Locational Net Benefits Analysis Working Group – Long Term Refinement Topics Scoping Document

Prepared for the ICA Working Group by More Than Smart

Background:

A June 7, 2017 Assigned Commissioner Ruling (ACR) set a scope and schedule[1] for continued long-term refinement (LTR) discussions on both Integrated Capacity Analysis (ICA) and Locational Net Benefit Analysis (LNBA). This ACR includes pre-Working Group (WG) deliverables, status reporting, and final reporting milestones for continued long-term refinement discussions. This ACR groups the identified long-term refinement topics into three tiers, which front-loads work on topics of relatively high complexity and/or importance to the further development of ICA and deems other topics out of scope (please refer to Table 6 in the ACR). The June ACR also states, "The Working Group shall develop succinct scoping documents, no longer than ten pages in length, that briefly summarize discussions on these topics to date and detail relevant framing questions or considerations to move discussions forward from the outset… More Than Smart shall facilitate the compilation of the scoping documents, which will entail engaging with Working Group members and referencing previous reports to capture all previous discussions and stakeholder positions on the scoped topics". This scoping document summarizes discussions on topics to date and details relevant framing questions or considerations to move discussions forward, drawn from the discussion points already highlighted in the Interim Long-Term Refinement Report[2] and the Final LNBA WG Report[3] previously filed. More Than Smart will facilitate the long-term refinement Working Group meetings, lasting six months from the date of the first meeting.

LNBA Working Group Long-Term Refinement Topics as outlined in the June ACR

Group I:

1. ***Methods for valuing location-specific grid services provided by advanced smart inverter capabilities***

Objective: The LNBA WG will use the existing scoping proposal as a starting point, identifying if there are additional smart inverter functions to map to grid services identified in LNBA, and developing and refining methodology to evaluate smart inverter capability or grid function in response to an identified need, as well as better understanding the practical challenges to deploying smart inverters to serve that need.

Background: This topic was scoped and included in the interim long-term refinement report. The LNBA WG agreed to use the seven smart inverter functions identified in the Smart Inverter Working Group. PG&E presented a scoping proposal which identifies specific grid services enabled by each smart inverter capability, and determines which LNBA components may include that service. Those mapped services-to-LNBA components are below:

[1] http://drpwg.org/wp-content/uploads/2016/07/189819375_ACR_06.08.17.pdf
[2] http://drpwg.org/wp-content/uploads/2016/07/R.14-08-013-First-Intermediate-Status-Report-Final.pdf
[3] http://drpwg.org/wp-content/uploads/2016/07/R1408013-et-al-SCE-LNBA-Working-Group-Final-Report.pdf

#	LNBA Component	Tx Upgrade Deferral (Transmission Capacity)	Tx Congestion Mitigation	Tx Losses Mitigation	Tx Reliability (Spinning Reserve)	Tx Reliability (Frequency Regulation)	Tx Reliability (Frequency Response/Inertia)	Dist. Upgrade Deferral (Distribution Capacity)	Dist. Upgrade Deferral (Voltage Support)	Dist. Upgrade Deferral Reliability-Back Tie)	Dist. Upgrade Deferral (Reliability Microgrid)	Dist. Upgrade Deferral (Hosting Capacity)	Dist. Efficiency/Loss Reduction (e.g. CVR)	Support Safety
1	Sub-tx/Substation/Feeder (Distr. Project Deferral)							x				x		
2	Distr. Voltage/Power Qual. (Distr. Project Deferral)								x					
3	Distribution Reliability/Resiliency									x	x			
4	Transmission (Trans Project Deferral)	x	x	x										
5	System and Local RA													
6	Flexible RA													
7	Avoided Energy		x	x									x	
8	Avoided GHG		x	x									x	
9	Avoided RPS													
10	Avoided Ancillary Services				x	x	x							
11	Renewable Integration Costs					x								
12	Societal Avoided Costs													
13	Public Safety Costs													x

The WG, in review of the scoping proposal, agreed that the scoping document provides a good framing of grid services enabled by smart inverter functions by directly mapping services as defined in the IDER Competitive Solicitation Framework (CSF) Working Group final report to the LNBA components as defined in the ACR. Two smart inverter capabilities outlined in SIWG do not directly map to an LNBA component: 1) transmission reliability (frequency response/inertia) should be considered embedded in existing energy, ancillary services, and capacity components' avoided costs until a separate market for these services is established; and 2) distribution upgrade deferral (hosting capacity) could be included under a new component within the LNBA. The scoping proposal identified the challenges of both developing and refining a methodology to evaluate smart inverter capability or grid function in response to an identified need, as well as the practical challenges to deploy smart inverters to serve that need, considering communications, control systems, etc. to enable dispatch to provide a needed function.

