



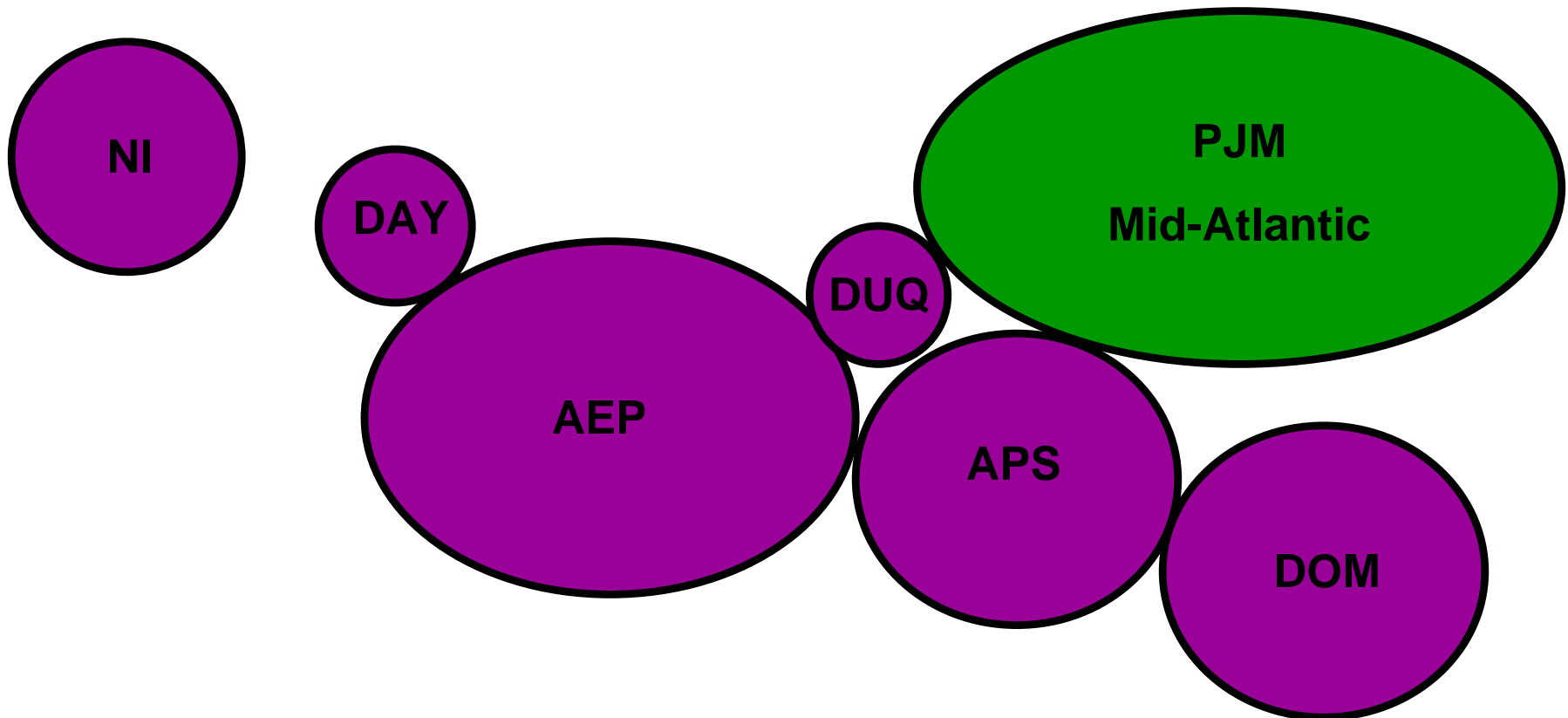
PJM-MISO
Stakeholder
JCM Briefing
June 30, 2005



