

Congestion Rents, Cost, Etc.?

- **Definition**
- **Reporting of Historical Data**
- **Projections of Future Congestion**

Transmission Congestion

- NY OATT: A characteristic of the transmission system produced by a constraint on the economic operation of the power system, such that the marginal price of Energy to serve the next increment of Load, exclusive of losses, at different locations on the transmission system is unequal.
- *In general, congestion* is the result of physical limitations of discrete transmission grid components that limits the amount of power that can flow over portions of the transmission lines without jeopardizing the reliability of the system. Ideally, the goal of "*economic dispatch*" is to supply load utilizing resources which result in the lowest overall cost. However, because system conditions can result in transmission delivery limitations into a particular location or zone in the grid, lower cost generation that is available to supply the load cannot be utilized and higher cost generation must be operated to meet the demand at that location.

Components of Congestion Rents

<p>1. Congestion Rental or Transmission Opportunity Costs</p>	<p>Is the difference in locational prices net of losses. It is measured relative to a reference bus or location.</p>	<p>William F Hogan definition</p>
<p>2. Congestion Rent</p>	<p>Is the congestion rental times the constrained load.</p>	<p>In NY, it is the congestion component of LBMP that is attributable to transmission congestion times the zonal load. The total would be the sum across all zones.</p>
<p>3. Congestion Costs</p>	<p>Is the portion of the congestion rent that is payable by the flow based portion of the load in the constrained area. It is the congestion rental times the flow into the constrained location. In NY, these are the dollars that are available to pay to holders of TCCs.</p>	<p>For the NY market as a whole, this has been defined as the LBMP payments by loads, including TUC charges to bilaterals, minus LBMP payments to generators net of losses. This is the number the NY Market Monitor reported in his 2002 market report.</p>
<p>4. Congestion Payments to Generators</p>	<p>Is the portion of the congestion rent that is payable to the generation in the constrained location. It is the constrained load minus the flow times the congestion rental.</p>	<p>In NY, it can be defined as the total congestion rent for the NY market minus the congestion costs as defined above for the NY market.</p>

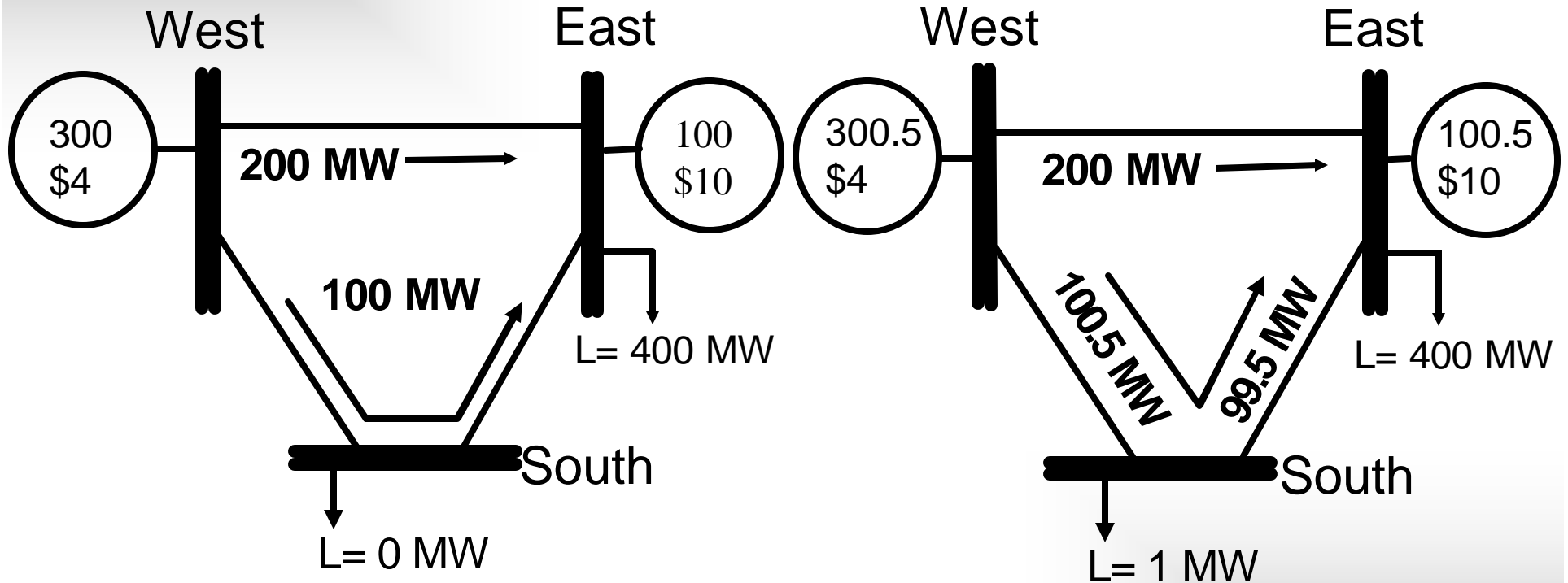
Example of Calculating LMP Prices from Shadow Prices

