



**BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA**

FILED
5-13-16
04:59 PM

Order Instituting Rulemaking to consider policy and implementation refinements to the Energy Storage Procurement Framework and Design Program (D.13- 10-040, D.14-10- 045) and related Action Plan of the California Energy Storage Roadmap.

Rulemaking R.15-03-011
(Filed March 26, 2015)

**COMMENTS OF TeMix Inc.
ON STATION POWER AND MULTIPLE-USE APPLICATION
WORKSHOPS**

May 13, 2016

Edward G. Cazalet
CEO
TeMix Inc.
101 First Street, Suite 552
408-621-2772
ed@temix.com

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Overview

Thank you for this opportunity to comment on the issues and solutions for multiple use applications (MUA) for storage and distributed generation. To address these issues simply and effectively we propose the following:

- Unbundling tariffs for all energy produced or consumed on the distribution grid (transmission, or customer connected) into two-way tariffs for energy products and distribution service products. Both spot and longer-term forward tariffs would be offered.
- The two-way energy tariff prices all energy at the retail/transmission interface wholesale prices including allocations of fixed energy and transmission costs. Buy and sell prices per kWh are on hourly, 15-minute or 5 minute intervals depending on metering resolution.
- The two-way distribution tariff recovers more of the largely fixed costs of distribution grid with higher per kWh prices when a distribution feeder is more heavily loaded in either direction. The same intervals as for energy are used. The price of distribution thus varies by interval and is different for each distribution feeder and perhaps for each section

of a feeder depending on net flow on the feeder. Counter flows to the net flow in each interval are paid the associated interval distribution price.

In these comments we show that the MUA cases raised in this proceeding can be straightforwardly addressed with this approach. We do not address wholesale issues to properly price wholesale energy and transmission services that impact storage and generation anywhere on the grid.

As this is not a ratemaking proceeding we do not propose specific tariff rates or tariff language; we only outline a cross-cutting approach to address MUA issues for storage and distributed generation as a more effective alternative to other solutions to the MUA challenges offered in this proceeding.

Background

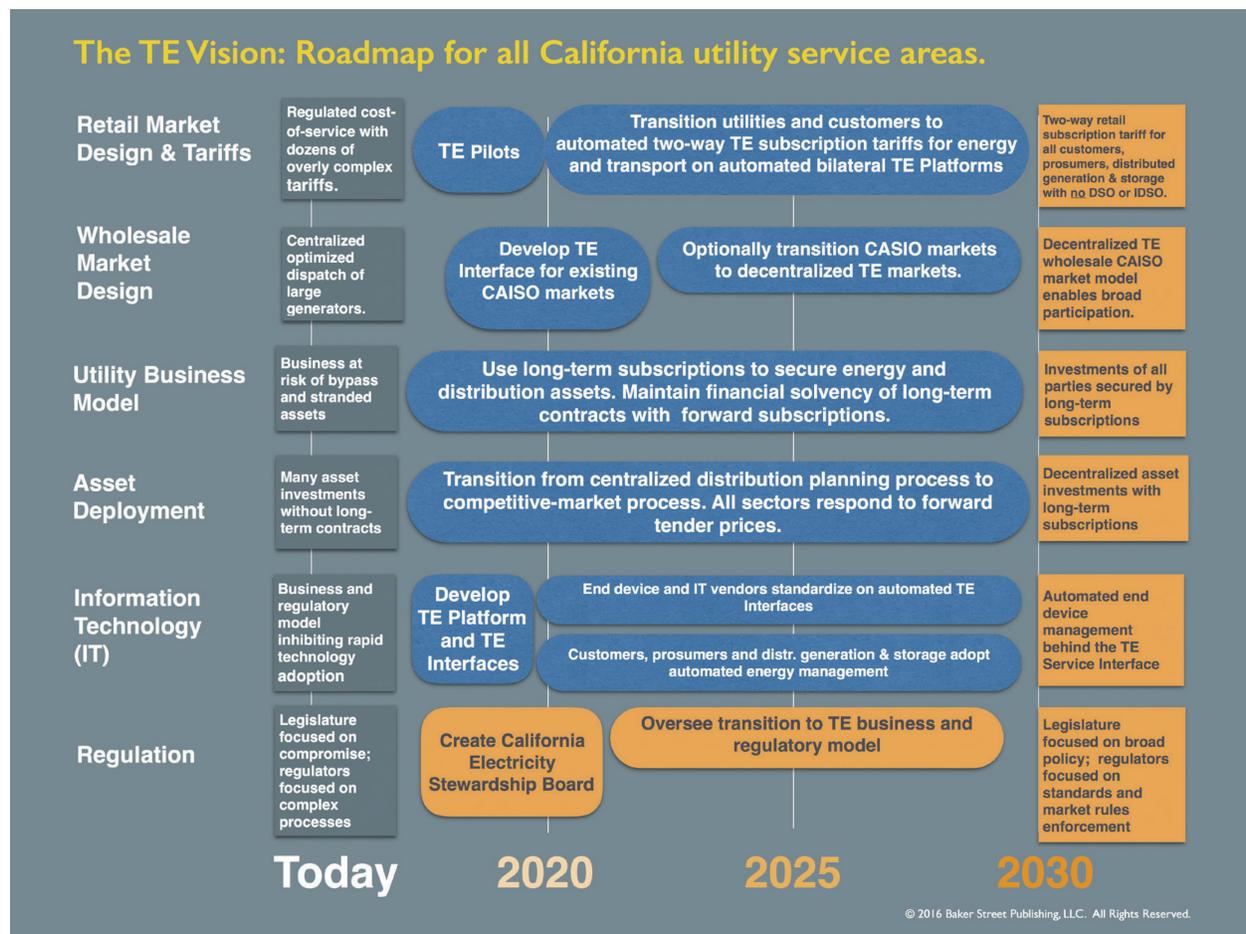
TeMix has previously provided comments on the CAISO's Energy Storage and Distributed Energy Resources (ESDER) Phase 2 Issue Paper that is related to this CPUC proceeding: <https://www.caiso.com/Documents/TeMixIncComments-EnergyStorageandDistributedEnergyResourcesPhase2-IssuePaper.pdf>.