Ancillary Services

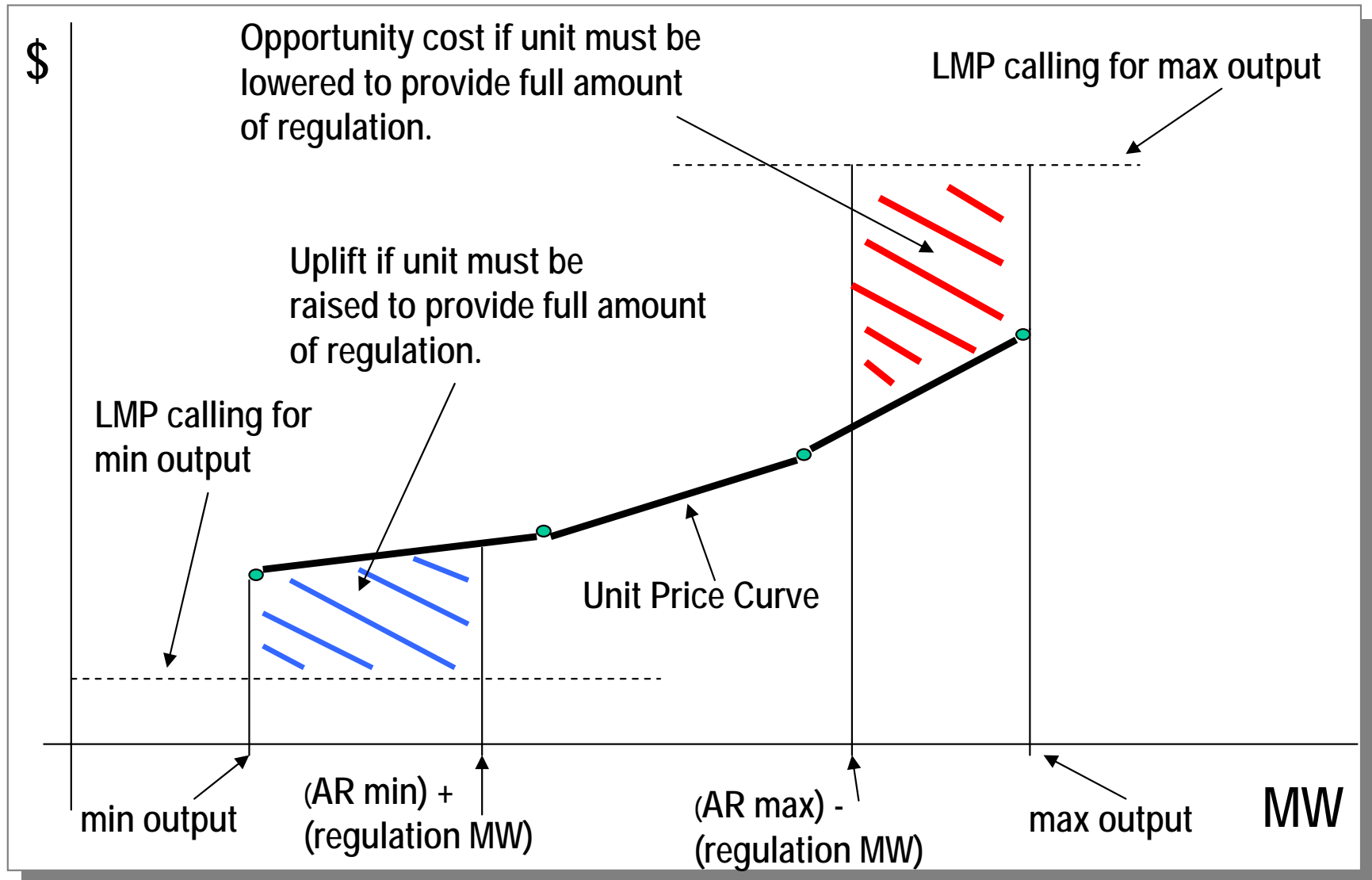
*PJM Market-based
Regulation Features &
System*

- Regulation Zones: Western and Mid-Atlantic



- Self-Scheduled
 - Generator is guaranteed to regulate
 - Real-time opportunity costs are **not** covered
- Pool Assigned
 - Generator is assigned to regulate if economic
 - Real-time opportunity costs **are** guaranteed to be recovered



