

Transactive Energy Tariffs and Markets for Smart Consumers, Prosumers, DG, Storage, Microgrids and T&D

Agrion Microgrid Taskforce

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Current Utility Tariff Issues

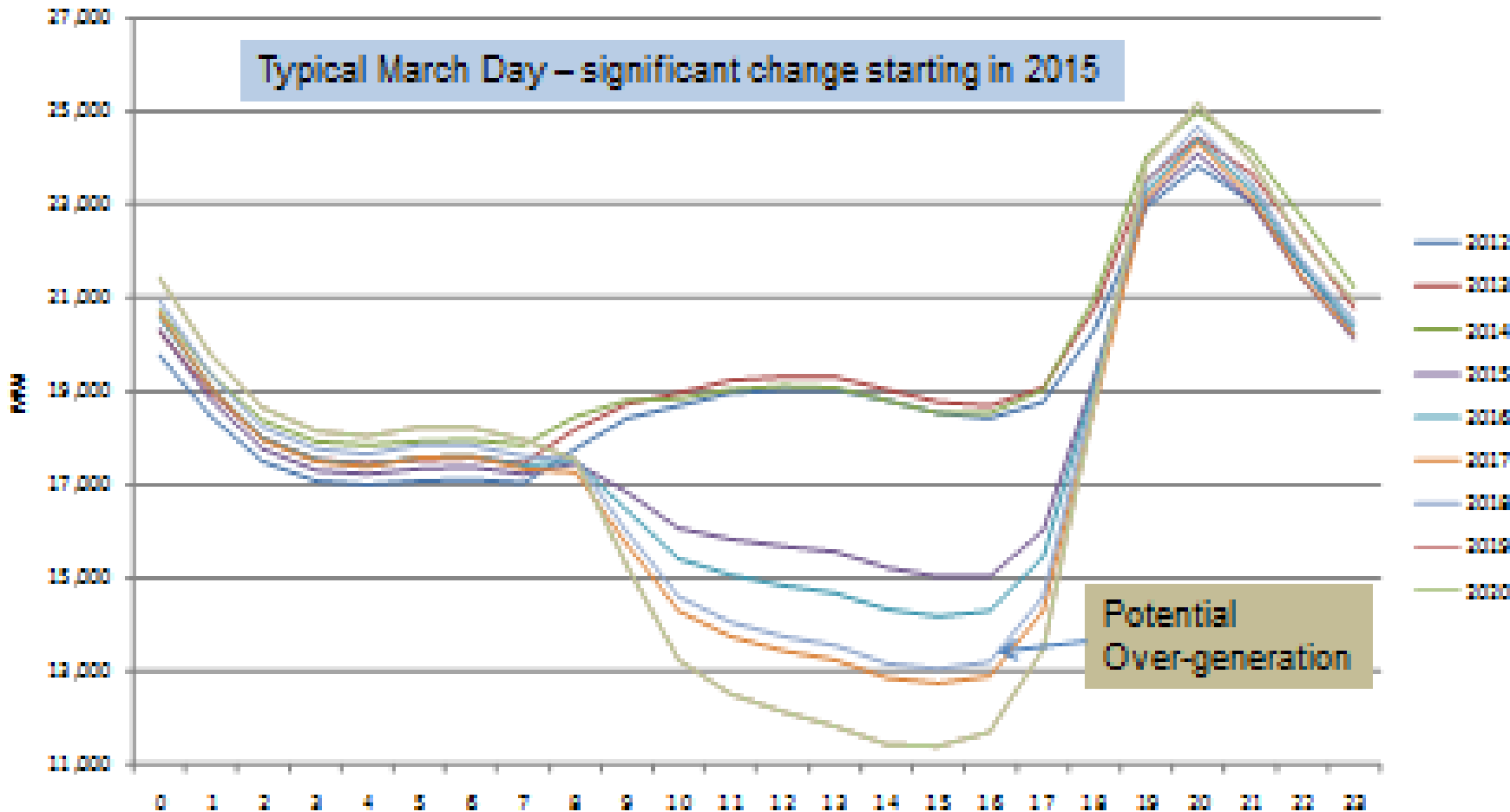
1. Volumetric charges versus fixed charges
2. Incentive for self-supply
3. Microgrids disconnecting from the grid in response to fixed charges
4. May lead to the utility “death spiral” from an ever-increasing non-virtuous cycle of dwindling revenues requiring higher rates

Proposals in CPUC Residential Rates OIR

1. Increasing block monthly prices & baselines
2. Time of Use (TOU)
3. TOU + CPP
4. Fixed charges
5. Demand charges
6. Event-based demand response
7. Unbundling of commodity, distribution & other services

Will TOU & CPP Help in 2020?