Scoping questions:

- Are there additional methodology refinements needed to evaluate smart inverter capabilities or grid function? What is the value of smart inverter services, as defined within LNBA?
- Are there other instances where grid services enabled by smart inverters do not fall into these predefined LNBA benefits categories? For these values, it may be valuable to include the closest available methodology estimate and identify where estimates have been made, as well as whether it can be refined.
- What methods of smart meter control will best enable the utility to realize potential avoided costs (i.e. utility central control, local automation, or voluntary customer response to utility signals)?

2. *Method for evaluating the effect on avoided cost of DER working "in concert" in the same electrical footprint of a substation (ACR considers the same as "improving heat map and*

spreadsheet tool by enabling modeling of a portfolio of DER projects at numerous nodes to respond to a single grid need")

Objective: The LNBA tool should be able to analyze a portfolio of projects at multiple locations responding to one or more grid needs. The WG will work to incorporate this function into the existing tool. There are also instances where coordination between DER may enhanced aggregated capabilities and potentially address multiple grid needs. The WG will continue to explore this potential.

Background: The LNBA WG was in consensus that the LNBA tool should allow the input of multiple projects and multiple locations. The IOUs will develop the means to include this functionality. In addition, Clean Coalition developed a scoping proposal for review by the LNBA WG for the interim long-term refinement report. The proposed actions in that scoping document ask the WG to review the assumptions regarding how DER will interact on the grid, including the degree or circumstances under which they would be expected to act in concert or other coordinated fashion, and review the modeling of the impact this will have on benefits and costs realized by the utility and their customers. This will require assumptions to be developed for review, and illustrated in at least one modeled example demonstrating the various impacts of coordinating DER, and should at a minimum include the role of utility DERMS on both generation and load and of autonomous advanced inverter functionality (outside of DERMS) in coordinating DER for maximum value. The proposal states that methodological enhancement may be needed in determining how aggregation and coordination of individual resources will change the value proposition of DERs.

Scoping questions:

- What additional resources or tests are needed to incorporate this consensus recommendation into the LNBA tool?
- What resources are needed to develop a model example of DER working in concert?

3. Improve heat map and spreadsheet tool by: i) including options to automatically populate DER generation profile input; ii) enabling modeling of a portfolio of DER projects at numerous nodes to respond to a single grid need; and iii) allowing hourly VAR profiles to be input in order to capture DERs ability to inject or absorb reactive power

Objective: The LNBA WG was in consensus that the LNBA heat map and spreadsheet tool may be improved to better present information. Within long-term refinement, the WG will propose, review, and decide on means of improvement.

Background: After reviewing Demo B projects, the LNBA WG identified short-term improvements that improve the functionality of the LNBA tool and heat map. These improvements do not change the underlying LNBA analysis, but rather refine the tool to improve its accuracy and add improvements to both the tool and map. These three recommendations were made with consensus by the LNBA WG after review of the Final Demo B reports.

i) *Including options to automatically populate DER generation profile input:* The LNBA tool currently asks users to manually provider DER information, benefits that the DER can obtain, and a DER hourly profile. The WG came to a consensus recommendation to modify the tool so that there is an option to select a typical or generic hourly DER generation profile and capacity and automatically populate output. These sample profiles would be illustrative only.

ii) *Enable modeling of portfolio of DER projects at numerous nodes to respond to a single (or more) grid need(s):* The LNBA WG came to a consensus recommendation to refine the LNBA tool to allow for modeling for a portfolio of projects, as a DER alternative to a larger distribution upgrade may require a portfolio of projects as numerous nodes.

iii) *Allowing hourly VAR profiles to be input in order to capture DERs ability to inject or absorb reactive power*: The LNBA tool as developed under Demo B captures DERs' ability to defer voltage support projects, but only captures DERS' ability to reduce load via the user-input hourly DER profile, which does not capture the ability of some DERs to produce or absorb reactive power as a way to avoid voltage-related investments. The LNBA came to a consensus recommendation to include a 8760 VAR requirement input, DER VAR profile, and develop hourly VAR deficiency values. This modification would expand the way in which the voltage support project deferral requirements are stated so that smart inverter-based DERs could meet the deferral requirements through reactive power management.