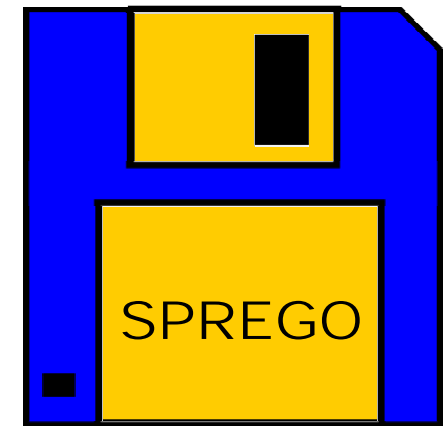


Unit Merit Order Price = Regulation Offer + Opportunity Cost

Opportunity Cost = $|LMP - ED| * GENOFF$

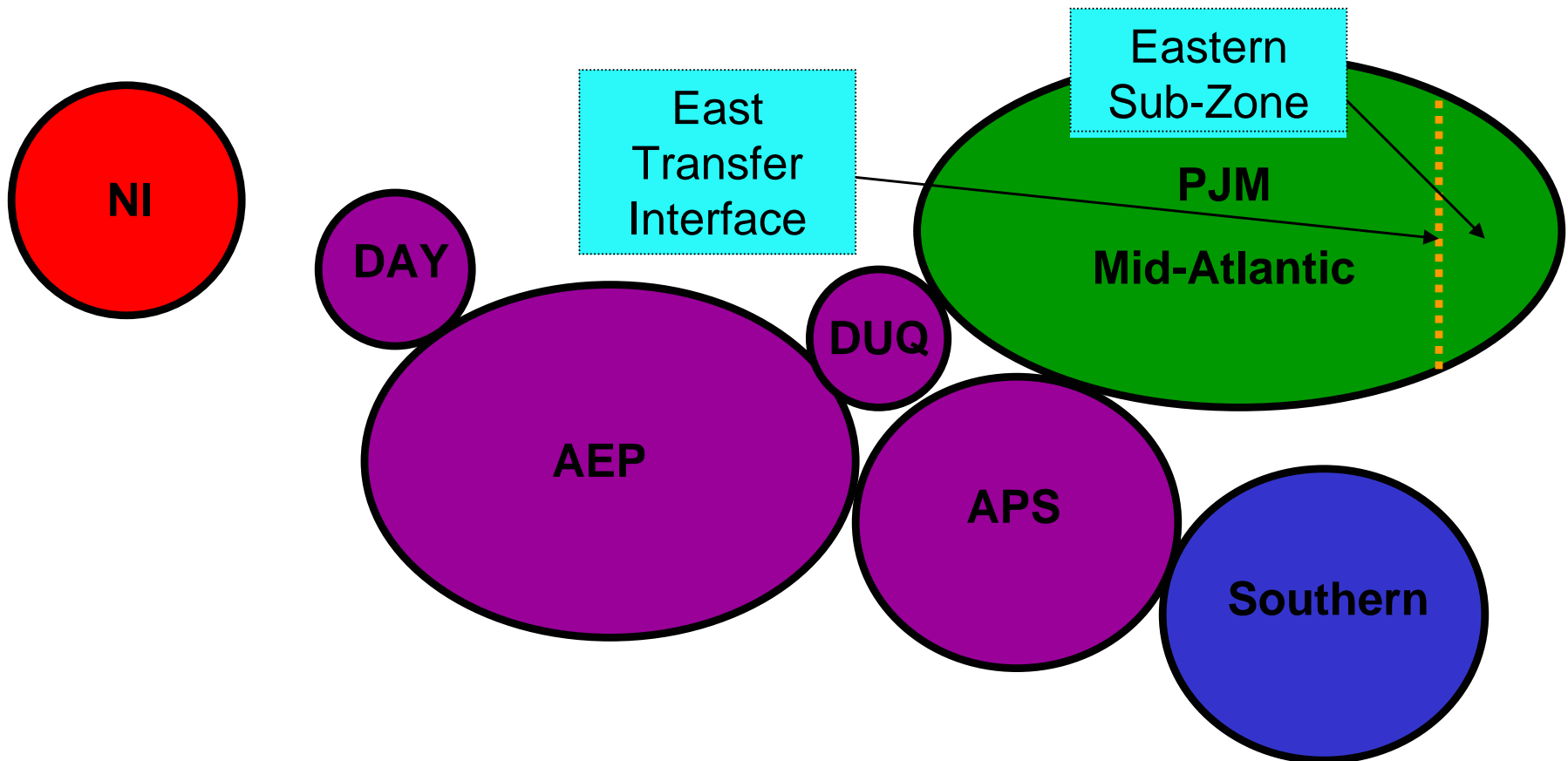
<i>LMP</i>	forecasted LMP at generator bus
<i>ED</i>	price at setpoint unit must maintain to provide full amount of regulation
<i>GENOFF</i>	MW deviation between economic dispatch & regulation set point

