Decision on ISO 2018-2019 Transmission Plan

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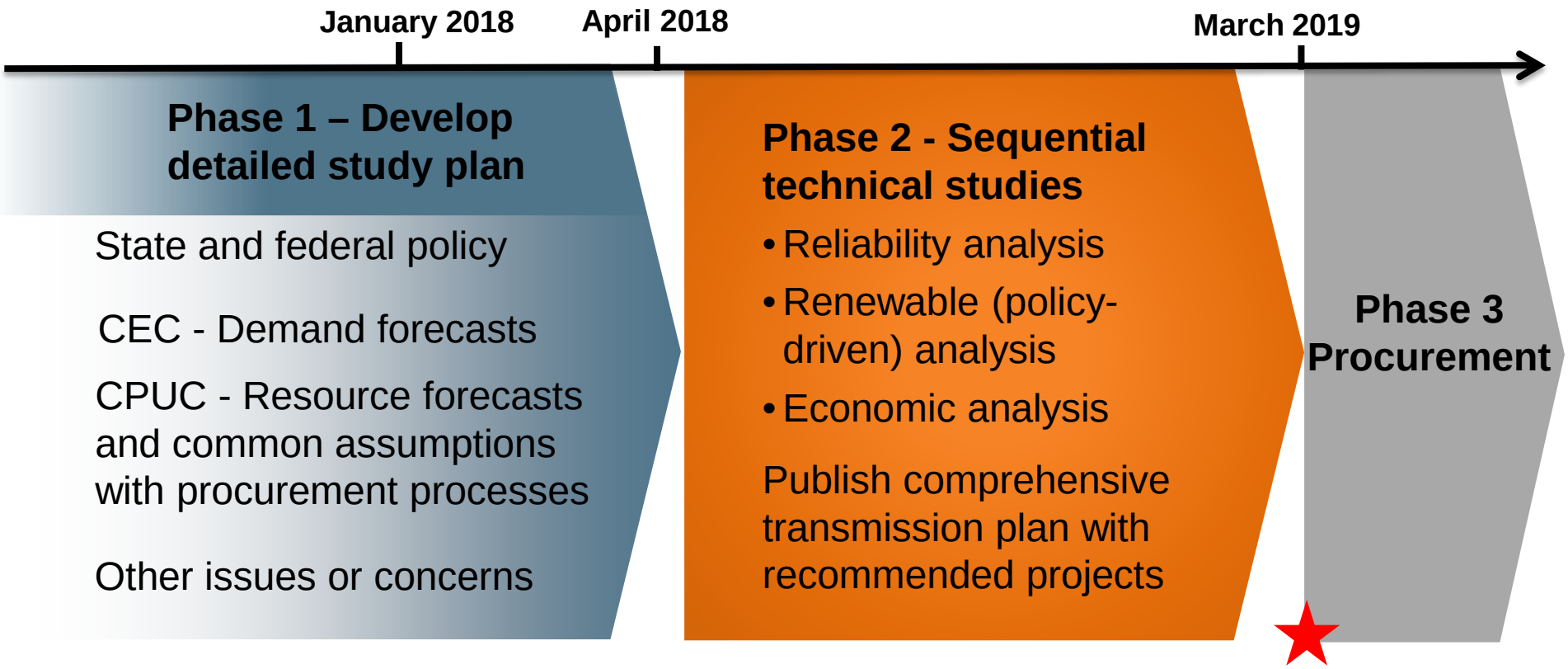
Approving the plan means approving determinations and recommendations contained in the plan.

- 13 transmission projects identified as needed:
  - 11 reliability-driven projects totaling $607.2 million
  - 2 economic-driven projects totaling $37 million
- Changes to previously-approved projects
  - Canceling 6 projects of the 7 that were left on hold
  - 1 project require further evaluation in future planning cycles
  - Revising the scope of a number of other smaller projects
- No policy-driven projects

