

# Integration Capacity Analysis Working Group - Group I Interim Status Report

*Prepared for the ICA Working Group by More Than Smart on August 31, 2017*

## Background:

A June 7, 2017 Assigned Commissioner Ruling (ACR) set a scope and schedule<sup>1</sup> for continued long-term refinement (LTR) discussions on both Integration 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 four tiers, which front-loads work on topics of relatively high complexity and/or importance to the further development of ICA. The four Group I topics are as follows:

Topic	June 7 ACR Item #
1. Further define ICA planning use case and methodologies	WG - 1
2. Develop standard PV generation profile for use in online maps (near term relevance to interconnection use case and online map display of ICA results)	WG - 2
3. Develop methods and tools to model smart inverter functionality in ICA calculations	WG - 5
4. Perform comparative assessment of IOUs' implementation of ICA methodology on representative California reference circuits	WG - 8

The Working Group has had two meetings since the release of this ACR. The meeting notes, webinar recordings, participant lists, and slides from those meetings are included as links in Appendix A of this status report.

The Working Group established a consensus method for discussing topics, developing written proposals, and receiving edits or comments on those proposals. These are detailed in the proposal document, [found here](#)<sup>2</sup>. This interim status report identifies which parties have submitted proposals, which parties have submitted comments, and summarize discussion and next-steps to date. These proposals can be found in Appendix B and reflect the main work products of this WG to date, incorporate feedback and comments made during the in-person monthly meeting, and will assist the WG in developing the final WG report due January 2018.

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<sup>1</sup> [http://drpwg.org/wp-content/uploads/2016/07/189819375\\_ACR\\_06.08.17.pdf](http://drpwg.org/wp-content/uploads/2016/07/189819375_ACR_06.08.17.pdf)

<sup>2</sup> <http://drpwg.org/wp-content/uploads/2016/07/High-Level-ICA-LNBA-LT-Refinements-WG-Project-Plan-v.6.29.docx>

## 1. Further define ICA planning use case and methodologies

**Overview:** The ICA WG briefly discussed this topic in July and discussed this topic in greater depth at the August meeting. The scoping document states that “The ICA WG will determine how the ICA may inform and identify DER growth constraints and opportunities in the planning process, in which applications and how ICA may be used, and what methodology (streamlined or iterative), levels of granularity and frequency of updates, may best serve the planning use case.”

**Initial proposals:** The joint IOUs presented<sup>3</sup> on one definition and purpose of the planning use case, which is known as the “distribution capacity planning use case.” The purpose of this use case is to identify system needs expected to be created by future DER growth, for the purpose of preemptively addressing these needs. This use case is envisioned to become an integral part of utility operations and feed in directly to the utility annual distribution planning process. The outcome is expected to be either IOU capital investment to meet the need, or sourcing of DERs to defer the conventional investment. This analysis would be performed annually, looking at a 1-5 year time horizon, and aligned with existing distribution planning efforts. Coordination is also necessary to avoid duplicating efforts from the normal planning process. For this use case, the ICA tool should be able to consider a dispersion of smaller DER resources throughout the circuit rather than single interconnection points, as was considered in the interconnection use case. The IOUs proposed two general means of including DER growth scenarios within the analysis, and identify a need to determine which DER forecasts should be used.

**Edits and comments:** Several stakeholders during the August meeting expressed that the IOU presentation, covering the “distribution capacity planning use” of ICA, does not adequately cover the full suite of uses for ICA, and pointed out that ICA may also inform policy discussions, such as tariffs or incentives. A subgroup of stakeholders representing IREC, ORA, SEIA, Vote Solar, Clean Coalition and Stem submitted edits and comments<sup>4</sup> to the IOU written proposal, which represents a preliminary conversation in defining broader ICA use, and anticipates further conversation on appropriate methodology. The stakeholder proposal identifies planning to also include broader activities that shape the grid, and includes a list of open issues to be resolved by the WG. These open issues include: defining the desired functionality of ICA for the planning use case; what ICA requirements are needed while considering future needs for additional functionality; how DER growth scenarios within the ICA may be assessed; and understanding what methodology and processes can be used to meet these proposed uses (and if any modifications are needed). The proposal describes potential ICA planning applications (including a list of technical ICA characteristics), and recommendations on how to minimize IOU effort and ratepayer costs to develop and maintain more than one ICA tool, if one is needed.

**Timeline and next steps:** The WG has not discussed the stakeholder response comments yet in person. These comments reflect a desire for a broader use case discussion, and identifies some concerns with the distribution capacity planning use case regarding how DER growth forecasts are used and how resulting ICA values lead to proactive investments. The WG will continue discussions at a future meeting.

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<sup>3</sup> <http://drpwg.org/wp-content/uploads/2016/07/ICA-Item-1-Planning-Use-Case.docx>

<sup>4</sup> <http://drpwg.org/wp-content/uploads/2016/07/ICA-Item-1-Planning-Use-Case-FINAL.docx>

## 2. Develop standard PV generation profile

**Overview:** The ICA WG discussed this topic at the July meeting. The typical PV profile was identified in the Final Working Group Report as a value (shown both with and without the operational flexibility criteria) to be used in the online maps within the first system-wide rollout, and should also be appropriate for use in interconnection approval of PV-based connections.

**Initial proposal(s):** The joint IOUs proposed<sup>5</sup> a three month study plan to determine the appropriate PV curve. During discussion, the WG discussed several data components or considerations that should be included, at a minimum, in the determination of an appropriate PV curve. These considerations are fully detailed in the IOU proposal. The IOUs also indicated that they would present a preview of the data used to the ICA WG before the three month study period concludes.

**Edits and comments:** The July meeting resulted in multiple discussion topics regarding the source of data, and how the resulting profile would be considered adequately conservative, including discussing how oversized or non-typical installations should be considered.

Clean Coalition submitted edits<sup>6</sup>, noting that IEEE 1547.1 is considering requiring inverter oversizing that would provide capacity that would increase ICA.

**Next steps:** The ICA WG will review the proposed PV shape at the November WG meeting, and the detailed data prior to that date.

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<sup>5</sup> <http://drpwg.org/wp-content/uploads/2016/07/ICA-Item-2-Standard-PV-Profile.docx>

<sup>6</sup> [http://drpwg.org/wp-content/uploads/2016/07/ICA-Item-2-Standard-PV-Profile\\_CleanCoalition.docx](http://drpwg.org/wp-content/uploads/2016/07/ICA-Item-2-Standard-PV-Profile_CleanCoalition.docx)

### 3. Develop methods and tools to model smart inverter functionality in ICA calculations

**Background:** This issue was initially previewed at the July meeting and explained in further detail at the August meeting. Within Demo A, the IOUs did not recommend methods for evaluating hosting capacity with smart inverter functionality, but tested smart volt-VAR function within Demo A on a limited basis on one distribution feeder, to determine how smart inverters may be able to increase hosting capacity. Resulting studies revealed that smart inverters may be able to support higher levels of hosting capacity in certain system conditions.

**Initial proposal(s):** At the August meeting, the joint IOUs identified which smart inverter functions would impact ICA. These include: 1) volt-VAR function with active (watt) power priority; 2) volt-VAR with reactive (VAR) power priority; 3) fixed power factor; and 4) volt-watt. The WG also discussed when each function is expected to be available, providing an indication of priority. The joint IOU written proposal<sup>7</sup> identified how each function will be evaluated. The joint IOUs proposed to conduct the following evaluations, beginning Q1 2018: 1) conduct additional evaluation on the impact to ICA using the proposed Rule 21 volt-VAR curve with reactive power priority, using a reactive power system flow study to determine reactive power resource needs; 2) evaluate how the volt-watt curve may be used to increase the DER nameplate capacity over the value of ICA; and 3) evaluate how CYME and Synergi could support the automated process for inclusion of smart inverter functions into ICA. System-wide implementation of ICA with smart inverter functionality would be implemented Q4 2018- Q2 2019.

