BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

Order Instituting Rulemaking to Oversee the Resource Adequacy Program, Consider Program Refinements, and Establish Annual Local and Flexible Procurement Obligations for the 2019 and 2020 Compliance Years	Rulemaking 17-09-020 (Filed September 28, 2017)

CALIFORNIA INDEPENDENT SYSTEM OPERATOR CORPORATION
TRACK 2 TESTIMONY

CORRECTED CHAPTER 6: AVAILABILITY LIMITED RESOURCES

SPONSOR: John Goodin, Manager, Infrastructure and Regulatory Policy[1]

Nebiyu Yimer, Regional Transmission Engineer, Lead, Regional Transmission South[2]

Proposal No. 5: The Commission Should Recognize the Impact of Availability Limited Resources and Adopt the CAISO's Hourly Load and Resource Adequacy Analysis to Determine Availability Needs in Local Capacity Areas

I. The Commission Should Recognize the Impact of Availability-Limited Resources.

The California Independent System Operator Corporation (CAISO) defines availability-limited resources as those resources that have significant dispatch limitations such as limited duration hours (*e.g.*, per year, season, month, or day) or event calls (e.g., per year, season, month or consecutive days) that would limit the resources' ability to respond to a contingency event within a local capacity area. The CAISO's definition is limited to resources that count towards meeting a local capacity area or sub-area need. The CAISO strongly urges the Commission to adopt this definition.

[1] *See* John Goodin's statement of qualifications, attached hereto as Appendix A.
[2] *See* Nebiyu Yimer's statement of qualifications, attached hereto as Appendix B.

The resource adequacy program is currently based on meeting a peak capacity requirement defined in megawatts (MWs) without consideration of other resource availability needs. For example, under today's paradigm, a 10 MW/40 MWh resource has the same resource adequacy capacity value as a 10 MW/80 MWh resource. If a local capacity area requires 10 MW of capacity for an eight hour period during a contingency event, only the latter resource is capable of meeting this reliability need. Yet from a resource adequacy perspective, these hypothetical resources provide equivalent resource adequacy value because the resource adequacy program does not consider availability limitations. In recent years, the quantity of resources with some level of availability limitations, such as certain preferred and energy storage resources, has increased considerably. To continue this progression toward increasing levels of preferred and energy storage resources, the CAISO and the Commission must identify and account for availability limitations within local capacity areas and sub-areas to ensure that sufficient resources are procured to meet reliability requirements in all hours and during contingency situations.

II. The Commission Should Adopt the CAISO's Proposed Hourly Load and Resource Analysis to Determine Availability Needs in Local Capacity Areas.

In recent transmission planning studies, the CAISO demonstrated that simply satisfying the peak capacity needs in a local capacity area does not assure reliability consistent with the Local Capacity Technical Study criteria. Specifically, the CAISO's Moorpark Sub-Area Local Capacity Alternative Study and Supplemental Local Capacity Assessment for the Santa Clara Sub-Area (Moorpark and Santa Clara Studies) show that availability-limited resources with a four-hour minimum duration were insufficient, due to a lack of energy (*i.e.*, available MWh), to fully address the contingency events identified in the local capacity criteria.[3] In the Moorpark and Santa Clara Studies, the CAISO developed and performed detailed hourly load and resource analyses to determine whether there were binding availability limits in the local capacity sub-

[3] CAISO, Moorpark Sub-Area Local Capacity Alternative Study, August 16, 2017, https://www.caiso.com/Documents/Aug16_2017_MoorparkSub-AreaLocalCapacityRequirementStudy-PuentePowerProject_15-AFC-01.pdf; and Santa Clara Sub-Area Local Capacity Technical Analysis, June 18, 2018, http://www.caiso.com/Documents/2023LocalCapacityTechnicalAnalysisfortheSantaClaraSub-Area.pdf.

area to better inform regulatory proceedings and specify more precisely the local capacity procurement needs in those areas. The CAISO proposes to conduct similar analysis to inform Commission's resource adequacy proceeding and corresponding load serving entity (LSE) or central buyer procurement efforts. The Commission should adopt the CAISO's hourly load and resource analysis to set local resource adequacy procurement requirements that are designed to meet both capacity and energy needs for each local area. If the Commission adopts this proposal, the CAISO plans to submit the results of its hourly load and resource analysis for each applicable local capacity area and sub-area in the Commission's 2019 resource adequacy proceeding (for the 2020 compliance year).

