a clean energy fund for supporting qualified projects or competitive solicitations, including from clean energy imports or associated transmission • For example, New York uses revenue from its RGGI allowance auctions to fund a green bank, community energy programs, residential energy efficiency, and renewable energy projects[23]
Competitive Solicitations for Clean Energy	• Utilities or state agencies can engage in competitive solicitations to procure clean energy including imports, signing contracts for cost-effective supplies • For example, Massachusetts has proposed a 1,200 MW solicitation for clean energy, including imports of new and existing clean energy[24]
Incorporating Clean Energy Imports in Integrated Resource Planning	• States can enable utilities to consider clean energy imports as one of the portfolio of options that may be used toward meeting the CPP standard within the integrated resource planning process • Utilities can use competitive solicitations to identify the lowest-cost clean energy opportunities from in-state or imported resources • For example, the Minnesota Public Utilities Commission approved a 20-year power purchase agreement between Minnesota Power and Manitoba Hydro as part of Minnesota Power's long term resource plan[25]

[22] See Table 7 for additional examples of states that accept renewable energy credits from resources located in Canada.

[23] See New York State Energy Research and Development Authority (2015).

[24] In July 2015, Massachusetts Governor Charles Baker proposed procurement of 1,200 MW of clean energy as part of Senate Bill No. 1965, see Massachusetts 189th General Court (2015).

[25] See Great Northern Transmission Line (2016).

2. Example of a Retail Restructured State with Allowance Auctions

The mechanics of how clean energy imports from Canada can help meet a mass-based standard in a retail restructured state is related to the CO_2 allowance allocations and enforcement, as summarized in Figure 2. This is the case even though clean energy importers are not directly involved with the transfer of these allowances in this example. Similar to the approach used in the retail restructured states participating in RGGI, we assume that the state sells off the entire budget of CO_2 allowances via competitive auction to the fossil generators who need allowances to demonstrate CPP compliance. As the compliance period progresses, fossil generators will adjust the quantity of allowances they hold through bilateral market transactions. Covered generators will then surrender one allowance for each ton of CO_2 emitted at the end of each compliance period. Covered generators may purchase CO_2 allowances from other states if further in-state CO_2 reductions are costly or infeasible. The relative supply and demand of CO_2 allowances will determine the price for CO_2 allowances in both the auctions and the bilateral market.

The flow of CO_2 allowances is very similar in a state that pursues clean energy imports from Canada as a major component of its CPP compliance strategy. Clean energy imports contribute to meeting the mass-based standard by displacing in-state fossil generation and the associated emissions. The resulting implications for the state could be to:

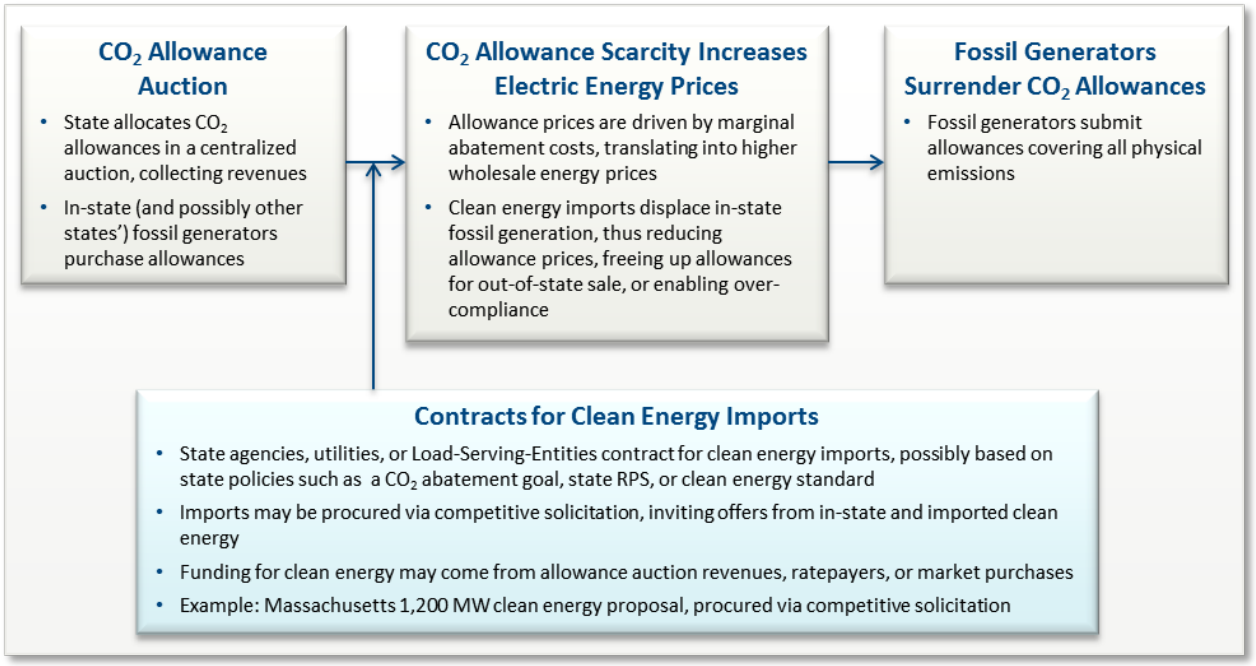
- Displace CO_2 emissions that would have occurred above the budget (and thus avoid the need for in-state fossil generators to purchase allowances from other states or entities);
- Displace enough CO_2 emissions to allow the state to emit less than the budget, thus giving the state the option to either: (a) free up some allowances for sale to out-of-state fossil generators and create net revenues to the state; or (b) over-comply compared to the CPP mass standard and achieve greater emissions reductions than required by EPA; and/or
- Reduce the relative scarcity of CO_2 allowances and, as a consequence, reduce the CO_2 allowance price as well as the wholesale power price.

As an example of a restructured state integrating clean energy imports into a CO_2 reduction plan, Governor Baker of Massachusetts proposed a clean energy procurement of 1,200 MW of supply through long-term (15–25 year) contracts, with clean energy imports competing with other clean energy options.[26] The clean energy would be procured in a competitive solicitation administered by distribution companies and the Massachusetts Department of Energy Resources. The distribution companies would contract with cost-effective clean energy resources to procure the associated energy, capacity, and renewable energy credits (RECs), and to pass the associated costs on to their customers. The contracts would displace the same quantity of energy and capacity

[26] See Massachusetts 189th General Court (2015).

that would otherwise have been procured from the wholesale market or provided by competitive suppliers.[27]

Figure 2
How Clean Energy Imports Contribute to Mass-Based CPP Compliance
Example of a Retail Restructured State with CO_2 Auctions



3. Example of a Traditionally Regulated State with Allowance Allocations

The mechanics of how clean energy imports from Canada would contribute to CPP compliance are somewhat different in a traditionally regulated state that directly allocates CO_2 allowances and where the utilities conduct integrated resource planning. As summarized in Figure 3, the state would allocate CO_2 allowances to utilities, LSEs, or generators within the state (which may be the same entity). Utilities will then conduct a forward-looking integrated planning process to comply with the CPP and meet other objectives. That plan could involve a combination of coal retirements, coal-to-gas fuel switching, energy efficiency, and clean energy procurements (including Canadian imports). The utility can then take on responsibility for managing CO_2 allowance needs by procuring any shortfall or selling any excess on the bilateral market, and surrendering allowances at the end of the compliance period.