**Edits and comments:** A group of non-utility stakeholders (CALSEIA, Clean Coalition, IREC) submitted recommendations<sup>8</sup> in response to the joint IOU proposal. These parties recommend and state that: 1) the proposed studies on changes to the volt-VAR curve are unnecessary, or should be revisited through the Smart Inverter Working Group or R.17-07-007; 2) the initial system-wide rollout of ICA should incorporate the benefits of volt-VAR functionality with reactive power priority; 3) volt-watt functionality will support larger DER sizes without further studies, and that both volt-VAR and volt-watt functions should be used in the ICA tool; and 4) the Phase 3 scheduling function will support increased sizes of DERS, and should be acknowledged in the WG that it is a technically appropriate use of ICA to schedule changes to inverter settings. The stakeholder subgroup recommends a method for assuming smart inverter penetration.

**Next steps:** Given the comments in the stakeholder proposal, the WG is in non-consensus as to whether the additional studies proposed by the utilities is necessary given multiple reasons, particularly referencing the work conducted through the Smart Inverter Working Group. The WG will likely revisit the smart inverters topic at a future monthly meeting to discuss the submitted written comments before the joint IOUs commit to undertaking any additional potential studies.

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<sup>7</sup> <http://drpwg.org/wp-content/uploads/2016/07/ICA-Item-5-Smart-Inverters-V2.docx>

<sup>8</sup> <http://drpwg.org/wp-content/uploads/2016/07/ICA-smart-inverters-non-utility-party-comments.docx>

#### 4. Comparative analysis across reference circuits

**Background:** This topic was addressed at the July meeting. The IOUs used the IEEE 123 test feeder to compare Demo A results of both the iterative and streamlined methods, and between power system analysis tools. The Final WG report recommended using more representative California feeders to conduct comparative analysis as a long-term refinement item.

**Initial proposal(s):** At the July meeting, the ICA WG identified that the comparative analysis topic aligns with two other Group IV items (Item F: Development of ICA validation plans, describing how ICA results can be independently verified; and Item G: definition of QA/QC measures) and agreed to consolidate the topics. The joint IOUs identified additional EPRI test circuits that may be more indicative of urban and rural circuits in California. Given that these include a larger number of nodes, the joint IOUs propose<sup>9</sup> to first have a non-IOU party conduct external validation on the publicly available IEEE 123 circuit and compare it to the IOU results before starting comparative assessment using a more complex model.

**Edits and comments:** During the July meeting, it was discussed that non-IOU parties may be able to assist in performing this validation, or help by comparing notes and results of separate efforts with the joint IOUs. The joint IOUs agreed to follow up with potential third party partners. No written edits or comments were circulated. The joint IOUs only made one modification to the IEEE 123 test circuit to ensure operational flexibility and can supply the modified file for external validation.

**Next steps:** The joint IOUs agreed to follow up with potential third party partners. DNV GL, as well as the LLNL/LBNL who originally developed scoping documents for the Group IV topics, are potential third party volunteers.

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<sup>9</sup> <http://drpwg.org/wp-content/uploads/2016/07/ICA-Item-8-Comparative-Analysis.docx>

## Appendix A: Summary of Meetings

Meeting date	Meeting documents
July 7: ICA WG	<p>Group I Topics Discussed:</p> <ul style="list-style-type: none"> <li>- Develop standard PV generation profile for use in online maps</li> <li>- Comparative analysis</li> </ul> <p>Group I Topics Previewed:</p> <ul style="list-style-type: none"> <li>- Planning use case and methodologies</li> <li>- Smart inverters</li> <li>• <a href="#">webinar recording</a></li> <li>• <a href="#">meeting notes (draft)</a></li> <li>• <a href="#">slide deck</a></li> <li>• <a href="#">SEIA updated slide deck</a></li> <li>• <a href="#">participant list</a></li> <li>• <a href="#">high level project plan proposal</a></li> </ul>
August 15: ICA WG	<p>Group I Topics Discussed:</p> <ul style="list-style-type: none"> <li>- Planning use case and methodologies</li> <li>- Smart inverters</li> <li>• <a href="#">participant list</a></li> <li>• <a href="#">slide deck</a></li> <li>• <a href="#">webinar recording</a></li> </ul>

## Appendix B: Written Proposals and Submitted Comments

Topic	June 7 ACR Item	Initial written proposals	Comments
Further define ICA planning use case and methodologies	1	<a href="#">Joint IOUs</a>	<a href="#">Joint stakeholder parties</a> representing IREC, ORA, SEIA, Vote Solar, Clean Coalition and Stem
Develop standard PV generation profile for use in online maps (near term relevance to interconnection use case and online map display of ICA results)	2	<a href="#">Joint IOUs</a>	<a href="#">Clean Coalition</a>
Develop methods and tools to model smart inverter functionality in ICA calculations	5	<a href="#">Joint IOUs</a>	<a href="#">Joint stakeholder parties</a> representing CALSEIA, IREC, Clean Coalition
Perform comparative assessment of IOUs' implementation of ICA methodology on representative California reference circuits	8	<a href="#">Joint IOUs</a>	

# Item 1: Planning Use Case

Joint IOUs' Initial Proposal  
ICA Working Group

## Summary of Recommendations

- IOUs recommend that the term “planning” use case refer only to use cases that will directly feed into distribution planning activities. The two visions should be considered separate and distinct use cases.
- Evaluate proposed options of assessing DER growth scenarios within ICA

## Introduction and Background

The ICA WG identified two use cases for ICA: 1) to inform and improve the Rule 21 interconnection process, and 2) to inform and identify DER growth constraints and opportunities in the planning process. The interconnection use case is detailed in the Final ICA WG report. With regards to planning, the ICA may be used to inform the distribution planning process by identifying when and where capacity upgrades may be needed as a result of DER growth, as well as where there is opportunity for additional DER deployment and where DERs could be used to address capacity constraints using various growth scenarios. The ICA has been identified by the CPUC for use in multiple planning processes, including, but not limited to, grid modernization (within the DRP proceeding) and the IRP proceeding.

The ICA WG will determine how the ICA may inform and identify DER growth constraints and opportunities in the planning process; in which applications and how ICA may be used; and in what methodology (streamlined or iterative), levels of granularity and frequency of updates, may best serve the planning use case.

## Clarification of Multiple visions of “planning use case”

During the Working Group discussion, it became clear that stakeholders had different visions for the definition and purpose of “planning use case.” Two distinct versions emerged from the discussion:

**“Distribution Capacity Planning Use Case”:** This purpose of the use case is to *identify system needs expected to be created by future DER growth, for the purpose of preemptively addressing these needs*. This use case is envisioned to become an integral part of utility operations and feed in directly to the utility annual distribution planning process. The outcome is expected to be either IOU capital investment to meet the need, or sourcing of DERs to defer the conventional investment. Thus, forecasts and other policy assumptions should be consistent with current commission policy for distribution planning and investment. **This IOU proposal contained in this write-up refers to this Distribution Capacity Planning Use Case.**

**“Policy Scenario Analysis Use Case”:** This use case would involve alternative assumptions for growth scenarios, policies, tariffs, incentives, etc. The outcomes of this use case would clearly *not* feed into any

utility operations, planning or investment activity. Rather, the results of this use case would inform future policy discussions. This use case has not yet been well defined. The IOUs invite stakeholders to develop proposals for this use case. Many questions that need to be addressed regarding what scenarios would be analyzed, how (and in what forums) the results would be used, and whether there would be incremental ratepayer cost to fund these analyses. While this use case is not yet defined, the IOUs' tools will be able to accommodate this use case: it is not a question of developing new tools to accommodate this use case; rather, the current need is simply to define the assumptions and use of this use case.

