Zonal Approach for Greenhouse Gas Pricing in a Day-Ahead Organized Market: Regulatory Considerations

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Extended Day-Ahead Market Stakeholder Workshop

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TOPICS

1. Background
2. Cap-and-Trade Compliance Obligation for Unspecified Imports
3. Addressing Leakage
4. Federal Considerations
5. Verifying Specified Source Imports
6. Discussion

BACKGROUND: GHG PRICING PROGRAMS

- The purpose of a GHG-pricing program is generally to reduce GHG emissions by imposing a cost of emissions from electricity generated within the GHG-pricing program's footprint

- GHG programs are intended to make low- or non-emitting resources relatively more economic than resources that emit high amounts of GHG emissions

- May also include rules applicable to imports in order to prevent "leakage"
  - Leakage occurs when electricity production shifts from GHG-emitting generating resources located within a jurisdiction applying GHG pricing to GHG-emitting generating resources located outside the jurisdiction (instead of reducing overall GHG emissions)

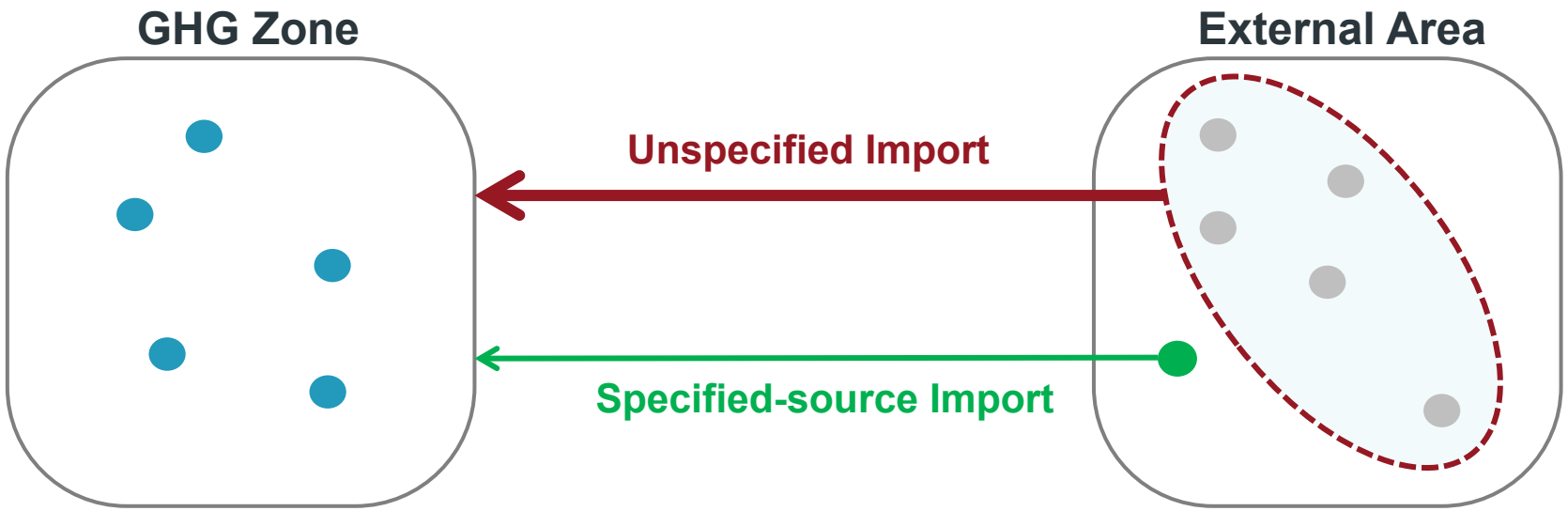
BACKGROUND: POLICY FRAMEWORK IN CALIFORNIA & WASHINGTON

- California Cap and Trade in place since 2013, Washington Cap and Invest begins 2023

- Both programs apply to energy **generated** in the state or **imported** into the state
  - Both state program separate imports into ‘specified’ and ‘unspecified’ buckets
  - Specified imports are where the source of the import is known and unspecified imports are where the source of the import is not known
  - Specified import emissions are resource-specific and unspecified import emissions are based on a default emissions rate

- Both programs regulate the “first jurisdictional deliverer” (FJD)
  - Whoever first delivers energy into the state (either the in-state generator or the importer) has a compliance obligation
  - Megawatt-hours and emissions associated with imports are reported and quantified (includes non-emitting imports)
  - Importers with a compliance obligation must purchase and retire allowances
    - One allowance per ton of GHG

