



# PJM Load Response Programs

Virtual Training  
Joe Polidoro  
August 19, 2003

PJM, the country's first fully functioning regional transmission organization, operates the world's largest competitive wholesale electricity market. The company currently coordinates a pooled generating capacity of more than 74,000 megawatts and operates a wholesale electricity market with more than 200 market buyers, sellers and traders of electricity. PJM has administered more than \$15 billion in energy and energy service trades since the regional markets opened in 1997. More than 70 nations have sent delegates to PJM to learn about its market model and the operation of the grid in a region including more than 25 million people in all or parts of Del., Md., N. J., Ohio, Pa., Va., W. Va. and the District of Columbia.

Visit PJM at [www.pjm.com](http://www.pjm.com).



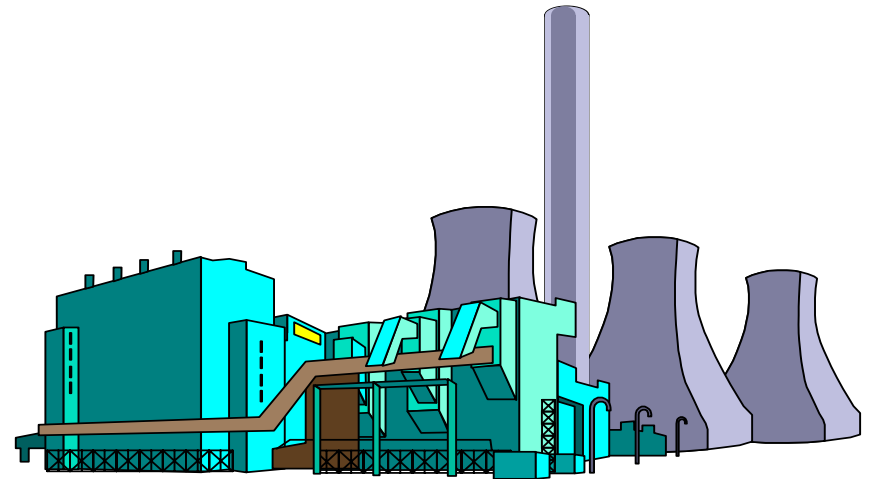
## Energy Market

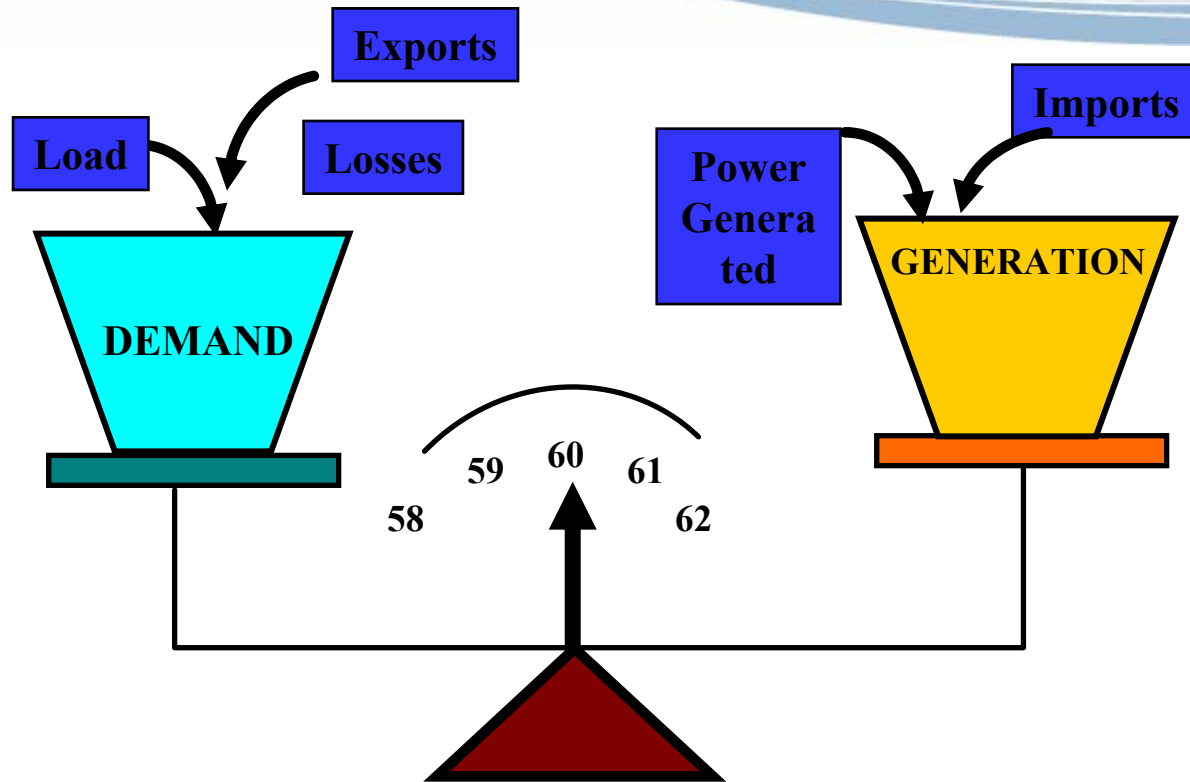
- PJM Interconnection coordinates the continuous buying, selling and delivery of wholesale electricity through the Energy Market. In its role as market operator, PJM balances the needs of suppliers, wholesale customers and other market participants and monitors market activities to ensure open, fair and equitable access.



## Energy Market

- PJM's Energy Market operates much like a stock exchange, with market participants establishing a price for electricity by matching supply and demand.
- The market uses locational marginal pricing that reflects the value of the energy at the specific location and time it is delivered. If the lowest-priced electricity can reach all locations, prices are the same across the entire grid. When there is transmission congestion, energy cannot flow freely to certain locations. In that case, more-expensive electricity is ordered to meet that demand. As a result, the locational marginal price (LMP) is higher in those locations





Without a demand response mechanism, the [independent system] operator is forced to work under the assumption that all customers have an inelastic demand for energy and will pay any price for power.

- A working demand response program puts downward pressure on price.
- It is an alternative to generating more electricity.
- When wholesale prices are high, Demand response can stabilize prices by reducing demand. When electricity supplies are short, demand response reduces stress on the grid.



- The PJM Demand Response Program allows participants to play a significant part in developing price stability as well as providing support to assist in system security.
- This program is designed to provide a revenue stream for end users who wish to reduce their electric costs.
- The PJM Demand Response Participants, at opportune times, can be paid for curtailing demand just as a generator is paid for putting energy onto the system.
- The sunset on the existing program is 12/1/04.
- No special software required. No cost to sign up.



## There are Demand Response Programs in 19 States and Canada

- Manufacturers
- School Districts
- Municipalities
- Co-ops
- Retailers
- Office Buildings
- Government Facilities
- Military Bases
- PJM's Demand Response Program enables customers to manage their own electricity costs. These program grew 300 percent in 2002.



- **PJM Load Response Programs**
- Settlement Examples
- Program Mechanics / Checklist
- Registration
- Operations
- Participation To Date
- Summary / Action Items

**EMERGENCY**

**ECONOMIC**

## **EMERGENCY**

**Designed to provide a method by which end-use customers may be compensated by PJM for voluntarily reducing load during an emergency event.**

## **ECONOMIC**

**Designed to provide an incentive to customers or curtailment service providers to reduce consumption when PJM LMP prices are high**

**Two options:  
Day Ahead Option  
Real Time Option**

## **EMERGENCY**

- **Special or Full PJM Membership**
- **Active Load Management (ALM) Participant may participate if contract explicitly excludes payment for energy**
- **Cannot receive simultaneous credit for ALM reductions**

## **ECONOMIC**

- **Full PJM Membership only**
- **Active Load Management (ALM) Participant may participate if contract explicitly excludes payment for energy**
- **Cannot receive simultaneous credit for ALM reductions**

## **EMERGENCY**

- **Distributed generating units must submit applicable environmental permits to PJM.**
- **Written justification for the lack of permits may also be provided to PJM.**

## **ECONOMIC**

- **Distributed generating units must submit applicable environmental permits to PJM.**
- **Written justification for the lack of permits may also be provided to PJM.**

## **EMERGENCY**

- **Voluntary Curtailment**
- **PJM calls Emergency event**
- **PJM sends notification**

## **ECONOMIC**

### **Day Ahead Option**

- **Submit Day Ahead Bid**
- **Obligated in Real Time if Bid clears**

### **Real Time Option**

- **Voluntary Curtailment**
- **Customer Notifies PJM via email one hour prior**
- **Customer may choose to be dispatched by PJM**

## **EMERGENCY**

### **Backup Generation**

- Measured Output

### **Measured Load**

- Required for the hour prior to the reduction, as well as every hour during reduction