The CAISO notes that the Commission currently uses the CAISO's Local Capacity Technical Study as the basis for determining local resource adequacy capacity requirements. The CAISO conducts its local capacity technical study annually, and the Commission sets local capacity procurement obligations each year after reviewing the CAISO's recommendations. The Commission issues a decision requiring its LSEs procure a MW capacity amount; it does not expressly consider other needs, such as energy delivery or how availability limited resources satisfy these other critical needs in local capacity areas. The hourly load and resource analysis adds a layer of detail to the Local Capacity Technical Study that is necessary to ensure reliability as LSEs increasingly procure availability-limited resources to meet local capacity requirements. By adopting the CAISO's hourly load and resources analysis, the Commission will be taking important steps toward better informed LSE procurement in local capacity areas and minimizing the potential for CAISO backstop procurement.

III. The CAISO's Hourly Load and Resource Analysis Is Based on Existing Local Capacity Technical Study with Additional Steps to Ensure Energy Sufficiency.

The CAISO proposes to maintain the existing Local Capacity Technical Study process with certain changes described below, which will add detailed hourly load and resource analyses to determine the availability needs for each viable local capacity area and sub-area. The CAISO will continue to conduct its annual Local Capacity Technical Study to determine the local capacity requirements (in MW) for each local capacity area and sub-area, but the hourly load and

resource analysis will provide additional critical information regarding availability needs in each local capacity area.[4] This analysis will require the additional inputs and study steps that are not included in the current Local Capacity Technical Study. The CAISO details these additional inputs and study steps below.

A. Additional Inputs for Hourly Load and Resource Analysis.

- **Projected hourly load data** for each local capacity area and sub-area, for each year of analysis under a multi-year resource adequacy framework. The projected load data should include the impact of BTM PV but exclude the impact of supply-side demand response resources. In prior analyses, the CAISO relied on data from either the California Energy Commission (CEC) or the participating transmission owners (PTOs). The CAISO is open to exploring additional sources. As a default, the CAISO suggests using CEC data, if available, followed by the PTOs as the data source.
- **Determine the voltage stability or thermal area load limit** for the critical contingency with variable and availability-limited resources excluded for each local capacity area and sub-area, for each year of analysis under a multi-year resource adequacy framework. In the determination of the load limit, CAISO will assume all conventional (non-availability-limited, non-variable) resources that have not announced to retire will be available throughout the multi-year resource adequacy horizon. The CAISO needs to conduct this additional assessment to determine the MW limit where non-availability-limited local resources will need to be dispatched to serve the local or sub-area load to avoid voltage collapse. Voltage collapse or thermal overloads for contingency events are typically the most limiting condition and often set the local area requirements.

[4] The CAISO's hourly load and resources analysis will maintain the same criteria and assumptions—such as the requirements to adhere to North American Electric Reliability Corporation (NERC) reliability standards, Western Electricity Coordinating Council (WECC) regional requirements, the CAISO transmission planning standards and the local capacity technical study criteria set out in the CAISO tariff. CAISO Tariff Section 40.3.1.1 provides that "[t]he Local Capacity Technical Study will determine the minimum amount of Local Capacity Area Resources needed to address the Contingencies identified in Section 40.3.1.2."

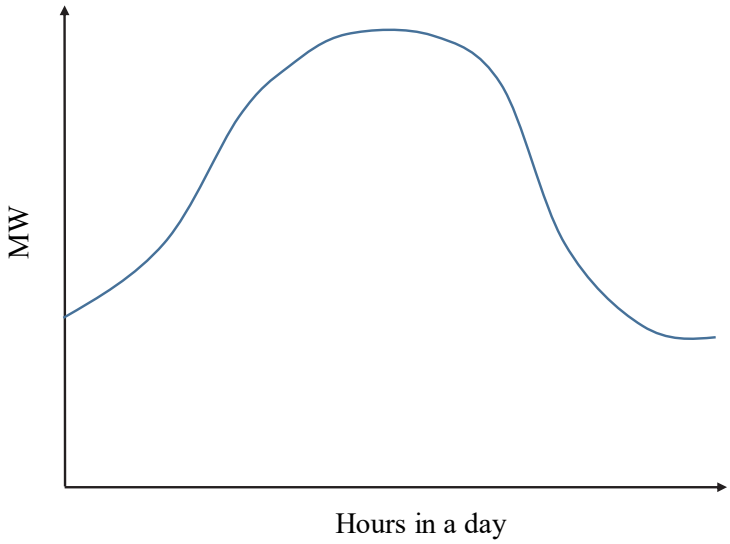
- **Hourly output data for supply side solar PV located in the area or sub-area** will also be needed to develop the net load shape.

