DEPARTMENT OF ECOLOGY
State of Washington

Electricity Markets Rulemaking Chapters 173-441 & 173-446 WAC

July 25, 2023

Ecology Staff

- **Nick Bourgault** – Host
- **Gopika Patwa** – Rule Lead
- **Bill Drumheller** – Lead Subject Matter Expert
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Overview

Rulemaking overview

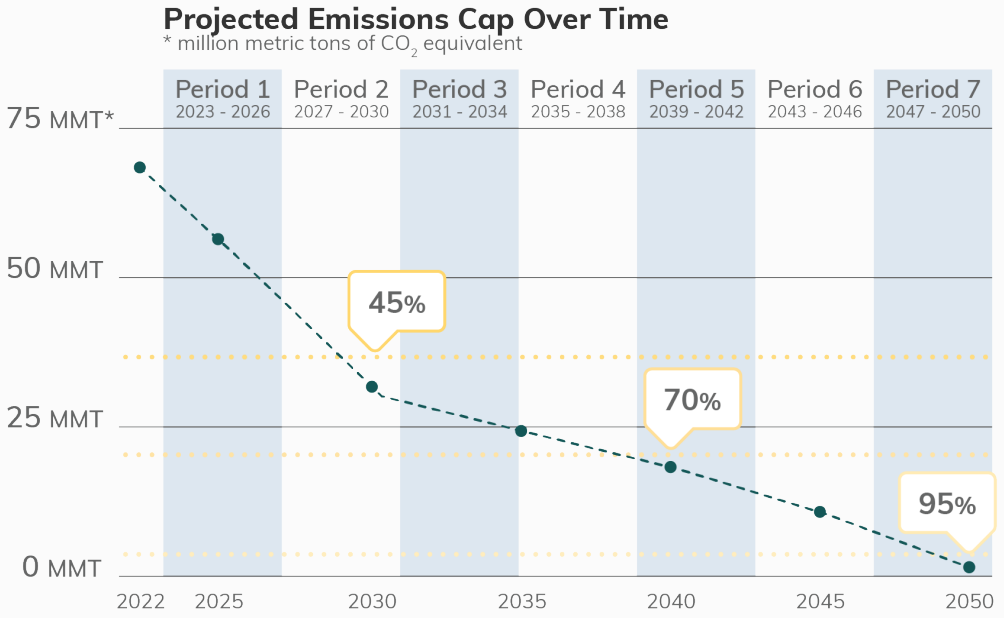
Regulatory Assistance Project (RAP)

Rule language context

Questions

Background: The Climate Commitment Act (CCA)

- Passed in 2021 to cap and reduce greenhouse gas (GHG) emissions from Washington's largest emitting sources and industries.
- Created a cap-and-invest program
  - Sets statewide cap on GHG emissions
  - Auctions or allocates emissions allowances
  - Cap is reduced over time to ensure emissions reduction commitments are met.
- Will help Washington reduce GHG emissions by 95% by 2050.



Rulemaking Context and Statute

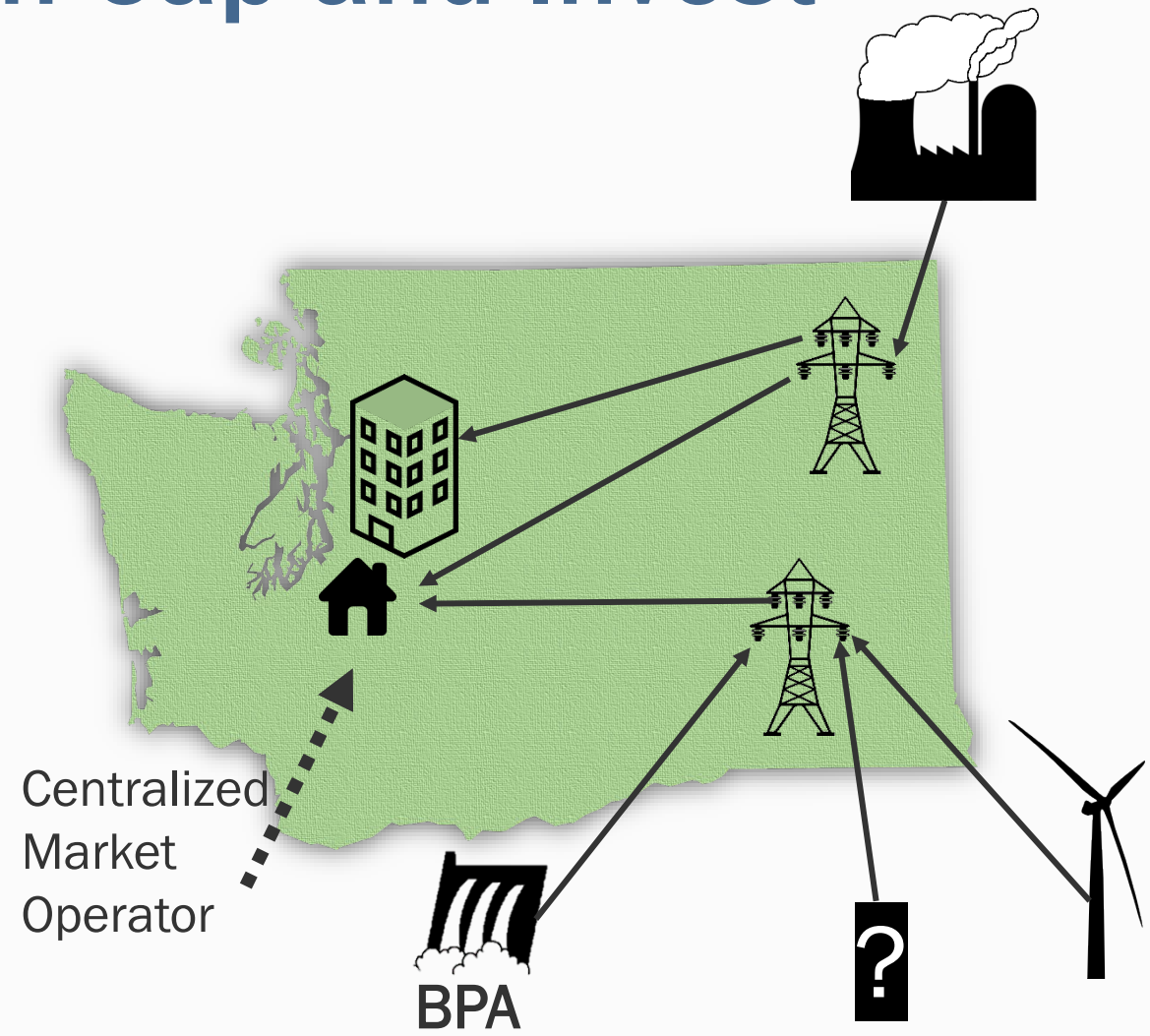
- This rulemaking will adopt amendments to Chapters **173-441** and **173-446** WAC.
- This rulemaking is required by the Climate Commitment Act.
  - RCW 70A.65.080(1)(c)
- Interagency Communication
  - Department of Commerce and the Utilities and Transportation Commission

Background on Electricity Transactions

- The entire western USA is covered by one large electrical grid.
  - Flows of electrical energy can be measured (at meter)
  - Can't track electrons from source to sink (can't know generation source)
- Electricity follows the rules of physics, not finance.
- Assigning emissions to electricity is purely an accounting exercise.
- Electricity in the West is largely transacted in two ways:
  - Bilateral transactions – Contracts for electricity from points A to B
  - Organized markets – Sell electricity like a commodity on exchanges
    - Long-term markets – Known excess generation is offered for sale well in advance
    - Short-term markets – New markets, like trading floor for sub-hour blocks of electricity

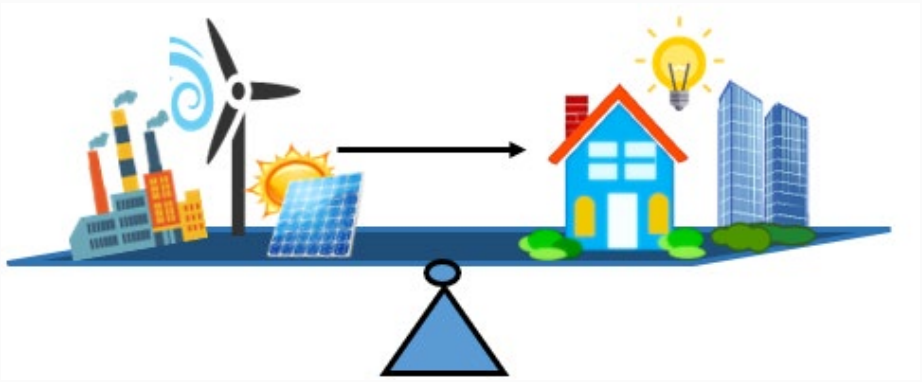
Imported Electricity in Cap and Invest

- "Resource-Specific" import
  - Imported electricity is from a specific known resource (e.g., wind or coal).
  - Imported electricity is from a mix of resources averaged to one number (Bonneville Power Administration).
- "Unspecified" import
  - Imported electricity is from unknown or undesignated sources.
- "Centralized Market" import
  - "Deemed" resource can be assigned by market-run computer algorithm.