### **No Customer Baseline Calculation (CBL)**

## **ECONOMIC**

### **Metered Data**

- Every hour during reduction

### **Customer Baseline Calculation (CBL)**

- Compare metered load against an estimate of what metered load would have been absent the reduction
- May be adjusted for weather

## **EMERGENCY**

**Actual MWh relief plus losses**

**Minimum Duration of request is Two Hours**

## **ECONOMIC**

### **Day Ahead Settlement**

- **MWh committed in Day Ahead Market**

### **Real Time Settlement**

- **Actual MWh relief provided in excess of Day Ahead load reductions plus losses**



## EMERGENCY

**PJM pays higher of  
Zonal LMP or \$500/MWh**

## ECONOMIC

**If LMP < \$75/MWh OR if  
calendar year subsidy >  
\$17.5 million**

- **PJM pays zonal  
LMP - Retail Rate  
(Retail Rate =  
Generation +  
Transmission)**

**If LMP > = \$75/MWh,  
• PJM pays zonal  
LMP**

## EMERGENCY

**Charges for Emergency Load Response are allocated among PJM Market Buyers in proportion to their increase in net purchases from day-ahead to real-time**

## ECONOMIC

**If  $LMP < \$75/MWh$  OR if calendar year subsidy  $> \$17.5$  million**

- PJM recovers LMP less Retail Rate from LSE

**If  $LMP \geq \$75/MWh$ ,**

- PJM recovers LMP less Retail Rate from LSE
- PJM recovers Retail Rate from all LSEs in zone

- PJM Load Response Programs
- **Settlement Examples**
- Program Mechanics / Checklist
- Registration
- Operations
- Participation To Date
- Summary / Action Items

**LMP = \$600**  
**Emergency Load Response Program Activated**

Net DA Spot = 20 MW purch  
 Net RT Spot = 20 MW purch

**LSE #3**

**2/3 total payment**

**LSE #2  
EDC**

Net DA Spot = 20 MW purch  
 Net RT Spot = 30 MW purch  
**10 MW Increase in purchase**

**PJM**

**\$600/MW**

**CSP**

**X% of \$600/MW**

**Customer**

Net DA Spot = 20 MW purch  
 Net RT Spot = 20 MW purch

**LSE #1**

**1/3 total payment**

**GenCo**

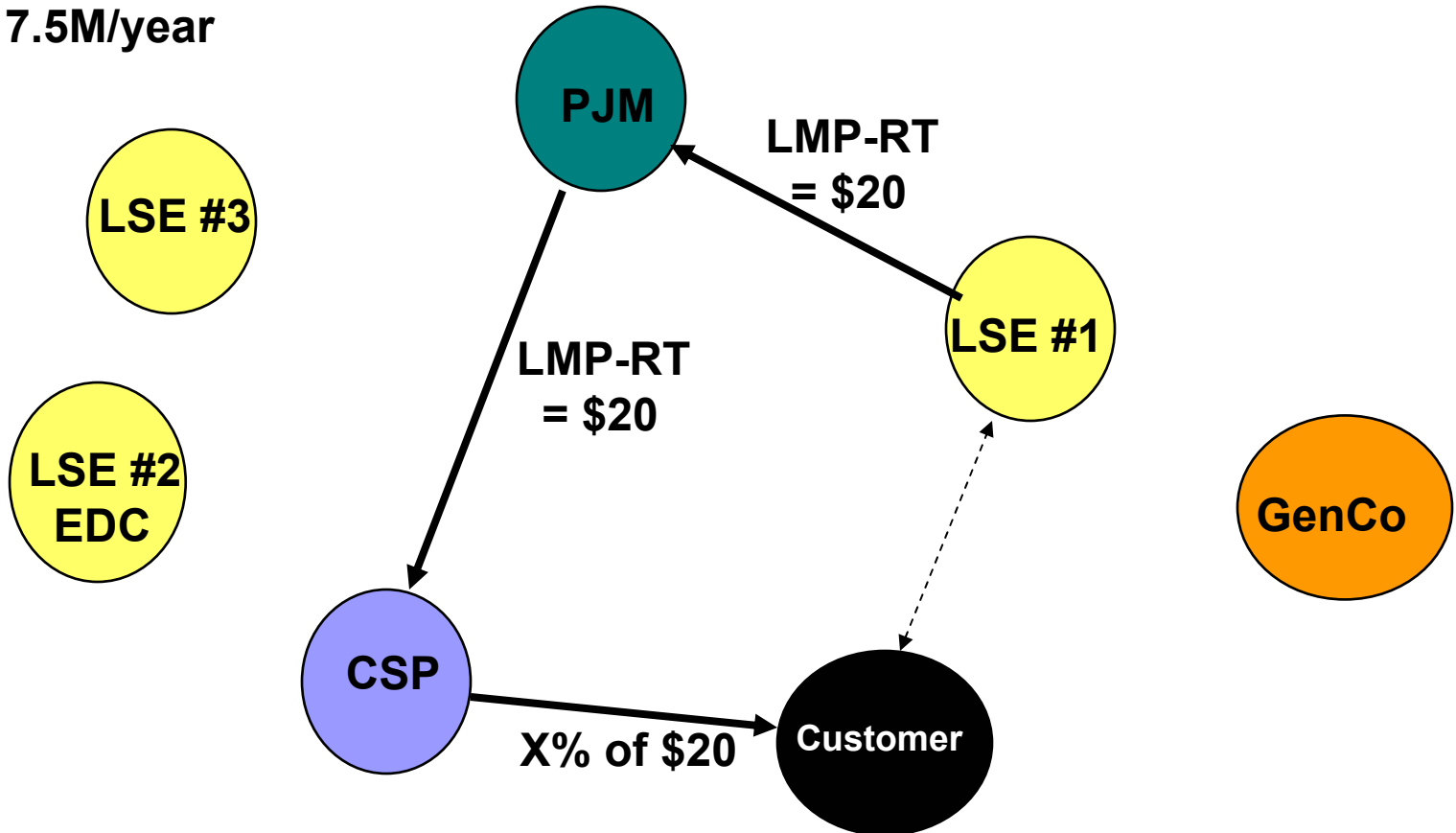
Net DA Spot = 40 MW sale  
 Net RT Spot = 35 MW sale  
**5 MW Decrease in sale**

LMP = \$60 (Less than \$75 threshold)