In our CAISO ESDER comments, we stated that the core of the MUA problem is retail energy and distribution tariffs that poorly coordinate wholesale operations and investment with distribution operations and investment and end-customer use, generation, and storage. TOU tariffs with fixed blocks now being considered by the CPUC and real-time pricing tariffs are inadequate for the required wholesale, distribution and retail coordination. Demand response concepts using estimated baselines cannot be trusted for two-way response compensation on the distribution grid and behind-the-customer-meter. Aggregation of storage and distributed resources and demand response for CAISO dispatch is complex, inefficient and inaccurate and is currently unable to coordinate well with distribution operations. Proposals to form a Distribution System Operator (DSO) or an Independent DSO (IDSO) are likely years from fruition, and are complex, expensive and will not address these coordination issues well.

Alternatively, we propose “A Sustainable Electricity Business and Regulatory Model and Roadmap for California Electricity”

(http://www.sepa51.com/submissions/Roadmap_Reports/Baker%20Street%20Publishing_TeMix_TransactiveEnergy.pdf.) We submitted this model and roadmap for California to the SEPA 51st State Project Phase 2 (<http://www.sepa51.com/submissions.php>) that was held in Denver CO, on April 13, 14 2016. We now offer this California transactive energy (TE) vision and roadmap for consideration by the CAISO, CPUC and the stakeholders. The references in this roadmap describe the extensive standards and technology development over many years that supports this proposal.

One of the key illustrations in the roadmap document is the roadmap swim lane diagram shown below:



This vision and roadmap outlines a comprehensive and practical roadmap for California that is better, faster, lower cost and less complex than current plans for California. And it can be implemented incrementally without institutional changes such as a creating DSO or ISDO or requiring retail competition and without major changes to CAISO or IOU and POU distribution systems. The proposal will eliminate the problems of estimated baselines for demand response, storage and distributed generation on the distribution grid that are elements of the ESDER Phase 2 initiative. As we explain below it will support the multiple-use, autonomous dispatch of storage and other distribution connected and behind-the-customer-meter resources while fully coordinating distribution operations and transmission operations that are the subject of this CPUC proceeding.

