



IR Application Generator Facility Data Form Overview

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Senior Regional Transmission Engineer

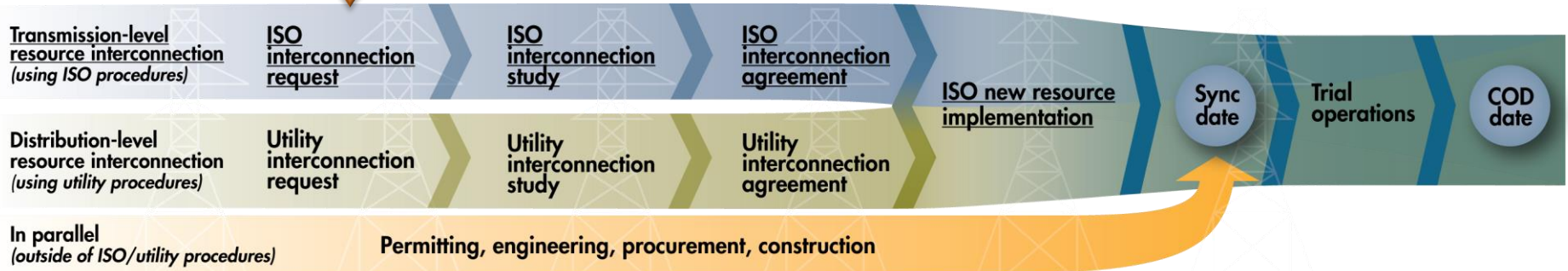
Resource Interconnection Fair
February 27, 2019

Objective – IR Application Generator Facility Data Form Overview

- Understand how to fill out the required documents for each Interconnection Application
 - Appendix 1, Interconnection Request (Word)
 - Same file as in previous years
 - Attachment A to Appendix 1, Generator Facility Data (Excel)
 - Minor updates to last year's version
- Have all documents completed and validated in time for the studies

Interconnection Process Map

You are here



Appendix 1 and Attachment A Instructions tab



Appendix 1 Interconnection Request INTERCONNECTION REQUEST

NO HARD COPY REQUIRED FOR INTERCONNECTION REQUESTS SUBMITTED ELECTRONICALLY VIA [RIMS 5](#)

Provide **one hard copy** of this completed form pursuant to Section 7 of this Appendix 1 below for non-electronic submissions.

- The undersigned Interconnection Customer submits this request to interconnect its Facility with the CAISO Controlled Grid pursuant to the CAISO Tariff (**check only one**):
 - Fast Track Process.
 - Independent Study Process.
 - Queue Cluster Process.
 - Annual Full Capacity Deliverability Option pursuant to GIDAP Section 9.2. (Required fields: 3, 4a Project name including Q#, 4e, 8, and 9 only.)
 - Deliverability from Non-Participating TOs pursuant to GIDAP Section 9.4.
 - A repowering request, Qualified Facility contract conversion, or other agreement to CAISO markets.
- This Interconnection Request is for (**check only one**):
 - A proposed new Generating Facility.
 - An increase in the generating capacity, repowering, or a Material Modification to an existing Generating Facility.
- Requested Deliverability Status is for (**check only one**):
 - Full Capacity (For Independent Study Process and Queue Cluster Process only)

- Attachment A Instructions tab must match Appendix 1
- Guidelines and directions provided in Instructions tab

Attachment A, Generating Facility Data to GIDAP Appendix 1 Interconnection Request	
GENERATING FACILITY DATA	
CAISO Public Document Version: FINAL Last Updated: March 15, 2018	
Project Information Completed by Interconnection Customer (Must match Appendix 1)	
Project Name	
Q# (if assigned)	
Interconnection Customer Name	
Interconnection Customer Contact	
Requested Point of Interconnection (POI)	
Table of Contents	Descriptions
Instructions	Project Specific Information (above) & Guidelines for this document
I. Project Configuration	Project Data Input
II. Technical Validation	Validation Calcs based on Project Data input on Tab I.
III. Power Flow (.epc)	Power Flow Model Data Input
IV. Dynamic Model (.dyd)	Dynamic Model Data Input
V. IR Validation & Comments	IR Review and Validation questions and verifications
Color Codes:	
Green Cells: Choose input from options	
White Cells: Enter input data/notes - default values may be pre-populated and can be changed	
Orange Cells: Predetermined/populated Cells - Can be changed	
Yellow Cells: Headers / Titles - DO NOT CHANGE	
Gray Cells: Calculations or intentionally blank - DO NOT CHANGE	
Instructions I. Project Configuration II. Technical Validation III. Power Flow Model IV. Dynamic Model	

Attachment A Project Configuration tab

- Project data and information
- Fill in Section I, II and all other applicable sections consistent with Appendix 1

Item #	UNITS	I. Overall Project MW Information										
0												
1.1	Total Generating Facility gross capacity	MVA	0	<i>The gross MW output to achieve requested MW at POI</i> <i>Include all transformer and line losses between the generating units and the POI at total Generating Facility gross output as calculated by the power flow model in .epc file</i> <i>must match MW value derived from power flow model in .epc file</i>								
1.2	Total Generating Facility gross output	MW										
1.3	Generating Facility Auxiliary Load	MW										
1.4	Project net capacity at Generating Facility	MW	0									
1.5	Anticipated Losses between the Generating Facility and POI	MW										
1.6	Desired net output at POI	MW	0									
1.7	Standby Load when Generating Facility is off-line	MW										
1.8	For combined cycle plants, specify the plant net output capacity for an outage of the steam turbine or an outage of a single combustion turbine	MW										
II. Individual Generating Facility Characteristics												
II.1	Generating Facility Name		Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8	Unit 9	
II.2	Technology											
II.3	Type											
II.4	Manufacturer											
II.5	Model Name											
II.6	Model Number											
II.7	Version (if applicable)											
II.8	Year Manufactured											
II.9	Number of Individual Generators or Inverters											
II.10	Nominal Terminal Voltage	kV										
II.11	Individual generator rated MVA	MVA										
II.12	Individual generator rated MW	MW										
II.13	Individual generator power factor at rated MW											
II.14	Individual generator power factor regulation range at rated MW output	Leading (-)										
II.15		Lagging (+)										
II.16	Generator Voltage Regulation Range (+/-)	%										
II.17	Phase											
II.18	Connection											
II.19	ACTION REQUIRED: Please submit generator reactive capability curves											
Click here to Prepare Data Sections below Required for Each Generator in Section II												
Show All Sections Below												