➤ Three bus model

- *West (reference bus), East & South*
- *East bus has 400 MW of load and \$10/MWh generation*
- *West bus has no load and \$4/MWh generation*

Calculation of LMP Prices

Line West-East at Limit



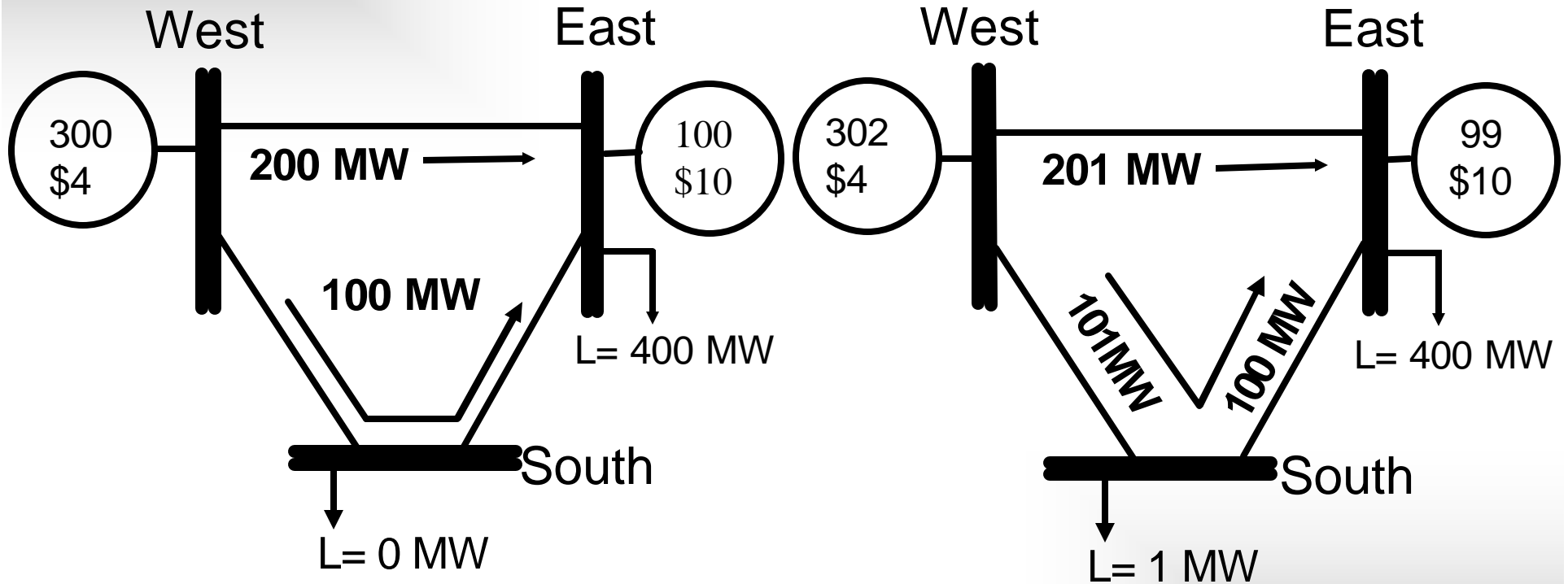
Load Payments = \$4000
 Congestion Rental = \$6
 Congestion Rents = \$2400
 Congestion Costs = \$1800
 Cong. Paid to East Gen = \$600

