GHG Accounting Methodology for LSE Portfolio Development in the IRP 2017-18 Cycle

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Introduction

On February 8, 2018, pursuant to Senate Bill (SB) 350, the California Public Utilities Commission (CPUC) voted to set requirements for load serving entities (LSEs) to file integrated resource plans (IRP). Among other things, the decision concludes that the Commission should adopt 42 million metric tons (MMT) by 2030 as the greenhouse gas emissions (GHG) target for the electric sector in IRP. The decision also delegates to Commission staff and the assigned administrative law judge (ALJ) to develop and publish a common methodology and set of assumptions for LSEs to use in accounting for GHG emissions in their IRP portfolios.

As the decision explains, the GHG accounting methods used in IRP will serve a very different purpose from those developed for the California Energy Commission's (CEC's) Power Source Disclosure (PSD) program as modified by AB 1110.[1] Whereas the CEC's AB 1110 process addresses the reporting and disclosure of actual emissions during the previous calendar year, the CPUC's IRP process is designed to estimate GHG emissions out to 2030 and to guide LSE planning and procurement behavior in the future. Similarly, the GHG accounting methods used in IRP may differ from those used in the California Air Resources Board's (CARB's) GHG emissions reporting and compliance programs, such as the Mandatory Reporting Regulation, which are focused on accounting in previous years for compliance purposes. It is not the intent of the IRP process to recommend a particular outcome in the AB 1110 process or to contradict the emissions reporting in CARB's compliance programs. IRP will use its own GHG accounting methods to meet a separate and distinct objective: to ensure that CPUC-regulated entities are on track to achieve GHG reductions consistent with the state's long-term climate goals.

The purpose of this document is to propose a GHG accounting method and seek party comments in order to develop the best-available methodology for this cycle of IRP (2017-18). The goal is not to create a perfect methodology, but rather to develop a reasonable method for emissions approximation that aligns with the production cost modeling that staff plans to conduct in 2018, so that individual IRPs may be compared across LSEs and with the Reference System Plan adopted for IRP 2017-18.

Policy Context for GHG Accounting

Generally speaking, GHG accounting frameworks can range from source-based to demand-based, or contain some combination of the two. Under a source-based accounting framework, such as with the

[1] To implement the changes introduced by AB 1110, the Energy Commission must adopt guidelines for the reporting and disclosure of unbundled RECs and the GHG emissions intensity associated with retail sales, and also adopt a method in consultation with California Air Resources Board (CARB) for calculating GHG emissions intensity factors for each purchase of electricity by a retail supplier to serve its customers.

method used in the CPUC's Energy Resource Recovery Account (ERRA) applications,[2] all emissions from an LSE's owned and contracted GHG-emitting resources are attributed to that LSE, regardless of whether those resources are used to serve that LSE's load. This method provides insights into the GHG emissions-related costs that are associated with an LSE's resource portfolio. Under a demand-based accounting framework, GHG emissions are attributed to each LSE based on the energy it uses to serve its load. This method provides insights into the GHG emissions associated with the resources necessary to match an LSE's load profile.

An important and related point is that GHG emissions estimates depend on the time variable used in the calculation. GHG emissions are often calculated on a "net annual basis," for example, by multiplying total energy (MWh) in a given year by an emissions factor (tons of carbon/MWh) to estimate tons of carbon associated with that energy for that year. An advantage of this approach is that the calculation is simple and straightforward, which is important for LSEs making long-term resource investment decisions when there is uncertainty about the magnitude and shape of its future load. On the other hand, this method may obscure the actual value of those resources to the system on an hourly basis, potentially allowing LSEs to claim "credit" for producing GHG-free energy during times of day when it is not needed.

Indeed, evaluating LSE progress toward achieving GHG targets by calculating GHG emissions on an annual basis may incentivize an LSE to procure resources that generate more zero-emission electricity than it needs to serve its load, and then to credit any extra supply against the system power it plans to purchase at a different time of day. For example, if an LSE sells its oversupply of solar generation into the CAISO system during midday hours, but relies on market power during evening hours when there are more GHG emitting resources serving the system, the LSE may be able to report zero or near-zero GHG emissions for its portfolio on a net annual basis, despite the fact that it is consuming GHG-intensive power during some or many hours of the year.

The Clean Net Short Methodology

Staff recommends using a GHG accounting methodology in IRP that apportions GHG emissions to each LSE based on its projected hourly electricity demand. Staff believes that such a method would help ensure that the GHG emissions reported by an LSE more closely match the system emissions generated to serve that LSE's load, and that the emissions of all LSE plans in aggregate would be more comparable to the Reference System Plan.