BACKGROUND: DESIGN PROPOSAL



Generation within a GHG zone

1. **Internal resources** include their GHG costs in their offer prices

Imports into a GHG zone

2. **Specified-source Imports** are transfers of specific resources to the GHG zone at a resource-specific GHG rate

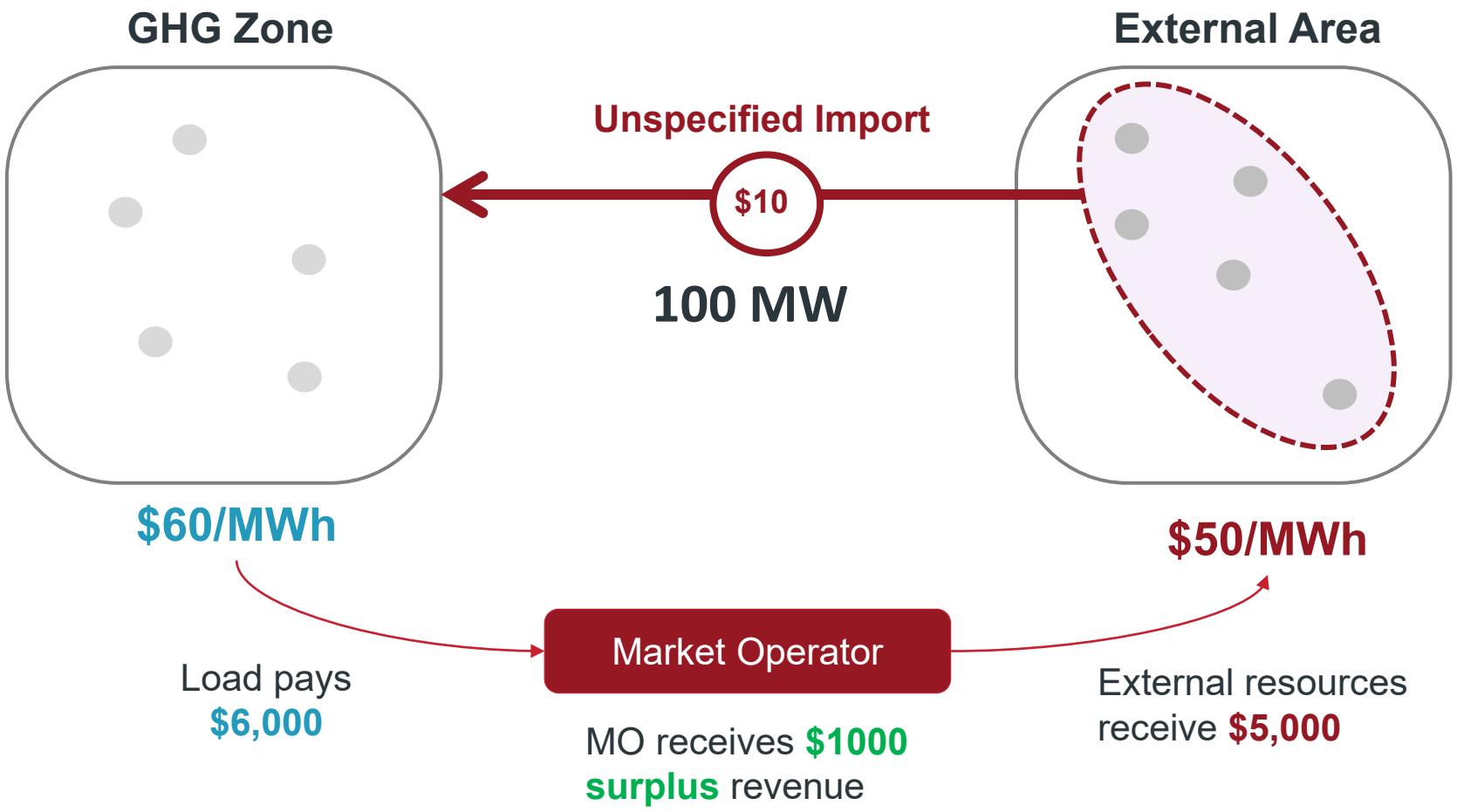
3. **Unspecified Imports** are assigned a default GHG emissions rate associated with the aggregate surplus generation in the external region

BACKGROUND: MARKET OPTIMIZATION OF UNSPECIFIED IMPORTS

Internal generation: **$60/MWh** >= **$10** + External generation: **$50/MWh** ✓ Import occurs

Internal generation: **$55/MWh** < **$10** + External generation: **$50/MWh** ✗ No Import