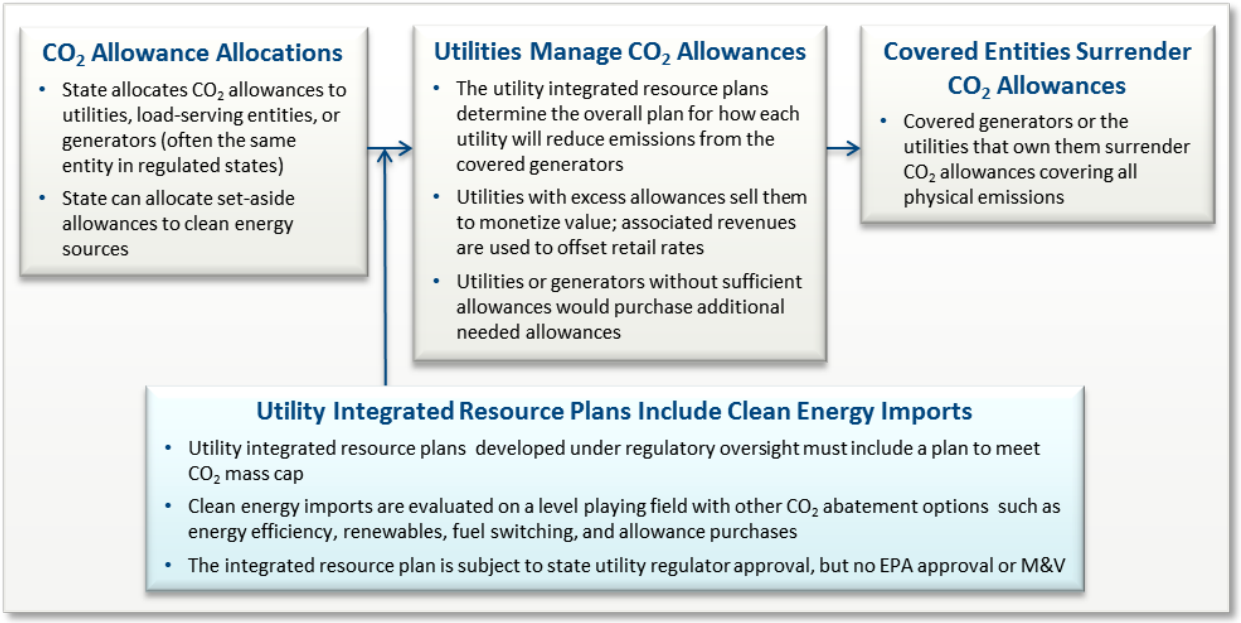
Clean energy imports from Canada can be used to contribute to compliance like any other source of clean energy supply that the utility might consider. States could direct utilities to consider

[27] We have not evaluated the potential Offer Review Threshold Price that such capacity imports may be subjected to by ISO New England, which could restrict the quantity of capacity procurements that would be displaced.

clean energy imports as one option for compliance, for example through competitive solicitations, and pursue those opportunities if they meet the same CO_2 abatement and state policy objectives as domestic resources.

Minnesota Power, for example, has signed a power purchase agreement with Manitoba Hydro as part of its long term clean energy strategy. The contract for hydropower includes the construction of a new 750 MW transmission line between Minnesota and Manitoba and is scheduled to be in service by June 2020.[28]

Figure 3
How Clean Energy Imports Contribute to Mass-Based CPP Compliance
Example of a Regulated State with CO_2 Allocations



[28] See Great Northern Transmission Line (2016).

III. Using Canadian Clean Energy Imports under Rate-Based Plans

In a state adopting a rate-based compliance strategy, affected fossil generators are required to reduce their emissions rate down to the EPA standard specified in units of pounds of CO_2 per MWh. The fossil generator can meet the standard either by reducing its physical emissions rate or by purchasing enough ERCs to bring the collective rate down to the standard.

Canadian clean energy imports, in-state clean energy, and energy efficiency can generate emission rate credits (ERCs) to help meet the standard. However, domestic resources and clean energy imports are subject to a number of eligibility and verification criteria to qualify. Rate-based SIPs must include provisions describing eligibility requirements for clean energy imports, although the EPA's guidance is limited on what these provisions should include.

We explain here how clean energy imports from Canada are accounted for in rate-based standards, what the SIPs must include to facilitate them, and their interactions with other state energy policies. While we are not offering legal advice and cannot guarantee that the options described here would necessarily be approved by the EPA, our aim is to offer solutions that meet our understanding of the intent of the EPA's guidelines while minimizing regulatory hurdles for states to use clean energy imports.

A. Accounting for Imported Clean Energy Resources

Under a rate-based plan, each covered EGU must show that its CO_2 emissions are below the rate standard imposed by the EPA (in units of pounds of CO_2 per MWh). Generators that emit at CO_2 rates higher than the standard may reduce their effective emissions rate by purchasing and surrendering ERCs, as shown in Equation 1. Each ERC is equivalent to 1 MWh of zero-emissions generation or energy efficiency that is qualified under the SIP, including from clean energy imports. By surrendering ERCs, a fossil generator demonstrates that it has reduced its effective emissions rate by increasing the total generation for each ton of CO_2 emissions produced.

Equation 1

$$\frac{\text{EGU } CO_2 \text{ Emissions}}{\text{EGU Generation + ERCs}} \leq \text{Emission Rate Standard}$$

Where:

EGU CO_2 Emissions (lbs) are the annual CO_2 emissions from a fossil generator.
EGU Generation (MWh) is the annual generation.
ERCs (MWh) are the emission rate credits surrendered by the generator.
Emission Rate Standard (lbs/MWh) is the rate that a generator must meet.

States may select either a *subcategory rate* or a *state-average rate* standard in their SIPs, with the rates decreasing over time as summarized in Table 3. The *subcategory rate* standard approach

sets one emissions rate standard for natural gas CC units (771 lbs/MWh by 2030) and a different emissions rate standard for fossil steam units (1,305 lbs/MWh by 2030). The applicable rate is the same across all states, but different between the two types of fossil plants. The subcategory rate standard is the one applicable for the rate-based model rule that the EPA has described in the proposed Federal Implementation Plan (FIP), meaning that ERCs created within that state could be sold to entities in other states adopting a subcategory rate approach.