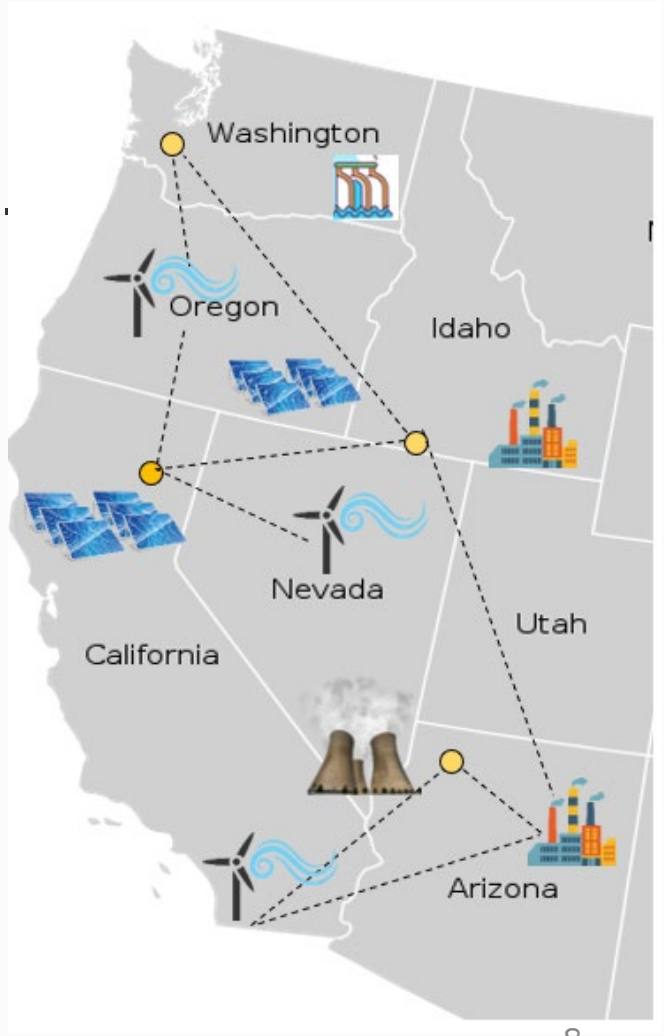


Why Centralized Electricity Markets

- Electric utilities maintain a delicate balance of supply and demand.
  - Limited energy storage options for renewables (wind, solar)
  - Energy consumed needs to match energy provided
- Centralized electricity markets **facilitate trade** over a large region.
  - Example: Address electricity shortfall in one region by importing surplus electricity generated elsewhere
- Makes the grid more **affordable**, **reliable**, and **clean**.



Balanced supply and demand



Future Energy Landscape

Current Trends

- Electricity demand in Washington has been relatively stable for past 30 years.
- Washington generally exports more electricity than it consumes (hydropower).
- Most trades are bilateral, modest integration with neighboring states.

Projections for 2050

- Electricity use to **double by 2050**, per Washington Department of Commerce.
- Washington expected to **import 40% or more** of its electricity from out-of-state sources.
- Highly integrated power grid, centrally dispatched through electricity markets.

We need more electricity for…

Industry: Growth in data centers, semiconductor manufacturing, clean hydrogen (electrolysis)

Transportation: Electrification of passenger vehicles, short-haul air travel

Buildings: Increasing adoption of heat pumps, electric stoves

Demographic Trends: Population growth, new housing construction

Rulemaking Objectives

- Identify and establish compliance obligations for entities importing electricity to Washington through centralized electricity markets
- This rulemaking will:
  - Eliminate gaps (We currently have no way to put compliance obligation on importing entity.)
  - Allow necessary data infrastructure to be put in place to track importing entities.
- Electricity markets addressed in this rulemaking:
  - Western Energy Imbalance Market
  - Extended Day Ahead Market
  - Markets + initiative underway by the Southwest Power Pool
  - Potential additional new markets
- Why now

Takeaways

We intend this rule to:

- Ensure Washington has the necessary data to include and account for imports from centralized electricity markets under the cap-and-invest program.
- Prepare Washington to participate more fully in centralized electricity markets, allowing the state to meet its growing demand for energy with electricity imports.
- Help Washington transition to 100% clean electricity by 2045, while electrifying key sectors such as transportation.

Rulemaking Timeline

Rule Announcement

- Introduce rulemaking
- **Hold stakeholder meetings**
- Develop rule language
- **Hold informal public comment periods**

July 2023 – January 2024

Rule Proposal

- Propose rule language
- **Hold public comment period**
  - Hold public hearings
  - Submit comments

January 2024 – July 2024

Rule Adoption

- Adopt final rule language (CR-103)
- Concise Explanatory Statement (CES)
- Economic analysis
- Rule effective after 31 days

Anticipated July 2024

Questions

Process and Timeline

25 July 2023

Day-Ahead Markets and State GHG Policy

Washington Department of Ecology

Doug Howe and Jessica Shipley

Day-Ahead Markets & State GHG Policy

- Today's agenda:
  - Introduction to day-ahead market basics
  - The issue of emissions leakage
  - Cap-and-Trade integration into EDAM and Markets+