B. Additional Study Steps for Hourly Load and Resource Analysis.

After receiving the additional inputs and using information available from the current Local Capacity Technical Study (such as existing and expected online resources in each local area and sub-area), a spreadsheet-based hourly load and resource analysis must be performed for each local capacity area and sub-area.[5] The figures below help to illustrate the steps the CAISO will take as part of the hourly load and resource analysis.

- **Determine the hourly load shape for each year of analysis under a multi-year resource adequacy framework.** Figure 1 below provides a graphical representation of the hourly load data that will be provided in the spreadsheet.

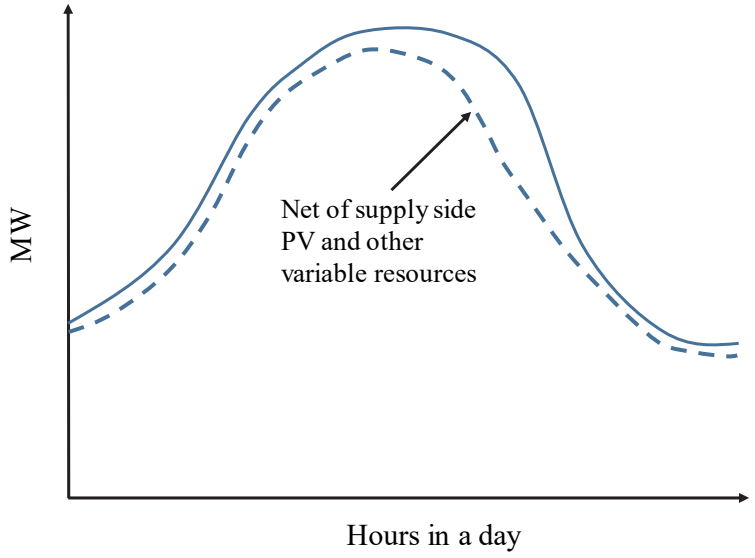
Figure 1: Illustrative Hourly Load Shape



- **Starting with the projected hourly load, subtract supply-side solar PV and other variable supply side resources not used in the derivation of the voltage-stability or thermal-load limit.** These resources are assumed to provide load reduction or generation largely based on their profiles. This net load is shown as the dotted blue line in Figure 2.

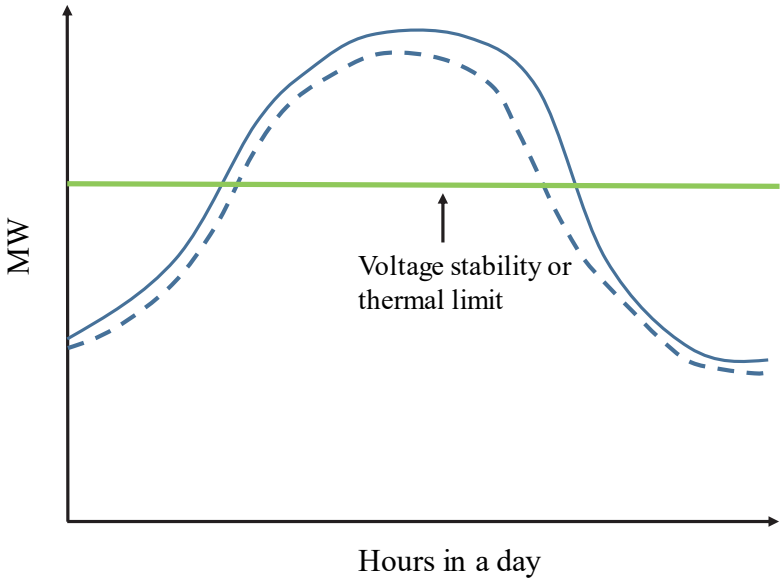
[5] *See* Moorpark Study, Appendix A – Hourly Load and Resource Analysis Worksheets.