Attachment A Power Flow and Dynamic Model tabs

- Powerflow and dynamic data input and output
- Tools to help create *.epc and *.dyd files (use of tool is optional)
- May not fit all project configurations and must be tested before submission

The screenshot displays a software interface with three main components:

- Project Connectivity Spreadsheet (Top Left):** A table with columns for Bus Name, Bus Voltage, and Bus No. It lists various buses including Point of Interconnection, High/Low Sides of GSU, Feeder 1-5, EQ Gen 1-5, and For three winding transformers (Tertiary, Internal, and Internal Bus).
- Sample One-Line Diagram (Top Center):** A schematic diagram showing the ISO Point of Interconnection (Bus 1) connected to Bus 2, which is further connected to Bus 3...5 and Bus 6...10. It includes components like Generator, Main GSU, Collector Lines, Pad-mount, and IC's Interconnection Facilities.
- Generator Model Table (Bottom Right):** A detailed table for defining generator models. It includes columns for Model Name, Comment, and various parameters such as mva, lvp1sw, lvp1, vfmmax, lvpnt1, lvpnt0, lqmin, accel, lg, lfttr, lqrmx, lqrmn, ae, and socini. A 'Disclaimer' section notes that the tool helps create an initial draft but does not test all models, and that models not supported by the tool must be created without using it. A 'Guideline for Electrical Control Model' section provides instructions on when to use 'reec_a' or 'reec_b' models based on solar inverter settings.

At the bottom of the interface, there are navigation tabs: Instructions, I. Project Configuration, II. Technical Validation, III. Power Flow Model, IV. Dynamic Model, and V. IR Validation & Comments.

Attachment A IR Validation & Comments tab

- Interconnection Customer to confirm prior to IR submission – make a selection in all question boxes in Column A
- ISO & PTO to confirm during IR validation process

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	
1	0																		
2	Customer Confirmation & Validation Checklist									Comment & Validation Tracking									
3	<p>The following section is intended for:</p> <p>1) the Interconnection Customer to review and ensure all items are included and tasks are complete prior to submitting this form for IR validation.</p> <p>2) the CAISO and PTO to review the data and attachments for completeness and sufficient to consider the IR valid.</p>									<p>The following section is intended to identify and track comments and recommendations to and from the parties involved in the IR Validation process.</p> <p>DO NOT DELETE OR CHANGE PREVIOUS COMMENTS.</p>									
7	Customer Confirmation			Objective is All Answers = Yes or N/A			CAISO & PTO Review			Version Control:									
8										Date:			Reviewed By:			Comment:			
9	Supporting Document Submittal Confirmation (see Instructions & I. Project Configuration Tabs for further details)																		
11	Choose	Project One-line Drawing							Choose										
12	Choose	Site Drawing showing POI AND Site Map with aerial imagery							Choose										
13	Choose	kmz File (Google Earth)							Choose										
14	Choose	Manufacturer supporting data sheets provided for the generators/inverters							Choose										
15	Choose	Manufacturer supporting data provided for SCD characteristics							Choose										
16	Choose	Section II. Generator reactive capability curves							Choose										
17	Choose	Section III. (A.) Plot of generator terminal voltage versus field current							Choose										
18	Choose	Section III. (B.) Copy of the block diagram of the excitation system from its instruction manual							Choose										
19	Choose	Section III. (C.) Copy of a block diagram of the PSS from the PSS Instruction Manual and the correspondence between dial settings and the time constants or PSS gain							Choose										
20	Choose	Section X. A Tower Configuration Diagram							Choose										
22	Choose	Power Flow Model in .epc format							Choose										
23	Choose	PSLF plot showing MW injection at Point of Interconnection							Choose										
24	Choose	Dynamic Model in .dyd format							Choose										
25	Choose	PSLF plot showing flat Pg and Qg for 10 seconds no-disturbance dynamic simulation							Choose										
26	Attachment A, Consistency with Appendix 1 Data input, and Non-Technical Validation																		
28	Choose	Is Appendix 1 properly filled out? Boxes checked, data consistent with technical data in this form?															Choose		
29	Insert Notes Here:																		
30																			
31																			
32	Choose	Is the POI an existing (or planned) PTO facility under CAISO control?															Choose		
33	Insert Notes Here:																		
34																			
35																			
36	Choose	Do the GPS coordinates in Appendix 1 match the Site Map?															Choose		
	Date:			mm/dd/yyyy			Commenter Name:			Representing:			Choose One						
	Date:			mm/dd/yyyy			Commenter Name:			Representing:			Choose One						