- Calculate unit merit order price for each unit that provided a regulation offer
 - estimate unit opportunity cost for each unit
- Rank all available regulating units in ascending merit order
- Determine least expensive set of units to meet PJM Regulation Requirement



*PJM Spinning reserve
Market*

- Spinning Reserve Zones: Western, NI, Southern and Mid-Atlantic



Tier 1 – Economic	Marginal, partially loaded units - online, following economic dispatch and able to increase output in response to a Spinning event
Tier 2 – Non-economic	Condensers (CTs and hydro), steam reduced to provide spinning, CTs on at min – operating at a point that deviates from economic dispatch

**Enter bilateral
agreements with
other market
participants**

**Self-scheduling
Tier 2
resources**



**Purchasing from
the spinning
market**

**Owning Tier 1
resources or allocation
from other Tier 1
resources**

- Spinning market clearing is a joint optimization between regulation and spinning reserves
- The goal of the optimization is to minimize the total cost of producing energy, regulation, and spinning reserve

- Tier 2 required based on:
 - Tier 2 Requirement = Spinning Requirement - Tier 1 Estimate - Fixed Reserves - Available Transfer Capability (Sub-zone only)
- Amount of Tier 2 assigned comes from:
 - Tier 2 Assigned = Tier 2 Requirement - Tier 2 Self Scheduled

- Tier 2 selection based on merit order stacking of available units
 - Merit order price: spinning offer + estimated opportunity cost + energy usage + startup costs
 - Start-up costs spread over expected duration of commitment
- Highest merit order price cleared determines SRMCP
 - SRMCP = Spinning Reserve Market Clearing Price
 - Each area and sub-zone will have its own SRMCP