BACKGROUND: MARKET SETTLEMENT OF UNSPECIFIED IMPORTS

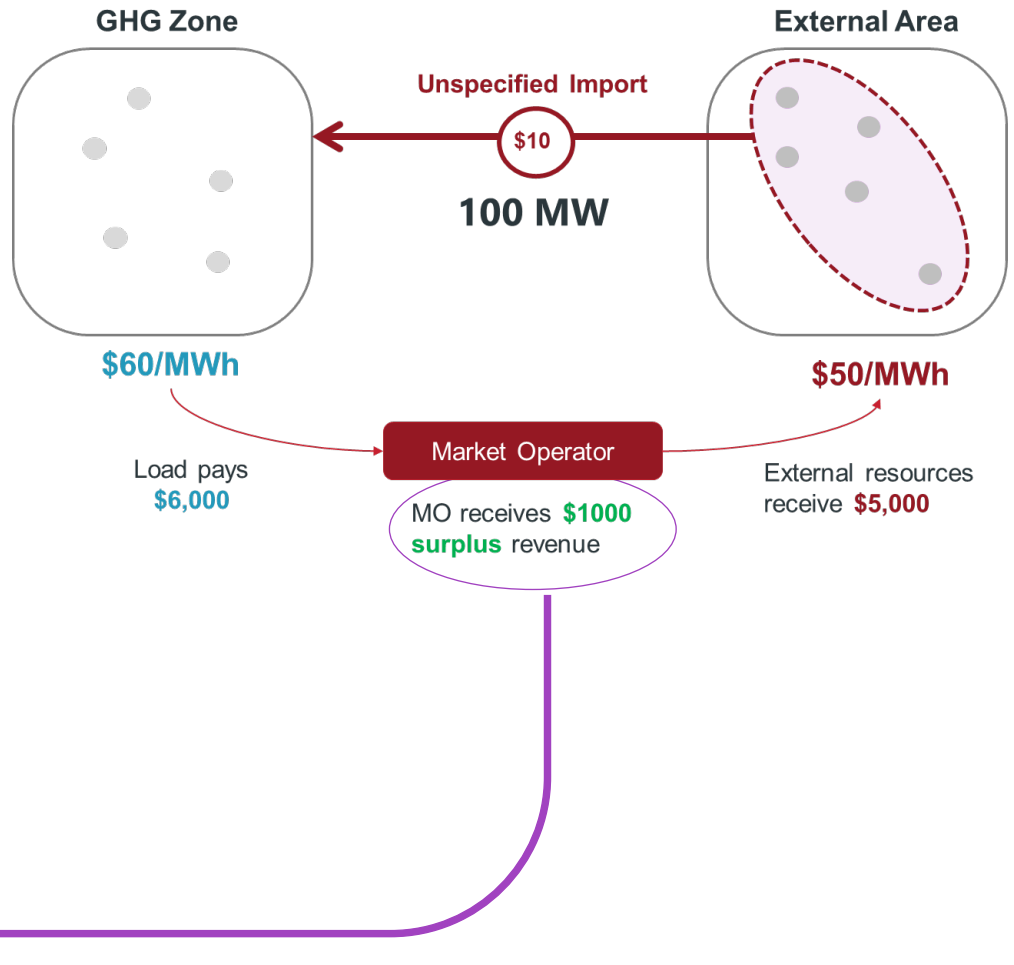


COMPLIANCE FOR UNSPECIFIED IMPORTS

- Unspecified Imports are not linked to any particular resource and there is no GHG price paid to external resources

- When GHG zone is a net importer, price separation between zones will reflect the unspecified rate
  - Generators in non-GHG zone will receive a (lower) price that does not reflect GHG costs
  - Load in the GHG zone will pay a (higher) price that reflects GHG costs

- Surplus revenue collected by Market Operator fully funds GHG compliance requirements
  - 100 MW * 0.50 MTCO2/MWh = 50 allowances required
  - 50 allowances * $20 per allowance = **$1000**



FIRST JURISDICTIONAL DELIVERER (FJD) FRAMEWORK

- The FJD approach was an innovation from the original Western Climate Initiative (WCI) Program Design that was designed to eliminate emissions leakage
- The approach has evolved over time through public rulemaking processes and is intended to:
  - Ensure in-state generators and importers are treated the same way
  - Provide for accuracy and verification of emission reporting
- For power that is generated outside California or Washington for consumption within those states, the FJD is the **first entity that delivers that electricity over which the consuming jurisdiction has regulatory authority**
- In the bilateral market, the FJD is the electricity importer, who is generally identified based on e-tags
  - For specified imports, individual external resources are identified and resource-specific emissions factors are used
  - For unspecified imports, individual external resources are not identified and a default emissions factor is used
  - In both cases, individual external entities are identified who have a compliance obligation for the imported electricity and associated emissions