Studies & Study Results

Abhishek Singh
Lead Regional Transmission Engineer

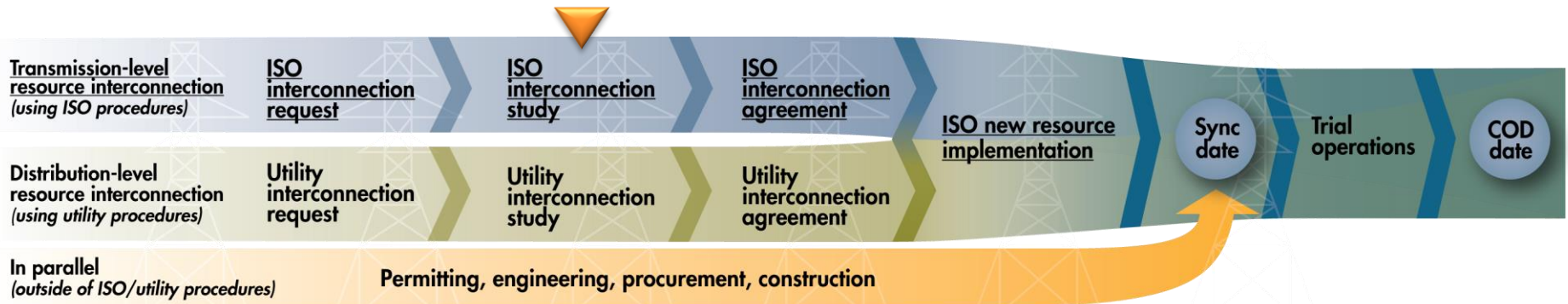
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Objective – Studies, Study Results

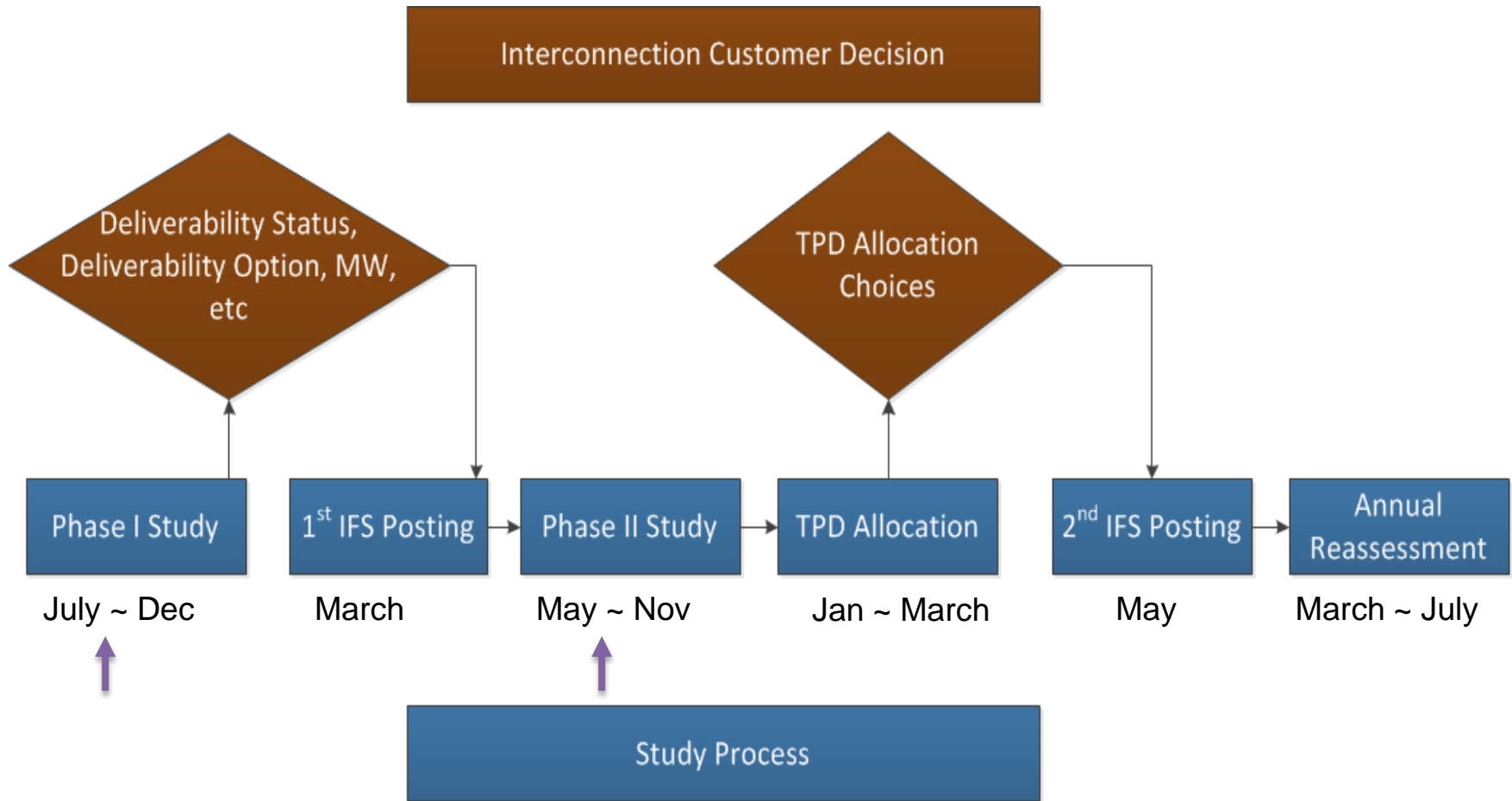
- Understand the study processes and study results
- Understand requirements for posting financial security associated with your project