Introduction to Day-Ahead Market Basics

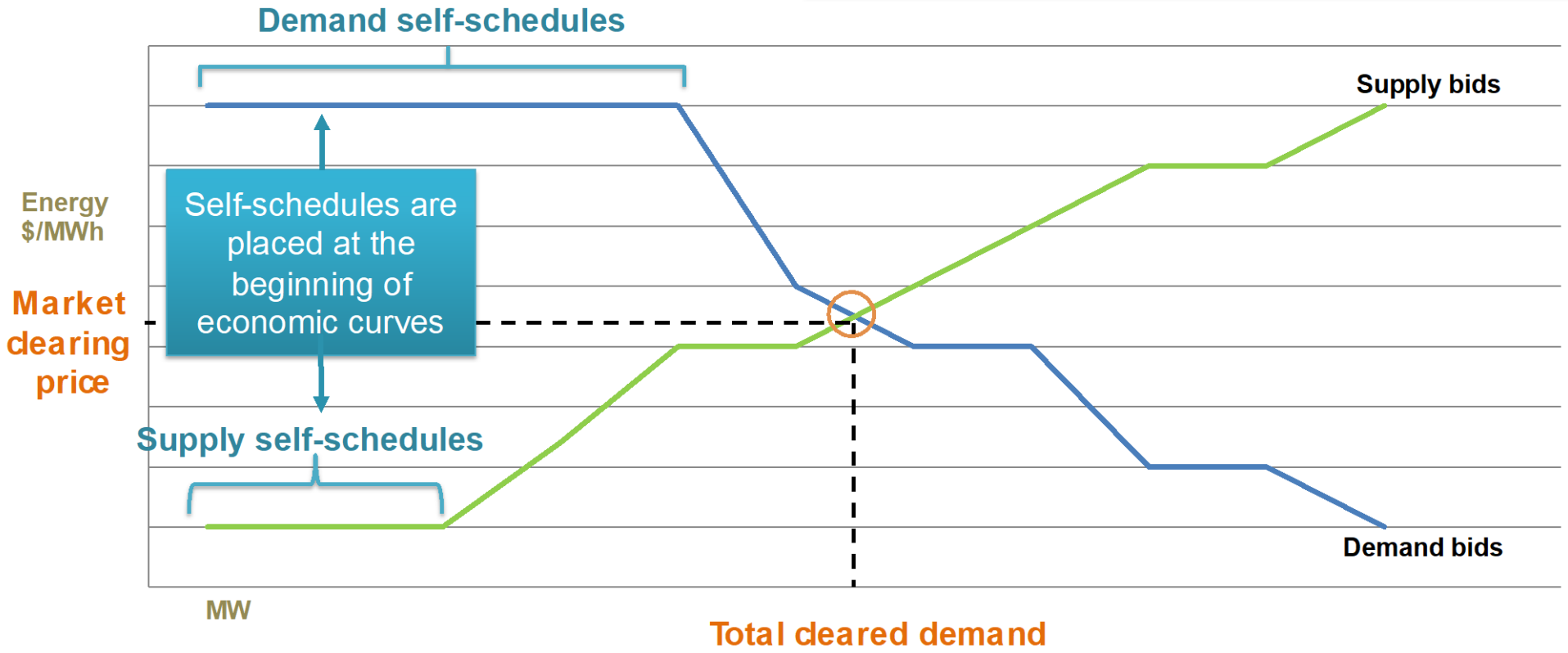
Day-Ahead-Market Basics

- A market in which sellers can bid prices for the sale of electricity to be supplied for every hour of a particular future day.
- Sellers can post prices between as early as 7 days and as late as the day before the settlement hour.
- The market operator makes awards (winning bids) to meet the projected load in the footprint based on minimizing the total system bid cost.

Day-ahead market clearing

Day-ahead clears supply bids against demand bids;

Real-time clears supply against ISO load forecast.



Straight From the Tariff

California Independent System Operator Corporation
Fifth Replacement Tariff

Locational Marginal Price (LMP)

The marginal cost ($/MWh) of serving the next increment(*) of Demand at that PNode(**) consistent with existing Transmission Constraints and the performance characteristics of resources.

***1 MWh more of load**

****PNode: Pricing Node**

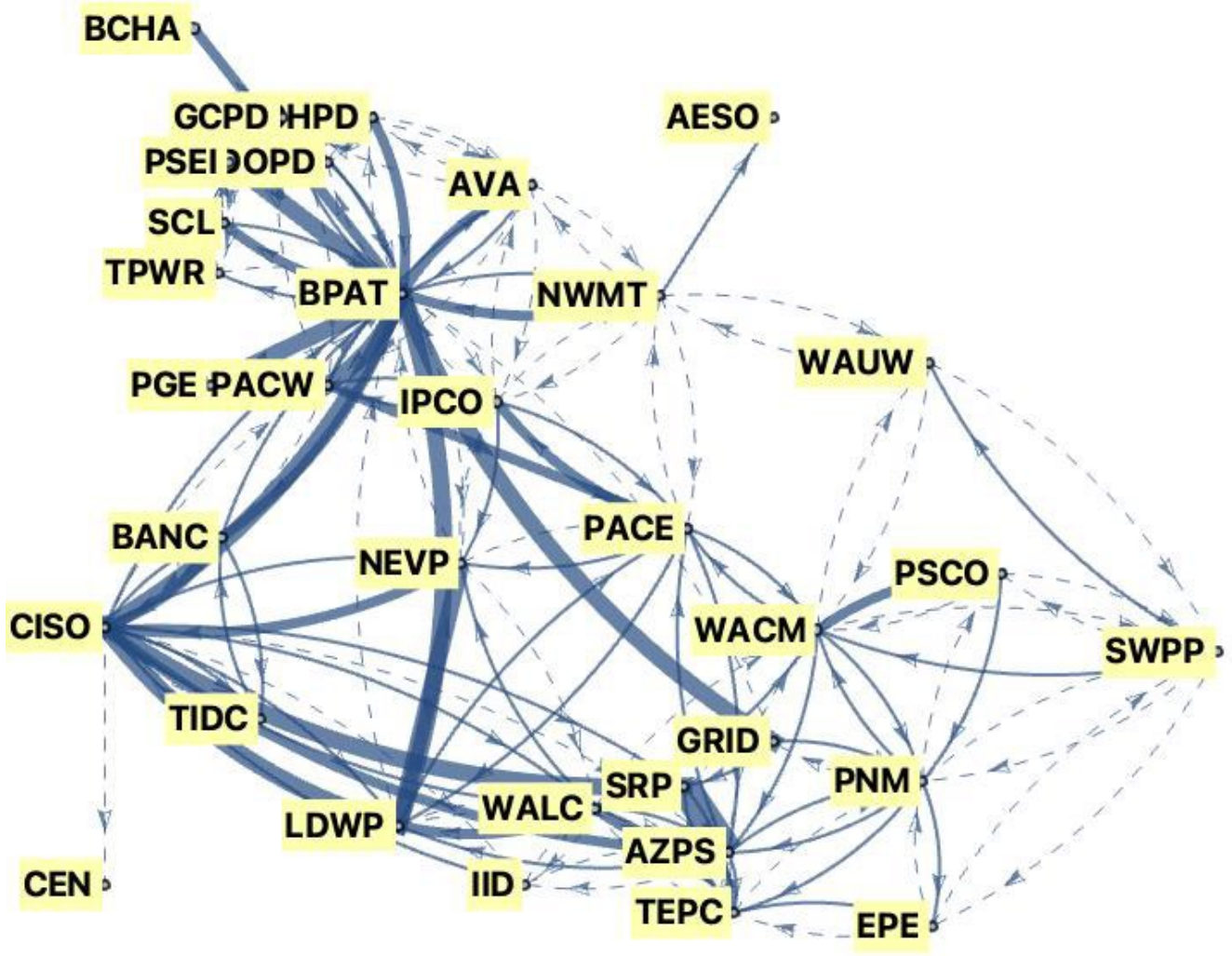
How Do Generation Owners Price Their Electricity Production?

- A generator can choose to bid any amount subject to a cap (usually $1000/MWH).
- A generator typically chooses to bid its **fuel cost + variable operating cost**. If it has Market-Based Rate Authority, it may price at market rates.
- Generators in a state with a fee-based GHG program – cap-and-trade – will include the cost of allowances as a variable operating cost. For external generators, it will vary.

How are Prices Set?

- Dispatch is optimized to produce the lowest total bid cost for the entire market.
- A marginal energy cost is computed which is the cost of serving 1 MWh more in the market.
- A marginal GHG cost is computed which is the cost of serving 1 MWh more in the GHG Zone. The marginal GHG cost is always zero for non-GHG zone.
- The LMP of a zone is the sum of the two (ignoring congestion costs and losses for simplicity).
- Loads pay and generators are paid the LMP of the zone they are located in.

Western Interchange Backdrop



Average Hourly Transmission Volumes

- Largest volumes involve PNW interchange to CAISO – almost entirely hydro – and DSW to CAISO – mainly nuclear and gas.
- Moving east, volumes are much lower, transmission links smaller
- Trade can and will occur across market seams, but efficiency will be affected by large seams. Different GHG regimes will complicate, but likely not make impossible.

