REGENERATE Power

Why the Proposed Strategic Transmission Expansion Plan (STEP) is Good for California

Regenerate Power appreciate the opportunity to participate in this important process and submit the following Comments:

Objective

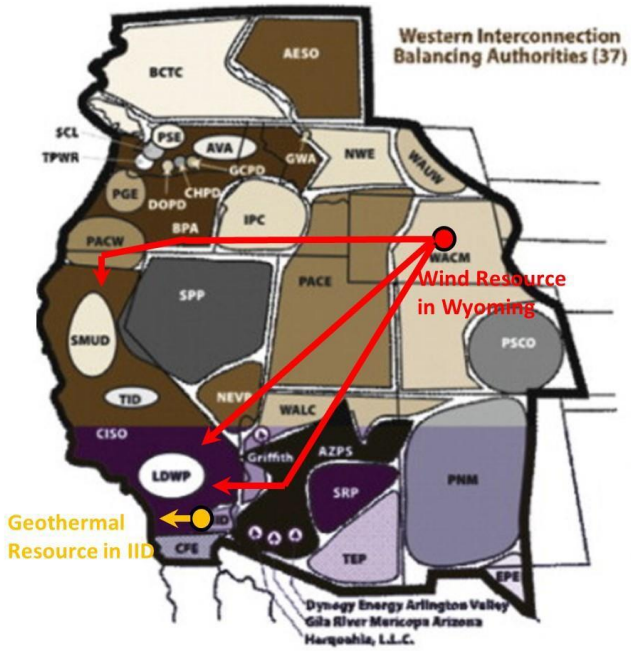
Regenerate Power have submitted a proposed Midway – Devers 500kv line in the CAISO TPP and wishes to point out our views through this high level comparison of renewable energy produced from wind resources located in Wyoming with the renewable energy produced from geothermal resources located in California's Imperial Valley. In addition, we present other important factors such as transmission losses, resource viability, and economic justice along with the Salton Sea restoration efforts that we request that CAISO to consider in their TPP and analysis supporting SB 350 implementation Effort and further evaluated.

Transmission Overview

Similar to paying tolls to drive across a bridge, energy produced in Wyoming and delivered to California would require fees be paid to multiple transmission service providers. The common term "Pancaking" describes paying rates under each service provider's open-access tariff. If transmission rights were not available because a system or systems are fully subscribed (usually an initial review indicates when transmission capacity is or is not available), a new transmission line would be required. A new line would require construction along a route of approximately 1,000 miles at an estimated cost of $29/MWh[1]. Similar multi-regional transmission facilities currently in process have spent more than 10 years stuck in the development phase.

Wyoming wind generation would be interconnected to either the Western Area Colorado Missouri (WACM) service area or Pacific Corp (PACE). Resources located in the Imperial Valley and interconnected to the Imperial Irrigation District's (IID) balancing area would need to acquire and pay for transmission rights from a single transmission service provider (IID). The figure below is a diagram of balancing areas in the Western United States showing how a resource in Wyoming would transmit energy to California.

[1] NREL California-Wyoming Grid Integration Study Phase 1 – Economic Analysis, page viii "Transmission Costs"; See http://www.nrel.gov/docs/fy14osti/61192.pdf .



Energy Losses

Electricity transmitted through power lines produces heat that, through energy exchange become losses. For example, a kWh of energy produced does not result in a kWh of energy available for consumption. The farther the distance the generation source is from the end consumer of energy, the higher the losses.

Every transmission service provider calculates losses to determine how much electricity is lost as it moves through its system. Typically, losses are in the 3-4% range. For example, when electricity leaves Wyoming and is transmitted across multiple service areas, the amount of electricity received in California is roughly 10% less than the original transmitted amount. Energy produced closer to consumer's experience far fewer losses. IID's current loss factor is 3%.

Energy Production Characteristics

Wind generation is characterized by its dependency on the intermittency of wind. Wind generation in Wyoming operates at an estimated 46%[2] annual capacity factor[3]. This means that a 1 MW wind generator will produce 4,030 MWh of electricity annually[4], which corresponds to providing electricity for 598 California residential households[5].

Because geothermal generation is derived from a constant heat source, the capacity factor for typical geothermal facilities is in the range of approximately 97%. A 1 MW geothermal resource will produce 8,497 MWh of electricity annually, which corresponds to sufficient electricity to serve approximately 1,262 California residential households.

Grid Integration

[2] NREL California-Wyoming Grid Integration Study Phase 1 – Economic Analysis, page viii "Transmission Costs"; See http://www.nrel.gov/docs/fy14osti/61192.pdf .

[3] Capacity factor is a ratio energy produced to full production capability over a period of time, typically over a year.

[4] Annual Energy = 1 MW x 8,760 hours per year x 46%

[5] United States Energy Information Administration data from 2014 states that the average monthly consumption for California residential households is 562 kWh; See http://www.eia.gov/tools/faqs/faq.cfm?id=97&t=3 .