These are two *different* use cases. Whether or not one refers to both use cases under the umbrella term of "planning," it is critical to recognize the fundamental difference in these use cases: The former use case is envisioned to provide results that will be incorporated into actual IOU operational activities. The latter case is envisioned to provide results that inform policy decisions, *but will not directly be used in utility activities* as the results are based on policies, forecasts, or other assumptions that have not yet been adopted. To avoid confusion, the IOUs therefore recommend that these two visions be considered separate and distinct use cases. Furthermore, to avoid confusion, the IOUs recommend that the term "planning" use case refer only to use cases that will directly feed into distribution planning activities.

## Technical Discussion

It is important to acknowledge that ICA is intended to determine deficiencies in the grid to integrate DER, but not the solutions. ICA can be useful to help identify locations and timing of deficiencies, but further review and engineering is required to determine the solutions to mitigate. The hosting capacity upgrade would also have to be coordinated with the normal planning efforts to not duplicate any work already being proposed.

### Timing

It is proposed that the IOUs perform in a similar cadence and timing that aligns with distribution planning efforts. Analysis would be performed once a year after the load forecasting is complete and before final distribution analysis is performed. The analysis would be seen helpful to be done in a 1 to 5 year planning horizon. Anything past 5 years on the distribution circuits is not as precise unless you are looking at larger scale impacts at the substation.

### Types of Resources Analyzed

The California ICA working group and methodology has thus far been focused on the interconnection use case which isolates analysis to single interconnections. The analysis has reflected this by only really considering the impacts of single DER placement on a circuit. In the planning context, it is important to understand the broader impact of multiple generators and what the combined aggregate effect would be over a longer time frame. As ICA progresses, it is important that the components of the tool be able to consider a dispersion of smaller DER throughout the circuit. EPRI's tools have developed to be able to include analysis of this dispersion and the working group should research and explore the incorporation of these techniques in order to properly consider DER for the planning context.

### Using the DER Growth in the Analysis

One challenging fact is that the utilities can't forecast growth to the nodal precision of the models with proper accuracy. Typically we will have growth factors granular down to the feeder at the max. The IOUs must then determine how feeder level growths are to be considered in a nodal level analysis. Two general ways of inclusion have been identified which are:

1. Pre-Analysis Modeling
2. Post-Analysis Comparison
  - a. Based on single DER ICA
  - b. Based on dispersed DER ICA

The first approach would take the expected growth and embed within the load allocation methods to distribute into the model. The dispersion would assume the same dispersion of load on the circuit. While not as sophisticated, this approach seems reasonable to perform in the short term while more complex approaches are being explored.

The second approach would not change the input to the model to reflect the DER growth, but compare the DER growth to the calculated ICA. For instance, if ICA is calculated to be 1MW and DER growth is 1.5MW then there would be a 0.5MW deficiency to be addressed. As mentioned earlier, it could be deceptive when performing this if comparing retail growth to single DER ICA. This is why there are two options under approach 2. The first would calculate based on single DER ICA and the second would calculate based on dispersed DER ICA. Ideally the tools would need to properly consider dispersed DER in the analysis, but this is not fully supported yet in the tools. The other challenge to the post analysis approach is how to determine which forecasts to embed in the future time horizon and which to analyze post analysis.

The IOUs will explore the different options and evaluate which one will be the best to implement moving forward.

## Conclusion and Next Steps

- Determine the definition of the "Planning" use case and if we need to define a new use case
- Determine DER forecasts to include to use in the Distribution Capacity Planning use case.
- IOUs to evaluate best option of implementation of incorporating growth scenarios as well as the best long term

# Item 1: Planning Use Case

Draft Non-IOU Proposal

ICA Working Group

## Summary and Next Steps

- All anticipated planning use case scenarios are defined in this report.
- IOUs recommend that the term “planning” use case refer only to use cases that will directly feed into grid investments.
- Non-IOUs recognize that “planning” encompasses both the annual Distribution Planning Process that will likely be addressed in a Track 3 decision this fall and broader planning activities that shape the grid, including policymaking.
- Non-IOUs recommend that the planning use case be defined and evaluated before defining a methodology that will be used for the “planning” ICA or ICAs.
- Open issues to be evaluated and resolved:
  - Define desired functionality of the ICA for the planning use case
    - This could be characterized as multiple different use cases, or rather an identification of the specific ways it would be used in order to shape ICA modeling functionality (scenarios).
  - Define ICA requirements for the use case, while considering future needs for additional functionality
    - Incorporate findings, conclusions, and orders from the Track 3 proposed decision to help define planning use case, understanding that these are draft pending a final decision
    - Incorporate input from IRP proceeding
  - Evaluate proposed options of assessing DER growth scenarios within ICA
  - Determine if the iterative methodology and process for producing ICA values and maps can be modified to meet planning use cases, or if another methodology is needed.
  - Determine if any of the identified functionality will be difficult to meet within current capabilities and/or reasonable costs. Prioritize functionalities accordingly.
  - Finalize ICA methodologies to be used, and define interactions if more than one method is used.

## Introduction and Background

The need for a definition of “use cases” was identified by the ICA Working Group (WG), rather than the CPUC, in part to help ensure compliance with ORA’s proposed success criteria for ICA to provide accurate and “meaningful” results. Based on WG efforts to date, it is apparent that the optimum ICA methodology involves balancing accuracy, processing time, spatial granularity, and other factors, and that the optimum balance depends on the “use case” defining how the tool will be used. Development of the optimum ICA methodology is driven by the use case, but it is also an iterative process where information of cost and timing of development and implementation can and should be fed back into the definition of the use case. Ideally, one ICA tool will meet all functionalities, but the WG recognizes that this may not be feasible.

The ICA WG March 15, 2017 Final Report on short-term issues identified two broad use cases for ICA, summarized as: 1) to inform and improve the Rule 21 interconnection process, and 2) to inform and identify DER growth constraints and opportunities in the planning process. The interconnection use case and its impact of ICA requirements were detailed in the Final ICA WG report.

This proposal documents a planning use case which includes the following:

- Descriptions of potential planning ICA applications and how ICA may be used, beyond the interconnection use case,
- A descriptive list of the technical ICA characteristics that are driven by this use case,
- A preliminary discussion of the technical ICA characteristics that are driven by this use case,
- Recommendations regarding how to minimize IOU effort and ratepayer costs to develop and maintain more than one ICA tool (if one is needed).

These recommendations are supported by the Office of Ratepayer Advocates, the Interstate Renewable Energy Council, Inc., Vote Solar, the Solar Energy Industries Association, the Clean Coalition, and Stem.

## ICA Applications and Uses Beyond Interconnection Use Case

The ICA has been identified by the CPUC and parties for use in multiple planning processes, including, but not limited to the following scenarios:

1. Identification of low IC locations where current or queued DER require immediate mitigation,<sup>10</sup>
2. Identification of low IC locations where current or queued DER justify additional data acquisition and analysis,
3. Identification of locations where forecast DER and load growth could support mitigation through the annual IOU distribution planning process,
4. Identification of locations where forecast DER and load growth could support additional data acquisition and analysis identified through the annual IOU distribution planning process, for use in subsequent annual planning processes,
5. Definition and prioritization system wide grid investments, if any, to accommodate DER or enable benefits from DER (Grid Modernization), and
6. Analysis of impacts and implications of potential policy interventions, including, but not limited to, incentives, rate changes, and tariffs.

