Transmission Planning at the California ISO & Overview of Generation-related Transmission

Governor's Committee on Energy Choice

Technical Working Group on Generation, Transmission and Delivery

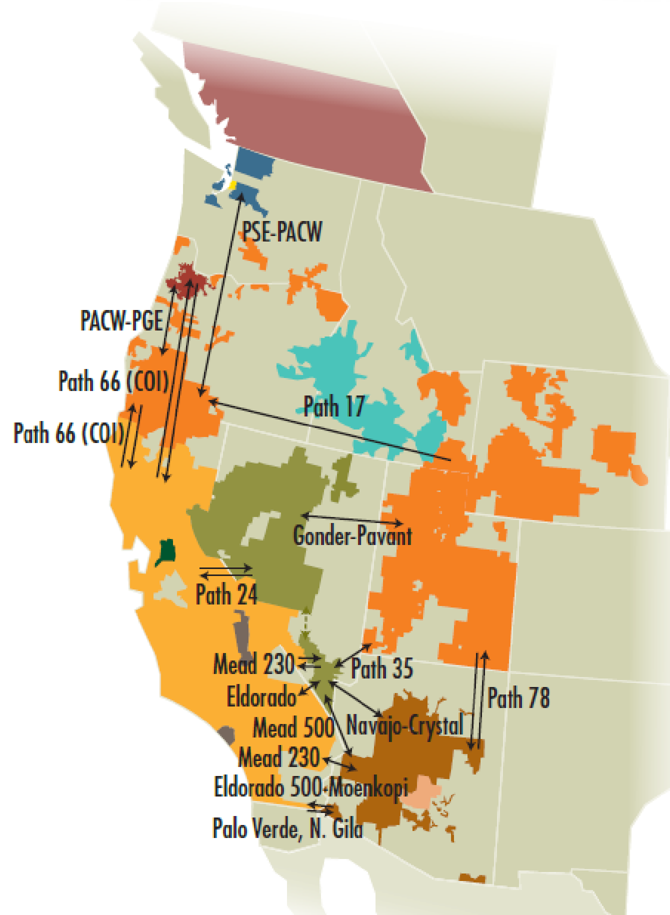
Phil Pettingill, Director, Regional Integration

January 12, 2018

Key Topics

1. Transmission under ISO operational control
2. Planning process and approvals
3. Generation Interconnection Process
4. ISO studies to support State Resource Adequacy
5. Revenue recovery through the Transmission Access Charge (TAC)

ISO is well integrated in the west, with significant transfer to and from Nevada



Path	Estimated Max Capacity (MW)*
Path 24 *(west to east)*	100
Path 24 *(east to west)*	35-90
Eldorado	797
Path 35 *(west to east)*	580
Path 35 *(east to west)*	538
Gonder-Pavant	130
PACW to PGE	320
Path 66 *(ISO to PGE)*	627
Path 66 *(PGE to ISO)*	296
Path 66 *(ISO to PACW)*	331
Path 66 *(PACW to ISO)*	432
Path 17	400
PSE to PACW	300
Eldorado 500-Moenkopi	732
Palo Verde, N. Gila	3,151
Path 78 *(PACE to APS)*	625
Path 78 *(APS to PACE)*	660
Navajo-Crystal	522
Mead 500	349
Mead 230 *(APS <–> ISO)*	236
Mead 230 *(ISO to NVE)*	3,443
Mead 230 *(NVE to ISO)*	3,476

← one direction ↔ bi-directional

- California ISO
- PacifiCorp
- NV Energy
- Arizona Public Service
- Portland General Electric
- Puget Sound Energy
- Idaho Power Company *(planned entry 2018)*
- Powerex *(planned entry 2018)*
- Seattle City Light *(planned entry 2020)*
- BANC/SMUD *(planned entry 2019)*
- Los Angeles Dept. of Water & Power *(planned entry 2019)*
- Salt River Project *(planned entry 2020)*