Because both resources are dependent upon fuel sources that are not controlled, System Operators have to account for uncertainty in electricity production. System Operators must maintain a set of generation resources that can be called upon within seconds when electricity production or consumption changes. The cost of addressing that uncertainty is higher for wind resources than more certain baseload of geothermal resources. Studies estimate that the cost for wind integration is $5.00/MWh[6], while the cost for geothermal is near zero.

Impact to Local Economy

In communities where these projects are located; especially in a high unemployment area such as Imperial County these projects provide opportunities for work to the local community. The most recent (2014) unemployment statistics showed an unemployment rate of over 23.5 percent in Imperial County the highest in California[7]. Nearly one in four residents of Imperial County live at or below the federal poverty level. The development of the renewable energy industry in Imperial County will provide economic development and jobs to a region of California that is in desperate need.

These projects are estimated to generate ~ $2.5 billion in earnings and $6.5 billion in total economic activity for Imperial, Riverside and San Diego Counties.

High Solar Quality

The Imperial Valley has long been at the forefront of renewable energy production. For nearly 20 years, more than 500 MW of geothermal capacity and associated energy has been produced and delivered to California Load Serving Entities ("LSE"). There is a significant amount of additional geothermal resources in the Imperial Valley. These renewable resources produce zero emissions, utilize proven technologies and are produced in-state.

[6] American Wind Energy Association website "Explore the Issues" tab under the article "Wind Energy and Storage" See http://www.awea.org/Issues/Content.aspx?ItemNumber=5452

[7] http://www.labormarketinfo.edd.ca.gov/file/Maps/County_UR_2014BM2014.pdf

Imperial County is also located near the Chocolate Mountain area which has one of the highest known geothermal resource potential in the country. In addition, the area has the highest solar irradiance as shown in Table 1.

Table 1. Solar Irradiance in the West

Western Locations	Solar Irradiance (kWh/square meter per day)[8]
Phoenix	7.3
Albuquerque	7.45
Denver	6.12
Las Vegas	7.62
Reno	6.49
El Paso	7.36
Imperial	**8.18**
Riverside	6.15
San Bernardino	6.85

Permitting Renewables and Right of Way

On August 2013, the Bureau of Land Management adopted a Record of Decision that approved an amendment to the California Desert Conservation Area ("CDCA") Plan to create the West Chocolate Mountain Renewable Energy Evaluation Area ("West Chocolate Mountain REEA"). The West Chocolate Mountain REEA is located on Federal lands in the Imperial Valley between the Salton Sea and West Chocolate Mountain.

After preparing a Final Environmental Impact Statement, BLM has approved this amendment to the CDCA Plan that identifies BLM managed lands in the West Chocolate Mountain REEA as suitable for geothermal leasing and development as well as strong solar development. In addition, in 2015, the CDCA in collaboration with the California Department of Fish and Wildlife, the federal Bureau of Land Management, and the U.S. Fish and Wildlife Services outlined a specific "preferred alternative" that sets aside more than 2 million acres for renewable energy development in an effort to provide space for up to 20,000 megawatts of new generation by 2040. Solar, wind and geothermal projects would be fast-tracked across these so-called "development-focused areas," benefiting from streamlined environmental review and permitting processes. The preferred alternative is along the Proposed STEP project in Imperial and Riverside counties.

[8] https://maps.nrel.gov/nsrdb-viewer/#/?aL=8VWYIh%255Bv%255D%3Dt&bL=groad&cE=0&lR=0&mC=40.21244%2C-91.625976&zL=4

In support of further renewable development, Regenerate Power has proposed the Strategic Transmission Expansion Plan ("STEP") that would provide the necessary transmission for Southern California load centers to access renewable energy from the West Chocolate Mountains REEA. The STEP initiative is designed not only to facilitate the export of Imperial Valley renewables to the Southern California load centers but also to deliver this energy to other regions of the Southwest. Approximately 70 percent of the proposed STEP system has already been permitted by IID. This will greatly ease the burden of siting and permitting.