Interconnection Process Map

You are here



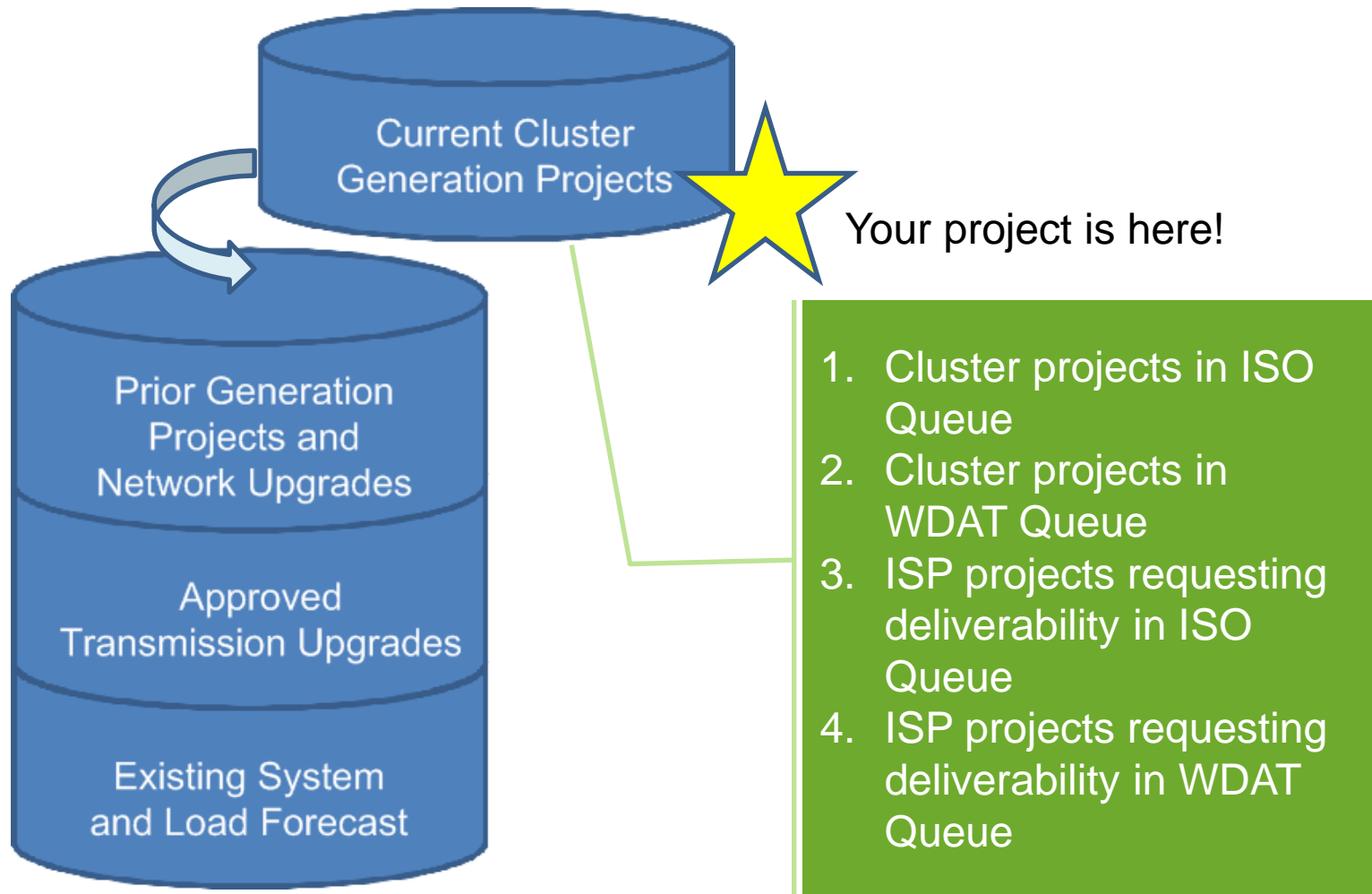
Generation Interconnection Study Process-General Timeline



Acronyms:
IFS - Interconnection Financial Security
TPD - Transmission Plan Deliverability

Phase I and Phase II Studies – Model Development

Study Assumptions



Phase I and Phase II Studies

Studies are performed based on applicable ISO Tariff and in coordination with the applicable PTOs

- Deliverability Assessment
 - Generating Mode
 - On Peak
 - Off-Peak (Information Only)
- Reliability Assessment
 - Generating Mode (Simultaneous maximum generation)
 - On Peak
 - Off-Peak
 - Charging Mode (Simultaneous max charging)
 - Peak, Off-Peak
 - Partial Peak

Additional Phase II Operational Study

Current Cluster date-based transmission assessment is performed.

- Year by year peak deliverability assessments
- Year by year reliability assessments
- One study model per study year
- Transmission upgrades are modeled according to their in-service dates
- Generation projects are modeled according to their commercial operation dates