Figure 2: Illustrative Hourly Load Shape Net of Supply Side Solar PV and Other Variable Resources



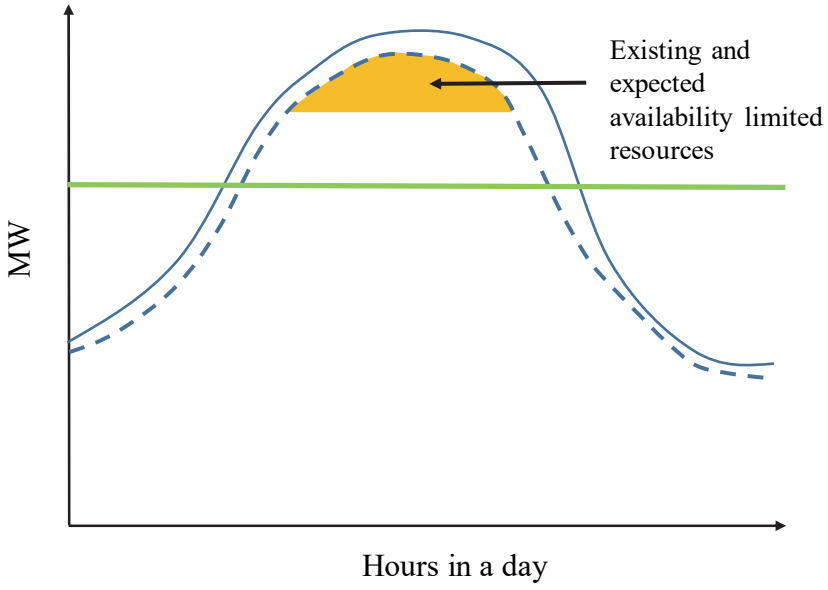
- **Subtract the voltage stability or thermal area load limit (input analysis) to derive the remaining load that may be served by availability-limited resources.** In Figure 3, this area is bounded by the voltage stability or thermal area load limit shown as a green horizontal line and the hourly load net of energy efficiency and solar PV shown as dotted blue line.

Figure 3: Voltage Stability or Thermal Area Load Limit



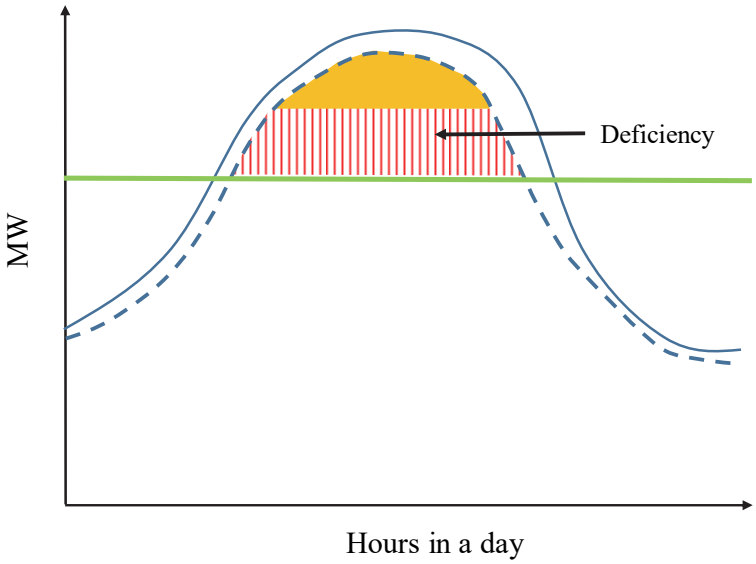
- **Assess whether existing and expected online availability-limited resources can meet the local capacity need.** This part of the assessment assumes availability-limited resources can serve the net load when the net load is greater than the voltage stability area load limit, recognizing all resources must be dispatched at the peak load hour and demand response is to be used last. The CAISO will use the resource parameters provided to the CAISO to appropriately model each resource's ability to meet the local area need such as number of calls or runtime for demand response programs or the need to recharge energy storage resources to be prepared for next day duty. Figure 4 below shows in yellow existing and expected online availability-limited resources' ability to serve load in this illustrative example.

