Powerex

Clean Energy Trade Standard

White Paper

April 2021

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EXECUTIVE SUMMARY

Over the past decade, multiple western states and Canadian provinces have adopted programs to reduce greenhouse gas (“GHG”) emissions associated with the production of electricity. More recently, there has been growing support for a decarbonized western electricity grid, in which the use of fossil-fueled generation is sharply limited or even eventually eliminated. Successful decarbonization of the electricity grid can also be a powerful catalyst for further GHG reductions in other sectors, such as through electrification of transportation, buildings and industrial processes.

Achieving these ambitious environmental goals will require multiple approaches, including the continued build-out of renewable resources, the installation of utility-scale storage, and expanded demand-side participation. But the optimal mix of resources and decarbonization approaches is almost certain *not* to be achieved by multiple different jurisdictions acting on their own, as if each were an island separate from all others. Regional coordination and collaboration—which has long been recognized as providing extensive economic and reliability benefits in the context of the dispatch of available generating resources—will need to be leveraged in order to achieve deep decarbonization in a least-cost, reliable manner.

Powerex believes that a key barrier to regional coordination and collaboration on achieving GHG reductions has been the challenges inherent in establishing whether wholesale electricity imports from other regions genuinely reflect clean supply. In particular, questions persist regarding whether an electricity import that is identified as being from a clean generating resource is actually just being backfilled with fossil-fueled generation, increasing carbon emissions elsewhere in the western grid and negating any GHG reductions in the importing jurisdiction.

Perhaps because of continuing concern that clean electricity imports may, in fact, increase carbon emissions elsewhere in the western grid, many jurisdictions have continued to rely primarily on “local” solutions for achieving GHG reductions in the electricity sector. But the effectiveness of this “local build” approach depends on the ability of the existing grid to absorb large quantities of renewable resource output. As the penetration of renewable resources has increased, there have been clear indications that some local areas may be approaching a “saturation point” of certain renewable resources during certain hours. At the same time, however, the *demand* for clean electricity is only growing, as a result of continued retirements of conventional fossil-fueled generation, expansion of clean energy procurement requirements, growing demand for clean electricity from high-profile corporate consumers, and electrification of energy-intensive sectors.

Developing a framework that enables purchasers to procure wholesale clean electricity with confidence from other regions is critical to expanding the options for meeting the growing demand for clean electricity in the region. Such a framework will enable customers to purchase clean electricity from other regions across the west in the hours and quantities it is needed, rather than being limited to the hours and quantities of electricity production from local renewable facilities. More importantly, such a framework can help drive the development of new clean generation throughout the west that represents the “best fit, least-cost” in terms of cost, technology, and location.

Powerex has developed the Clean Energy Trade Standard described in this white paper to meet the need for a robust framework to enable wholesale clean electricity transactions. This Clean Energy Trade Standard is designed to give all interested entities confidence that wholesale clean electricity deliveries from adopting regions represent genuine surplus clean supply that is not enabled by backfilling with fossil-fueled generation, and does not increase carbon emissions elsewhere in the western grid. This confidence can unlock new options for entities to achieve their clean energy goals, and allow for the development of new clean resources across the west in the most cost-effective manner.

Beginning January 1, 2021, all of Powerex's Specified Clean Exports from the BC Hydro system have been conducted under this Clean Energy Trade Standard. Powerex is hopeful that other entities that are capable of demonstrating surplus Clean Supply—including several hydro-based entities in the Northwest U.S. that likely could do so in the near term—will consider adopting and implementing this Clean Energy Trade Standard (in a manner tailored to their specific circumstances).

Powerex believes that suppliers that adopt this Clean Energy Trade Standard (or similar) will have a clear leadership position in wholesale clean electricity, distinguishing themselves from entities that purport to sell clean electricity but decline to demonstrate that they are not engaging in backfilling activity that increases carbon emissions elsewhere in the western grid. Entities that adopt a Clean Energy Trade Standard will be ideally placed to meet the rapidly growing demand for clean electricity from a range of customers, including load-serving entities in the west under a clean procurement requirement, but also corporate users that increasingly seek to demonstrate 100% clean electricity procurement as part of their corporate vision and identity. And looking farther ahead, entities that adopt a Clean Energy Trade Standard will be well-placed to participate in existing and evolving, as well as new, GHG programs in jurisdictions across the west.

I. A CREDIBLE CLEAN SUPPLY FRAMEWORK IS NEEDED TO UNLOCK REGIONAL COLLABORATION TO ACHIEVE DECARBONIZATION GOALS

Over the past decade, multiple western states and Canadian provinces have adopted programs to reduce greenhouse gas ("GHG") emissions associated with the production of electricity. More recently, there has been growing support for a decarbonized western electricity grid, in which the use of fossil-fueled generation is sharply limited or even eventually eliminated. Successful decarbonization of the electricity grid can also be a powerful catalyst for further GHG reductions in other sectors, such as through electrification of transportation, buildings and industrial processes.

Achieving these ambitious environmental goals will require multiple approaches, including the continued build-out of renewable resources, the installation of utility-scale storage, and expanded demand-side participation. These efforts will need to be undertaken while ensuring the continued reliability of electricity service. The mix of approaches employed will also need to be cost-effective, so that electricity remains affordable. Affordability protects ratepayers from excess costs and supports the competitiveness of industries for whom electricity represents a significant portion of their costs. Affordable electricity rates are also essential to enabling the electrification of energy-intensive industries, which represents a key component of achieving GHG reductions in other sectors of the economy.

Finding the right mix of approaches that achieves GHG reductions in electricity production, maintains reliability of service, and does so at least cost will continue to be largely made at the state or provincial level, as this is largely where jurisdiction rests regarding resource planning and environmental policy. But the optimal mix of resources and decarbonization approaches is almost certain *not* to be achieved by each jurisdiction acting on its own, as if it were an island separate from all others. Regional coordination and collaboration—which has long been recognized as providing extensive economic and reliability benefits in the context of the dispatch of available generating resources—will need to be leveraged in order to achieve deep decarbonization in a least-cost, reliable manner.

Powerex believes that a key barrier to regional coordination and collaboration on achieving GHG reductions has been the challenges inherent in establishing whether wholesale electricity imports from other regions genuinely reflect clean supply. These challenges are indeed formidable; numerous eastern states do not even attempt to identify the specific generating resources or related GHG emissions associated with an electricity import. California's pioneering cap-and-trade program is one of the first programs to develop a "resource specific" GHG reporting framework for imports, requiring both documentation of production from the identified resource (*e.g.,* meter data) and delivery of that output to California (*e.g.,* e-Tag). But even with these requirements, questions persist regarding whether an electricity import into California that is identified as being from a clean generating resource is actually just being backfilled with fossil-fueled generation, increasing carbon emissions elsewhere in the western grid and negating any reductions in GHG emissions in California.

