CALIFORNIA ISO

Scheduling Coordinator Aggregate Liability Estimation (SCALE) Measurement File Development Process

Defined Terms

EMS Utility Distribution Control Area (UDC) Load *– ISO control area load MWhs aggregated at the PG&E, SCE and SDG&E level.*

Generation Deviation Allocation Flag – The generation deviation allocation flag denotes which MP load profiles are allocated generation deviation / UFE MWhs.

Load Profiles

Annual Load Profile – Load profile developed from actual meter MWhs for the period of Trade Date (T) + 50 to T+415.

Current Load Profile – Load profile developed from actual meter MWhs for period of T+50 to T+80.

Schedule Load Profile – Load profile developed from scheduled meter MWhs for the period of T+1 to T+49.

Seasonal Load Profile – Load profile developed from actual meter MWhs for the prior season.

Short-Term Schedule Load Profile - Load profile developed from scheduled meter MWhs for the period of T+1 to T+14.

Load Profile Adjustment Percentage – The load profile adjustment percentage is calculated as the percentage variance between actual metered load and allocated EMS UDC Load. This percentage is utilized to develop actual metered load, utilized by the settlement system, from allocated EMS UDC Load.

Meter Load to Scheduled Load Adjustment Percentage – The meter load to scheduled load adjustment percentage is calculated as the variance between actual meter load and scheduled load. The percentage is utilized to create representative meter load from scheduled load.

Off-Peak – This term represents the day of the week to which a load profile corresponds. The Off-Peak days of the week include: Saturday, Sunday and Holidays.

On-Peak –This term represents the day of the week to which a load profile corresponds. The On-Peak days of the week include: Monday, Tuesday, Wednesday, Thursday and Friday.

Other Adjustment Percentage – For those MP where the load profiles and adjustment percentages do not reflect a participant's load, the other adjustment percentage approach is utilized. This approach is only rarely used.

Use Meter Load to Scheduled Load Adjustment Percentage Flag – This flag identifies those calculated MP load profiles that are subsequently adjusted by the meter load to scheduled load adjustment percentage.

Use Scheduled Load Flag – This flag identifies those MPs where utilization of scheduled load a proxy for metered load is appropriate.

Market Participant Liability Estimations

Over the past year, the focus of Scheduling Coordinator Liability Estimation (SCALE) project has been on the development of settlement statements seven days after the trade date using a system that is essentially a copy of the settlement system with missing load, generation and intertie data derived from a combination

of meter, telemetry and estimated data from other systems. In order for SCALE to effectively and accurately calculate participant liabilities, three essential data inputs are needed: load, generation and intertie MWhs. Currently, 75 to 80 percent of generation and intertie MWhs are derived from CAISO polled meter data stored in the CAISO's Data Warehouse, however the load MWhs are difficult to estimate because participants submit meter data 45 days after the trade date. Thus, the main focus of the SCALE project team's efforts to date has been on the estimation of load data. The analysis conducted produced the following findings:

1.) Utilization of current actual meter load profiles, which are based on meter data that is 50 to 80 days old, to allocate EMS UDC Load did not alone accurately reflect a market participant's current position in the market. For example, a MP's load profile based on past data would not accurately reflect a situation where it has transferred its load/customers to another MP.

2.) Utilization of annual load profiles to allocate EMS UDC Load in many instances did not reflect load increases or decreases that appear over time. For example, since September 2001, certain MPs have acquired a substantial amount of load from other MPs, but the annual load profiles generated did not reflect this load shift.

3.) Utilization of schedules to estimate system load and to derive participant liabilities did not reflect the actual daily system load or participant imbalances. This was mainly due to a participant's ability to schedule whatever amount of load that they choose. Analysis of participant scheduling patterns has shown that many participant's schedules are closely related to their actual metered quantities, however participant scheduling practices may not be consistent.

4.) After conducting an analysis of the load estimation methodologies above, it was determined that all three methods should be combined to provide for a more accurate load estimate. The methodology, outlined below, includes the information gathered through the liability estimation process.

Additional areas that the SCALE team worked on were the estimation of the remaining 15 to 25 percent of missing generation and intertie MWhs. The team developed a methodology to estimate the remaining generation and intertie MWhs, and an explanation of the methodology is outlined below.

Load Estimation Methodology

As mentioned in the previous section, three approaches were considered to estimate load MWhs and each had significant shortcomings that precluded them from being utilized exclusively. By utilizing each of the methodologies in conjunction with each other, a proxy for metered load was developed that more closely represented each participant's position in the market. The following are the steps developed to a market participant's load estimate.

1.) **Develop Load Profiles -** Development of each MP's "On Peak" (Monday through Friday) and "Off Peak" (Saturday, Sunday and Holidays) hourly load profiles by UDC area. The load profiles developed consist of:

- Annual Load Profiles,

- Seasonal Load Profiles,
- Current Load Profiles,
- Scheduled Load Profiles, and
- Short-Term Scheduled Load Profiles.