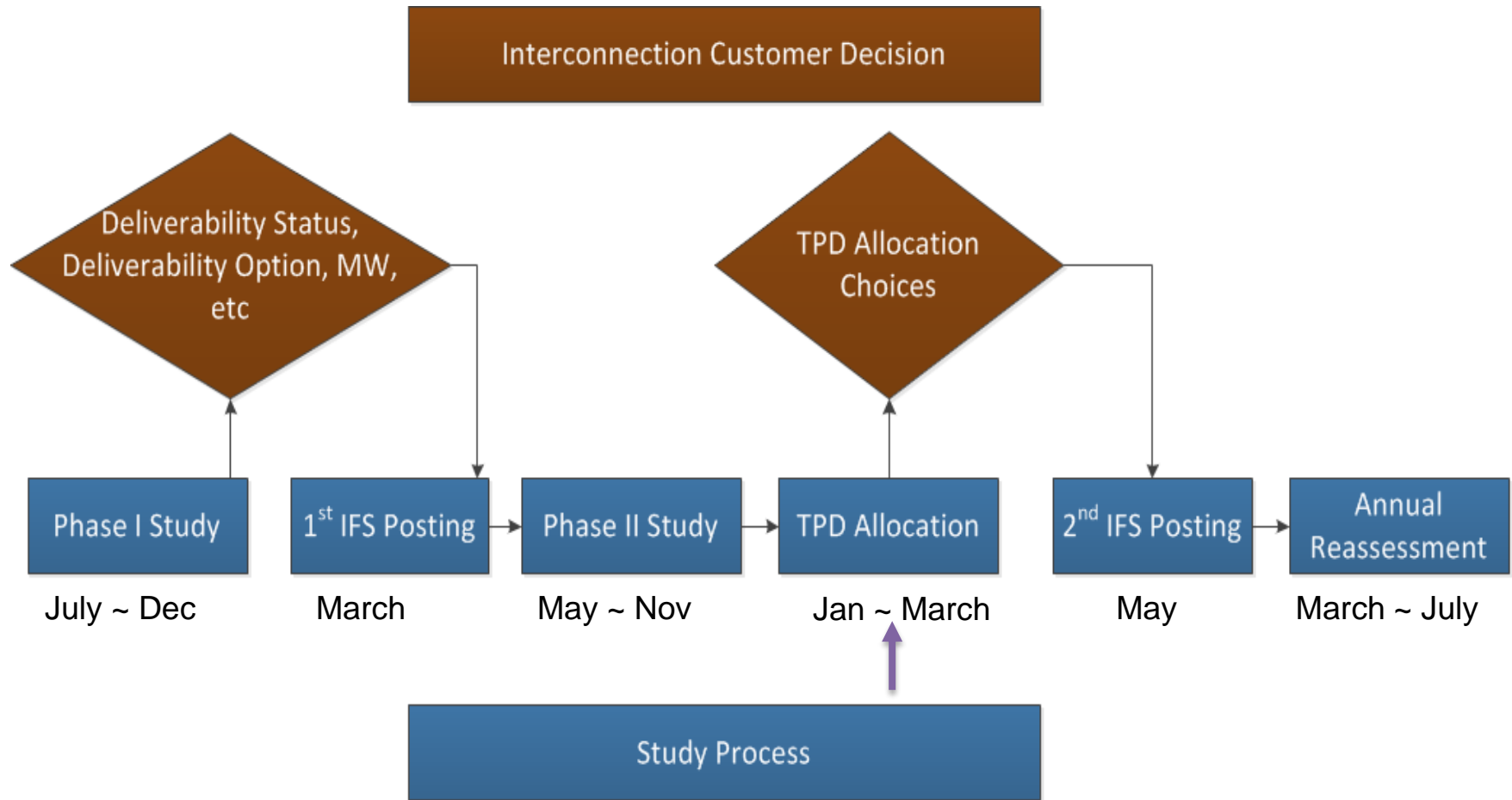
Phase I and Phase II Studies – what to expect out of the studies

- Facilities required to interconnect the project
 - Some are PTO's Interconnection Facilities (IF)
 - Some are Reliability Network Upgrades (RNU)
- Upgrades required to mitigate adverse impacts and deliver power to the grid
 - Reliability Network Upgrades (RNU)
 - Local Delivery Network Upgrades (LDNU)
 - Area Delivery Network Upgrades (ADNU)
- Estimated costs and construction time for IFs and NUs
- Potential Affected System impacts and coordination

Affected Systems

- The ISO does not comprehensively study the impacts on Affected Systems
- The Interconnection Customer shall:
 - cooperate with the ISO in all matters related to the Affected System studies,
 - enter into a study agreement with the Identified Affected System Operator to evaluate potential impacts on the Identified Affected System, and
 - pay for necessary studies and any upgrades necessary to mitigate the impacts of the interconnection on the Identified Affected Systems

Generation Interconnection Study Process-TPD Process and Timeline



Acronyms:
IFS - Interconnection Financial Security
TPD - Transmission Plan Deliverability

Transmission Plan Deliverability (TPD)

- Renewable portfolios are developed by the CPUC and then adopted by the ISO Transmission Planning Process (TPP)
- ISO TPP approves new transmission upgrades to meet reliability, economic planning and policy needs
- The transmission system with the TPP approved transmission upgrades provides capability to support certain level of generation deliverability across one or more renewable zones, which is called Transmission Plan Deliverability (TPD)
- Specific TPD is calculated for each electrical area with a known area deliverability constraint

How does TPD Affect Generation Interconnection

- In some electrical areas, the generation in the interconnection queue exceeds the corresponding TPD
- To increase TPD, Area Delivery Network Upgrades (ADNUs) would be needed
- ADNUs are typically expensive and require long lead times for permitting and construction
- Interconnection Customers (IC) are given a choice between the two deliverability options:
 - Option (A) projects do not fund any ADNUs and rely on TPD allocation
 - Option (B) projects are willing to fund ADNUs without reimbursement if they don't receive TPD allocation

More on Deliverability Options

- Deliverability Status: Full Capacity (FC), Partial Capacity (PC) or Energy-Only (EO)
- If the project requests EO, the deliverability option is not applicable
- If the project requests FC or PC, the project must select Option (A) or Option (B) after the Phase I but prior to the Phase II studies
- To move forward into Phase II, Option (A) project posts for IF and $NU=(RNU + LDNU)$; Option (B) posts for IF and $NU=(RNU+LDNU+ADNU)$
- After Phase II, both Option (A) and Option (B) are subject to TPD allocation