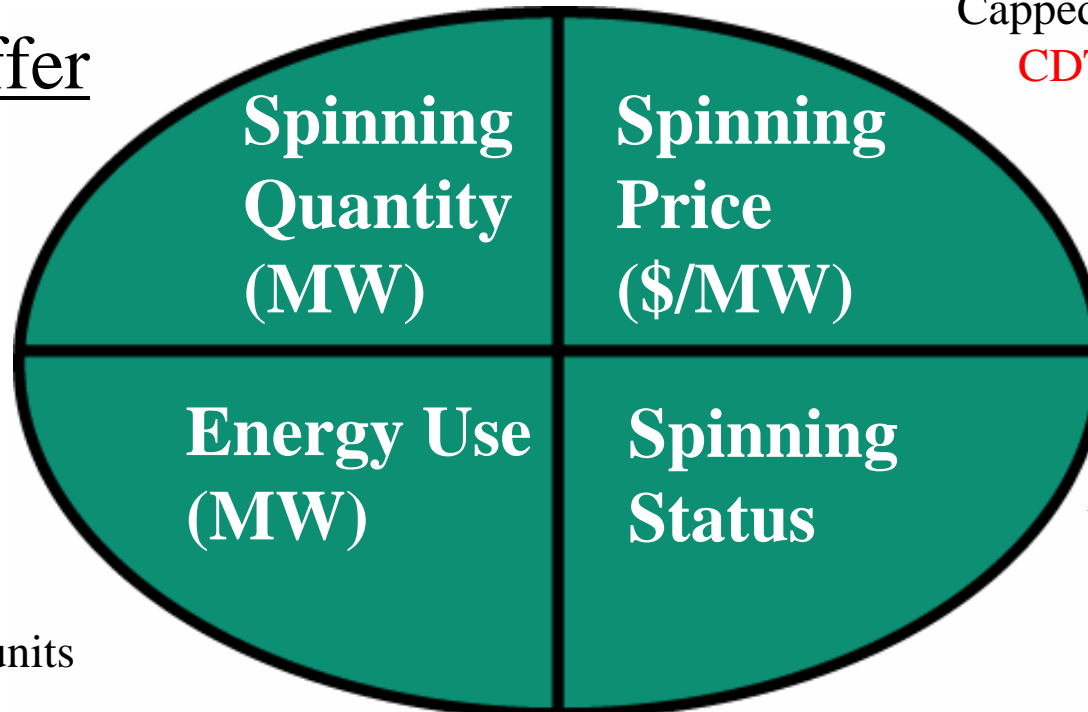
Tier 1 Information

>= Economic Max



>= Economic Ramp Rate

Tier 2 Offer



Capped at O&M plus \$7.50 (see CDTF manual for details)

Available, Unavailable
Self scheduled

For condensing units

T-120 min.

T-120 Minutes
PJM executes
Tier 1
estimation case
for the operating
hour

At or prior to T-
90 minutes,
PJM posts
results of Tier 1
estimation and
amount of Tier 2
required

T-90 min.

T-60 min.

T-60 Minutes
Self-schedules for
the operating hour
are due, and all
Spinning and
Regulation offer
information is
locked down.
Tier 1 estimation
is executed for
next operating
hour.

T-30 Minutes
PJM posts Tier 2
Spinning and
Regulation
assignments and
communicates
them to
generation
owners. Tier 1
estimate for next
operating hour is
posted

T-30 min.

- Spinning Reserve and Regulation consistent in their design
- Spinning Reserve resources classified as Tier 1 and Tier 2
- Tier 1 resources used first to meet obligation
- Separate settlements for Tier 1 and Tier 2 resources
- Penalty structures in place for non-delivery of assigned Tier 2 Spinning Reserve
- eMKT used to submit and view Spinning information

Ancillary Services
in the
Midwest ISO Energy Markets

Ancillary Services in today's Midwest ISO energy markets:

➤ Schedules 3, 5, and 6 (regulation, spin and non-spin) – available from

- Self Supply
- 3rd Party
- Balancing Area
- Midwest ISO (POLR)

➤ Ancillary services provided by the Midwest ISO are charged at the applicable balancing area rate. Revenues are passed straight through to the Balancing Area.

Ancillary Services in today's Midwest ISO energy markets:

Balancing Area responsibilities

- Submit to the Midwest ISO on an aggregate basis:
 - regulation MW,
 - reserve MW, and
 - total operating reserve MW
- Provide estimate up to 7 days prior
- Can be updated up to 30 minutes prior to the operating hour

Ancillary Services in today's Midwest ISO energy markets:

Market Participant responsibilities

- Day-Ahead Offers structured to include
 - Regulation requirements
 - Reserve (spin) requirements
- As capacity between dispatch maximum and emergency maximum
- Non-spin reserves can be submitted as an offline resource designated as emergency status

ANCILLARY SERVICES TASK FORCE -- CHARTER

Mission Statement:

The Ancillary Services Task Force (ASTF) is formed under the governance and direction of the Market Subcommittee to research, develop, and recommend the processes, criteria, and business rules for any Regulation and Operating Reserves Ancillary Services Markets.

Two meetings-to-date: 15 March, 2 May

Set charter, goals, deliverables

High level review of other ISOs/RTOs A/S markets

Next meeting: 8 July

Agenda item: PJM A/S markets