States may alternatively select a single *state-average rate* standard. The state-average rate would apply to all covered generators regardless of technology type, but the applicable rate is different for each state.[29] The EPA has calculated the state-average rates in a way that is intended to result in equivalent CO_2 reductions compared to the subcategory rate approach. ERCs qualified and created in a state-average rate approach can be transferred among entities within the state, but they may not be sold to entities outside the state.[30]

Table 3
Emissions Rate Standards under Subcategory and State-Average Rate Approaches

	Rate Standards by Compliance Period			
	2022-2024 *(lbs/MWh)*	2025-2027 *(lbs/MWh)*	2028-2029 *(lbs/MWh)*	2030 *(lbs/MWh)*
Subcategory Rate				
Coal and Other Fossil Steam	1,671	1,500	1,380	1,305
Natural Gas Combined Cycle	877	817	784	771
State-Average Rate				
National Average	1,337	1,213	1,130	1,081
Range Across States	877-1,671	818-1,500	785-1,380	771-1,305

Sources and Notes:
National average computed as simple average across all states and territories, see EPA (2015).

Canadian clean energy imports that meet M&V requirements can create ERCs. Eligible resources, discussed in Section III.D.1 below, create 1 ERC for each verified MWh of generation. These ERCs can be traded in the same manner as domestically-generated ERCs and may be used by affected generators to demonstrate compliance.

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[29] The statewide average rate is an average of the natural gas combined cycle and fossil steam subcategory rates, weighted by the proportion of generation from each source in 2012. The EPA has calculated a different state-average rate for each state, see 80 Federal Register 64661, §60.5745.

[30] The differences in rates across states create an inconsistency that makes the emissions rate credit a product with a fundamentally different value in states with different applicable rates. The EPA would allow states to engage in multi-state trading using a single-rate approach if several states joined into a trading pool with a single uniform rate that has been EPA-approved, see 80 Federal Register 64661, §60.5750.

Table 4 illustrates the calculation of how many ERCs a coal-fired generator must surrender to comply with the CPP. In this example, the coal plant has a physical emissions rate of 2,200 lbs/MWh and must meet the 2030 subcategory rate standard of 1,305 lbs/MWh. Because its emissions rate is higher than the standard, if the coal plant generates 10 MWh of energy in the compliance period, it must surrender 7 MWh of ERCs to demonstrate compliance. The coal generator can obtain the ERCs created by any qualified clean energy resource, including clean energy imports from Canada.

Table 4
Rate-Based Compliance Example for an Existing U.S. Coal Generating Plant

Existing U.S. Coal Plant			
Physical Emissions Rate	[1]	2,200	*(lbs/MWh)*
Energy Production	[2]	10	*(MWh)*
CO_2 Emissions	[3] = [1] × [2]	22,000	*(lbs)*
EPA Compliance Showing			
Emission Rate Standard	[4]	1,305	*(lbs/MWh)*
ERCs Needed for Compliance	[5] = [3] ÷ [4] - [2]	7	*(MWh)*

B. State Options and Considerations

A state using a rate-based approach that wants to consider clean energy imports from Canada will need to examine how best to incorporate those imports. The SIP is one aspect of the state's energy policy framework, and codifies the EPA-approved mechanisms for tracking and enforcing CPP compliance. States may want to develop a complementary set of state policies to align CPP compliance strategies and other state policy objectives. Table 5 briefly summarizes policy elements that states will need to consider when developing their SIPs and complementary state policies, and describes how they relate to clean energy imports from Canada.

Any state wishing to facilitate clean energy imports as part of a rate-based implementation plan will need to develop eligibility and verification requirements consistent with EPA guidelines. Critical issues for states to consider include:

- Examining the potential for interactions between ERC and REC tracking mechanisms (see Section III.C);
- Developing a SIP that explicitly enables imported clean energy and meets the EPA's guidelines for qualification, physical interconnection, contracting, and M&V standards (see Section III.D); and
- Ensuring that eligible clean energy imports are enabled or supported by state-level policies, including through RPS programs, utility integrated resource plans, or other state-driven clean energy initiatives (see Section III.E).

In the following sections, we discuss how states can use clean energy imports from Canada under a rate-based approach to comply with the CPP and pursue complementary state policies.

Table 5
Policy Issues and Options for States Pursuing Rate-Based CPP Compliance

Policy Element	Primary Options and Considerations
ERC Eligible Resource Types	• New renewable resources (including hydroelectric) installed after 2012 and uprates to existing renewable resources (no existing plants, nuclear, or efficiency)
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 in the FIP, 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 CO_2 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 FIP (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)

C. HARMONIZING ERCS AND RECS

States that have an RPS standard and use a rate-based CPP compliance approach will face the question of whether and how to coordinate ERCs and RECs. Each ERC or REC represents 1 MWh of qualified generation. Because RECs and ERCs may be generated by similar renewable

energy resources, they appear to be similar products. However, they are used for two different purposes by two different types of entities:

- **RECs** are typically obtained by LSEs. Each LSE needs to demonstrate that a certain fraction of its energy supply is met using eligible resources and surrendering that quantity of RECs. RECs are generated by qualified resources, which vary by state, and are tradable among all LSEs in the state and, at times, across a particular region (see Section III.D.3 below). Regardless of how the RECs are traded, a state can confirm that its RPS target is achieved in aggregate as long as each LSE meets its own requirement.
- **ERCs** need to be purchased by CPP-covered fossil generators. The generator will need to procure enough ERCs to meet the rate-based standard and demonstrate compliance to CPP. ERCs will be tradable within the state and across states in the same trading pool (which could be a nation-wide trading pool if the state uses the trade-ready subcategory rate approach described as one of the FIP model trading rules). As another distinction, ERCs can be created by resources that are not typically eligible for the RPS, including nuclear, efficiency, and sometimes low-emitting fossil generation.

In other words, RECs and ERCs have two different meanings, are used for different purposes, and likely have different eligible generation types. We therefore recommend that these be maintained as two separate products, consistent with EPA's recommendation in the CPP.[31] Any resource eligible to contribute to both the RPS and CPP compliance would create 1 ERC *and* 1 REC for generating 1 MWh of generation.

This may at first seem like double-counting or awarding excess incentives for creating clean energy, but upon further consideration, it is not. Rather than causing over-payment for clean energy, competitive forces will work to ensure that the combined value of selling ERCs and RECs is just enough to incentivize clean resources. If ERCs are in high demand, the REC price may decrease or fall to zero, and the state will likely exceed its RPS target. If ERCs are in abundance, then REC prices will need to be higher to meet the state's RPS. [32]

The primary concern for a mismatch between ERCs and RECs would be when some resources are eligible to meet only one of the two standards while other resources are eligible for both. Resources eligible to generate both products would be awarded greater incentives than resources eligible to create only one.