During the WG discussion in August 2017, it became clear that stakeholders had different visions for the definition and purpose of the “planning use case.” The IOU vision focused on a “Distribution Capacity Planning Use Case”<sup>11</sup> that is intended to identify potential grid investments that the utilities would address directly:

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<sup>10</sup> Mitigation is typically determined following IOU “needs” assessments, and can include operational changes, capital investment in “traditional” upgrades to identified circuits and substations, and identification of DER portfolios to meet the identified need. Due to the uncertainties of circuit level DER and load forecasts, there will likely be situations where mitigations are required outside of the annual distribution planning process.

<sup>11</sup> This definition was provided in an IOU proposal following the August 15, 2017 WG meeting.

*“The purpose of the use case is to identify system needs expected to be created by future DER growth, for the purpose of preemptively addressing these needs. This use case is envisioned to become an integral part of utility operations and feed in directly to the utility annual distribution planning process. The outcome is expected to be either IOU capital investment to meet the need, or sourcing of DERs to defer the conventional investment. Thus, forecasts and other policy assumptions should be consistent with current commission policy for distribution planning and investment.”*

This corresponds to scenario 3 in the application list above. While WG members generally agreed that this is an important component of the use case, the non-IOU parties believe this is only one relevant scenario under the planning use case. Additionally, ORA has previously expressed concern about using forecasts of DER growth and resulting IC values for proactive investments and this is reflected by the inclusion of Scenarios 1 and 2 below.<sup>12</sup>

The non-IOU parties also feel it is not appropriate to limit this use case to only considering upgrades for DERs where upgrades are socialized. Indeed, the scope of the new Rule 21 interconnection proceeding (R.17-07-007) includes consideration of how costs might be allocated among interconnecting DERs in a ways other the current last-in-line method of allocating costs for an upgrade. Forecasts of needs for such upgrades, and their costs, through the ICA planning scenario may be needed to facilitate a cost-sharing scheme. Utilities can break out socialized costs and pursue those costs in their rate cases as appropriate under current policy, but forecasting of upgrade needs should not be limited only to categories of eligible projects (i.e., net energy metering projects under 1MW).

Non-IOU parties felt it was important to define all potential ICA planning scenarios even if it subsequently decided to focus its current six month process on a prioritized list of scenarios. Non-IOU parties provide the following descriptions for the components of the planning use case listed above:

**Planning Use Case Scenario 1** – Unanticipated changes to distribution equipment (e.g. equipment failures), forecasted load, and forecasted DER could reduce the integration capacity of individual circuits and require mitigation to prevent interconnection delays for new DER on those circuits. Even if the CPUC adopts policies that favor proactive Grid Modernization based on DER growth forecasts, uncertainty in the DER and load forecasts will result in DER or load growth where it was not expected. IOUs will be obliged to mitigate any adverse grid impacts that result to meet their responsibilities per PUC 451. This use case requires accurate ICA values that are updated frequently, and WG members agree that it can be met using an ICA tailored to the interconnection use case.

**Planning Use Case Scenario-2** – This scenario arises from the same unanticipated changes as Scenario 1 above. However some situations may warrant additional data gathering and analysis rather than immediate capital investment for mitigation. ICA requirements are the as the same as Scenario 1.

**Planning Use Case Scenario 3** – The IOU description of this scenario is above, and detailed requirements are discussed in the following section. WG members anticipate that additional definition of this scenario can be provided in the final ICA WG report based on the pending Track 3 decision regarding Growth Scenarios, Grid Modernization, and Distribution Deferral.

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<sup>12</sup> See ORA’s Grid Modernization comments dated June 19, 2017, pp. 19-21.

**Planning Use Case Scenario 4** – This scenario arises from the same planning analyses as Scenario 3 above. However some situations may warrant additional data gathering and analysis rather than capital investment for mitigation. ICA requirements are the same as Scenario 3.

**Planning Use Case Scenario 5** – It is likely that some grid investments will be system wide in nature, and justified based on DER. The CPUC Staff Grid Mod proposal included a schema that used ICA as one metric to help prioritize specific investments. ORA’s comments regarding the staff proposal posited that less accuracy is required for ICA in this application since “The only impact of an erroneous forecast is that one location would be enabled before another.”<sup>13</sup> Detailed requirements for this scenario are provided below, but as with other scenarios above additional definition can be provided in the final ICA WG report based on the pending Track 3 decision regarding Growth Scenarios, Grid Modernization, and Distribution Deferral.

**Planning Use Case Scenario 6** – The tools developed in the DRP and IDER will allow stakeholders to understand grid constraints and the relative locational values associated with addressing them. Numerous policy interventions may be proposed based on this information, including, but not limited to, incentives, rate changes, and tariffs. In addition, the state will be considering pathways for meeting state environmental and emissions goals, including in the IRP. The ICA is an important tool that will enable exploration of the grid impacts and implications of these numerous potential interventions. The ICA, alone, or potentially in combination with growth scenarios and the LNBA, should enable grid operators and stakeholders to see how policy changes may effect specific locations of the grid (such as, for example, a TOU rate specific for storage customers). This information can then be used to guide both policy making and planning decisions about grid investments. This use will require flexibility to consider multiple scenarios, both in a grid-wide and site-specific manner and the potential to run layered scenarios.

## Technical Requirements for Planning Use Cases

It is important to acknowledge that ICA is intended to inform both the location of deficiencies in the grid to integrate DER and the types of potential solutions. ICA can be useful to help identify locations and timing of deficiencies, but further review and engineering is required to determine the solutions to mitigate. ICA also provides the type of deficiency (e.g. thermal, voltage, protection, and OpFlex) for each location which can help define the types of potential mitigations. The hosting capacity upgrade would also have to be coordinated with the normal planning efforts to not duplicate any work already being proposed. Technical requirements driven by the planning use case scenarios are listed below with preliminary discussion from the non-IOU parties.<sup>14</sup>

### Engineering Assumptions

ICA involves a number of engineering assumptions including specific thresholds for each ICA criteria, pre-existing conditions, and status of LTCs. Methods to increase computational efficiency were also

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<sup>13</sup>ORA’s Grid Modernization comments dated June 19, 2017, p. 20: “For system-wide GM investments that enable DER benefits, forecasting uncertainty has minimal impact since the tools and technology will ultimately be deployed on most, if not all, distribution assets. The only impact of an erroneous forecast is that one location would be enabled before another.”

<sup>14</sup> As stated above, the ICA regularly performed to support the interconnection use case may be sufficient to support Cases 1 and 2 above. Case 4 will be addressed consistent with Case 3.

recommended by the ICA in its March 2017 Report. Given the overarching goal of having a common methodology, the WG determined there is no need to use any different assumptions for the planning use. (Need to verify with IOUs)

### **Accuracy**

The required ICA accuracy depends on the planning use case. For Scenario 5 and 6, granular accuracy by line-section is not critical, as the ICA is only proposed to prioritize investments as previously discussed. For Scenario 3, ICA accuracy is of paramount importance because it will be used to justify in targeted investments to increase localized hosting capacity. However, the accuracy of DER forecasts becomes increasingly uncertain as the analysis increases in spatial resolution so there is currently a clear tension between accuracy and spatial resolution where DER forecasts are involved. This is discussed more in the DER section below and is currently an unresolved issue.

### **Frequency of Update**

Planning scenarios generally require annual or less frequent updates.<sup>15</sup> Scenario 2, 4, and 5 require updates annually in advance of the annual distribution planning process, and potentially the Grid Needs Assessment (GNA) based on the Track 3 decision. Analysis would be performed after the load forecasting process has been completed and before final distribution analysis is performed. Scenario 6 would likely be run on an as-needed basis.