New York Independent System Operator

LMP South Bus = \$7

Calculation of LMP Prices

Line South-East at Limit

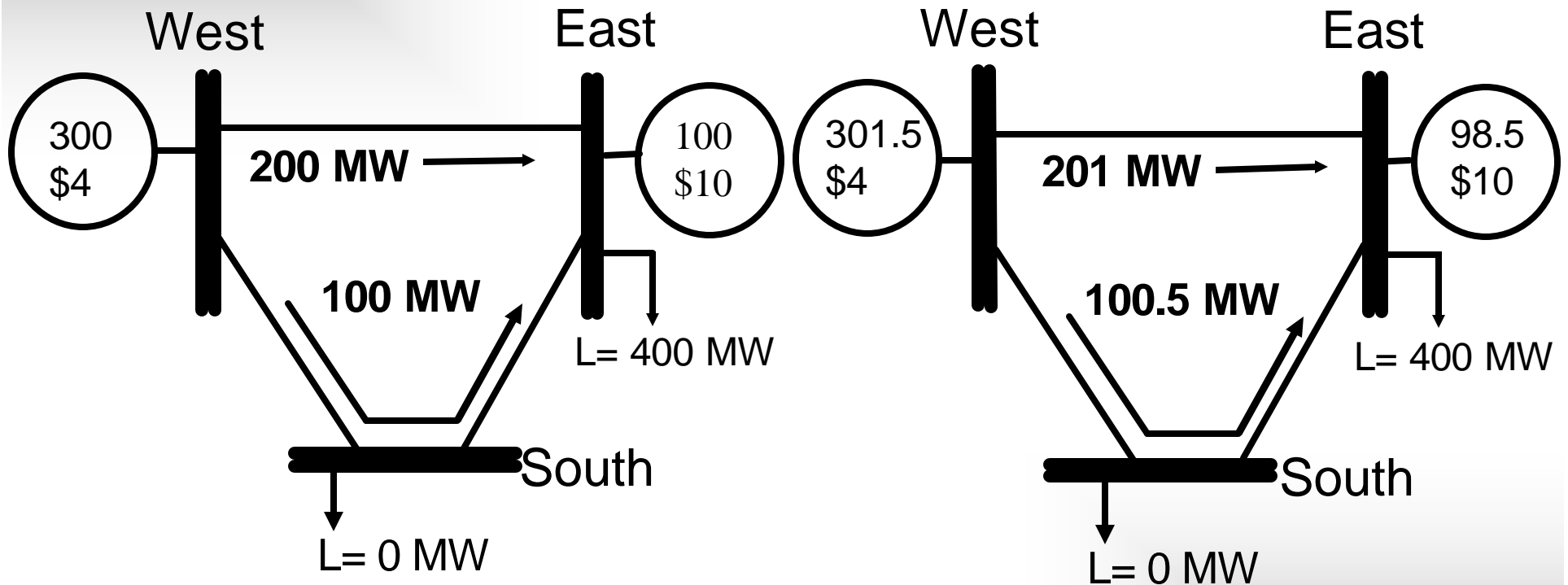


Congestion rents same as previous

LMP South Bus = -\$2

Calculation of Shadow Prices

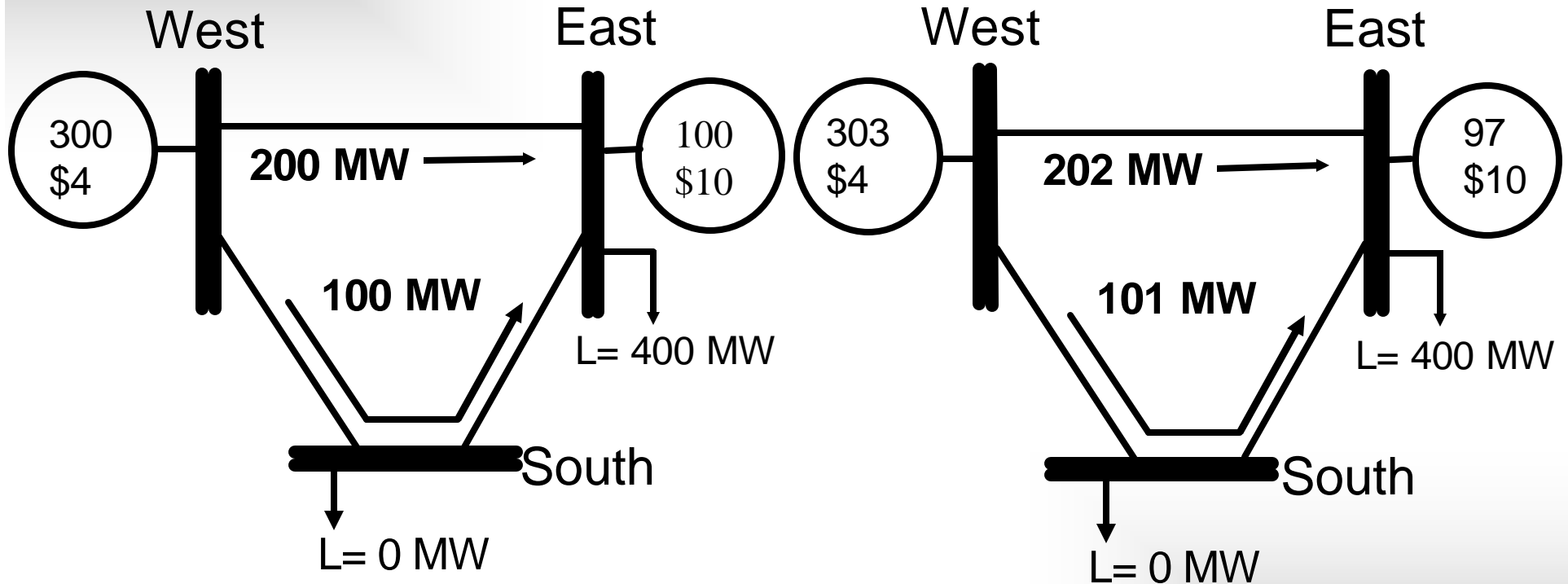
Line West-East at Limit



The shadow price of the west-east limit is \$9

Calculation of Shadow Prices

Line West-South (or South-East) at Limit



The shadow price of the west-south limit is \$18

Calculating LMP from Shadow Prices

- Reference Bus – West
- Reference BUS LMP is \$4
- Generator Shift Factor (GSF) for South Relative to:
 - *West – East* = $-1/3$
 - *West – South* = $-2/3$
 - *South – East* = $1/3$
- LMP at South Bus = Ref. Bus LMP - ? (shadow price) * GSF
 - *West – East Limiting*: $LMP = 4 - \$9 * (-1/3) = \7
 - *South – East Limiting*: $LMP = 4 - \$18 * (1/3) = -\2
 - *West – South Limiting*: $LMP = 4 - \$18 * (-2/3) = \16

