Clean Coalition
Making Clean Local Energy Accessible Now

Planning Distributed Generation for Transmission Savings[1]

By Kenneth Sahm White and Stephanie Wang[2]

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The Clean Coalition recommends that state regulators and utilities account for potential transmission savings when planning for and awarding contracts to resources on the distribution grid. Distributed generation can have significant locational value to ratepayers, including avoided transmission costs, avoided line losses, and avoided transmission and distribution upgrade costs. Such value especially applies to any portion of the generation that is deemed "deliverable" and does not exceed 100% of the coincident load at the substation, as all such generation avoids use of transmission system and associated access charges when delivering energy to load. This local generating capacity may also avoid, reduce, or defer the need for additional new transmission capacity. For example, the PSEG Long Island, formerly Long Island Power Authority, recently offered a 7¢/kWh premium to 40 MW of appropriately sited solar DG facilities to encourage locational capacity sufficient to avoid $84,000,000 in new transmission costs that would otherwise be incurred, resulting in a net savings of $60,000,000.[3]

The Clean Coalition is a California-based nonprofit organization whose mission is to accelerate the transition to local energy systems that deliver cost-effective renewable energy, strengthen local economies, foster environmental sustainability, and enhance energy security and reliability. The Clean Coalition drives policy innovation to remove barriers to procurement, interconnection, and realizing the full potential of integrated distributed energy resources, such as wholesale distributed generation, advanced inverters, demand response, and energy storage. The Clean Coalition also designs and implements programs for utilities and state and local governments, including demonstrating that local renewables can provide at least 25% of the total electric energy consumed within the distribution grid, while maintaining or improving grid reliability. The Clean Coalition participates in numerous proceedings in California agencies and before other state and Federal agencies throughout the United States.

In collaboration with Pacific Gas & Electric, the Clean Coalition is currently performing a detailed analysis of the economic and environmental impacts of a high distributed

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[1] Adapted from Clean Coalition testimony to the California Public Utilities Commission in A.12-01-008 and A.12-04-020 on January 10, 2014 by Kenneth Sahm White, prepared by Stephanie Wang, and Clean Coalition comments to the California Public Utilities Commission in R.11-05-005 relating to the potential reauthorization of the Renewable Auction Mechanism, by Kenneth Sahm White and Stephanie Wang.

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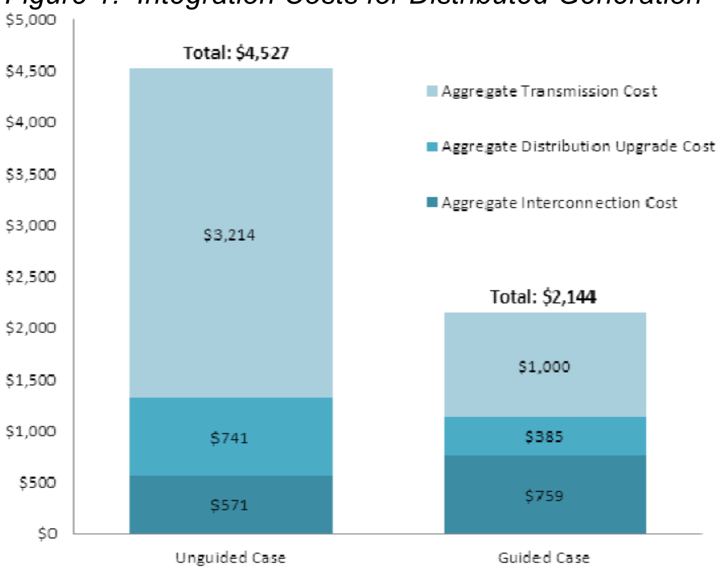
[3] Proposal Concerning Modifications to LIPA's Tariff for Electric Service, available at http://www.lipower.org/pdfs/company/tariff/proposals-FIT070113.pdf. LIPA's guidance states: "The rate will be a fixed price expressed in $/kWh to the nearest $0.0000 for 20 years applicable to all projects as determined by the bidding process defined below, plus a premium of $0.070 per kWh paid to projects connected to substations east of the Canal Substation on the South Fork of Long Island."

generation and intelligent grid project for the underserved Bayview-Hunters Point area of San Francisco. The Hunters Point Project, named after the substation that serves both the Bayview and Hunters Point areas, will demonstrate the feasibility and practicality of providing up to 25% of total electric energy consumption though local renewable generation, effectively meeting the bulk of current RPS requires through a combination of wholesale DG and DG on the customer side of the meter. As part of the Hunters Point Project Analysis,[4] the Clean Coalition found that over the course of 20 years, each additional 10 MW of local distributed generation will avoid $7,580,000 in Transmission Access Charges, $2,367,000 in line losses, and an average of $6,100,000 in new transmission capacity costs.