Customer reduces load under Economic Program

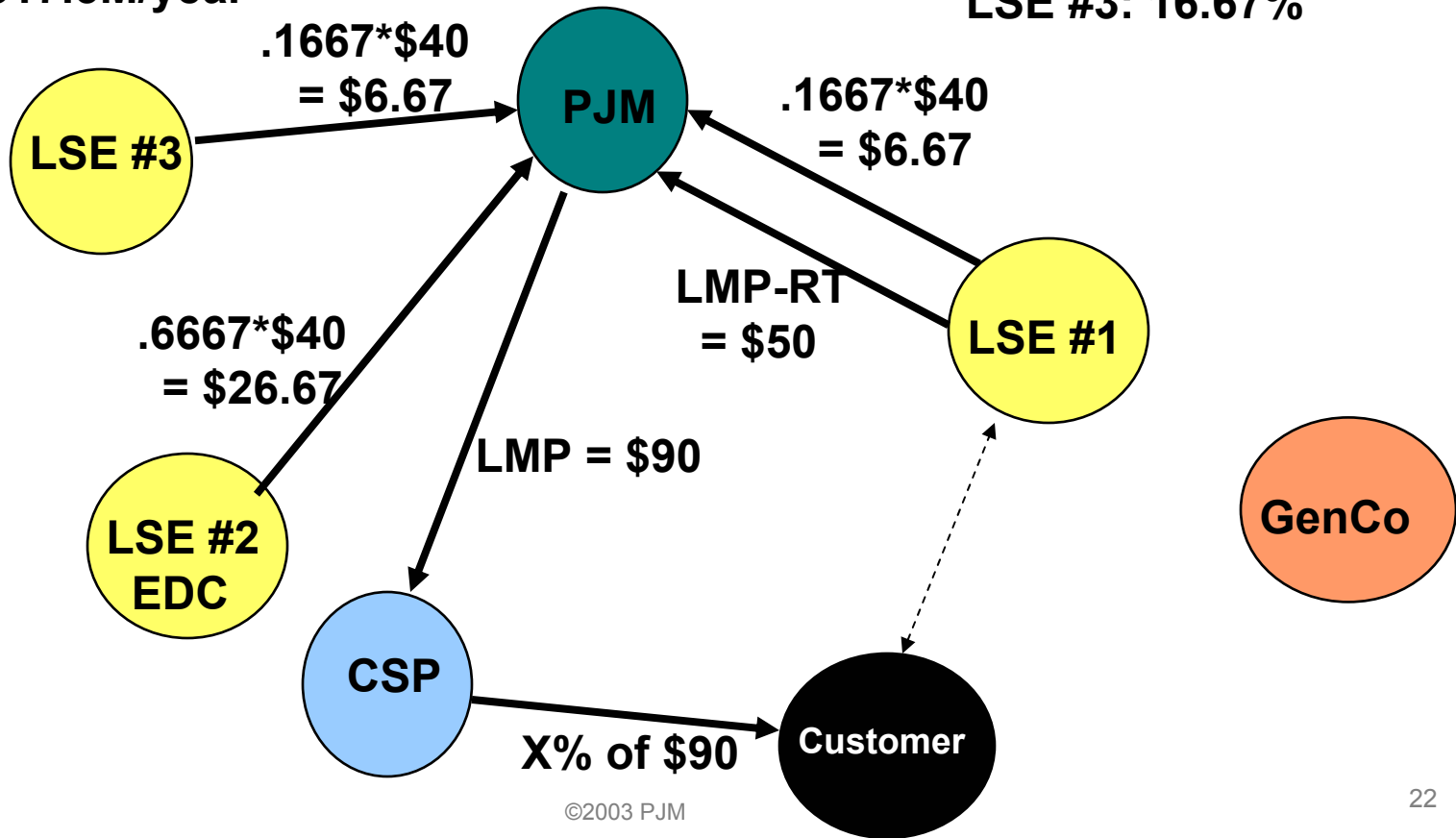
Retail Rate (RT) = \$40

Subsidy < \$17.5M/year



**LMP = \$90 (greater than \$75 threshold)**  
**Customer reduces load under Economic Program**  
**Retail Rate = \$40**  
**Subsidy < \$17.5M/year**

**Load Ratio Shares w/in zone:**  
**LSE #1: 16.67%**  
**LSE #2: 66.67%**  
**LSE #3: 16.67%**



LMP = \$90

Customer reduces load under Economic Program

Retail Rate = \$40

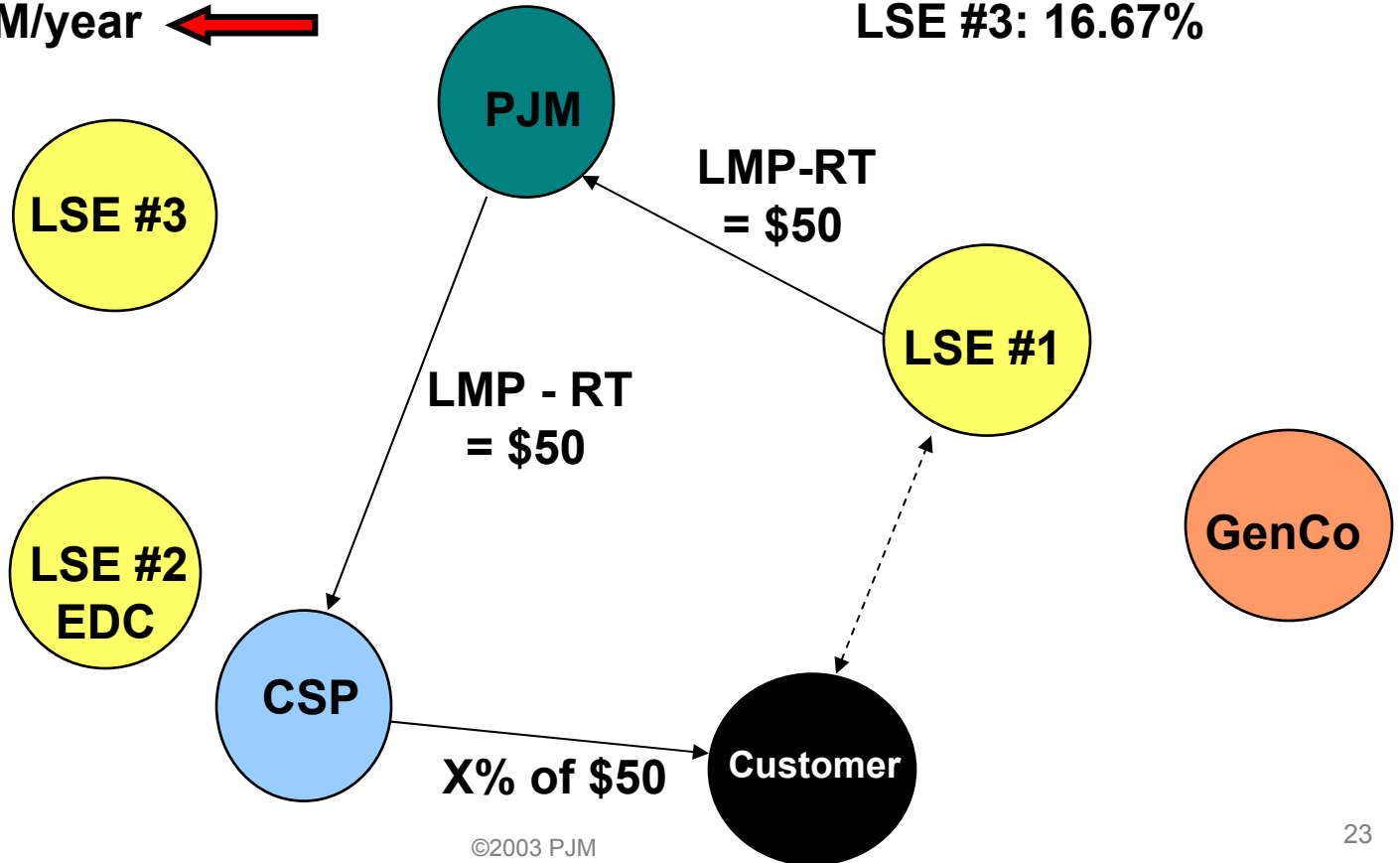
Subsidy > \$17.5M/year ←

Load Ratio Shares w/in zone:

LSE #1: 16.67%

LSE #2: 66.67%

LSE #3: 16.67%



**Day-ahead (Hour 13)**

- DA reduction bid of 10 MW cleared in the DA market
- DA LMP = \$100

Customer credit =  $(\$100)(10) = (\$1000)$

**Real-time (Hour 13)**

- Real-time reduction = 9 MW
- Deviation from DA commitment =  $10 \text{ MW} - 9 \text{ MW} = 1 \text{ MW}$
- RT LMP = \$200

Customer charge =  $(\$200)(1) = \$200$

**Net credit =  $(\$1000) + \$200 = \$800$**



## Customer has ALM obligation of 8 MW

### Day-ahead (Hour 13)

- Customer has ALM obligation (not LMP based) of 8 MW
- DA reduction bid of 10 MW cleared in the DA market
- DA LMP = \$100

Customer credit =  $(\$100)(10) = (\$1000)$

### Real-time (Hour 13)

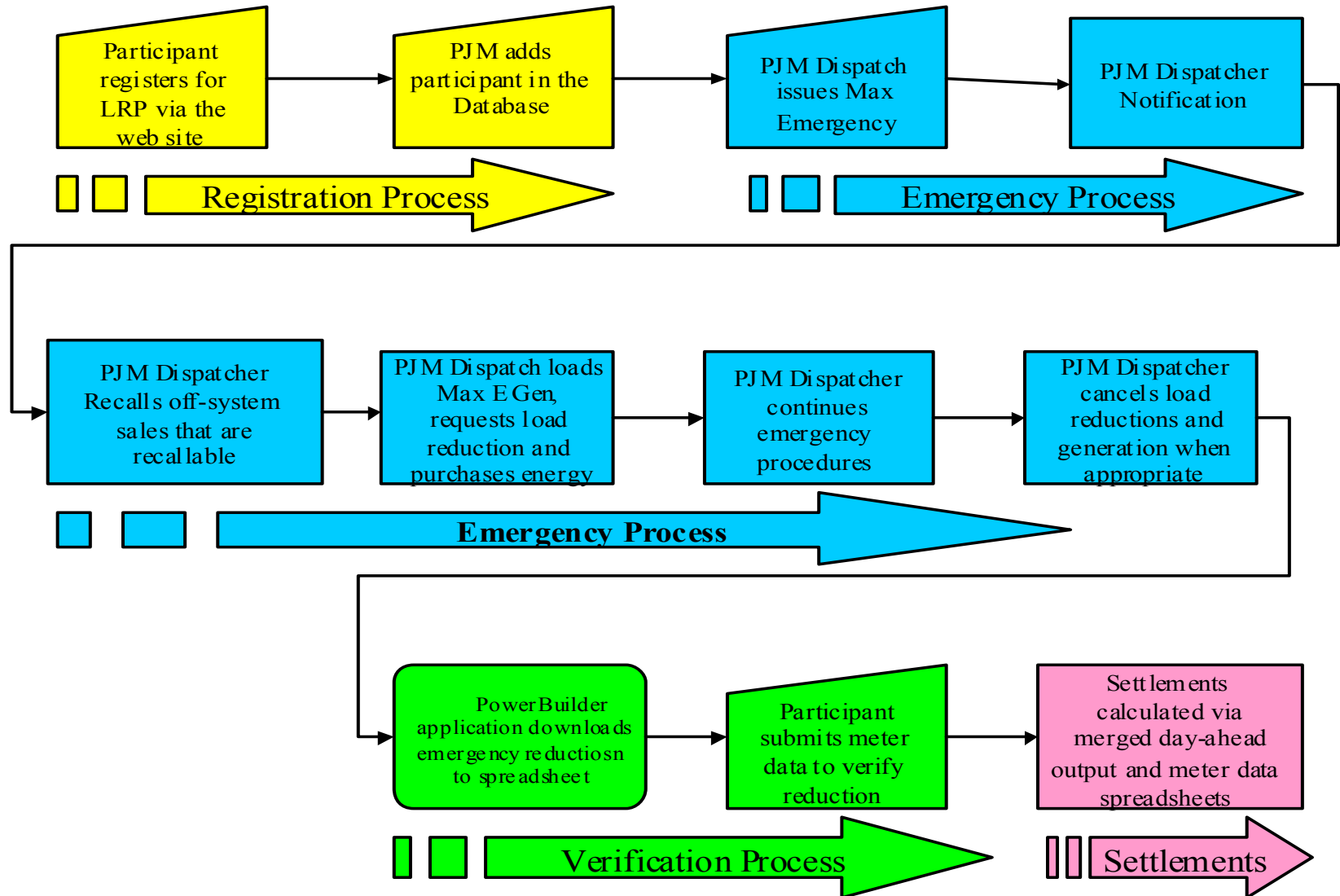
- ALM is in effect from hours 1200-1700
- Real-time reduction = 19 MW
- Reduction – ALM commitment = 11 MW
- Deviation from DA commitment =  $10 \text{ MW} - 11 \text{ MW} = -1 \text{ MW}$
- RT LMP = \$200