**Current as of December 2017*

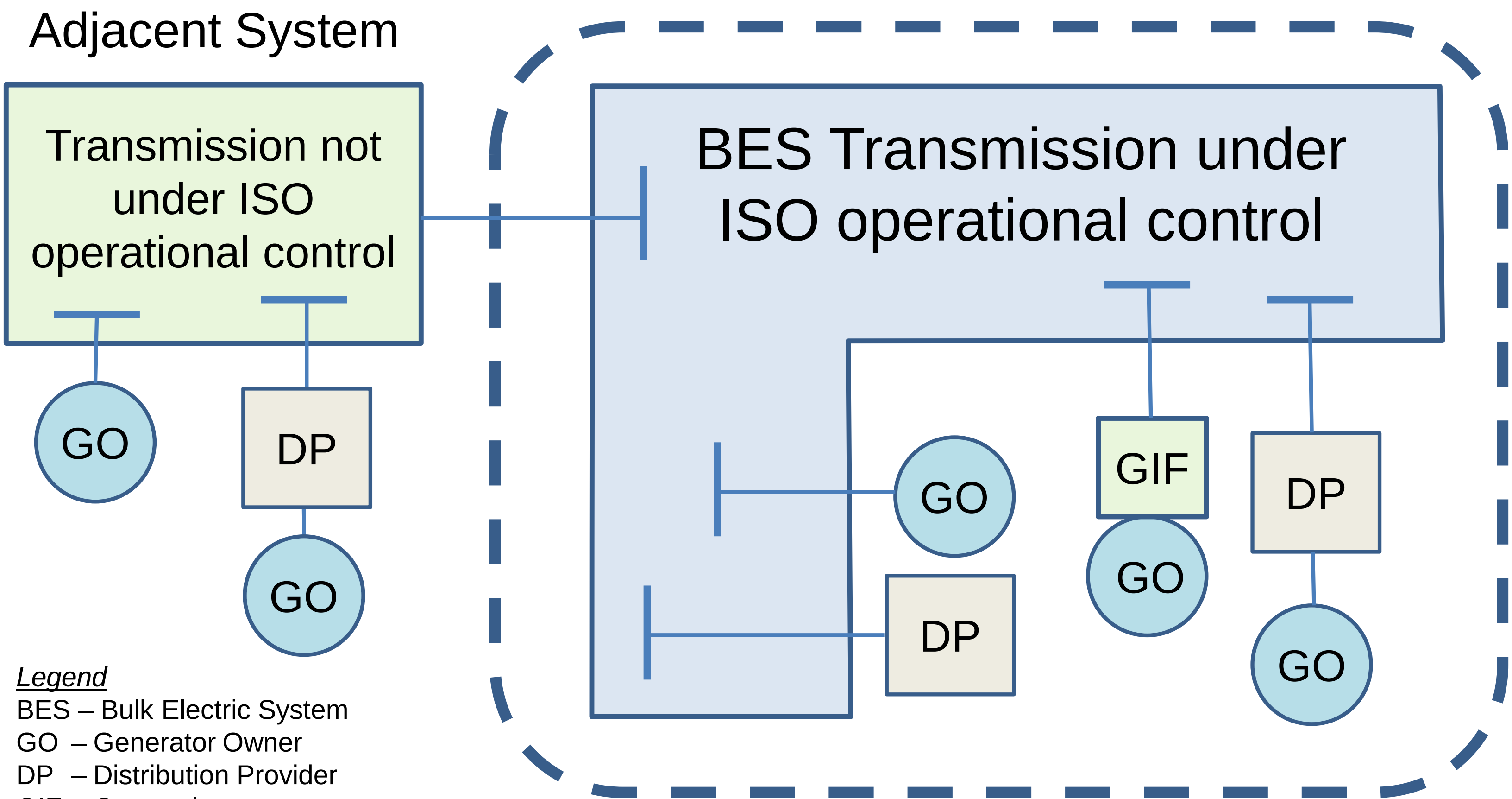
Transmission facilities under ISO operational control

Transmission under ISO operational control

FERC has defined what is generally NOT considered transmission

- Radial lines connecting generation facilities
- Distribution facilities defined by FERC functional test
  - Normally in close proximity to retail customers
  - Primarily radial in character
  - Power flows into and rarely, if ever, flows out
  - Power enters and is not reconsigned or transported to some other market
  - Power is consumed in a comparatively restricted geographical area
  - Meters at the transmission/distribution interface measure flows into the local distribution system
  - Will be of reduced voltage

