

CALIFORNIA
TRANSMISSION
PLANNING
GROUP



Technical Steering Committee Report

CTPG Executive Committee Meeting
September 1, 2011

Agenda

- General Update – Mo Beshir
- Stakeholder Comments and Responses – Jan Strack
- 2011 Final Study Plan – Garry Chinn
- Technical Study Team – Ben Morris
- 2011 CTPG Work Plan – Mike Deis
- TEPPC Activity Update – Mike Deis
- Next Steps – Mo Beshir

General Update

- TSC conducted 6 conference calls in July and August.
- Conducted a stakeholder meeting on July 25th and July 26th
- Meeting topics included:
 - 2011 Phase II Work Plan and deliverables
 - July 25th and 26th Stakeholder Meeting planning and results
 - Written stakeholder comments and responses
 - Proposed Path Flow Assumptions and Generation
 - Re-dispatch Methodology
 - CEC Peak Demand Forecast
 - CPUC Discounted Core Assumptions

STAKEHOLDER COMMENTS AND RESPONSES – JAN STRACK

Stakeholder Comments – 2011 Phase 2 Study Plan

Bay Area Transmission Users Group (BAMx):

- Only include permitted transmission upgrades in pre-renewable basecases
 - *CTPG response:*
 - ✓ BAMx's approach is too conservative because upgrades could not be included in studies for many years after projects are determined to be needed.
 - ✓ Example: SDG&E submitted initial Sunrise CPCN application 12/2005 and received final Notice to Proceed from U.S. Forest Service 8/2011 (5 ½ years)

- Opposes CTPG's decision to use of CEC staff's May, 2011 "High" load forecast; should use "Low" or "Mid"
 - *CTPG response:* CTPG has selected assumptions likely to have the most impact on the existing transmission system.
 - ✓ CEC staff's "High" load forecast
 - ✓ 25% of CEC staff's incremental energy efficiency and incremental behind-the-load-meter solar PV.

- Perform a "maximum use of existing transmission" scenario
 - *CTPG response:* This scenario would force CTPG to select renewable projects based on whether existing transmission is available. This, by itself, is not the criteria that regulatory entities and generation permitting authorities use to approve renewable projects.

- Perform a scenario reflecting Governor's plan for 12,000 MW of new distributed generation
 - *CTPG response:* CTPG will consider including this scenario in its 2012 study plan

Stakeholder Comments – 2011 Phase 2 Study Plan

Bay Area Transmission Users Group (BAMx) Cont.:

- Adjust CPUC Discounted Core to exclude generation projects that the E3 Calculator model determines are uneconomic
 - *CTPG response:* Renewable projects that have received regulatory approvals are likely to be built and should not be excluded on the basis of highly generic modeling assumptions for transmission cost and usage.
- Use CREZs with “existing/approved transmission infrastructure,” rather than RETI Best CREZs, to supplement Discounted Core
 - *CTPG response:* RETI Best CREZs reflect renewable development potential that is economic and has lower environmental impacts, and is therefore a reasonable basis for supplementing the POU-CPUC Discounted Core projects
- CTPG’s Phase 2 scenarios exceed 25% limit on out-of-state renewables imposed by SBx1-2
 - *CTPG response:* CTPG believes SBx1-2 will be implemented in a manner which permits out-of-state renewables to exceed the 25% limit applied on a strict geographic basis:
 - ✓ Out-of-state renewables directly connected to CA Bal Auth. (includes buses in CA, UT, NV and AZ) treated as “in-state”
 - ✓ Out-of-state renewables dynamically transferred to CA treated as “in-state”
 - ✓ Out-of-state renewables that are “firmed and shaped” treated as “in-state”
 - ✓ Out-of-state renewables that are scheduled-when-produced (wheeling) may be treated as “in-state”
 - ✓ Legal questions surrounding possible restraint of interstate commerce

Stakeholder Comments – 2011 Phase 2 Work Plan

Large-scale Solar Assc. (LSA):

- Update CPUC Discounted Core
 - *CTPG response:* CTPG agrees an update is needed but believes CPUC should be the entity to update
- Does not support use of E3 Calculator model to exclude generation projects from the CPUC Discounted Core
 - *CTPG response:* CTPG agrees with LSA.
 - ✓ Renewable projects that have received regulatory approvals are likely to be built and should not be excluded on the basis of highly generic modeling assumptions for transmission cost and usage.

