February 22, 2022

EDAM working group #3 participants,

Below is my attempt to fill out the revised scope document that was posted on February 18 based on how the current Western Energy Imbalance Market (WEIM) works today. This document is not a proposal to change how the WEIM works today; rather I intend this to be a factual description of how GHG costs are accounted for in the CAISO's real-time market as of February 2022. None of the changes contemplated in the EDAM working group #3 have been incorporated into this document.

The purpose of this document is to help SCs understand how the market works today to provide a perspective on the changes that are being proposed in the working group. In other words, this is the "baseline" for the EDAM's GHG optimization design against which the proposed changes can be compared. Because it is implied in the EDAM initiative, the most significant change – namely that the EDAM will be executed in the day-ahead timeframe rather than the WEIM's real-time horizon – is not explicitly discussed below. Also, the WEIM uses a resource-specific approach for the GHG optimization and, as such, some of the aspects of the unspecified/zonal approach like the calculation of the hurdle rate are not relevant to the WEIM approach today.

I apologize for any factual inaccuracies; these are my own and don't reflect the CAISO's official policy. If I was unsure of any particular aspects, I have highlighted these in yellow.

We will review this document briefly in the Feb 22, 2022 meeting and this will be posted onto the working group website for future reference.

Best,

Kevin Head

EDAM working group #3 facilitator

Issue	Key Market Design Question	Homework assignment question ID	Detailed Market Design Question(s)
1) General Accounting			
Area Identify GHG Compliance Area(s)	Are entities aligned that state boundaries are the GHG compliance area?	A	Decide: What should the GHG compliance area be? Options include: Geographic - State - No - GHG compliance area - No - Balancing Authority Area (BAA) – Yes, this what the EIM uses today

			- Load Serving Entity - No - International considerations – No special considerations, Canadian/Mexican suppliers are treated the same as other non-California US states Topics: - Boundaries (UA-1) and potential need for alignment of transmission boundary concepts developed in Transmission working group – N/A - Implications for BAA spanning multiple states (RA-2, RA-3) – BAAs that span multiple states are treated as either being in the GHG area or not, regardless of whether their resources are physically located in California. - Impacts to EIM – N/A - Rules that need to be established for renewable resource dispatch in/out of a GHG zone (UA-4) – No unique rules for renewable resources.
Availability Eligibility to serve demand in the GHG compliance area	What rules for availability need to be developed for EDAM for GHG?	B	Decide: What will availability to serve load in a GHG compliance area look like? Options include: - Optional - Yes - Never - No - Always - No - Daily - No - Hourly - Yes Topics: - Determining availability - Supply resources election to make capacity available to support transfers to a GHG compliance area (RB-1, RB-2, UB-1) – Yes, supply resources can make this election.
Costs being optimized	Which costs should be included in the market optimization?		Are we optimizing: - Carbon prices? - Yes - RPS/CES? - No Types - Carbon pricing (including how to consider GHG costs reflected in natural gas prices) - Yes - Clean energy/renewable - No Transactions covered - GHG zone: o Generation w/in GHG zone - Yes, these are covered. In California, generators include GHG costs in their bids implicitly. Accordingly, there is no separate GHG component of the LMP.

			○ Imports into GHG zone – Yes, these are covered as well. As explained in CARB's presentation from 2/15, there are several options to allow for imports: specified imports, unspecified imports, and EIM imports. EIM imports are deemed delivered to California by the CAISO's WEIM market algorithm based on GHG bids submitted by WEIM Participating Resource Scheduling Coordinators. These GHG bids – which are separate from the SC's energy bids – create a separate component of the LMP which is paid by California load to the WEIM generating resources based on the WEIM market results. - Non-GHG zone: ○ Generation w/in non-GHG zone – No, these are not considered EIM imports so long as the energy is not deemed delivered to California. Accordingly, the LMPs paid by load outside of California do not reflect the costs of GHG compliance. ○ Exports into GHG zone – Yes, these are covered. See the "Imports into GHG zone" response above.
Emissions attribution	How should GHG emission attribution be determined?		Decide: How should emissions be attributed? Options include: - Resource specific – Yes, the emissions are attributed in a resource-specific manner in the WEIM today. - Unspecified – No, this option is not in effect in the WEIM today.
Participation options		A	Determining emissions attribution with different participation options (RA-4): - Imports at EDAM Boundaries – Imports at CISO Scheduling Points are delivered to CA and they can internalize GHG regulation costs in the energy bid, just like internal CA generating resources. No import bids are allowed at EIM interties, thus no GHG bids and no GHG attribution. - Pseudo-ties – Included in the GHG zone that they are pseudo-tied into. Pseudo-tie resources are "physically located outside of the CAISO Balancing Authority Area, but contractually part of the CAISO Balancing Authority Area for purposes of production, ancillary services responsibility, operating jurisdiction, etc." As such, they are treated as CAISO internal generation for the purposes of the market optimization (i.e. no separate GHG bid but GHG costs are implicitly assumed within the resource's bid). - Wheels though GHG compliance area – Excluded, no special GHG consideration. - Virtual bids – There are no virtual bids in the WEIM's real-time market. - Energy storage – No special GHG consideration, treated like supply resources. - Jointly-owned units – No special GHG consideration. - Self-scheduled resources (RA-1, UA-2, UA-3) – No special GHG consideration but there must also be an energy bid and a GHG bid
Multiple GHG Zones	Can the model accommodate multiple GHG zones? If so, how?	C	- From a technical perspective, can the model accommodate multiple GHG zones? (RC-2) – The WEIM does not currently support multiple GHG zones; it is based on there being only one GHG zone (California). - If it can, how are the following impacted? ○ Bidding between GHG zones (GHG zone A -> GHG zone B), linked versus unlinked – N/A