The MUA Problem

The common thread with the multiple use application (MUA) cases that are the focus of this proceeding is that distributed resources should be able to provide services to any or all end-use customers, the distribution grid and the CAISO market. As is proven in current practice and by workshop comments, current and proposed retail and wholesale markets and tariffs do not support monetization of all revenue streams for distributed storage and generation resources and often require metering, control, market systems and settlement systems that are so costly and complex that costs are likely to exceed the benefits.

The CPUC has identified five MUA cases for comment in this proceeding as summarized in the table below:

Storage/Generation Location	Providing Services To		
	End-Use Customers	Distribution Grid	CAISO Market
1: Front of Meter		√	√
2: Behind the Meter	√	√	
3: Behind the Meter	√		√

4: Behind the Meter		√	√
5: Behind the Meter	√	√	√

The first four cases are special cases of the fifth case, especially if we consider the first case as behind its own meter, but without an end-use customer load. This means by addressing the fifth case we address all five MUA cases.

To address the MUA monetization and complexity problems, we propose the California electricity roadmap and specifically the two-way energy and distribution tariffs briefly described above. This roadmap supports the transition to demand-side, responsive customer end use, and the phase out of supply-side demand response and its complications of estimated baselines, complex systems for aggregators, Load Serving Entities (LSEs), Distribution Operators (DOs), the CAISO and end customers.

In this roadmap end use load responsiveness and behind-the-customer-meter generation and storage are load modifiers as seen by the CAISO, LSEs and DOs. Customers can be either buyers or sellers of energy at any point in time. Distribution connected storage and generation are also load modifiers and storage will be buyers in some intervals. All uses, generation, and storage are autonomously operated and invested in by their owners or third parties acting on their behalf; all are responsive to the prices of wholesale energy and distribution service transport.

Two-way subscription tariffs for energy and distribution transport coordinate both spot operations and long term forward investments between the customer and the wholesale energy and distribution transport service markets (see example in the figure below). These tariffs also apply to behind the customer meter and in front of the meter distribution connected storage and generation. There is no need for end users and distributed generation and storage to bid into a centralized dispatch by the CASIO, DO or a future DSO and incur the complexities of resolving dispatch conflicts, double payments, and estimated baselines made evident by workshop comments.

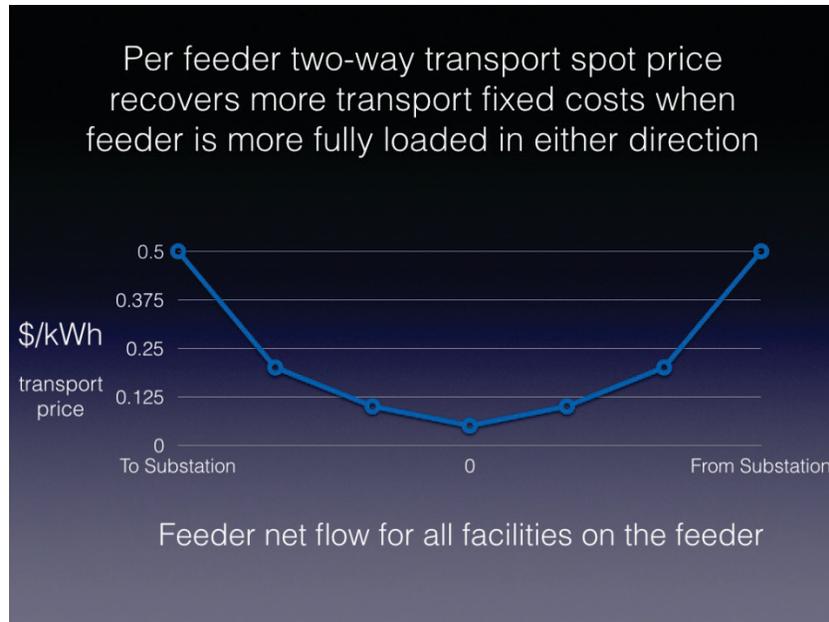
Example of how a two-way subscription TE tariff works for a typical retail consumer.