Stakeholder Comments – 2011 Phase 2 Work Plan

Large-scale Solar Assc. (LSA):

- Use Trajectory scenario, rather than CPUC Public Policy scenario, to capture commercial interest and to reflect advances in renewable technologies and resulting cost reductions
 - *CTPG response:* CPUC has requested CAISO to use the CPUC Public Policy scenario as the base case for the CAISO's 2011/2012 Transmission Planning Process
 - ✓ Includes Discounted Core generation (reflects commercial interest)
 - ✓ Includes significant amount of economically attractive out-of-state renewables
 - ✓ Shift of renewable technologies from solar thermal to solar PV reflected in Discounted Core
 - ✓ Future advances in renewable technology beyond the scope of Phase 2 work

Independent Energy Producers (IEP):

- Put together an “Assumptions Workbook”—updated on an ongoing basis—to improve stakeholders’ ability to understand and comment on CTPG work
 - *CTPG response:* CTPG Study Plan provides the key assumptions underlying CTPG’s study work.
 - ✓ Spreadsheet detail provided on request
 - ✓ Power flow data files provided on request

Stakeholder Comments – 2011 Phase 2 Work Plan

CEC Staff:

- Perform on off-peak sensitivity of CTPG's Central California scenario to simulate the off-peak impact of adding 12,000 MW of new distributed generation – Central California scenario includes high level of solar resources which will be off-line at night
 - *CTPG Response:* Off-peak sensitivity of Central California scenario will not be useful in addressing:
 - ✓ Preferred level of imports into CA. (Power flow analysis uses pre-determined imports; does not predict a preferred level.)
 - ✓ Because imports are pre-determined, power flow analysis is of limited value in identifying whether contingencies would limit such imports. (Hourly economic grid simulation models are designed to identify the preferred level of imports; CTPG will not be using such models in its Phase 2 work.)
 - ✓ Impacts of OTC shutdown/refurbishment/replacement are better addressed comprehensively
 - *CTPG Response:* CTPG will consider including this scenario in its 2012 study plan
 - *CTPG Response:* Off-peak sensitivity of Central California scenario will require considerable effort since it would simulate an entirely new month (December) and hour (7:00 pm).
 - ✓ CTPG's 2011 studies already cover several off-peak periods (Spring, 5 pm; Fall, 9 am)
 - ✓ CTPG will consider including additional off-peak studies in its 2012 study plan

2011 FINAL STUDY PLAN – GARRY CHINN

Scenarios

No.	Name	Description	Season Date Time	Path Flow	Net Short Renewable Resources
1	Pacific Northwest Import	Wind imports from Pacific Northwest combined with hydro runoff.	spring (early June, 5 PM)	stress COI (n-s)	CPUC/POU Discounted Core Out of State RETI Best CA CREZs
2				foundation ¹	
3	Northwest Nevada Import	Geothermal from Nevada & wind and solar from Northern California.	summer peak (July 4PM)	stress COI (n-s)	CPUC/POU Discounted Core Out of State RETI Best CA CREZs
4				foundation ¹	
5	South to North Flow	Determine transmission needs required during this time period generally characterized as light load with significant wind and morning solar generation. Paths 15 & 26 flows are south to north.	fall (Sep 9 AM)	foundation ¹	CPUC/POU Discounted Core RETI Best CA CREZs
6	CPUC Public Policy	Updates cost constrained scenario: includes Eldorado-Ivanpah, 1,384 MW of DG, 25% of 2020 RPS is out of state and projects from CAISO 2010/11 Transmission Plan.	summer peak (July 4PM)	foundation ¹	CPUC/POU Discounted Core CPUC Public Policy
7	Central California	Large development of disturbed land with low environmental impact. Inject power at Panoche, Gates and Midway.	summer peak (July 4PM)	foundation ¹	CPUC/POU Discounted Core Central California gen queue RETI Best CA CREZs
8	West of River Import	High wind & solar imports from Wyoming, Utah, Nevada and Arizona to stress WOR. Inject power at Eldorado (50%), Palo Verde (37%) and N. Gila (13%).	fall (Sep 9 AM)	stress WOR (e-w)	CPUC/POU Discounted Core Out of State RETI Best CA CREZs
9		Same as above, except inject power at Eldorado (37%), Palo Verde (50%) and N. Gila (13%).			

