

TEMIX, a transactive profile of EMIX 1.0

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Technical Committee:

[OASIS Energy Market Information Exchange \(eMIX\) TC](#)

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- Energy Market Information Exchange (EMIX) 1.0 Committee Specification Draft 04 (<http://docs.oasis-open.org/emix/emix/v1.0/csd04/emix-v1.0-csd04.html>)

Abstract:

Summary of the purpose of the document

Status:

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10 1 Introduction

11 TeMIX (Transactive Energy Market Information Exchange) is a subset or profile of the EMIX
12 information model for Transactive Energy (see EMIX Note XX on Transactive Energy)¹. The TeMIX
13 profile is described by conformance rules defined in EMIX 12.3. These rules restrict each TeMIX
14 transaction to a single interval. For each interval, the rate of delivery of energy (power) over the
15 interval is constant. For example, if the interval duration is one hour then the rate of delivery
16 (power) for each five minute sub interval in the hour is the same. This makes it easy to add up a
17 number of transactions for different intervals for a month, day, hour and 5-minute interval to
18 determine the position in each 5-minute interval. TeMIX conformance rules also restrict the
19 intervals to standard nested intervals such as a year, month, day, hour, and 5-minutes.

20 TeMIX products are restricted to Energy and Transport in single intervals and Options on these two
21 products.

22 TeMIX tenders and transactions are useful for price discovery, negotiation and response to grid
23 conditions using many small, automated tenders and transactions. Complex positions with ramps,
24 shaped delivery, and storage and withdrawal can be automatically constructed and modified from
25 several small TeMIX transactions of various sizes, durations and start times.

26 1.1 References

27 **NOTE:** The proper format for citation of technical work produced by an OASIS TC (whether Standards
28 Track or Non-Standards Track) is:

29 [Citation Label]

30 Work Product [title](#) (italicized). Approval date (DD Month YYYY). OASIS [Stage](#) Identifier and [Revision](#)
31 [Number](#) (e.g., OASIS Committee Specification Draft 01). Principal URI ([version-specific URI](#), e.g., with
32 filename component: [.../csd01/somespec-v1.0-csd01.html](#)).

33 For example:

34 **[CAP-1.2]**

35 *Common Alerting Protocol Version 1.2*. 01 July 2010. OASIS Standard. [http://docs.oasis-
open.org/emergency/cap/v1.2/CAP-v1.2-os.html](http://docs.oasis-
36 open.org/emergency/cap/v1.2/CAP-v1.2-os.html)

¹ TeMIX was first described in a Draft White paper approved by the EMIX Technical Committee
"Transactive Energy Market Information Exchange [TeMIX] an approved White Paper of the EMIX TC. Ed
Cazalet et al. <http://www.oasis-open.org/committees/download.php/37954/TeMIX-20100523.pdf>." This
paper was written in the early stages of the work on EMIX and has not been updated to utilize the
information models developed by the EMIX Technical Committee.

2 Transactive Energy Dynamic Price Example

This example is for a Load Serving Energy (LSE) serving retail customers (residential, commercial, industrial, distributed generation, or storage). The example applies to competitive and regulated LSEs. Determination of price is out of scope for this example. The LSE price is an *all-in price* for energy, transmission, distribution and fixed charges. The LSE tendered price is for the sale or purchase of a specific quantity of energy (a Tender) to a customer for a delivery interval and at a location. The buy and sell price and quantity may differ. Prices may vary by customer class. Customers will typically respond to LSE tenders but can also submit tenders to the LSE.

This example does not discuss the transactions between the LSE and the distribution operator, the system operator markets, other wholesale markets and other parties. Such transactions may or may not be based on TeMIX. The example assumes each retail customer purchases from a single LSE, but TeMIX allows for a retail customer to interact with multiple LSEs at the same time where regulations permit.