Similarly, a May 2012 study by Southern California Edison found that transmission upgrade costs for their share of the Governor's goal of 12,000 MW of distributed generation could be reduced by over $2 billion from the trajectory scenario. The lower costs were associated with the "guided case" where 70 percent of projects would be located in urban areas, and the higher costs were associated with the "unguided case" where 70 percent of projects would be located in rural areas.[5]

Figure 1: Integration Costs for Distributed Generation



Source: Southern California Edison[6]

We recommend that regulators and utilities use the following standards and rules for determining the locational value to be associated with distributed resources for avoided Transmission Access Charges (TAC), avoided future TAC rate increases on all transmission dependent energy, local capacity value, avoided transmission system impact costs, and avoided line losses.

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[4] The Clean Coalition's Hunters Point Project Benefits Analysis is available at http://www.clean-coalition.org/site/wp-content/uploads/2013/12/HPP-Benefits-Analysis-19_jb-20-Dec-2013.pdf.
[5] The Impact of Localized Energy Resources on Southern California Edison's Transmission and Distribution System, SCE, May 2012
[6] The Impact of Localized Energy Resources on Southern California Edison's Transmission and Distribution System, SCE, May 2012

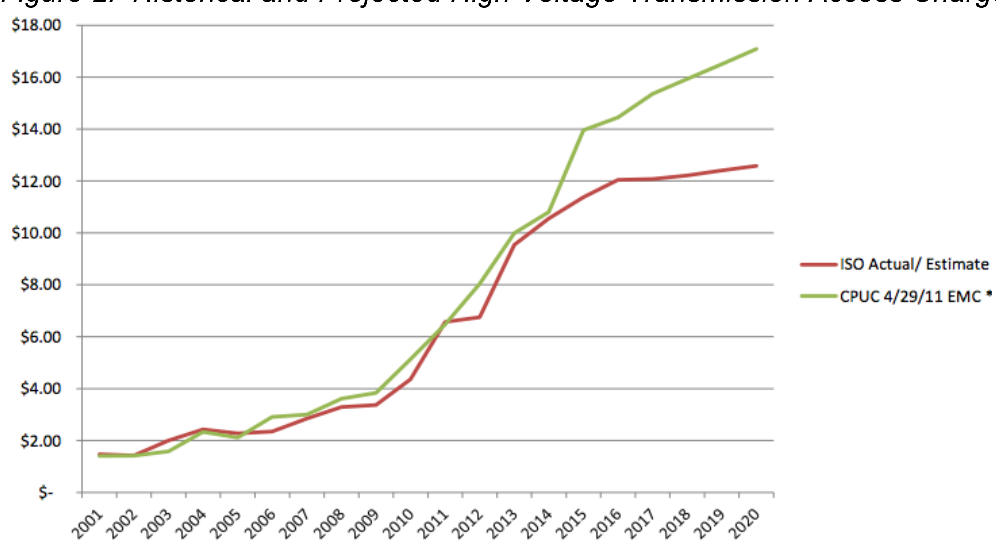
a. *Avoided Transmission Access Charges*

Transmission related costs of delivering energy from remote generation are often combined into costs that are charged by the transmission operators. In California, these costs are called Transmission Access Charges (TACs). This is a flat "postage stamp" fee for every kWh delivered to the distribution system from the transmission grid. TACs are avoided by energy that is delivered directly to the distribution system to serve loads on the same substation.

The High Voltage TAC is currently charged at $8.86/MWh and is consistent throughout the CAISO system. The Low Voltage TAC applies to the CAISO operated portion of systems within each individual utility service territory. For PG&E, the use rate charged is currently $6.057/MWh, resulting in a total 2013 charge of $14.92/MWh (1.492¢/kWh). While the threshold definition of sub-transmission voltage and ISO operation varies between utilities, comparable cost allocation occurs either through ISO charges or internal utility accounting.