Customer credit =  $(\$200)(-1) = (\$200)$

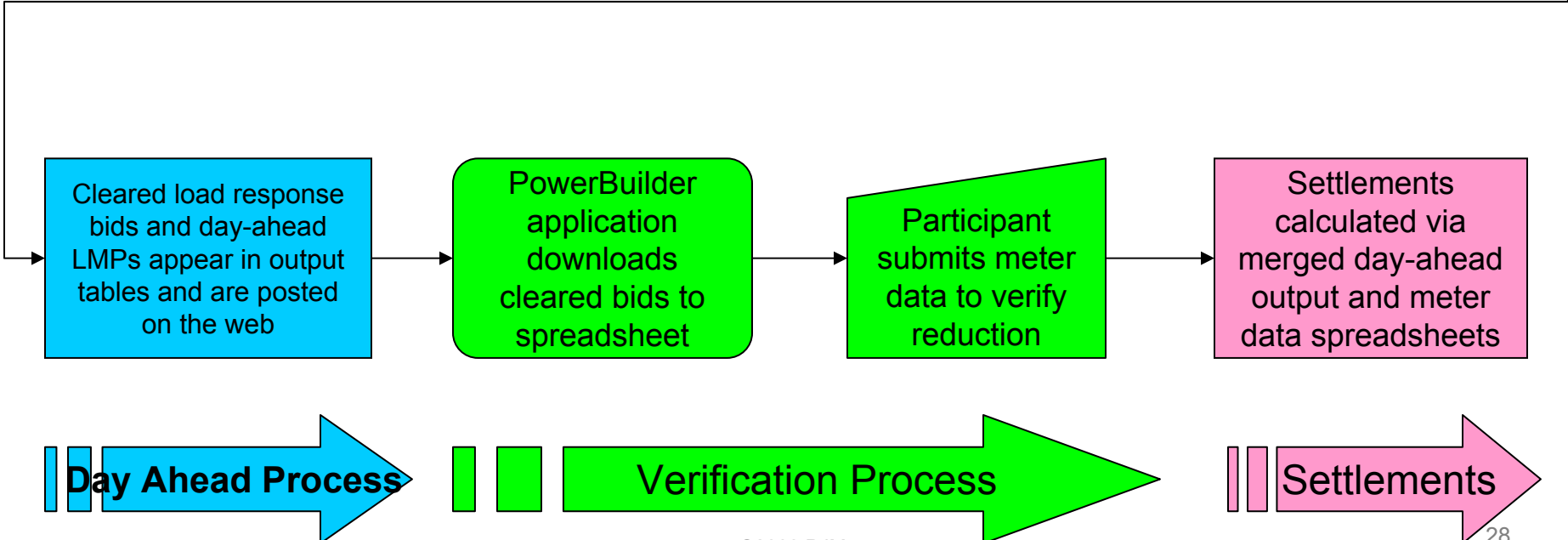
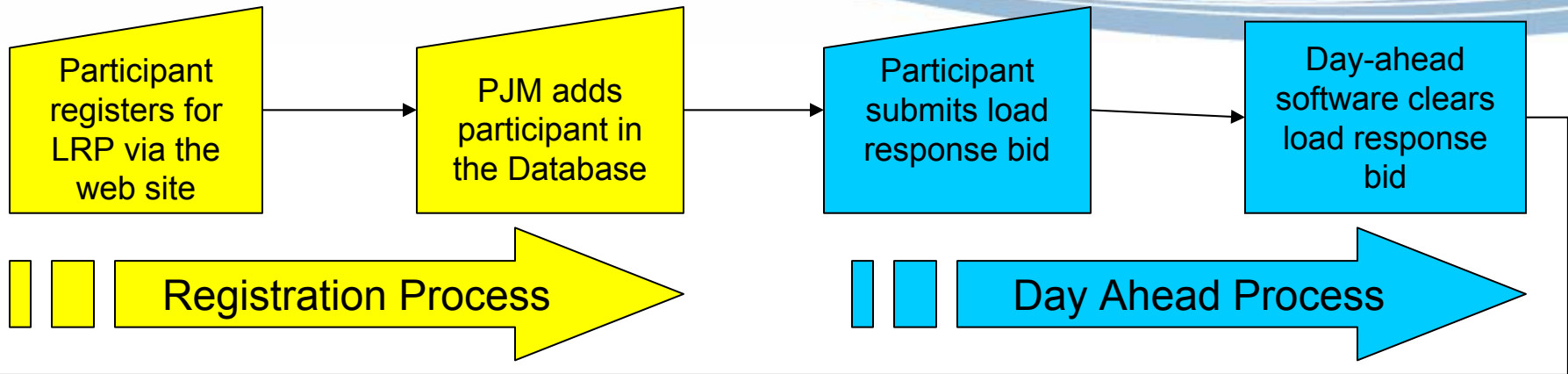
**Net credit =  $(\$1000) + (\$200) = \$1200$**

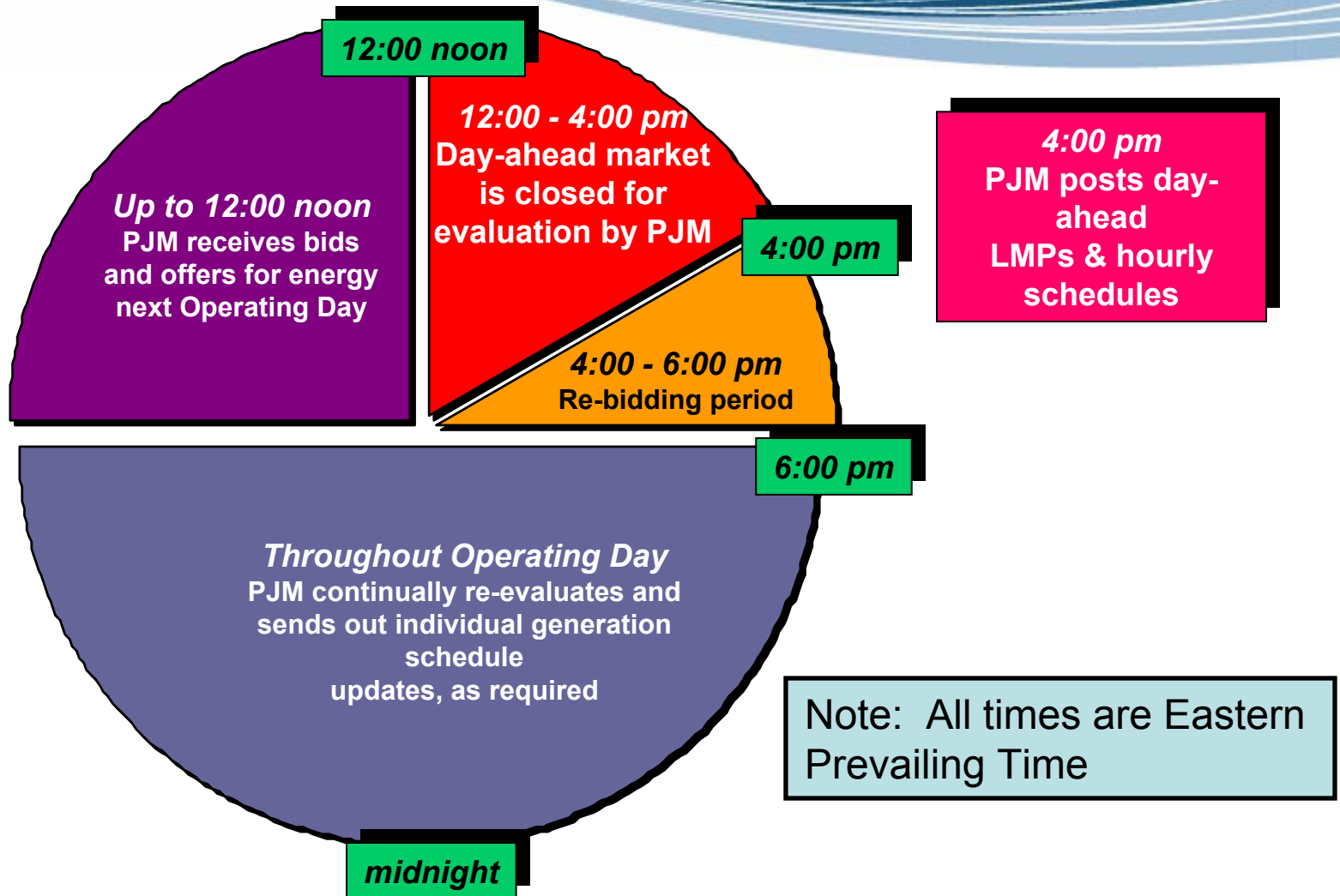
- PJM Load Response Programs
- Settlement Examples
- **Program Mechanics / Checklist**
- Registration
- Operations
- Participation To Date
- Summary / Action Items