### **Temporal Resolution**

In the March 2017 report, the WG agreed that a 576 hour profile, based in part on computational efficiency, should be used for the initial statewide ICA roll out, but expressed that “a more granular hourly profile may be needed and justified.”<sup>16</sup>

### **Spatial Resolution**

For the interconnection use case, ICA values will generally be calculated at each circuit node. However, In the March 2017 Report, the WG agreed to limit the number of nodes analyzed based on computational efficiency for the initial statewide ICA rollout.<sup>17</sup> It is likely less spatial resolution will be required for planning. For Scenario 5, system-wide Grid Modernization upgrades would only be *prioritized* based on ICA, and should be sufficient to target entire circuits for upgrades rather than specific nodes. For planning Scenario 3, there is currently significant uncertainty in DER forecasts more granular than for specific feeders that limits the accuracy of forecast nodal ICA values. This is discussed in the DER forecast section below. While this remains an open topic, the WG initially recommends that ICA values should only be calculated at a locational granularity that is supported by a reasonably accurate DER forecast.

### **Spatial Modeling of DER**

The California ICA WG and methodology has thus far been focused on the interconnection use case which isolates analysis to single interconnections while only considering the impacts of single DER placement on a circuit. In the planning context, it is important to understand the broader impact of

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<sup>15</sup> See previous footnote regarding Cases 1 and 2.

<sup>16</sup> March ICA WG report, p.9.

<sup>17</sup> March ICA WG report, p.33.

multiple generators and what the combined aggregate effect would be over a longer time frame. As ICA progresses, it is important that the components of the tool be able to consider a dispersion of smaller DER throughout the circuit. The iterative and streamlined methods discussed by the WG to date only provide for single DER placements.<sup>18</sup> Other tools have been developed to include analysis of this dispersion and the WG should research and explore the incorporation of these techniques in order to properly consider DER for the planning context.

### **Using the DER Growth in the Analysis**

Most planning scenarios involve estimates of the future condition of the grid, loads, and DER, and how they impact hosting capacity. The IOUs believe that this forecasts should be done in a 1 to 5 year planning horizon, as anything past 5 years on the distribution circuits is not as precise unless you are looking are larger scale impacts at the substation.

One challenging fact is that the utilities cannot forecast growth to the nodal precision of the models with proper accuracy. At maximum, growth factor forecasts will only be granular down to the feeder level. The IOUs must then determine how feeder level growths are to be considered in a nodal level analysis.

Two general ways of inclusion have been identified which are:

3. Pre-Analysis Modeling
4. Post-Analysis Comparison
  - a. Based on single DER ICA
  - b. Based on dispersed DER ICA

At the August 15, 2017 WG meeting, the IOUs presented slides related to Scenario 3 above that focused on how forecasted DER should be incorporated. Three alternatives were presented. The first approach would take the expected growth and embed within the load allocation methods to distribute into the model. The dispersion would assume the same dispersion of load on the circuit. While not as sophisticated, this approach seems reasonable to perform in the short term while more complex approaches are being explored.

The second approach would not change the input to the model to reflect the DER growth, but would compare the DER growth to the calculated ICA. For instance, if ICA is calculated to be 1MW and DG growth is 1.5MW, then there would be a 0.5MW deficiency to be addressed. As mentioned earlier, it could be deceptive when performing this if comparing growth to single DER ICA. This is why there are two options under approach 2. The first would calculate based on single DER ICA, and the second would calculate based on dispersed DER ICA. Ideally, the tools would need to properly consider dispersed DER in the analysis, but this is not fully supported yet in the tools. The other challenge to the post analysis approach is how to determine which forecasts to embed in the future time horizon and which to analyze post analysis.

The ICA WG will explore the different options and evaluate which one will be the best to implement moving forward.

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<sup>18</sup> IOU input required here. Isn't it possible that the iterative method could be modified to provide distributed DER on each circuit, for example various levels of uniform distribution, and or distributions that are skewed towards the beginning of end of each circuit?

**Scenario Analysis**

Statewide long term planning such as LTPP and IRP typically involves performing analysis under a number of scenarios, as low, medium, and high penetration of Energy Efficiency. This allows decision makers to consider the impacts of uncertainty when determining policy. Initial ICA WG discussions indicated that the ability to perform scenario analyses is an advantage of the streamlined ICA method compared to the iterative method. The WG will investigate the types of scenarios planned for the IRP proceeding and also scenarios unique to ICA that should be performed for planning use cases, particularly Scenario 6.

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# Item 2: Develop standard PV generation profile

Joint IOUs' Initial Proposal  
ICA Working Group

## Summary of Recommendations

- There is general consensus that a standard PV profile should be incorporated into the ICA tool.
- The IOUs are currently performing additional analysis to develop a standard PV profile, as discussed further below.
- The IOUs plan to present this standard profile in the November meeting.

## Introduction and Background

In DRP Demonstration Project A, the IOUs utilized a common PV profile to show how a PV profile could be used in combination with the technology agnostic ICA to develop common PV ICA values. Those values were then further mapped on the IOU's online maps.

The Objective of this topic is to develop a PV profile which can be used for ICA system-wide rollout and which can be used for interconnection approval of PV based DER interconnections.

## Discussion

During the July 7, ICA working meeting it was agreed on that the IOUs would proceed with the determination of the appropriate PV curve. To do this, the IOUs plan to collaborate for three months to evaluate the available data sets. Subsequently, the IOUs plan to present to the ICA working group a proposed PV curve along with the underlying assumptions and data used to determine the proposed PV curve.

The ICA working group agreed that at minimum the following would be evaluated by the IOUs in their determination of the PV curve:

1. The data used should be cleaned from inaccurate data. Such as verifying the zero values for periods where PV output greater than zero
2. NREL PVWatts<sup>®</sup> Calculator should be evaluated to determine adequacy. (Note: Ultimately the ICA should not rely upon a third-party tool, as the ICA will be used in the interconnection process, and the interconnection process should not rely upon a third party tool. Instead, the PVWatts calculator can be used to develop a standard profile that will then be used in the ICA, independent of any further modifications (or potential discontinuation) of the PVWatts tool.)
3. The proposed PV profile should have adequate temporal details covering 12 months of PV performance.
4. The PV profile should be developed with the same nameplate PV modules as that of the inverter nameplate. Example: 100KW of PV modules connected to a 100KW inverter
5. The IOUs plan to evaluate the impact to PV-ICA when the DC power is oversized as compared to the inverter. For example: 120KW of PV modules connected to a 100KW inverter
6. The IOUs plan to evaluate how tracking systems (PV with trackers) affect ICA

It was also agreed that IOU should provide the underlying data to the ICA working group at least one week prior to IOU presentation of the proposed PV profile

## Conclusion and Next Steps

- The IOUs are currently in the process of evaluating a standard PV profile as described above.
- The IOUs plan to review the proposed PV shape at the November WG meeting
- The IOUs will provide the detailed data prior to the WG meeting.

# Item 2: Develop standard PV generation profile

Clean Coalition proposed edits to joint IOU proposal

ICA Working Group

## Summary of Recommendations

- There is general consensus that a standard PV profile should be incorporated into the ICA tool.
- The IOUs are currently performing additional analysis to develop a standard PV profile, as discussed further below.
- The IOUs plan to present this standard profile in the November meeting.

## Introduction and Background

In DRP Demonstration Project A, the IOUs utilized a common PV profile to show how a PV profile could be used in combination with the technology agnostic ICA to develop common PV ICA values. Those values were then further mapped on the IOU's online maps.

