



ERCOT Emergency Interruptible Load Service

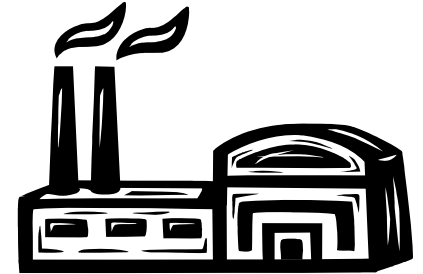
OVERVIEW

Updated: July 2009



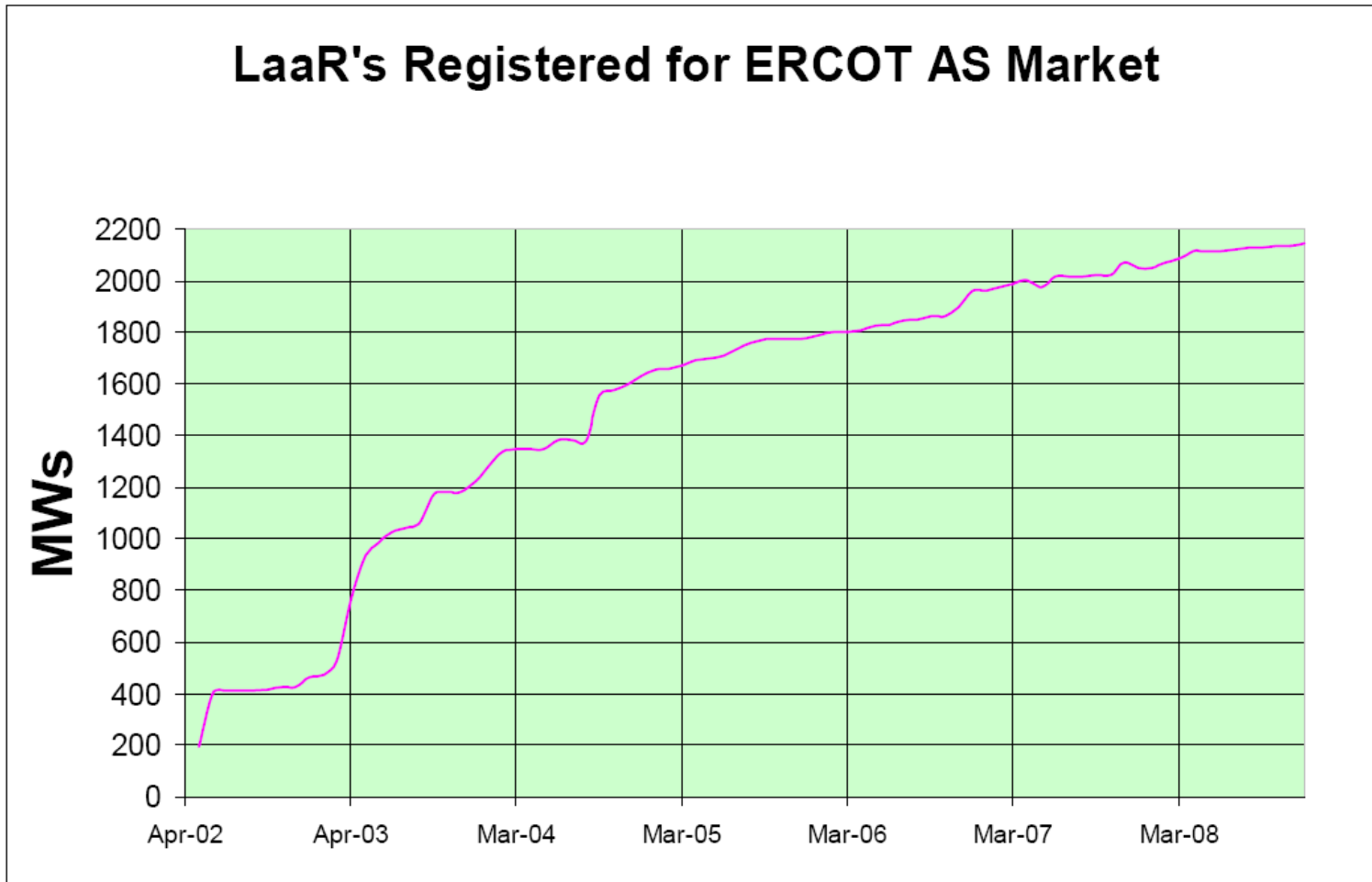
Interruptible Loads in ERCOT: A Brief History

- **Prior to 2001, a reported 3200 MW of customer load (mostly industrials) provided an emergency interruptible safety net**
- **Customers' year-round electric rates were discounted in exchange for this**
- **In May 2000, ERCOT deployed interruptible loads four times during emergency conditions**
 - Unseasonably hot weather
 - Nearly 20% of generation fleet out for planned maintenance
 - New wave of gas-fired generation had not yet come online



- **Loads Acting as a Resource (LaaRs):**
 - When the ERCOT market was restructured (Senate Bill 7, effective 1/1/02), PUC urged market participants to develop new vehicles for load participation
 - LaaRs became the market-based replacement for interruptible tariffs
- **LaaRs can provide ERCOT Ancillary Services (operating reserves)**
 - Responsive Reserves
 - LaaRs regularly provide ERCOT Responsive Reserves up to an 1150 MW cap (total RRS procurement of 2300-2800 MW)
 - Market payment = ~\$30 avg. per MW per hour (YTD in 2008)
 - Also eligible to provide:
 - Non-Spin Reserve (30 minutes notice)
 - Regulation Up and Down Service (Controllable Load Resource-type LaaRs only)
 - Replacement Reserve Service
- **Ancillary Services markets are run each day for the following day**

137 LaaRs currently registered with a peak interruptible capacity of 2121 MW



- **LaaRs providing RRS can be deployed in 4 ways:**
 1. Automatic trip based on Under Frequency Relay (UFR) settings
 2. Verbal Dispatch Instruction (VDI) by ERCOT during Energy Emergency Alert (EEA)* event (deployed as block)
 3. VDI during frequency event reportable to NERC (deployed as block)
 4. VDI to solve a local congestion issue (location-specific)
- **LaaRs have been deployed 9 times since April 2006:**
 - April 17, 2006 EECP VDI
 - Oct. 3, 2006 Frequency event VDI
 - Dec. 22, 2006 Frequency event UFR & VDI
 - July 2, 2007 Frequency event VDI
 - Sept. 5, 2007 Frequency event VDI
 - Dec. 12, 2007 Frequency event VDI
 - Feb. 28, 2008 EECP VDI
 - Mar. 16, 2008 Frequency event UFR & VDI
 - Aug. 11, 2008 Frequency event VDI

* Formerly Emergency Electric Curtailment Plan (EECP) (amended by PRR 775, effective 5/1/09)

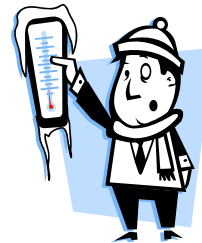


EILS Background

- **ERCOT Operators have the authority to instruct transmission & distribution utilities to curtail service to selected customers to avoid a system-wide outage**
- **These rotating outages have been ordered by ERCOT twice since 1989:**