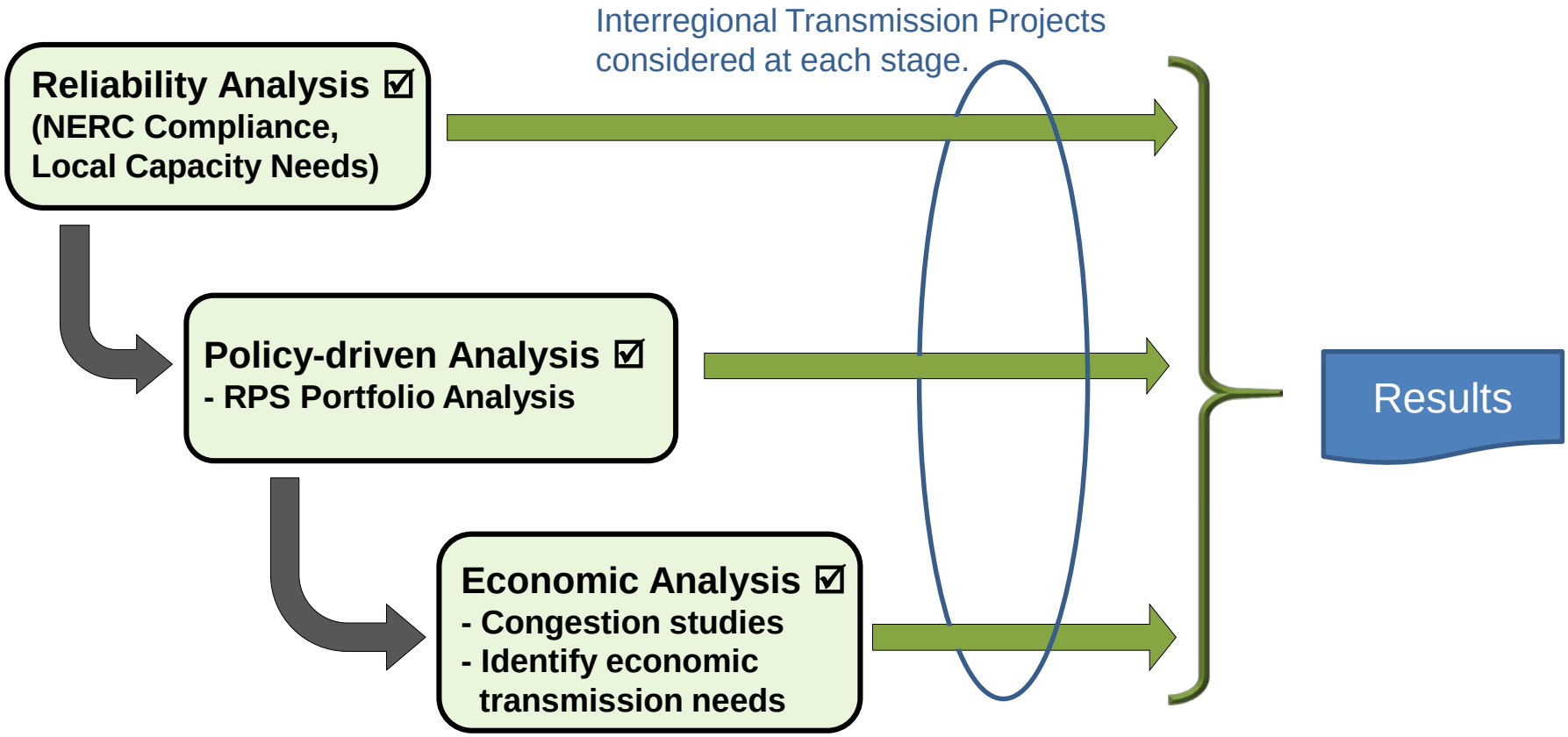
2018-2019 Transmission Planning Process



Emphasis in the transmission planning cycle:

- A modest capital program, as:
  - Reliability issues are largely in hand,
  - Policy work was informational as we await actionable renewable portfolio policy direction regarding moving beyond 50%
  - Very little economic–driven opportunity, largely due to status of IRP decision-making
- Final cleanup of previously approved projects needing review
- Massive interest in development community for transmission lines and storage (battery and pumped hydro) – 13 proposals for major" facilities needing detailed economic analysis
- "Special" study efforts on local capacity areas and gas-fired generation requirements, and on improving access to northwest hydro resources for purchase or shaping solar

Following our sequential study process has been challenging – but critical to managing study requests:



Stakeholders have submitted proposals into multiple forums, *e.g.* as reliability projects, economic study requests, alternatives to reduce local capacity requirements, and interregional transmission projects

The ISO's reliability analysis led to the following:

- 11 new reliability projects of approximately $607.4 million, all located in the PG&E service territory.
  - 9 smaller projects totaling $167.4 million
  - two dynamic voltage support projects totaling $440 million, for voltage support on 500 kV system after Diablo Canyon retires.