Scoping questions:

i) Which profiles should be added in a public resource library? What publicly available resources already exist (e.g., EM public tool, typical solar PV and EE profiles, etc.)

ii) How might the LNBA tool be enhanced to support benefit analysis of deferring one or more projects with multiple locational elements?

iii) It is mentioned that the development of 8760 VAR requirement input and DER VAR profiles would not be a complex addition. What additional engineering analyses need to be done to develop hourly VAR deficiency values?

4. Incorporate additional locational granularity into Energy, Capacity, and Line Losses system-level avoided cost values

Overview: Additional components of avoided costs which currently employ system-level values should incorporate additional locational granularity.

Background: The LNBA Demo B tool directly used DERAC values for certain avoided cost components. The LNBA WG was in consensus recommendation to update energy, capacity, and line loss avoided costs with more location-specific values. IOUs may update the tool using known values for energy and capacity. Specifically, avoided energy costs may be developed using locational information such as CAISO LMPs. Avoided generation capacity values may be represented by local resource adequacy (RA) values in constrained areas. Currently for line losses, the LNBA tool uses IOU-specific average distribution line loss factors, which does not accurately reflect line loss reductions created by DERs across the entire system. Within the LNBA WG Final Report, the WG had agreed to first analyze the variability of this parameter across the system to understand this value's benefits, as it was expressed that there may not be enough variability in line losses in specific locations.

Scoping questions:

i. What values should be used to make energy and capacity avoided costs more location-specific?

ii. How should the LNBA Working Group improve location specific line loss value?

iii. What pricing forecast methodologies should be used to provided consistency and develop future prices at each location?

5. ***Form technical subgroup in LT refinements to develop methodologies for non-zero location-specific transmission costs (requires coordination/co-facilitation with CAISO)***

Overview: The LNBA WG will form a technical subgroup, coordinated with CAISO, to determine a non-zero locational avoided transmission cost, in coordination with its long-term TPP refinement. From this subgroup meetings, the WG will work to develop and test a potential methodology for the value's inclusion within the LNBA tool.

Background: Original guidance for Demo B projects specified that LNBA would include avoided transmission capital and operating expenditures, a value not currently included in the DERAC. The ACR states that "IOUS shall, to the extent possible, quantify the co-benefit value of ensuring (through targeted, distribution-level DER sourcing) that preferred resources relied upon to meet planning requirements in the CAISO's 2015-2016 transmission plan materialize as assumed in those locations". However, the transmission plan did not identify specific projects that would be required in the absence of preferred resources or associated project costs or provide information needed to develop DER load reduction requirements. Currently, the LNBA tool contains a user input for a generic system-wide transmission benefit. No current consensus default value exists. In developing the Final Demo B Report, the WG agreed to develop a technical subgroup that includes IOUs, CPUC, CAISO, and interested parties to ensure that the CAISO TPP evaluates locational avoided transmission costs within its long-term TPP refinement activities. The LNBA WG aims to complete the following over the next six months: 1) understand the shortfalls of the transmission system capability in determining this avoided cost; 2) develop a potential methodology for inclusion, 3) test the functionality of the methodology within the LNBA tool; 4) ensure that any avoided cost value adopted reflects the ability to actually avoid transmission cost in the near or long-term; and 5) coordinate with and understand how CAISO's transmission planning process reflects contribution of DERs to avoid or defer actual transmission investment.

The LNBA WG has not yet held extensive discussion on this topic. Some stakeholders have submitted suggested starting points for consideration, detailed on Page 24 of the LNBA Final Demo B Report. It is expected that the CPUC Energy Division will assist in facilitating coordination with CAISO.

Scoping questions:

- What elements of the CAISO TPP plan are needed, but may not exist, with regards to development of both a system-wide default avoided transmission cost system wide and location specific avoided transmission costs?
- Does the expected avoided cost value accurately reflect the ability to actually avoid transmission costs in the near/long term?
- What information needs to be included in the CAISO long-term transmission planning process? Are there ongoing/future coordination needs between CPUC/CAISO/IOUs with regards to locational avoided transmission cost value?
- How should this avoided cost be incorporated into LNBA methodology?