			○ Bidding from non-GHG zone to multiple GHG zones – N/A ○ How market decides which GHG zone should be served – N/A - When there are multiple state GHG areas (e.g. WA and CA), how will the algorithm determine and prioritize which resources are deemed to which GHG area? (RC-1, UC-1) – N/A
2) Approach-specific Issues			
Baseline for evaluation of attribution (Resource-specific)	What should the baseline for evaluating GHG attribution?	D	- Under the EIM model today, GHG attribution quantity (MW) is limited by the upper economic limit minus the base schedule (note: not limited by WEIM incremental dispatch). Because there will be no base schedule in EDAM, what will the UEL be compared to determine GHG attribution? (RD-1) – N/A, WEIM uses base schedules as baseline. ○ RUC D+1 results? ○ 2nd IFM pass w/o transfers ○ Other - If RUC D+1 results, what improvements or additional requirements are needed to improve the RUC D+1 results? ○ Additional bidding requirements? ○ Improvements to the RUC D+1 forecast?
Hurdle rate calculation (Unspecified/ Zonal)	How would the hurdle rate calculation work?	E	- Will the hurdle rate be an exogenous input into the market? What are the components of this calculation? (UE-9, UE-11, UE-12) – N/A, WEIM does not use a hurdle rate - Will the hurdle rate be dynamic or static? (UE-2, UE-8) – N/A, WEIM does not use a hurdle rate ○ If static, does this present gaming opportunities? - Will the hurdle rate be responsive to the prevailing market rate of GHG allowances? (UE-2) – N/A, WEIM does not use a hurdle rate - Will the hurdle rate factor in the grid emissions intensity? If so, should it use an average emissions intensity or the marginal emissions intensity? How frequently would this be adjusted? Are out-of-zone clean resources that are "assigned to the zone" backed out of the unspecified rate (i.e. “the calculation of imports reflects that [the out-of-zone resources are] in the zone”)? (UE-6) – N/A, WEIM does not use a hurdle rate - Can EDAM SCs negotiate their own specified emissions rate? Would self-scheduled power qualify for a resource specific emission rate? (UE-1, UE-4) – N/A, WEIM does not use a hurdle rate
Alternate pathways to serve GHG zones	What alternative pathways would exist for a resource in a non-GHG zone to serve a GHG zone?	F	- What are the criteria for resources outside the zone to be included inside the zone? (UF-1, UF-3) – N/A, WEIM does not have alternative pathways - Can entities voluntarily opt-in? If so, how frequently can this election be made? (UF-2)) – N/A, WEIM does not have alternative pathways