FJD FRAMEWORK IN A FULLY ORGANIZED MARKET

- A market based on locational marginal pricing (LMP) produces a set of independent injections and withdrawals at individual nodes
  - There is generally no specific link between where resources inject and where loads withdraw
  - There is no longer a mechanism to identify individual importers (of specified or unspecified electricity) based on e-tags or bilateral transactions
- Under a full organized market (e.g., RTO), the output from an individual resource is generally sold at its physical location (e.g., busbar) and the aggregate output from all resources across the entire footprint is simultaneously "delivered" by the market operator to all load locations
  - Energy delivered to any particular location is not easily tied to a specific resource or entity
  - Approaches that require the market dispatch to accurately "link" resources to loads have the potential to be arbitrary
- The entity "responsible for delivering electricity" from resources to loads is the market operator, who has taken operational control of transmission assets
- However, the market operator is not a source of emissions and does not have ownership over assets that produce emissions

FJD FRAMEWORK FOR ZONAL APPROACH IN EDAM

- EDAM is a hybrid market that retains certain elements of the existing bilateral markets and physical OATT transmission framework

- The zonal approach for GHG pricing is also a hybrid that reflects the overall market design
  - Reporting of specified imports uses a similar approach to CARB's existing approach for bilateral markets if certain criteria are met
  - Compliance for unspecified imports reflects the realities of a simultaneous organized market dispatch but is functionally similar to the bilateral market - revenue collected from load used to purchase and retire allowances

- Data verification based on total quantity of imports into the GHG zone and application of unspecified emissions rate

FJD FRAMEWORK FOR ZONAL APPROACH IN EDAM

- In EDAM, the market operator could administer the FJD function for unspecified imports:
  - The market operator will determine the total quantity of unspecified imports that will occur each interval and will collect the surplus revenue associated with GHG emissions of unspecified imports
  - The purchase and retirement of allowances could become an administrative function performed by the market operator itself
  - While the market operator does not own generating assets and therefore is not a “source” of emissions, it is the administrator of the dispatch of those sources of emissions and could potentially administer compliance for those sources
  - Verification of data includes total imports and application unspecified emissions rate
  - Source of the data will be the market operator regardless of who ultimately is responsible for the purchase and retirement of allowances

- Other solutions may also be possible, such as using a third party or assigning the responsibility to entities within the GHG zone who are responsible for imports from the market
  - Revenue collected by the market operator could be redistributed so the compliance obligation is not burdened with a new cost ot purchase allowances

ADDRESSING LEAKAGE

Inaccurately Low
Import GHG Rate

e.g. all imports treated as clean generation

- GHG "leakage" as electricity production (and emissions) shift outside the GHG zone.
- Clean and low-emitting generators outside GHG zone receive suppressed value for GHG attributes.
- Higher-emitting generators outside GHG zone benefit from increased opportunity to sell into GHG zone.
- Market prices in GHG zone do not accurately reflect GHG costs, weakening incentives for clean resources

