

Heavy Southwest Import Scenario for CTPG
RETI Stakeholder Steering Committee Discussion
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Background

RETI has been asked by the California Transmission Planning Group (CTPG) to assist in the preparation of a renewable energy generation scenario which includes import of substantial amounts of renewable energy into Southern California. CTPG plans to examine the implications of this scenario for California transmission planning in Phase 4 of its 2010 work. RETI and CTPG continue to collect data on renewable generation and transmission planning from utilities and sub-regional planning groups throughout WECC. The structure of the proposed scenario has been discussed by RETI's Regional Transmission Working Group (RTWG) for several weeks.

This paper describes the results of the RTWG discussion to date and outlines the major features of a scenario proposed for purposes of consideration by the RETI Stakeholder Steering Committee (SSC). The SSC may modify the proposed scenario as it sees fit. Upon approval by the SSC, the scenario will be forwarded to CTPG for its Phase 4 studies.

Purpose of the Scenario

The purpose of the scenario is to examine the adequacy of the California transmission grid to handle substantial amounts of renewable energy imported into Southern California. Adequacy of transmission outside California to deliver this energy to the California system will not be considered by CTPG in its Phase 4 study of this scenario.

Basic Considerations for the Scenario

In order to specify the scenario sufficiently, several considerations must be addressed.

1. The amount of energy to be imported. CTPG assumes that the total amount of new renewable energy requiring transmission access and needed to meet a 33% renewable portfolio standard (RPS) equals the amount estimated earlier by RETI, known as the renewable 'net short', 52,764 GWh/year. This value has also been used in previous CTPG studies. The RTWG has discussed the amount of energy to be imported in this scenario as a percentage of the net short.
2. Locations or 'portals' at which the imported energy will be assumed to be injected into the California transmission system and the amounts of energy imported at each location. The choice of these portals and import levels helps determine power flows in California and throughout the WECC.
3. Resources providing the remainder of the net short.
4. Out-of-state renewable energy resources which will provide the imported energy and the characteristics of these resources.

The RTWG has considered all of these issues, as discussed below. This paper describes RTWG recommendations to the SSC on which the group reached consensus or near consensus. Alternative proposals discussed have also been noted for consideration by the SSC.

Import Energy Recommendation

The majority of RTWG participants agree that a scenario in which approximately **40% of the net short** is imported into Southern California represents a reasonable level for purposes identified by CTPG.

This 40% level is comparable to imports in the heavy Northwest scenario previously studied by CTPG.¹ It is believed to be large enough to significantly stress important elements of the California system and allow the studies to provide useful information without being so large as to be extremely unlikely ever to occur. As discussed below, resources comprising the remaining 60% of the net short may include additional out-of-state resources.²

Some RTWG participants argued for a larger amount, concerned that existing available transmission capacity and fossil energy ‘redispatch’³ could result in flows which do not sufficiently stress the system and therefore do not provide useful information. In addition, there is a large amount of new transmission capacity in various stages of planning to deliver renewable energy to California far in excess of the 40% level.

The current value of the RETI net short is **52,764 GWh/year**. 40% of this amount is **21,106 GWh/year**. If the renewable resources providing this energy have an annual average capacity factor of 35%, for example, the nameplate capacity required would be **6884 MW**. The capacity factors and other characteristics of resources proposed to be used in the scenario are discussed below.

Scenario Import ‘Portals’

After considerable discussion, there is apparent consensus from RTWG participants that, for purposes of this scenario, the following locations (substations) should be used as the portals at which the imported energy connects to the California system. In addition, there is near consensus on the amounts of renewable energy imported through each portal, shown as a fraction of the scenario import total.

- Eldorado⁴, NV (50%)
- Palo Verde, AZ (25%)
- North Gila, AZ (25%)

Limiting the imports to the three portals focuses CTPG’s study on the West of River Path (Path 46) and appears to represent the near-consensus focus of the RTWG. These are not the only substations through which power flows into Southern California. Some participants suggested that the Intermountain Power Plant (IPP) in Utah, the Control substation feeding the Owens Valley line, and Imperial Valley’s receipt of proposed energy from Baja California also be included.

¹ See CTPG Phase 3 Report.

² The so-called ‘discounted core’ projects included in the first scenario given to CTPG by RETI included some out-of-state projects.

³ Under current demand forecasts, attaining the 33% RPS goal would require a decrease in conventional generation. CTPG accordingly decreases or ‘redispatches’ fossil energy resources in its power flow model studies. A decrease in the amount of fossil energy imported is expected to increase available transmission capacity on lines carrying imported renewable energy in this scenario.

⁴ Eldorado serves as a proxy for the substations in Southern Nevada serving California.