Net Short of 44.85 TWh for all scenarios.

1. The foundation cases represent the generation dispatch pattern present in the WECC seed cases;
i.e., in the foundation cases paths are not “stressed” prior to addition of the Net Short renewable resources.

Changes to Study Plan

- Update 2020 Load Forecast
 - Use CEC Staff's May, 2011 "High" 1-in-10 peak demand forecast
 - Include 25% of CEC staff's incremental energy efficiency & behind-the-load meter solar PV program impacts
 - Updated summer peak forecast of 68,853 MW is comparable to 68,511 MW from 2010 CTPG studies
- Update Net Short
 - Use CEC Staff's May, 2011 "High" annual energy forecast
 - Include 100% of CEC staff's incremental energy efficiency & behind-the-load meter solar PV program impacts
 - Matched Solar PV Program capacity factors to CPUC's, increasing available energy by 279 GWh
 - Reduced net short to 44,852 GWh

CPUC Public Policy Scenario

- This scenario differs from resource portfolio sent by CPUC to CAISO on June 6, 2011
 1. Revised CPUC Discounted Core to create a CPUC/POU Discounted Core
 - ✓ Removed 78.2 MW Round Mountain-B CREZ wind since this reflected in existing/under construction renewables
 - ✓ Added municipal utility “discounted core” equivalents
 - 128 MW of wind in Solano CREZ
 - 8.5 MW of solar PV in Tehachapi CREZ
 - 10 MW of solar PV in Victorville CREZ
 - 25 MW of distributed solar PV in the Los Angeles area (non-CREZ)

2. Set CPUC/POU Discounted Core as anchor resources

CPUC Public Policy	June 6 Transmittal	Type & Location
230 MW	0 MW	solar PV in Fairmont CREZ
250 MW	62 MW	solar thermal in Kramer CREZ
500 MW	275 MW	solar thermal in Pisgah CREZ
642 MW	492 MW	solar thermal in Riverside East CREZ
82.5 MW	0 MW	wind in Santa Barbara CREZ
516 MW	450 MW	wind in Alberta

3. Scaled-back CPUC’s updated “Public Policy” resource portfolio (as provided by CPUC via E3 Calculator model) to meet CTPG’s updated net short of 44,852 GWh subject to:

- ✓ Retaining CPUC/POU Discounted Core as anchor resources
- ✓ CPUC’s updated “Public Policy” resource portfolio which includes

CPUC Public Policy	June 6 Transmittal	Type & Location
1247 MW	1273 MW	geothermal in Imperial CREZ
97 MW	103 MW	wind in Imperial CREZ
939 MW	1246 MW	distributed solar PV in SCE
1391 MW	1030 MW	distributed solar PV in PG&E
104 MW	160 MW	distributed solar PV in SDG&E

Economic Re-Dispatch

- Background
 - Fossil units turned down in economic merit order as renewables are added
 - CTPG issued survey to WECC transmission planning entities to identify minimum generation levels to meet reliability requirements
 - Survey results did not provide significant information regarding min gen levels
 - Minimum generation levels would override economic merit order
- Two issues appeared during economic re-dispatch:
 - Unable to achieve stress path flow targets for CTPG scenarios
 - Decrementing specific units or large blocks of units in an area produced low voltages or stressed intertie capabilities in areas outside of California
- Technical Study Team next steps
 - Significant finding: a strict economic re-dispatch can reduced path flows into California resulting in minimal impact to California's transmission system
 - Team proceeded to a traditional transmission planning approach to determine impact of a specific assumption; high import path flows into California by skipping some fossil units in economic merit order
 - Also skipped economic merit order for units which provide local voltage support and maintain existing path/area limits outside California
- Final Study Plan will be modified to reflect these additional steps