Congestion Statistics Available
on the
NYISO Web Site

Real Time Market: Constraining Facility

<http://mis.nyiso.com/public/P-33list.htm>

Timestamp	Constraint Name	Point ID	Constraint Type	Constraint Cost (\$)
7/1/2003 8:00	VERNON/GREENWOOD	23325	N	0
7/1/2003 8:00	ASTORIA WEST/QUEENSBRIDG	23322	N	21.55
7/1/2003 8:00	CONED CABLE INTERFACE	23320	N	0
7/1/2003 8:00	DUN-SHORE RD Y50	25091	N	0
7/1/2003 8:00	DUNWO-SHORR345 Y50 @	25091	C	14.68
7/1/2003 8:05	ASTORIA WEST/QUEENSBRIDG	23322	N	29.94
7/1/2003 8:05	CONED CABLE INTERFACE	23320	N	0
7/1/2003 8:05	DUN-SHORE RD Y50	25091	N	0
7/1/2003 8:05	DUNWO-SHORR345 Y50 @	25091	C	22.36
7/1/2003 8:06	ASTORIA WEST/QUEENSBRIDG	23322	N	32.51
7/1/2003 8:06	CONED CABLE INTERFACE	23320	N	0
7/1/2003 8:06	DUN-SHORE RD Y50	25091	N	0
7/1/2003 8:06	DUNWO-SHORR345 Y50 @	25091	C	25.1
7/1/2003 8:11	ASTORIA WEST/QUEENSBRIDG	23322	N	20
7/1/2003 8:11	AST EAST/CORONA/JAMAICA	23321	N	0
7/1/2003 8:11	CONED CABLE INTERFACE	23320	N	0
7/1/2003 8:11	DUN-SHORE RD Y50	25091	N	0
7/1/2003 8:11	DUNWO-SHORR345 Y50 @	25091	C	12.35
7/1/2003 8:16	ASTORIA WEST/QUEENSBRIDG	23322	N	23.11
7/1/2003 8:16	AST EAST/CORONA/JAMAICA	23321	N	2.87
7/1/2003 8:16	CONED CABLE INTERFACE	23320	N	0
7/1/2003 8:16	DUN-SHORE RD Y50	25091	N	0
7/1/2003 8:16	DUNWO-SHORR345 Y50 @	25091	C	15.7
7/1/2003 8:18	ASTORIA WEST/QUEENSBRIDG	23322	N	27.88
7/1/2003 8:18	AST EAST/CORONA/JAMAICA	23321	N	32.67
7/1/2003 8:18	CONED CABLE INTERFACE	23320	N	0
7/1/2003 8:18	DUN-SHORE RD Y50	25091	N	0
7/1/2003 8:18	DUNWO-SHORR345 Y50 @	25091	C	19.97
7/1/2003 8:23	ASTORIA WEST/QUEENSBRIDG	23322	N	23.02
7/1/2003 8:23	AST EAST/CORONA/JAMAICA	23321	N	2.27