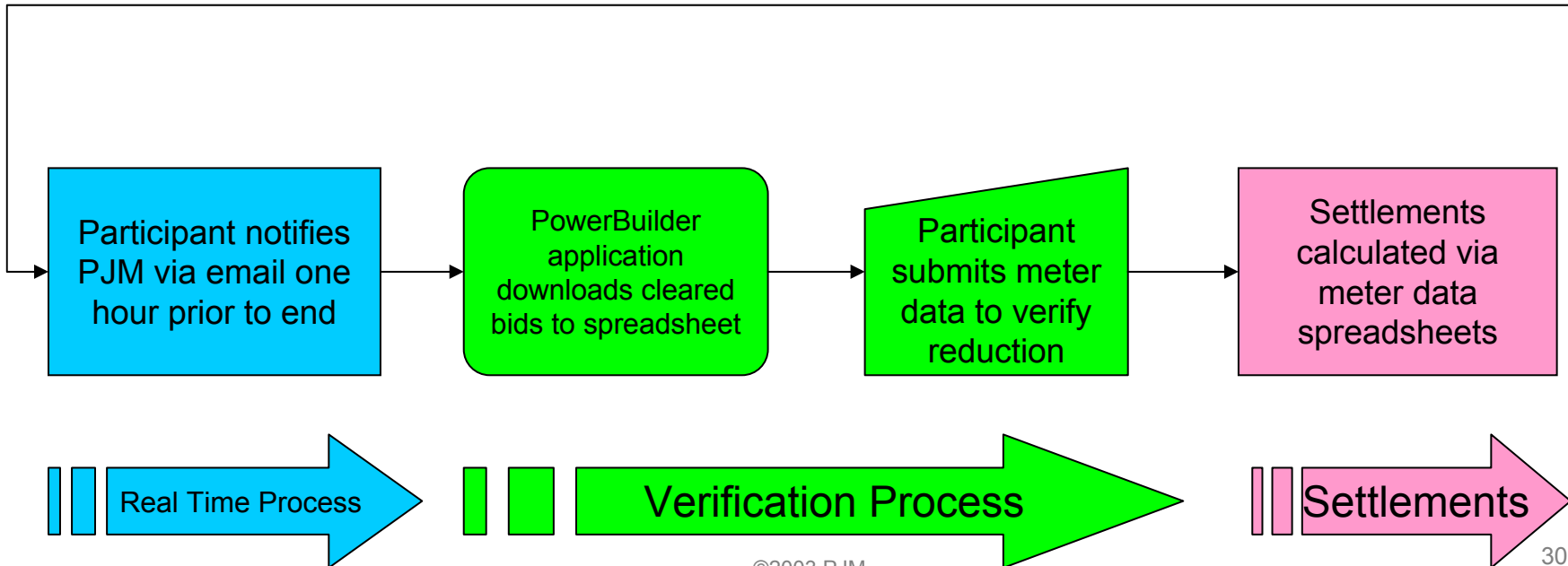
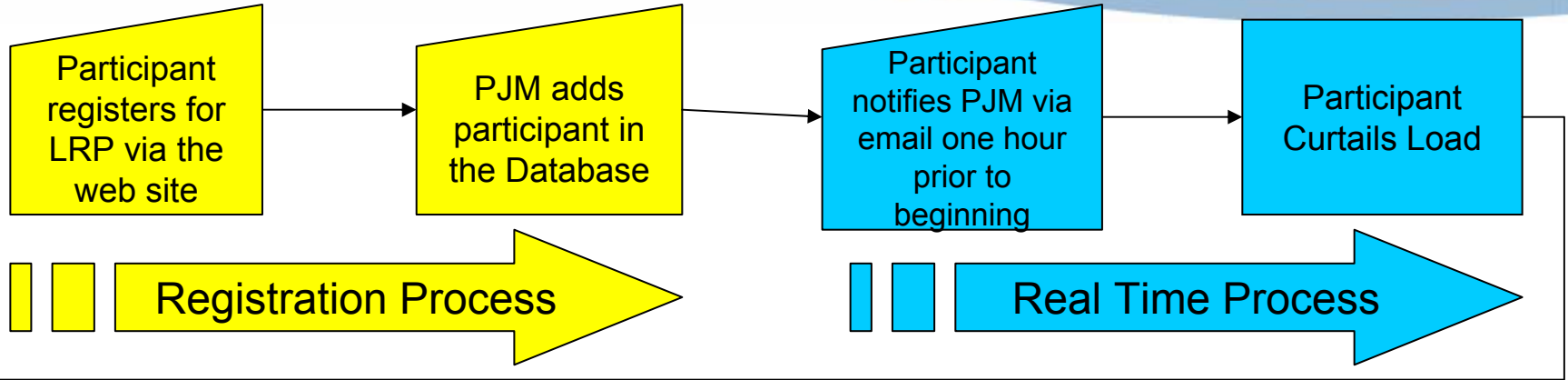
# Emergency Load Curtailment



# Day Ahead Load Response Bidding







- PJM Load Response Programs
- Settlement Examples
- Program Mechanics / Checklist
- **Registration**
- Operations
- Participation To Date
- Summary / Action Items

https://... Load Response Registration Detail - Microsoft Internet Explorer provided by PJM Interconnection, LLC

**Load Response Registration Detail**

PJM Member Company: PJM Interconnection, L.L.C.  
Registration ID:  
Registration Status: New  
\* Effective Date:   
Terminate Date:

**Customer Data**

- \* End Use Customer Name:
- \* EDC Account Number:
- \* Pricing Zone:
- \* Customer Energy Supplier:
- \* Program Option:
- \* ALM Participant:  Yes  No
- ALM Provider:
- \* Metering Requirement:
- \* Required information

**Operation Data**

- \* Load Reduction:  KW
- Reduction LMP (Economic Option):  \$/MW
- \* Time to Reduce:  minutes
- \* Load Reduction Method:
- Backup Generation:
  - Type of Generator:
  - Amount:  KW
  - Fuel Type:
- Dispatchable in Real Time:  Yes  No
- Shutdown Costs:
  - Apr. 1 - Sep. 30:
  - Oct. 1 - Mar. 31:
- Minimum Down Time:  Hours
- \* Weather Sensitivity:  Yes  No
- Weather Station:
- Loss Factor:
- Retail Rate (G & T):  cents/KWH

Load reduction, On-site generation, Both

© 1999 PJM Interconnection

Start | Inboxes | Database | DOCS | Demand | Microsoft | Settlements | https://e... | Microsoft | Load R... | 1:48 PM