- Reassessment of seven "on hold" projects in PG&E service territory:
  - Six are recommended to be canceled, representing $440 to $550 million in savings from current estimates
  - One project continues to need further review in future cycles

Policy-driven analysis was not conducted for approval purposes – only as a sensitivity, as per CPUC direction:

- Per CPUC decision in integrated resource planning proceeding:
  - *50% RPS portfolio (IRP "default" scenario) provided for reliability and economic study purposes*
  - *42 MMT portfolio (IRP "reference" scenario) provided as a policy study "sensitivity", and specifically excluded providing a "policy base case" that would be necessary for any policy-driven transmission to be approved.*
- The decision anticipated that the "preferred" plan coming out of the 2018 IRP effort would form a "base case" for the 2019-2020 planning cycle.

Economic Study Issues:

- A large number of stakeholder proposals for transmission and storage were received – both pumped hydro and battery
- Proposals were submitted as proposed reliability projects, economic study requests, and/or interregional transmission project proposals
- Two key study assumptions largely impacted study results downward from proponents' expectations:
  - ISO process focuses on ratepayer benefits, not WECC system-wide production cost reductions
  - Local capacity requirement reductions were valued at the difference between local capacity prices and system capacity prices for this cycle, given CPUC 2017 & 2018 IRP assumptions

New Projects Recommended for Approval (all in PG&E)

Projects	Project cost (millions)	Comment
Gates 500 kV Dynamic Voltage Support	$210-$250	Reliability – Eligible for Competitive Solicitation
Round Mountain 500 kV Dynamic Voltage Support *	$160-$190	Reliability – Eligible for Competitive Solicitation
Tyler 60 kV Shunt Capacitor	$5.8-$7	Reliability
Cottonwood 115 kV Bus Sectionalizing Breaker	$8.5-$10.5	Reliability
Gold Hill 230/115 kV Transformer Addition Project	$22	Reliability
Jefferson 230 kV Bus Upgrade	$6-$11	Reliability
Christie-Sobrante 115 kV Line Reconductor	$10.5	Reliability
Moraga-Sobrante 115 kV Line Reconductor	$12-$18	Reliability
Ravenswood 230/115 kV transformer #1 Limiting Facility Upgrade	$0.1-$0.2	Reliability
Tesla 230 kV Bus Series Reactor project	$24-$29	Reliability
South of Mesa Upgrade	$59.2	Reliability
Giffen Line Reconductoring Project	Less than $5	Economic
Pease Local Capacity Requiremenet Reduction Project	$32	Economic

* Additional engineering detail is needed for the termination of the Round Mountain project. The competitive solicitation process will commence after those engineering details have been completed and posted as an addendum to the transmission plan.

Projects to be Canceled ($440-$550 million)

Projects	Planning Area
Atlantic-Placer 115 kV Line	Central Valley
Jefferson - Stanford #2 60 kV Line	Greater Bay Area
Morro Bay 230/115 kV Transformer Project Table	Central Coast and Los Padres
Diablo Canyon Voltage Support Project	Central Coast and Los Padres
Gates-Gregg 230 kV Line	Fresno
Bridgeville – Garberville No. 2 115 kV Line	Humboldt

Projects remaining on hold

Projects	Planning Area
Midway-Andrew Project	Central Coast and Los Padres

Special study efforts conducted in 2018:

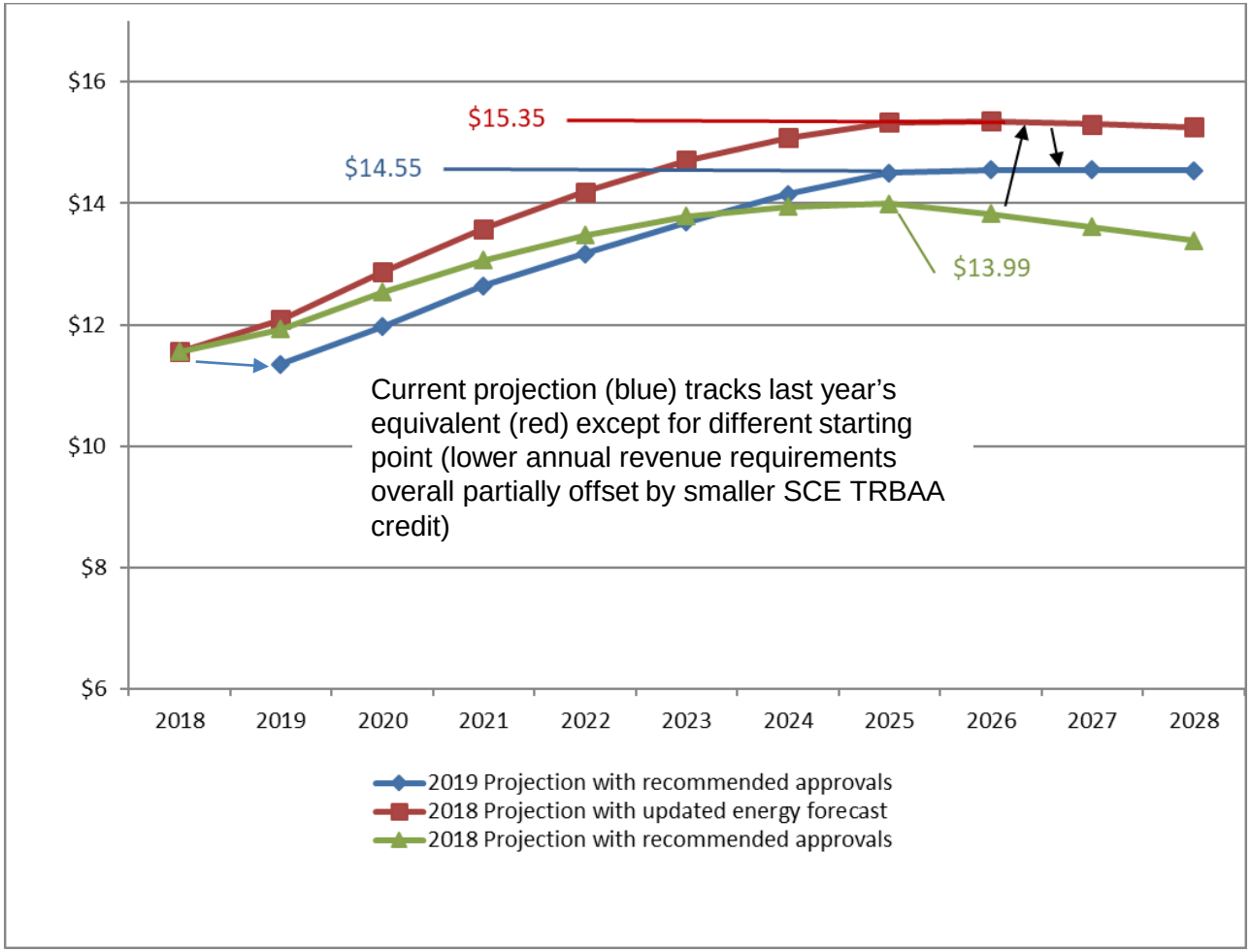
- Long term system and flexible capacity needs (MQ&RI work also feeding into IRP process)
- Large scale storage system benefits – found significant production cost benefits, but capacity benefits needed in order to be viable

PLEXOS updates to prior years' efforts

- CPUC/CEC study request re transfers of non-GHG resources with Pacific Northwest
- In-depth study of local capacity resource requirement needs (e.g. profiles of "need") and development of conceptual mitigations for half of the areas and sub-areas (none were found to be economic).

Regional high voltage transmission access charge projection trended from January 1, 2019 values:

Regional High Voltage TAC $/MWh



* Existing returns are maintained for existing PTO rate base, and 11% return on equity is assumed for new transmission capital.

Stakeholder feedback:

- General support for much of the transmission plan
- Mixed reactions to assumptions that put downward pressure on the benefit calculation for proposed projects
- Concerns with CPUC portfolios used for planning.
- Concerns with the ISO's coordination with the CPUC on transmission capabilities information
- Concerns with California-Oregon Intertie day-ahead congestion not being considered as a driver for new transmission solutions.

Management recommends the Board approve the 2018-2019 ISO Transmission Plan.

- Continues to pursue low emissions strategies in addressing reliability needs of the ISO controlled grid
- Sets a foundation for higher renewable energy goals
- Provides for prudent and economic development of the transmission system