The expansion of organized wholesale electricity markets—and the associated use of sophisticated economic dispatch algorithms and greater visibility of all participating generating resources—may have initially been expected to help address these import-related GHG emissions questions. But the opposite has proven to be the case. In organized markets there is no link between the electricity produced by a particular generator and the delivery of that electricity to a particular load or location, eliminating one of the core mechanisms that can help establish the source of electricity imports.

Perhaps because of the persistent concerns that clean imports may, in fact, be the result of activity that increases carbon emissions elsewhere in the western grid, many jurisdictions have continued to rely primarily on "local" solutions for achieving GHG reductions in the electricity sector. This is understandable, as when new renewable resources have been built in a particular state or province, it has been possible to be highly confident that these new clean resources will displace electricity production and GHG emissions from fossil-fueled generation. For example, there can be little doubt that the more than 10,000 MW of utility-scale solar generation installed in California over the past ten years has displaced a very significant amount of GHG emissions from fossil-fueled generation in the state, and enabled the retirement of large portions of the state's conventional fossil-fueled generation fleet.

Importantly, the effectiveness of this "local build" approach depends on the ability of the existing resource fleet to back down its output, enabling the grid to absorb large quantities of renewable resource output. As the penetration of renewable resources has increased, there have been clear indications that some local areas may be approaching a "saturation point" of certain renewable resources during certain hours.[1] In many of these areas, the initial phases of renewable resource development represented "low hanging fruit," but further additions of the same type of local renewable resources may now require costly transmission upgrades, may increasingly lead to the curtailment of renewable output, and/or may require the development of supporting resources such as utility-scale battery storage.

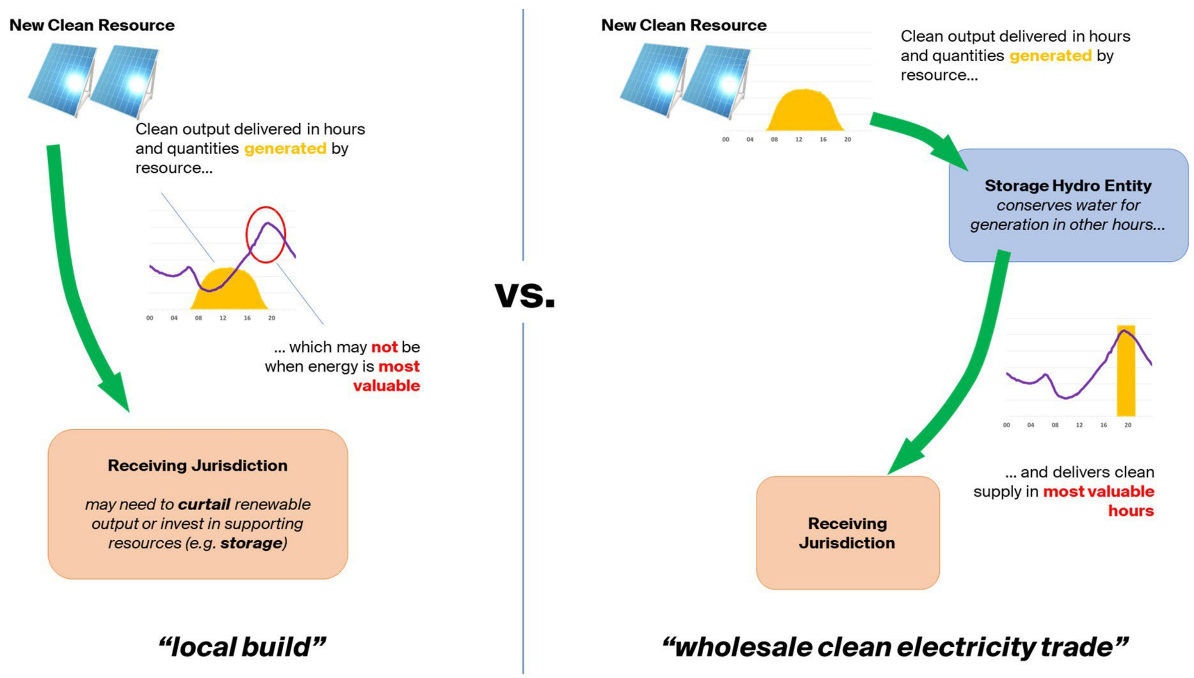
At the same time that renewable resource development in some local areas is reaching a saturation point, the *demand* for clean electricity continues to grow rapidly, reflecting multiple drivers:

- Continued retirements of conventional fossil-fueled generation;
- Expansion of clean energy procurement requirements, up to 100% of retail sales;
- Demand for clean electricity from high-profile corporate consumers who see a commitment to clean electricity as a reflection of their core values; and
- Electrification of certain industrial, building and/or transportation activities as a key strategy for reducing GHG emissions from those sectors.

[1] This can occur in hours that conventional resources are already operating at their minimum stable output levels, requiring a resource to shut down in order to allow the grid to absorb additional renewable energy. But this can result in insufficient generation being available later in the day (*e.g.,* after sunset) or raise other operational challenges.

Developing a framework that enables purchasers to procure wholesale clean electricity with confidence from other regions is critical to expanding the options for meeting the growing demand for clean electricity in the region. Such a framework will enable customers to purchase clean electricity from other regions across the west in the hours and quantities it is needed, rather than being strictly limited to the hours and quantities of electricity production from local renewable facilities.

More importantly, as demand for wholesale clean electricity outstrips the surplus clean supply that can be provided from existing resources, such a framework can help drive the efficient development of new clean generation throughout the west. A robust framework for wholesale clean electricity procured from other regions can unlock access to new resource development opportunities that represent the "best fit, least cost" in terms of cost, technology, and location. This is illustrated below, where a new clean resource is developed under a dedicated local development approach (left panel) versus the same purchaser increasing its clean electricity imports from an external hydro system that has "shaped" the renewable resource output of a new clean resource into the optimal delivery hours:



The benefits of the scenario in the right-hand panel are self-evident: the same investment in a new clean resource yields clean electricity provided in the hours that are actually needed, without the need for additional storage and without the loss of clean supply to curtailments due to oversupply from other renewable resources in the local area. This not only yields greater benefits for the same renewable resource investment, it also makes it possible to reliably integrate a larger quantity of cost-effective new renewable resources. But in order for these benefits to be realized, the purchaser must have confidence that the electricity it receives in the evening hours from the external hydro system is indeed clean. That is, the purchaser must have confidence that the hydro system's exports have been enabled by the output of the new clean resources and not simply by the external hydro system increasing the use of fossil-fueled resources to serve its own demand over time (commonly referred to as "backfilling").

