Greenhouse Gas Emission Tracking Methodology

December 28, 2016

www.caiso.com | 250 Outcropping Way, Folsom, CA 95630 | 916.351.4400
Author: Hundiwale, Abhishek

Revision History

Date	Version	Description	Author
12/26/2016	1.0		Hundiwale, Abhishek

Note: ***This document is provided for the convenience of market participants and other stakeholders. The ISO provides no warranties in connection with its use.In the event there is any conflict between this document and the ISO tariff, the ISO tariff will control.***

Table of Contents

Executive Summary

California Assembly Bill 32 (AB 32), the Global Warming Solutions Act of 2006, directed the California Air Resources Board (CARB) to develop regulations to reduce greenhouse gas (GHG) emissions to 1990 levels by 2020. Starting in January 2013, CARB implemented an enforceable compliance obligation associated with the GHG cap-and-trade program. In support of the greenhouse gas cap-and-trade compliance requirements, the ISO enhanced its market dispatch to allow scheduling coordinators to incorporate GHG costs into their energy bids. Since the introduction of the western Energy Imbalance Market (EIM), the ISO has been operating an expanding regional electric grid across the western United States. The EIM allows for the economic transfer of energy between participating systems in real time to serve electric load. To provide increased transparency into the overall GHG effects of serving load in the ISO, the ISO has developed a GHG tracking report. This report quantifies the amount of estimated GHG emission to serve ISO load.

Background

This document outlines the methodology of tracking of GHG emissions for the ISO Balancing Authority Area (BAA) as a direct result from dispatch of ISO internal resources, including dynamic resources, and imports serving ISO load, including EIM transfers.

Total GHG emissions to serve ISO demand is calculated by adding GHG emissions from internal ISO dispatches, including dynamic schedules, and GHG emissions from imports serving ISO load.

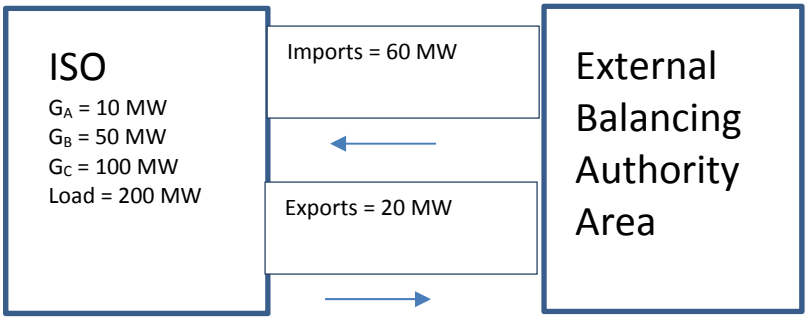
The GHG emissions for internal ISO dispatches include all the resources dispatched by the ISO market within the BAA to serve the ISO load, including the resource-specific dynamic resources. The GHG emissions from ISO imports includes all the energy to be transferred to the ISO BAA from another BAA, based on agreed-upon megawatts, start and end time, beginning and ending ramp times and rate, and type required for delivery and receipt of power and energy between the source and sink BAAs involved in the transaction. The GHG emissions from ISO imports serving ISO load includes EIM transfers into the ISO to serve ISO load. These amounts do not reflect GHG emissions associated with exports and EIM transfers out of the ISO that are serving load outside of the ISO.

For the purpose of this GHG tracking report, the GHG emissions from unspecified imports, including EIM transfers serving ISO load, are based on the unspecified emission rate established by CARB of 0.428 mTCO2/MWh. For dispatches of ISO internal resources, the resource-specific CO2 emission rate was used.

The heat rate for specified resources used in the ISO's emission calculations is based on the heat rate provided by the resource's scheduling coordinator.

GHG Emissions (mTCO2) = resource heat rate (MMBTU/MWh) * CO2 emission factor by resource type[1] (mTCO2/MMBTU) * Energy (MWh)

Example 1:



ISO Assumptions:

ISO resource A = $G_{iso,a}$ = 10 MW (Gas with heat rate of 8500 BTU/KWh)
ISO resource B = $G_{iso,b}$ = 50 MW (Gas with heat rate of 9500 BTU/KWh)
ISO resource C = $G_{iso,c}$ = 100 MW (Wind)
ISO imports = I_{iso} = 60 MW
ISO exports = E_{iso} = 20 MW
Emission associated with unspecified imports including EIM transfers into ISO are based on multiplying the volume of , by the unspecified emission rate established by CARB[2].

GHG Emission for ISO:

ISO internal dispatch = $G_{iso} = G_{iso,a} + G_{iso,b} + G_{iso,c}$
= 10 + 50 + 100 = 160 MW

ISO Demand = L_{iso} = ISO internal dispatch + ISO imports – ISO exports + EIM transfers into ISO
= $G_{iso} + I_{iso} – E_{iso}$
= 160 + 60 – 20 = 200 MW

Total GHG Emission for ISO = GHG_{iso}
= GHG emission to serve ISO demand = GHG_{Liso}

[1] http://www.ecfr.gov/cgi-bin/text-idx?c=ecfr&tpl=/ecfrbrowse/Title40/40cfr98_main_02.tpl
[2] Until the EIM GHG dispatch accounting is enhanced to differentiate the GHG emissions associated with EIM transfer to serve load in Califorina from the dispatches supporting external load, the ISO will track total GHG emission from EIM trasnfers using the unspecified emission rate of 0.0428 mTCO2/MMBtu assuming a 10,000 BTU/KWh heat-rate or 0.428 mTCO2/MWh.

= GHG emission ISO internal dispatch + GHG emission ISO imports – GHG emission ISO exports.

$= GHG_{Giso} + GHG_{Iiso} – GHG_{Eiso}$

GHG emission from ISO internal dispatch $= GHG_{Giso}$

$= GHG_{Giso,a} + GHG_{Giso,b} + GHG_{Giso,c}$

$GHG_{Giso,a}$ = (8500/1000)*0.053165*10 = 4.519 mTCO2
$GHG_{Giso,b}$ = (9500/1000)*0.053165*50 = 25.25 mTCO2
$GHG_{Giso,c}$ = 0 mTCO2

GHG emission from imports = GHG_{Iiso} = 0.428*60 = 25.68 mTCO2
GHG emission from exports = GHG_{Eiso} = 0.428*20 = 8.56 mTCO2

GHG emission to serve ISO demand = $GHG_{Giso} + GHG_{Iiso} – GHG_{Eiso}$
= (4.52 + 25.25 + 0) + 25.68 – 8.56
= 46.89 mTCO2

Implementation Plan

The GHG report will be published by the end of the month and reflect updated data from the previous month.