Additional Resources

There appears to be consensus among RTWG participants that the remaining 60% of the required renewable energy resources should be chosen in a manner similar to that used in the first scenario given by RETI to CTPG earlier this year. In that scenario, the so-called 'heavy in-state scenario', 70% of the net short came from California resources and 30% came from out-of-state (OOS) resources. Those resources were chosen to include a 'discounted core' of projects having power purchase contracts (PPAs) with investor-owned utilities and advanced permitting status. In addition to the discounted core, additional energy from California and OOS resources having lowest cost and least environmental concerns as identified by RETI's ranking methodology were included in the heavy in-state scenario.

Discounted Core Projects

The RTWG proposes that the heavy SW import scenario include the same discounted core of renewable projects as the earlier heavy in-state scenario. These projects have approved PPAs and permit applications which have been approved or at least filed. They contribute capacity and energy to CREZ as shown in the table below:

Table 1 – Heavy In-state Discounted Core			
CREZ		MW	GWh/yr
Carrizo South		760	1,616
Imperial North		49	168
Imperial South		300	648
Mountain Pass		310	800
Palm Springs		37	118
Pisgah		500	1,047
Round Mountain		103	303
San Bernardino-Lucerne		42	96
San Diego South		20	158
Santa Barbara		83	280
Solano		2	5
Tehachapi		1,597	5,000
Non-CREZ		188	1,276
OOS		1,773	5,083
Total		5,764	16,598

As shown in Table 1, the discounted core includes 5,083 GWh/yr of energy from OOS resources located in the areas shown in Table 2:

	Capacity (MW)				Energy (GWh/year)			
	Geoth.	Solar	Wind	Total	Geoth.	Solar	Wind	Total
Idaho/Montana			390	390			1,299	1,299
Nevada - Owens Valley	30			30	231			231
Nevada - Mountain Pass		448		448		1,246		1,246
Oregon			905	905			2,307	2,307
Totals				1,773				5,083

In the heavy in-state scenario, the 5,083 GWh/yr from OOS resources in the discounted core was counted toward the 30% OOS resources total.

Additional California Resources

In the heavy SW import scenario proposed here, it is suggested that the entire discounted core (including OOS resources) be included in the 60% of 'additional resources'. I.e. none of the OOS resources in the discounted core are counted toward the 40% imported through the Southwest. The proposed breakdown of resources in the heavy SW import scenario, by area and annual energy, is shown in Table 3:

Resource	GWh/year	% Total
SW Imports	21,106	40.0%
Discounted Core	16,598	31.5%
Other California	15,060	28.5%
Totals	52,764	100.0%

In the heavy in-state scenario, 'Other California' resources were chosen from CREZ in the lower left-hand quadrant of the RETI bubble chart, pro rated to provide a total of 70% from California resources. In the proposed heavy SW import scenario considered here, it is suggested that these same CREZ be pro rated to provide the 15,060 GWh/yr shown in Table 3.

Characterization of SW Import Resources

In addition to annual energy provided by renewable energy resources, transmission modeling requires knowledge of power flows from these resources which depend on generation technology, nameplate capacity, and time-of-day (TOD) profiles. In the heavy in-state scenario, Black & Veatch provided this information for the discounted core projects and for California CREZ. This information is also available for the Western renewable energy zones (WREZ) which provide energy for the SW imports, once these WREZ are assumed to be known.

For purposes of the heavy SW import scenario, the RTWG has proposed the breakdown of import resources shown below, by portal:

Portal	GWh/yr	% Total
Eldorado	10,553	50%
Palo Verde	5,277	25%
North Gila	5,276	25%
Totals	21,106	100%

The RTWG also recommends that half of the total SW import energy be assumed to be from wind and half from solar resources for each portal. However, the WREZ feeding each portal are proposed to be different for Nevada and Arizona portals, as shown in table below:

Portal	GWh/yr
Eldorado	10,553
Solar, S_NV	5,277
Wind, S_NV & NW_AZ	2,639
Wind, Wyoming	2,638
Palo Verde	5,277
Solar, NW_AZ & SW_AZ	2,639
Wind, NE_AZ & NM	2,638
North Gila	5,276
Solar, SW_AZ	2,638
Wind, NE_AZ & NM	2,638
Total	21,106

Other choices are possible, of course. Black & Veatch has agreed to provide average capacity values and time of day profiles for whatever combination of resources and WREZ is chosen to supply energy to the portals. Maps of renewable energy projects having positions in interconnection queues in neighboring states are included in attachments to this document and are available on the RETI web site.

Conclusion and Next Steps

The discussion above represents the RETI coordinators' best effort to describe the results of the heavy SW import scenario deliberations by the RTWG, but RTWG participants' assessment may be different. In either case, the final choice of scenario parameters is the responsibility of the SSC.

CTPG hopes that the SSC can reach consensus on a heavy SW import scenario at its meeting on 7 October. In the absence of consensus, CTPG's deadline requires them to proceed, using the SSC discussion as the basis for their scenario decisions. The second draft of the CTPG Phase 4 study plan is scheduled to be posted 14 October and the draft Phase 4 study report posted 22 November. A CTPG stakeholder meeting to discuss the results is scheduled for 1 December.