Group II:

1. ***Incorporate a (forecasting) uncertainty metric in LNBA tool for planned deferrable projects (requires coordination with development of deferral screening criteria under development in DRP Track 3 Sub-track 3***

Overview: There is non-consensus whether an uncertainty metric is able to be incorporated within the LNBA Tool, and whether it is within scope of the LNBA WG or within Track 3 deferral framework activities. The WG will discuss and review how the deferral framework addresses uncertainty, whether a methodology exists or how such a value might be included within the tool and represented on the heat map.

Background: Through the evaluation of Demo B, the WG discussed means to continue and refine the LNBA methodology in ways that expanded past the analytical scope of Demo B. One of these means was to improve how forecasting uncertainty is captured within the LNBA. Development of LNBA methodology requires making certain assumptions and developing scenarios for DER growth and value of DER to determine which planned projects may be deferred by DERs. Currently, IOUs' distribution load forecasting methodology determines growth projections over 10 years. As planning forecasts are, by their nature, uncertain, it is possible that projects may either appear or become unnecessary and change the value of DERs in a location. When a forecasted project is assumed to be deferrable, the quantification of that benefit does not necessarily indicate that the project is 100% certain.

At the time of the LNBA WG Final Report, there was non-consensus among the WG on both whether the topic should be discussed within the LBNA WG or as a Track 3 Deferral Framework topic. Some WG members supporting an uncertainty metric believe that it would increase the accuracy of quantification of T&D benefits in LNBA. The heat map would be modified to show the certainty of investment next to the relative dollar amount of potentially deferrable investment. It was proposed that projects with the highest certainty and dollar amount may be prioritized for DER deferral.

Scoping questions:

i) What is the status of the developing deferral screening criteria under DRP Track 3 Sub-track 3? How is the Deferral Framework addressing uncertainty?
ii) What methodology might be used to accurately indicate project certainty?
iii) How should uncertainty be represented on the heat map?

2. ***Only use base DER growth scenario, not high growth scenario (may entail substantive discussion, but likely will not entail incremental methodology development; requires coordination with DER growth scenarios under development in DRP Track 3 Sub-track 1***

Overview: There is non-consensus whether the high growth scenario is consistent enough to add value within the LNBA tool and heat map.

Background: For Demo B the ACR directed the IOUs to use two DER growth scenarios from the 2015 DRP filings – a base DER growth scenario, and a very high DER growth scenario. In some of the IOU Demo B reports, it was determined that the impact of the very high DER growth scenario was not consistent or intuitive. Further, the high growth scenario depends on many policy interventions that cannot be assumed.

Scoping questions:

i) Methodological choices for the high growth scenario and lessons learned from Demo B should be shared with the Track 3, sub-track 1 of the DRP (load and DER forecasts) and vice versa. With additional information and knowledge gained through the conclusion of Demo B and the DER Growth Scenarios Working Group, are there possible methodological changes or alternatives to using the very high DER growth scenario that are within scope of the LNBA WG? What ongoing coordination needs to be developed between the LNBA WG and Track 1 Sub-track 1 of the DRP?

Group III:

The following three non-consensus items are considered by the ACR to be the same, given that valuing unplanned grid needs encompasses long-term (>10 year grid needs). However, such values are speculative and likely difficult to quantify for practical use in the LNBA.

1. *Methods for evaluating location-specific benefits over a long term horizon that matches with the offer duration of the DER project*
2. *Develop a methodology to quantify the likelihood of an unplanned grid need (Deferrable project) emerging in a given location*
3. *Value locational value of DERs beyond 10 years*

Objective: The WG needs to determine whether a value exists and can be quantified for unplanned grid needs within the planning period, and needs beyond the 10 year planning horizon, and whether they can be practically quantified and input into LNBA methodology.

Background: DER projects often have longer lifetimes than distribution benefits are currently valued within LNBA, which is consistent with the utility's ten-year distribution planning process. Further, planned upgrade projects for future years are uncertain due to inherent forecast uncertainty. Currently, the LNBA does not include methodology to include the locational distribution value of DERs beyond ten years. The LNBA also does not measure the avoidance of upgrades that would have been needed without DER growth but were not planned for ten years, or were never proposed in utility distribution plans. The WG disagrees whether the LNBA should include these values.

