



Long Term Transmission Rights (LTTR) Design Examples

1. Overview

The Energy Policy Act of 2005 directed FERC to issue a rulemaking that assures that Load Serving Entities can “secure firm transmission rights (or equivalent tradable or financial rights) on a long-term basis” FERC issued the Long Term Transmission Rights (“LTTRs”) Final Rule on 20 July 2006. In the Final Rule, FERC provides seven guidelines. The compliance filing is due 29 January 2007. To meet the compliance filing deadline and allow for stakeholder input, the LTTR design must be materially complete no later than November.

2. ISO’s Conceptual Design Principles

The LTTR allocation scheme must be compatible with competitive markets -- the introduction of allocated rights should not create perverse incentives to hoard transmission rights. Fundamental changes should be avoided. Of the percentage of the network set aside for long term rights, a “sufficient” amount should be reserved to provide for the reasonable hedging needs of LSEs consistent with their priority status under the Final Rule.

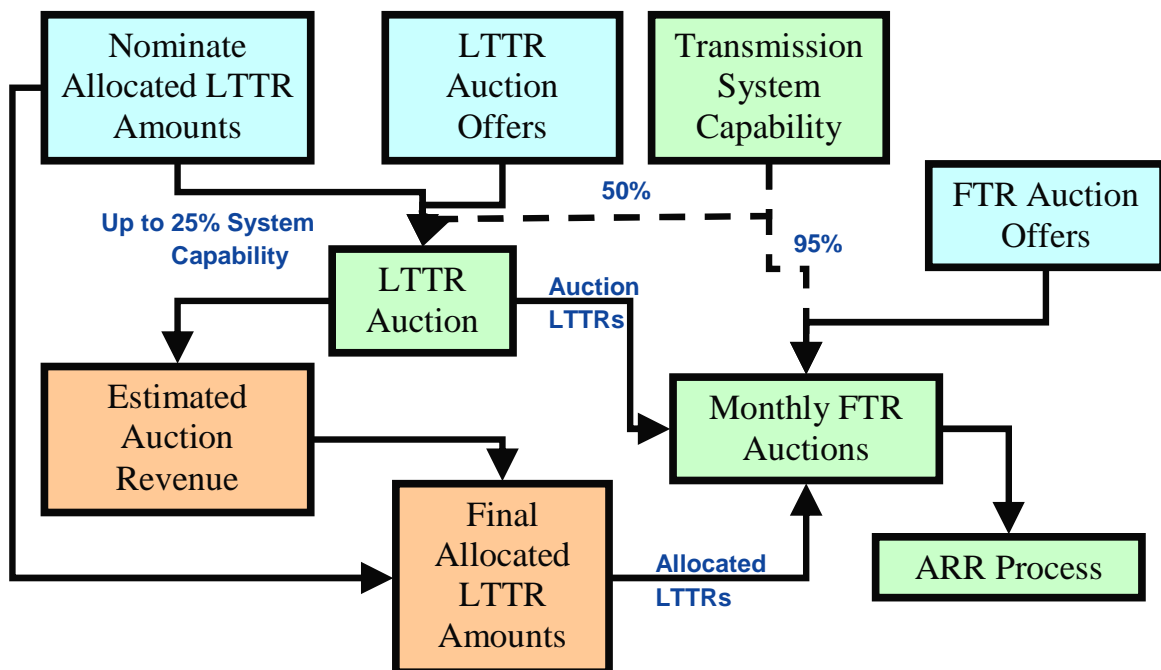
- 1) The Design introduces two types of Long Term Transmission Rights (LTTR)
 - a) Allocated LTTR: Instruments with a term of ten years *directly allocated* to Load Serving Entities with Real Time Load Obligations.
 - b) Auctioned LTTR: Instruments with a term of one to ten years awarded via annual auction, open to all participants
- 2) For Allocated LTTRs, LSEs forgo a compensating portion of their ARR revenue
- 3) All transmission rights (LTTRs and FTRs) are fully funded

2.1 LTTR Conceptual Process Summary

On an annual basis:

- ISO provides eligible LSEs with Maximum LTTR Allocation MW values per Load Zone based on historical year data, adjusted to reflect existing Allocated LTTR holdings
- LSE nominates desired Allocated LTTR paths (source, sink, MW)
- ISO evaluates and, if necessary, adjusts nominated MW amounts to ensure simultaneous feasibility with existing LTTRs and network limits.
- LSE accepts or rejects modified nominations (this step has 2 rounds) based on SFT results
- Nominated Allocated LTTR paths are preloaded into the auction
- Based on the auction results, ISO estimates the ARR \$ budget for each LSE and makes the Allocated LTTR awards.
- Allocated LTTRs will be valued based on the initial auction year prices. Allocated LTTR cost is compared to estimated budget derived from initial year results.
 - a) If the cost of the Allocated LTTRs is \leq the annual budget, the LSE will forgo annual ARR\$ in kind.
 - b) If cost of Allocated LTTRs $>$ annual budget at the time of allocation, then the Allocated LTTR award will be scaled so that cost = budget.
 - In succeeding auctions if the Allocated LTTR $>$ annual budget then the monthly ARR\$ will be drawn against.