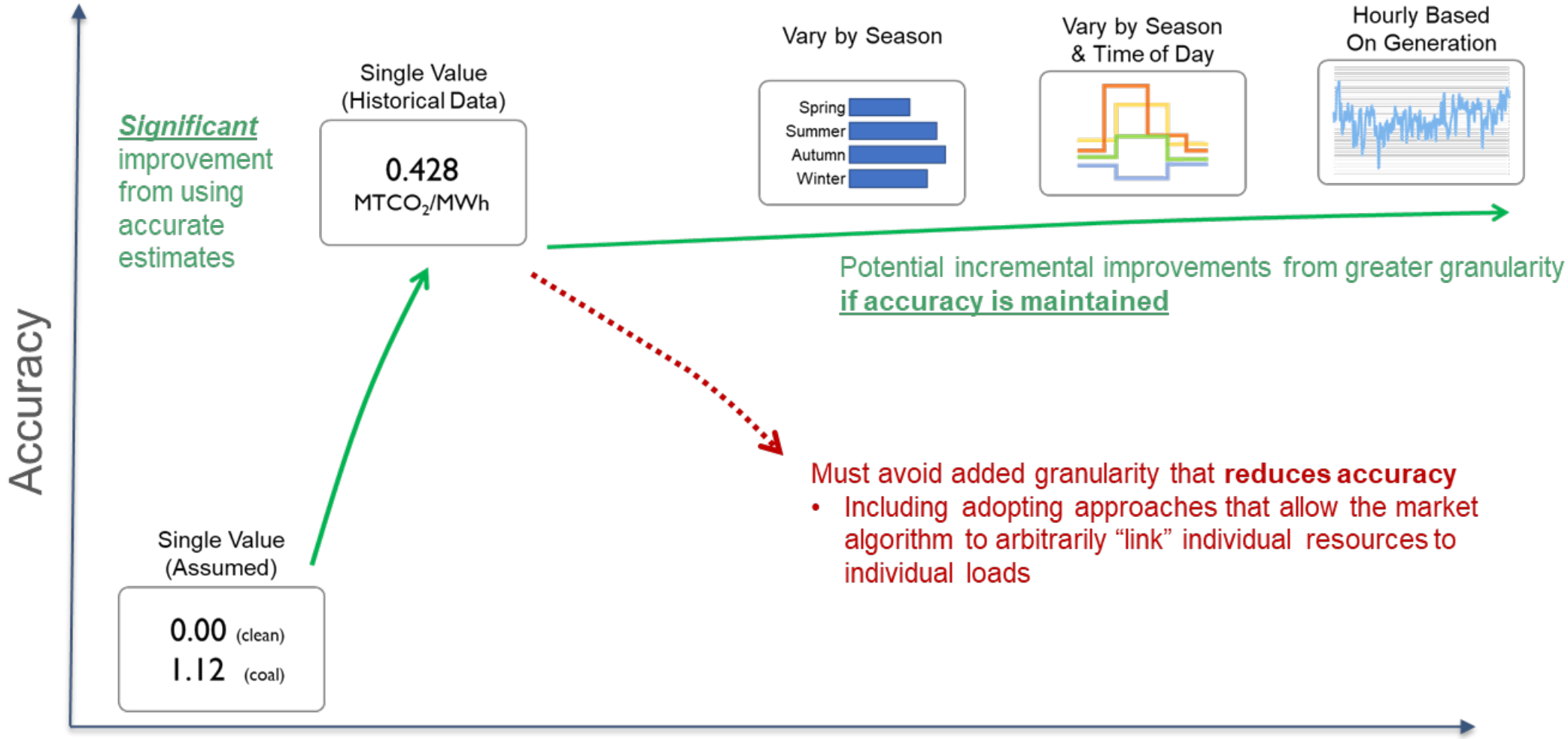
Inaccurately High
Import GHG Rate

e.g. all imports treated as coal generation

- Opportunities to reduce GHG emissions through import substitution are not realized.
- Consumers in GHG zone face excess costs to achieve environmental goals.
- Clean and low-emitting resources outside GHG zone have limited access to opportunities to sell into GHG zone.
- Higher-emitting generators inside GHG zone benefits from reduced imports.
- Areas outside GHG zone may experience export bottlenecks, oversupply challenges, and suppressed market prices

ACCURATELY DETERMINING THE GHG RATE FOR IMPORTS

UNSPECIFIED IMPORTS



FEDERAL CONSIDERATIONS

- FERC precedent on incorporating GHG pricing in wholesale energy markets is not settled
  - In the U.S., California and Washington are the only GHG programs that explicitly price emissions associated with imports into a state
  - The only precedent for incorporating this type of program into an organized market framework is the resource-specific approach in the EIM
  - Other organized markets have explored issues of sub-regional GHG pricing or addressing leakage through border adjustments

- In April 2021, FERC expressed an openness to consider a range of approaches to accounting for GHG emissions and costs in the context of an organized market
  - FERC stated that "proposals to incorporate a state-determined carbon price into RTO/ISO markets could potentially improve the efficiency of those markets" and encouraged "discussions among RTOs/ISOs and their stakeholders regarding wholesale market rules that would incorporate state-determined carbon pricing."
  - Rather than dictating a particular approach, FERC explained that it would "review any FPA section 205 filing that proposes to establish wholesale market rules that incorporate a state-determined carbon price into RTO . . . markets based on the particular facts and circumstances presented in that proceeding"

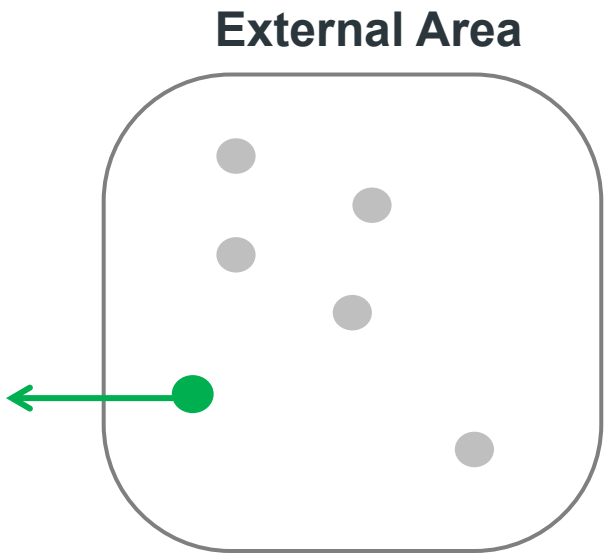
FEDERAL CONSIDERATIONS

- Potential questions to consider:
  - Non-discriminatory treatment of resources internal and external to the GHG zone
  - Role of the market operator in the collection and redistribution of GHG revenue
  - Ability of external entities to elect whether to serve demand in the GHG zone