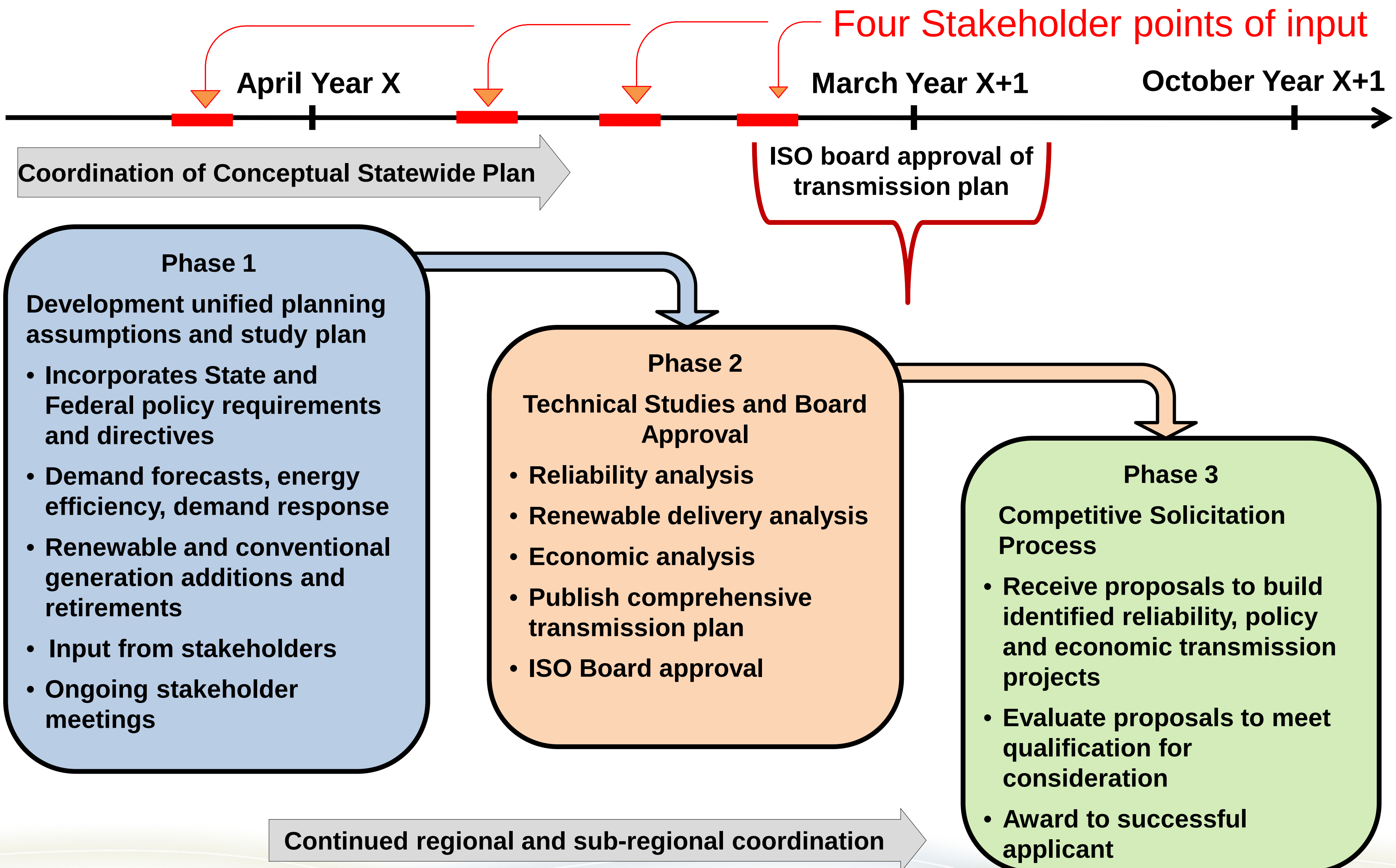
Planning area boundaries are defined by transmission under ISO Operational Control