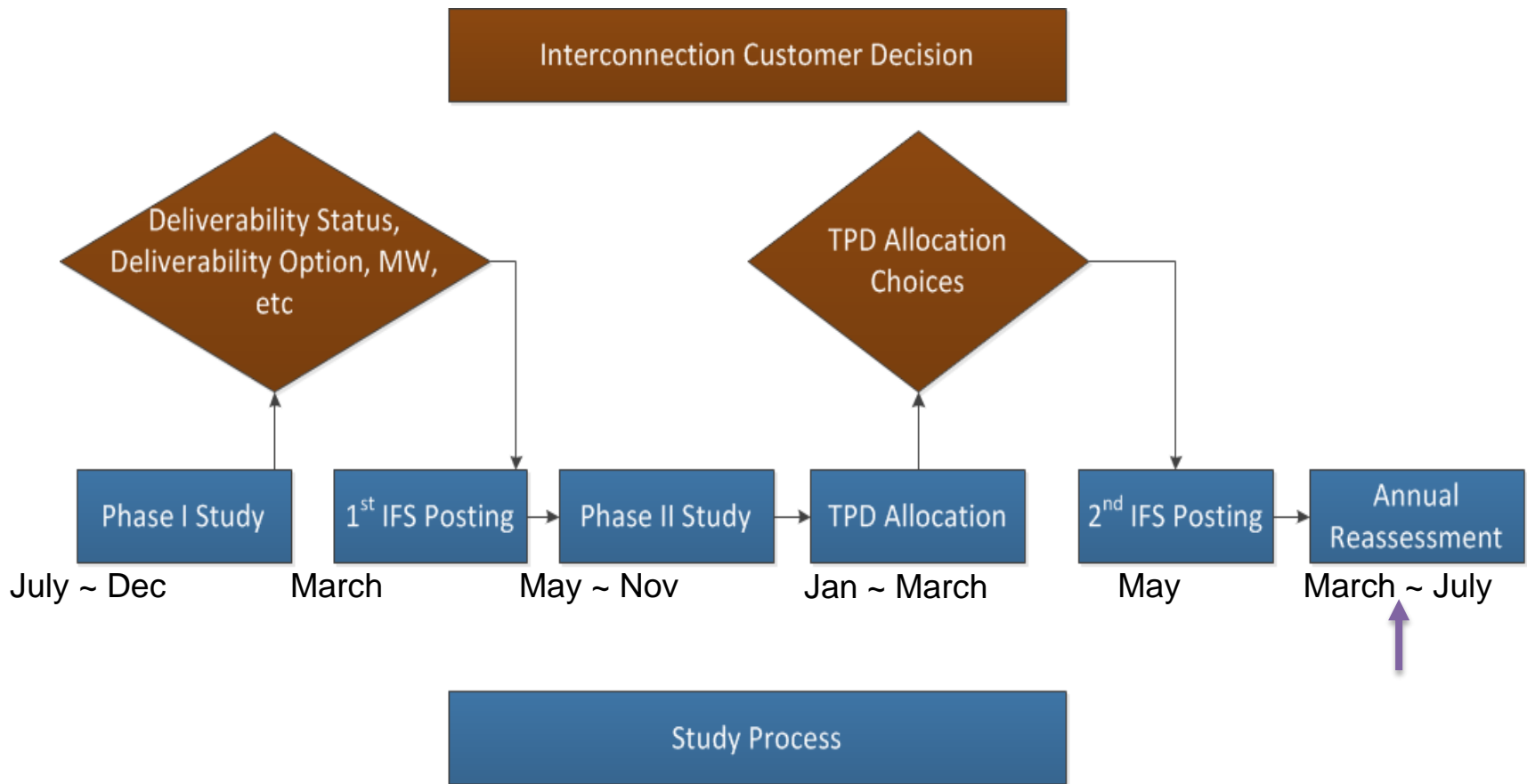
TPD Allocation

- All projects must meet the eligibility criteria to receive TPD allocation
- In an electrical area **without binding area constraints**, all eligible projects receive TPD allocation
- In an electrical area **with binding area constraints**
 - TPD is first reserved for prior commitments;
 - TPD is then allocated to current generation projects in the electrical area based on ranking scores reflecting the project development status in the submitted affidavits
- Option (A) and Option (B) projects get the same treatment in the TPD allocation study

TPD Allocation (Cont.)

- If a project does not receive full allocation for its requested deliverability status
 - Option (A) projects may park the entire or a portion of the project and get a second chance of TPD allocation
 - Both Option (A) and Option (B) projects may change the project size or deliverability status to match the allocation
- Cost responsibility
 - Option (A) and Option (B) projects **with** allocation are responsible for: IF and $NU=(RNU+LDNU)$ costs
 - Option (B) projects **without** allocation are responsible for: IF and $NU=(RNU+LDNU+ADNU)$ costs

Generation Interconnection Study Process- Reassessment Study and Timeline



Acronyms:
IFS - Interconnection Financial Security
TPD – Transmission Plan Deliverability

Annual Reassessment

- The Network Upgrade requirements could change after the Phase II study due to:
 - Generation project withdrawals
 - Generation project downsizing
 - Generation project modifications allowed by the tariff
 - System condition changes, such as newly approved transmission upgrades, resource retirement, etc.
- An annual re-assessment is performed to update the Network Upgrade requirements and cost responsibility



Project Cost Responsibility

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Resource Interconnection Fair

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For Cluster 10 and prior

COST RESPONSIBILITY AND MAX COST RESPONSIBILITY

Cost Re-allocation in the Annual Reassessment

- NU cost re-allocation (CR)
 - If an NU is no longer needed for all projects in the reassessment, the cost is removed
 - If an NU or its alternative is needed, the cost is allocated to the remaining projects in the original responsible group *pro rata* on the Phase II cost allocation factors
- Maximum (RNU + LDNU) cost responsibility (MCR)
 - Original MCR: lower between Phase I and Phase II
 - Current MCR: maximum RNU and LDNU cost responsibility effective until the reassessment is issued
 - Updated MCR: maximum RNU and LDNU cost responsibility updated in the reassessment and effective once the reassessment is issued