Day Ahead Market: Constraining Facility

<http://mis.nyiso.com/public/P-511Alist.htm>

Time Stamp	Time Zone	Limiting Facility	Contingency
7/1/2003 1:00	EDT	DUNWODIE 345 SHORE_RD 345 1	SPRNBRK_345_EGRDNCTY345CY49___
7/1/2003 2:00	EDT	DUNWODIE 345 SHORE_RD 345 1	SPRNBRK_345_EGRDNCTY345CY49___
7/1/2003 11:00	EDT	DUNWODIE 345 SHORE_RD 345 1	SPRNBRK_345_EGRDNCTY345CY49___
7/1/2003 4:00	EDT	DUNWODIE 345 SHORE_RD 345 1	SPRNBRK_345_EGRDNCTY345CY49___
7/1/2003 6:00	EDT	DUNWODIE 345 SHORE_RD 345 1	SPRNBRK_345_EGRDNCTY345CY49___
7/1/2003 12:00	EDT	DUNWODIE 345 SHORE_RD 345 1	SPRNBRK_345_EGRDNCTY345CY49___
7/1/2003 20:00	EDT	DUNWODIE 345 SHORE_RD 345 1	SPRNBRK_345_EGRDNCTY345CY49___
7/1/2003 18:00	EDT	DUNWODIE 345 SHORE_RD 345 1	SPRNBRK_345_EGRDNCTY345CY49___
7/1/2003 16:00	EDT	DUNWODIE 345 SHORE_RD 345 1	SPRNBRK_345_EGRDNCTY345CY49___
7/1/2003 22:00	EDT	DUNWODIE 345 SHORE_RD 345 1	SPRNBRK_345_EGRDNCTY345CY49___
7/1/2003 23:00	EDT	DUNWODIE 345 SHORE_RD 345 1	SPRNBRK_345_EGRDNCTY345CY49___
7/1/2003 13:00	EDT	DUNWODIE 345 SHORE_RD 345 1	SPRNBRK_345_EGRDNCTY345CY49___
7/1/2003 14:00	EDT	DUNWODIE 345 SHORE_RD 345 1	SPRNBRK_345_EGRDNCTY345CY49___
7/1/2003 15:00	EDT	DUNWODIE 345 SHORE_RD 345 1	SPRNBRK_345_EGRDNCTY345CY49___
7/1/2003 17:00	EDT	DUNWODIE 345 SHORE_RD 345 1	SPRNBRK_345_EGRDNCTY345CY49___
7/1/2003 19:00	EDT	DUNWODIE 345 SHORE_RD 345 1	SPRNBRK_345_EGRDNCTY345CY49___
7/1/2003 21:00	EDT	DUNWODIE 345 SHORE_RD 345 1	SPRNBRK_345_EGRDNCTY345CY49___
7/1/2003 3:00	EDT	DUNWODIE 345 SHORE_RD 345 1	SPRNBRK_345_EGRDNCTY345CY49___
7/1/2003 7:00	EDT	DUNWODIE 345 SHORE_RD 345 1	SPRNBRK_345_EGRDNCTY345CY49___
7/1/2003 11:00	EDT	E13THSTA 345 FARRAGUT 345 1	BASE CASE
7/1/2003 10:00	EDT	E13THSTA 345 FARRAGUT 345 1	BASE CASE
7/1/2003 0:00	EDT	E179THST 138 HELLGT_E 138 1	BASE CASE
7/1/2003 1:00	EDT	E179THST 138 HELLGT_E 138 1	BASE CASE
7/1/2003 3:00	EDT	E179THST 138 HELLGT_E 138 1	BASE CASE
7/1/2003 4:00	EDT	E179THST 138 HELLGT_E 138 1	BASE CASE
7/1/2003 2:00	EDT	E179THST 138 HELLGT_E 138 1	BASE CASE
7/1/2003 5:00	EDT	E179THST 138 HELLGT_E 138 1	BASE CASE
7/1/2003 7:00	EDT	E179THST 138 HELLGT_E 138 1	BASE CASE
7/1/2003 10:00	EDT	E179THST 138 HELLGT_E 138 1	BASE CASE
7/1/2003 12:00	EDT	E179THST 138 HELLGT_E 138 1	BASE CASE
7/1/2003 23:00	EDT	E179THST 138 HELLGT_E 138 1	BASE CASE
7/1/2003 22:00	EDT	E179THST 138 HELLGT_E 138 1	BASE CASE
7/1/2003 21:00	EDT	E179THST 138 HELLGT_E 138 1	BASE CASE