At present, there is no ability for purchasers to have this required level of confidence. Unless there is a robust framework for wholesale clean electricity transactions, it appears likely that the demand for clean electricity will continue to be met largely by a combination of:

- Local new clean generation, even in circumstances where it is not an optimal fit in terms of available transmission access, its output profile, its impact on operational challenges, and/or its cost; and
- Electricity imports that purport to be "clean," but are actually enabled by backfilling activity that increases carbon emissions elsewhere in the western grid.

Both of these options sacrifice one or more of the key objectives of (1) achieving GHG reductions; (2) ensuring high levels of grid reliability; and (3) minimizing costs to ratepayers.

Powerex believes that all of these key objectives can and must be achieved, but doing so requires developing a new, highly credible framework for the verification of wholesale clean electricity transactions between regions—a "Clean Energy Trade Standard."

The remainder of this paper presents a Clean Energy Trade Standard, and is organized as follows:

- **Section 2** explains how current frameworks enable notionally "clean" supply exports to be created through the increased use of GHG-emitting resources and/or the purchase of unspecified electricity, either as part of a deliberate strategy by a seller or inadvertently;
- **Section 3** outlines the core elements that are needed to verify that clean exports are not enabled by "backfilling," including the need to account for storage that can enable backfilling in a different time period than the delivery of the clean supply;
- **Section 4** provides a technical summary of this Clean Energy Trade Standard, which is included as **Attachment A** to this white paper; and
- **Section 5** sets out the anticipated benefits of adoption of this Clean Energy Trade Standard, which Powerex has implemented for all of its clean electricity transactions to and from the BC Hydro system beginning January 1, 2021.

II. THE CHALLENGE: ENSURING A REGION'S CLEAN EXPORTS DO NOT INCREASE CARBON EMISSIONS ELSEWHERE IN THE WESTERN GRID

Efforts to reduce GHG emissions in a jurisdiction have generally taken two broad approaches. One approach has been to require the construction of new non-emitting resources such as wind and solar. The negligible operating costs of these facilities generally ensure they produce electricity whenever the underlying natural resource is available, displacing production by more expensive—and typically fossil-fueled—generation resources. In other words, GHG emissions are reduced *indirectly,* by injecting electricity produced by non-emitting generation.

A second approach has been to *directly* regulate GHG emissions "at the stack" of fossil-fueled generating facilities. Examples include California's cap-and-trade program and British Columbia's carbon tax. Both approaches seek to internalize the environmental cost of GHG emissions into the cost of producing electricity. By making electricity from higher-emitting resources more costly than electricity from lower-emitting resources, the decision regarding which units to operate can incorporate the environmental consequences of that decision (in addition to other factors).

A. Tracking The GHG Emissions Associated With Imports Has Proven To Be Extremely Challenging

One measure of the effectiveness of a cap-and-trade program or a carbon tax is the change in GHG emissions associated with meeting customers' electricity needs. If electricity production from a high-emitting resource is replaced by electricity production from a lower-emitting resource in the same jurisdiction, this type of measurement can be done with relative accuracy. But if electricity from a high-emitting resource is replaced by imports from outside the jurisdiction, it can be significantly more challenging to determine the GHG emissions associated with this alternative source of electricity.

Among the key challenges are:

- Difficulty determining the "source" of the import;
- Lack of visibility by the regulatory entity of the importing jurisdiction into all external resources and associated GHG emissions; and
- Lack of legal authority by the importing jurisdiction to regulate or limit GHG emissions of resources located outside of the importing jurisdiction.

In the context of wholesale electricity markets in the west, these challenges are material for two reasons. First, environmental policy and programs are largely under the jurisdiction of individual states or provinces, meaning there are a large and growing number of different programs and rules across the region. Second, there is very extensive trading of wholesale electricity products between regions across the west. Taken together, this implies the potential for a large amount of activity in which electricity production from local GHG-emitting resources is replaced by imports, and hence in which accurately gauging the overall GHG impact is likely to be challenging.

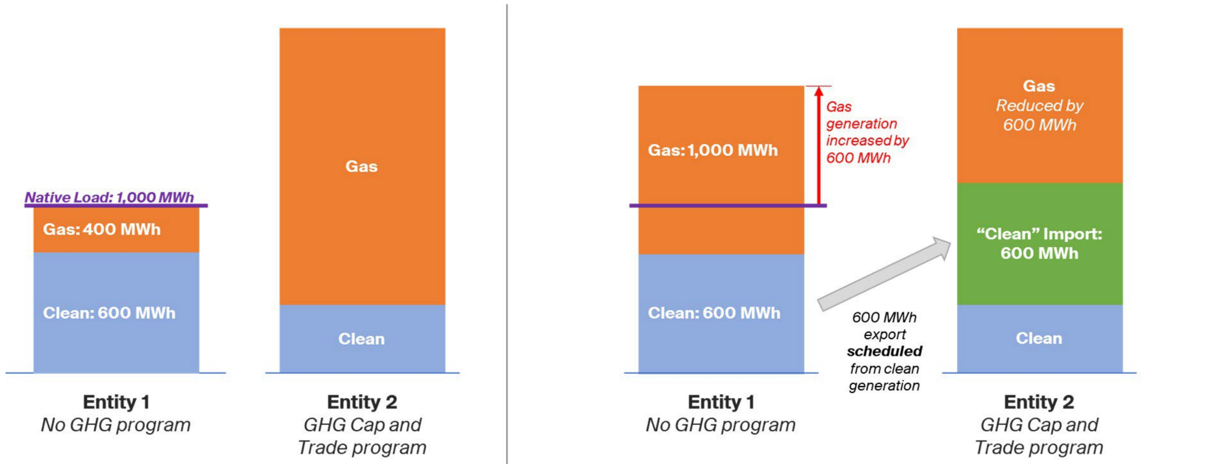
In light of these challenges, some jurisdictions simply acknowledge that they are unable to differentiate between imports from potentially different sources. In such cases, all imports are often assumed to implicate GHG emissions based on either the average emission rate of resources in the external region(s), or the emission rate of the presumed marginal resource technology. One of the principal objectives of applying a uniform "default" GHG emissions rate to imports is to help avoid "leakage" by preventing external fossil-fueled generating resources—which are not subject to regulation by the jurisdiction in the importing area—from gaining an inappropriate cost advantage over fossil-fueled generating resources located within the importing jurisdiction. While this type of undifferentiated approach can help address leakage concerns, it is unable to create desirable incentives for imports from non-emitting resources. The importing jurisdiction's goal of shifting electricity production from fossil-fueled generation to clean generating resources is thus limited only to clean generating resources within its geographic area, since it lacks a way to distinguish among imports from different external sources.

California's cap-and-trade program sought to improve upon this undifferentiated import framework, and introduced the ability for imports to be reported as being from a "specified source." A seller of the output of a clean generating resource could report imports as being from a "specified source" by demonstrating (1) that the specified resource had produced electricity; and (2) that the resource's output was scheduled and delivered to California. (Intermediaries that purchase electricity for import into California are also required to demonstrate that the purchase required the electricity to be produced by the specified resource.)