The Objective of this topic is to develop a PV profile which can be used for ICA system-wide rollout and which can be used for interconnection approval of PV based DER interconnections.

## Discussion

During the July 7, ICA working meeting it was agreed on that the IOUs would proceed with the determination of the appropriate PV curve. To do this, the IOUs plan to collaborate for three months to evaluate the available data sets. Subsequently, the IOUs plan to present to the ICA working group a proposed PV curve along with the underlying assumptions and data used to determine the proposed PV curve.

The ICA working group agreed that at minimum the following would be evaluated by the IOUs in their determination of the PV curve:

7. The data used should be cleaned of inaccurate data, such as verifying the zero values for periods where PV output is expected to be greater than zero
8. NREL PVWatts<sup>®</sup> Calculator should be evaluated to determine adequacy. (Note: Ultimately the ICA should not rely upon a third-party tool, as the ICA will be used in the interconnection process, and the interconnection process should not rely upon a third party tool. Instead, the PVWatts calculator can be used to develop a standard profile that will then be used in the ICA, independent of any further modifications (or potential discontinuation) of the PVWatts tool.)
9. The proposed PV profile should have adequate temporal details covering 12 months of PV performance.
10. The PV profile should be developed with the same nameplate PV modules as that of the inverter nameplate. Example: 100KW of PV modules connected to a 100KW inverter
11. The IOUs plan to evaluate the impact to PV-ICA when the DC power is oversized as compared to the inverter. For example: 120KW of PV modules connected to a 100KW inverter
12. IEEE 1547.1 is considering requiring inverter oversizing that would provide capacity that would increase ICA.
13. The IOUs plan to evaluate how tracking systems (PV with trackers) affect ICA

It was also agreed that IOU should provide the underlying data to the ICA working group at least one week prior to IOU presentation of the proposed PV profile

### Conclusion and Next Steps

- The IOUs are currently in the process of evaluating a standard PV profile as described above.
- The IOUs plan to review the proposed PV shape at the November WG meeting
- The IOUs will provide the detailed data prior to the WG meeting.

# Item 5: Smart Inverters

Joint IOUs' Initial Proposal  
ICA Working Group

## Summary of Recommendations

- The ICA WG concurred that the volt/var function with reactive priority should be incorporated into the ICA tool.
- The ICA WG had concurred that evaluating the impact of the volt/watt function in to ICA and particularly on impact to interconnected DER nameplate capacity
- The ICA WG concurred that there is need to evaluate the ramp rate and soft reconnect function and their impact to ICA
- The evaluation would then be used to determine automation tool requirements (Requirements on the CYME tool, Synergy Tools, etc.)
- The studies would include:
  - Evaluation of the Rule 21 volt/var function with reactive power priority, evaluation of the proposed Rule 21 volt/watt function and evaluation of the Rule 21 Soft Star with Ramp control function
  - Evaluation of the requirements for such as CYME and Synergy
  - Evaluation on a system wide implementation plan of ICA with Smart Inverters
- The ICA WG concurred that due to the timing of when Smart Inverter with reactive priority will be available on the market, the studies to be completed in Q2-2018 for a potential system wide implementation on Q4-2018 through Q2-2019

## Introduction and Background

In DRP Demonstration Project A, the IOUs performed a high level analysis utilizing the Smart Inverter reactive power functions. Due to the timeline associated with the completion of Demo A, the studies needed additional coordination in terms of methodologies and limitations. During the July and August ICA working group meetings, the various smart inverter function were discussed and consensus on which functions should be further evaluated for including into the ICA tool was reached.

## Discussion

In the August ICA working group meeting, the various smart inverter function were discussed and a concurrence was reached on which smart inverter function should be further investigated to determine their impact into ICA and determine how the ICA tools such Cyme and Synergy would need to be modified to allow automation of the Smart Inverter in the tools. **Table 1- Smart Inverter function** shows the function which the ICA working group concurred on for further investigation.

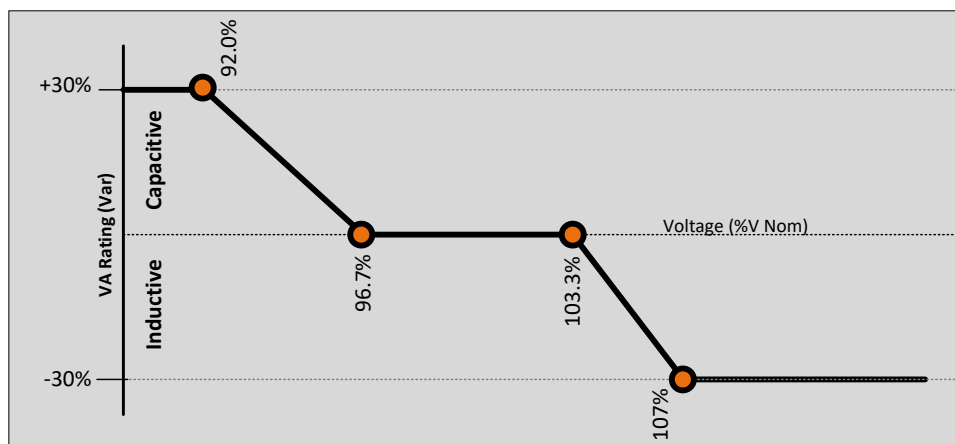
Function	Phase	Timing	Supports Higher ICA Values	Supports Higher Connected KW(KVA) Values	Comment	Limitations	Further Investigated
Anti-Islanding	I	Q4-2017	NO	NO	Safety Functions Requirement		NO
Low/High Voltage Ride-Through	I	Q4-2017	NO	NO	System Contribution		NO
Low/High Frequency Ride-Through	I	Q4-2017	NO	NO	System Contribution		NO
Dynamic Volt-Var Operations (Watt priority)	I	Q4-2017	Partially	Partially	Produces all real (KW) first and only reactive power if inverter has capacity remaining	Watt Priority Reduces Ability To Support Voltage Control	NO
Dynamic Volt-Var Operations (Reactive priority)	Extended Phase I	Q4-2018 - Q4 2019	Yes	Yes	Rule 21 does not require oversize. Reduction on real power when reactive power absorbed	Pending IEEE 1547.1 or CA stakeholders support to activity earlier in CA	YES
Ramp Rates Controls	I	Q4-2017	Evaluate	No	May support the flicker ICA limitation		YES
Fix Power Factor	I	Q4-2017	Yes	Yes	Rule 21 does not require oversize. Reduction on real power when reactive power absorbed	Deactivated, may conflict with voltage control	NO
Reconnect via soft start	I	Q4-2017	Evaluate	NO	May support the flicker ICA limitation		YES
Communication Capability	II	Q4-2018	NO	NO	Not intended to mitigate the violations which limit ICA	Capability Only - Not a requirement to apply	NO
Frequency Watt	III	Q4-2018	No	NO	System Contribution	Same as Volt/Watt	NO
Voltage/Watt	III	Q4-2018	NO	Yes	Will Reduce Real Power Production	Likely not available until Q3-2018. 12 months after approval of Phase III AL.	YES
Monitor Key Data	III	Q4-2018	No	NO	Information	Capability Only - Not a requirement to apply	NO
DER Cease-to Energy/Return to service	III	Q4-2019	NO	NO	Control	Pending IEEE 1545.1 Standard Development-Capability Only	NO
Limit Maximum Active Power Mode	III	Q4-2019	NO	NO	Not intended to mitigate the violations which limit ICA	Pending IEEE 1545.1 Standard Development-Capability Only	NO
Scheduling Power Values and Modes	III	Q4-2018	NO	NO	Scheduling Capabilities	Capability to Schedule Only	NO