As a starting point, staff proposes using a method called "clean net short" (CNS), which PG&E described in its comments filed on the CEC's AB 1110 Implementation Rulemaking.[3] Staff believes the CNS method is a reasonable starting point for approximating portfolio emissions because it more accurately depicts the emissions profile of the electricity an LSE delivers to its customers. Under the CNS method, each LSE would be assigned emissions associated with the system's dispatchable fossil generation based on how the LSE plans to rely on CAISO system power on an hourly basis in 2030. IRP is uniquely positioned to develop and apply such a method, as the hourly (8760) emissions intensity (tons/MWh) of fossil

[2] As described in the ALJ ruling on the Proposed Reference System Plan issued September 19, 2017, staff proposed that LSEs use the ERRA accounting method to calculate the emissions of their IRP portfolios. The ERRA accounting method relies on simplifying assumptions about the emissions embedded in wholesale CAISO market purchases.
[3] Docket Number 16-OIR-05.

generation on the CAISO system can be estimated for the Reference System Portfolio developed using RESOLVE modeling.

The conceptual steps of the CNS method, as modified by CPUC staff, are as follows:

1. The LSE will subtract out any owned or contracted non-dispatchable GHG-emitting resources (such as non-dispatchable combined head and power (CHP) or fossil imports) it plans to use to serve its hourly load from its projected hourly electricity demand in 2030.
2. The LSE will subtract its owned or contracted (either current or planned) GHG-free generation from the projected hourly electricity demand, less the amount subtracted in the previous step.
    a. "GHG-free" generating resources: RPS Bucket 1, hydroelectric, and nuclear generation, if delivered to a California balancing authority area.
    b. "GHG-emitting" generating resources: any resources other than those deemed GHG-free above.
3. The LSE will subtract the discharging pattern (and add the charging pattern) of any storage resources owned by or contracted to the LSE from the hourly profile derived in step #2. The result is the "clean net short" (CNS) in each hour.
4. The CNS will then be multiplied by the system GHG emissions intensity on an hourly basis, yielding total emissions associated with using unspecified system power for that LSE for every hour of 2030.
5. Finally, the emissions from all owned or contracted non-dispatchable GHG-emitting resources used to serve hourly load in step #1 will be computed using plant-specific emissions factors and added to the emissions from unspecified system power calculated in step #4.

For example, an LSE may anticipate 100 MW of demand in a given hour in 2030. If the LSE's owned and contracted resources produce 75 MW of GHG-free power and 5 MW of nondispatchable CHP in that hour, then the LSE's CNS is 20 MW for that hour. Assuming that the average emissions intensity of fossil generation on the CAISO system is estimated to be 0.5 tons/MWh for that hour. The LSE would multiply its CNS (20 MW) by the emissions intensity (0.5 tons/MWh) to yield 10 tons of CO2e for that hour of unspecified CAISO system power. The LSE would then add the emissions associated with the 5 MW of nondispatchable CHP to its total.

Under the CNS method, IOUs would not be solely responsible for emissions from dispatchable resources they procured on behalf of the system and which are subject to the cost-allocation mechanism (CAM) (e.g., combined heat and power resources). Emissions from those resources would be reflected in the hourly system power on which other LSEs rely. Only the emissions from non-dispatchable resources not subject to the CAM would remain exclusively with the IOU.

Staff has estimated the emissions intensity (tons/MWh) of fossil generation on the CAISO system associated with the Reference System Portfolio on an hourly (8760) basis in the year 2030. Using these hourly emission intensity values, staff has developed a calculator spreadsheet for LSEs to use in estimating the GHG emissions of their portfolios. The instructions for using this calculator are provided in the next section.