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[31] See 80 Federal Register 64661, section VIII.K.2.f.

[32] This assumes that both emission rate credit and renewable energy credit prices are positive. In the case where there are more resources generating emission rate credits or renewable energy credits than required to meet the demand, the price for the product with excess supply will be near zero.

D. Eligibility and Verification Requirements for Imported Clean Energy

The EPA has confirmed that Canadian imports into the U.S. can contribute to CPP compliance under rate-based plans through the generation of ERCs, as long as the resources meet eligibility and verification requirements. Eligible imported resources include new and incremental hydroelectric, wind, and other renewable resources developed after 2012, as long as those resources meet physical interconnection, contracting, and M&V requirements.

While the EPA provides some overall guidance, it has provided minimal instructions on how to interpret these requirements. We summarize this high-level guidance in Table 6 and in the following sections, along with our own interpretation of the options for how to include these requirements in the SIP. While we cannot guarantee that all of the options we suggest would necessarily be approvable by the EPA, we have attempted to prepare options that are consistent with our understanding of the intent of the CPP and precedents established in other contexts.

With respect to imports of clean energy from resources constructed up to and including 2012, states may utilize such imports to displace existing fossil generation. By displacing in-state fossil generation through reduced dispatch or retirements, imports can reduce the total number of ERCs that a state would need to meet the CPP standard. Thus, clean energy imports from resources constructed up to and including 2012 can contribute toward meeting rate-based compliance standards even though they do not create ERCs.

Table 6
Summary of ERC Eligibility Requirements for Canadian Imports to Create ERCs

Requirement	EPA's Existing Guidance	Possible Demonstration Approaches
Qualifying Resource Types	• New generation or uprates of hydroelectric and other renewables installed after 2012	• See M&V below
Physical Interconnection	• "…the country generating the ERCs must be connected to the U.S. grid."	• Demonstration of physical transmission system upgrade completed in connection with particular resources • Firm or non-firm point-to-point transmission rights • E-Tag schedules for after-the-fact demonstration • Regional Transmission Organization demonstrated delivery into footprint for "network access" • Any other method of demonstrating both: (a) sufficient transmission to support incremental imports, and (b) a delivery point in a rate-based state
Contracted Assets	• "…there must be a power purchase agreement or other contract for delivery of the power with an entity in the U.S."	• 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 • Settlement of energy sales to a qualified U.S. regional transmission organization or market delivery point • Any other method demonstrating both: (a) a U.S. entity counterparty; and (b) physical delivery into a rate-based state
Measurement and Verification	• Independent verification of generation unit eligibility and M&V, including *ex-post* documentation of clean energy generation • Registration of eligible resources with an ERC tracking system	• Registration and creation of ERCs through existing REC M&V organizations (proposed in FIP) • Tracking ERC holdings and transfers through EPA allowance tracking and compliance system (proposed in FIP); can use third party for this function

Sources and Notes:

Possible demonstration approaches; not explicitly discussed by EPA and not a legal interpretation.
See EPA (2015), VIII.K.1.a.(1).(c).(iii).

In describing options for meeting EPA requirements in the following sections, we draw extensively on existing state RPS policies as useful examples. As shown in Table 7, many states have mechanisms that could or might enable renewable resources from Canada to meet their RPS if other eligibility requirements are met. States that already enable Canadian imports will likely need to update their qualification and verification mechanisms to ensure that their approaches fulfill EPA's requirements and that Canadian imports are facilitated without excessive barriers to participation.

Table 7
Examples of States Accepting RECs from Canadian Resources
(Non-Exhaustive List, Additional RPS Programs May Qualify Canadian Imports)

States Accepting Canadian Renewables	Generator Provinces Accepted
California	Alberta, British Columbia
Oregon, Washington	British Columbia
New England (Connecticut, Massachusetts, Maine, New Hampshire, Rhode Island)	Newfoundland and Labrador, New Brunswick, Nova Scotia, Prince Edward Island, Québec
New York	Ontario, Québec
Minnesota	Manitoba, Ontario, Saskatchewan
Wisconsin	Manitoba, Saskatchewan

Sources and Notes:
Compiled from Holt (2014) and N.C. Clean Energy Technology Center (2016).
This table is not an exhaustive list of states that accept RECs from Canadian resources.

1. Qualified Resource Types

Not all imported Canadian clean resources are eligible to generate ERCs under rate-based plans. Table 8 summarizes the resources that are eligible to create ERCs, based on whether they are located in the U.S. or imported. As the table shows, clean energy imports from hydroelectric and other renewables built or uprated after 2012 are eligible to create ERCs. Canadian resources including low-emitting fossil, nuclear, existing generation, and energy efficiency are not eligible.

The fact that some types of clean Canadian resources are not eligible to generate ERCs under rate-based plans may be seen as a drawback by some states, when compared to the mass-based compliance approach. As discussed in Section II.B above, under mass-based plans the state would not be precluded from using a broader set of imported resources, if desired.[33]

[33] Non-eligible Canadian imports may be used to displace in-state fossil generation and thereby reduce the total number of emission rate credits required; however, these resources will not themselves be able to generate emission rate credits.

Table 8
Comparison of U.S. and Canadian Sources Eligibility for ERC Creation

Resource Type	U.S. Clean Energy	Imported Clean Energy
Low-Emitting Fossil Resources	Eligible*	Not Eligible
Existing Clean Resources as of 2012	Not Eligible	Not Eligible
New Renewables	Eligible	Eligible
New Nuclear	Eligible	Not Eligible
New Energy Efficiency	Eligible	Not Eligible

Sources and Notes:
*CPP-covered fossil resources emitting less than the applicable standard in rate-based states are eligible.
"New" resources include those online or uprated after January 1, 2013, see 80 FR 64661 §60.5800.

2. Physical Interconnection and Contracted Asset Requirements

Under the CPP, imported clean energy is required to be from countries that are physically interconnected with the U.S. grid, and the imports are must be contracted to supply energy to a U.S. entity. The specific language provided to describe these requirements is sparse, however, and is limited to a few brief statements, as follows:

- Physical Interconnection: The EPA states that other countries from which clean energy is imported "…may provide ERCs to adjust CO_2 emissions provided they are connected to the contiguous U.S. grid and meet the other requirements for eligibility…."[34]
- Contracting: The EPA requires that there must be "…a power purchase agreement or other contract for delivery of power with an entity in the U.S."[35] In a separate discussion of eligibility for generators located in non-CPP affected regions of the U.S., the EPA states that the requirements are put in place to demonstrate that "generation was delivered to the grid to meet electricity load in a state with a rate-based plan."[36] In this case, the power delivery contracts are described as possible demonstration methods; however, EPA also describes that it gives states "flexibility regarding the nature of this demonstration."[37]

Although the EPA has not provided a detailed discussion of the above two requirements, our understanding is that the physical interconnection and contracting requirements, when taken together, are intended to ensure that ERCs represent energy that has been physically delivered into a U.S. state using a rate-based approach. As long as the energy is physically delivered and displacing energy produced in a rate-based state, it will reduce CO_2 emissions from that state and contribute toward meeting the overarching policy goal of the CPP. To spell it out more

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[34] See 80 Federal Register 64661, § 60.5800 (e).