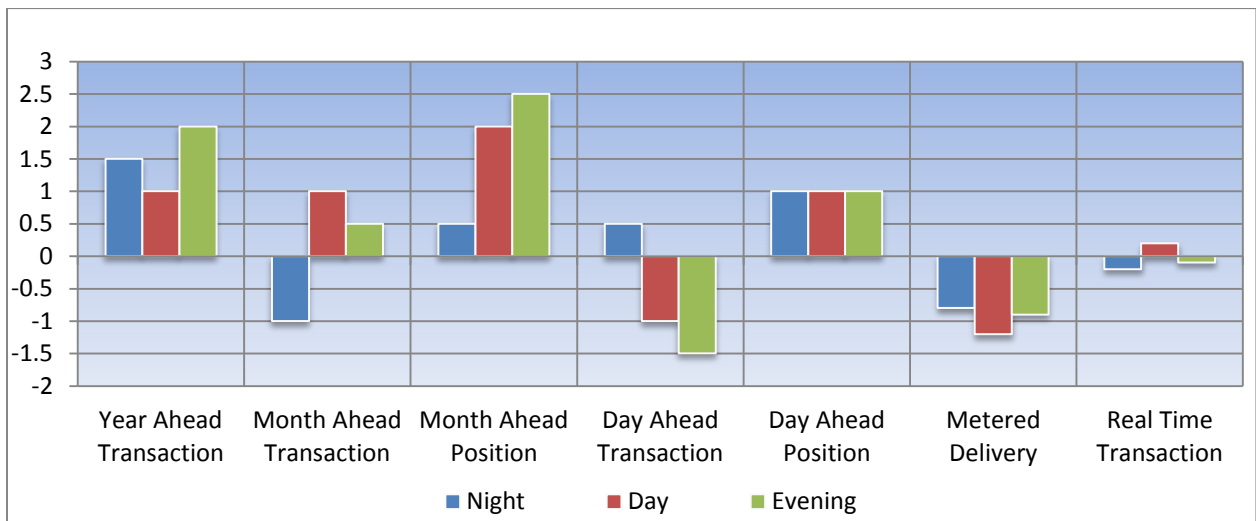


FIGURE 1: ILLUSTRATIVE SEQUENCE OF FORWARD AND REAL TIME TRANSACTIONS

The sequence of transactions in Figure 1 illustrates this example. TeMIX profile conformance rules are used. The sequence begins with LSE tenders for night, day, and evening blocks of power for a year at a buy and sell price. The tenders may be made one or more years ahead of delivery and a tender may be withdrawn before acceptance and a new tender made at any time. The customer may use behind the meter generation (such as PV or storage) to offset its usage or to sell the LSE. The tender price is cost- or market-based depending on the LSE's regulatory status. The customer or an automated device decides the transacted quantity in each block and the customer is obligated to pay the transacted price and quantity.

Monthly and daily, the LSE also may tender similar blocks of power at current buy and sell prices. The customer or the customer's device may transact to adjust his position as indicated in Figure 1. The customer incurs default 5-minute transactions for any difference between the 5-minute position

63 in each interval and the measured delivery at a real-time price posted before or after the close of the
64 interval.

65 The LSE may make tenders at any time. For example, ahead of each 5-minute interval the LSE may
66 tender energy in each 5-minute interval for each of the 5-minute intervals in the next two hours.
67 Customers may then forward buy and sell 5-minute energy at forward prices.

68 TeMIX transactions may be automatic using devices acting on the behalf of the customer and based
69 on customer preferences and not the LSE's preferences. Tenders made by the LSE will typically
70 reflect the LSE's marginal short and long-run costs for wholesale energy, ancillary services,
71 transmission congestion, transmission access, T&D losses, distribution congestion and other fixed
72 items. Theoretically, all such costs may vary by interval and be reflected in a varying price in each
73 interval. When because of variable demand, plant outages, transmission outages, variable wind or
74 solar or high levels of electric vehicle charging the tendered prices for each interval location and
75 customer price response can help to bring supply and demand into balance at each location on the
76 grid. For cost-based LSEs, the prices must, on average, recover regulated cost and profits.

77 TeMIX Tenders can be for small quantities offered to a retail customer at the tendered price. If the
78 customer needs more, then the customer can access additional tenders, perhaps at different prices.
79 The responsiveness of the customer to priced tenders provides information to the LSE on customer
80 price sensitive demand that helps guide the LSE's bids into system operator markets and transactions
81 in other forward wholesale markets. By working with sequences of small tenders and transactions
82 stability of the grid is also protected from sharp price changes avoiding the use of random or
83 arbitrary restrictions on the customers to smooth responses to price changes or control signals from
84 the LSE.

85 Real Time Pricing (RTP) can be viewed as an application of TeMIX where the only transaction is for
86 the metered delivery of energy. The forward transactions in the above example are forward hedges
87 to the RTP to manage risk for both the customer and the LSE and to provide forward information for
88 forward wholesale transactions by the LSE. RTP may be optional or mandatory and forward
89 transactions may be optional or mandatory depending on regulations. This approach provides the
90 full incentive for customers and smart devices to save money based on responses to real-time prices
91 while providing for hedging and forward commitment where customers and LSEs must make forward
92 decisions.

93 3 Summary

94 For LSE's and retail customers, TeMIX is most useful for smart meter enabled customers that use
95 smart appliances and other such devices. TeMIX provides transacted baselines in each interval so
96 that the response of customers to price is discovered without verification and statistical estimation
97 of baselines. Settlement and billing is simplified. The same system can apply to regulated or
98 competitive LSEs and to all customer classes and distributed energy resources. A major advantage of
99 TeMIX in this application is that customers and their automated devices respond with giving up any
100 control of devices to the LSE and without providing forecasts or demand curves to the LSE's.

101
102 TeMIX also has applications in other grid domains. The dynamic processes of TeMIX can help to
103 enable the coordinated, decentralized operation of variable renewables, distributed generation,
104 customer appliances, industrial processes, electric vehicles, storage, and peak load management
105 with distribution, transmission and centralized generation which is an important goal of the smart
106 grid.

107

108

Appendix A. Acknowledgments

109 The following individuals have participated in the creation of this specification and are gratefully
110 acknowledged:

111 Participants:

112 [Participant Name, Affiliation | Individual Member]

113 [Participant Name, Affiliation | Individual Member]

114

Appendix B. Some Section

116

Appendix C. Revision History

Revision	Date	Editor	Changes Made
01	2011-09-29	Ed Cazalet	Initial Document
02	2011-09-30	Toby Considine	Converted to standard format

117