## **Submit all required documentation and confirm participant information with PJM:**

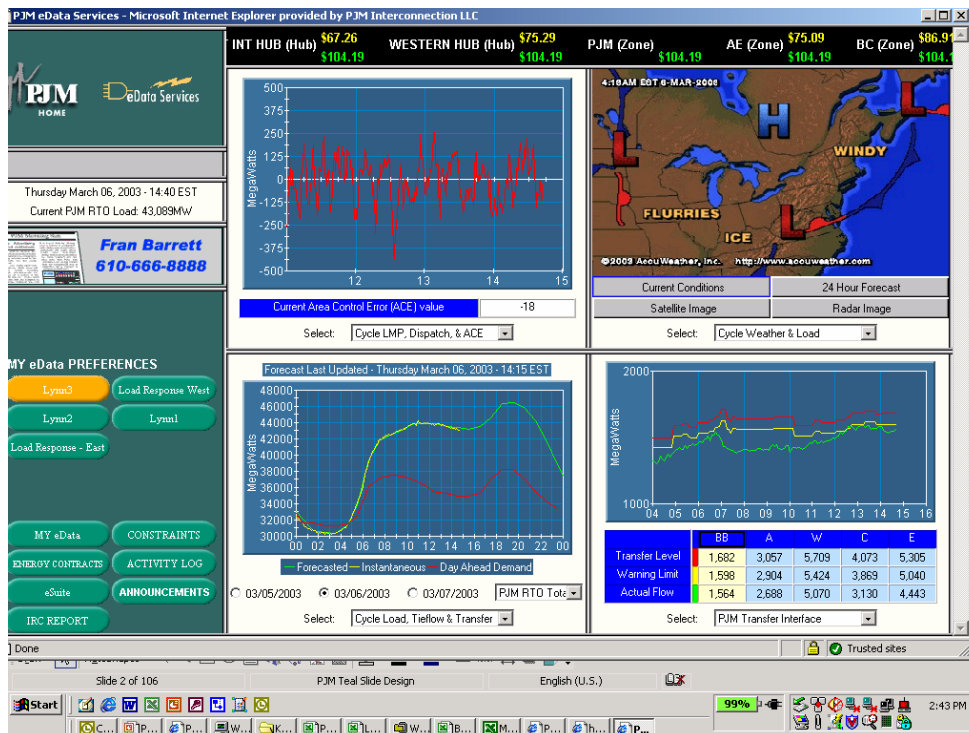
- End-use customer may not be registered simultaneously in Economic and Emergency Load Response Program.
- Program Participant intending to run distributed generating units in support of local load submits applicable environmental permits to PJM.
- PJM will verify that appropriate meters exist. If meter does not meet requirements Program participant is contacted via letter/email/phone.
- PJM confirms with the appropriate LSE and EDC whether the load reduction is an ALM customer. PJM contacts EDC and LSE to confirm.
- PJM confirms with the appropriate LSE and EDC whether the load reduction is under other contractual obligations. *(The EDC and LSE have ten (10) business days to respond or PJM assumes acceptance.)* PJM contacts EDC and LSE to confirm.
- If all requirements are sufficiently met, PJM accepts Program Participant.
- PJM informs the Program Participant of the acceptance into the program.

- PJM Load Response Programs
- Settlement Examples
- Program Mechanics / Checklist
- Registration
- **Operations**
- Participation To Date
- Summary / Action Items

## eData

Participants use eData for real time pricing and operational information.

Over a dozen customizable views.



- eData is an internet tool used to view:
  - LMP data
  - System conditions
  - Operational Information
  - Energy schedule information
  - Other data
- eData is very customizable

Best of all ....


**IT'S FREE!**

HUB (Hub)	\$27.01	Current Load	38,370MW	Min Dispatch	\$48.24	Max Dispatch	\$74.80	Area Control Error	.99M
	\$54.09								

- Ticker can display Day-Ahead (top-yellow) and Real-Time prices (bottom-green), load, min and max dispatch rates and Ace.

- Double click on the ticker to spawn this mini-ticker outside of the main eData window.

PJM eData Services
Speed  
Direction  
TRANSFER INTERFACE
TIE FLOW



WESTERN HUB (Hub) \$27.01

\$54.09

Current Load

38,370MW

LMP data current as of Tue 04-Sep-01 19:15 EDT

Day Ahead

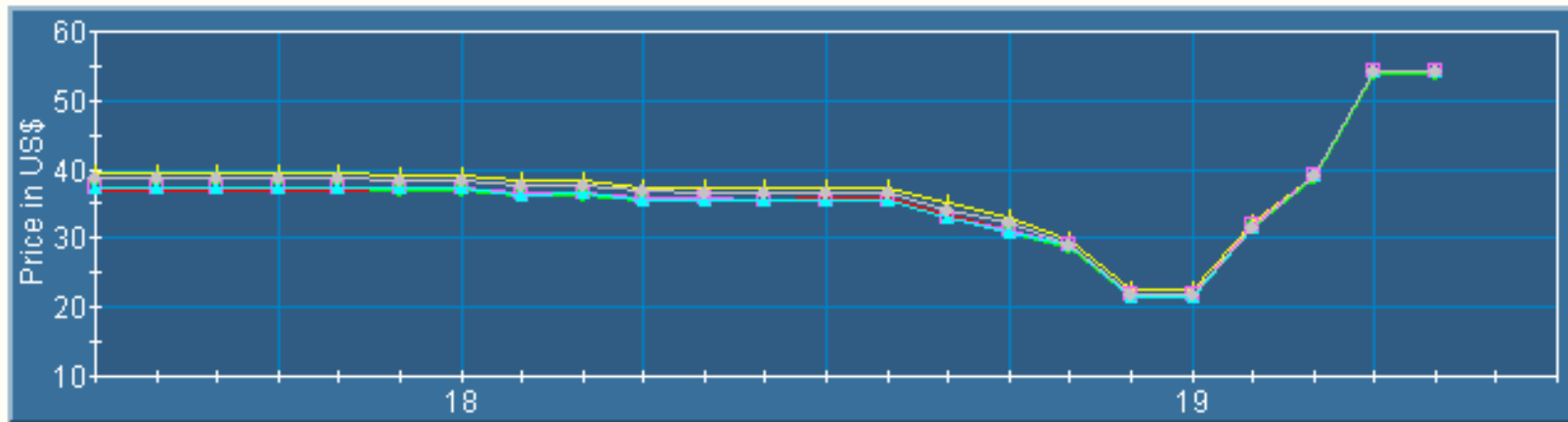
Real Time

AE (Zone) \$36.73

\$56.68

BC

MY eData
ENERGY CONTRACTS
CONSTRAINTS
ANNOUNCEMENTS
eSuite
ACTIVITY LOG



- RT
- DA
- BOTH

Scale

2 hr

LMPs

Time

< . >

09/04/2001

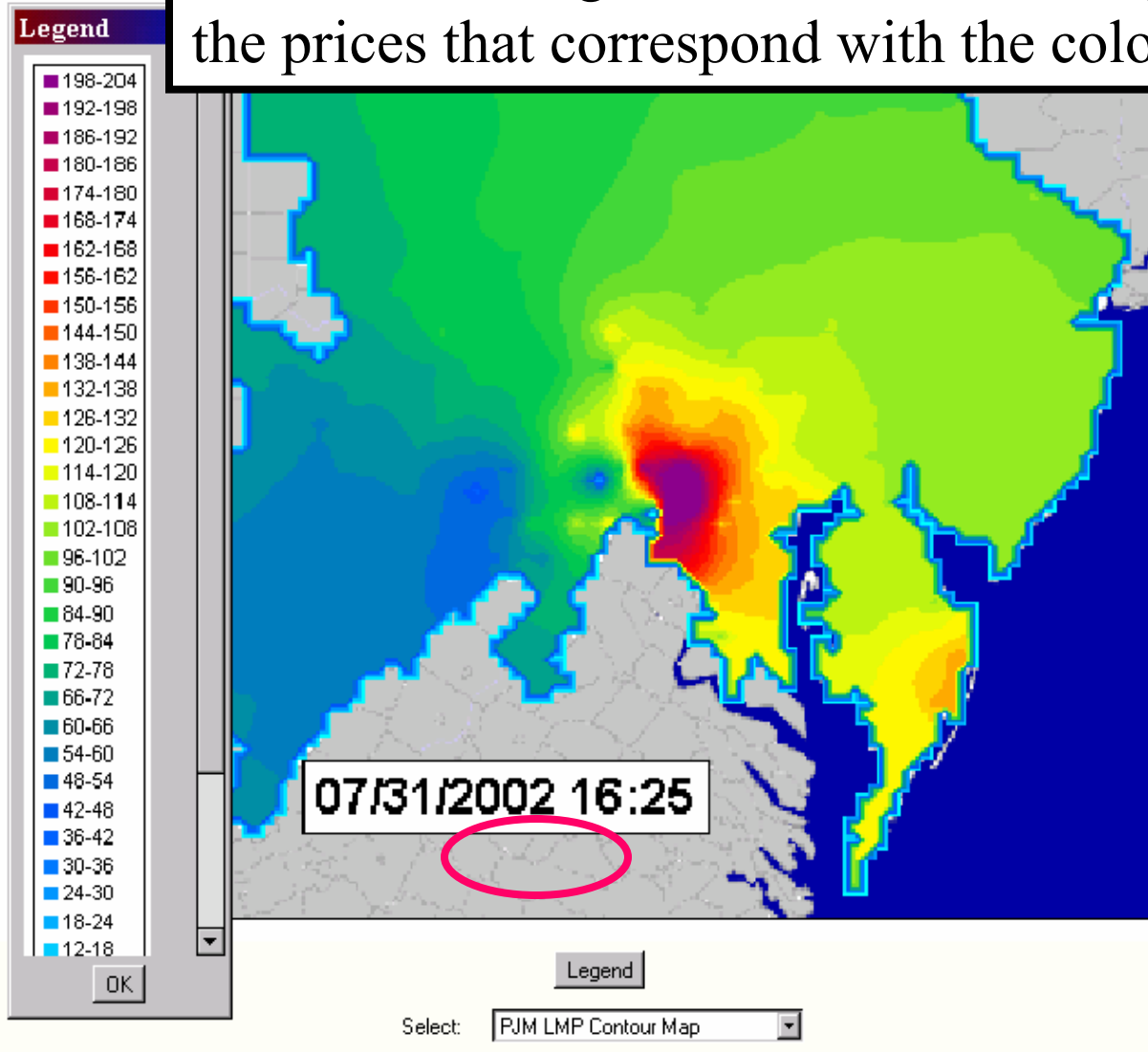
LMP	Cur	Avg	Min	Max
PE (Zone)	54.05	35.76	21.44	54.05
PL (Zone)	54.10	35.92	21.83	54.11
EASTERN HUB (Hub)	54.08	35.89	21.68	54.08