TECHNICAL STUDY TEAM – BEN MORRIS

Scope of Work

- Study Cases
 - WECC's 2020 HS, 2018 HSPR and 2016 Light Fall cases to be updated to reflect 2020 summer, spring and fall conditions (pre-renewable)
 - Cases will be adjusted to reflect the 9 scenarios (i.e. model renewable generation and associated transmission, and stress key paths as indicated)
- Studies involve
 - Power flow
 - Voltage Stability
 - Dynamic Stability
- Identify problems and test a potential solution
- Tabulate results

Renewable Resources Scenarios 1-4

Renewable Resources	Scenarios 1 and 2: Pacific Northwest Import (Stress and Foundation Path Flows)				Scenarios 3 and 4: Northwest Nevada Import (Stress and Foundation Path Flows)			
	GWH	%	Installed MW	Spring Dispatched MW	GWH	%	Installed MW	Summer Dispatched MW
Discounted Core	23,107	52	8,574		23,107	52	8,574	
Scenario Specific	10,950	24	2,500 (W)	1,588 (W)	6,345	14	1,000 (G/W/S)	751 (G/W/S)
RETI Best CA CREZ	10,795	24	3,797		15,400	34	5,397	
TOTAL	44,852	100	14,871	8,005 (W/S/B/G)	44,852	100	14,971	9,209 (W/S/B/G)

Renewable Resources Scenarios 5-6

Renewable Resources	Scenario 5: South-to-North Flow (Foundation Path Flows)				Scenario 6: CPUC Public Policy (Foundation Path Flows)			
	GWH	%	Installed MW	Fall Dispatched MW	GWH	%	Installed MW	Summer Dispatched MW
Discounted Core	23,107	52	8,574		23,107	52	8,574	
Scenario Specific	-	-	-	-	21,745	48	5,978 (W/S/ B/G)	
RETI Best CA CREZ	21,745	48	7,615		-	-	-	
TOTAL	44,852	100	16,189	9,312 (W/S/B/G)	44,852	100	14,552	7,341 (W/S/B/G)

Renewable Resources Scenarios 7-9

Renewable Resources	Scenario 7: Central California (Foundation Path Flows)				Scenarios 8 and 9: West of River Import (Foundation Path Flows)			
	GWH	%	Installed MW	Summer Dispatched MW	GWH	%	Installed MW	Fall Dispatched MW
Discounted Core	23,107	52	8,574		23,107	52	8,574	
Scenario Specific	11,824	26	5,027 (S/W/B)	2,942 (S/W/B)	18,318	40	7,236 (W/ST/S)	3,406 (W/ST/S)
RETI Best CA CREZ	9,921	22	3,490		3,517	8	-	
TOTAL	44,852	100	17,091	10,238 (W/S/B/G)	44,852	100	14,552	8,994 (W/S/B/G)

Spring Scenario Study Cases

Preliminary

	Rating	Spring "0" (Stress)	Scenario 1 Pacific NW Import (Stress)		
Generation			Inc	Dec	Net
Pacific NW/Rocky Mountain			2,233	(1,343)	890
Northern CA			713	(3,206)	(2,493)
Southern CA			5,032	(1,285)	3,747
Desert SW			27	(2,170)	(2,143)
Path Flows			Actual	Diff	
COI (N-S)	4,800	4,798	6,056	1,258	
PDCI (N-S)	3,100	3,095	3,096	1	
Path 15 (N-S)	3,265	1,238	(371)	(1,609)	
Path 26 (N-S)	4,000	3,409	2,119	(1,290)	
WOR (E-W)	10,623	5,662	4,611	(1,051)	
EOR (E-W)	9,300	4,771	2,843	(1,928)	