CAISO Net Load --- 2012 through 2020



The Underlying Problems

1. Each IOU has about 70 complex tariffs
2. Special interests engaging in negative-sum game
3. Utility, CPUC and CASIO silos of interest
4. Disconnects between retail and wholesale markets, prices and structure
5. New crisis every decade

Transactive Energy Tariff Proposal

1. Simple Standard Retail Energy and Distribution Tariffs for all customers and technologies – Smart Consumers, Prosumers, DG, Storage, Microgrids and T&D
2. Forward Subscriptions with balancing and variable prices on increasingly shorter intervals
3. Single-part pricing – no significant fixed charges and demand charges
4. No embedded subsidies – use side payments for policy based subsidies.

What is Transactive Energy?

1. Policy: Transactive Energy engages customers and suppliers in decentralized energy transactions that strive towards economic efficiency, reliability, and environmental enhancement.
2. Market: Transactive Energy is a business process for energy transactions among parties.

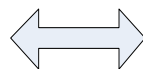
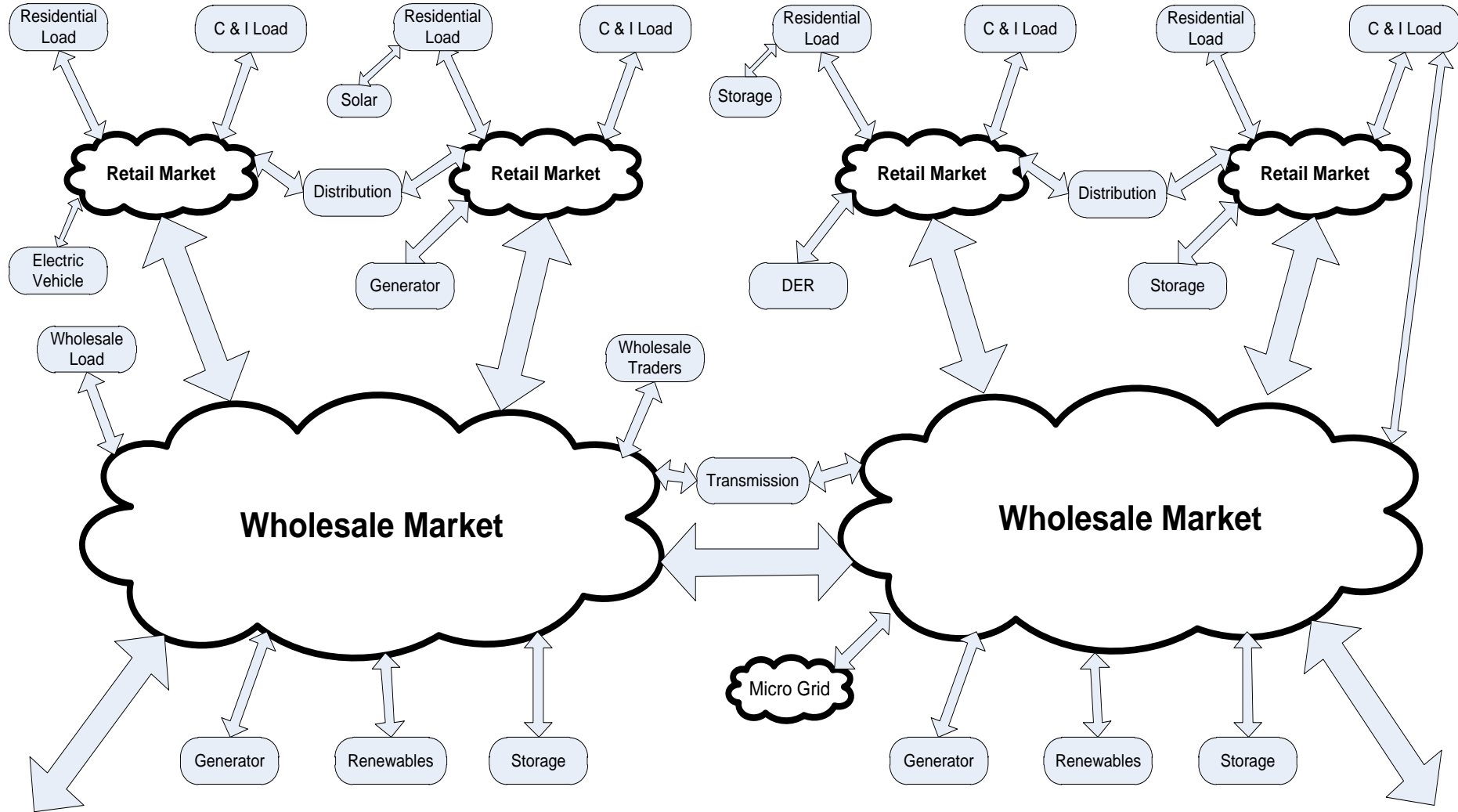
Transactive Energy Policy