Cost Effective

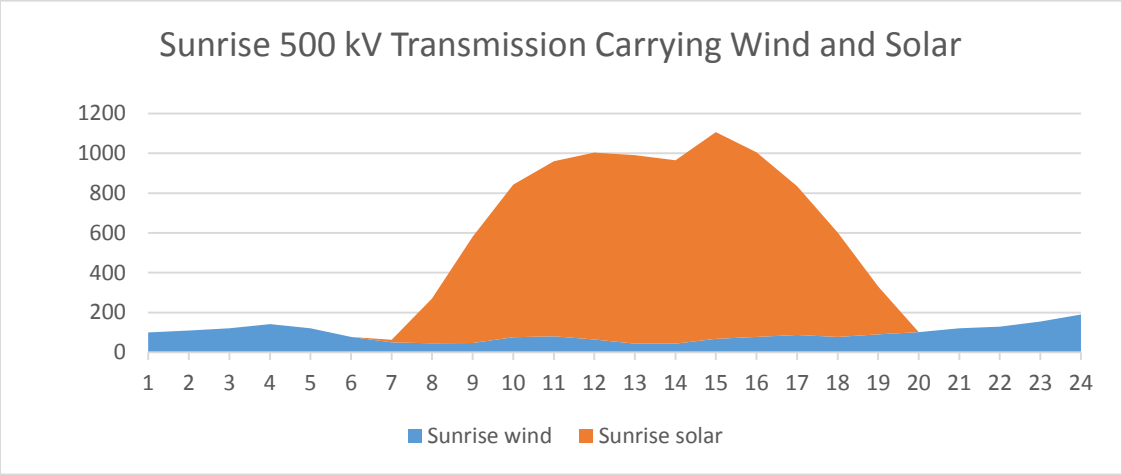
Regenerate Power submitted its STEP proposal into the CAISO 2013-14 and 2015-16 Transmission Planning Process request window. Although its proposed configuration could be refined, the STEP proposal's key element is a new 1100 MW; 500 kV AC transmission line from IID's existing Midway substation to SCE's existing Devers substation. The 500 kV circuit will span about 75 miles from the Imperial Valley to SCE's substation near Palm Springs.

The STEP also allows for further expansion of AC line capability by an additional 1100 MWs as well as further expansion of the capacity on the collector system in the Imperial Valley. Furthermore, this project could be completed with relatively limited environmental impacts.

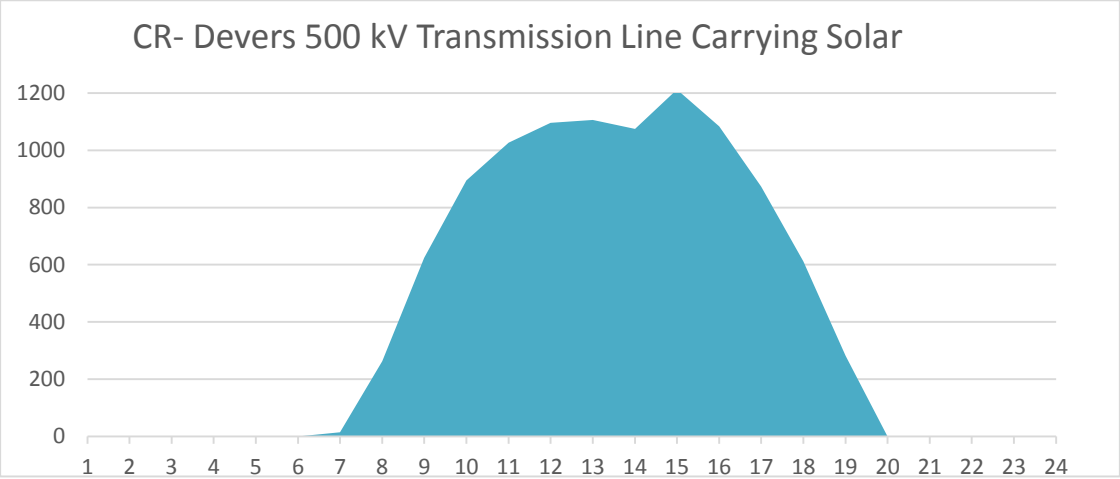
STEP maximizes the use of transmission. The ability for STEP to be able to tap into three renewable resources is quite advantageous from ratepayers' perspectives.

The use of transmission capacity is typically measured by the capacity factor (cf). The higher the capacity factor, the lower the cost to ratepayers. The summer daily capacity factors are listed below.

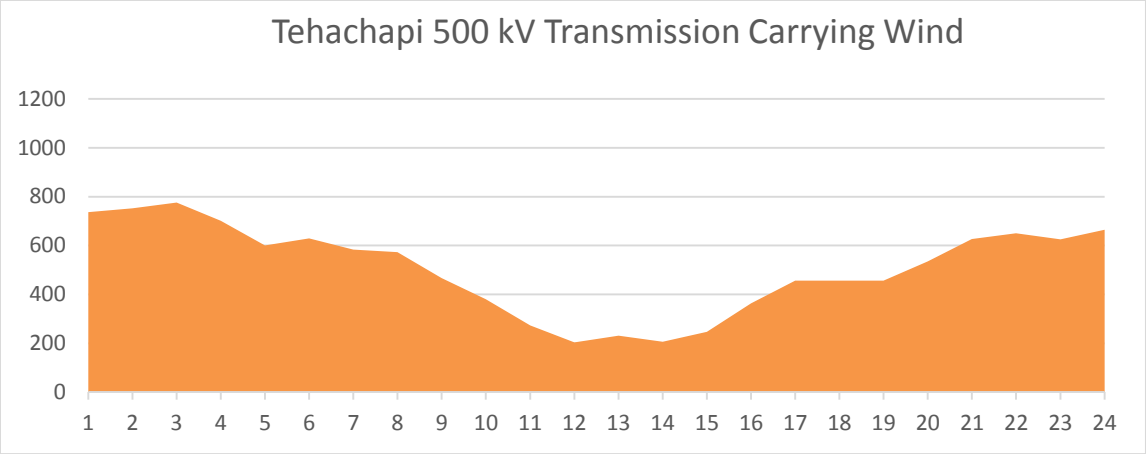
Sunrise Power Link Capacity Factor = 37.9%