- Dec. 22, 1989

- Extreme cold during morning peak
- Deployed 500 MW for 30 minutes

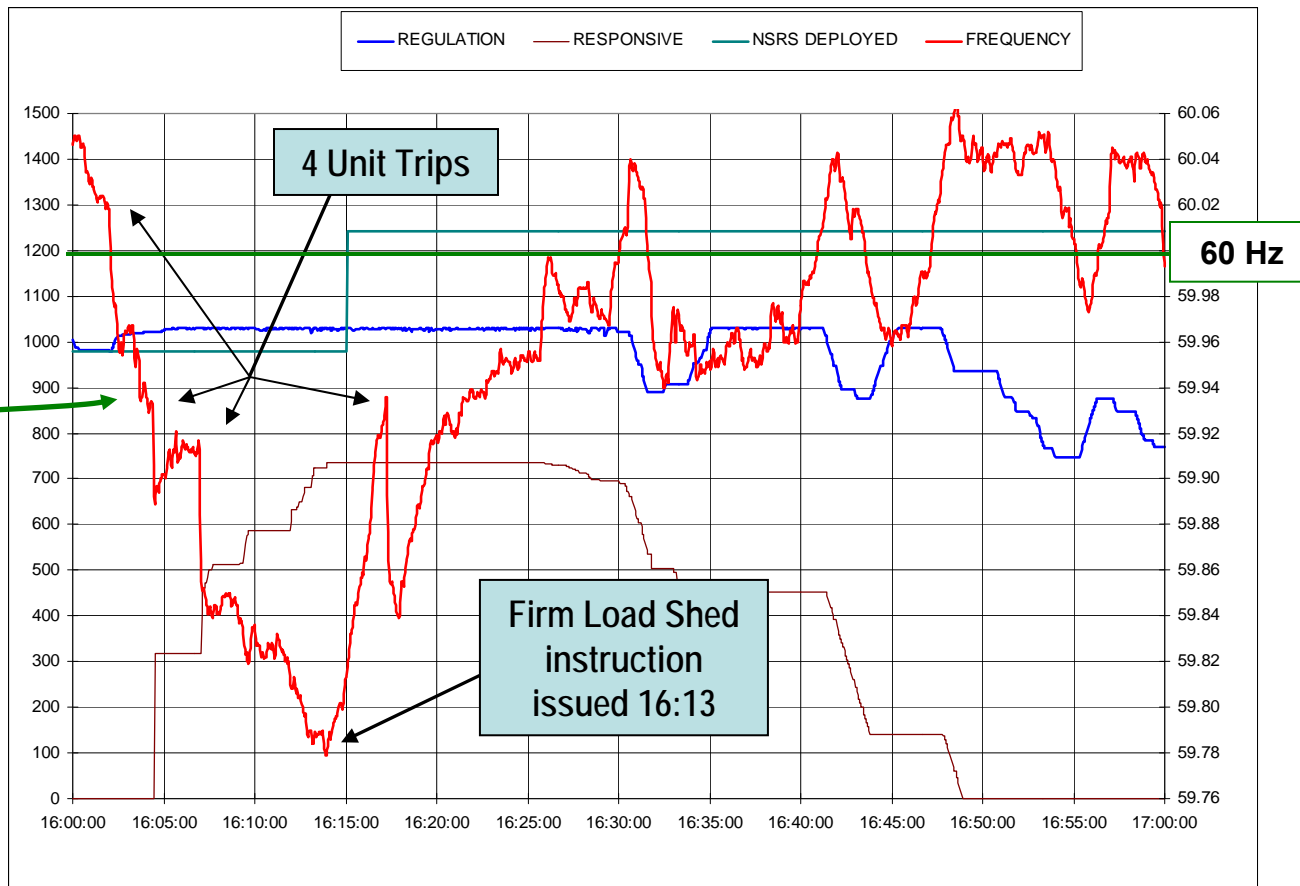


- April 17, 2006

- Extreme heat during afternoon peak
- Deployed 1,000 MW for almost 2 hours



- **20% of generation fleet (14,000 MW) out of service on planned maintenance**
- **ERCOT load forecast missed daily peak by nearly 10%**
 - DFW temperatures exceeded weather forecast by 5 degrees F
 - 100 degrees vs. usual high in low 80s
- **Five major unit trips during peak hours**
- **Emergency Electric Curtailment Plan (EECP) initiated**
 - All available generation, private network and maximum DC Tie supply deployed
 - LaaRs providing RRS deployed
 - 1,000 MW of firm load shedding (rotating outages) ordered by ERCOT
 - Approx. 2% of load tripped at distribution level over 2 hour period
 - Public appeal for conservation issued & remained in effect thru 4/18



- Additional resources deployed shortly after 16:00 could have averted the need for firm load shedding

- **Firm load shedding has been ordered only twice since 1989, but much has changed in Texas since then:**
 - Since the market was restructured (1996-2001), new generating units must be built by unregulated competitive companies
 - Regulators no longer have control over investment decisions
 - Since 2002, reserve margins have steadily declined
 - Fewer available generating resources adds to risk
 - ERCOT Region is now much more dependent on a single fuel supply -- natural gas
 - Huge influx of intermittent wind energy (8,000+ MW by end of 2008) poses new operational challenges



'Past performance is no guarantee of future results'

- **2005: ERCOT stakeholders evaluate emergency load program as substitute for ancillary service for alternate fuels service**
 - Alternate fuels service proposal was rejected by stakeholders
- **2005: PUC includes emergency load response program in its draft rule on resource adequacy**
 - Later removed
- **Sept. 2006: ERCOT proposes EILS at PUC Demand Response Workshop**
- **Nov. 2006: Commission initiates rulemaking in parallel with ERCOT Protocol development**
- **April 2007: EILS approved**
 - PUC approves Substantive Rule §25.507
 - ERCOT Board approves PRR 705

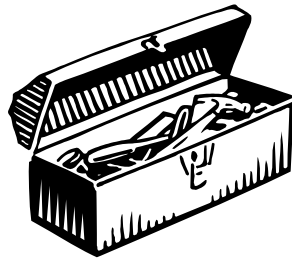
- **2007: ERCOT issues 3 RFPs for EILS**
 - April-May
 - June-Sept.
 - Oct.-Jan
- **None of the RFPs attract the minimum 500 MW of bids required to run the service**
- **November 2007: PUC Amends the EILS Rule**
- **Significant changes include:**
 - Elimination of the 500 MW floor
 - Raising the cost cap from \$20 million to \$50 million
- **ERCOT has been operating EILS since February 2008**



EILS Description

What EILS is:

- **Service provided by loads (customers) willing to interrupt during an electric grid emergency in exchange for a payment**
 - “Controlled interruption of prepared customers vs. uncontrolled interruption of unprepared customers”
- **An additional tool for ERCOT Operations, deployed ONLY in the late stages of a grid emergency**
 - Last resort prior to firm load shedding (rotating outages)