Spring Scenario Study Cases

Preliminary

	Rating	Spring "0" (Found)	Scenario 2 Pacific NW Import (Found)		
Generation			Inc	Dec	Net
Pacific NW/Rocky Mountain			1,233	(1,227)	1,006
Northern CA			713	(3,663)	(2,950)
Southern CA			5,032	(1,119)	3,913
Desert SW			27	(1,996)	(1,969)
Path Flows			Actual		Diff
COI (N-S)	4,800	3,751	5,064		1,313
PDCI (N-S)	3,100	2,600	2,600		0
Path 15 (N-S)	3,265	1,808	-187		(1,995)
Path 26 (N-S)	4,000	3,602	1,807		(1,795)
WOR (E-W)	10,623	5,534	4,893		(641)
EOR (E-W)	9,300	4,708	3,133		(1,575)

Summer Scenario Study Cases

Preliminary

	Rating	Summer "0" (Stress)	Scenario 3 NW Nevada Import (Stress)		
			Inc	Dec	Net
Generation					
Pacific NW/Rocky Mountain			1,296	(2,849)	(1,554)
Northern CA			1,007	(2,182)	(1,175)
Southern CA			6,663	(2,285)	4,379
Desert SW			243	(1,793)	(1,550)
Path Flows			Actual	Diff	
COI (N-S)	4,800	4,810	4,810	0	
PDCI (N-S)	3,100	3,100	3,083	(17)	
Path 15 (S-N)	5,400	953	1,670	717	
Path 26 (N-S)	4,000	1,556	1,443	(113)	
WOR (E-W)	10,623	2,266	1,290	(976)	
EOR (E-W)	9,300	4,010	3,786	(224)	

Summer Scenario Study Cases

Preliminary

	Rating	Sum "0" (Found)	Scenarios								
			4			6			7		
			NW Nevada Import (Found)			CPUC Public Policy (Found)			Central CA (Found)		
Generation			Inc	Dec	Net	Inc	Dec	Net	Inc	Dec	Net
Pacific NW / RMtn			1,296	(2,849)	(1,554)	728	(2,729)	(2,001)	546	(3,160)	(2,614)
Northern CA			1,007	(2,182)	(1,175)	925	(1,816)	(891)	3,867	(2,337)	1,530
Southern CA			6,663	(2,285)	4,379	5,034	(1,885)	3,149	5,798	(2,421)	3,377
Desert SW			243	(1,793)	(1,550)	655	(1,661)	(1,006)	27	(2,069)	(2,042)
Path Flows			Actual	Diff		Actual	Diff		Actual	Diff	
COI (N-S)	4,800	3,717	2,629	(1,088)		3,063	(654)		2,712	(1005)	
PDCI (N-S)	3,100	2,599	2,599	0		2,599	0		2,599	0	
Path 15 (S-N)	5,400	1,801	3,955	2,154		3,853	2,052		4,914	3,113	
Path 26 (N-S)	4,000	789	(975)	(1,764)		(757)	(1,546)		791	2	
WOR (E-W)	10,623	2,995	1,708	(1,287)		2,664	(331)		1,273	(1,722)	
EOR (E-W)	9,300	3,792	3,237	(555)		2,729	(1,063)		3,069	(723)	

Fall Scenario Study Cases

Preliminary

	Rating	Fall "0" Found	Scenarios								
			5 South-to-North (Found)			8 WOR Import - ED (Found)			9 WOR Import – PV (Found)		
Generation			Inc	Dec	Net	Inc	Dec	Net	Inc	Dec	Net
Pacific NW/R Mtn			296	(1,022)	(726)	329	(873)	(544)	329	(873)	(544)
Northern CA			1,026	(3,490)	(2,464)	832	(2,858)	(2,026)	832	(2,858)	(2,026)
Southern CA			7,963	(4,156)	3,807	4,110	(4,056)	54	4110	(4,056)	54
Desert SW			27	(644)	(617)	3,722	(644)	3,078	3,722	(644)	3,078
Path Flows			Actual	Diff		Actual	Diff		Actual	Diff	
COI (S-N)	3,675	1,740	1,334	(406)		1,345	(405)		1,345	(405)	
PDCI (S-N)	3,100	1,855	1,855	0		1,852	(3)		1,852	(3)	
Path 15 (S-N)	5,400	3,628	6,206	2,578		5,747	2,119		5,747	2,119	
Path 26 (S-N)	3,000	293	2,517	2,224		2,003	1,710		2,003	1,710	
WOR (E-W)	10,623	5,098	5,913	815		8,759	3,661		8,759	3,661	
EOR (E-W))	9,300	4,214	3,807	(407)		4,423	506		4,423	506	