- Based on my typical usage or production, I automatically transact for subscriptions for prescribed quantities of energy and transport in each hour of the year(s) for a fixed monthly payment (subscription.)
- If I use less than I subscribed for in each hour then I am paid for the difference at spot prices.
- If I use more than I subscribed for then I pay for the difference at spot prices.
- As my needs change I can automatically buy or sell to modify my subscriptions at the current tendered prices from a Transactive Energy Platform.

This means stable bills for customers and stable revenues for distribution operators and energy suppliers.

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The development of the spot prices on distribution feeders is illustrated in the figure below. The basic idea, as already mentioned, is to recover the same fixed distribution costs but more of the costs with higher \$/kWh distribution prices when the feeder is more heavily loaded in either direction. For example at higher loadings the prices may reflect long-run marginal distribution cost and at low loading the prices may reflect short-run marginal distribution costs. Furthermore, the forward subscriptions for distribution transport will provide revenue and cost stability.



The forward and spot energy prices incorporate wholesale energy, capacity and transmission costs. Wholesale RA requirements will be reduced as a result of the load modified by the investment and operation of distributed generation and distributed in response to wholesale forward and spot prices. Hence, wholesale RA is a product that need not be transacted with distribution and behind the customer meter connected resources.

With the two-way energy tariff all energy is priced at wholesale; there is no need for distributed energy resources to participate directly in the CAISO dispatch market or indirectly as a participant in a virtual power or storage plant aggregation that is participating in the CAISO market. The CASIO locational prices, properly communicated with adjustments for fixed costs will provide compensation to distributed resources and price responsive end use.

Storage and distributed generation owned and operated by a utility load serving entity are treated no differently than such resources owned and operated by any other party.

Wholesale ancillary services are addressed in this approach as is reactive energy.

An MUA Example:

In this example we consider the fifth and most complex use case, behind the customer meter storage providing services to the end customer, distribution operator and the CAISO.

Wholesale energy prices:

- With the proposed two-way tariffs when wholesale spot energy prices are high perhaps as a result of high grid-wide loads and low grid-wide supply then all end customers and their distributed storage, and generation will see high spot prices to buy and sell energy in each interval of an hour, 15- or 5-minutes.
- When the wholesale spot energy prices are low and perhaps negative because of high grid-wide solar production in relation to the total grid-wide load of all end customers connected to the wholesale grid then all end customers and their distributed storage and generation will see low or negative prices to buy and sell energy in each spot interval of an hour, 15- or 5-minutes.

Distribution transport prices:

- When the distribution feeder to an end customer and its distributed generation or storage is heavily loaded from the transmission substation such as when customers on the feeder have high evening air conditioning load then the distribution spot \$/kWh price will be high for flows from that transmission substation. Counter flows towards the substation at this time will be paid this distribution price.
- When the distribution feeder is heavily loaded from the customers toward the substation, such as when end customer PV generation is high for many customers on the feeder then then the distribution spot \$/kWh price will be high for flows towards that transmission substation. Counter flows from the substation at this time will be paid this distribution price.

The price seen by the end customer, its distributed generation such as PV, its storage and its price responsive appliances will be the total of the energy and the distribution price in each interval.

Mid-day with low solar penetration and high midday air conditioning loads, an end customer's total price will be high. Customers with PV will benefit at these high prices by load displacement and sales of any excess generation.

As PV penetration grid wide and on the customer's specific feeder increases, then mid-day energy prices may be negative and the distribution price for flows from the customer to the transmission substation will be high. The customer's PV system may then automatically shut down. However, a customer with storage would get paid to charge its storage mid-day and then could discharge the storage in the evening when both energy and distribution prices from the substation are high.

Aided by the subscription capability of the two-way subscription tariffs, customers, DOs, suppliers of distributed generation and storage, and suppliers of wholesale generation and storage wholesale parties and can also enter into long-term contracts to support investments.

SUMMARY

We suggest that market participants will continue be unsatisfied with the solutions to the MUA challenges that are possible given the current directions of this and related CPUC proceedings. Without a solution to the MUA challenges many distributed resources will appear uneconomic. The vision and roadmap outlined in these comments provide a comprehensive and practical roadmap for California that is better, faster, lower cost and less complex than current plans for California.

/s/ Edward G. Cazalet

Edward G. Cazalet
CEO
TeMix Inc.
Tel: 408-621-2772
E-mail: ed@temix.com