- Zonal approach considerations:
  - External resources have opportunity to deliver to the GHG zone on a specified basis and are functionally considered “internal” to the GHG zone
  - The toll rate could be set to $0 during periods of over-supply in the external area
  - Entities will not be directly subject to CARB’s obligations unless they choose to deliver to the GHG zone nor will individual resources be specifically dispatched to serve demand in the GHG zone
  - In collecting and redistributing revenue, or using revenue to purchase allowances, market operator is performing an essentially administrative function

SPECIFIED-SOURCE IMPORTS

- Specified-source imports allow external resources to contribute toward meeting environmental goals and to access market opportunities to compete, on a non-discriminatory basis, to sell to the GHG zone
  - Ensures external resources have the opportunity to be treated the same as resources internal to the GHG zone
  - Functionally similar to the approach for specified source imports in the bilateral market



- Two important considerations for supporting for Specified-source imports
  - Identification of the specific resource (and its emissions rate)
  - Verification that the specified resource was imported to the GHG zone
  - Should transmission be required as demonstration of import?

- Once specified-source treatment is established, the market software dispatches the resource based on its costs (including GHG) in tandem with scheduling a corresponding quantity of specified-source imports into the GHG zone

DISCUSSION

APPENDIX

PRINCIPLES FOR INCORPORATING GHG PROGRAMS INTO A DAY-AHEAD MARKET

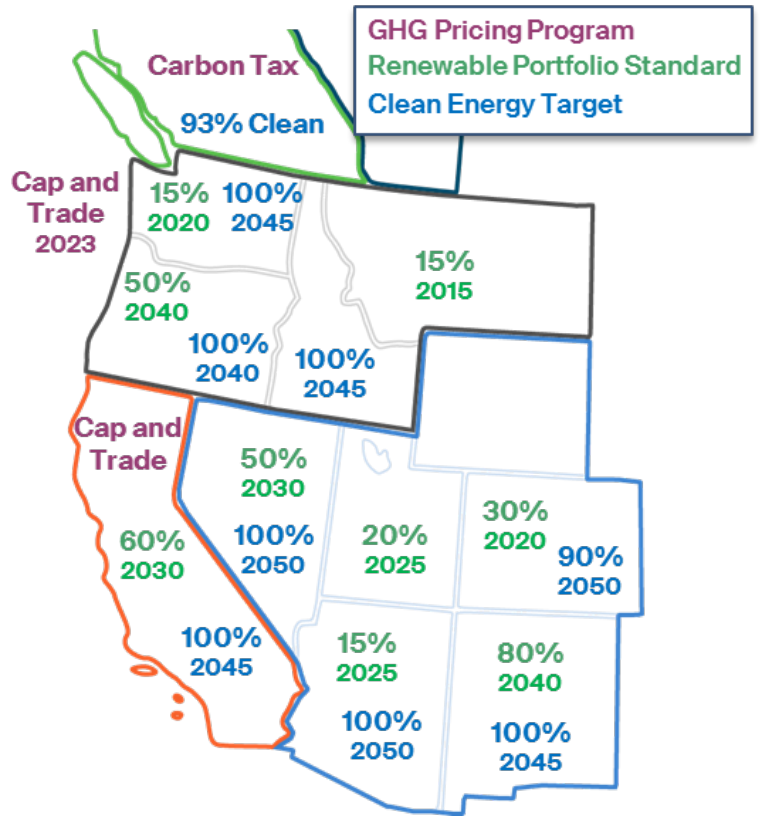
- It is up to each state or province to determine whether to implement a GHG-pricing program
  - Market design must not encroach upon state autonomy to adopt a GHG-related program and determine its associated rules

- Market design should accurately apply the provisions of each state or province's GHG-pricing program
  - But also recognize that market design can help to inform policy choices and vice versa, and harmonization of certain aspects of state GHG programs could enable improved efficiencies