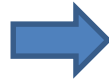
Final Costs in the Annual Reassessment

- Updated maximum (RNU+LDNU) cost responsibility
 - If (CR) is at least 20% lower and at least \$1M lower than the current MCR,
updated MCR = $\min\{\text{current MCR}, \text{sum of 100\% costs of all remaining (RNU + LDNU)}\}$
 - If $\{(CR) > \text{current MCR}\}$ and $\{\text{current MCR} < \text{original MCR}\}$,
updated MCR = $\min\{(CR), \text{original MCR}\}$
 - Otherwise, ***updated MCR*** = current MCR
- ***Current cost responsibility (CCR)*** = $\min\{(CR), (\text{Updated MCR})\}$

MCR and CCR in the Annual Reassessment -Example

Original MCR-Project A

- **LDNU Total Cost = \$30M**
- LDNU= \$15M(50% Allocation)
- RNU=\$10M (100% Allocation)
- **Original MCR & Current MCR = \$25M**
- **CCR = \$25M**



Updated MCR- Lower Total CR

- **LDNU Total Cost = \$5 M**
- LDNU= \$2.5 M(50% Allocation)
- RNU=\$10M (100% Allocation)
- CR (\$12.5M) < Current (\$25) and Original (\$25) MCR
- **Updated MCR I = $\min\{\$25, \$15\} = \$15M$**
- **CCR = \$12.5M**



Updated MCR- Higher Total CR

- **LDNU Total Cost = \$40 M**
- LDNU= \$20M(50% Allocation)
- RNU=\$10M (100% Allocation)
- CR (\$30 M) > Current (\$15M) & Original MCR (\$25M)
- **Updated MCR II = $\min\{\$25, \$50\} = \$25 M$**
- **CCR = $\min\{\$25M, \$30M\} = \$25M$**

For Cluster 11 and beyond, pending FERC approval

PROPOSED COST RESPONSIBILITY AND MAX COST RESPONSIBILITY

Network Upgrade Definitions

Proposed Definitions:

- **Assigned Network Upgrade (ANU)**
RNUs and LDNUs for which the Interconnection Customer has a direct cost responsibility.
- **Conditionally Assigned Network Upgrade (CANU)**
RNUs and LDNUs whose cost responsibility is assigned to an earlier Interconnection Customer, but which may fall to the then current Interconnection Customer.
- **Interconnection Service Reliability Network Upgrade (ISRNU)**
RNUs at the POI to accomplish the physical interconnection of the generator to the CAISO Controlled Grid. CANUs can be identified as ISRNUs.
- **Precursor Network Upgrade (PNU)**
Network Upgrades required for an Interconnection Customer that consist of (1) Network Upgrades whose cost responsibility is assigned to an earlier Interconnection Customer that has executed its GIA; and (2) Network Upgrades in the approved CAISO Transmission Plan.

Cost Responsibility Definitions

Proposed Definitions:

- **Current Cost Responsibility (CCR)**

The sum of the Interconnection Customer's (1) current allocated costs for ANUs, and (2) allocated ISRNUs, not to exceed the MCR. This cost is used to calculate the Interconnection Customer's IFS requirement.