B. Backfilling Artificially Increases Notionally "Clean" Supply Through Increased Use Of Fossil-Fueled Generation

California's specified source reporting framework was a major step toward tracking the GHG emissions of resources associated with imports. Yet it has long been recognized that verifying production and delivery to California of output from a clean generating resource is not enough to ensure that the activity did not increase carbon emissions elsewhere in the western grid. Of particular concern has been the potential for clean supply that is delivered to California but is then "backfilled" with increased production from fossil-fueled generation in order to meet demand in the jurisdiction where the clean supply originates.

The figure below depicts how a vertically-integrated utility that has built clean generating resources to meet its native load obligation (Entity 1) can instead sell the output of those resources to a jurisdiction that values clean supply (Entity 2), and then increase its use of fossil-fueled generation to meet its native load.



- **Entity 1 serves native load from combination of clean supply and gas generation**

- **Export leaves Entity 1 "short" of supply to meet native load.**
- **Entity 1 must backfill the export with increased gas generation.**
- **Entity 2 sees reduction in its own gas generation and GHG emissions, but does not account for increased GHG emission due to backfilling by Entity 1.**

In this example, the exports from Entity 1 displace fossil-fueled generation in Entity 2, but the backfilling—which is required since the output of the clean generating resources in Entity 1 was delivered elsewhere—increases fossil-fueled generation in Entity 1. Entity 2 will correctly perceive that its own GHG emissions have been reduced, but it will erroneously perceive that there are no GHG emissions associated with the purportedly "clean" imports that enabled that reduction. This is because Entity 2 does not—and perhaps cannot—recognize the increased GHG emissions in Entity 1 due to the backfilling activity that enabled the imports. As a result, Entity 2 will incorrectly conclude that overall GHG emissions have been reduced, whereas in fact aggregate GHG emissions may be entirely unchanged, and may even have increased.

There are numerous detrimental consequences from this failure to recognize the increased GHG emissions associated with the backfilling activity.

First, ratepayers in the importing jurisdiction will have funded potentially large payments to sellers for a product that supposedly enabled an environmental benefit but in fact did nothing of the sort. By the same token, the sellers of backfilled "clean" supply are enriched for selling a product (*i.e.,* clean electricity) they do not actually have available to provide.

Second, backfilling artificially "creates" clean supply through the increased dispatch of fossil-fueled resources, and gives the appearance that there is more available clean supply than actually exists. When the quantity of available "clean" supply is overstated, it defers or eliminates the need to develop new clean resources. Backfilling activity therefore gives the incorrect appearance of meeting the goals of GHG programs, but in fact delays the displacement of fossil-fueled generation with new clean resources.

C. Backfilling Cannot Be Addressed Through Organized Market Design Alone

The expansion of organized markets may initially have been perceived as being able to address the potential for backfilling, as a centralized market operator has greater visibility over all participating resources, and dispatch decisions are driven by optimization algorithms. In practice, however, organized markets may actually increase the challenges associated with preventing backfilling.

In 2014, the California Independent System Operator ("CAISO") invested extensive time and effort to develop a way to integrate GHG emissions into the dispatch decisions in the Western Energy Imbalance Market ("EIM"), with the goal of ensuring that all EIM imports into California were attributed to specific resources, those resources' GHG emissions were accounted for, and clear reporting and compliance obligations under California's cap-and-trade program were established. Among the anticipated benefits of this integrated GHG attribution and pricing design were that California electricity prices would fully reflect associated emissions, and the creation of strong financial incentives for EIM participation by clean resources, since the market would appropriately value those clean attributes. Notwithstanding the dedicated efforts that went into the Western EIM design, experience ultimately revealed that an organized market—due both to its comprehensive visibility and its powerful automated optimization processes—can actually pose significant GHG attribution challenges. In particular, organized markets—unlike bilateral markets—do not "link" specific generation with service to specific loads; rather the optimization software may have extensive latitude to allocate the cleanest generation anywhere in the footprint to imports into a particular jurisdiction. Absent specific restrictions, the organized market optimization software may seek to minimize GHG compliance costs by *maximizing* backfilling activity.

None of this discussion is intended to be a criticism of the Western EIM or of organized wholesale electricity markets more generally. To the contrary, organized markets—including energy imbalance markets—are essential to the efficient integration of sources of clean electricity, particularly variable energy resources such as wind and solar. But making efficient use of available clean electricity from one dispatch interval to the next is a distinct and separate issue from determining whether that clean electricity was made available by backfilling with either fossil-fueled generation or unspecified imports. What appears to be needed is a framework that first qualifies sources of verified clean supply, based on objective criteria and comprehensive data.

III. THE SOLUTION: A ROBUST FRAMEWORK TO VERIFY SPECIFIED CLEAN EXPORTS FROM A SOURCE JURISDICTION ARE NOT THE RESULT OF BACKFILLING ACTIVITY THAT INCREASES GHG EMISSIONS ELSEWHERE IN THE WESTERN GRID

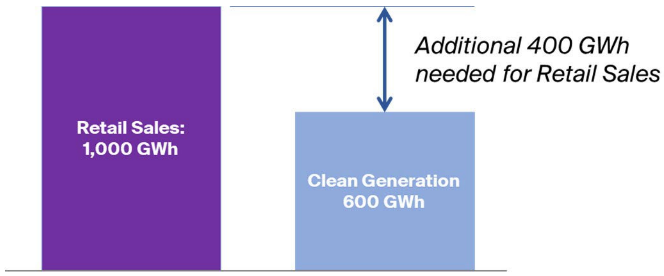
This section lays out a framework for verifying that a specified clean export from a source region is not enabled by backfilling, and therefore is not created as a result of increased use of fossil-fueled generation or unspecified imports. The framework is an important extension to the requirements for specified-source imports that have been adopted by some jurisdictions, as illustrated below:

A. Verifying That Retail Sales Are Not Supported by Fossil-Fueled Generation In Order To Increase Specified Clean Exports.

The key concern related to backfilling is straightforward: if an entity sells output from its clean generating resources to another party, does that leave the seller with clean supply that is less than its retail sales?

The answer to this question is examined through a series of stylized examples.

Example 1: Clean generation is less than retail sales



In this example, the source region includes 600 GWh of clean generation and relies on dispatching its fossil-fueled generation to serve its retail sales, which total 1,000 GWh. Any exports from the source region would leave the region even more "short" of the energy to serve its retail sales. Due to the nature of clean generating resources—namely, that the total electricity that can be produced is determined by natural phenomena and is not controllable by the unit operator—there is a strong expectation that the need for additional supply would be met from increased fossil-fueled generation, as these are the only resources with the ability to increase output. Any exports from the source region in this example can therefore be expected to increase carbon emission, regardless of whether those exports are scheduled from the region's clean resources.