**Table 1 – Smart Inverter Functions**

In its evaluation, the IOUs will baseline the analysis utilizing of each function utilizing the default settings being proposed as part of the CA Rule 21 Smart Inverter Working group. These function and their default settings are as follows:

### Volt-Var with reactive power priority

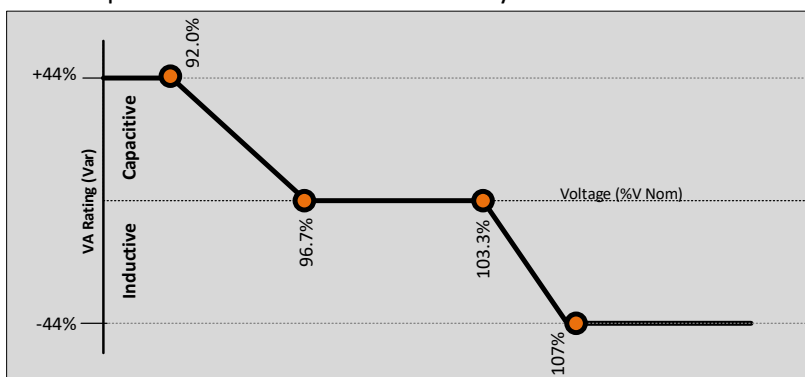
For the volt-var function with reactive priority evaluation, the curve depicted on **Figure 1- Rule 21 reactive power volt/var curve** will be used to baseline the impacts of the volt/var function to ICA values as well as to evaluate the impact to the reactive power flow and need of the distribution system.



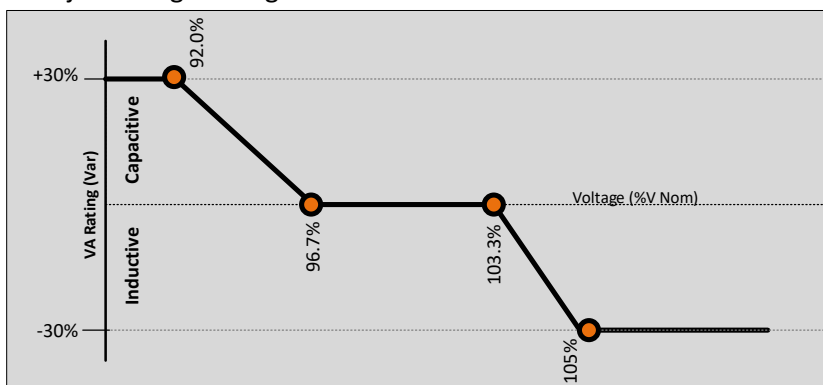
**Figure 1- Rule 21 reactive power volt/var curve**

Further evaluation will be conducted as follows:

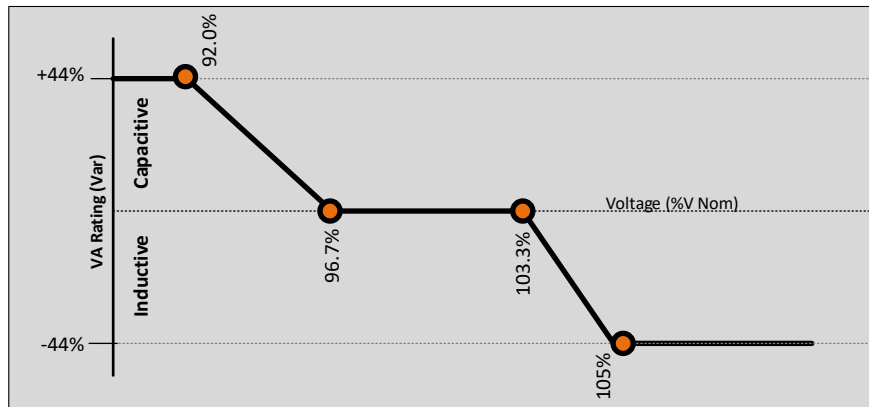
1. At 44% maximum reactive power as shown in the diagram below to evaluate the higher level of reactive power draw on the distribution system



2. At adjusted high voltage of 105% as shown below



- At 44% reactive power and 105% voltage as shown



The evaluation should be conducted on at minimum three feeders:

- Short feeder with high peak, medium and low recorded load
- Medium feeder with high peak, medium and low recorded load
- Long feeder with high peak, medium and low recorded load

### Volt-Watt Function

For the volt-watt function, the curve depicted on **Figure 2 – proposed Rule 21 volt/watt curve** will be used to baseline the impacts of the volt/watt function to ICA values

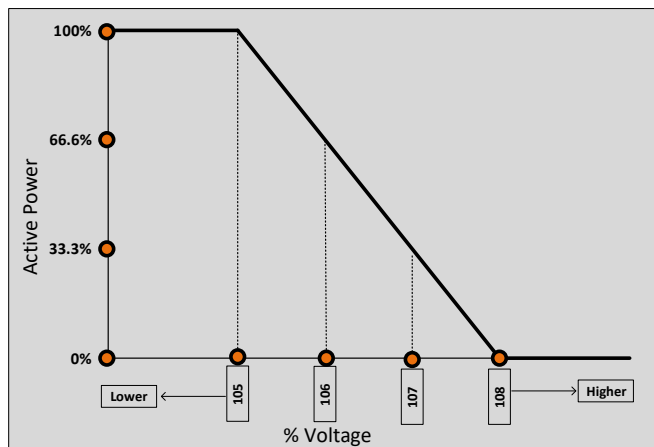


Figure 2- Proposed Rule 21 Volt/Watt Curve

The evaluation will be based on:

- Exclusively using only the volt/watt curve as shown in Figure 2
- Combination of the volt/var curve as shown on figure 1 and the volt/watt in figure 2.

The evaluation should be conducted on at minimum three feeders:

- Short feeder with high peak, medium and low recorded load
- Medium feeder with high peak, medium and low recorded load
- Long feeder with high peak, medium and low recorded load

## Ramp Rate and Soft Start Controls

For the **Soft Start with Ramp Control function**, the default settings on **Figure 3- Rule 21 Ramp Control Default Settings** will be used to baseline the impacts of these functions to ICA values.

Connect/Reconnect Ramp-up rate: Upon starting power into the grid, following a period of inactivity or a disconnection, the inverter shall be able to control its rate of increase of power from 1 to 100% maximum current per second. The default value is **2% of maximum current output per second**

**Figure 3- Rule 21 Ramp Control Default Settings**

The evaluation should be conducted on at minimum three feeders:

1. Short feeder with high peak, medium and low recorded load
2. Medium feeder with high peak, medium and low recorded load
3. Long feeder with high peak, medium and low recorded load

## Conclusion and Next Steps

The ICA working group concurred that these studies should be completed by end of Q2-2018 (6/30/2018) and should include:

- Report on the findings of the evaluation
- Tool implementation requirements
- System wide implementation plan. Depending on the findings of the study and the requirements for tool development, a system wide implementation for Smart Inverter function may be Q4-2018 to Q2-2019

# Item 5: Smart Inverters

Non-Utility Party Comments (CALSEIA, IREC, Clean Coalition) on Joint IOUs' Initial Proposal

ICA Working Group

August 29, 2017

## Summary of Recommendations

- The IOUs should not be conducting studies on potential changes to the Volt/Var curve in this proceeding.
- The initial system-wide rollout of ICA should incorporate the benefits of Volt/Var functionality with reactive power priority.
- The Volt/Watt function will support larger DER sizes without further studies.
- The Phase 3 scheduling function will support increased sizes of DERs.