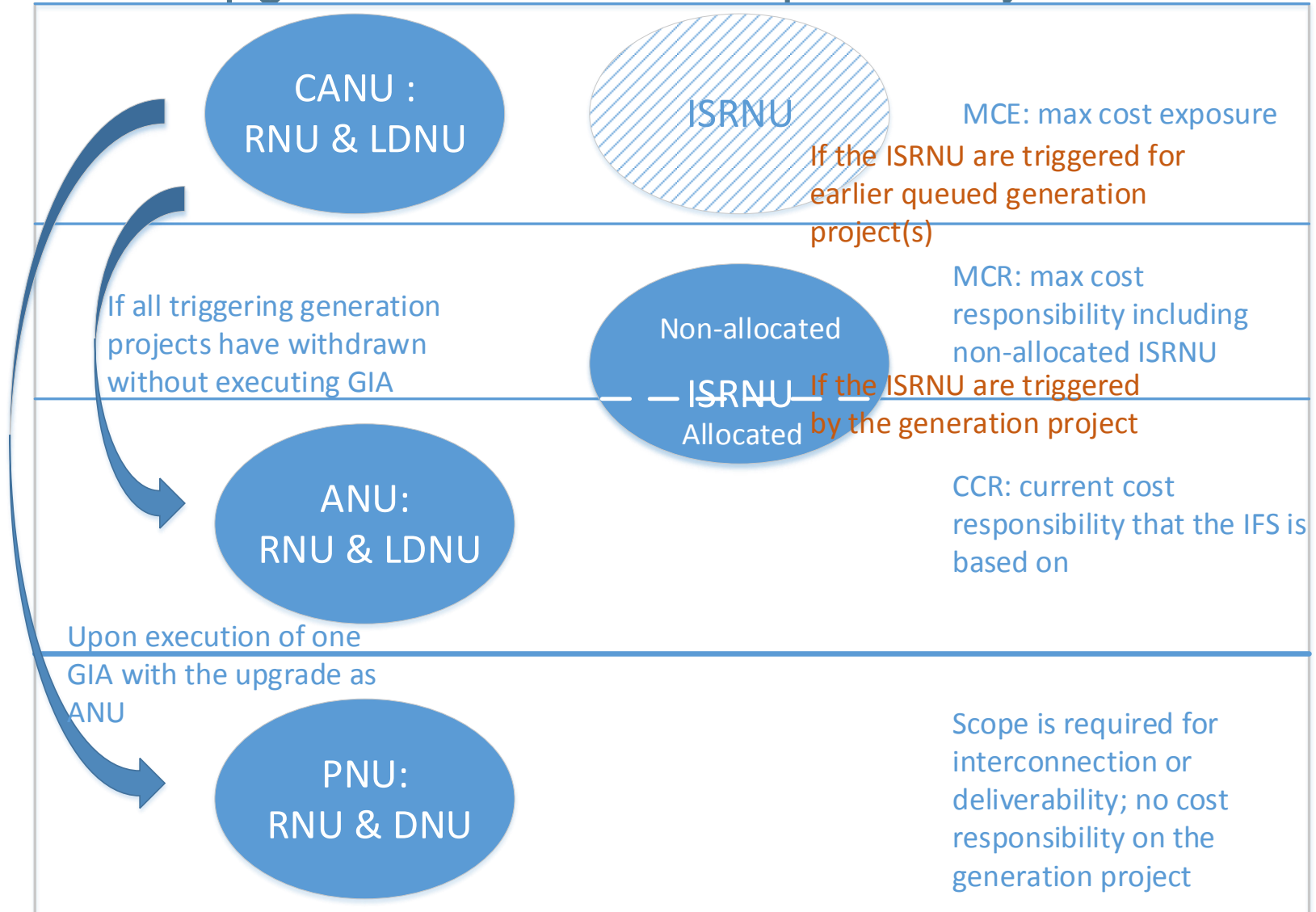
- **Maximum Cost Responsibility (MCR)**

The lower sum of an Interconnection Customer's (1) ANU costs, plus (2) 100% of ISRNUs costs, from its Phase I or Phase II Interconnection Studies, which may be adjusted if a subsequent reassessment converts CANUs to ANUs.

- **Maximum Cost Exposure (MCE)**

The sum of (1) the Interconnection Customer's MCR and (2) the sum of the Interconnection Customer's CANUs from its Phase I or Phase II Interconnection Studies.

Network Upgrades and Cost Responsibility



Cost Allocation

- RNU and LDNU as ANU in Phase I and Phase II
 - Short circuit duty (SCD) mitigation RNU: allocated by SCD contribution
 - Other RNU: allocated by MW at POI
 - LDNU: allocated by flow impacts
- RNU and LDNU as ANU in reassessment
 - If new upgrades are identified for the first time, allocate cost the same as Phase I and Phase II
 - Otherwise, re-allocate among remaining active projects by normalizing Phase II cost shares

Cost Allocation (cont'd)

- ISRNU as ANU in Phase I, Phase II and reassessment
 - Allocated portion: allocated equally among active projects in the same cluster utilizing the facilities
 - Non-allocated portion: full cost minus allocated portion
- ISRNU as CANU in Phase I, Phase II and reassessment
 - Full cost

Cost Allocation (cont'd)

- RNU and LDNU as CANU in Phase I and Phase II
 - same as ANU Phase I and Phase II allocation
- RNU and LDNU as CANU in reassessment
 - No re-allocation after Phase II, i.e. fixed at Phase II allocation in reassessment if still needed

CCR, MCR and MCE at Phase I

- Upon completion of Phase I study
 - $CCR = \text{allocated ANU} + \text{allocated ISRNU}$
 - $MCR = \text{allocated ANU} + \text{full cost of ISRNU}$
 $= CCR + \text{non-allocated ISRNU}$
 - $MCE = MCR + \text{CANU allocation}$

CCR, MCR and MCE at Phase II

- Upon completion of Phase II study
 - $CCR = \text{lower between (Phase I ANU allocation, Phase II ANU allocation)} + \text{allocated ISRNU}$
 - $MCR = CCR + \text{non-allocated ISRNU}$
 - $MCE = MCR + \text{CANU allocation}$
- * Allocated ISRNU and CANU allocation could be higher in Phase II than Phase I

CCR, MCR and MCE in Reassessment

- If a CANU becomes ANU, MCR increases by the Phase II allocated CANU cost.
- If a CANU is no longer needed or becomes PNU, MCE is reduced by the Phase II allocated CANU cost.
- If all projects in the same cluster triggering an ISRNU as ANU execute the GIA, the non-allocated ISRNU cost is removed from MCR.
- $CCR = \min\{\text{allocated ANU} + \text{allocated ISRNU}, \text{updated MCR}\}$

STUDY REPORTS

Phase I and Phase II Study Reports and Addenda

- During the life-cycle of interconnection process, an IC will receive various project reports from the ISO
 - Final Phase I and Phase II study reports
 - Addendum to Phase I and/or Phase II report
 - Correction to non-substantial errors or omissions
 - Remove cost responsibility after an assigned NU is approved in TPP
 - Does not change the next IFS posting due date
 - Revised Phase I and/or Phase II reports
 - Correction to substantial errors or omissions
 - May change the next IFS posting due date

Post-Phase II Notification and Updates

- During the life cycle of interconnection process, an IC will also receive from the ISO:
 - Notification of TPD allocation results
 - Information about the TPD allocation results
 - Annual reassessment reports
 - Updated NU requirements and cost responsibility

Resources

- Deliverability assessment methodology
<http://www.caiso.com/Documents/PLANNING/Reliability%20requirements/Deliverability/Deliverability%20assessment%20methodologies>
- TPP and TPD
<http://www.caiso.com/planning/Pages/TransmissionPlanning/Default.aspx>
- Study plans, data and reports
<https://portal.caiso.com/tp/Pages/default.aspx>
(This is a secure website that requires signed NDA with the ISO and certificate)

Resources

- Instruction to Transmission Plan Data NDA submission
<http://www.caiso.com/Documents/RegionalTransmissionNonDisclosureAgreementSubmissionInstructions.pdf>
- Regional Transmission NDA Form
<http://www.caiso.com/Documents/RegionalTransmissionNDA.pdf>

Questions?

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