[35] See 80 Federal Register 64661, VIII.K.1.a.(1).(c).(iii).

[36] *Ibid.*

[37] *Ibid.*

explicitly, we interpret the physical interconnection requirement as a means to demonstrate that a resource has the *ability to physically deliver energy* into the U.S., and the contracting requirement as a means to demonstrate that *energy actually has been delivered.*

We use this overarching interpretation to describe a menu of options that SIPs could include to demonstrate eligibility. We have attempted to describe a set of options that is broad enough to enable a wide range of business models and regulatory contexts, and enable participation for non-contiguous states and provinces *as long as* the ultimate result is to fulfill the spirit of EPA's requirement. We recommend that each state offer an open-ended option for clean energy importers to demonstrate that the requirement has been fulfilled through other means, as long as the demonstration shows certain minimum criteria have been met.

a. Options for Demonstrating Physical Interconnection

We interpret the physical interconnection requirement as a means of demonstrating that a specific clean energy resource has the *ability* to deliver energy into the U.S. We therefore suggest that a SIP should allow any resource to meet this standard, via any demonstration method, as long it meets the following minimum criteria:

- There is sufficient transmission capability to support the delivery of energy from the resource into the U.S. without displacing other energy imports that would have been imported from Canada even without the CPP. This criterion ensures that an incremental quantity of energy can be physically imported.
- The specified delivery point in the U.S. is either: (a) within the U.S. state that is submitting the SIP (the narrowest interpretation of EPA intent); (b) in another rate-based U.S. state in the same Regional Transmission Organization (RTO) and within the same ERC trading pool; or (c) within any rate-based U.S. state within the same ERC trading pool (the broadest interpretation of EPA intent). This criterion ensures that the resource can physically displace energy in one of the rate-based states with which the ERC is intended to be a uniform tradable product.

We suggest that the broadest interpretation of eligible delivery points be adopted as being the most consistent with context of the CPP. While this has not been fully articulated or tested, we interpret the EPA language on connectivity to mean that border U.S. states with direct interconnections can import Canadian generation and ERCs, and that these border states can act as a "landing point" for creating ERCs that can be transferred to other states. For the same reason, we interpret that non-border states should be eligible to qualify and verify an ERC, as long as it is delivered into another rate-based state in the same trading pool. This interpretation is consistent with EPA's overall approach that treats ERCs as a fungible product that can be transferred freely among rate-based states in the same trading pool.

Allowing the broadest interpretation of eligible delivery points will maximize the ability to rely on clean energy imports, including in U.S. states that do not border Canada, while still ensuring

that EPA's goals are met. However, we recommend that until the EPA specifically confirms this broadest interpretation, SIPs should include the two narrower options as secondary alternatives.

There are a number of specific options for demonstrating that a resource meets these minimum requirements. We describe several of these options, as follows, and explain the rationale regarding why we believe each of these options matches the spirit of EPA's intent:

- **Firm or Non-Firm Point-to-Point Transmission Rights:** Using this approach, generators in Canada could demonstrate deliverability to a U.S. entity by showing physical (not financial) transmission rights along a path of existing or new transmission infrastructure, from the eligible Canadian resource to a qualified delivery point within the U.S. Physical transmission rights are commonly used throughout the U.S. and through much of Canada to demonstrate that there is sufficient transmission to support deliverability for other purposes, including energy and capacity sales. Physical transmission rights can be used to demonstrate deliverability across a short path (*e.g.*, over the border), or a longer delivery path (*e.g.*, from a non-bordering province to a non-bordering U.S. state).
- **Physical Transmission Upgrades:** Another option would be to demonstrate that there are physical transmission upgrades being pursued in connection with the resource development. The resource would need to show that the physical transmission upgrade is somehow physically or financially connected to the renewable resource development and is large enough to support the resource project.
- **RTO Footprint "Network Access":** For states in an RTO, we recommend that transmission deliverability be defined in terms of "network access." This is the approach that RTOs have developed for demonstrating deliverability in their energy and capacity markets, under Federal Energy Regulatory Commission (FERC) oversight. Under this approach, as long as a Canadian resource has demonstrated deliverability to any point within the RTO footprint, it would be considered "deliverable" to all states within that RTO. This could mean, for example, that the Canadian resource acquires point-to-point transmission rights to an RTO border point or that it qualifies as a "pseudo-tied" resource into that RTO.
- **E-Tag Schedules:** Another option is to show, after-the-fact, that the clean energy importer has actually scheduled the energy into the U.S. using "E-Tags," also called North American Electric Reliability Corporation (NERC) Tags. E-Tags are used by system operators to track energy transactions from a source point to a specific sink point across systems. The advantage of using E-Tags is that they demonstrate that the energy was possible to deliver from source to sink, and that the energy was actually delivered. Using E-Tags to demonstrate deliverability is advantageous in that they can be used to demonstrate deliverability from Canadian provinces that do not have a mechanism for using physical point-to-point transmission rights. The disadvantage of requiring E-Tags is that it could be a relatively onerous requirement to demonstrate delivery of every MWh from source to sink over the resource's life. We therefore recommend that E-Tags be included as one, but not the only, option for demonstrating interconnection and delivery.

Many states include one or more of these requirements as part of a state RPS program. For example, several New England states (Maine, Massachusetts, New Hampshire, and Rhode Island) require that energy be deliverable to somewhere in the multi-state New England control area, implicitly using the idea of RTO network access as the definition of deliverability.[38] Three of those states impose additional requirements to demonstrate *actual after-the-fact* delivery through showing E-Tags.[39] Some of those states have requirements for demonstrating that the energy meets a contracting or settlement requirement (see the next section).[40] Clean energy resources from both bordering and non-contiguous Canadian provinces currently qualify for delivery under New England states' RPS programs, including resources from Québec, New Brunswick, and Prince Edward Island.[41]

b. Options for Demonstrating Contracting Requirement

We interpret EPA's contracting requirement as a means to confirm that the energy has been physically delivered into the U.S. We therefore suggest that a SIP should allow any resource to meet this standard, via any demonstration method, as long it meets the following minimum criteria:

- The contract is a physical (rather than financial) arrangement, specifying payment for physical energy delivery to a qualified location in the U.S.; and
- The counterparty is a "U.S. entity" as specified by the EPA, which could mean either: (a) an entity with a physical load interest in the U.S., such as an end user, utility, competitive retailer, or other LSE (narrowest interpretation); (b) the purchaser of the energy is any entity that purchases energy on behalf of physical load interests, including agents of the state, RTOs, energy brokers, or other intermediaries; (c) any entity with physical generation or load interests in the U.S. (with generators possibly acting as counterparties in order to secure ERCs for compliance); or (d) any entity with business operations in the U.S., including financial entities (broadest interpretation).