‘Another tool for the operator toolbox’

- **Emergencies can occur at any time:**
 - Cold weather months (due to natural gas curtailment & higher forced outages)
 - Shoulder months (due to unforeseen weather events & large amounts of scheduled maintenance)
 - Traditional summer peaks
 - Anytime, as may be caused by:
 - generation outages (scheduled, forced or both)
 - transmission outages beyond likely contingencies
 - extreme weather events
 - multiple simultaneous contingencies
- **EILS may be *more likely* to be needed in off-peak or shoulder months than during traditional summer peaks**

Emergency Operations

<i>Event/Action</i>	<i>Trigger</i>
ADVISORY: Notice to Market Participants	Physical responsive below 3000 MW
WATCH: Start Reliability Must Run units, suspend unit testing, deploy Replacement & Non-spin Reserves	Physical responsive below 2500 MW
<i>Energy Emergency Alert</i>	
Level 1: Dispatch all generation, issue public media appeal, acquire maximum power thru DC Ties	Physical responsive below 2300 MW
Level 2A: Deploy LaaRs	Physical responsive below 1750 MW
Level 2B: Deploy EILS Resources	Maintain frequency at 60 Hz
Level 3: Instruct transmission owners to shed firm load	Frequency below 59.8 hz

QSEs should have ample warning of tight conditions before EILS deployments.

ERCOT Operators have flexibility to skip Level 2B if frequency is decaying rapidly. In these cases EILS would be deployed immediately after Level 3 to enable faster recovery.

- **ERCOT Operations orders an EILS deployment via a phone call to the all-QSE hotline**



- **10-minute deployment period begins when QSEs have received the instruction in this call**



- **QSEs must then contact their committed EILS Resources (clock is ticking)**

- **EILS Resources must shed at least 95% of their committed load within 10 minutes of QSEs' receipt of the instruction**



- **EILS Resources must keep their committed load off until released**
- **ERCOT Operations will release EILS Resources after LaaRs have been recalled and generation providing Responsive Reserves has been restored**
- **EILS Resources have 10 hours to return to service after release**

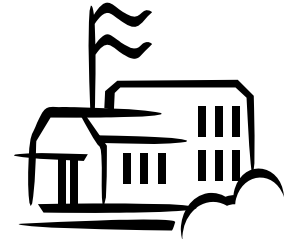
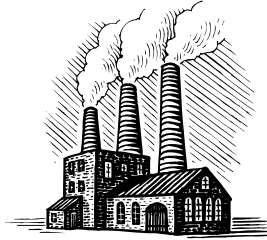


- **In the Zonal market, ERCOT will always deploy EILS Resources as a block**
- **In the Nodal market, ERCOT may deploy EILS Resources as a block or sequentially in two groups**
 - Operator will still issue a single VDI to deploy all EILS Resources, but may instruct Group 1 to deploy immediately and Group 2 to deploy at a set time in the future
 - ERCOT to develop a system for designating Groups 1 and 2
- **EILS Resources are subject to a maximum of 2 deployments (or 8 hours) per Contract Period**
 - If a deployment event is still in effect when the 8th hour expires, EILS Resources must remain offline until recalled by ERCOT Operations

Eligibility: Who can participate?

- **EILS Resources:**

- Individual Loads
- Aggregations



- **Must have:**

- 15-minute interval metering or statistically valid sample approved by ERCOT
- Capability of interrupting at least 1 MW of load on 10 minutes notice at any time during the committed hours
- Representation by a Qualified Scheduling Entity (QSE) with a wide-area network agreement with ERCOT
 - Must have 24/7 operations that can receive the verbal dispatch instruction
 - QSE (not ERCOT) is responsible for notifying the customer

- **QSEs representing selected EILS Resources are paid a capacity payment to be available for interruption**
- **EILS payments are made regardless of whether there is a deployment**
 - If deployed, participants do not receive any additional payment from ERCOT
- **ERCOT's only financial relationship is with the QSE**
 - QSE submits bid
 - If bid is accepted, QSE is paid by ERCOT
- **Payment to the EILS Resource (customer) is a private contractual issue between the customer and the QSE**



- **EILS is procured for 4-month Contract Periods**
 - February thru May
 - June thru September
 - October thru January
- **Participants may bid to provide the service for one or more Time Periods:**
 1. Business Hours 1: 8AM to 1PM Monday-Friday*
 2. Business Hours 2: 1PM to 4PM Monday-Friday*
 3. Business Hours 3: 4PM to 8PM Monday-Friday*
 - * Except ERCOT Holidays
 4. Non-Business Hours: All other hours
- **Time Periods are designed to allow flexibility in for customers during traditional business hours**

Step 1: Meter Data Evaluation & Baseline Assignment

- **QSEs identify and submit potential EILS Resources to ERCOT, including:**
 - Probable makeup of aggregations
 - Non-binding declared minimum base load
- **ERCOT staff reviews the prospective EILS Resource's historical load data (ideally 12 months or more)**
 - Assesses how much load has historically been available
 - Emphasis on corresponding Contract Period months from the prior year
- **ERCOT returns the results of its data evaluation back to the QSE as a service to help avoid over- or under-bidding of capacity**
- **ERCOT makes baseline assignments**
 - ERCOT's review of the usage history also includes a baseline methodology determination:
 - Default Baseline
 - Alternate Baseline

Step 2: Bidding

- **QSEs submit Bids on behalf of EILS Resources**
 - \$ per MW per Hour
 - Fractional MW bids accepted to tenths of a MW
- **Bidders also must declare Minimum Base Load**
 - Generally defined as load behind the EILS Resource's meter that is not subject to interruption in a deployment
 - Critical load you can't turn off
 - Minimum Base Loads have different roles depending on the baseline assignment
 - For some Loads, it is the target to which they must deploy
 - May be zero, or may be a fraction of a MW

- **ERCOT management selects EILS providers based on submitted QSE bids**
- **'Reasonableness' criteria and limits may be applied to stay under the PUC's cost cap of \$50 million per year**
 - See document posted at the EILS web page
- **Participants are paid as bid if ERCOT accepts their offer**
 - No clearing price mechanism
- **Payments are made ≤ 70 days after the end of the Contract Period**
- **Payments will be adjusted if the EILS Resource fails to perform in either of two ways:**
 1. **Availability:** Load must be online and available for interruption during the contracted hours
 2. **Performance:** Load must meet its curtailment obligations if ERCOT dispatches EILS in an emergency

- **Using interval meter data after the fact, ERCOT calculates an Availability Factor for each EILS Resource according to baseline assignment:**
 - Default Baseline: Percentage of committed hours that Load was greater than than 95% of committed MW capacity
 - Alternate Baseline: Average hourly load (minus declared Minimum Base Load) divided by committed MW capacity
 - Exempted:
 - Any hours an EEA is in effect
 - Scheduled Periods of Unavailability (up to 2% of hours in a Contract Period if noticed 5 Business Days in advance)
 - Any hours an EILS test was being conducted
- **If availability factor drops below 0.95, payment will be reduced**
- **If it's 0.95 or greater, it will be reset to 1.0**
- **Capped at 1.0**