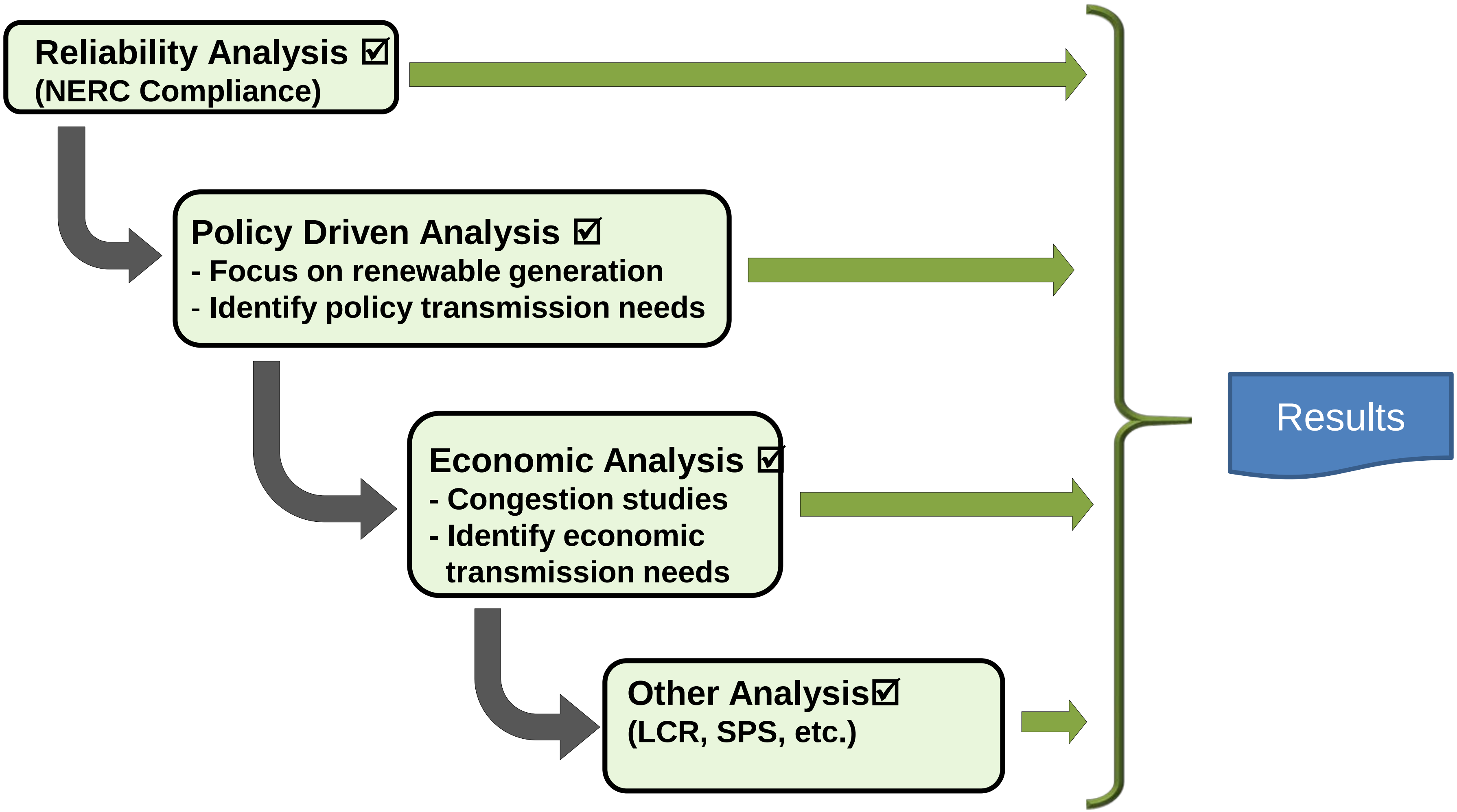
Legend
BES – Bulk Electric System
GO – Generator Owner
DP – Distribution Provider
GIF – Generation Interconnection Facilities

ISO transmission planning process and approvals

Transmission planning process begins each year and runs 23 months



Development of Annual Transmission Plan



Transmission planning is coordinated with state processes:

CEC & CPUC **1** Create **demand forecast** & assess **resource needs**

CAISO **2** Creates **transmission plan**

CPUC **3** Creates **procurement plan**

4 *Final plan authorizes procurement*

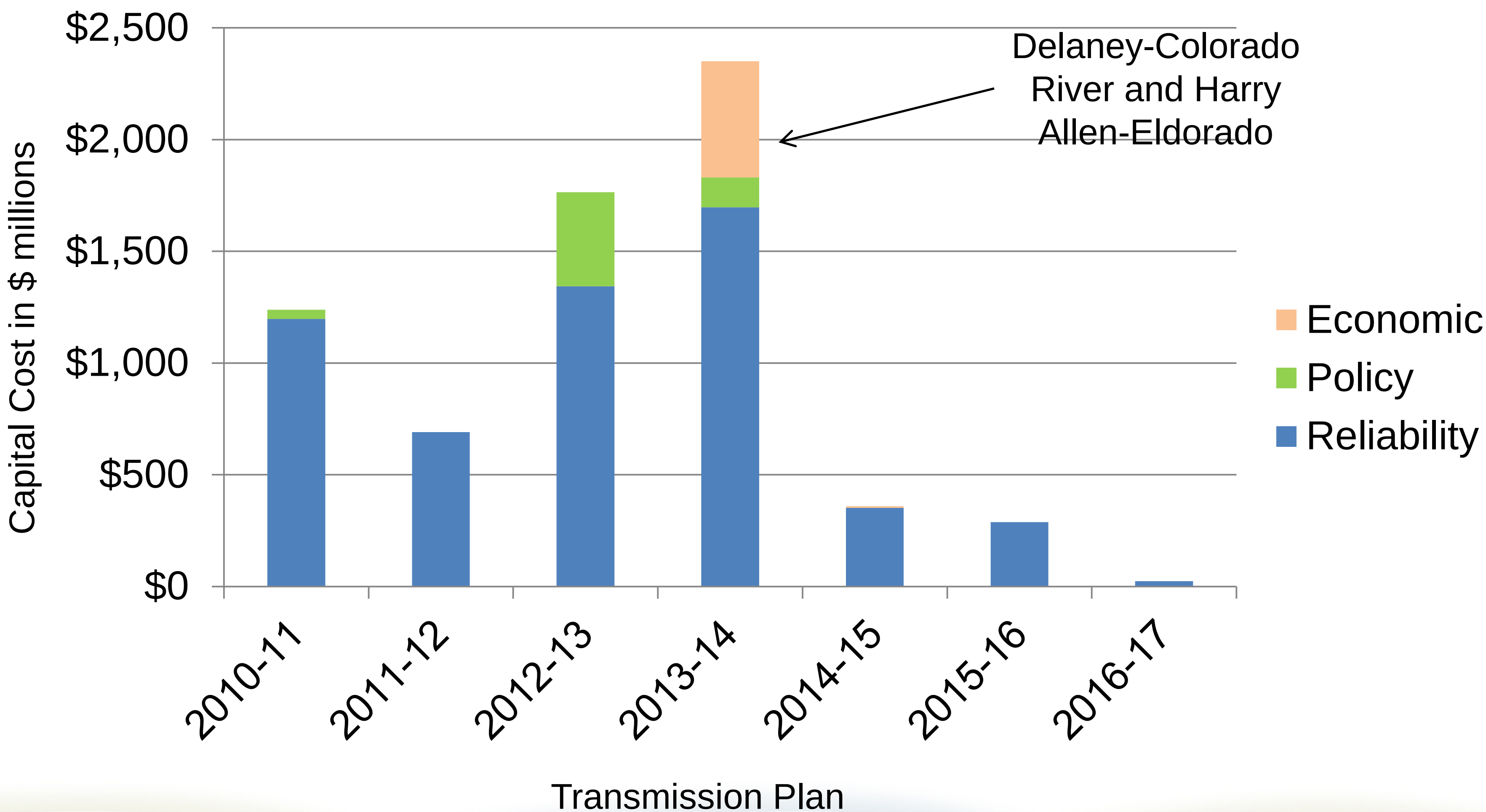
IOUs

Results feed into next biennial cycle

ISO Management and Board Approval Process

- ISO Management approves projects with a capital cost of $50 million or less
- The Revised Draft Transmission Plan is presented to the ISO Governing Board for approval resulting in the Board Approved Plan
  - Transmission upgrades and additions with estimated capital costs $50M or more will then be deemed approved
  - Approval of other findings, including selection of non-transmission alternatives
- ISO posts the Board Approved Comprehensive Transmission Plan
- ISO makes the Plan available to neighboring transmission providers, interconnected BAAs and regional planning groups

Transmission approvals over the last 6 years – over 30 projects a year until 2014-2015:

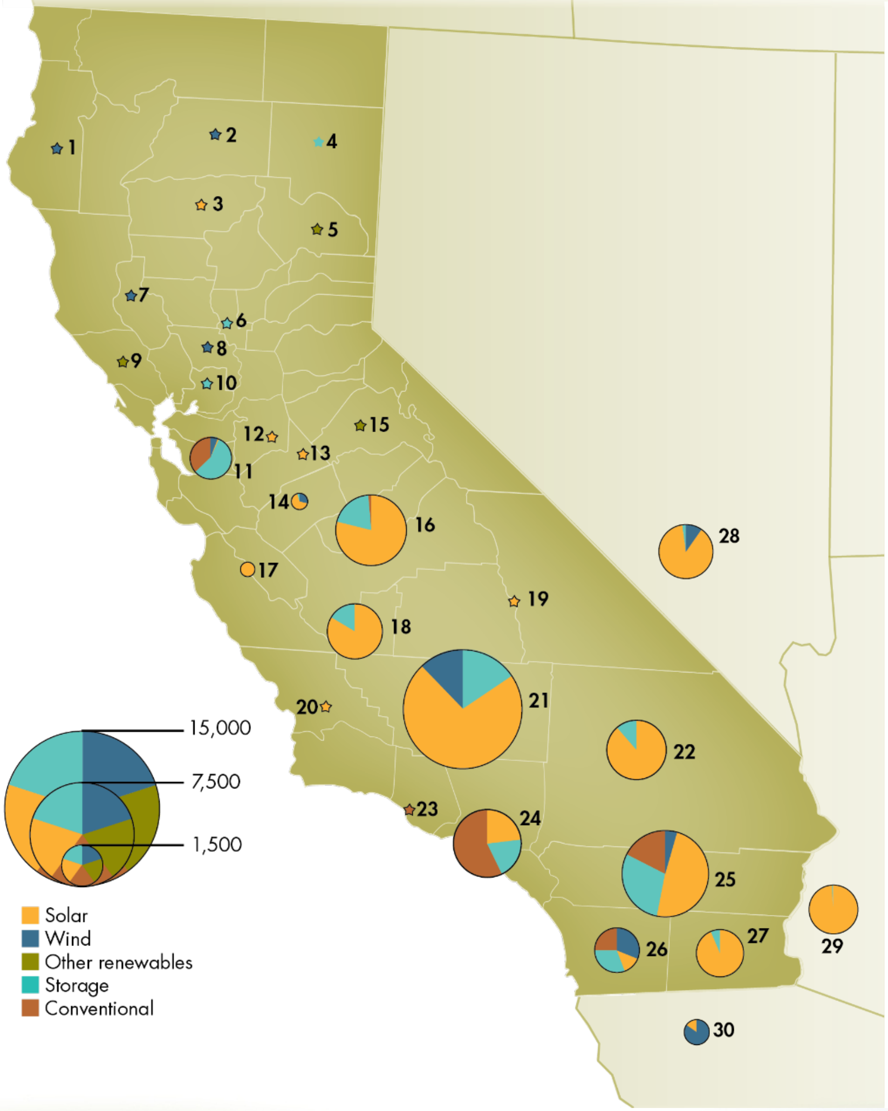


Examples of Special studies conducted inside the transmission planning process to focus on new and emerging challenges:

- Further study of system capacities at 50% renewables
- Generator frequency response modeling to improve quality of frequency response studies
- Gas-electric coordination studies
- Potential for economically driven retirement of gas-fired generation
- Required characteristics for further reliance on demand response products
- Benefits of Large Storage in managing resource balancing and integrating renewable generation

Generation Interconnection Process

ISO generation interconnection queue



Interconnection queue by county

	County	# of Projects	Megawatts			
			Renewables	Storage	Conventional	Total
1	Humboldt	2	106	28		134
2	Shasta	1	200			200
3	Tehama	3	259			259
4	Lassen	2	21	27		48
5	Plumas	1	35			35
6	Sutter	1		64		64
7	Lake	2	145	13		158
8	Yolo	2	170			170
9	Sonoma	1	35			35
10	Solano	1		314		314
11	Alameda, Contra Costa, Santa Clara	11	139	1,087	723	1,949
12	San Joaquin	6	171	55	24	250
13	Stanislaus	3	451			451
14	Merced	6	591	28		619
15	Toulumne	2	11	10		21
16	Fresno, Madera	45	3,887	972	60	4,919
17	San Benito, Monterey	2	520			520
18	Kings	21	2,388	468		2,856
19	Tulare, Inyo	6	305	23		328
20	San Luis Obispo	1	40			40
21	Kern	60	8,696	1,187		9,883
22	San Bernardino	21	2,924	369		3,293
23	Ventura	2		26	300	326
24	Los Angeles, Orange	10	1,082	912	2,644	4,638
25	Riverside	24	3,571	1,989	1,170	6,730
26	San Diego	20	811	560	457	1,828
27	Imperial	7	1,880	125		2,005
	In-state Totals	263	28,438	8,257	5,378	42,073
28	Nevada	14	3,078	64		3,142
29	Arizona	14	3,493	20		3,513
30	Mexico	4	1,321			1,321
	Out-of-state Totals	32	7,892	84		7,976
	TOTAL ALL PROJECTS	**295**	**36,330**	**8,341**	**5,378**	**50,049**

as of January 9, 2017

The CAISO's generator interconnection process has evolved to address our needs:

- The CAISO relies on a "cluster study" approach to deal with potentially huge volumes of interconnection requests in a competitive market
- The generator interconnection process is coordinated with our annual transmission planning process and the framework for policy-driven transmission
- A "fast track" for very small projects and an "independent study track" for projects needing faster service are available, on an "energy only" basis.

Overview of Generator Interconnection Process

- Phase 1 study assesses reliability and deliverability
  - reasonable MW amounts when queue is very large
  - projects may rely on available system capacity; or
  - project posts security deposit to enter phase 2 and pay its share of delivery upgrade costs
- Phase 2 study identifies delivery upgrades only for customers willing to pay for the upgrades
  - A second financial security posting is necessary to move forward into contracts and implementation

ISO studies to support State Resource Adequacy

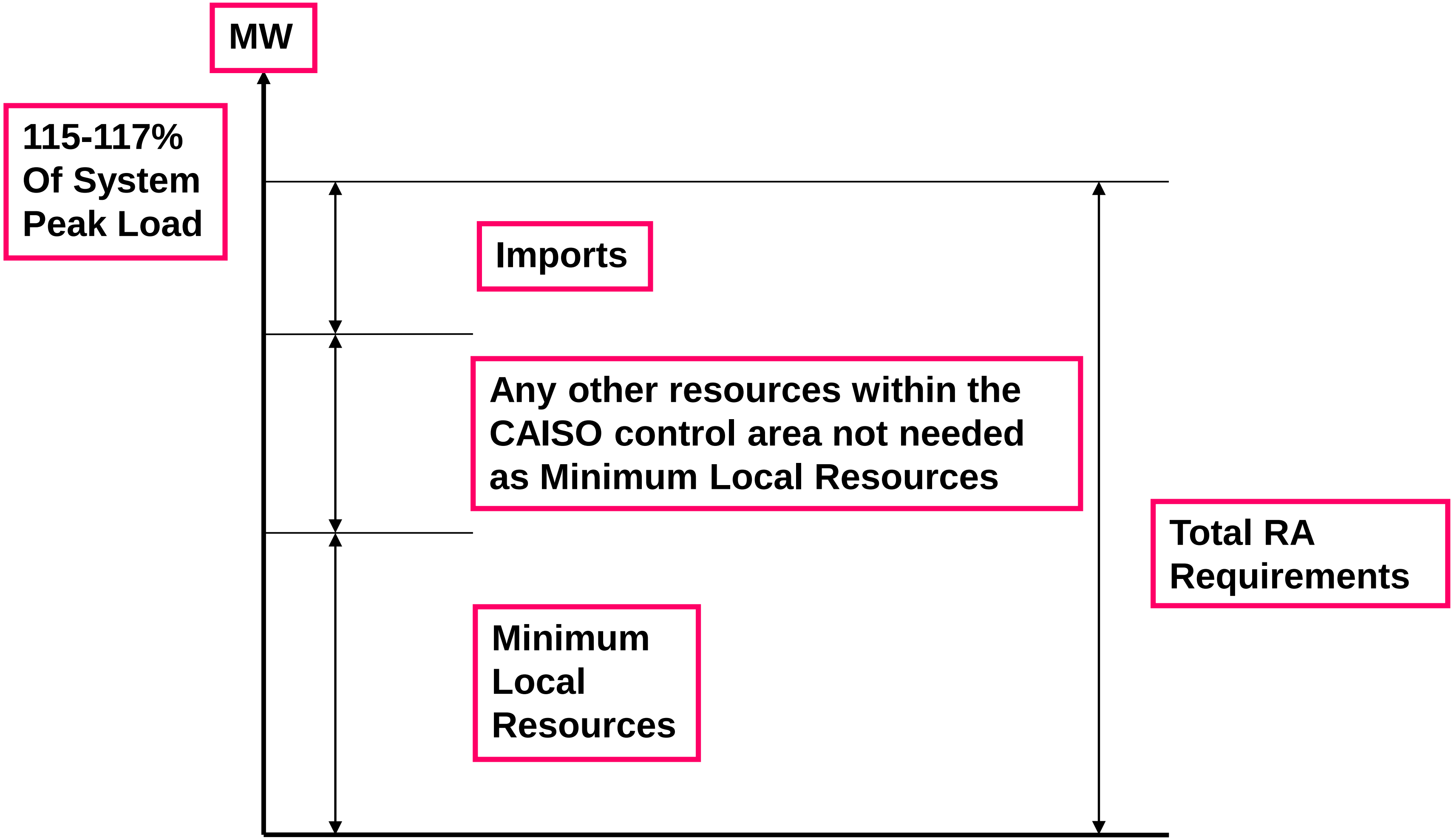
General Resource Adequacy Concepts

- Resource Adequacy (RA)
  - Ensure that capacity exists and is under contract in order for all load to be served by responsible Load Serving Entities (LSEs)
  - Generally, LSEs will demonstrate that they have secured adequate qualified capacity to serve their peak load including planning reserve (every month in the month ahead timeframe).
  - Generally, LSEs will demonstrate, in the year ahead timeframe that they have secured minimum 90% of the next summer’s peak load needs including planning reserve.
  - All resources participating in the ISO markets under an RA contract will have an RA must-offer-obligation to the ISO.

Transmission Planning analysis plays two roles in the California's annual Resource Adequacy program:

- State's resource adequacy program ensures:
  - adequate supply on a system wide basis and in local areas where transmission is constrained
- For "system" capacity:
  - ISO determines if "qualifying capacity" (determined by CPUC) should be discounted due to system limitations
  - establish qualifying import limits
- For local resource adequacy:
  - determine the needs in local load pockets, and validate that the procurement actually meets those needs

Total Resource Adequacy Procurement



Recovering transmission revenue requirements

Transmission Access Charge (TAC) is the ISO’s mechanism for transmission-owning utilities to recover their costs of transmission assets.

- A transmission-owning utility that transfers operational control to the ISO becomes a “participating transmission owner” (PTO)