TAC rates have increased at an annualized rate exceeding 15% since 2005 as new transmission dependent generation has been approved, and new transmission capacity is far more costly than maintaining existing capacity. CAISO mid value estimates for the rate of increase in TAC charges will be substantially less than the recent trend and prior CPUC estimates, as illustrated below. Utilizing CAISO's current projected average future estimate of 7% nominal escalation (5% real) over the next 20 years, the levelized current value of avoidable TAC charges applicable to a 20 year distributed generation power purchase agreement is 2.4¢/kWh.

Figure 2: Historical and Projected High Voltage Transmission Access Charges ($/MWh)



Source: CAISO 2012[7]

[7] http://www.caiso.com/Documents/BriefingLong-TermForecastTransmissionAccessCharge-Memo-Nov2012.pdf

The Clean Coalition recommends the following test for assigning avoided TAC costs to the value of an eligible project. Any portion of the generator's output that is below minimum coincident load (MCL) at the substation level will not utilize the transmission system, and therefore should be credited for avoided TAC costs. Any portion of the generator's output that is above MCL at the substation level will be deemed to backfeed to the transmission system and will not be credited for avoided TAC costs.

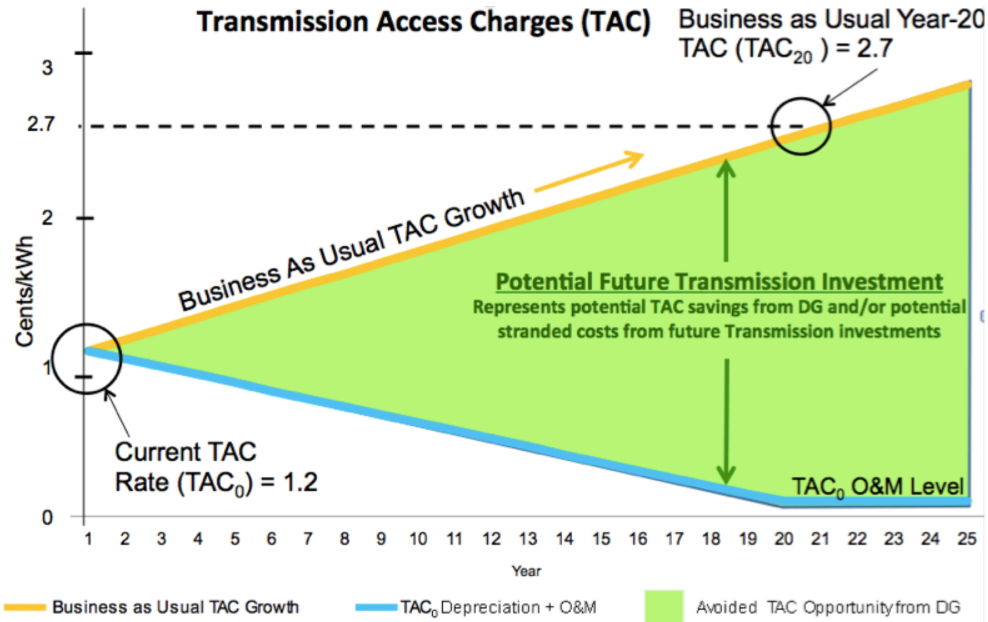
For example, if 90% of the output of a generator falls below MCL, and 10% of the output is above MCL, then the 10% of the output would be presumed to backfeed to the transmission system and would be associated with TAC charges. The project would be associated with the additional value of avoided TAC charges and avoided future TAC rate increases for 90% of its output over the course of its 20-year contract.

California Transmission Access Charges specific to each utility are calculated by CAISO each year. This data is publicly available and more accurately reflects the locational value than may be currently practical in assessing distribution impacts. In short, TACs are specific charges applied to each unit of energy only where it is delivered through the transmission system, and represent very good proxy for significant avoided transmission costs. Ideally, projects would be compared based on the value of existing infrastructure used for delivery of energy, even if only on a per MW mile or per MW standardized basis. At the very minimum, differentiation should be made based on the assessed delivery charges borne by ratepayers for both high voltage (HV) and low voltage (LV) transmission, as reflected in TACs or, in the case of SCE's own LV system, a comparable charge. For example, when comparing a project with energy deliveries incurring both HV and LV TACs against one serving regional load using only low voltage transmission, the difference in delivered energy costs for ratepayers is currently about $8/MWh.

b. Avoided future TAC Rate increases on all transmission dependent energy

Deploying distributed generation projects that displace transmission sourced energy during peak demand periods avoids the need to increase transmission capacity, which allows existing transmission investments to depreciate and preempts future investments in transmission – both of which reduce future TAC rates, as reflected in the diagram below.