Day Ahead Market: Constraining Facility

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Time Stamp	Time Zone	Limiting Facility	Contingency
7/1/2003 18:00	EDT	E179THST 138 HELLGT_E 138 1	BASE CASE
7/1/2003 13:00	EDT	E179THST 138 HELLGT_E 138 1	BASE CASE
7/1/2003 11:00	EDT	E179THST 138 HELLGT_E 138 1	BASE CASE
7/1/2003 8:00	EDT	E179THST 138 HELLGT_E 138 1	BASE CASE
7/1/2003 6:00	EDT	E179THST 138 HELLGT_E 138 1	BASE CASE
7/1/2003 23:00	EDT	FRESHKLS 138 WILLWBRK 138 1	BASE CASE
7/1/2003 22:00	EDT	FRESHKLS 138 WILLWBRK 138 1	BASE CASE
7/1/2003 20:00	EDT	FRESHKLS 138 WILLWBRK 138 1	BASE CASE
7/1/2003 8:00	EDT	FRESHKLS 138 WILLWBRK 138 1	BASE CASE
7/1/2003 9:00	EDT	FRESHKLS 138 WILLWBRK 138 1	BASE CASE
7/1/2003 19:00	EDT	FRESHKLS 138 WILLWBRK 138 1	BASE CASE
7/1/2003 21:00	EDT	FRESHKLS 138 WILLWBRK 138 1	BASE CASE
7/1/2003 7:00	EDT	FRESHKLS 138 WILLWBRK 138 1	BASE CASE
7/1/2003 6:00	EDT	FRESHKLS 138 WILLWBRK 138 1	BASE CASE
7/1/2003 0:00	EDT	HUDS_AVE 138 JAMAICA_ 138 2	BASE CASE
7/1/2003 2:00	EDT	HUDS_AVE 138 JAMAICA_ 138 2	BASE CASE
7/1/2003 3:00	EDT	HUDS_AVE 138 JAMAICA_ 138 2	BASE CASE
7/1/2003 1:00	EDT	HUDS_AVE 138 JAMAICA_ 138 2	BASE CASE
7/1/2003 4:00	EDT	HUDS_AVE 138 JAMAICA_ 138 2	BASE CASE
7/1/2003 6:00	EDT	HUDS_AVE 138 JAMAICA_ 138 2	BASE CASE
7/1/2003 8:00	EDT	HUDS_AVE 138 JAMAICA_ 138 2	BASE CASE
7/1/2003 10:00	EDT	HUDS_AVE 138 JAMAICA_ 138 2	BASE CASE
7/1/2003 19:00	EDT	HUDS_AVE 138 JAMAICA_ 138 2	BASE CASE
7/1/2003 18:00	EDT	HUDS_AVE 138 JAMAICA_ 138 2	BASE CASE
7/1/2003 17:00	EDT	HUDS_AVE 138 JAMAICA_ 138 2	BASE CASE
7/1/2003 16:00	EDT	HUDS_AVE 138 JAMAICA_ 138 2	BASE CASE
7/1/2003 15:00	EDT	HUDS_AVE 138 JAMAICA_ 138 2	BASE CASE
7/1/2003 14:00	EDT	HUDS_AVE 138 JAMAICA_ 138 2	BASE CASE
7/1/2003 13:00	EDT	HUDS_AVE 138 JAMAICA_ 138 2	BASE CASE
7/1/2003 12:00	EDT	HUDS_AVE 138 JAMAICA_ 138 2	BASE CASE
7/1/2003 11:00	EDT	HUDS_AVE 138 JAMAICA_ 138 2	BASE CASE
7/1/2003 23:00	EDT	HUDS_AVE 138 JAMAICA_ 138 2	BASE CASE
7/1/2003 22:00	EDT	HUDS_AVE 138 JAMAICA_ 138 2	BASE CASE

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Time Stamp	Time Zone	Limiting Facility	Contingency