Source: EIA-930

The Issue of Emissions Leakage

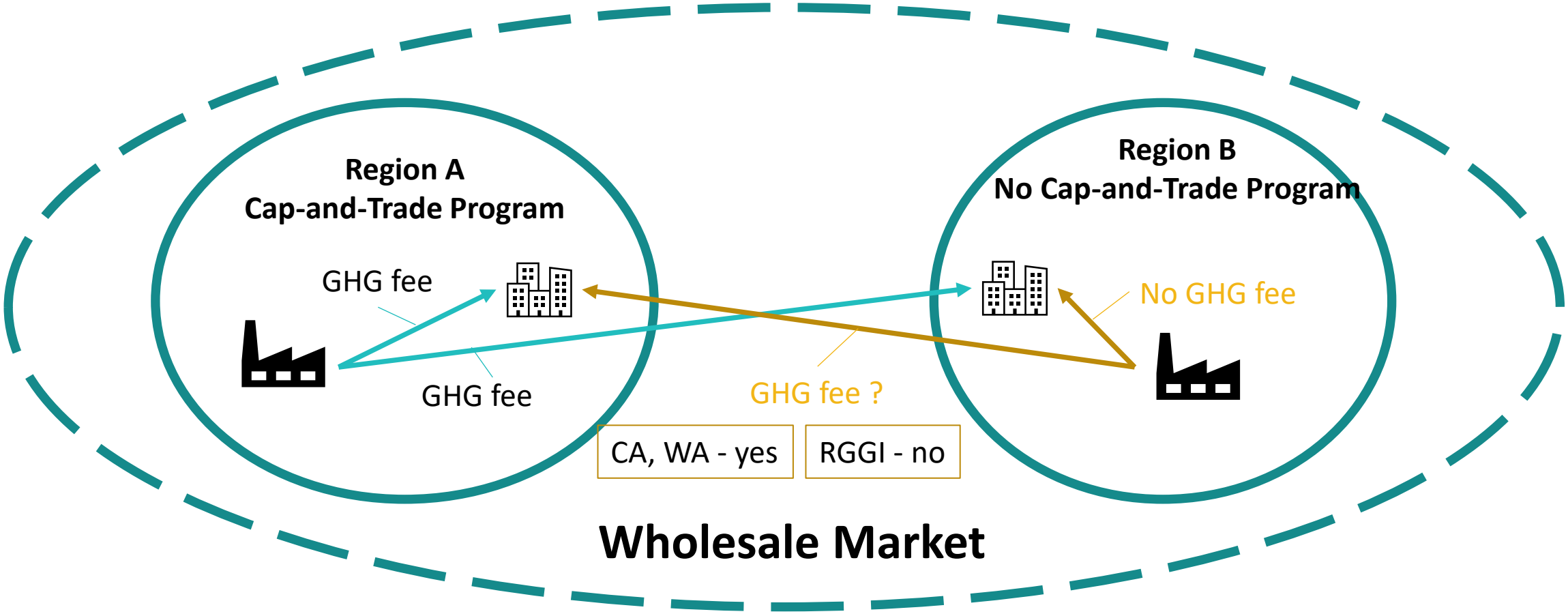
Two Broad Categories of GHG Policies Among Western States

- **Fee-based programs**
  - Cap-and-trade programs*:* An **allowance** is required to emit 1 metric ton (tonne) of CO_2e.
    - Allowances are sold through auction. The number of allowances is capped and decreases over time.
  - Washington & California
    - Programs are not linked currently.
- **Non-fee-based programs**
  - Renewable Portfolio Standards (RPS): Only western states without an RPS are ID and WY.
  - GHG Reduction Programs*:* WA, OR, NV, CO, NM

Importation of Electricity into a Cap-and-Trade State

- Both CA and WA require importation of electricity to meet rules under the cap-and-trade systems.
  - The entity responsible for compliance is called the First Jurisdictional Deliverer (FJD).
- Compliance is required in both bilateral and market imports.
  - Without this requirement, leakage would be prevalent and unaccounted for.
- Bilateral contracts will include compliance costs in the contracted price. Bilateral contracts generally specify the source and sink, making it easy to identify the FJD.
- Market imports must include compliance cost.
  - Markets don't specifically match sources to sinks, so "naming" the FJD of a market import and its compliance obligation is complicated and controversial.
- PJM and EIM cover both Cap-and-Trade states and non-Cap-and-Trade states.

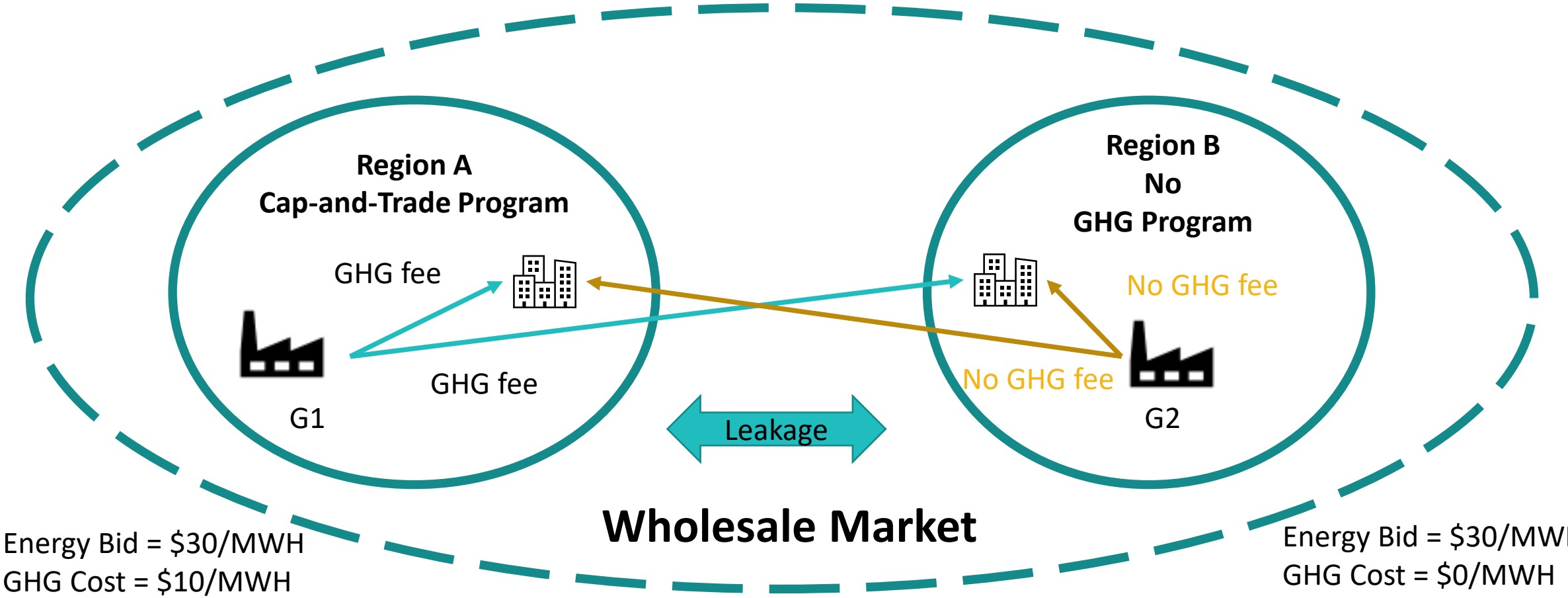
Cap-and-Trade Programs and Markets



What is Emissions Leakage?

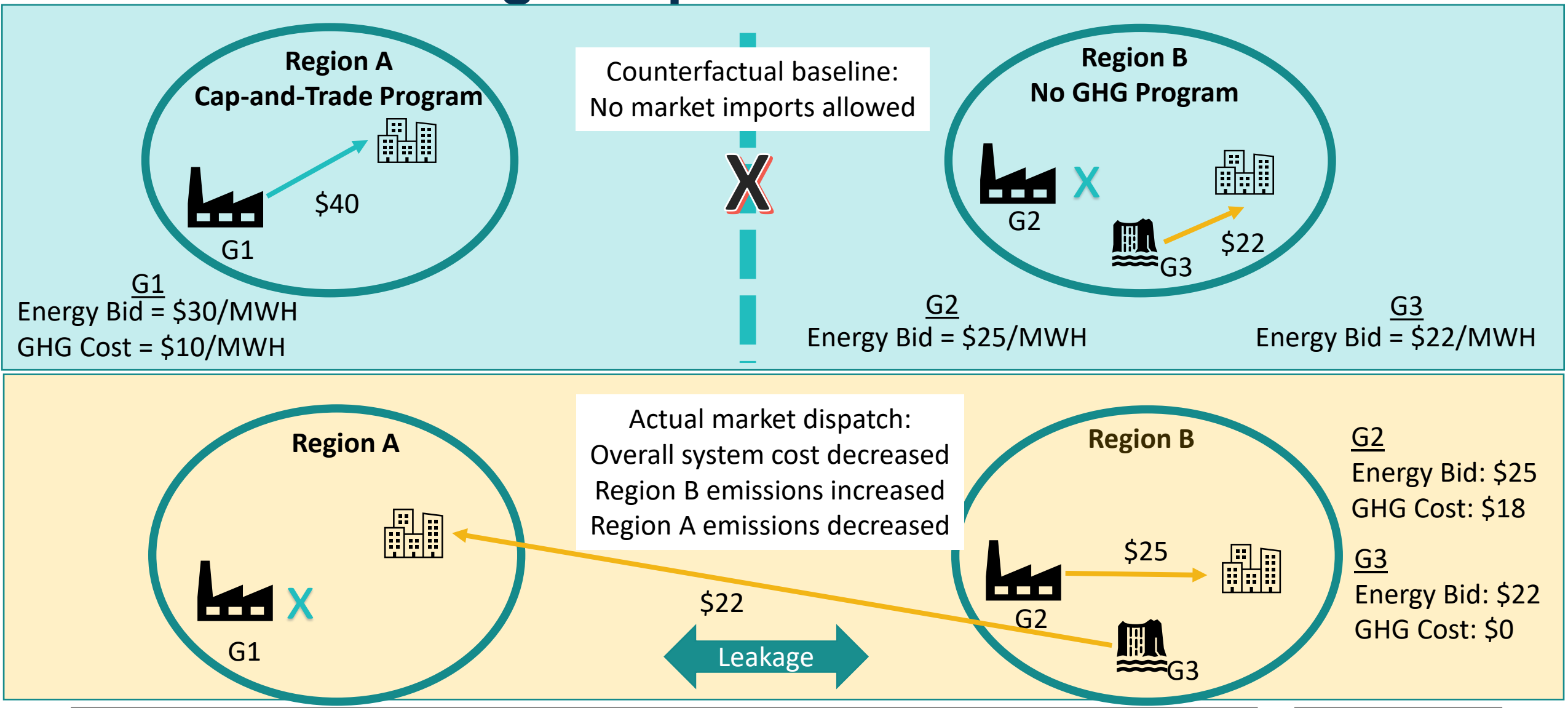
- GHG Zone: The physical area to which the cap-and-trade program applies
- Emissions Leakage: When a GHG program causes emissions to rise in areas outside of the GHG zone. Emissions are “leaking” from one area to another without being accounted.
- EIM/EDAM calls this "Secondary Dispatch." Markets+ calls this "MW Redesignation."
- Goal is to identify and mitigate leakage if possible.