- The organized market design should anticipate growing number of GHG-pricing programs, and that all GHG-pricing programs will likely evolve over time
  - Designing flexibility into the organized market will reduce the need for significant changes to the organized market design as GHG-pricing programs grow and evolve
  - A flexibly designed program may also be more able to accommodate clean energy or GHG policy frameworks that are not explicitly based on GHG pricing

PRINCIPLES FOR INCORPORATING GHG PROGRAMS INTO A DAY-AHEAD MARKET

- Resources have multiple regions where their generation can be delivered and their associated clean attributes applied
- Includes committing supply to meet a variety of environmental programs
  - RPS, clean energy standards, product content disclosure, GHG pricing programs
- A durable market design must allow the seller to determine the quantity – if any – that *it wishes to* commit to deliver to another region (Seller Autonomy)



Graphic represents simplified summary of targets and commitments for each State/Province. Includes voluntary targets from large load serving entities within the region

KEY OBJECTIVES FOR APPLYING GHG PRICING TO A DAY-AHEAD MARKET

Within A GHG Zone

- **Include the cost of GHG emissions in the dispatch of generation** resources inside the GHG zone
- **Include the cost of GHG emissions associated with imports** into the GHG zone;
- **Enable market access** for low- or non-emitting resources outside a GHG zone to compete to sell their low- or non-emitting output into a GHG zone;
- **Ensure market prices in the GHG zone reflect the cost of GHG emissions**, encouraging low and non-emitting resources to be developed and available when they provide greatest value.

Outside A GHG Zone

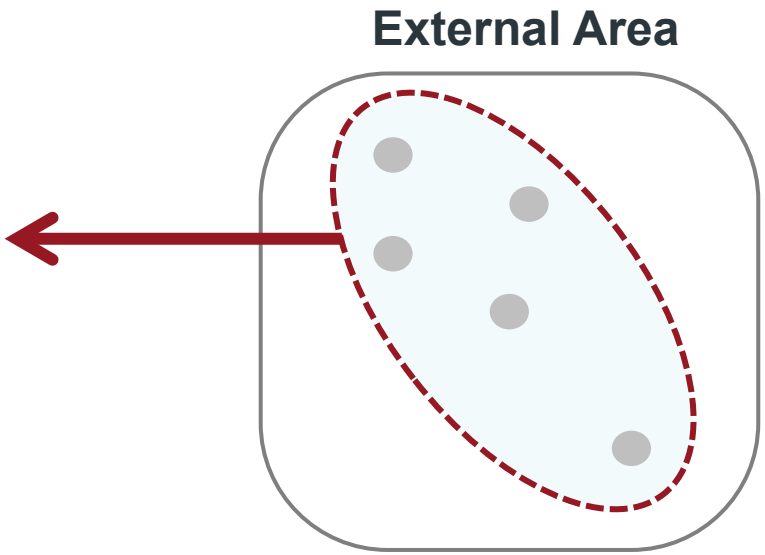
- **Ensure the cost of GHG emissions are *not* included in the dispatch of generation** outside of GHG zones;
- **Ensure the cost of GHG emissions are *not* included in transfers** that occur entirely outside of GHG zones;
- **Ensure that market prices for electricity do *not* include costs of GHG emissions of resources outside the GHG zone**.

UNSPECIFIED IMPORTS

- Unspecified Imports are imports that do not meet the GHG program requirements for Specified-source
  - Unspecified imports are not linked to any particular resource

- Existing GHG programs apply a single emissions rate to unspecified imports based on historical information regarding the type of generation that tends to be marginal in the region
  - *e.g., 0.428 MTCO2/MWh*

- Market optimization will use the relevant GHG program's default emission rate when evaluating unspecified imports into the GHG zone

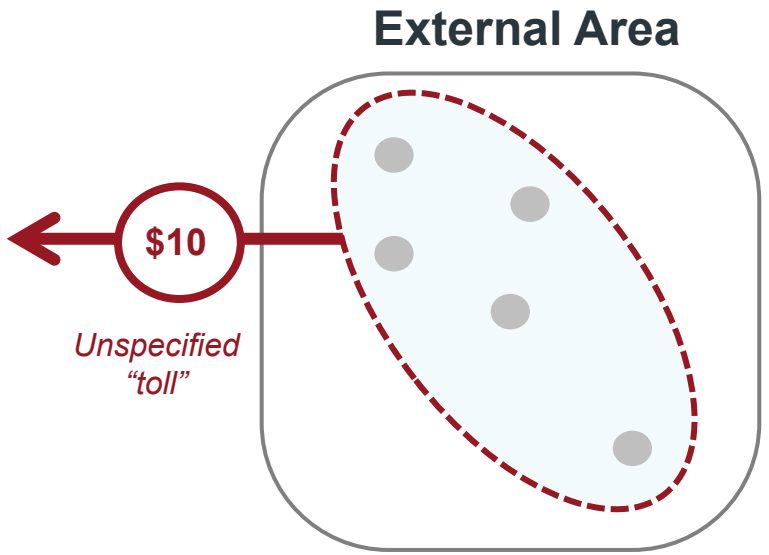


UNSPECIFIED IMPORTS

- The default GHG emissions rate is multiplied by the cost of GHG allowances to determine a “toll” for scheduling Unspecified Imports through the market optimization