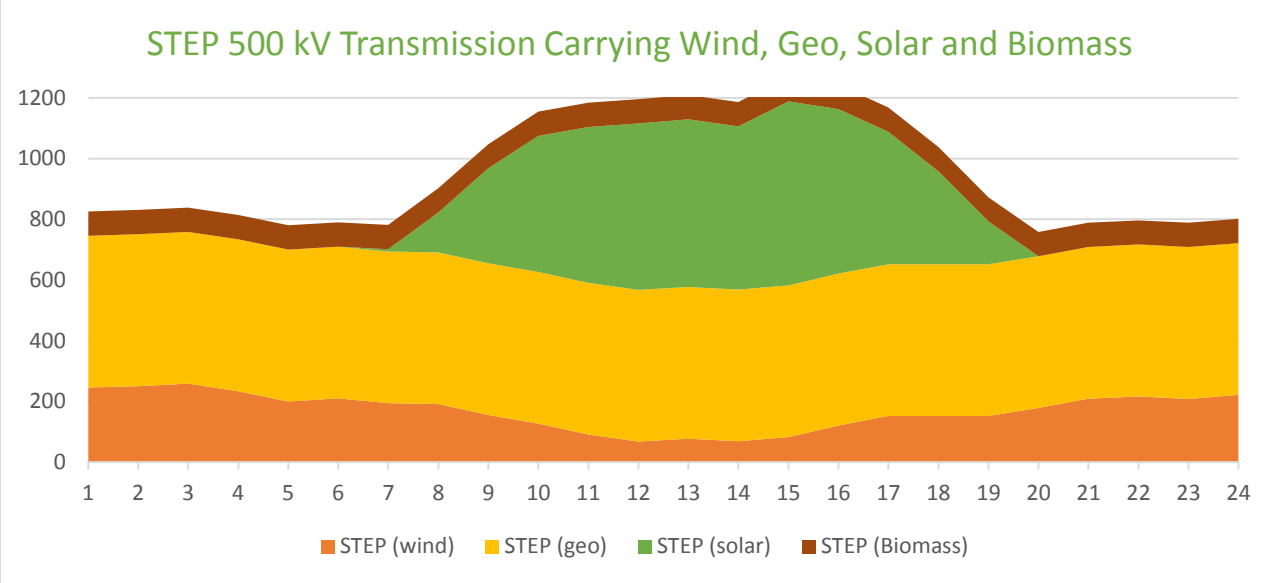
Colorado Rivers - Devers Capacity Factor = 35.3%



Tehachapi Transmission Line Capacity Factor = 42.3%



STEP Capacity Factor = 80.4%



Conclusion

The capital cost of the proposed STEP is approximately $375 million for 1100 MW. This project represents significant (by a factor of 2 to 6) lower cost that recent and similar completed transmission projects in Southern California. Therefore, the cost to California ratepayers is significantly below the current 10$/MWh transmission cost. This project will not increase the current transmission rate but would rather decrease it.

On the surface, wind resources in Wyoming appear to be a low-cost, high capacity factor source of renewable energy for California. However, when other important aspects (transmission, grid integration, energy production characteristics, resolving the Salton Sea Environmental disaster and impacts to local economy a) are considered, geothermal resources located in Imperial Valley become a superior and more viable alternative than wind from Wyoming. The table below summarizes the key points of this comparison.

Table 2. Comparison of Wyoming Wind vs. Imperial Geothermal

Resource	New Transmission Cost ($/MWh)	No. of Utilities' Systems	Capacity Factor	Existing Transmission Cost ($/MWh)	Losses	Integration Cost ($/MWh)	Total Cost Using Existing Transmission ($/MWh)	Total Cost Using New Transmission ($/MWh)	Homes Powered
Wyoming Wind	$29.00	4	46%	$21.74	13%	$5.00	$29.57	$34.00	495
	$29.00	2	46%	$14.96	6%	$5.00	$20.86	$34.00	535
IID Geothermal	N/A	1	97%	$2.39	3%	N/A	$2.46	N/A	1,164

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