Emissions Leakage: Imports Not Assessed GHG Fee



- **If G2 does not pay GHG cost to serve Region A, it will cost $30 and it will displace G1. Resources inside the GHG zone will be displaced by imports, increasing total system emissions. Emissions are leaking between A and B with no accounting. This happens in RGGI**

Emissions Leakage: Imports Assessed GHG Fee



Cap-and-Trade Implementation in Day-Ahead Markets

Implementing Cap-and-Trade Programs in EDAM and Markets+

- Problem Statement:
  - For generators outside of the GHG zone, incorporating GHG cost into the generator bid if it serves the GHG zone load, but not incorporating GHG cost if it serves only non-GHG zone load.
  - Minimize leakage and account for it when it cannot be avoided.
  - However, the reality of central electricity markets is that electricity cannot be factually traced from a specific source to a specific sink.
  - So how do we assess GHG costs on generators outside the GHG zone which are centrally dispatched by the market operator?
- Two proposals:
  - **Resource-Specific** model will be used in CAISO's EDAM
  - **Zonal** model will be used in SPP's Markets+

Resource Specific Model: Key Features

- Uses an algorithm to “deem” that specific resources in the non-GHG zone are serving LSE’s in the cap-and-trade zone with a calculated quantity of imported MWh’s.
- The scheduling coordinator for deemed resources is the FJD and is responsible for submitting allowances equal to their calculated importation.
- Leakage can be calculated using a counterfactual as in the previous example and allowances are assessed against GHG Zone LSE’s at the system default emissions rate (e.g. ~ 0.4 to 0.5 tonnes/MWH).

Resource Specific Model: Details

- Generators in the market offer energy (MWh) and prices ($/MWh).
- Generators in the GHG zone include the GHG compliance cost in their energy bid.
- Generators outside the GHG Zones may offer to supply electricity to the GHG Zone. A GHG bid would consist of energy (MWh) and a GHG adder ($/MWh) which equals its allowance cost if it is awarded a GHG dispatch: resource-specific emission factor x GHG Zone allowance price.
- EXAMPLE: Generator G1

	MWH	$/MWH
Energy-Only Bid	300 MWH	$35/MWH
GHG Zone Bid Adder	175 MWH	$10/MWH

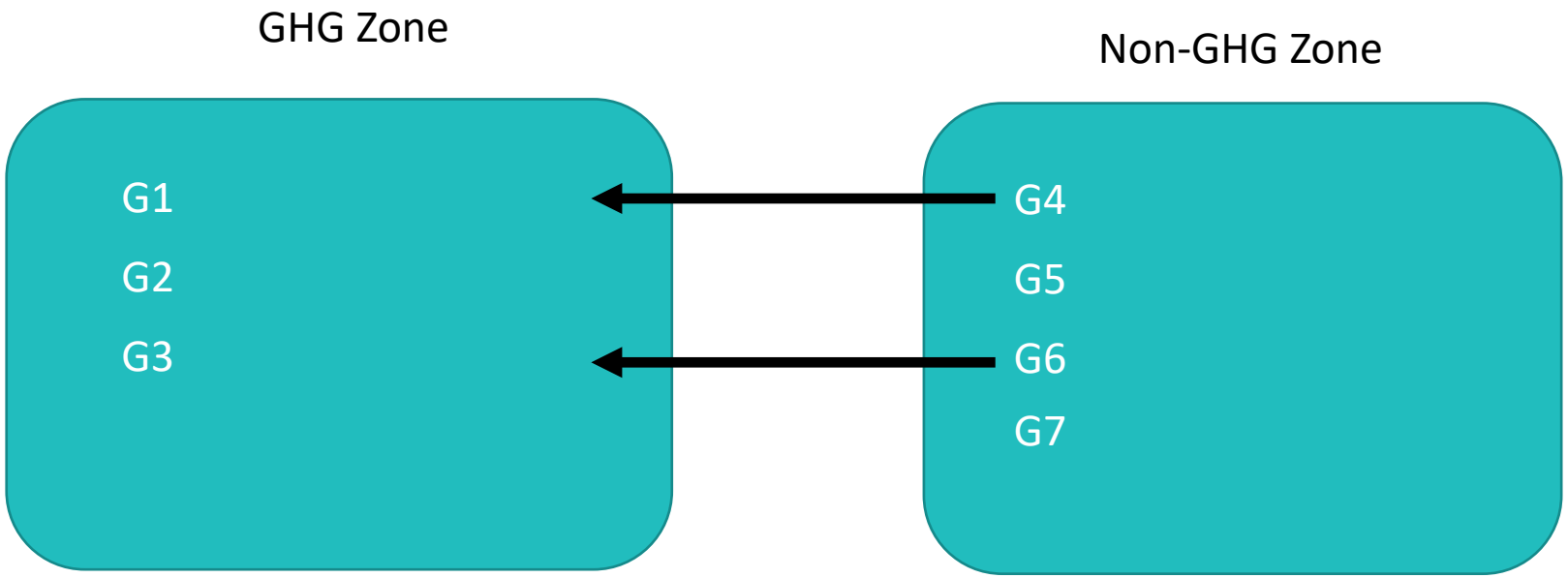
Resource Specific Selection Process

- Resources are selected to meet total system load at the least total system bid cost, subject to several constraints.
- Certain resources are “deemed” to be serving the GHG Zone.
  - Example: Generator G1 has 300 MWH Upper Economic Limit.
  - It is selected to dispatch 200 MWH.
  - 75 MWH are deemed to be serving the GHG zone.
  - The remaining 125 MWH are serving the non-GHG Zone.
  - Generator G1 must acquire and submit allowances to account for its 75 MWH “importation” to the GHG Zone.
- Deeming is an accounting device only.
  - It is not an assertion that electrons physically flowed from that generator to the load in the GHG Zone.
- A generator may elect to not be deemed to a GHG zone.
  - It signals this by offering a GHG bid of 0 MWH.

Resource Specific: Reference Pass

- The Resource Specific model for EDAM will require two model runs.
- The first run is called the Reference Pass.
  - Deeming is generally not allowed.
  - This creates a dispatch solution counterfactual.
- The Second Pass allows deeming to occur.
  - However, deeming from a generator is limited to the generator's Upper Economic Limit (UEL) minus the generator's scheduled dispatch from the Reference Pass (Reference Schedule).
  - Also, deeming generation from an external BAA is not allowed if the external BAA is a net-importer in the dispatch interval.

Resource Specific Model



G5 and G7 will not be deemed.

G4 and G6 are available to be deemed if economic to do so.

Enough generation must be dispatched internally and deemed externally to meet load of GHG Zone.

← Available to be deemed

Resource Specific: Final Notes

- This model works with two GHG Zones (e.g., CA and WA). A generator could be deemed from one GHG Zone to the other, but would have to pay both GHG adders. This “double fee” would be eliminated with linkage of CA and WA programs.
- The approach has met criticism due to
  - Possibility of significant leakage
  - Inequitable treatment of low or zero emitting external resources.