Initial Findings

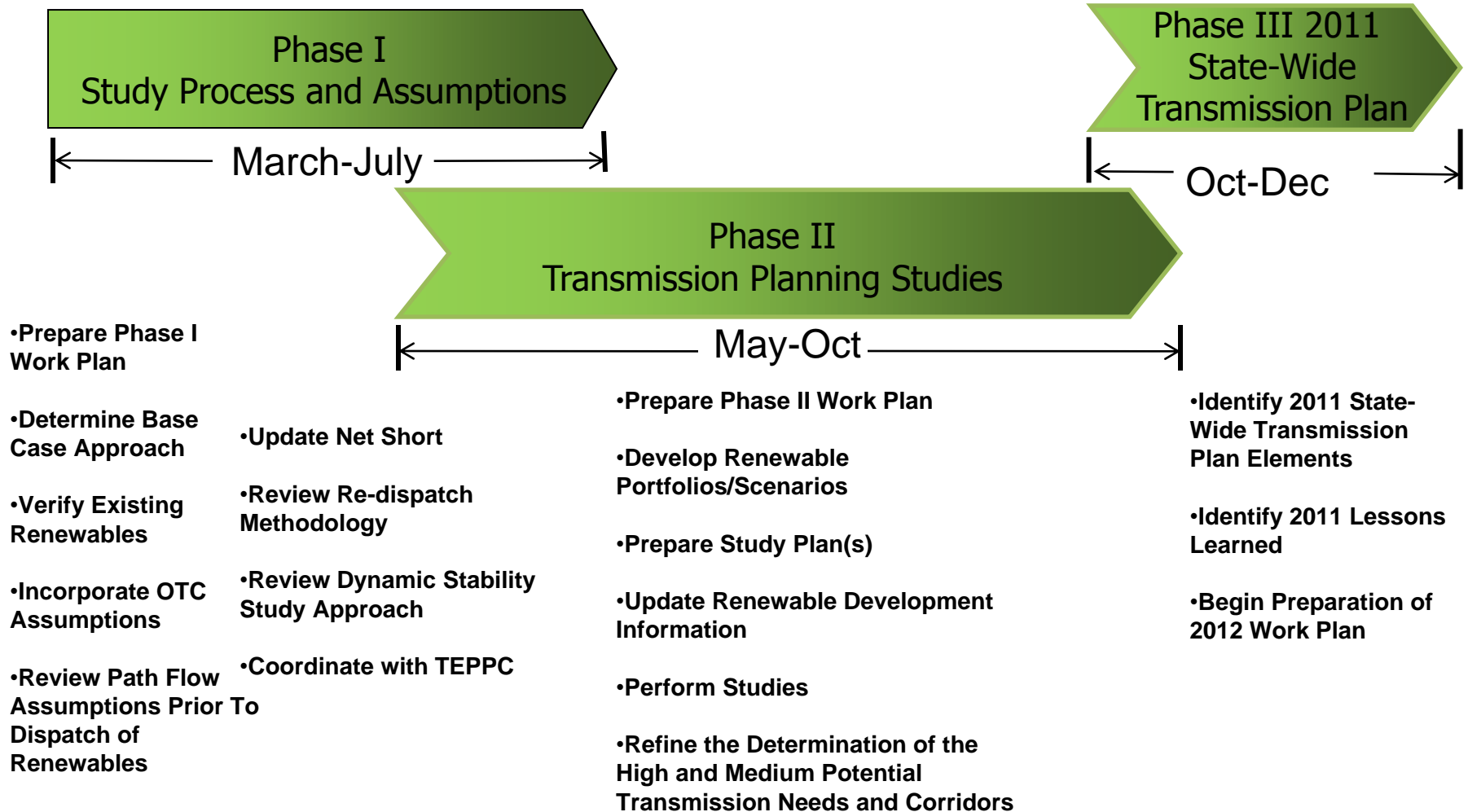
- Scenarios 1 and 2: Northwest Imports – Spring (Stressed & Foundation Path Flows)
 - Thermal generation adjustments in Alberta had to be limited to about 700 MW so as to stay within existing import limits. Even then low voltages and overloads are noted on Alberta system.
 - COI path flow increased by 1,200-1,300 MW as a result of the renewable/thermal generation re-dispatch in the “2” case
- Scenarios 5, 8, 9: S-N and WOR – Fall (Foundation Path Flow)
 - Decrementing tool forced a 170 MW unit off-line in Alberta which caused voltage collapse
 - Forced the tool to exclude this unit
 - Underlying system voltages in Arizona are lower than normal in the “0” case and are lower still in the “2” cases due to the renewable/thermal generation dispatch