Figure 4: Assessment of Availability Limited Resources



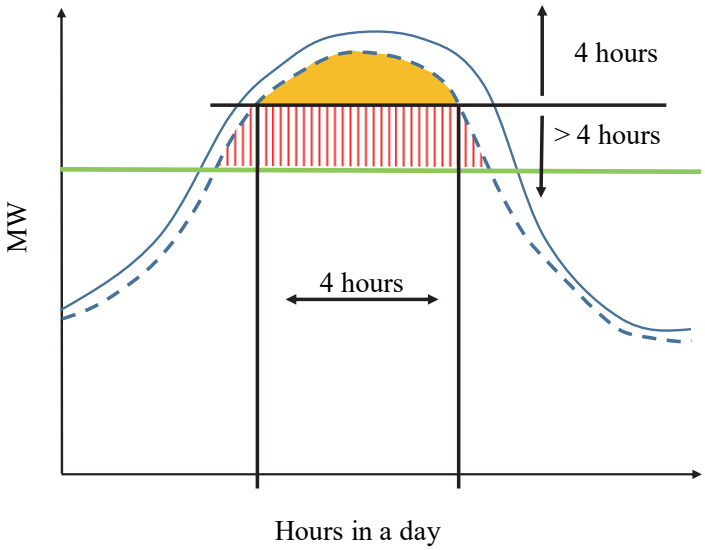
- **Identify any local area deficiencies.** Some local capacity areas or sub-areas may show a deficiency. If this is the case, the CAISO analysis will identify the deficiency on an hourly basis shown as the red striped area in Figure 5.

Figure 5: Identifying Local Area Deficiencies



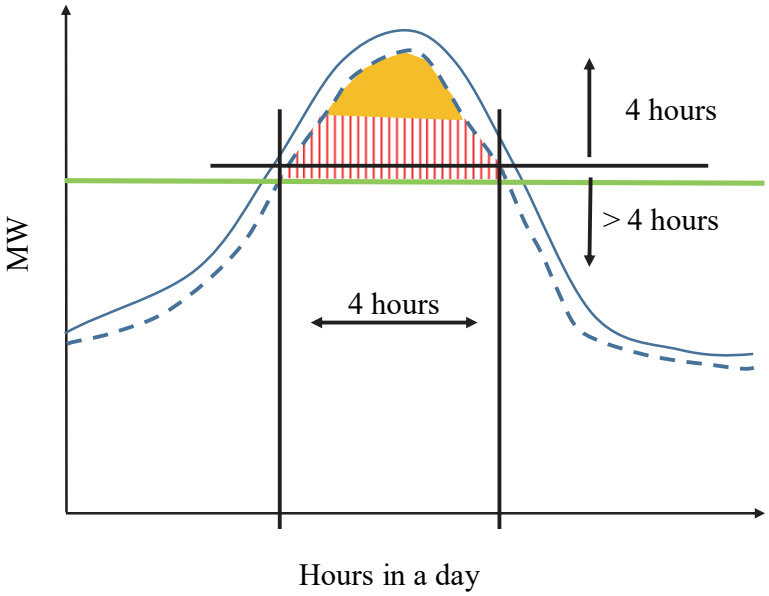
If there is a deficiency, CAISO's analysis will provide critical information to inform the additional procurement of availability-limited resources. The study assumes the Commission continues considering local and system resources as bundled for resource adequacy purposes, and the minimum availability requirement is four hours. In Figure 6 below, the solid vertical black lines reflect a four hour minimum availability threshold that includes the peak hour. Above the solid black horizontal line is the load that can be served with resources that meet this minimum availability. Below the solid black horizontal line is load that will need to be served with resources with greater than four hours of availability. In this example, the area below the line is the local area deficiency. Therefore, the deficiency can be met by both availability-limited and non-limited resources, but the duration of availability-limited resources must exceed four hours and specifically meet the needs of this local area.

Figure 6: Four Hour Minimum Availability Threshold



In comparison, Figure 7 shows another illustrative load profile with a much steeper and narrower peak period. This example shows that the minimum four hour availability threshold has not yet been reached so load serving entities wishing to procure more availability-limited resources can continue to rely on the minimum four-hour requirement up to the threshold. By providing the spreadsheet analysis, load serving entities will have a transparent and straightforward process to evaluate future procurement of necessary capacity.

Figure 7: Illustrative Alternative Load Shape



After load serving entities have followed this guidance, procurement will be validated against the availability needs as discussed in the next section.

IV. The Commission Should Adopt the CAISO's Proposed Process for Incorporating an Hourly Load and Resource Analysis into the Local Capacity Technical Analysis.