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38 See State of Maine Statutes (2011), Massachusetts Department of Energy Resources (2014), New Hampshire Statutes (2014), and Rhode Island Public Utilities Commission (2014).

39 New Hampshire, Rhode Island, and Massachusetts all require an E-Tag demonstration. See Massachusetts Department of Energy Resources (2014), New Hampshire Statutes (2014), and Rhode Island Public Utilities Commission (2014).

40 New Hampshire and Rhode Island require demonstration of a bilateral contract plus settlement into the ISO New England market. Massachusetts also requires settlement into the ISO New England. See Massachusetts Department of Energy Resources (2014), New Hampshire Statutes (2014), and Rhode Island Public Utilities Commission (2014).

41 New England states including Connecticut, Massachusetts, New Hampshire, and Rhode Island require that eligible resources imported into the region be located in a control area adjacent to the New England Control Area. This restriction is not necessary to confirm Clean Power Plan eligibility, interconnection, or physical delivery. See Massachusetts Executive Office of Energy and Environmental Affairs (2016b).

We interpret the EPA's intention to be seeking confirmation that the energy will be physically delivered into the U.S. Thus, we believe the first of these two criteria to be the most important. We therefore suggest that SIPs maintain the broadest possible interpretation of potential counterparties, as long as the contract requires physical energy delivery to a qualified point for payment.

We propose the following options for demonstrating this requirement and explain the rationale for why we believe each of these options matches our interpretation of EPA's intent:

- **Contracts with U.S. Entities:** Contracts with any U.S. entity (whether load, generation, or financial). Contracts of any duration, magnitude, or settlement arrangement could be considered, as long as 1 MWh of energy is physically delivered at a qualified delivery point for every ERC registered. This delivery could be confirmed via: (a) after-the-fact demonstration that the energy has been delivered, using E-Tags or settlement data; or (b) before-the-fact demonstration based on contract terms that require 1 MWh of energy to be purchased at the delivery point for every ERC generated and purchased.
- **Settlement of Energy Sales into a U.S. RTO or Market Trading Point:** Another option used in several RPS programs, including that of Massachusetts, would be based on after-the-fact demonstration of settling energy sales from the generating resource to a qualified U.S. delivery point (*e.g.*, delivery point in a U.S. RTO). This method requires a loose interpretation of the EPA's requirement that there be a "contract," but matches the spirit of ensuring physical delivery, given that RTOs purchase physical energy on behalf of loads.

3. Measurement, Verification, and Tracking

The EPA requires that a SIP include M&V mechanisms for registering qualified ERCs and tracking their transfer to compliance entities. The M&V requirements needed for CPP are very similar to those widely in use to support state RPS requirements. There are several REC tracking systems currently in place that support U.S. and Canadian generation, as shown in Figure 4.

These existing REC registries perform all of the same functions that will be needed to generate and track ERCs for CPP. The registries specify metering requirements, issue RECs, prevent double-counting, and provide a platform for independent verification of claimed generation. When a REC is generated, the registry designates the specific state RPS programs for which it is qualified, based on that state's qualification and deliverability criteria. For example, 465 MW of renewable generators in Québec and Prince Edward Island are registered with the NEPOOL Generation Information System (NEPOOL GIS).[42] Most of these Canadian generators have qualified into one or two states' RPS programs (including those of Connecticut, Massachusetts, and Maine). However, these resources are not automatically qualified into all of the RPS programs across New England simply by being registered in NEPOOL GIS.

[42] See New England Power Pool Generation Information System (2016b).

In the proposed FIP and Model Trading Rules, the EPA recommends that states rely on these same organizations for ERC M&V requirements. The company that supports most of the existing registries, APX Inc., announced in May 2015 that it will support CPP-compliant ERC M&V.[43]

States that wish to enable a broad set of clean energy imports may want to consider allowing ERCs certified by multiple REC tracking systems. As shown in Figure 4, there are geographic eligibility requirements for generators that wish to register with the REC tracking systems. For example, the Midwest Renewable Energy Tracking System (M-RETS) allows only generators that are located within M-RETS footprint, owned by a utility in the M-RETS footprint, or have a contract to deliver renewable energy into the M-RETS footprint.[44] NEPOOL GIS has similar geographic restrictions.[45] Each REC tracking system provides the same M&V functionality, so enabling ERCs originating in multiple REC tracking systems will enable more clean energy imports that meet the delivery and contracting requirements. This type of transfer between REC registries exists between REC systems. RECs issued by the M-RETS registry, for example, can be exported to the North American Renewables Registry (NAR), North Carolina Renewable Energy Tracking System (NC-RETS), and Michigan Renewable Energy Certification System (MIRECS).[46]

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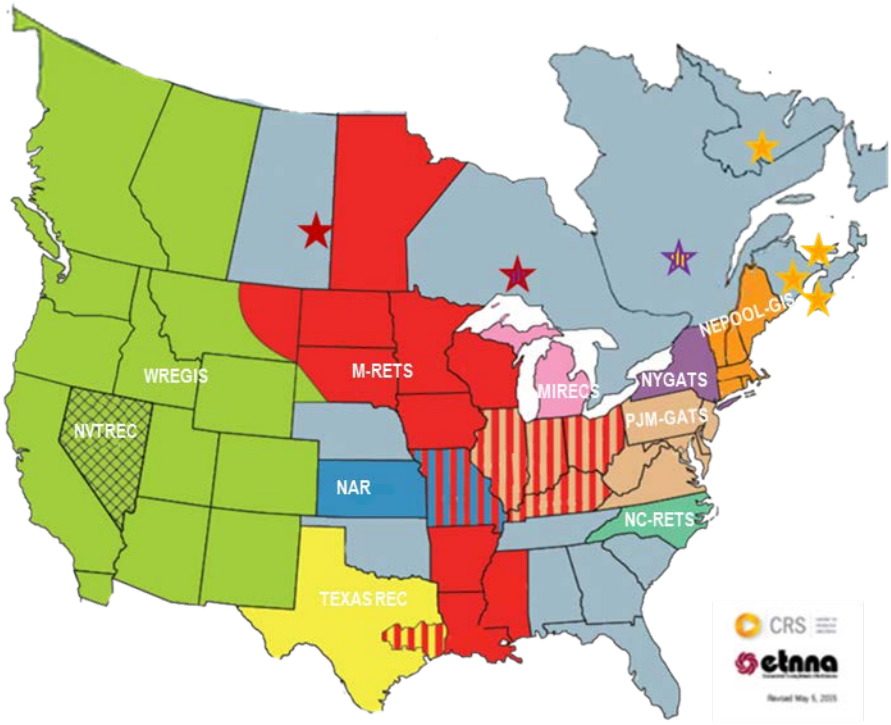
43 See 80 Federal Register 64966, and APX (2015).