1. Sustainable energy: efficiency, reliability, renewables, and resilient decentralized generation
2. Coordinated decentralized investment and operation decisions
3. Parties and their automated agents control their own devices, facilities, T&D, etc. and not those of other parties
4. Comprehensive market oversight

Transactive Energy Market Design

1. Simple Products: Subscriptions for Energy and Transport (T&D)
2. Products combine energy & capacity - kWh
3. Simple Forward Transactions:
(Price, Quantity, Start, Duration, Interface, Side)
4. Coordination by mutually beneficial forward tenders and transactions among parties
5. Market Clearing: peer-to-peer, bilateral, retail tariff, or exchange

Transactive Energy Markets



Two Examples

1. Transactive Retail Subscription Tariffs
2. Five-Point Transactive Energy Policy

Transactive Retail Subscription Tariffs

1. Retailer & distribution operator make forward buy and sell tenders for unbundled subscriptions to customers
2. Customer agent accepts or ignores tenders as transactions for subscriptions
3. Repeat 1 & 2 as necessary
4. Delivery imbalance: metered quantity less accumulated subscription quantity for each settlement interval paid or credited at all-in variable ex-post price

(see www.CalFER.org)

Transactive Distribution Tariffs

1. Customers subscribe forward for a slice of the distribution grid
2. Distribution forward subscriptions payments recover all fixed and variable distribution costs
3. Customers that use more than their subscription automatically buy from other customers at variable prices
4. Customers that use less than their subscription automatically sell to other customers at variable prices

Five-Point Transactive Energy Policy

1. Legislature/ PUC: unbundled retail energy and distribution subscription tariffs
2. FERC/ ISO or RTO:
 - \$10,000/MWH wholesale price cap
 - -\$2,500/MWH wholesale price floor
 - post forward buy and sell 5-minute and 15-minute tenders
3. Legislature/PUC: locational retail prices

Five-Point Transactive Energy Policy

4. PUC: deploy current surplus, decentralized generation /storage, and flexibility from transactive tariffs before new centralized capacity
5. Legislature/PUC/FERC:
 - accelerate competitive access
 - aggressively monitor markets

Transactive Energy Links

1. OASIS eMIX <http://bit.ly/11CZs6O>
2. OASIS Energy Interop <http://bit.ly/1585fQO>
3. Automated Transactive Energy (TeMix) <http://bit.ly/1580gPS>
4. Transactive Device Architecture <http://bit.ly/U8tydX>
5. Draft Transactive Energy US Roadmap <http://bit.ly/X1lw6x>
6. Transactive Energy Association (TEA) www.tea-web.org
7. TeMix Inc. www.temix.com

TEA Discussion Links

1. INTRODUCTION TO TRANSACTIVE ENERGY:

What is Transactive Energy? <http://lnkd.in/EUqVy3>

Transactive Energy Description and Benefits <http://lnkd.in/NGwdsZ>

2. TRANSACTIVE RETAIL TARIFFS:

Which Should Come First, Customer Automation or Transactive Energy Tariff?

<http://lnkd.in/8adFp5>

Transactive Energy for ERCOT Retail Markets <http://lnkd.in/7cneEh>

Transactive Energy for California IOU Tariffs http://lnkd.in/wZ_pHm

3. TRANSACTIVE ENERGY FOR THE END-TO-END GRID:

How Will Transactive Energy Assist the California Grid? <http://lnkd.in/ycgFPM>

Transactive Energy and Ancillary Services <http://lnkd.in/idDTU3>

4. TRANSACTIVE SUBSCRIPTIONS FOR T&D AND FIXED COSTS:

Transactive Energy Recovery of Fixed Costs <http://lnkd.in/-a6RuV>

Transactive Energy and Net Energy Metering <http://lnkd.in/WreWmi>

TEA Discussion Links

5. RELIABILITY AND CONTROL:

Does Transactive Energy Need Capacity Products? <http://lnkd.in/e498JX>

Transactive Energy and Control/Management <http://lnkd.in/62qnUa>

Transactive Energy and Grid Reliability and Adequacy <http://lnkd.in/uSWzqz>

6. CUSTOMER BENEFITS:

Where is the Value for the Customer? <http://lnkd.in/humHrh>

Is It Worth It? <http://lnkd.in/SgGh63>

Smart Devices and Transactive Energy Spot Prices <http://lnkd.in/fCswB7>

7. RELATED TOPICS:

Transactive Energy and Peer-to-Peer Home Energy <http://lnkd.in/zfcuAk>

How Does TE Deal With Issues Such as Coal Externalities? <http://lnkd.in/XyvgQf>

From EISA 2007 to Transactive Energy <http://lnkd.in/m6aVmU>

Transactive Energy and the Smart Toaster <http://lnkd.in/nvsHd4>

Transactive Energy in a 100% Solar & Wind Grid – A Thought Experiment
<http://lnkd.in/B4Wbh9>