The CAISO's proposed hourly load and resource analysis to determine availability limitations requires significant new inputs and analyses. Below, the CAISO proposes a schedule for adopting and implementing the proposal to target implementation by the 2020 resource adequacy compliance year to align with multi-year resource adequacy procurement requirements. The CAISO's proposed implementation timeline is as follows:

Time	Activity
Q4 2018	• In Track 2 decision, Commission adopts CAISO's definition of availability-limited resources and hourly load and resource analysis.
Q1 2019	• Single forecast set is adopted by the CEC. Hourly load data may be available from the CEC or PTOs. • CAISO performs hourly load and resource analysis within the Local Capacity Technical Analysis stakeholder process
Q2 2019	• CAISO submits availability needs assessment into the Commission's resource adequacy proceeding as part of the Local Capacity Technical Analysis to guide resource procurement
Q4 2019	• Validate LSE procurement with power flow modeling

To leave enough time for the rest of the process, the CAISO requests the Commission adopt this proposal no later than in the fourth quarter of 2018. Shortly after, the CAISO must receive hourly load shapes for each local area and sub-area. A potential source for this data is the CEC's 10-year demand forecast adopted as part of its Integrated Energy Policy Report in the first quarter of 2019. The CAISO also expects to work collaboratively with its participating

transmission owners to determine additional load or supply data, especially for local capacity sub-areas. The CAISO will evaluate several years of data to match the multi-year resource adequacy construct ultimately adopted by the Commission. During the rest of this quarter, the CAISO will perform the hourly load and resource analysis within its existing Local Capacity Technical Analysis stakeholder process.

In the second quarter of 2019, the CAISO expects to submit the results of the hourly load and resource analysis into the 2019 resource adequacy proceeding (for the 2020 compliance year) with the Local Capacity Technical Study. The hourly loads and resource analysis can then be used to guide local procurement for the 2020 compliance year.

In the fourth quarter of 2019, after load serving entities procure additional local capacity resources, the CAISO will validate the showings based on power flow modeling. This step is necessary because the spreadsheet load and resource analysis described in the preceding section does not consider reactive power and locational impacts. In this step, the CAISO models the load and resource dispatch for each hour of the 24-hour period obtained from the hourly load and resource analysis in the power flow model as needed to confirm that the dispatch yielded acceptable results. If the dispatch in any hour failed to yield acceptable results, the CAISO will use the existing process to allow load serving entities to cure any deficiencies.

In the first iteration of this process, the CAISO will analyze every local area and sub-area across the multi-year resource adequacy procurement horizon. In subsequent iterations, the CAISO may reduce the frequency and analysis of areas to those that show significant or increasing availability limitations, in order to manage CAISO's workload. Adopting the CAISO's study methodology will provide LSEs information to conduct procurement designed to meet the technical and operational characteristics the CAISO needs to ensure that local capacity requirements are fully met. In turn, this would reduce the need for CAISO backstop procurement.

Appendix A

Statement of Qualifications

John Goodin, Manager, Infrastructure and Regulatory Policy

Statement of Qualifications

John Goodin – Manager, Infrastructure and Regulatory Policy at the California ISO

Mr. Goodin has over 30 years' experience in the electric industry. In 1997, he was a part of the original start-up team for the California ISO (CAISO). Prior to joining the California ISO, Mr. Goodin worked at Pacific Gas & Electric Company for 10 years serving in various roles.

Mr. Goodin's current responsibilities at the California ISO include:

- Managing the Infrastructure and Regulatory Policy Team. This team is responsible for formulating the CAISO's market design and policies related to:
    - Resource adequacy and procurement
    - Transmission Infrastructure
    - Demand Response
    - Distributed Energy Resources

Mr. Goodin holds a Bachelor of Science in Mechanical Engineering from California Polytechnic State University, San Luis Obispo.

Appendix B

Statement of Qualifications

Nebiyu Yimer, Regional Transmission Engineer, Lead, Regional Transmission South

Statement of Qualifications

Nebiyu Yimer – Regional Transmission Engineer, Lead, Regional Transmission South at the California ISO.

Mr. Yimer has over 20 years of Transmission Planning experience in California, Canada and Ethiopia. Mr. Yimer is a licensed Professional Electrical Engineer in the province of Alberta, Canada.

Mr. Yimer's current responsibilities at the California ISO (CAISO) include:

- Planning the CAISO-controlled transmission system in southern California in the most cost effective manner and to ensure compliance with
    - North American Electric Reliability Corporation (NERC) reliability standards,
    - Western Electricity Coordinating Council (WECC) regional criteria, and
    - CAISO Transmission Planning Standards.
- Performed the CAISO local capacity requirements (LCR) technical analysis for the Moorpark sub-area for the 2017 local capacity technical study process.

Mr. Yimer holds a Master of Science in Renewable Energy from the University of Oldenburg, Germany and a Bachelor of Science in Electrical Engineering from Addis Ababa University, Ethiopia.