- The PTO continues to own, maintain and operate transmission assets turned over to ISO operational control
- Each PTO submits its transmission revenue requirements (TRR) to FERC for approval to recover through the TAC

FERC orders and precedents emphasize several basic principles for allocation of TRR.

1. Costs must be allocated in a way that is roughly commensurate with benefits
2. Calculation of benefits is not an exact science
3. The process for determining benefits and beneficiaries must be transparent
4. Broad agreement among affected parties that the cost allocation is fair

Existing TAC structure for the current ISO region was approved by FERC as part of Order 1000 compliance.

Existing TAC structure consists of:

- Postage stamp "regional" rate to recover TRR for all facilities rated > 200 kV under ISO operational control
  - $/MWh charge to all internal load and exports
- PTO-specific "local" rates to recover TRR for all facilities rated < 200 kV under ISO operational control
  - $/MWh charge to internal load in each PTO's territory
- Currently, no differentiation of cost allocation based on project type (e.g., reliability, economic, or policy projects), in-service date or other non-voltage level factors

CAISO Draft Regional TAC Framework Proposal

Objectives for any alternative to the current TAC structure when new PTOs join

- TAC should not represent a barrier to joining the ISO
  - avoid “rate shock” for either new or existing PTOs
  - apply equally well for all new PTOs
- Align cost allocation with benefits as far as possible
- Align structure with the ISO’s transmission planning process & criteria as far as possible
- Maximize the likelihood of state commission, FERC, existing PTO, and other stakeholder acceptance

Proposed a draft framework for the cost allocation of existing high voltage facilities

- Costs will be recovered via “license plate” sub-regional TAC rates for their respective loads
- Each sub-region’s existing facilities will comprise “legacy” facilities for which subsequent new sub-regions have no cost responsibility

New facilities will have costs allocated to align with benefits (purpose)

- For a reliability project that is designed only to meet a reliability need within a sub-region, allocate the full project cost to that sub-region

- For a policy-driven project with multi-area benefits, allocate costs to loads of relevant state or local regulatory authorities
  - If connected entirely within the same sub-region where the policy driver originated, allocate full cost to that sub-region

- For a purely economic project, allocate cost shares to sub-regions in proportion to their economic benefits

Thank You