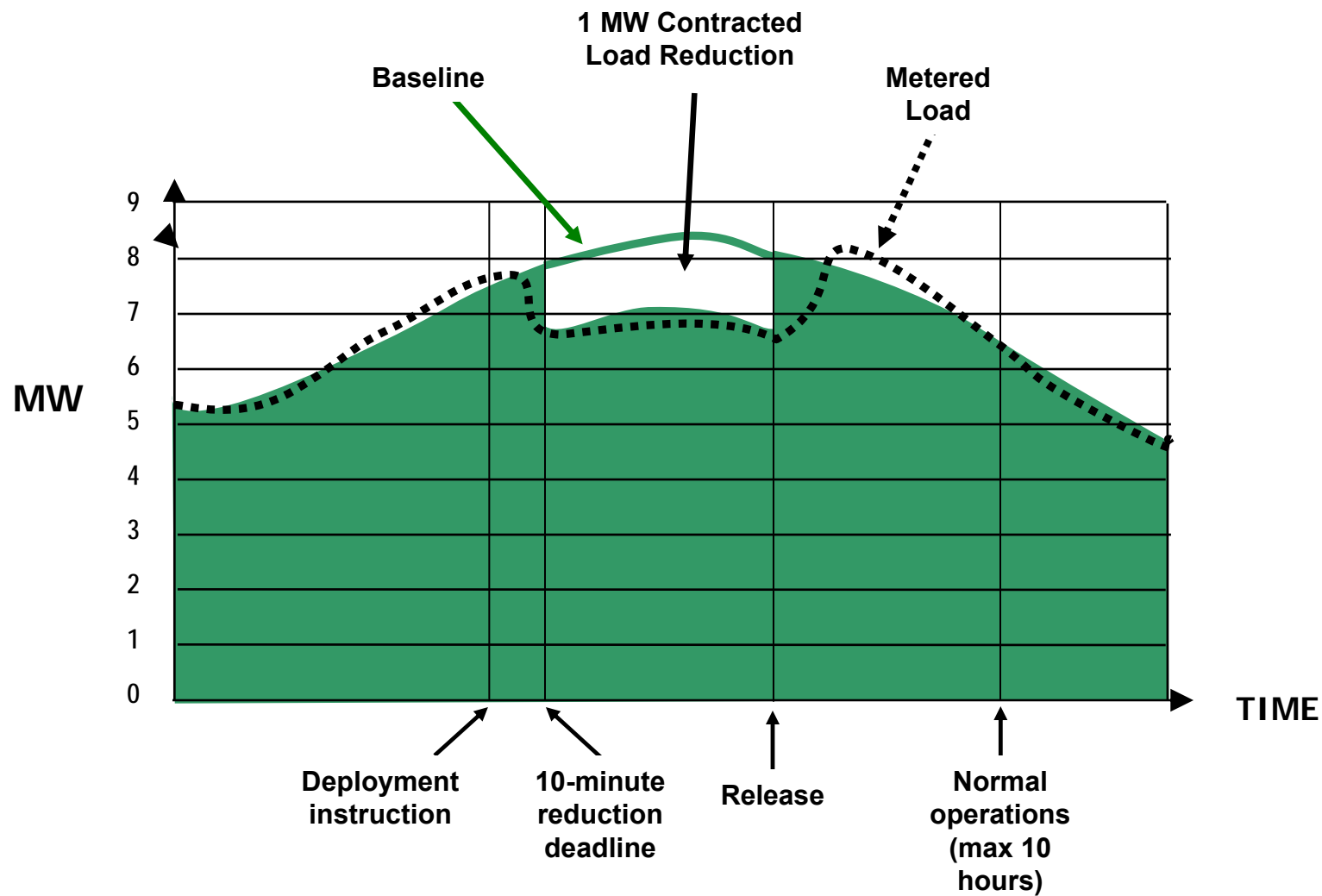
- **If there is a deployment event, the EILS Resource must shed its committed load within 10 minutes and keep it off until released**
- **Performance will be evaluated by ERCOT using 15-minute interval data via the following calculations:**
 - Interval Performance Factor (number between 0 and 1) = ratio of actual to committed load reduction during each 15-minute interval covered by the event
 - Event Performance Factor = average of the interval performance factors for all intervals of the deployment
- **If the event performance factor drops below 0.95, payment will be reduced**
- **If it's 0.95 or greater, it will be reset to 1.0**



Baselines

- **ERCOT will attempt to establish a default baseline model for each EILS Resource using:**
 - Industry-standard load modeling software
 - Historical interval meter data (12+ months) and interval data collected during the contract period
 - Weather & calendar data
- **The default baseline is a statistical estimation of what the load would have been doing under business-as-usual conditions**
 - IE, in the absence of a deployment
- **Performance in an EILS deployment event is measured by comparing actual load data to the baseline**
 - Interval performance factors are calculated by comparing actual load to the baseline for each 15-minute interval
 - Event Performance Factor is the average of all interval performance factors