Status

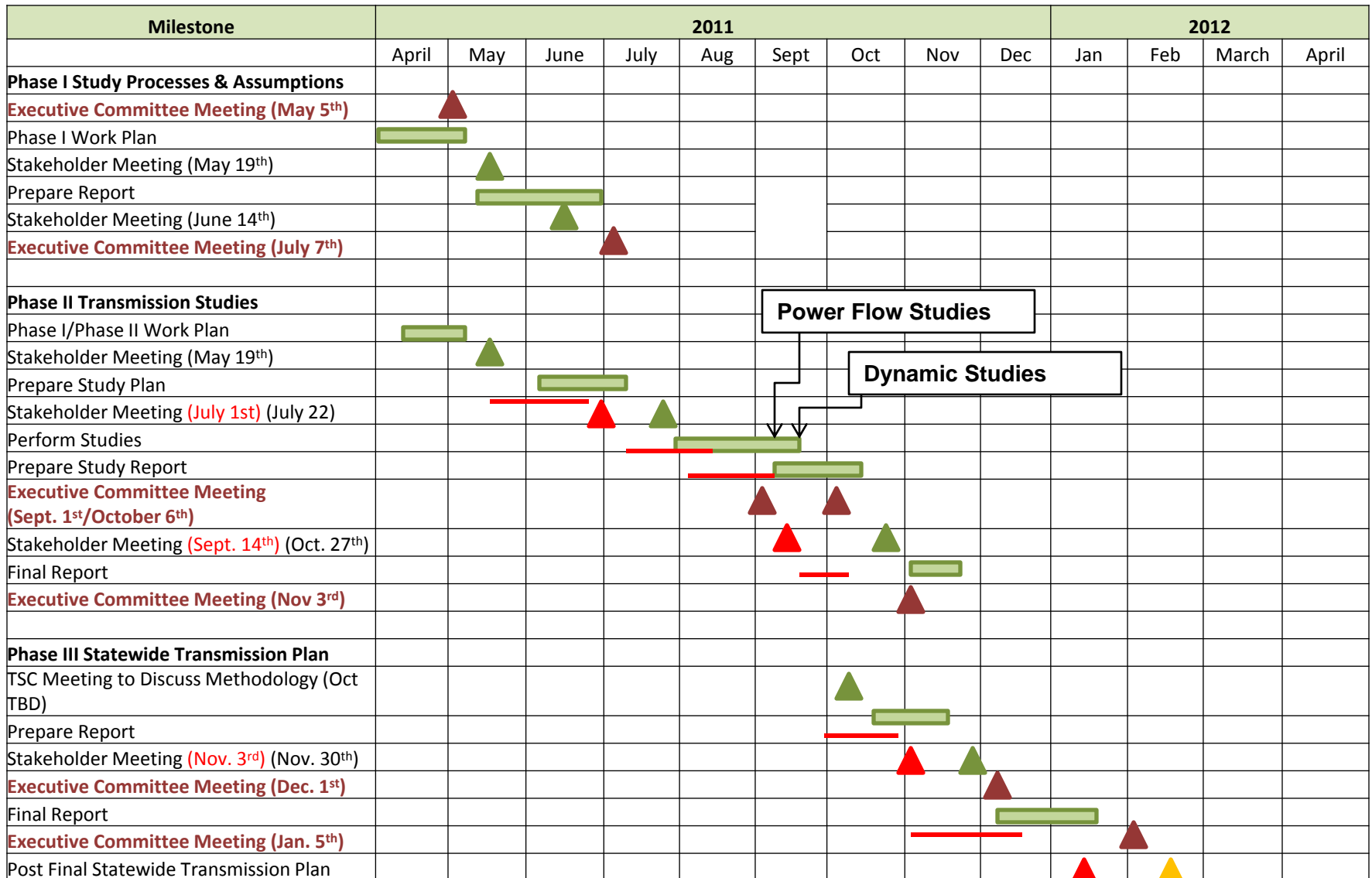
- Preliminary “2” series cases are complete
- Power Flow Studies are in progress