2.) **Select Load Profile –** Once the load profiles are developed for a given time period, the next step in the load estimation process is to determine which load profile (Annual, Seasonal, Current etc) most closely reflects a MP's actual position in the market. For example, the EMS UDC Load from 12/16/2002 to 1/15/2003 is allocated to each of the load profiles listed above. Next, the allocated MWhs for each set of profiles is compared against the actual metered MWhs for the same time period 12/16/2002 to 1/15/2003. The load profile that best represents a MPs actual meter MWhs is utilized for subsequent load allocations.

3.) **Calculate / Select Load Profile Adjustment Percentages and Load Profile Application Flags –** The following adjustment percentages and load profile application flags, which are defined above, are calculated or selected to be utilized in subsequent calculations:

- Load Profile Adjustment Percentage,
- Meter Load to Scheduled Load Adjustment Percentage,
- Other Adjustment Percentage,
- Use Meter Load to Scheduled Load Adjustment Percentage Flag, and
- Use Scheduled Load Flag.

(note: the results of steps 1 thru 3 are utilized for a designated period, such as 30 days)

4.) **Validate EMS UDC Load –** EMS UDC Load validation for each trade date is conducted to ensure that the data derived from EMS does not include significant outlier MWhs. The calculation includes comparing an historical EMS load profile (T+1 to T+50) to the current trade date load profile. Where the current load profile MWh does not meet the 15 percent tolerance level ,the current EMS MWh value is adjusted to within tolerance.

5.) **Allocate EMS UDC Load –** Next, the ISO will utilizes the selected load profile for determining the MP's hourly load to allocate EMS UDC Load. The following steps are required for the allocation of EMS UDC Load:

   a. The EMS UDC Load is allocated to MP's based on the following formula (all calculations are conducted on an hourly basis):

      i. Where Use Schedule Load Flag = "True"; Scheduled Load * (1+Meter Load to Scheduled Load Adjustment Percentage)

ii. Where Use Schedule Load Flag = "False" and Use Meter Load to Scheduled Load Adjustment Percentage Flag = "True", EMS UDC Load * Selected Load Profile / 1000 * (1+ Load Profile Adjustment Percentage) * (1+ Other Adjustment (what is this? Percentage)*(1+ Meter Load to Scheduled Load Adjustment Percentage),

iii. Else, EMS UDC Load * Selected Load Profile / 1000 * (1+ Load Profile Adjustment Percentage) * (1+ Other Adjustment Percentage)

b. The value of Hourly EMS UDC Load * Selected Load Profile is divided by 1000 because the hourly load profile percentages derived are multiplied by 1000 for data representation purposes.

6.) **Calculate Generation Deviation / Unaccounted for Energy (UFE) Quantity by UDC -** For each UDC, a Generation Deviation / UFE calculation is completed, which provides a residual amount of Load MWhs that are allocated to designated MPs on a *pro rata* basis. The purpose of the calculation and load MWh allocation is to minimize Charge Type 406 UFE charges. The UFE calculation is outlined in the settlement and billing protocols under CT 406. The allocation process is as follows (all calculations are conducted on an hourly basis):

a. Where Generation Deviation Allocation Flag = "False", MP Load + (UDC UFE *MP Load / Total UDC Load where Generation Deviation Allocation Flag = "False").

7.) **Load Distribution and Upload –** Upon deriving the load MWhs to be utilized in the settlement statement calculation, the MWhs are distributed to each MP's valid resources IDs in the following manner and then uploaded into SCALE.

a. Development of a list of valid metered and scheduled resources utilized by each MP over a given time period (T+1 to T+80).

b. Allocate the estimated load to the valid resources on a weighted basis by hour. For all resources that have both metered quantities and scheduled quantities, metered quantities will be utilized for weighting purposes. Resources that have scheduled quantities and no metered quantities are assumed to be recently utilized resources and scheduled quantities will be used for weighting purposes.

c. Allocate the resource quantities calculated above evenly across the six sub-hour interval levels for upload into the measurements table in SCALE.

Issues Related to the Load Estimate Development Process

1. Further enhancements to the load allocation methodology are expected.

2. The ISO will explore the future feasibility of involving SCs in the load factor development process, prior to the trade date to allow MPs the ability to comment on and revise any load factor developed.

3. If such communications are feasible, those MPs that decide to provide estimated metered data for a T+7 estimated settlement calculation may do so, and in such cases the ISO estimated

meter data would be used to validate or provide a reasonableness check on the MP's estimated meter data.