## Background

SCE, on behalf of the IOUs, made a presentation at the August ICA Working Group meeting on the impacts of smart inverter functions on ICA. There was limited time for discussion during that meeting. The California Solar Energy Industries Association (CALSEIA), the Interstate Renewable Energy Council (IREC), and the Clean Coalition offer the following comments and recommendations in response to the IOU proposal.

## Discussion

The three smart inverter functions that are most important to consider in an interconnection context are Volt/Var, Volt/Watt, and Scheduling.

### **Volt/Var**

The Volt/Var function with active power priority will provide a large amount of voltage support, but the non-utility parties recognize that with active power priority it will be difficult for utilities to rely on that functionality when it is needed most. When the default setting of this function is changed to reactive power priority, it will increase hosting capacity.

Approximately 100,000 customers per year will install smart inverters throughout California IOU service territories. This will quickly become an asset that will have positive impacts on hosting capacity.

As part of Demo A, the utilities worked with Cyme and Synergi to begin building modules to incorporate smart inverter functionality into the ICA. At previous Working Group meetings, the utilities expressed that the vendors are willing to enhance that capability as needed and as feasible.

Rather than incorporating this functionality into the ICA calculation, the IOUs have proposed unnecessary studies. The IOUs propose to use the adopted Volt/Var curve as a baseline and measure the impacts of changes to the Volt/Var curve against the baseline. Such an exercise is out of place in this proceeding. The utilities and other stakeholders in the Smart Inverter Working Group (SIWG) have put a lot of work into developing the adopted Volt/Var curve. If the utilities want to revisit the outcome of that work, they should do so within the SIWG or in the new Rule 21 proceeding, R17-07-007.

The task in this proceeding is to produce numbers for the ICA. In Demo A, the utilities did not incorporate the benefits of Volt/Var with reactive power priority in the ICA. They should begin immediately to do so for the first system-wide rollout. The deadline for inverters to be set to reactive power priority is still not settled, but most or all parties agree that the requirement is coming in the near future. By the time the final report is submitted by this Working Group, the start date for reactive power priority will likely have been set.

The utilities will need to make assumptions for smart inverter penetration for purposes of ICA calculation. The non-utility parties recommend assuming the same number of monthly DER installations in 2018 and beyond as in 2016, dispersed according to the disaggregation methodology adopted this month in this proceeding.<sup>19</sup>

### **Scheduling**

With Phase 3 functions, customers will be able to interconnect systems that would exceed constraints in certain hours of the year if they guarantee that they will curtail production during those hours to avoid exceeding the constraints.

The advice letters that utilities recently issued for the technical standards of Phase 3 functions include the Scheduling function. Discussion of scheduling of inverter settings in the SIWG was mostly in the context of demand response. However, the same functionality that enables day-ahead settings changes for demand response purposes will enable seasonal scheduling for interconnection purposes.

Since scheduling is likely a few years out, any impacts of scheduling on modeling ICA do not have to be addressed immediately. Scheduling will give options to customers according to the current methodology for the ICA. The rules for scheduling changes to inverter settings in response to ICA limitations will be developed in R.17-07-017. In this proceeding, the Working Group report simply needs to acknowledge that it is a technically appropriate use of the ICA to schedule changes to inverter settings to alter the generating or load profile during certain periods of the year in order to avoid ICA constraints.

### **Volt/Watt**

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<sup>19</sup> “Assigned Commissioner’s Ruling on the Adoption of Distributed Energy Resources Growth Scenarios,” August 9, 2017.

The Joint Parties agree that the Volt/Watt function will not increase the ICA value but will allow interconnection of larger systems. The Volt/Watt curve proposed by the utilities in pending advice letters does not require a DER system to reduce production until voltage is above 106% of the nominal voltage. This is above the upper limit of the acceptable ANSI range, meaning that utilities should be managing the circuit in ways that ensure that level is only reached on very rare occasions. The Volt/Watt function may be employed on circuits that have unstable voltage despite the utilities' efforts to keep voltage within range, but that is not a scenario the utilities should plan for.

To the extent that DERs are assumed to provide a negative impact when the circuit segment is at or near 106% of the nominal voltage, that impact should not be applied for inverter-based DERs with Volt/Watt functionality. This will allow larger DERs to be allowed within the ICA values.

The utilities propose to study the impacts on ICA of having Volt/Var functionality in combination with Volt/Watt as compared to only having Volt/Watt. It is not clear to the non-utility parties why this is a useful analysis. The SIWG has accepted that both functions can work in tandem. The utilities should be including both functions for purpose of ICA calculation.

# Item 8: Comparative Assessment

Joint IOUs' Initial Proposal  
ICA Working Group

## Summary of Recommendations

- The IOUs invite stakeholder feedback on Demo A Comparison of IEEE 123 test feeder
- The IOUs recommend that a non-IOU analysis of IEEE 123 test feeder should be completed, including comparison to IOU results
- The above analysis and comparison can be used to indicate whether there are any major gaps or needed improvements for ICA implementation
- The WG Final Report should summarize non-IOU analysis comparison

## Introduction and Background

The May 23 2016 ACR required the IOUs conduct a comparative assessment on one or more representative California feeders. In Demo A, the IOUs used the IEEE 123 test feeder as a reference circuit to compare IOU Demo A results (using both the “streamlined” and “iterative” methodologies) and between power system analysis tools (PG&E and SCE use CYME software, while SDG&E uses Synergi software). It was concluded that ICA results do not show significant variation when tested across the IEEE 123 test feeder, with slight variations attributed to how power flow models are treated between CYME and Synergi. In the ICA WG Final Report, the WG recommended utilizing more representative California feeders as a long-term refinement issue, while considering prioritization of other long-term refinement studies, give potential costs and resource needs.

At the July 7 ICA WG meeting, Tom Russell (PG&E), on behalf of the joint utilities, presented a review of the results from Demo A on the comparison of the IEEE 123 feeder. The presentation explained how variations within modeling on the IEEE 123 feeder were the most significant factor in the discrepancies. Due to the inherent differences in models and tools, it was expected that the numbers would not be exactly identical across the IOUs. The IOUs did find good tracking of similar results. Because the analyses were converging on similar results, the IOUs concluded that the IOUs' respective ICAs are sufficiently consistent and accurate.

It was identified that Item 2 overlaps considerably with Group IV Items F and G, which cover validation and QA/QC of ICA results, respectively. It was also identified that there are additional EPRI test circuits that are more realistic, with geography more similar to urban and rural circuits in California. Given that these include a significantly larger number of nodes (1000-6000 vs. 123 nodes), the joint IOUs recommend the first step should be external validation by a non-IOU party on the IEEE 123 circuit, which should occur prior to a comparative assessment using more detailed EPRI test circuits. The joint IOUs only made one modification to the IEEE 123 test circuit to ensure operational flexibility and can supply the modified file for external validation.

## Discussion

The Working group discussed how, and with what tools, non-IOU parties may be able to perform this validation. While similar tool comparison would ensure consistency, there is question on if we need different tools to help validate as well.

One stakeholder representing DNV GL volunteered to help given that they are the developers of the Synergi tool used by SDG&E. They are currently performing validation on the ICA modules, and mention that this may be a good opportunity to compare notes and results with the ICA WG.

Overall there seemed to be consensus that third party validation was the next step to ensure non-IOU consistency.

## Conclusion and Next Steps

- Variations in IOU results differ mainly due to model assumptions and deviations versus hosting capacity method
- Align with items F and G from Group IV
- Get third party results on IEEE 123 test feeder to compare
- Tom Russell (PG&E) will follow up with potential third party volunteers to perform this external validation.
- The Group IV topic on validation/verification was originally scoped by LBNL/LLNL.