Regarding value beyond 10 year grid needs:

- Stakeholders who believe those values should be included propose that avoided costs should extend to the end of project life, and could use system average values to calculate value beyond Year 10. The DERAC calculator currently includes system wide averages for transmission and distribution values that extend out 30 years.
- The IOUs have stated that he LNBA currently includes non-deferral benefits beyond 10 years, and the deferral benefit, when calculated using the Real Economic Carrying Charge (RECC) method, captures the benefit of deferral throughout the life of the deferred asset. The distribution electric system configuration can change significantly over time, any locational distribution benefit beyond the 10-year planning window is highly speculative.

Regarding unplanned grid needs emerging:

- Some stakeholders state that DERs can avoid more than the projects identified as deferrable in the current T&D plans, and would like the IOUS to develop a method to quantify the likelihood of an unplanned project emerging in a location based on forecasted conditions and forecast uncertainty, resulting in unexpected upgrades. This is given that some distribution upgrades are not identified in annual distribution planning, and not considered deferrable by DERs within LNBA. Current installed DERs may also reduce future utility loads such that T&D upgrades that would have been required in the absence of DERs never even need to be considered in the utility planning process.

- The IOUs believe that quantifying these avoided costs are speculative, as projects in those scenarios were never developed. Determining avoided projects would require comparison of multiple years of forecast and recorded data to determine how historic load and DER profiles each impacted the distribution profile. Next, an entire planning analysis would be required for a scenario without DER to determine if the removal of existing DER could have contributed to a new project identified in this "no DER" scenario. This recommendation is requesting an avoided cost calculation for projects that were never developed while also establishing if the cause of why these projects were never needed is due to increasing DER or reducing load growth.

Scoping questions:

- What additional study or analysis is needed to determine whether these values exist, and if there is an existing methodology to include them? Are there existing studies or results that can be leveraged? What types of resources and modifications would be needed to include this value in the LNBA tool?

<u>*For remaining Group III topics:*</u>

Some WG stakeholders, after reviewing Demo B, recommended that LNBA include additional grid services, to the best estimated non-zero value possible based on a demonstrated methodology for quantification of indicative values if available, and reflecting a degree of uncertainty. A primary question is how and whether LNBA should include values to replace a default zero value where an industry-recognized method has yet to be established. For the following discussion topics, the WG is encouraged to consider the type of value derived (e.g., avoided utility expenditure), and who receives the benefits. The ACR identifies these four items as "… value proposition is speculative and potentially low, WG should only address these issues if time permits".

4. *Explore asset life extension/reduction value provided by DERs*

Objective: The WG needs to explore whether this additional grid service exists, how to quantify its service, what research may be leveraged, and how it may be included into the LNBA.

Background: DERs could extend or shorten asset life of existing equipment by, for example, reducing thermal stress or increasing usage. This potential service was identified in IOU Demo B final reports, where it was noted that this benefit is difficult to accurately quantify. For example, there are significant concerns that a utility would replace aging infrastructure at a certain point regardless of DER deployment, which means DER's would be credited for a value they do not provide. Each DER impacts distribution equipment in different ways, complicating the analysis even further. However, some stakeholders had noted that there is already research demonstrating this value.

Scoping questions:

i) What current research exists on DER asset life extension/reduction value?
ii) Why is this value difficult to quantify? Are there primary steps the LNBA WG can take to explore how this value might be included?

5. Explore possible value of situational awareness or intelligence (Value of data-as-service for situational intelligence is likely hard to quantify on avoided or marginal cost basis, and is driven to some degree by Commission policy on the use of DER data for grid operations and/or planning)

Objective: The WG needs to explore how to quantify this grid service, what existing research may be leveraged, and how it may be included into the LNBA.