LMP	Cur	Avg	Min	Max
PJM (Zone)	54.21	37.40	22.58	54.21
PS (Zone)	54.10	36.00	21.89	54.11
WESTERN HUB (Hub)	54.09	36.79	21.82	54.10

Select:

- LMP Chart
- Cycle LMP Dispatch & ACE**
- Cycle Load, Tieflow & Transfer
- Cycle Weather & Load
- LMP Chart
- PJM Tie Flows
- PJM Transfer Interface
- PJM Load
- PJM Dispatch Lambda Signal

Click on the “legend” and it will show you the prices that correspond with the colors.



**Elevated** Significant Risk

Monday July 14, 2003 - 16:30 EDT  
Current PJM RTO Load: 48,482MW

**Information Is Power**

**MY eData PREFERENCES**

danedata

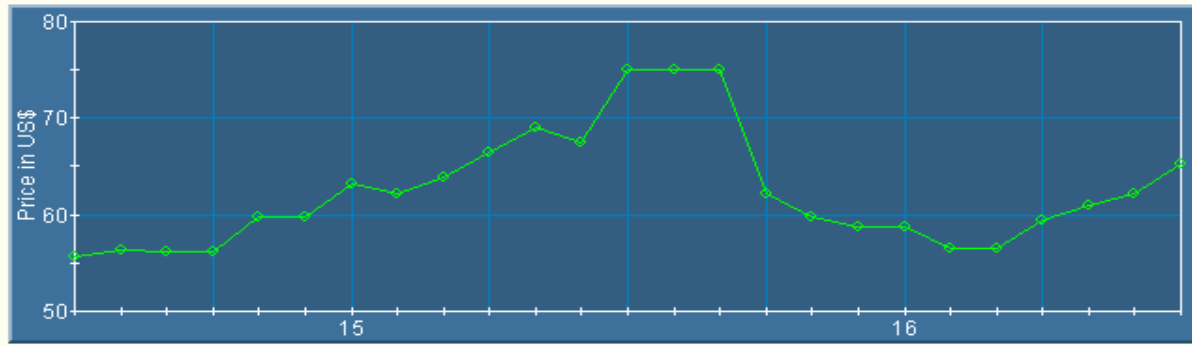
**MY eData**

ENERGY CONTRACTS

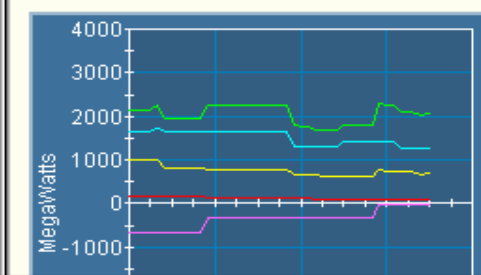
eSuite

IRC REPORT

5.07 Area Control Error 100MW LMP data current as of Mon 14-Jul-03 16:30 EDT Day Ahead Real Time EASTERN HUB (H)



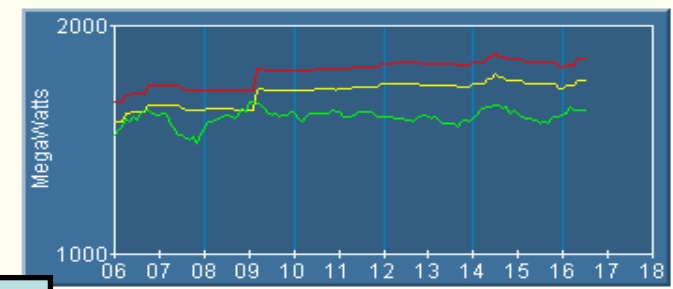
LMP	Cur	Avg	Min	Max
PJM (Zone)	65.20	62.46	55.68	75.10



(+) Into PJM

FE	684
DLCO	93
NYIS	-9
AEPVP	1,280
NET	2,048

(-) Out of PJM



	BB	A	W	C	E
Transfer Level	1,854	3,140	5,685	3,828	6,318
Warning Limit	1,762	2,983	5,401	3,637	6,002
Actual Flow	1,633	2,703	4,495	2,151	5,000

Click on 'MY eData' to customize your preferences. A "pop-up" screen appears, allowing you to start customizing your eData screens.


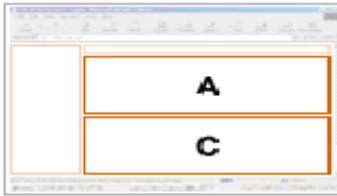
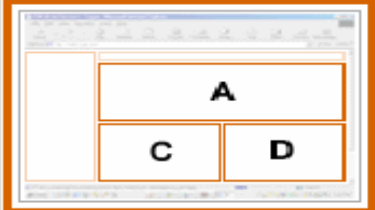
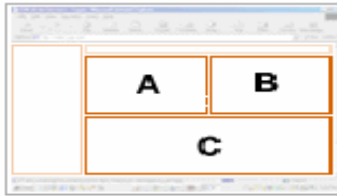
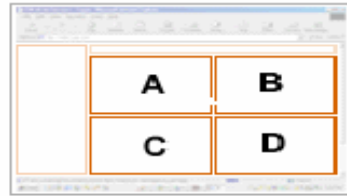


**My eData** [X] Help

Select:  Help

Preference Name: danedata **1**

Select screen layout

Select LMPs (double click on an 'LMPs to monitor' item to graph up to 6 LMPs)

All Available LMPs: **4**

Name	Voltage	Station
PJM		
Zone		
Hub		
Aggregate		
Interface		
Load		
Gen		
500KV/765KV		
NY		
Zone		
Gen		

LMPs to monitor:

Name	Voltage	Station	Graphed
EASTERN HUB			No
WEST INT HUB			No
WESTERN HUB			No
PJM			Yes
AE			No
BC			No
DPL			No
JC			No
ME			No
PS			No

Select Ticker preference **2**

Top

Bottom

No Ticker

Select default graph **3**

Frame A:

Frame B:

Frame C:

Frame D:

Set LMP default time-scale **5**

Save this as my default Preference

Save As... OK Cancel Apply

My eData Alerts Management Help

**Alerts Configuration**

Name	Voltage	Station	Alert
EASTERN HUB			
WEST INT HUB			
WESTERN HUB			
PJM			
AE			
BC			
DPL			
JC			
ME			
PS			

**Alert Criteria**

\$60.00 Minimum

\$62.50 Maximum

% Change

\$ Change

Disable Alert

Minimum and Maximum - generate an alert when the current value crosses the specified values.