Example 2: Clean generation exceeds retail sales

In contrast, the example below illustrates a scenario in which exports do not leave a source region short of the supply needed to serve retail sales.

In this example, the source region has more available clean supply (1,200 GWh) than what it needs for its retail sales (1,000 GWh). Therefore, a specified clean export would not require the seller to produce additional electricity. Instead, the seller in this example has sufficient clean supply to meet its native load obligation and deliver up to 200 GWh of specified clean exports.

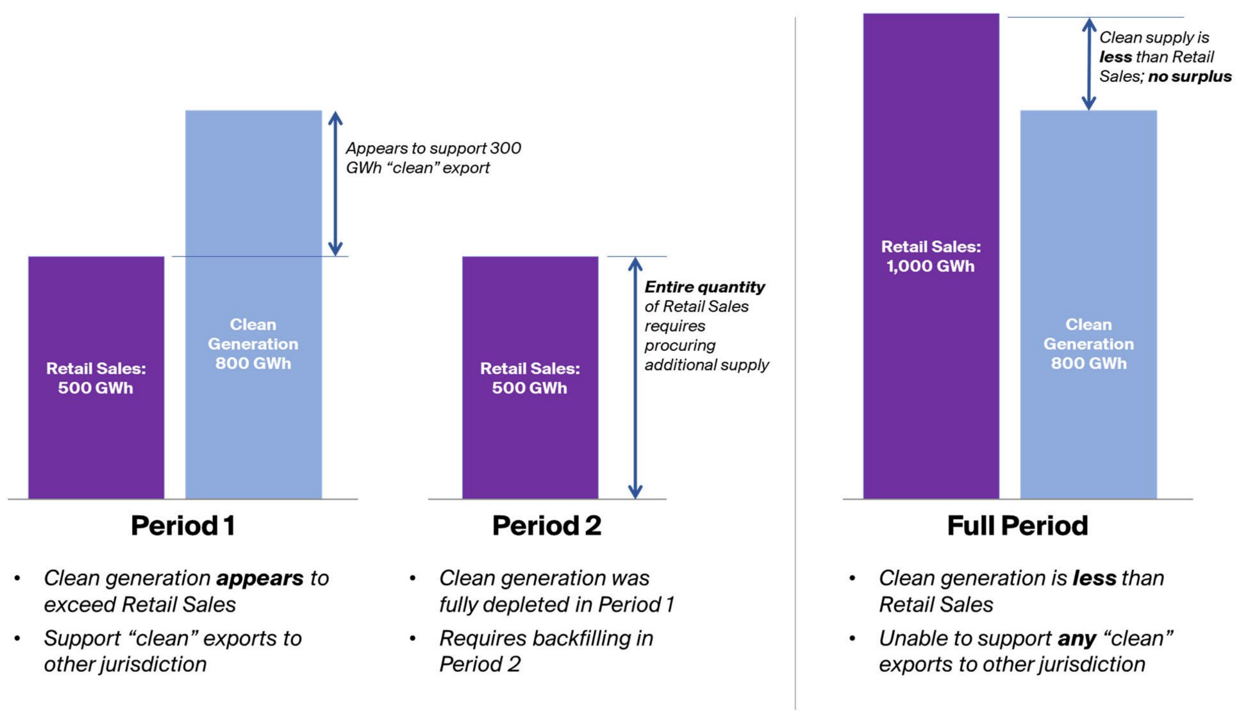
From the above examples, we can identify a general principle: ***entities with surplus clean supply (i.e., greater than retail sales) can support specified clean exports up to the quantity of the surplus without creating opportunities for backfilling with fossil-fueled generation over time. Conversely, entities that do not have surplus clean supply—and hence already rely on fossil-fueled generation for retail sales—cannot support specified clean exports without creating an opportunity for backfilling with additional fossil-fueled generation.***

It is important to note that in the prior examples, there was no indication of the timeframe to which the examples applied. The timeframe becomes important when the clean resources are energy-limited, and there is storage to allow control over the timing of the use of the energy-limited clean resource.

Example 3: Clean generation with storage enables non-concurrent backfilling

This example considers a source region that includes an energy-limited hydroelectric resource capable of producing 800 GWh, and sufficient storage to allow this quantity to be produced either in Period 1 or in Period 2 (or a combination of both). Retail sales are 500 GWh in each of the two periods, and the source region also includes additional generation from fossil-fueled generation.

In this example, the source region could *appear* to have surplus clean supply *if Period 1 is examined in isolation*. Indeed, it would appear to be able to support 300 GWh of specified clean exports. Critically, however, the specified clean export requires the clean resources of the source region to be fully depleted in Period 1. This means that, in Period 2, there is no remaining clean supply available, and retail sales must be met entirely from fossil-fueled generation. This example still represents backfilling, it is just that the increased use of fossil-fueled generation occurs in a different period than the delivery of the specified clean export.



This example demonstrates that it is not enough to verify that there is surplus clean supply only at the time that the specified clean export occurs. Rather, the surplus clean supply must be verified over a longer time horizon, for several reasons.

First, the reporting period must, at a minimum, be at least as long as the relevant storage timeframe of the energy-limited clean resources in order to verify there is no non-concurrent backfilling activity.

Second, the reporting period must be sufficiently long to account for the variability and uncertainty inherent in hydro systems. Inflows can vary substantially from one year to the next, and conditions are often not known with any degree of certainty until close to the end of each water year. A hydro entity adopting a Clean Energy Trade Standard may have little ability to anticipate the quantity of specified clean exports it can commit to in any specific year, which can lead it either to be overly conservative (*i.e.,* transact specified clean exports well below its actual surplus clean supply) or to only commit to specified clean exports at the last minute. Neither outcome is desirable or efficient.

Finally, a multi-year reporting period can help avoid skewing decisions under the standard toward below-normal or stressed conditions, and instead enabling decisions and commitments to reflect typical or average conditions. A multi-year reporting period would be consistent with the timeframes of various state environmental programs, and Powerex understands that Washington has adopted a four-year reporting period.