44 See Midwest Renewable Energy Tracking System (2016b).

45 See New England Power Pool Generation Information System (2016a).

46 See Midwest Renewable Energy Tracking System (2016b).

Figure 4
Existing North American REC Tracking Systems



Sources and Notes:
Figure developed by the Environmental Tracking Network of North America (2015).
Gray regions indicate locations where no tracking system has been formally adopted.
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.
MIRECS: Michigan Renewable Energy Certification System.
M-RETS: Midwest Renewable Energy Tracking System.
NEPOOL GIS: New England Power Pool Generation Information System.
NVTREC: Nevada Tracks Renewable Energy Credits.
NYGATS: New York Generation Attribution Tracking System.
NAR: North American Renewables Registry.
NC-RETS: North Carolina Renewable Energy Tracking System.
PJM-GATS: PJM-Generation Attribute Tracking System.
WREGIS: Western Renewable Energy Generation Information System.
Texas REC: Texas Renewable Energy Credit Program.

E. INCORPORATING IMPORTS INTO THE STATE'S CLEAN ENERGY PORTFOLIO

Clean energy imports from Canada may be a viable option to meet both CPP compliance and state policy objectives under a rate-based plan. To achieve the most competitive resource mix, states need to craft policies that put domestic and imported clean energy on a level playing field. In this section, we describe the state policy options beyond the SIP that states could pursue to enable clean energy imports from Canada. These options are similar, but not identical, to the options applicable under mass-based plans, as described in Section II.D.1 above. We then

provide a concrete example of how clean energy imports can contribute to meeting a rate-based standard in a traditionally regulated state.

1. State Policy Options for Enabling Clean Energy Imports

States that wish to enable clean energy imports from Canada as a compliance option under a rate-based standard have several options for supporting their development, as summarized in Table 9. These approaches to facilitating clean imports are similar to those described above in association with mass-based plans. The policy mechanisms summarized in Table 9 can apply equally to all ERC-eligible demand- and supply-side resources. Many of these mechanisms are complementary, and need not be viewed as mutually exclusive alternatives. For example, incorporating eligible clean energy imports into utilities' integrated resource plans may help a state achieve its RPS. We recommend that these options for meeting clean energy goals be incorporated on a level playing field.

Table 9
Options for Enabling Clean Energy Imports on a Level Basis with Other CO_2 Abatement Options

Option	Description
Renewable Portfolio Standard	• Some states may introduce or expand RPS or clean energy standards, requiring that utilities or LSEs procure at least a minimum percentage of their energy needs from clean sources • Clean energy imports can be qualified on a level basis with in-state resources as long as they meet eligibility and verification criteria
Competitive Solicitations for Clean Energy	• Utilities or state agencies can engage in competitive solicitations to procure clean energy including imports, signing contracts for cost-effective resources
Incorporating Clean Energy Imports in Integrated Resource Planning	• States can direct utilities to consider clean energy imports as one of the portfolio of options that may be used toward meeting the CPP standard within the integrated resource plan • Utilities can use competitive solicitations to identify the lowest-cost clean energy opportunities from in-state or imported resources
Importing Clean Energy in Excess of Need and Selling ERCs to Other States	• States can pursue a strategy of over-compliance relative to the rate-based standard • Utilities or load representatives contracting for the eligible clean energy imports would accrue an excess of ERCs that could be sold to out-of-state entities, with the revenues used to offset customer rates

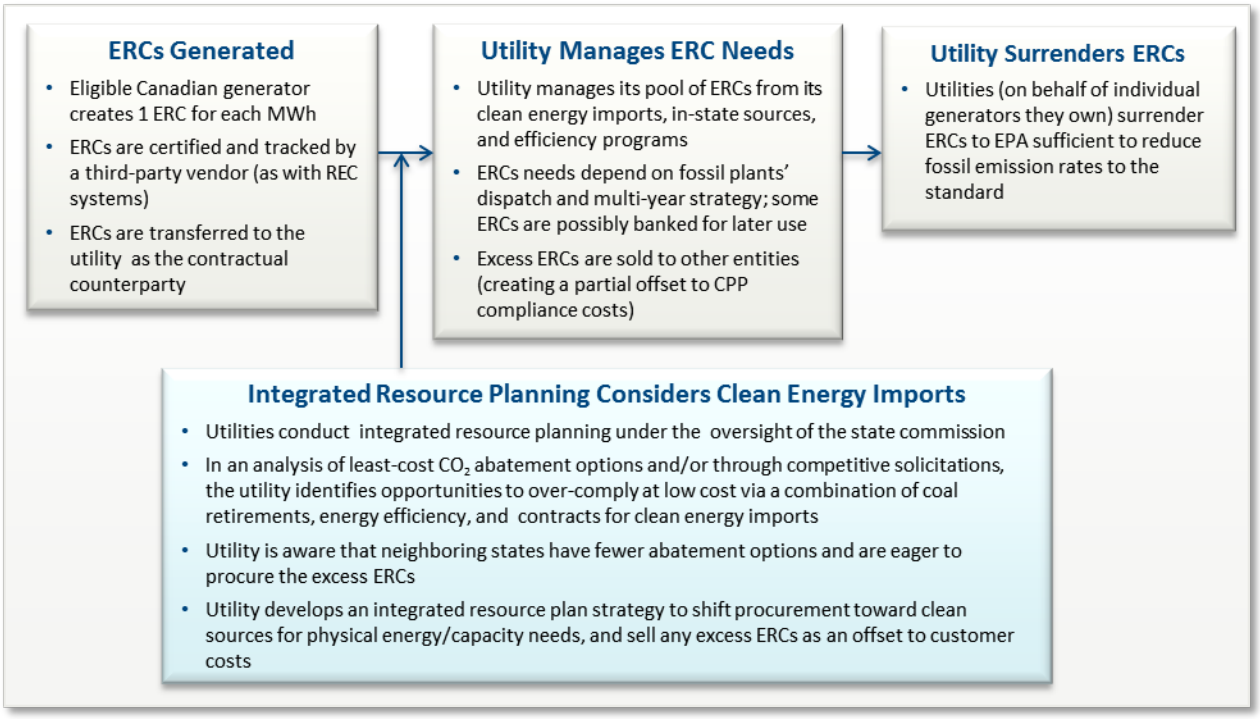
2. Example of a Regulated State Exporting ERCs

The mechanics of how clean energy imports from Canada would contribute to CPP compliance under a rate-based plan follow the transfer of ERCs generated by clean energy importers and fossil generators that comply with the standard. We summarize that process in Figure 5, using the example of a regulated state that relies on utility planning and has a strategy to over-comply and export the excess ERCs.