Zonal Model: Key features

- **IMPORTANT CAVEAT**: The definition of various Zonal features and their application to dispatch is still under discussion. The final version of all Zonal features not likely to be known until the final draft tariff language is written.
- Like the Resource Specific model, GHG Zone generators must include their cap-and-trade compliance costs in their energy bid.
- The key difference from Resource Specific model is that imports to the GHG Zone can happen via two pathways:
  (1) as a Specified Source, or
  (2) the Unspecified Source pathway.

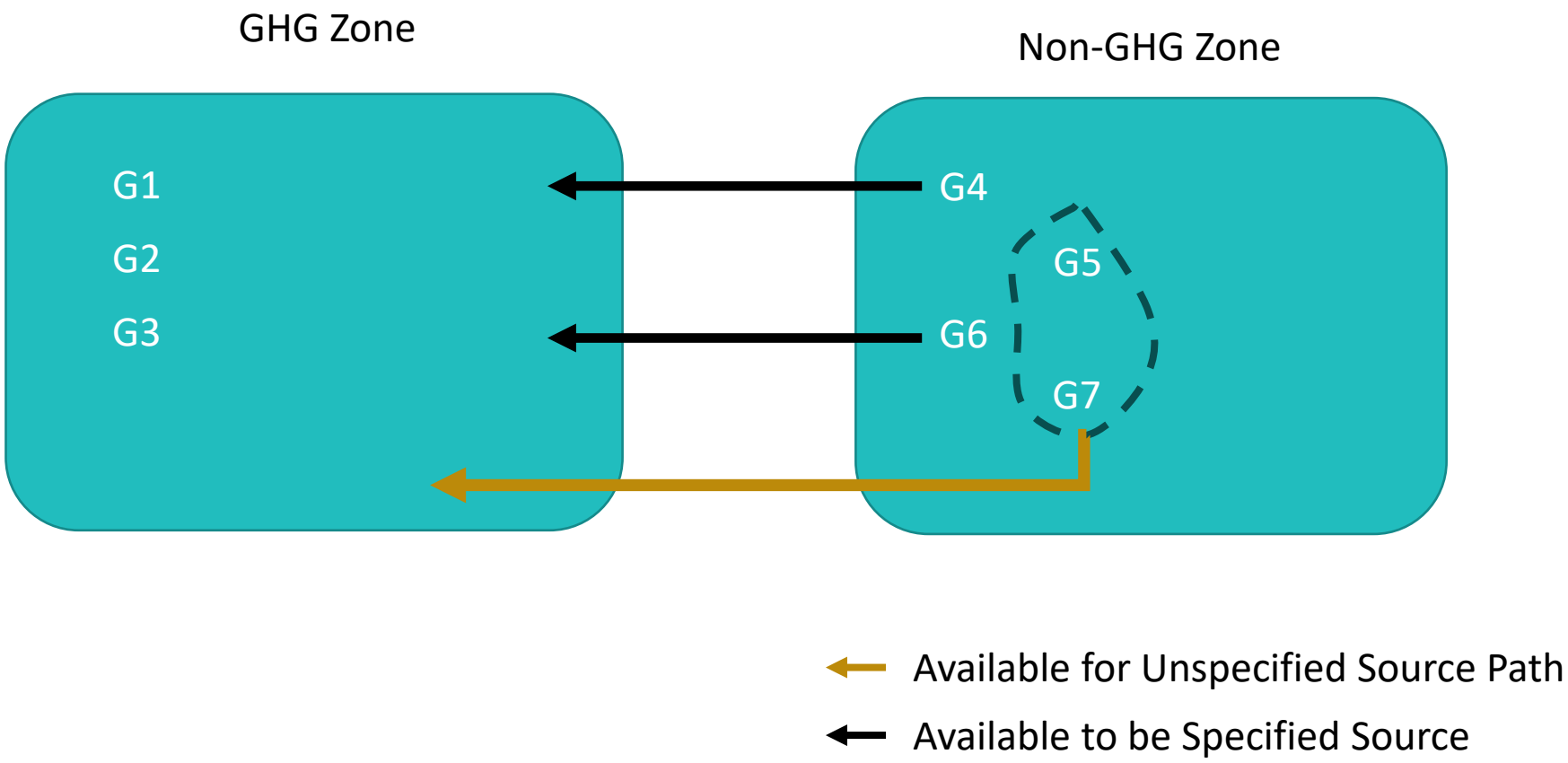
Zonal Model: Specified Sources (tbf)

- Two Types:
  - Type 1: pre-arranged external sources which have some obligation to serving the GHG zone load: owned generation like MOU or MJR, long- & short-term PPAs
  - Type 2: not pre-arranged external sources which may have ”surplus” generation available from time to time which would be offered to serve the GHG Zone
  - The SC for the Specified Source is the FJD for the source.
- What is “surplus?”
  - Amount in excess of a Reference Pass?
  - Determined by MO or SC on information known to them?
  - Can surplus be deemed to the GHG zone if the base amount has not been fully dispatched?

Zonal Model: Unspecified Source Path (tbf)

- A bulk amount of generation imported to the GHG Zone, but no attribution to specific resources.
  - It cannot be derived from Specified Sources.
- Imported quantity is assigned a default emission factor for purposes of assessing allowances to be submitted.
  - It appears that the default emission factor will be the state-sanctioned default emission factor, at least initially.
- The FJD for this importation is open issue at this time.
- Whether a resource can indicate that it is not available to be included in the Unspecific Source path is open issue.

Zonal Model


GHG Zone
Non-GHG Zone
G1
G2
G3
G4
G5
G6
G7
Available for Unspecified Source Path
Available to be Specified Source

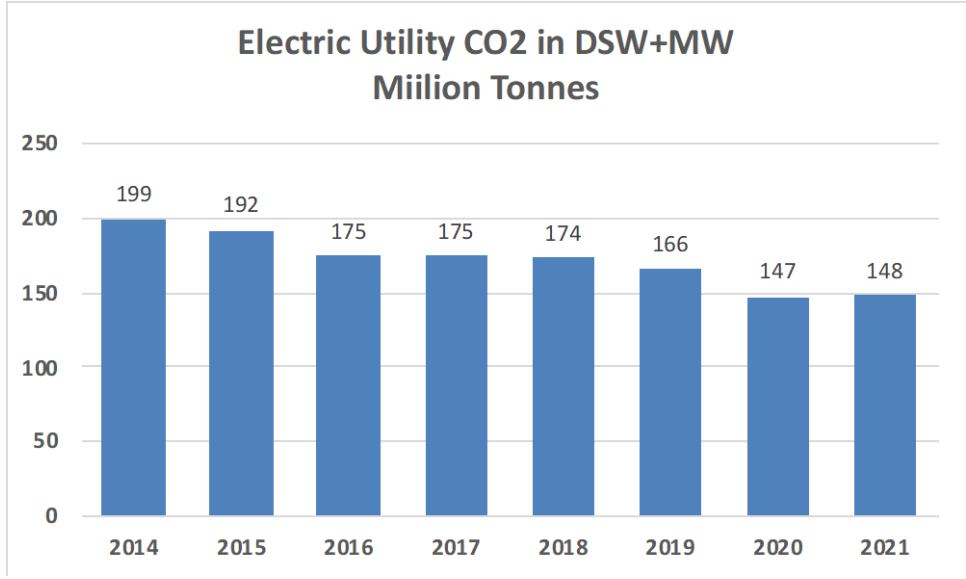
Two Models: Why?

The Critique of Resource Specific

- The Resource Specific model is the original model, used in EIM.
- Some discontent with it:
  - Can be significant leakage
  - Equity issues with low and non-emitting resources
- The critique:
  - In the EIM, PNW hydro resources are the first to get deemed to CA because they are abundant and have a $0 GHG adder. The dispatch algorithm seeks lowest system cost.
  - This results in gas generation in CA being dispatched down due to its emission cost.
  - The generation gap is then filled with gas generation from DSW+MW.
  - This creates significant leakage and suppresses marginal GHG cost.

Does Zonal Address the Leakage Issue?

- Dispatch data supports the leakage argument (see PWRX paper)
  - But in general, CO2 in the DSW+MW has decreased 25% since EIM began.
  - Would it decrease more in absence of the Resource Specific model?
- Does Zonal eliminate leakage?
  - Leakage through the Unspecified Source pathway
  - Path switching possible with Type 2?
  - Will M+ be a predominantly PNW market, or will it include significant DSW+MW participation?