B. A Clean Energy Trade Standard Can Unlock More Alternatives For The Development Of New Clean Resources

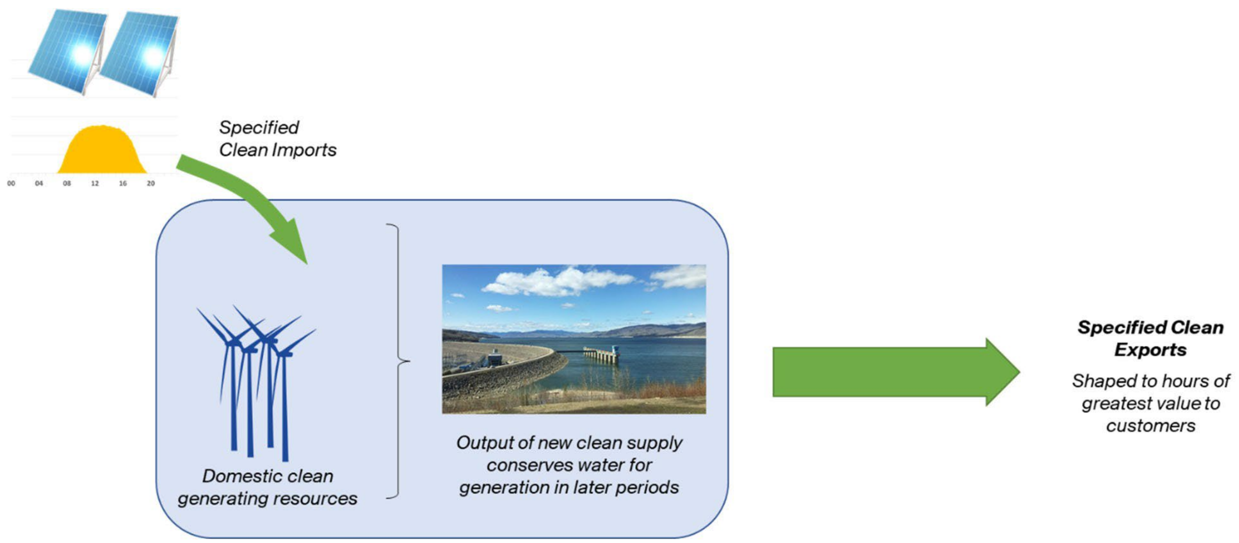
The above examples serve to establish the key concept behind Powerex's Clean Energy Trade Standard. Namely, the standard provides a framework for a supplier to establish that it has sufficient clean supply to meet 100% of its retail sales (across an appropriate time horizon). Meeting this standard provides confidence that any specified clean exports are supported by surplus clean supply, and not by clean supply that is merely "freed up" by the use of fossil-fueled generation.

A customer of a supplier that adopts this Clean Energy Trade Standard will be able to have confidence in two inter-related outcomes:

1. Specified clean exports do not require the increased use of fossil-fueled generation or unspecified imports; *and*
2. The increased use of fossil-fueled generation or unspecified imports does not increase the quantity of specified clean exports.

These complementary outcomes not only provide confidence regarding transactions of existing clean surplus supply, they also create the appropriate incentives to drive the development of new clean resources. Under the Clean Energy Trade Standard, the *only* way to increase the quantity of specified clean exports that are possible from a source region is by increasing the surplus clean supply in the source region, such as by developing new clean resources.

Returning to the hypothetical example discussed in Section I, the Clean Energy Trade Standard provides the transparency necessary for the seller from the hydro system to demonstrate that its additional clean exports to its purchaser were enabled by the development of new clean resources:



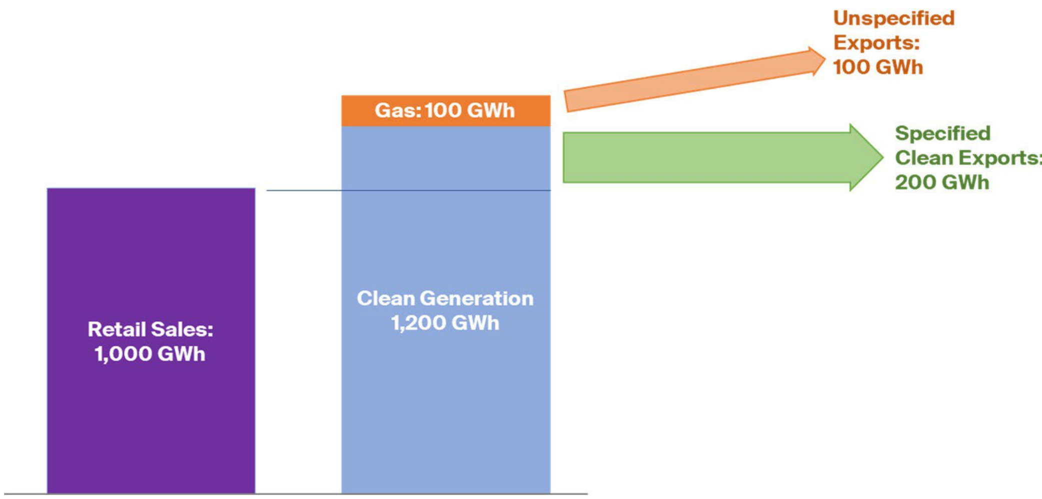
Note that *any* additional source of supply—clean or otherwise—would enable water to be conserved in order to enable additional exports at a later period. But the Clean Energy Trade Standard provides the critical verification to ensure that additional specified *clean* exports are only enabled by additional sources of *clean* supply.

This illustrates one of the greatest benefits of a Clean Energy Trade Standard, which is to promote the addition of new clean resources in the most cost-effective manner possible. More specifically, a Clean Energy Trade Standard enables entities with existing flexible hydro generation and storage to add new clean resources—located in or delivered to their region—in order to increase their clean surplus and enable additional specified clean exports to other customers and jurisdictions. And because these entities have storage and flexibility, the additional specified clean exports do not have to be delivered in the hours and quantities that the new clean resource produces electricity. Instead, the additional specified clean exports can be delivered in the hours and quantities of greatest value; that is, when demand is high and/or renewable resource output is low in the receiving jurisdiction.

C. To Be Effective, A Clean Energy Trade Standard Must Be Workable

For the Clean Energy Trade Standard to help facilitate decarbonization while ensuring reliability and protecting ratepayers from excessive costs, it must not only provide confidence that clean supply does not result in increased carbon emissions elsewhere in the western grid, but it must also be workable for entities with surplus clean supply that elect to implement the standard. It must also be workable in the context of the practical considerations of extensive existing wholesale electricity transactions. The essence of a *workable* standard is to avoid being more proscriptive *than is required* in order to achieve the intended objective.

For example, the Clean Energy Trade Standard does not categorically prohibit all unspecified imports, nor does it categorically prohibit all fossil-fueled generation in the source region. Such prohibitions are not necessary to achieve the fundamental objective of ensuring that specified clean exports are not enabled by increased fossil-fueled generation. To illustrate, consider the example below:



This entity satisfies the core criterion of the standard, as it does not require fossil-fueled generation in order to serve native load obligations. Since its clean supply exceeds its needs, it can support up to 200 GWh of specified clean exports. And because the 200 GWh of specified clean exports is calculated from metrics that are not affected either by unspecified imports or by fossil-fueled generation, there is confidence that the specified clean exports will not increase GHG emissions. That is, the key objective of the Clean Energy Trade Standard is satisfied, even where some fossil-fueled generation continues to occur.