Figure 3: Clean Coalition estimate of TAC increases



Source: Clean Coalition, 2012

The orange "Business as Usual" line represents the expected growth in TACs as more investment is made in the transmission system to accommodate additional remote generation. The blue line represents the decrease in TACs that is possible if that net additional remote generation was entirely replaced with distributed resources (the down ramp is based on a 40-year average depreciation schedule for TACs-related assets like transmission lines). Thus, the green wedge represents the potential cost savings achieved with distributed resources and continued operation of existing transmission capacity.

Reduced demand on transmission will reduce or defer the need for additional investment to expand transmission capacity, slowing the growth in TAC rates that is driven by the need to recoup new investment costs. Reducing the need for new investment in transmission will reduce charges across the board for all energy utilizing the system in a Merit Order Effect.

Transmission costs vary widely between projects, but if an average figure of $1 million is used as the marginal cost per megawatt of new transmission capacity, the savings are seen to accrue rapidly. While existing transmission will still be broadly utilized to supply energy during hours in which local intermittent DG is not available, even intermittent DG can offset its full generation capacity in new transmission capacity required for peak annual transmission loads.

With approximately $20 billion in planned future investments, 1 gigawatt of aggregated avoided new transmission capacity resulting from procurement of DG represents a 5% reduction in the basis for future TAC rates, or 0.005% per fully qualifying MW. Taking a levelized 20-year TAC rate of 2.4¢/kWh, a 0.005% reduction results in a savings of 0.0012¢/kWh. This appears a very small number, but this savings would be realized by virtually all of the 254,000 GWh[8] consumed within CAISO transmission system electricity by 2020 which is subject to TAC charges. These Merit Order cost savings in TAC charges at 0.0012¢/kWh would equal $30,540 in annual CAISO wide ratepayer savings for each MW reduction in required transmission capacity, assuming a 1:1 peak annual capacity reduction. Applied to a DG PV output of 1,500 MWh/MW/yr, this results in an added ratepayer value of 2¢/kWh. While the applicable transmission capacity reduction will depend on CAISO projected relationship between the generation and peak demand profiles, the value of avoided future transmission capacity cost is too large to ignore.

As the CAISO evaluates transmission requirements and costs under the approved CPUC resource development scenariosin the Transmission Planning Process, values associated with both general peak load reduction and specific regions can be clearly established. Historical values may be recognized through review of CPUC approved transmission procurement and transmission costs identified in each utility's rate base.

c. *Local Capacity Value*

We recommend that regulators and commissions explicitly include the local capacity value of projects located within a transmission constrained local resource adequacy area. For example, in calculating the avoided cost value of local generation when developing the standard offer price for the Palo Alto CLEAN Program PPA, the City of Palo Alto Utilities estimated the value of avoided local capacity purchase costs at 0.7¢/kWh.

d. *Avoided transmission system impact costs*

California's Renewable Auction Mechanism program adjusts the value of projects based on whether transmission upgrades to be reimbursed by ratepayers will be required.[9] The Clean Coalition recommends this test for assigning avoided transmission upgrade costs to certain projects when comparing projects.

e. *Avoided line losses*

Where line losses are avoided, these should be recognized in determining the value of a resource. Average transmission losses are tracked by CAISO for each regional transmission zone and average 3% statewide (with the exception of the LA Basin).[10] Losses also occur on the distribution system, averaging 3%, and proportional to the distance between energy supply and load. Where generation is located in closer proximity to load, these losses may also be reduced. System wide losses are

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[8] California Energy Demand 2012-2022 Final Forecast Volume 1: Statewide Electricity Demand and Methods, Mid Energy Demand

[9] Commission D.10-12-048

[10] CAISO, *2012 Local Capacity Technical Analysis Final Report and Study Results*, April 29, 2011

substantially higher due to congestion factors during peak demand periods, averaging approximately 10%, and time of delivery differentials should be recognized.[11]

[11] Table ES-1: Comparison of Loss Factors, *A Review of Transmission Losses in Planning Studies*, August 2011, California Energy Commission, CEC-200-2011-009