7/1/2003 21:00	EDT	HUDS_AVE 138 JAMAICA_ 138 2	BASE CASE
7/1/2003 20:00	EDT	HUDS_AVE 138 JAMAICA_ 138 2	BASE CASE
7/1/2003 9:00	EDT	HUDS_AVE 138 JAMAICA_ 138 2	BASE CASE
7/1/2003 7:00	EDT	HUDS_AVE 138 JAMAICA_ 138 2	BASE CASE
7/1/2003 5:00	EDT	HUDS_AVE 138 JAMAICA_ 138 2	BASE CASE
7/1/2003 6:00	EDT	NIAGARA_ 345 ROCHESTR 345 1	KINTIGH_345_ROCHESTR345_SR-1__
7/1/2003 23:00	EDT	NIAGARA_ 345 ROCHESTR 345 1	KINTIGH_345_ROCHESTR345_SR-1__
7/1/2003 23:00	EDT	PJ - NY	BASE CASE
7/1/2003 4:00	EDT	PJ - NY	BASE CASE
7/1/2003 2:00	EDT	PJ - NY	BASE CASE
7/1/2003 3:00	EDT	PJ - NY	BASE CASE
7/1/2003 6:00	EDT	RAINEY__ 138 VERNON__ 138 1	TWR: 22, 21,A2253
7/1/2003 11:00	EDT	RAINEY__ 138 VERNON__ 138 1	TWR: 22, 21,A2253
7/1/2003 13:00	EDT	RAINEY__ 138 VERNON__ 138 1	TWR: 22, 21,A2253
7/1/2003 15:00	EDT	RAINEY__ 138 VERNON__ 138 1	TWR: 22, 21,A2253
7/1/2003 17:00	EDT	RAINEY__ 138 VERNON__ 138 1	TWR: 22, 21,A2253
7/1/2003 21:00	EDT	RAINEY__ 138 VERNON__ 138 1	TWR: 22, 21,A2253
7/1/2003 20:00	EDT	RAINEY__ 138 VERNON__ 138 1	TWR: 22, 21,A2253
7/1/2003 19:00	EDT	RAINEY__ 138 VERNON__ 138 1	TWR: 22, 21,A2253
7/1/2003 18:00	EDT	RAINEY__ 138 VERNON__ 138 1	TWR: 22, 21,A2253
7/1/2003 16:00	EDT	RAINEY__ 138 VERNON__ 138 1	TWR: 22, 21,A2253
7/1/2003 14:00	EDT	RAINEY__ 138 VERNON__ 138 1	TWR: 22, 21,A2253
7/1/2003 12:00	EDT	RAINEY__ 138 VERNON__ 138 1	TWR: 22, 21,A2253
7/1/2003 10:00	EDT	RAINEY__ 138 VERNON__ 138 1	TWR: 22, 21,A2253
7/1/2003 7:00	EDT	RAINEY__ 138 VERNON__ 138 1	TWR: 22, 21,A2253
7/1/2003 9:00	EDT	RAINEY__ 138 VERNON__ 138 1	TWR: 22, 21,A2253
7/1/2003 8:00	EDT	RAINEY__ 138 VERNON__ 138 1	TWR: 22, 21,A2253
7/1/2003 7:00	EDT	RAINEY__ 345 DUNWODIE 345 2	DUNWODIE345_RAINEY__ 345_72_____
7/1/2003 22:00	EDT	RAINEY__ 345 DUNWODIE 345 2	DUNWODIE345_RAINEY__ 345_72_____
7/1/2003 19:00	EDT	RAINEY__ 345 DUNWODIE 345 2	DUNWODIE345_RAINEY__ 345_72_____
7/1/2003 23:00	EDT	RAINEY__ 345 DUNWODIE 345 2	DUNWODIE345_RAINEY__ 345_72_____
7/1/2003 8:00	EDT	RAINEY__ 345 DUNWODIE 345 2	DUNWODIE345_RAINEY__ 345_72_____
7/1/2003 7:00	EDT	VALLYSTR 138 EGRDNCTY 138 1	BUS: E F BARRET 292, 459, BA