The utility would begin by analyzing the most economic mix of energy efficiency, fuel switching, and zero-emission generation to meet the rate-based CPP standard. Through a combination of resource planning analysis and competitive solicitations, the utility would determine an efficient combination of in-state and imported opportunities for generating ERCs and meeting the compliance standard. The utility then signs contracts to procure energy and ERCs (as well as possibly procuring capacity and RECs) from the identified clean energy resources.

The utility, under the oversight of the state utility commission, may pursue an opportunity to over-comply relative to the rate-based standard at low cost. For example, this could happen if the clean energy imports from Canada are a competitive resource to meet incremental energy and capacity needs even if the utility holds sufficient ERCs for its own use. The utility would show compliance to the EPA by surrendering enough ERCs to cover the needs of its own fossil generators and have additional ERCs to sell on the bilateral market. Depending on the availability of low-cost abatement opportunities in other regions, selling ERCs to other generators in the state or in other states could be a material revenue stream. The collected revenues could then be used to offset the cost of service.

Figure 5
How Clean Energy Imports Contribute to Rate-Based CPP Compliance
Example of a Traditionally-Regulated State that Exports ERCs



IV. Conclusions

The Canadian generating fleet is dominated by hydro, nuclear, wind, and other zero-emitting resources. Combined, these resources generated approximately 83% of Canadian electricity in 2015. Moreover, continued growth in zero-emitting generation is substantial. For U.S. states to incorporate clean energy imports from Canada into their CPP compliance strategy, state policymakers can consider a combination of provisions within the SIP itself and within related state energy policies.

Mass-based plans will generally provide the most flexibility in how states can incorporate clean energy imports. Rate-based plans will not be able to qualify some types of clean energy imports to create ERCs, with excluded resource types including energy efficiency, resources constructed in 2012 or earlier, and nuclear. Rate-based plans will require a more focused effort to ensure that the policy design does not inadvertently preclude certain types of resources or business models. Both types of plans can enable clean energy imports, although the exact mechanisms differ to some extent.

All Rate and Mass Plans. Some options for most effectively enabling clean Canadian imports would be beneficial regardless of the implementation approach, including:

- Establishing a level playing field for all domestic and imported clean energy resources;
- Minimizing barriers for clean energy imports from Canada to participate under existing or expanded RPS programs, or other state programs for zero-emitting generation;
- Working with resource owners and system planners to develop the necessary transmission infrastructure to facilitate clean energy imports; and
- Structuring competitive solicitations for clean energy resources to enable all types of resources to be developed.

Mass-Based Plans. The EPA does not require states to define eligible clean Canadian imports or M&V requirements for imports under mass-based plans. However, to facilitate clean energy imports, states may:

- Design allowance set-asides that allow all zero-emission generation to participate; and
- Consider the potential for domestic and international emission leakage risks, and either demonstrate that the generation portfolio poses minimal CO_2 leakage risks or develop policies to mitigate this CO_2 leakage risk.

Rate-Based Plans. The EPA requires that countries from which clean energy is imported be physically interconnected to the U.S. and that the imports be contracted in order to qualify for

producing ERCs. However, the EPA's guidance on how to demonstrate those requirements is limited in several areas. To minimize barriers to clean energy imports, we recommend that states enable a broad range of different approaches to demonstrating physical interconnection and contracting requirements, as long as the combination of the two demonstrates that the energy has been physically delivered into a rate-based state in the U.S. We recommend:

- *Physical Interconnection* to be defined as the ability to deliver energy into a sink point in any rate-based state in the U.S. This could be demonstrated before the fact by obtaining point-to-point transmission service, investing in physical transmission upgrades in connection with the clean energy resource, or obtaining approval for "network access" delivery into an RTO footprint. It could be demonstrated after the fact by showing that the energy was physically delivered based on E-Tag schedules, RTO settlement data, or settlement data associated with a U.S. counterparty that required physical delivery for payment;
- *Contracting with a U.S. entity* to be interpreted broadly to mean contracts of any term with any U.S. entity including load, generation, RTO, and financial counterparties, as long as payment for the energy requires physical delivery to a settlement point within a rate-based U.S. state. Some of the options for demonstrating this contract requirement would simultaneously demonstrate the physical interconnection requirement above. Demonstration options include E-Tag schedules, RTO settlements data, or bilateral settlements data with a U.S. counterparty along with contract terms specifying that payment required physical delivery;
- Specifying that the delivery point does not need to be within the state that issues the ERC, as long as the delivery point is in a U.S. state within the same rate-based ERC trading group;
- Specifying that the clean energy resource does not need to be in a province with a physical border with the U.S. state that issues the ERC. The energy can be deemed deliverable and wheeled through intermediate provinces and states, as long as the above requirements are fulfilled in a way that demonstrates physical delivery was achieved; and
- Using existing REC registries for verifying and tracking ERCs.

By following this technical guidance, states would maximize their ability to incorporate clean energy imports from Canada into their strategies for achieving CPP compliance and other complementary clean energy goals.

List of Acronyms

BAU	Business-As-Usual
CC	Combined-Cycle
CCS	Carbon Capture and Sequestration
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide Equivalent
CPP	Clean Power Plan
CT	Combustion Turbine
EGU	Electric Generating Unit
EPA	Environmental Protection Agency
ERC	Emission Rate Credit
FERC	Federal Energy Regulatory Commission
FIP	Federal Implementation Plan
ISO	Independent System Operator
LBS	Pounds
LSE	Load Serving Entity
M&V	Measurement and Verification
M-RETS	Midwest Renewable Energy Tracking System
MIRECS	Michigan Renewable Energy Certification System
MW	Megawatt
MWh	Megawatt-Hour
NAR	North American Renewables Registry
NC-RETS	North Carolina Renewable Energy Tracking System
NEPOOL	New England Power Pool
NEPOOL GIS	New England Power Pool Generation Information System
NERC	North American Electric Reliability Corporation
NVTREC	Nevada Tracks Renewable Energy Credits
NYGATS	New York Generation Attribution Tracking System
PJM-GATS	PJM-Generation Attribute Tracking System
REC	Renewable Energy Credit
RGGI	Regional Greenhouse Gas Initiative
RPS	Renewable Portfolio Standard
RTO	Regional Transmission Organization

SIP	State Implementation Plan
TWh	Terawatt Hour
U.S.	United States
WREGIS	Western Renewable Energy Generation Information System

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