Background: This service was identified in the IDER CSF WG Final Report and in Demo B final reports, but not formally defined or discussed within the LNBA WG. There is current non-consensus whether this service, to what scope, and to what extent it can be qualified, may be provided by DERs, as well as what information currently exists. Stakeholders who support additional study and its potential inclusion state that DER systems can provide additional information on local grid conditions (e.g., through DER metering equipment that collect granular data) that can potentially avoid utility investments in telemetry and monitoring equipment. These stakeholders point to Hawaii as a good example where DER providers provide available data to utilities that assist with grid management. IOUs (and other stakeholders) who oppose the inclusion of this potential benefit category state that there is no analysis to date to provide sense of scope/magnitude of additional "situational awareness" provided by DERs. Further, it is unclear what specific information might be provided to IOUS, as well as the format, quality, frequency, and cost of this information may be. The WG additionally not yet had a discussion on the usefulness and value of this information, how much information is necessary to begin to improve situational awareness, and who benefits from this information (e.g., reduced ratepayer expense).

Scoping questions:

i) Are there existing data or information sources or examples which quantify the value of data-as service for situational intelligence? What information is available/ missing?
ii) How much data or information is needed to provide situational awareness, how reliable is it?
iii) Who benefits from the addition of a value for situational awareness (including the cost of information)

6. Include benefits of increased reliability (non-capacity related) provided by DERs

Overview: The WG needs to explore how to quantify this grid service beyond what is already included in the LNBA via back-tie capacity or microgrid services, what existing research may be leveraged, and how it may be included into the LNBA.

Background: DERs may provide increased reliability benefits through reduction of frequency, duration, or magnitude of customer outages. Some stakeholders would like that value represented in ICA methodology. For example, if a DER provides reliability service in a location where the cost or value of reliability is above average, to a relatively small set of customers but those customers have a high "value of service", then the value that the specific DER provides could be significant. The IOUs have stated that the current LNBA methodology includes value of increased reliability via investments providing back-tie capacity or microgrid services. Further, if a particular customer/set of customers places a value on reliability above the standard level that is provided, that customer can make investments in DERs to improve their reliability. This should not be a cost that other customers bear through additional incentives for that customer's DER investment.

Scoping questions:

- Who benefits from increased reliability?
- How would methodology need to change from the current method of considering the value of increased reliability?

7. LNBA should value benefits of DERs reducing the frequency/scope of maintenance projects

Overview: The WG needs to explore whether this potential exists, how to quantify this grid service, what existing research may be leveraged, and how it may be included into the LNBA.

Background: The WG disagrees whether DERs can or cannot defer maintenance projects. Those stakeholders who believe such a potential value should be quantified believe that DERs may defer maintenance due to their role in reducing thermal stress. Those stakeholders who disagree state that there is little or no available evidence that DERs can defer maintenance, and that it actually may be the case that DERS increase the need for maintenance projects. Further, there is no existing method to predict if a piece of distribution equipment will require more or less maintenance during the life expectancy of the DER connected to that piece of distribution equipment.

Scoping questions:

i) Is there existing evidence or data to show how DERs may defer maintenance projects?

8. LNBA should include benefits of DER penetration allowing for downsized replacement equipment due to be installed in the case of equipment failure or routine replacement or aging assets

Overview: The WG needs to explore whether this value exists, how to quantify this grid service, what exist research may be leveraged, and how it may be included into the LNBA.

Background: The WG disagrees whether the value of DER in reducing the amount of replacement equipment exists or is substantive. Those stakeholders who agree believe that increasing installed DER on a distribution feeder reduces loading on upstream equipment, which reduces the need for potential replacement facilities to be of equal capacity or “like-for-like”, due to reduced system load growth. The IOUs believe that, in reality, this value either doesn’t exist or is small, due to several reasons. First, the incremental cost savings of downsizing any particular piece of equipment are quite modest. Furthermore, given that ultimately in the long-term, load tends to grow, downsizing replacement equipment may actually be adding to the long-term cost, as in the future another replacement may become necessary to upsize the equipment. Utility investments are “lumpy” by their nature. When an equipment replacement is necessary, it generally does not make sense to downsize equipment – it is easiest and fastest to replace failed equipment “in kind”, so existing infrastructure (e.g., transformer pads) do not have to change. In addition, downsizing equipment would then reduce the hosting capacity of that particular distribution equipment. If the scenario arises where DER is then causing the need for more capacity, the smaller distribution equipment would then need to be replaced. This would make the distribution system less robust at accepting both increases in load and DER.

Scoping questions:

i) What additional study or analysis is needed to determine whether downsizing increases expected ratepayer benefits?