2011 CTPG WORK PLAN – MIKE DEIS

CTPG 2011 Work Plan



2011 Work Plan Schedule



Power Flow Studies

Dynamic Studies



TEPPC UPDATE – MIKE DEIS

TEPPC Update

- WECC/TEPPC Up-coming Open Season
 - November 2011-January 2012
- TEPPC Scenario Planning Steering Group (SPSG) continues to work on long-term planning scenario development
 - Currently four (4) scenarios under development
 - Each of the scenario's incorporates a forecast of High vs. Low Economic Growth and Evolutionary vs. Breakthrough Technology

TEPPC Update

- Each scenario also includes predicted outcomes to key drivers identified by the SPSG. They are:
 - The evolution of electricity demand in WECC region
 - The evolution of electricity supply in the WECC region
 - Innovation (smart grid) in electricity supply technology & distribution systems
 - The course of regional economic growth in the WECC region
 - Changes in the regulation of electric power systems in the WECC region
 - Changes in federal regulation affecting electric power industry
 - Changes in social values related to energy issues
 - Changes in society's preferences for environmental & natural resources
 - Shifts in national & global financial markets
 - Shifts in the availability & prices of commodity fuels used in the electricity sector
- SPSG Environmental Data Task Force continues to work on a methodology for analyzing transmission alternatives

TEPPC Update

- SPSG Environmental Data Task Force Update
 - Preparing WECC wide environmental and cultural data sets and associated maps
 - Preparing WECC wide Land classification maps
 - Developing an environmental transmission alternative analysis protocol
 - Developing an economic environmental analysis methodology
 - Developing a stakeholder process

TEPPC Update

- TEPPC moved the WECC 10-year plan to the WECC Board for approval in September. Many stakeholder comments were received.
 - WECC's studies were congestion studies only and did not include reliability studies. In addition, no environmental review was conducted. As result, WECC was asked to modify the report to include caveats that additional studies and analysis is required and/or removal of statements that cannot be supported by the studies.
 - There was significant discussion by the state agencies throughout the WECC on the assumed "foundation lines" that were assumed to constructed by 2020. The state agencies felt that these assumptions may be premature since the states have not approved the need for some of these projects and the overall study assumptions do not reflect the respective state's IRPs.
 - Stakeholders were still unclear on the assumptions made for comparing the cost of California in-state renewables with out-of-state renewables. Certain costs may not have been included in the analysis for out-of-state renewables.
 - The state's wanted the report to include a clarification that the studies represent a potential future outcome instead of a forecast of the future.

NEXT STEPS – MO BESHIR

Next Steps

- Post Final Study Plan
- Complete Power Flow Studies
- Complete Dynamic/Voltage Stability Studies
- Begin Preparing Phase II Report
- Request Executive Committee Meeting for October 6th
- TSC will meet to discuss Statewide Transmission Plan methodology

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Thank you!