D. The Same Clean Supply Must Not Be Used To Support Claims Of GHG Reductions In Multiple Jurisdictions

Multiple states in the west have developed programs to encourage or require a shift away from fossil-fueled generation, and some states have developed more than one program. Each program can generally be viewed as working toward a lower-carbon grid by focusing on a particular attribute or metric. Some programs, for example, focus on whether a resource is renewable; other programs levy a tax or require emissions allowances to be retired depending on a resource's GHG emissions when it produces electricity; and still others encourage or require a "content label" in order to allow customers to choose their electricity supply based on the associated generator fuel type and corresponding GHG impact.

The variety of different programs reflects the multiple different ways of understanding and pursuing the challenges of a transition to a low-carbon grid. But it also creates the potential for the same clean supply to be "double counted" across multiple jurisdictions, since not all program requirements are mutually exclusive. For example, consider a clean resource located in Washington State. When the resource produces electricity, it will create renewable energy and a Renewable Energy Certificate ("REC"), which is expected to be eligible for compliance with Washington's Clean Energy Transition Act ("CETA"). But in addition, absent sufficient measures, the physical output of the clean resource may be scheduled to California, and reported as a specified-source import from a non-emitting resource under the California Air Resources Board ("CARB") cap-and-trade program. The result in this example is that two states—California and Washington—may be taking credit for environmental benefits associated with the same quantity of electricity produced by the same resource over the same period. It should be plainly evident that 1 MW of renewable output cannot provide 2 MW of environmental benefits.

Any standard that verifies a source region's quantity of specified clean exports can be significantly weakened if those specified clean exports are counted by more than one receiving jurisdiction. Similarly, the standard can be undermined if *unspecified* exports are incorrectly identified as specified clean exports, when in fact they are not.

E. A Clean Energy Trade Standard Avoids The Need For Additional Restrictions That Impede Efficiency And Harm Ratepayers

The Clean Energy Trade Standard provides a robust framework to verify that specified clean exports are not enabled by backfilling with fossil-fueled generation or unspecified imports. Customers and jurisdictions that receive specified clean exports from an entity adopting the Clean Energy Trade Standard can be confident that the clean supply they purchase does not increase carbon emissions elsewhere in the western grid. At the same time, the source jurisdiction is assured that specified clean exports do not represent double-counting of the clean supply that has already been counted toward meeting demand in *its own* jurisdiction.

The Clean Energy Trade Standard ensures that increased use of fossil-fueled generation or increased unspecified imports does not and cannot inflate the quantity of specified clean exports from the source region. The Clean Energy Trade Standard thereby makes it unnecessary for either the source jurisdiction or the receiving jurisdiction to apply or maintain any other types of restrictions regarding how clean resources must be dispatched or how the output of clean resources is sold.

Indeed, applying unnecessary and overbroad restrictions when they are not necessary to achieve the key objective of ensuring clean supply does not increase carbon emissions elsewhere in the west creates a significant risk of sacrificing one or more of the three critical objectives of: (1) achieving GHG reductions, (2) ensuring reliability, and (3) minimizing costs to ratepayers.

Consider, for example, a hydro entity located in the Northwest that has adopted the Clean Energy Trade Standard and committed all of its surplus clean supply to other wholesale customers located in the same jurisdiction (*i.e.,* state or province). The Clean Energy Trade Standard provides objective verification that the clean electricity sold by this Northwest hydro entity is limited only to its surplus clean supply, and is not enabled by backfilling with fossil-fueled generation. Both wholesale electricity purchasers and regulators in the source jurisdiction can be confident that this clean supply will reduce the need for electricity production from fossil-fueled generation, and will thus help meet the source jurisdiction's GHG reduction goals.

Assume further that, in addition to transacting in wholesale clean electricity, the Northwest hydro entity also continues to utilize the flexibility of its hydro system to engage in ongoing trade with California, in which it:

1. Receives unspecified energy from California during the midday hours (when California typically has abundant generation from its solar fleet), allowing the solar fleet to avoid curtailment and allowing the Northwest hydro entity to conserve water to enable generation later in the day; and
2. Increases generation and delivers unspecified energy to California in the evening hours, when California demand is high but its solar production is decreasing.

This type of trade or battery-like service is highly beneficial, as it enables California to avoid curtailing the output of its renewable resources during midday hours of oversupply, and it also enables California to receive electricity imports in the evening, reducing the need for fossil-fueled generation (either within California or imported from generators elsewhere in the Northwest or Southwest). It also enables the Northwest hydro entity to earn revenue for the valuable shaping services it provides, reducing retail electricity rates for its customers. These battery-like services may also be beneficially provided to areas with high wind production, such as the Northwest or Alberta.

These benefits would be unnecessarily lost, however, if either the source jurisdiction or California were to impose restrictions on unspecified electricity deliveries from the Northwest hydro entity to California. Without the evening deliveries from the Northwest hydro entity, more fossil-fueled generation would be needed to meet California's needs in the evening hours. And if it no longer makes these deliveries in the evening, the Northwest hydro entity is unlikely to have the ability to receive unspecified electricity imports from California during the midday hours, leading to increased curtailments of California renewable production. The loss of this beneficial trade would likely ultimately lead to higher retail electricity rates both for customers of the Northwest hydro entity and California ratepayers, since the most economic resources are prevented from being utilized as efficiently as possible.

A similar outcome would occur if the source jurisdiction were to deduct any unspecified electricity deliveries by the Northwest hydro entity to California from the quantity of eligible clean supply recognized under that source jurisdiction's clean energy procurement program. While not an outright prohibition on unspecified deliveries to California, such a restriction would often render unspecified deliveries to California uneconomic, as they would now carry the opportunity cost of reduced clean sales to wholesale customers in the source jurisdiction.

It is absolutely critical and appropriate for all jurisdictions to put in place rules and requirements that ensure clean supply recognized under their programs is not backfilled with increased use of fossil-fuel generation. That goal is robustly and fully achieved by entities or regions that adopt the Clean Energy Trade Standard, however, making any additional requirements or restrictions unnecessary and ultimately detrimental to the efficient, reliable and cost-effective decarbonization of the regional grid.

IV. SUMMARY OF THE CLEAN ENERGY TRADE STANDARD

This section provides a summary of the Clean Energy Trade Standard; Attachment A to this white paper contains the framework and specifications of this Clean Energy Trade Standard. It provides substantial detail on the general framework, concepts, and process. Each entity that adopts this Clean Energy Trade Standard will be differently situated and have specific circumstances that must be addressed. It is therefore expected that any entity that adopts this Clean Energy Trade Standard will document the implementation details specific to their circumstances.