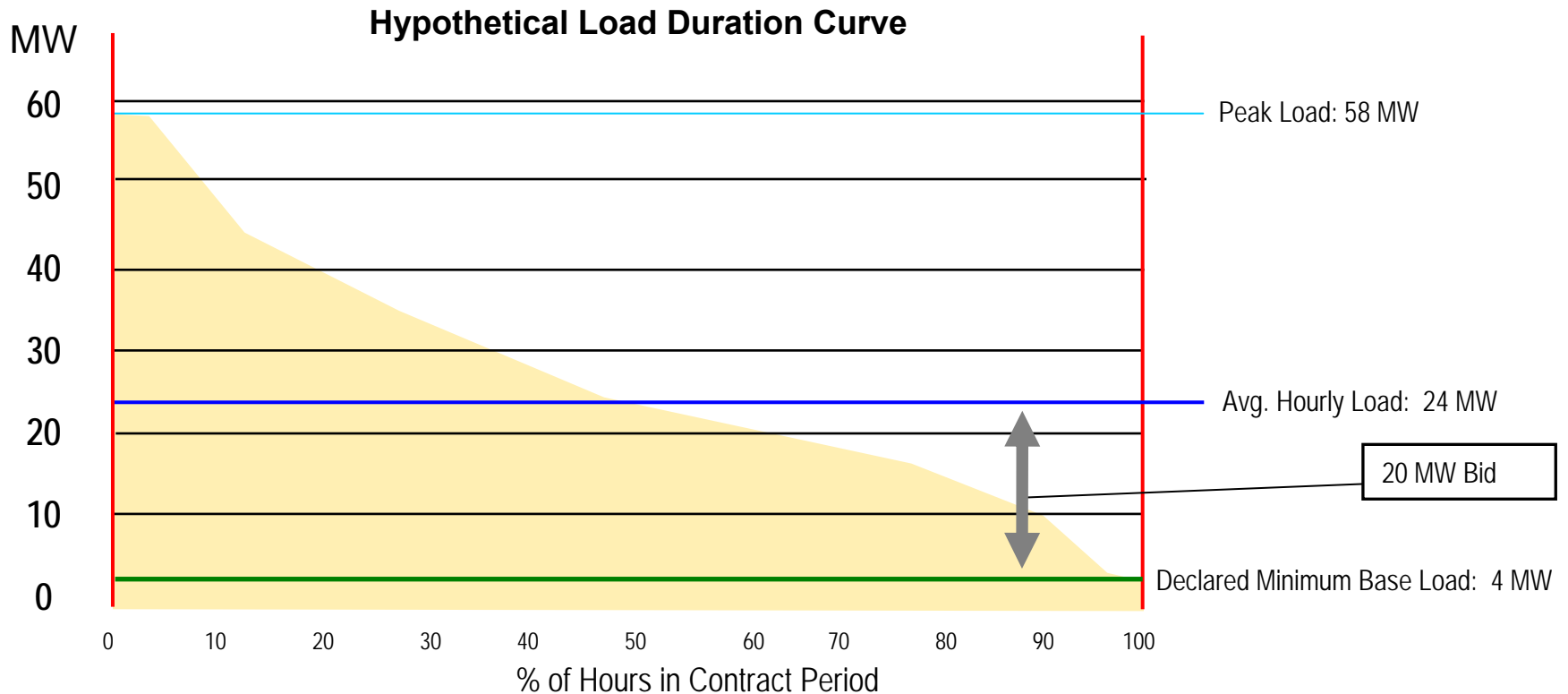
Default Baseline concept



- **Some loads do not have enough predictability to allow ERCOT to create a default baseline model; for example:**
 - Fluctuating or batch-process loads
 - Loads with unpredictable downtimes or irregular schedules
 - Even flat industrial loads with high load factors
- **ERCOT will assign such loads to the Alternate Baseline**
- **MW Bids should be \leq average hourly load minus declared Minimum Base Load**
- **In an EILS deployment event, load must shed to its Minimum Base Load $\div .95$ and must stay at or below that load level throughout the event**
 - Load is not penalized if not 'on' at moment of dispatch

Alternate Baseline (Sample)

- **EILS Resource bid is awarded at 20 MW**
- **In a deployment event the EILS Resource must shed to ≤ 4.21 MW (declared Minimum Base Load of 4 MW \div .95)**



- **Aggregations receive baseline assignments (default or alternate) just as individual EILS Resources**
- **Aggregations are typically easier than individual loads to model on the default baseline (i.e., default baseline assignment more likely)**
 - Larger aggregations are easier to model than small aggregations
- **Performance & availability of aggregations are:**
 - Calculated the same as for individual EILS Resources -- according to baseline assignment
 - Determined at the aggregation level using summed load totals

- **Within 70 days after the end of a Contract Period, QSEs representing EILS Resources are paid as follows, by Time Period:**

(Bid amount X MW X Hours)

X

(Availability Factor) Number between 0 and 1

X

(Performance Factor) Number between 0 and 1

- **Who pays for EILS?**
 - Costs are allocated (uplifted) to QSEs based on their load ratio share by Time Period
- **QSEs representing Load may ‘self-provide’ EILS**
 - Same as a competitive bid, only without the \$
 - Relieves the QSE of some or all of its uplifted EILS obligation
 - Payment to participating load is subject to agreement between the QSE and the load

- **Failure to meet availability or performance obligations is a violation of ERCOT Protocols**
 - In addition to payment reduction, EILS Resource and/or its QSE are subject to suspension from program
 - For aggregated EILS Resources, the entire aggregation is subject to suspension
 - Subject to review by the Texas Regional Entity of the Electric Reliability Organization (NERC)
 - Subject to potential administrative penalties by the Public Utility Commission of Texas
- **EILS Resources are subject to annual unannounced testing**
 - Must deploy in 10 minutes just as in an actual event
 - Failure will result in re-testing
 - Two failures in a row subjects the EILS Resource to a 6-month suspension



EILS Procurement History

- **April-May 2007 Contract Period**
 - 156 MW of bids received (did not meet 500 MW minimum)
- **June-Sept. 2007 Contract Period**
 - 213 MW of bids received (did not meet 500 MW minimum)
- **Oct. 2007 – Jan. 2008 Contract Period**
 - 180 MW of bids received (did not meet 500 MW minimum)

- **February thru May 2008 Contract Period**

Time Period	Business Hours	Non-Business Hours
Definition	8 AM to 8 PM Mon-Fri except Holidays	All other hours
EILS Procured	262 MW	185 MW
# of EILS Resources	10 (includes 5 aggregations)	7 (includes 2 aggregations)
Avg. Cost per MW per Hour	\$9.73	\$7.86

- **Total cost for this Contract Period: \$5.3 million**

- **June thru September 2008 Contract Period**

Time Period	Business Hours	Peak Hrs. 1	Peak Hrs. 2	Non-Business Hours
Definition	8 AM to 1 PM Mon-Fri except Holidays	1 PM to 4 PM Mon-Fri except Holidays	4PM to 8 PM Mon-Fri except Holidays	All other hours
EILS Procured	310 MW	219 MW	216 MW	216 MW
# of EILS Resources	19 (includes 13 aggregations)	16 (includes 10 aggregations)	15 (includes 9 aggregations)	14 (includes 8 aggregations)
Avg. Cost per MW per Hour	\$10.92	\$11.06	\$11.29	\$8.97

- **Total cost for this Contract Period: \$6.4 million**

- October 2008 thru January 2009 Contract Period**

Time Period	Business Hours 1	Business Hours 2	Business Hours 3	Non-Business Hours
Definition	8 AM to 1 PM Mon-Fri except Holidays	1 PM to 4 PM Mon-Fri except Holidays	4PM to 8 PM Mon-Fri except Holidays	All other hours
EILS Procured	270.8 MW	287.6 MW	289.5 MW	271.5 MW
# of EILS Resources	35 (includes 25 aggregations)	37 (includes 25 aggregations)	35 (includes 23 aggregations)	33 (includes 21 aggregations)
Avg. Cost per MW per Hour	\$10.83	\$11.28	\$11.40	\$9.61

- Total projected cost for this Contract Period: \$8.23 million**
- Total projected cost for the 2008 EILS program year: \$19.9 million**

- February thru May 2009 Contract Period**

Time Period	Business Hours 1	Business Hours 2	Business Hours 3	Non-Business Hours
Definition	8 AM to 1 PM Mon-Fri except Holidays	1 PM to 4 PM Mon-Fri except Holidays	4PM to 8 PM Mon-Fri except Holidays	All other hours
EILS Procured	163.6 MW	168.2 MW	163.4 MW	137.9 MW
# of EILS Resources	38 (includes 24 aggregations)	38 (includes 24 aggregations)	36 (includes 22 aggregations)	32 (includes 20 aggregations)
Avg. Cost per MW per Hour	\$11.10	\$11.56	\$11.62	\$10.15