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Time Stamp	Time Zone	Limiting Facility	Contingency
7/1/2003 9:00	EDT	VALLYSTR 138 EGRDNCTY 138 1	BUS: E F BARRET 292, 459, BA
7/1/2003 23:00	EDT	VALLYSTR 138 EGRDNCTY 138 1	BUS: E F BARRET 292, 459, BA
7/1/2003 10:00	EDT	VALLYSTR 138 EGRDNCTY 138 1	BUS: E F BARRET 292, 459, BA
7/1/2003 8:00	EDT	VALLYSTR 138 EGRDNCTY 138 1	BUS: E F BARRET 292, 459, BA
7/1/2003 22:00	EDT	VALLYSTR 138 EGRDNCTY 138 1	BUS: E F BARRET 292, 459, BA
7/1/2003 11:00	EDT	VALLYSTR 138 EGRDNCTY 138 1	BUS: E F BARRET 292, 459, BA
7/1/2003 12:00	EDT	W49TH_ST 345 SPRNBRK_ 345 2	SCB: SPBK (RS-4): M52, 99941
7/1/2003 16:00	EDT	W49TH_ST 345 SPRNBRK_ 345 2	SCB: SPBK (RS-4): M52, 99941
7/1/2003 14:00	EDT	W49TH_ST 345 SPRNBRK_ 345 2	SCB: SPBK (RS-4): M52, 99941
7/1/2003 17:00	EDT	W49TH_ST 345 SPRNBRK_ 345 2	SCB: SPBK (RS-4): M52, 99941
7/1/2003 13:00	EDT	W49TH_ST 345 SPRNBRK_ 345 2	SCB: SPBK (RS-4): M52, 99941
7/1/2003 15:00	EDT	W49TH_ST 345 SPRNBRK_ 345 2	SCB: SPBK (RS-4): M52, 99941
7/1/2003 0:00	EDT		ACTIVE DNI
7/1/2003 1:00	EDT		ACTIVE DNI
7/1/2003 21:00	EDT		ACTIVE DNI
7/1/2003 22:00	EDT		ACTIVE DNI