- Example:
  - Assume unspecified rate = 0.5 MTCO2/MWh
  - Assume $20 allowance cost
  - 0.5 MTCO2/MWh * $20 allowance cost = **$10/MWh toll**

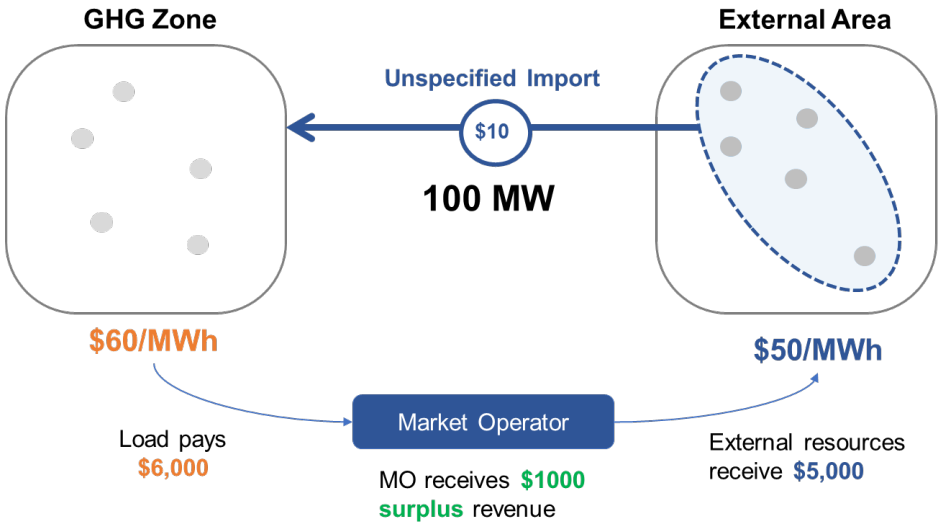
- Unspecified imports will only occur when the market price inside the GHG zone (which includes GHG costs) is higher than the market price in the non-GHG zone (which does not include GHG costs) by at least as much as the “toll” (e.g., $10/MWh)



COMPLIANCE FOR UNSPECIFIED IMPORTS

- Must define the entity that will assume responsibility for reporting and compliance for unspecified imports

- Entity will also receive the surplus market revenues associated with unspecified imports
  - Allowance obligation is fully funded by market revenue received from Market Operator



GHG APPROACH ENABLES COMPREHENSIVE REPORTING

Import Summary (MWh)

Type	Resource Name	Technology	Emissions Factor	Source Location	Importer	HE 7	HE 8	HE 9	….	HE 19	HE 20	HE 21	HE 22	Total
Specified-Source	Resource A	Wind	0	Oregon	Seller X	100	100	100	100	70	80	90	100	1200
Specified-Source	Resource B	Solar	0	Nevada	Seller Y	50	60	70	100	85	50	20	0	1395
Specified-Source	Resource C	Natural Gas	0.397	Arizona	Seller Z	385	385	385	385	385	385	385	385	6160
Unspecified	n/a	Unspecified	0.428	Unspecified	n/a	900	1100	1100	900	600	600	600	600	10900
Total Imports to GHG Zone						1435	1645	1655	1485	1140	1115	1095	1085	19655

Emissions Summary (MTCO2)

Type	Resource Name	Technology	Emissions Factor	Source Location	Importer	HE 7	HE 8	HE 9	…	HE 19	HE 20	HE 21	HE 22	Total
Specified-Source	Resource A	Wind	0	Oregon	Seller X	0	0	0	0	0	0	0	0	0
Specified-Source	Resource B	Solar	0	Nevada	Seller Y	0	0	0	0	0	0	0	0	0
Specified-Source	Resource C	Natural Gas	0.397	Arizona	Seller Z	153	153	153	153	153	153	153	153	2446
Unspecified	n/a	Unspecified	0.428	Unspecified	n/a	385	471	471	385	257	257	257	257	4665
Total Emissions						538	624	624	538	410	410	410	410	7111