This Clean Energy Trade Standard requires periodic reporting of certain information, along with supporting documentation. One of the key calculations to be determined is the Eligible Clean Supply of a source region over the course of a Reporting Period.[2] Eligible Clean Supply is comprised of:

- Clean Generating Resources located within the source region; and
- Specified Clean Imports delivered to the source region; adjusted for
- Net supply reasonably determined to be received by (or delivered from) the source region pursuant to treaties and inter-utility agreements associated with Clean Generating Resources.

For each Reporting Period, the Eligible Clean Supply of the source region must be shown to be at least equal to 100% of Retail Sales plus the total Specified Clean Exports:

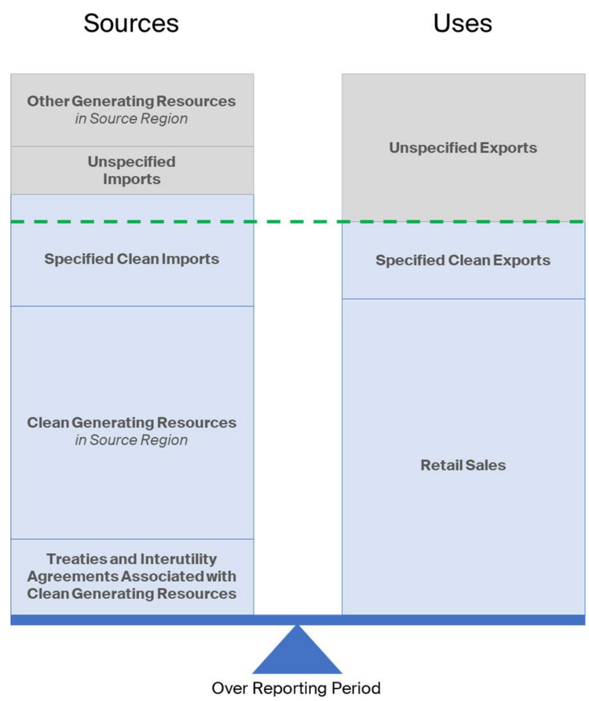
$$\frac{Eligible\ Clean\ Supply}{Retail\ Sales + Specified\ Clean\ Exports} \geq 100\%$$

Stated differently, this requires that for each Reporting Period:

$$Specified\ Clean\ Exports \leq Eligible\ Clean\ Supply - Retail\ Sales$$

The relationship between the sources of Eligible Clean Supply, Retail Sales, and the maximum quantity of Specified Clean Exports is illustrated below:

[2] Eligible Clean Supply also requires contractual rights or "Clean Attributes" as well as evidence of generation and delivery from Clean Generating Resources. The requirements associated with Eligible Clean Supply are described in further detail in Attachment A.



The core requirement of the Clean Energy Trade Standard achieves two complementary objectives. First, it implements a Source Region's environmental policy objective of procuring Eligible Clean Supply for 100% of Retail Sales. Second, it leverages this objective as the means of demonstrating that all Specified Clean Exports represent surplus Eligible Clean Supply in the Source Region, and therefore do not increase GHG emission elsewhere in the western grid. Since the Source Region must demonstrate Eligible Clean Supply equal to 100% of Retail Sales, increased electricity from fossil-fueled generation cannot "free up" Eligible Clean Supply to support Specified Clean Exports.

In practice, the total electricity produced in a Source Region will exceed the sum of Retail Sales and net exports, as a result of transmission losses. If transmission losses in a Source Region are material, there may exist the opportunity to increase electricity from fossil-fueled generation in order to increase the quantity of exports, which can be reported as Specified Clean Exports. It is Powerex's understanding that none of the clean energy procurement standards that have been implemented to date include any specific requirements related to transmission losses. This represents a potential gap that can undermine the ultimate effectiveness of measures to ensure that Specified Clean Exports are not the result of activity that increases GHG emissions.

The Clean Energy Trade Standard addresses this gap by requiring entities that adopt the standard to set forth the procedures they will use to demonstrate that transmission losses do not enable an increase in electricity from fossil-fueled generation (or from unspecified imports) to increase the quantity of Specified Clean Exports. By applying comprehensive requirements to all uses of electricity (*i.e.,* Retail Sales, exports, and transmission losses), the Clean Energy Trade Standard provides confidence that Specified Clean Exports are supported by Eligible Clean Supply and are not the result of activity that increases GHG emissions in the western grid.

V. ANTICIPATED BENEFITS OF THE CLEAN ENERGY TRADE STANDARD

Powerex believes there is a clear and pressing need to enable wholesale clean electricity transactions. To date, the lack of confidence regarding whether a transaction represents genuine surplus clean supply as opposed to the output of clean resources that was backfilled with fossil-fueled generation or unspecified imports has presented a barrier to such wholesale clean electricity trade. Powerex has developed this Clean Energy Trade Standard to overcome this barrier through a robust framework supported by objective and transparent reporting. Beginning January 1, 2021, all of Powerex's Specified Clean Exports from the BC Hydro system have been conducted under this Clean Energy Trade Standard.

This Clean Energy Trade Standard is designed to give all interested stakeholders confidence that wholesale clean electricity transactions with adopting jurisdictions represent genuine surplus clean supply that is not enabled by backfilling with fossil-fueled generation, and does not increase carbon emissions elsewhere in the western grid. This confidence can unlock new options for entities to achieve their clean energy goals, and allow for the development of new clean resources across the west in the most cost-effective manner.

Powerex is hopeful that other entities that are capable of demonstrating surplus Eligible Clean Supply will consider adopting and implementing the Clean Energy Trade Standard in a manner tailored to their specific circumstances. There are several hydro-based entities in the Northwest U.S. that likely could adopt the standard in the near term, if they elected to do so. Powerex believes that committing to a Clean Energy Trade Standard will help distinguish clean hydro systems as a fully credible and reliable source of clean supply for meeting clean energy procurement targets in the region, as the standard addresses all existing concerns associated with backfilling activity.

Powerex also believes that suppliers that adopt this Clean Energy Trade Standard (or similar) will have a clear leadership position in wholesale clean electricity, distinguishing themselves from entities that purport to sell clean electricity but decline to demonstrate that they are not engaging in backfilling activity that increases carbon emissions elsewhere in the western grid. Entities that adopt a Clean Energy Trade Standard will be ideally placed to meet the rapidly growing demand for clean electricity from a range of customers, including load-serving entities in the west under a clean procurement requirement, but also corporate users that increasingly seek to demonstrate 100% clean electricity procurement as part of their corporate vision and identity. And looking farther ahead, entities that adopt a Clean Energy Trade Standard will be well-placed to participate in existing and evolving, as well as new, GHG programs in other states and provinces in the west.

ATTACHMENT A:
CLEAN ENERGY TRADE STANDARD
FRAMEWORK AND SPECIFICATIONS

Clean Energy Trade Standard

Framework and Specifications

The Clean Energy Trade Standard Framework is now a standalone document at

https://www.powerex.com