4. For those MPs that do not provide estimates of their load, the ISO will estimate their load using one of the approaches outlined. As the ISO has an obligation to protect the interests of other MPs, a conservative or "Worst Case" approach would be used in such instances. Thus, a MP's estimated charges will likely be higher than what would be expected in order to mitigate potential credit risk to the market.

5.

Generation Estimation Methodology

As mentioned above, at T+7 approximately 15 to 25 percent of generation meter data is not available. The following is an explanation of the methodology utilized to develop a proxy for the missing generation meter data.

The ISO determined that the missing generation data consists of the following:

1. ISO polled unit MWhs thatwere either not available at T+7 or were being worked on by the metering department at the time of the T+7 data push, and

2. Qualifying Facility (QF) unit and other non-polled unit MWhs.

The process for determining the remaining generation data is based on EMS and schedule data.

1. **Download T+7 Meter Data Acquisition System (MDAS) Generation Data –** For the trade date being worked on, all generation data available in the T+7 measurement table is downloaded for analysis purposes.

2. **Download Scheduled Generation Data –** From Market Operation's Scheduling Infrastructure (SI) database, download hourly scheduled generation by resource ID.

3. **Download Real Time (RT) Dispatch Data –** From Market Operation's SI database, download hourly real time dispatched data by resource ID.

4. **Download EMS Data from Plant Information (PI) –** A table has been developed from information provided by Market Operations that contains approximately 800 generation resource IDs mapped to the appropriate PI tags. Using the PI tags, generation unit hourly EMS MWhs are downloaded from PI.

5. **Download Actual Meter & Schedule Data –** From the Data Warehouse, download actual metered and scheduled quantities for a period of T+50 to T+80 for analysis purposes.

6. **Utilization of T+7 MDAS Generation Data –** Where T+7 MDAS generation data exists for a particular resource, even if the measurement quantity is zero, use this value. (Between 75 and 85 percent of all generation MWhs)

7. **Utilization of EMS Generation Data –** Where MDAS data is not available and Dispatched Generation MWh >0 and EMS MWh >0, use EMS MWhs. (Approximately 18.75 percent of all generation MWhs)

    a. Dispatched Generation MWh = Scheduled Generation MWh + RT Dispatched Generation MWh

    b. Where the EMS MWh * 1.15 is greater than the maximum generation capacity of the unit utilize the maximum generation capacity of the unit.

8. **Utilization of Dispatched / Scheduled Generation MWhs –** Where MDAS data is not available and Dispatched Generation MWh >0 and EMS MWh = 0, use Adjusted Dispatched / Scheduled Generation MWh. (Approximately 6.25 percent of all generation MWhs)

    a. **Adjusted Dispatched Generation MWh** =

        i. For all Dispatched / Scheduled Generation MWhs >=1 MWh, Dispatched / Scheduled Generation MWhs* 1+(Hourly Metered vs Scheduled Generation Variance Percentage).

    b. **Resource Historical Metered vs. Scheduled Variance Percentage (T+50 to T+80)** = (average hourly metered MWh – average hourly scheduled MWh) / average hourly scheduled MWh

9. **Upload the Developed MWhs to SCALE -** Allocate the resource quantities calculated above evenly across the six sub-hour interval levels for upload into the measurements table in SCALE.

Intertie / Intratie (TIE) Estimation Methodology

Currently, 75 to 80 percent of the TIE data is available from ISO polled meters. The process for determining the remaining intertie MWhs is based on the utilization of EMS data and allocated load MWhs derived in the Load Estimation Methodology for various intraties.

1. **Download T+7 MDAS Intertie Data –** For the trade date being estimated, all TIE data available in the T+7 measurement table is downloaded for analysis purposes.

2. **Download EMS Data from PI –** A table has been developed from information provided by Market Operations that contains TIE resource IDs mapped to the appropriate PI tags. Using the PI tags, TIE hourly EMS MWhs are downloaded from PI.

4. **Utilization of T+7 MDAS Intertie Data –** Where T+7 MDAS TIE data exists, use MDAS data. (Approximately 84 percent of all TIE MWhs)

5. **Utilization of EMS Intertie Data –** Where MDAS data is not available use the EMS data. (Approximately 13 percent of all TIE MWhs)

6. **Utilization of Load Data –** For intratie IDs, utilize the amount calculated as load as the intratie MWhs where appropriate. (Approximately 3 percent of all TIE MWhs)

7. **Upload the Developed MWhs to SCALE -** Allocate the resource quantities calculated above evenly across the six sub-hour interval levels for upload into the measurements table in SCALE.

SCALE Data Development Conclusion

The above steps are a high level overview of how missing meter MWh data is developed for an estimated T+7 settlement run. The ISO has been testing the T+7 measurement file development process since January 1, 2003, and it has found, after implementing various enhancements, that the methodology has stabilized and is ready to put into production. The ISO looks forward to working proactively with MPs to further refine this process.