Source: EIA-767,-906,-920,-923

Does Zonal Address the Equity Issue?

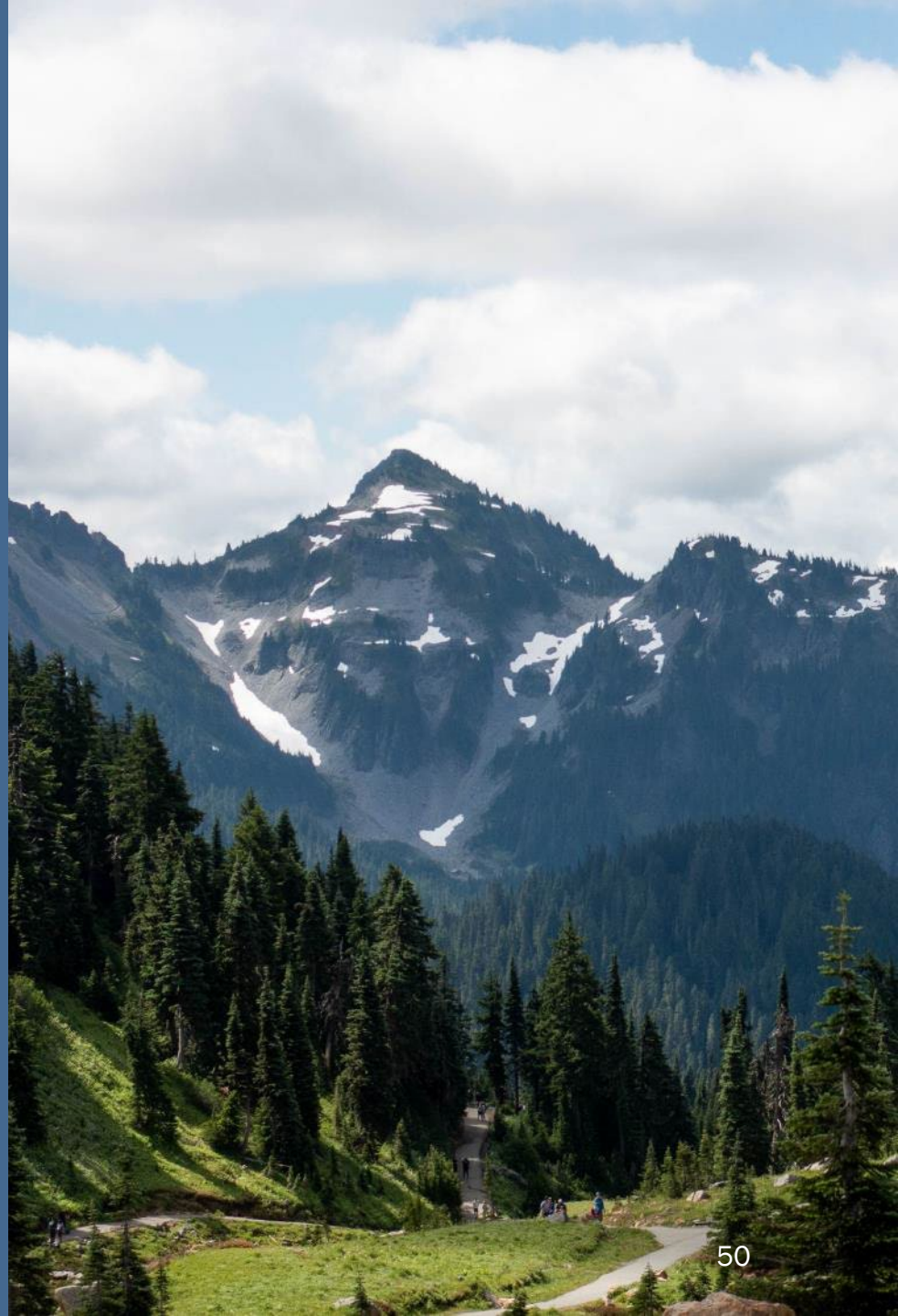
- Resource Specific marginal GHG adder for last 12 months averages less than $5/MWh and is $0 almost 60% of the time.
- Preliminary modeling would indicate that the marginal GHG price would be set often by the Unspecified Source pathway and would equal the GHG adder assigned to that pathway
  - Allowance price x default emission factor (e.g., ~$25)

Conclusion

- Data suggests the critiques of Resource Specific model have merit.
- Whether the critiques require a redesigned approach for integrating cap-and-trade in the DAM depends on the viewpoint and incentives of each market stakeholder.
- Also, whether Zonal model would fully address these critiques cannot be fully understood until the final draft is released and there is some indication of what the M+ footprint would look like.

Questions

5-minute break

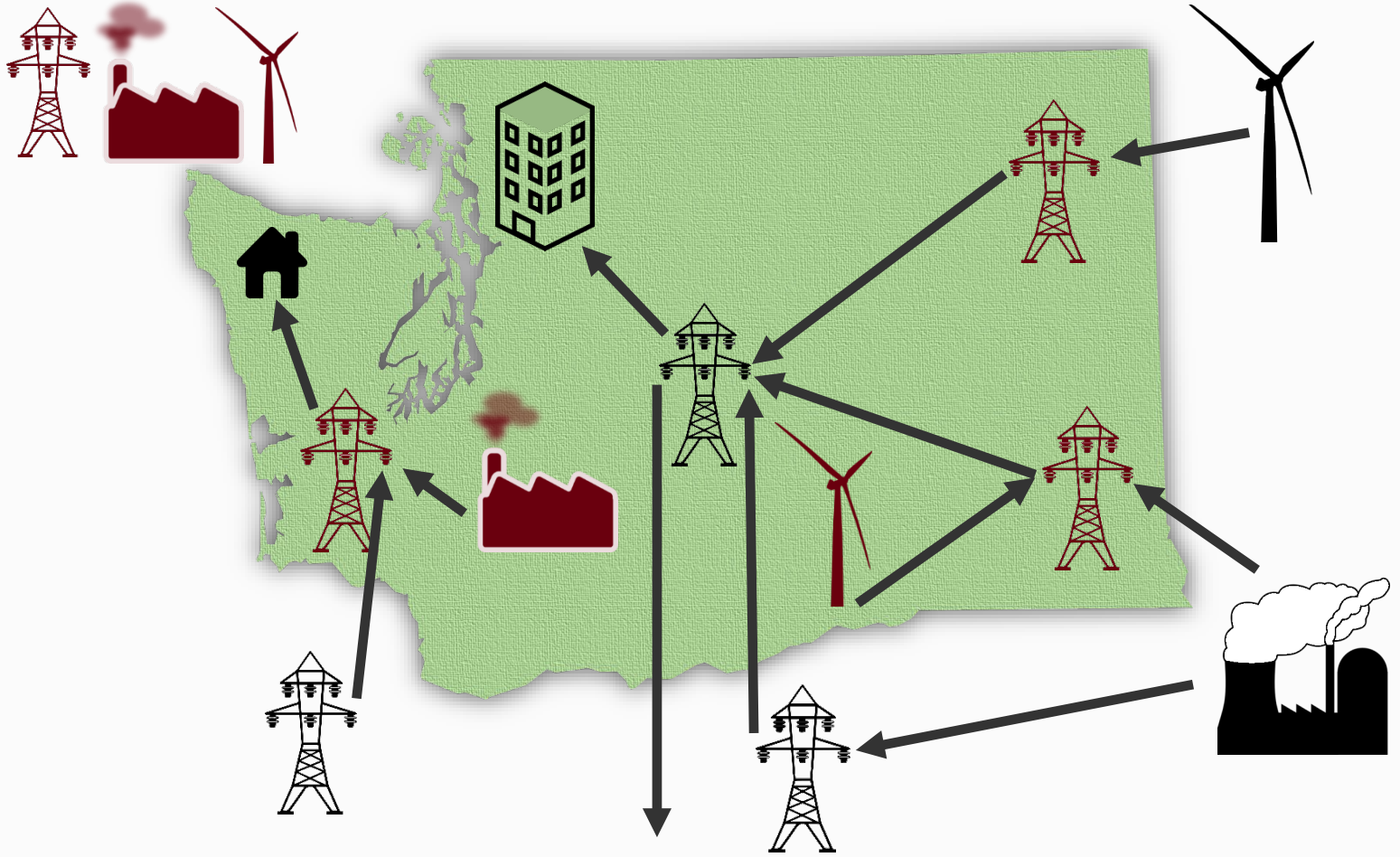


Rule Language Context

Bill Drumheller, Climate & Energy Specialist

First Jurisdictional Deliverer (FJD) Compliance

- First point of delivery in Washington
- In-state power plants
- Federal entities (BPA) not necessarily jurisdictional, so FJD is next down the line