- Projected cost for this Contract Period: \$4.51 million**

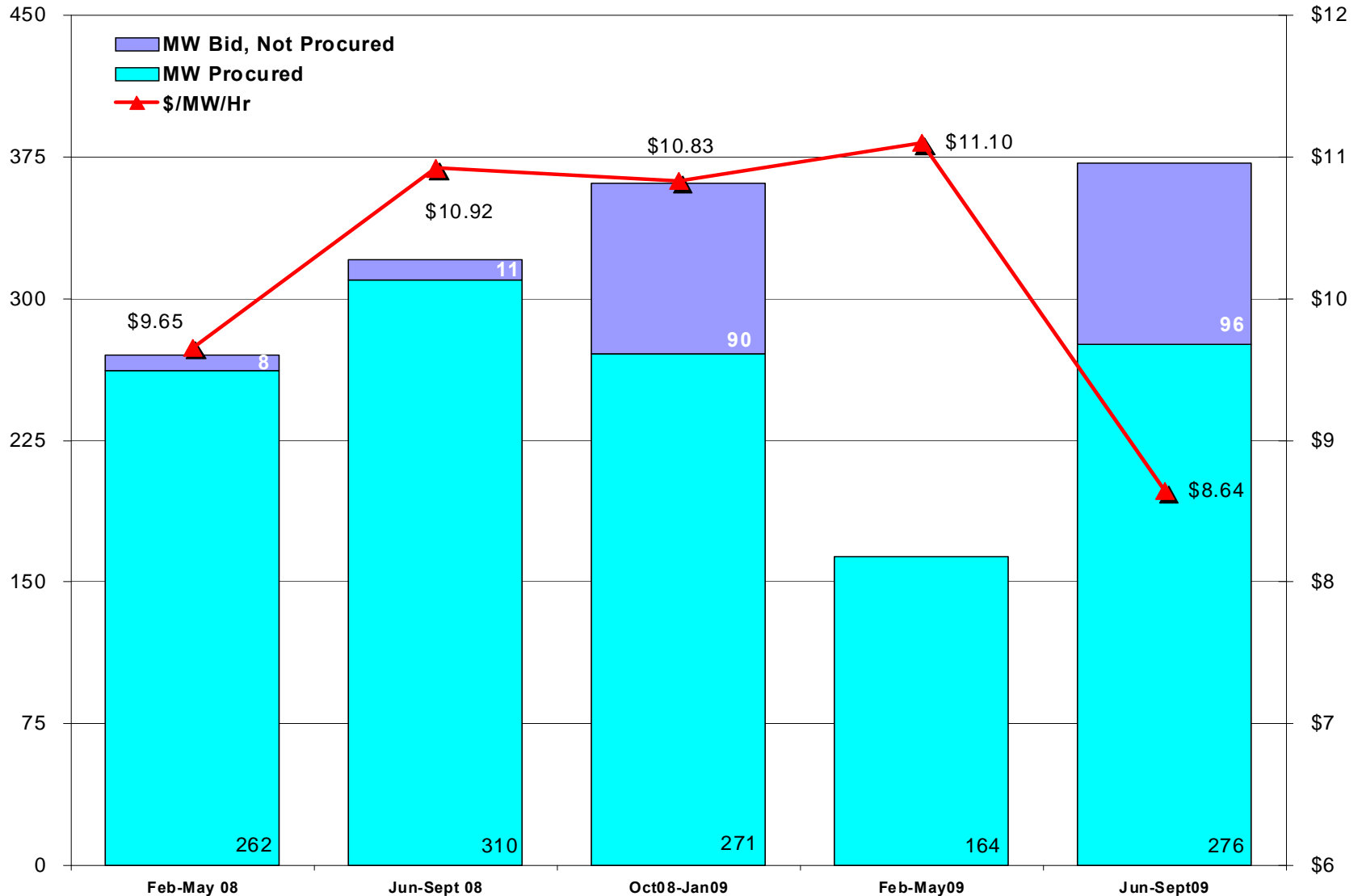
- June thru September 2009 Contract Period Procurement Results**

Time Period	Business Hours 1	Business Hours 2	Business Hours 3	Non-Business Hours
Definition	8 AM to 1 PM Mon-Fri except Holidays	1 PM to 4 PM Mon-Fri except Holidays	4PM to 8 PM Mon-Fri except Holidays	All other hours
EILS Procured	276.4 MW	154.7 MW	237.3 MW	255.6 MW
# of EILS Resources	47 (includes 34 aggregations)	34 (includes 27 aggregations)	50 (includes 34 aggregations)	46 (includes 30 aggregations)
Avg. Cost per MW per Hour	\$ 8.64	\$ 8.29	\$ 9.90	\$ 8.66

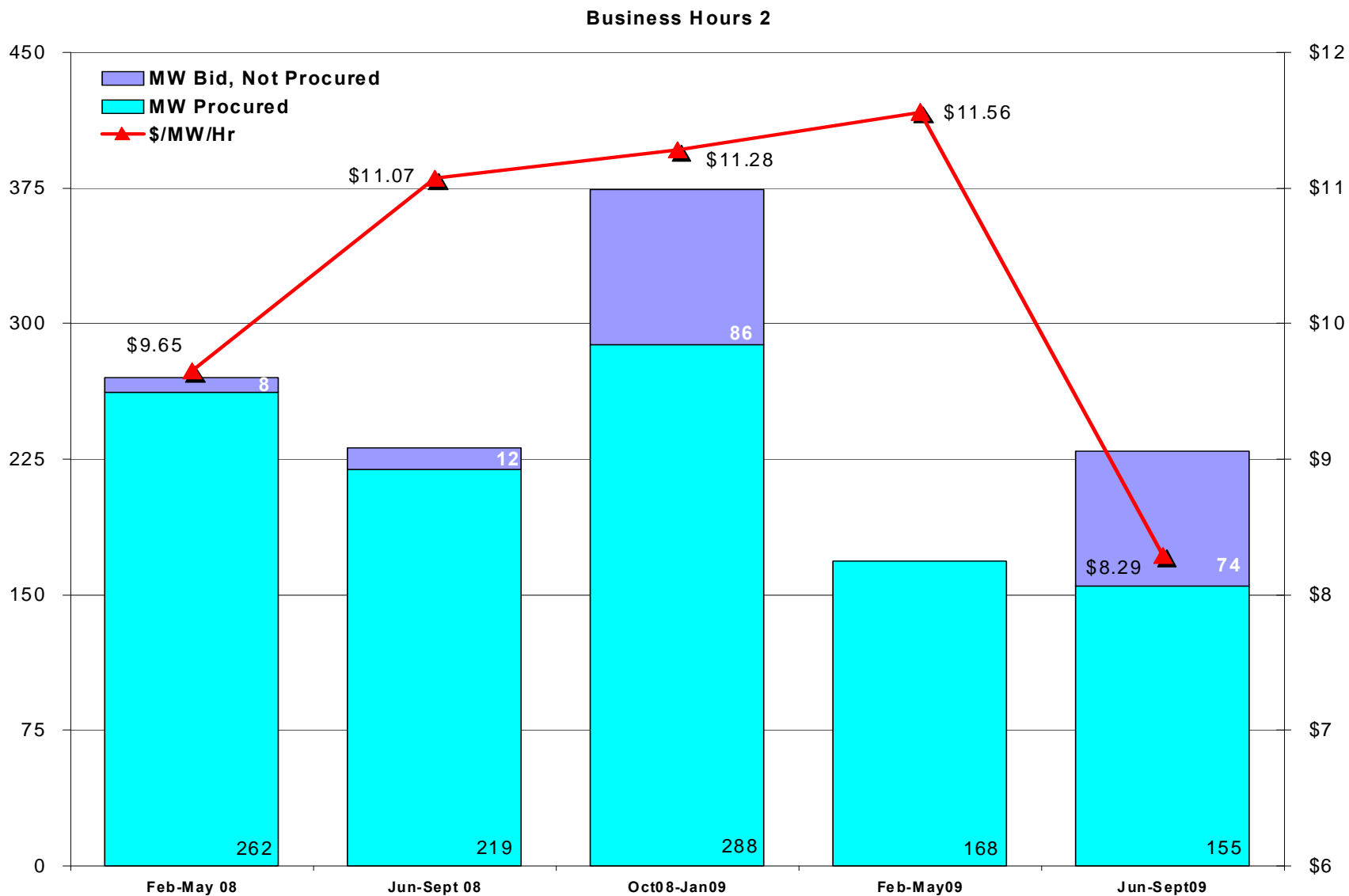
- Projected cost for this Contract Period: \$ 6.36 million**
- Total projected cost year-to-date: \$10.87 million**