(Unspecified/ Zonal)			
3) Secondary Dispatch and Other Consequences			
Leakage minimization	What mechanisms exist to limit leakage and secondary dispatch?	G	- How would secondary dispatch occur in the model and how it is designed to limit it? (RG-1, RG-2, UG-1, UG-2) – Secondary dispatch is the portion of EIM dispatch that backfills GHG attributions associated base schedules. The WEIM attempts to minimize secondary dispatch by limiting the GHG attribution to the volume of difference between upper economic limit and base schedule.
Other consequences of approach	Are there other unintended consequences of the model and how does the approach deal with these?	E, G	- Resource-specific approach o Under the resource-specific approach, it is possible for resources to have been deemed to serve CA when it is impossible based on their transmission capabilities? If so, how does the approach deal with this? – Yes, this is possible. The current model does not consider transmission capabilities in determining which resources can be deemed delivered to California. - Unspecified approach: o It is possible that non-emitting resources might need to clear the hurdle rate that is meant to reflect GHG costs? (UE-10) – N/A, WEIM does not use a hurdle rate o Would the proposal shift concerns about secondary dispatch from the day-ahead and real-time markets into the forwarding contracting horizon? (UG-2) – N/A, WEIM does not use an unspecified/zonal approach o In what specific way does this approach provide advantages to zero or low-emitting resources as compared to high-emitting resources outside GHG Regulation Areas? (UG-4) – N/A, WEIM does not use an unspecified/zonal model
4) Reporting and Settlements			
Reporting: Market Results	What type of information and at what granularity will GHG information be reported to support state reporting requirements?	H	- What process can be developed to ensure that LSEs and other market participants subject to GHG/RPS/CES regulations will receive data necessary to satisfy compliance obligations? What entity is responsible for reporting imported energy into a GHG zone? (RH-2, UH-1, UH-2, UH-4, UH-6, UH-7) – The current model does not have any special functionality designed to provide information for the purposes of complying with RPS and CES regulations. Regarding GHG compliance, the WEIM algorithm deems energy delivered to California on a resource-specific basis for the purpose of complying with CARB's MRR program. No special functionality is designed to provide information for the purposes of complying with other GHG compliance programs. - Should we consider policy that is in effect/will be in effect by Jan 2024 or try to accommodate hypothetical reporting systems? – The WEIM only considers GHG policies that are in effect as of Feb 2022.

			- What data needs to be tracked for compliance and harmonization with clean energy policy purposes (including other instruments that attribute generation to load)? – Currently, the WEIM tracks only the subset of the transactions that are deemed delivered to California as discussed more above. The CAISO does not share the EIM Deemed Delivered data with WREGIS. - How would energy be identified/tracked or tagged under a specified approach? (RH-3) – Energy is identified/tagged according to NERC standards. While the WEIM algorithm deems energy delivered to California, the E-tags do not explicitly include this information.
Settlements	How are GHG costs settled?	I	- Will entities bearing GHG compliance obligations be made whole for purchasing credits? If so, how? (RI-1) – Settlement of GHG costs differs between transactions within the CAISO BAA and transactions that are deemed delivered to California via the WEIM algorithm. o For transactions within CAISO, the GHG costs are assumed to be implicitly included within generators' energy bids. Assuming that the GHG costs were accurately reflected in the resource's bid, the LMP should implicitly reflect the cost to procure compliance instruments. Thus, the market revenues paid to generators should make entities whole. o For WEIM transactions that are deemed to delivered to California, there is a separate component of the LMP that is paid by load in California to importing generators. Assuming that the GHG costs were accurately reflected in the resource's separate GHG bid, this LMP component should reflect the cost to procure compliance instruments. - In the unspecified approach, how will the hurdle rate revenue be distributed to the suppliers? (UI-1, UI-3) – N/A, the WEIM does not use the unspecified/zonal approach.
5) Miscellaneous			
Bidding of GHG costs	How will GHG costs be reflected to EDAM within, between, and outside a GHG zone?		Topics: - Should GHG costs be reflected in bids? If so, how? – Yes, GHG costs are reflected in bids as discussed above. - How do cost reference level (DEBs and proxy costs) reflect GHG costs? Do they differ between DAM and RTM? How would this differ between WA and CA in terms of indices used? And how are they used in market power mitigation? – Cost reference levels for generators within California include GHG costs based on the prevailing GHG index price and the resource's specific characteristics (heat rate, GHG emissions rate, etc.). Cost reference levels for generators outside of California do not include GHG costs. However, for the WEIM resources that submit separate GHG bids, these GHG bids are subject to a GHG bid cap based on the prevailing GHG index price and the resource's highest heat rate (i.e. its least efficient operating point). Currently, only California index prices are used in cost reference levels.

Effects of EIM	What GHG bid and settlement implications arise from DA vs. RT deviation?	I, K	- Do we need to make updates to the RTM EIM GHG model to align it with EDAM? (UK-1) If not, what are the implication of this decision? (UK-2) – N/A - What allowable changes to either GHG quantity or bid price between DA and RT should be allowed? – N/A - What are the associated settlement impacts to any variation allowed? (UI-2) – N/A