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Instructions for Using the LSE GHG Calculator

The LSE GHG Calculator is an Excel tool created to help LSEs calculate their emissions using the proposed Clean Net Short (CNS) method. It calculates the LSE's CNS and annual emissions for the four modeling years used in the IRP RESOLVE framework (2018-2022-2026-2030). The Excel spreadsheet consists of the following worksheets:

1. **Dashboard**: This worksheet contains input tables that the LSE is to fill out (left) as well as the final CNS and emission results (right).
2. **Assumptions**: This worksheet contains information regarding key assumptions made in calculating the CNS, and explains the color-coding used for the worksheets.
3. **Calculations**: This worksheet contains the core hourly calculations for calculating the CNS, emissions, and curtailment.
4. **Curtailment Heat Map**: This worksheet displays month-hour heat maps of the average curtailment in the LSE's territory for each of the modeling years, based on the LSE's input on the Dashboard.
5. **Heat Rates**: This worksheet displays the average heat rates by month-hour and modeling period, as calculated for the Proposed Reference System Plan using the RESOLVE model. These heat rates are used as an input to calculate the LSE's CNS emissions. This worksheet is a **read-only input worksheet** that the user should not change.
6. **Storage Dispatch**: This worksheet displays the average storage dispatch (assuming 4-hour batteries) by month-hour and modeling period, as calculated for the Proposed Reference System Plan using the RESOLVE model. This storage dispatch pattern is applied to any storage that the LSE specifies on the Dashboard. This worksheet is a **read-only input worksheet** that the user should not change.
7. **Renewable Profiles**: This worksheet displays hourly renewable capacity factors for all the possible candidate resources that the LSE can choose from on the Dashboard. The capacity factor shapes are for one full year (8760 hours) and are based on 2007 weather. This worksheet is a **read-only input worksheet** that the user should not change.
8. **Load Profiles**: This worksheet displays the hourly, normalized load shape that will be applied to the LSE's annual load forecast for each of the modeling periods. It also contains shapes for electric vehicle loads (both home charging and work + home charging), electrification loads, and energy efficiency. This worksheet is a **read-only input worksheet** that the user should not change.

To use the tool effectively, a user would generally take the following steps:

1. On the Dashboard, input the LSE's load forecast on the Dashboard for each of the modeling years, including electric vehicle loads, electrification loads, and energy efficiency. Note that the baseline load should be the load *before* the addition of electric vehicle loads and electrification loads, and *before* the subtraction of energy efficiency savings and behind-the-meter PV generation. Behind-the-meter PV will be treated in step #3 below.

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2. On the Dashboard, input the LSE’s owned or contracted non-dispatchable GHG-emitting resources (e.g. CHP; current and planned), in units of average MW (assumes a 100% capacity factor shape), as well as the weighted average GHG emission factor for these resources.
3. On the Dashboard, input the LSE’s owned or contracted renewable (GHG-free) resources (current and planned) for each of the modeling years. Only resources that are delivered to California should be added here. Note that behind-the-meter PV generation should be included here rather than in the load inputs (see row 41 – “BTM_Distributed_PV”; LSE should input the estimated installed capacity of behind-the-meter PV in its service territory).
4. On the Dashboard, input the LSE’s owned or contracted energy storage resources (current and planned). The tool will use this user-specified capacity to scale the RESOLVE month-hour shape that is provided in the Storage Dispatch worksheet. Please note that this shape varies by modeling year.
5. Press F9 to recalculate the spreadsheet (calculations are set to “manual” in this spreadsheet).
6. On the Dashboard (right side), investigate the results, such as total emissions, average emission factor, and percentage of curtailment.
7. [optional] Investigate the curtailment heat map to gain intuition on overgeneration patterns.
8. [optional] Adjust inputs in the Dashboard to explore different resource and demand scenarios.

The CNS Method in Practice

There are important differences between what is considered “GHG-free” under the CNS methodology and what is considered “renewable” under the state’s Renewables Portfolio Standard (RPS) compliance rules. Certain resources may be RPS-eligible but treated as GHG-emitting under CNS, whereas other GHG-free resources may not be RPS-eligible. For example, the Portfolio Content Category (PCC)-1 designation of an RPS resource is based on where and how the energy was generated, not whether it was used to serve load. Furthermore, certain GHG-free resources that are considered non-renewable, such as nuclear and hydroelectric, would be still be considered GHG-free under CNS provided they are delivered to a California balancing authority area. Indeed the RPS rules are not themselves entirely consistent with GHG policy under the state’s Cap and Trade Program, as the two programs are designed to achieve different goals using different compliance rules and mechanisms.

The CNS method is intended to leverage the success of the RPS program and orient new investments toward achieving the state’s long-term economy-wide GHG reduction goal of 80% below 1990 levels by 2050. The average hourly system power in 2030 reflects a resource mix that is significantly cleaner than today’s resource mix, in large part due to the expected procurement of additional renewables to comply with RPS mandates. The CNS method allows LSEs and their customers to benefit from the collective efforts of all entities investing in low- and zero-GHG emitting resources, regardless of whether those resources are RPS-eligible.

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