EILS Procurement Trends (Business Hours 1)

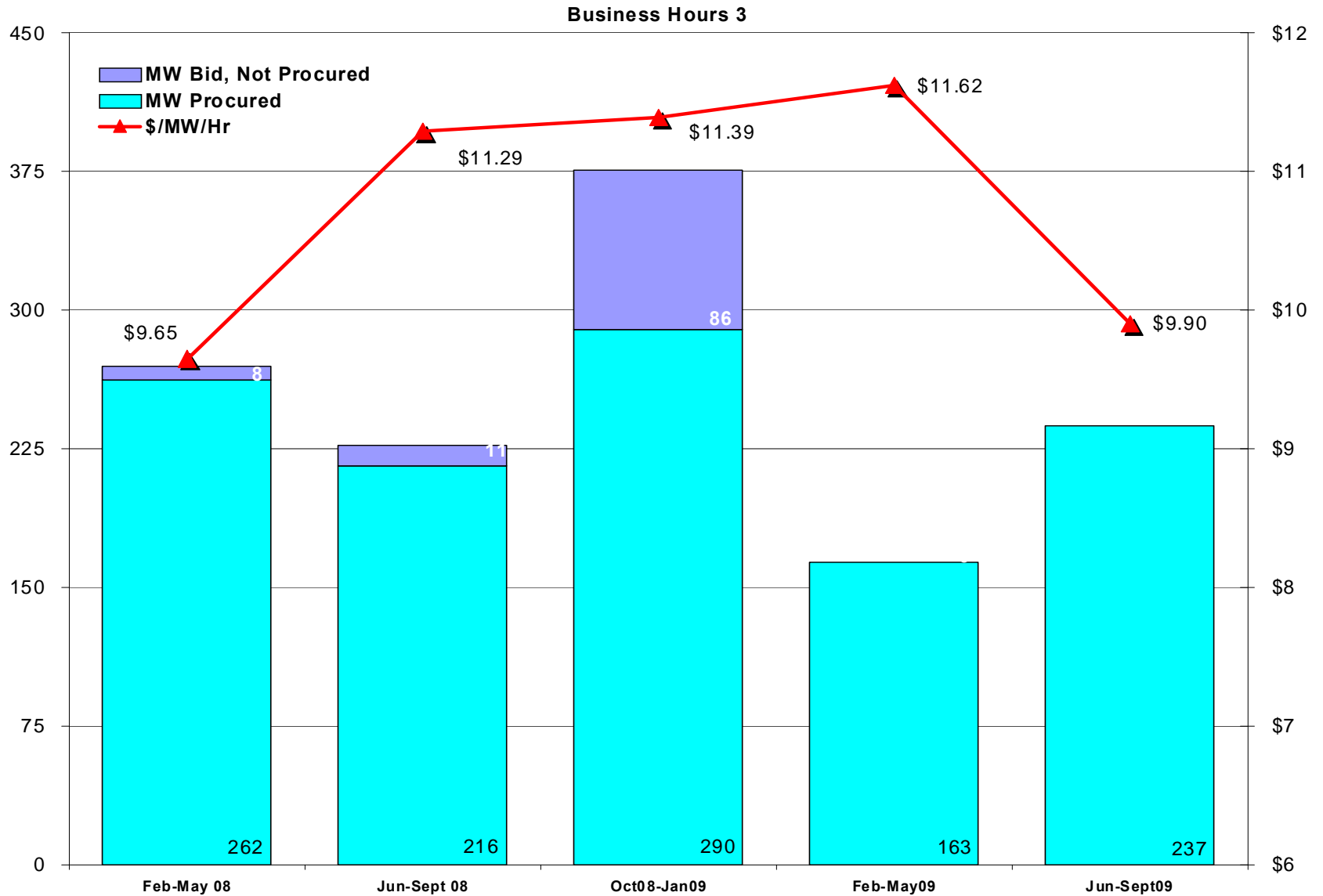
Business Hours 1



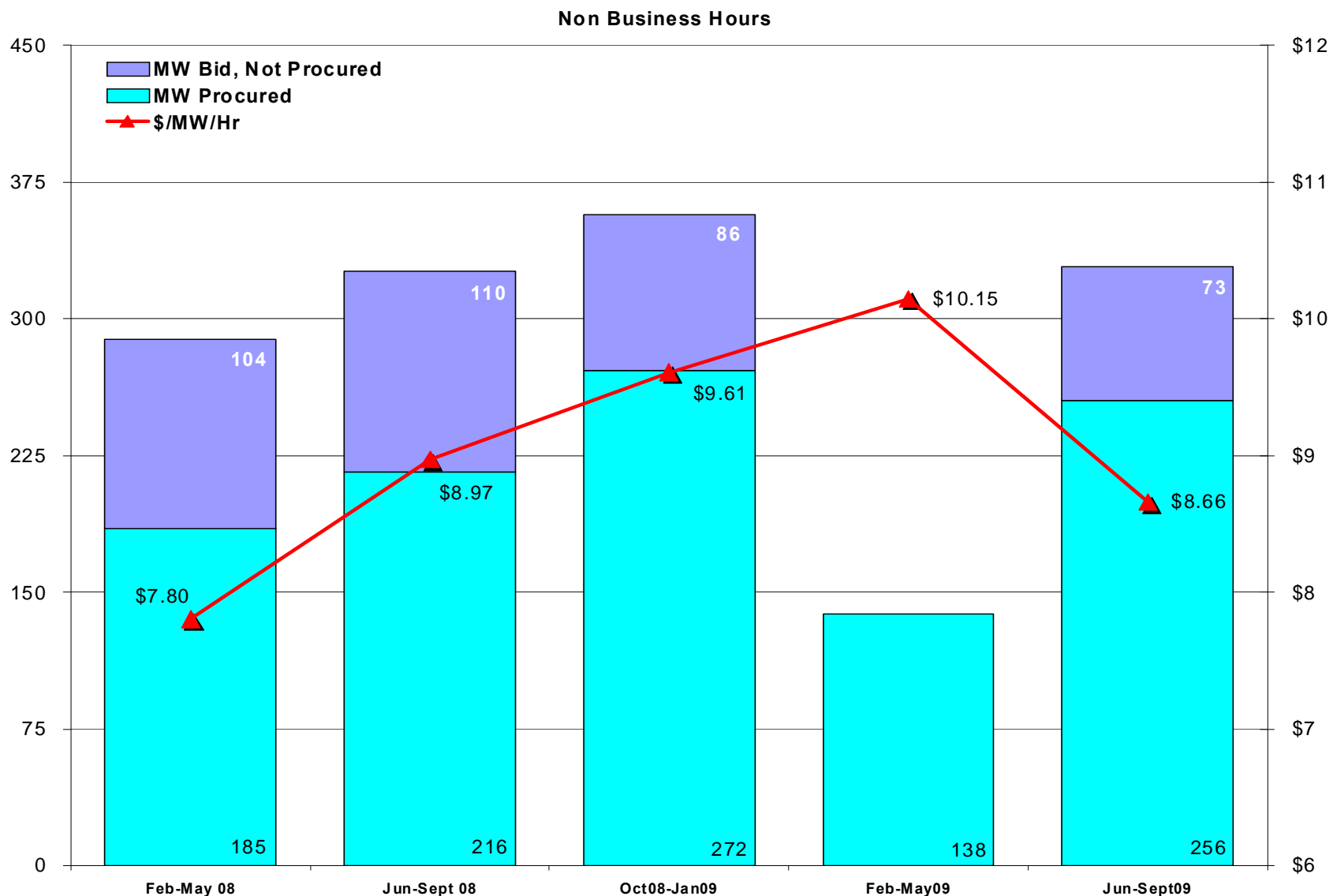
EILS Procurement Trends (Business Hours 2)



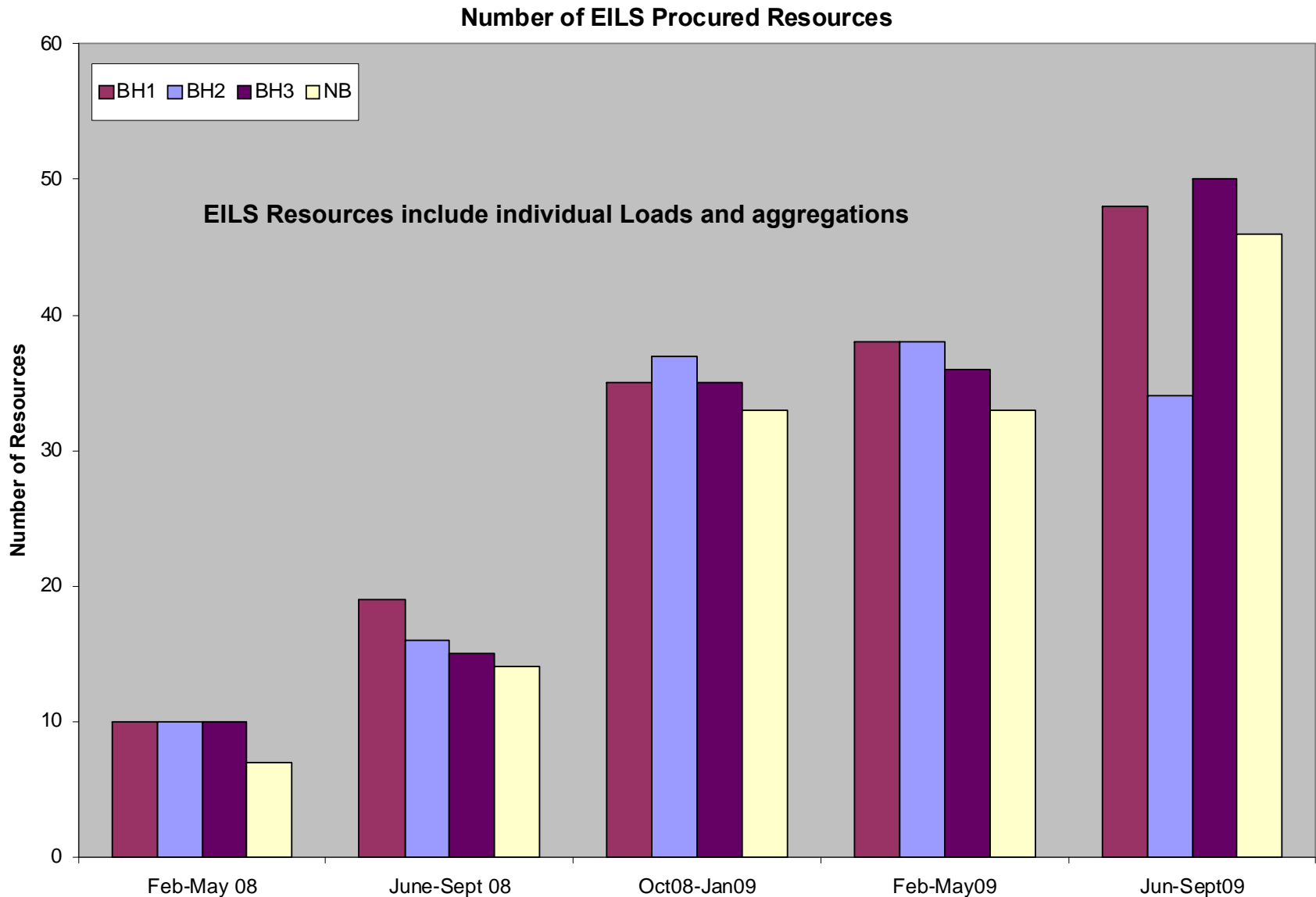
EILS Procurement Trends (Business Hours 3)



EILS Procurement Trends (Non-Business Hours)



EILS Procurement Trends (Number of Resources)



- **EILS page at ERCOT.com**

- <http://www.ercot.com/services/programs/load/eils/index.html>

- Includes:

- Technical Requirements & Scope of Work
- Reports of procurement results from previous Contract Periods
- FAQs
- Description of factors used in determining reasonableness of bids
- Annual report to the Public Utility Commission
- Other supporting documents

- **PUC Substantive Rule §25.507**

- <http://www.puc.state.tx.us/rules/subrules/electric/25.507/25.507ei.cfm>

- **ERCOT Protocols**

- <http://www.ercot.com/mktrules/protocols/current>

- **Questions may be submitted to:**
 - EILS@ercot.com
 - Answers will be added to the Q&A section if appropriate
 - Submitters of questions will remain anonymous
- **Demand Side Resources contacts at ERCOT:**
 - Paul Wattles, pwattles@ercot.com
 - Steve Krein, skrein@ercot.com
- **Market Participants may also contact their Client Services account manager**