Mandate to Address Centralized Electricity Markets

- RCW 70A.65.080 Program coverage
- (c) Where the person is a first jurisdictional deliverer importing electricity into the state and the cumulative annual total of emissions associated with the imported electricity, whether from specified or unspecified sources, exceeds 25,000 metric tons of carbon dioxide equivalent. **In consultation with any linked jurisdiction to the program created by this chapter, by October 1, 2026, the department, in consultation with the department of commerce and the utilities and transportation commission, shall adopt by rule a methodology for addressing imported electricity associated with a centralized electricity market;**

Climate Commitment Act: Two Key Concepts

- **Imported Electricity**
  - RCW 70A.65.010 (42) "Imported electricity" means electricity generated outside Washington with a final point of delivery within the state.
    - (a) "Imported electricity" includes electricity from an organized market, such as the energy imbalance market.
- **Electricity Importer**
  - RCW 70A.65.010 (27) "Electricity importer" means:
    - (c) For electricity imported through a centralized market, the electricity importer will be defined by rule consistent with the rules required under RCW 70A.65.080(1)(c).

Implications for Rule Language

- Statute and rule language is clear that electricity from centralized electricity markets is “imported electricity.”
  - Electricity and associated greenhouse gas emissions are “covered emissions.”
  - There is no gap in coverage for these emissions, now or in the future.
  - There is currently a gap in assigning responsibility for that coverage.
- Primary purpose of rule is to clearly identify the “electricity importer” for the imported electricity coming from these markets.
  - The electricity importer is the First Jurisdictional Deliverer for that electricity.
  - The FJD bears the compliance obligation under the cap-and-invest program.
  - Electricity importer needs to be a type of legal entity (e.g., company).

New Rule Language in Two Programs

Cap-and-Invest Program

(Chapter 173-446 WAC)

- Replace WAC 173-446-040 Covered emissions. (3)(e))(iv) that currently only addresses EIM for first compliance period
- Add robust mechanism for addressing imports from multiple centralized electricity markets, including new markets that may emerge in future
- Potentially add new definition(s)

Greenhouse Gas Reporting

(Chapter 173 -441 WAC)

- Add terms and definitions
- Revise definitions to broaden beyond existing EIM references
- Modify WAC 173-441-124 (3) (ii), (v), and potentially other places to expand beyond existing EIM references with new terms

Goals for Cap-and-Invest Program

- One holistic approach to centralized electricity markets
  - Energy Imbalance Market
  - Extended Day Ahead Market
  - Markets+ (Southwest Power Pool)
  - Future market initiatives
- Consistency with First Jurisdictional Deliver compliance approach
- Compatibility in approach with potential linkage partners
- Clear identification of compliance entity with varying participation
- Availability of data infrastructure and tracking mechanisms

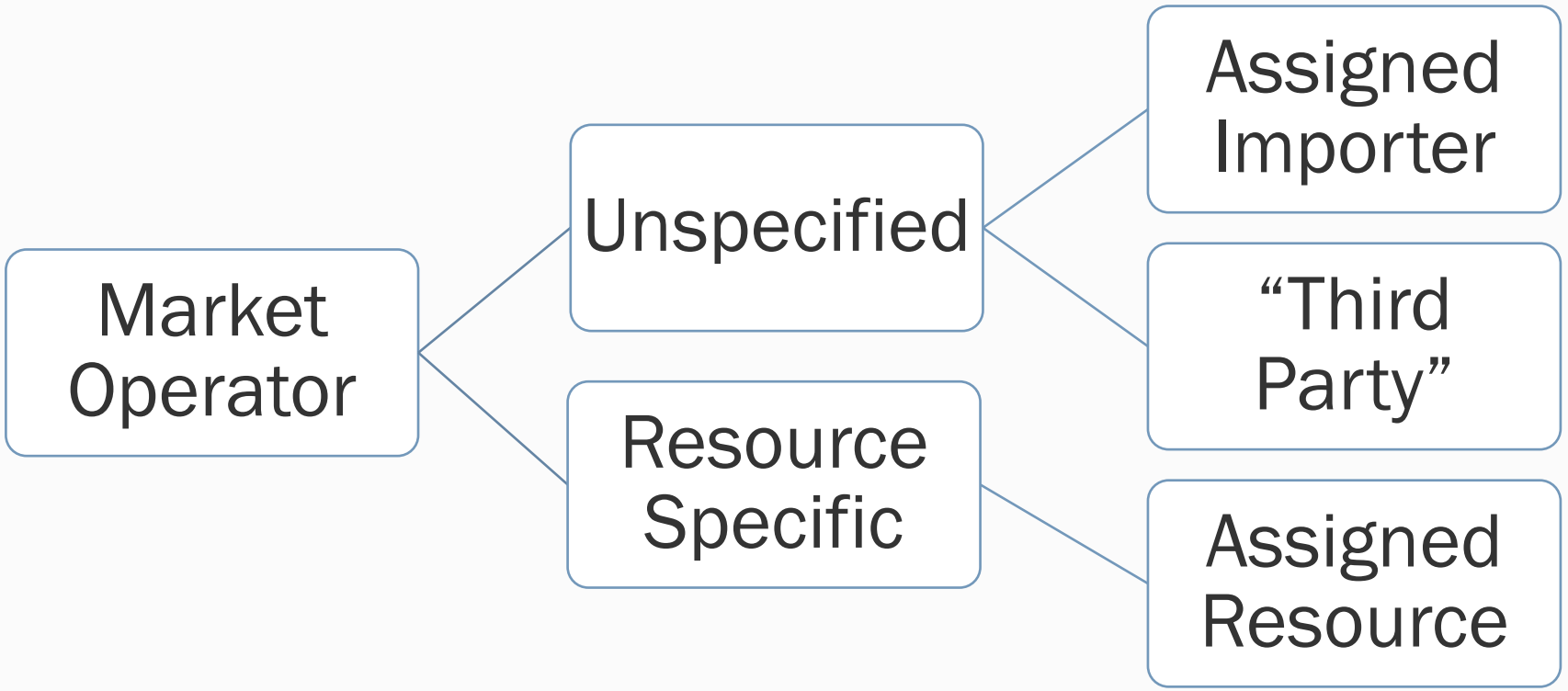
Goals for Greenhouse Gas Reporting

- Data foundation for greenhouse gas cap-and-invest program
- Majority of detail in rulemaking anticipated to fall in this bucket
- Link specific markets to broad terminology in cap-and-invest rule
- Collect sufficiently broad data to support multiple approaches
  - Meet informational, performance tracking, and compliance needs
  - Collect data on both front (importing) and back (purchasing) end
- Support establishment of compliance tracking data infrastructure
- Clear methods that translate to Electric Power Entity reporting tool
- Designate emissions rate(s) or methodologies for various approaches

Concept for Electricity Importer Approach

"Hierarchy" Approach

- "Electricity Importer" is always identified for compliance.



Questions

Initial Input

- What hopes and concerns do you have about this rulemaking?
- What barriers might make it harder to participate in this rulemaking?
  - What scheduling, accessibility, or other changes might make it easier?
- What else would you like to share?

Informal Comment Period

- Collecting initial input
- Open July 25, 2023 – August 16, 2023
- Comment online: https://aq.ecology.commentinput.com/?id=9M5UaihD4

Next Steps

Informational Stakeholder Meetings

- July 25, 2023, 10 a.m. – noon
- August 2, 2023, 10 a.m. – noon

Listening Session

- August 17, 2023, 9 a.m. – 10:30 a.m.

Draft Rule Language Input Meetings

- October 12, 2023, 3 p.m. – 5 p.m.
- October 16, 2023, 3 p.m. – 5 p.m.

Ecology Contacts

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360-338-2419

Rulemaking webpage
https://ecology.wa.gov/regulations-permits/laws-rules-rulemaking/rulemaking/wac-173-441-446

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