- Disable Alerts Function
- Always show this page when editing My eData

- PJM Load Response Programs
- Settlement Examples
- Program Mechanics / Checklist
- Registration
- Operations
- **Participation To Date**
- Summary / Action Items

## EMERGENCY

**2002**

- ◆ **61 Registered Sites**
- ◆ **548 MW**
- ◆ **Payments \$177,000**

**2003**

- ◆ **38 New Registered Sites**
- ◆ **81 Additional MW**
- ◆ **\$0 Payments for 2003**

## ECONOMIC

**2002**

- ◆ **116 Registered Sites**
- ◆ **337 MW**
- ◆ **Payments \$895,000**

**2003**

- ◆ **105 New Registered Sites**
- ◆ **374 Additional MW**
- ◆ **Payments \$111,000 (up to Q2)**

- Total Sites: 320 / Total MW: 1,340 MW
- Pending Sites: 79 / Pending MW: 36 MW
- 1,340 MW is approximately 2 % of the All Time Peak Demand

- 2 Load Response programs
  - Emergency and Economic
  - Economic has Day-ahead option
- Emergency reduction gets paid higher of \$500 or LMP
- Economic payout depends on LMP value
- See Business rules for specific requirements and further information

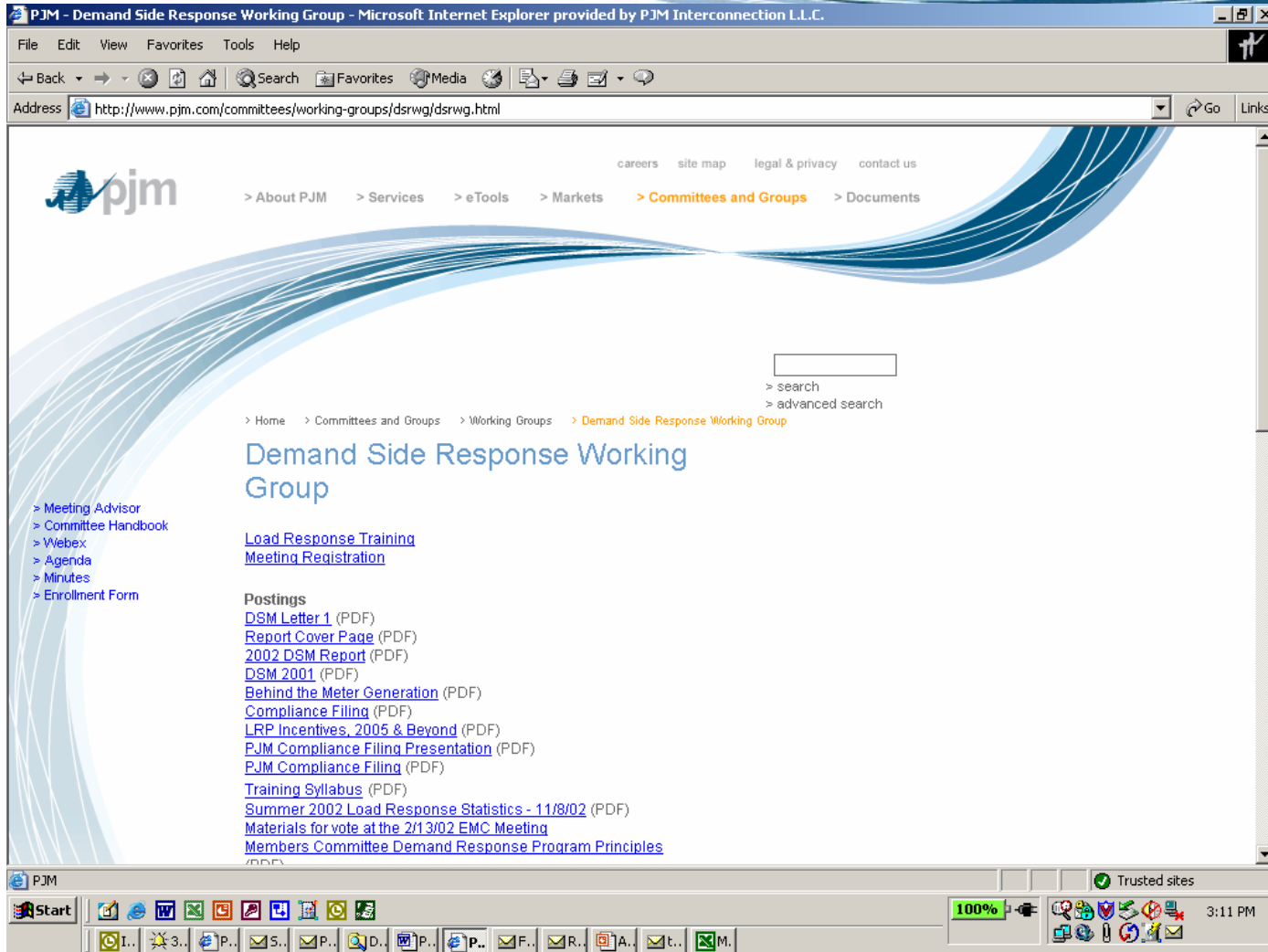
- PJM Load Response Programs
- Settlement Examples
- Program Mechanics / Checklist
- Registration
- Operations
- Participation To Date
- **Summary / Action Items**

1. Enroll in the program (contact a CSP or obtain PJM membership)
2. Select a program (Emergency or Economic)
3. Obtain an eData account

<b>Company</b>	<b>Contact</b>	<b>Phone Number</b>
AES NewEnergy, Inc.	Bruce Heberton	215-563-9290 ext 222
Allegheny Power	Jason J. Wojciechowicz	724-838-6189
Amerada Hess Corporation	Blas Hernandez	732-750-6148
Baltimore Gas & Electric	Gregory M. Urbin	410-265-4221
Borough of Ephrata	Rick Gilkey	484-840-1412
Commercial Utility Consultants, Inc	Joe McGillian	800-296-2821
Conectiv	Katharine Olinchak	(302) 454-5189
ConEdison Solutions	Adam H. Fairbanks	(888) 210-8899
Constellation Energy Source	George Pleat	410-907-2052
Constellation NewEnergy	Bruce Heberton	(215) 320-1170
Continental Cooperative Services (CCS)	Phil Cervený	(717) 920-1111



<b>Company</b>	<b>Contact</b>	<b>Phone Number</b>
FirstEnergy Companies	Bruce Rimmel	610-921-6839
The Legacy Energy Group	Delbert Roberts	540-351-0981
Mirant	Robert Fairey	678-579-3130
Orange and Rockland Utilities	Mike Thorpe	(845) 577-3169
PECO Energy	Gene Flanagan	215-841-5363
PEPCO	Steve Sunderhauf	202-872-3507
PEPCO Energy Services	Carolyn Moses	703-253-1661
PSE&G	Mike Prendergast	(973) 430-6601
Reliant Energy Solutions	Andy Bakey	(732) 321-2037
South Jersey Energy Co.	Lou Decicco	609-561-9010
UtiliTech, Inc.	Ken Wnek	610-777-3200
Washington Gas Energy Services	Emily Harrall	(703) 793-7570



The screenshot shows a Microsoft Internet Explorer browser window. The title bar reads "PJM - Demand Side Response Working Group - Microsoft Internet Explorer provided by PJM Interconnection L.L.C.". The address bar shows the URL "http://www.pjm.com/committees/working-groups/dsrwg/dsrwg.html". The browser's menu bar includes File, Edit, View, Favorites, Tools, and Help. The search bar contains a search icon and a "Go" button. The main content area features the PJM logo and a navigation menu with links for "About PJM", "Services", "eTools", "Markets", "Committees and Groups", and "Documents". A search box is present with options for "search" and "advanced search". The breadcrumb trail indicates the current location: "Home > Committees and Groups > Working Groups > Demand Side Response Working Group". The main heading is "Demand Side Response Working Group". On the left, there is a sidebar with links: "Meeting Advisor", "Committee Handbook", "Webex", "Agenda", "Minutes", and "Enrollment Form". The main content area includes links for "Load Response Training" and "Meeting Registration". A "Postings" section lists several PDF documents: "DSM Letter 1", "Report Cover Page", "2002 DSM Report", "DSM 2001", "Behind the Meter Generation", "Compliance Filing", "LRP Incentives, 2005 & Beyond", "PJM Compliance Filing Presentation", "PJM Compliance Filing", "Training Syllabus", "Summer 2002 Load Response Statistics - 11/8/02", "Materials for vote at the 2/13/02 EMC Meeting", and "Members Committee Demand Response Program Principles". The browser's status bar shows "PJM" and "Trusted sites". The Windows taskbar at the bottom displays the Start button, a taskbar with various application icons, a system tray with a 100% zoom level, and the time "3:11 PM".

- **PJM Load Response Program:** The PJM Load Response Program allows participants to play a significant part in developing price stability as well as providing support to assist in system security. This program is designed to provide a revenue stream for load curtailers who wish to participate in the market. The PJM Load Response Participants, at opportune times, can be paid for curtailing load just as a generator is paid for putting energy onto the system. The sunset on the existing program is 12/1/04. For more information contact an existing Curtailment Service Provider or send a request to [LoadResponse@pjm.com](mailto:LoadResponse@pjm.com)
- **Real Time Price with eData:** sophisticated Internet-based software applications that give members access to a continuous flow of real-time energy data. *No special software required. No cost to sign up.* User ID and password required. Send request [LoadResponse@pjm.com](mailto:LoadResponse@pjm.com)
- **Historical Real Time Prices:** can be found at <http://www.pjm.com/markets/jsp/lmp.jsp>





PJM Demand Response Team:

Susan Covino, Mgr

610-666-8829

Joe Polidoro

610-666-4693

PJM Markets Hotline:

610-666-8998

PJM Customer Relations:

610-666-8980

PJM Technical Support:

610-666-8886