2.2 LTTR Conceptual Diagram



2.3 LTTR Description of Conceptual Design

Nomenclature used in following examples

$C_{i,j}$ = Allocated LTTR in year (i) for year (j)

$A_{i,j}$ = Network Capacity Available for Auction in year (i) for year (j)

$AC_{i,j}$ = Auctioned Cleared LTTR in year (i) for year (j)

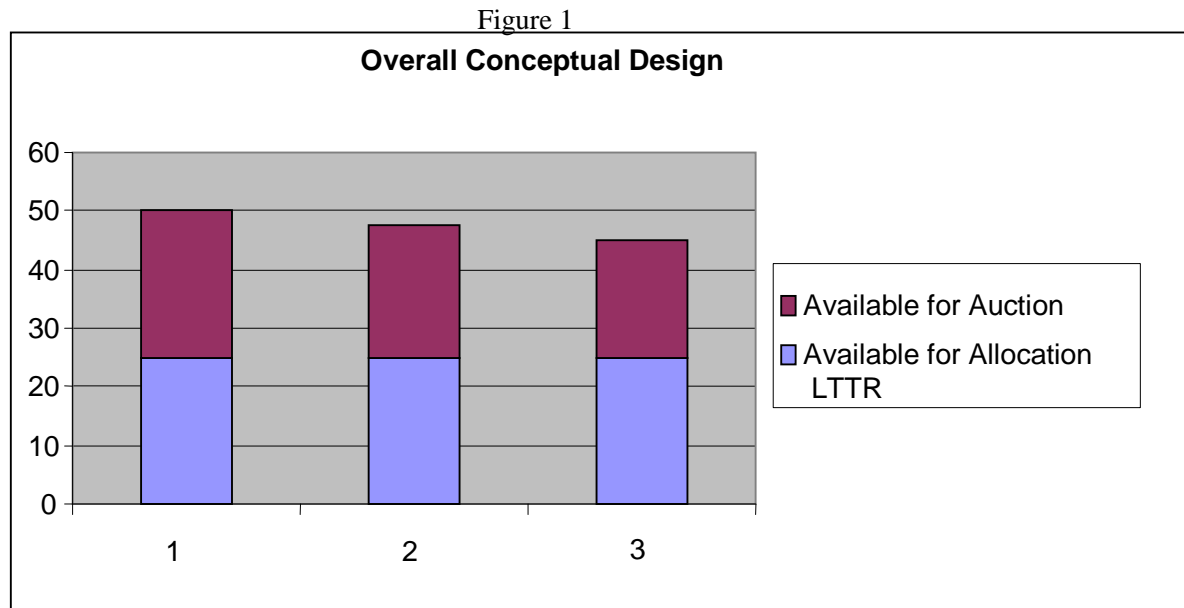


Figure 1:

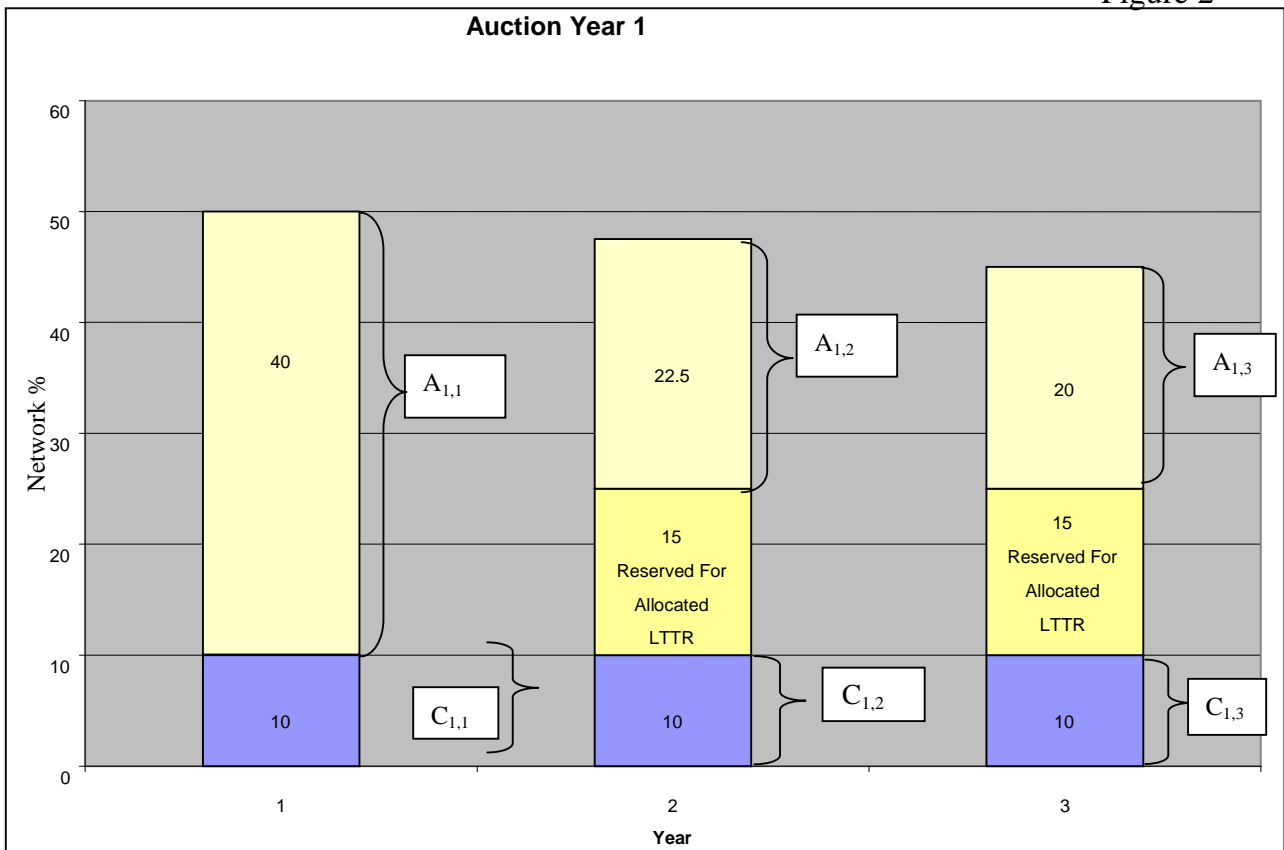
The above chart shows the overall conceptual design. The percentage of the system that is available for Allocation in any given year is 25% (i.e. the allocated transmission rights must be simultaneously feasible when all limits in the transmission system are evaluated at 25% of their actual values). In the “Current Year” the amount available for Auction is up to 50% subject to any preloaded Allocated LTTR and Auctioned LTTR..

In anticipation of diminishing demand for LTTRs in the auctions for $A_{1,1}$, $A_{1,2}$, $A_{1,3}$, ... $A_{1,10}$, the percentage supply of the network made available for auction is decreased by 2.5% each year. Therefore, in the auction conducted for $A_{1,2}$, 22.5% of the network is available for auction. The network capacity available for auction is independent of any Allocated LTTRs, but does account for any LTTRs in that year that may already have been auctioned in a previous year. If the auction and the allocation in year $A_{1,2}$ are both fully subscribed, this could mean that the 25% of the network consumed by Allocated LTTRs, plus the 22.5% consumed by Auctioned LTTRs, would together consume a total of 47.5% of network capacity.

Similarly, in the auction $A_{1,3}$ the network capacity made available to the auction is reduced by an additional 2.5% to 20%. Auctions are conducted for 10 future years, and the network capacity available for Auctioned LTTRs in $A_{1,10}$ would therefore be reduced to only 2.5%.

We note, using $i=1$ and $j=2$ as an example, if both the 25% available for allocation and the 22.5% available for auction are fully subscribed, but the auctioned LTTRs were all effectively “counterflow” to the allocated LTTRs, then the amount of the network actually consumed by the combined allocated and auctioned LTTRs would be only $25\% - 22.5\% = 2.5\%$. However, the ISO considers this type of outcome to be highly unlikely. It is far more likely that LTTRs on desirable paths (from areas with low LMPs to areas with high LMPs) will be fully subscribed, and there will be little demand for the “counterflow” LTTRs. When year 2 becomes the current year and Auction $A_{2,2}$ is conducted with “up to 50%” of network capacity available, the counterflow will allow additional LTTRs to clear in the auction.

Figure 2



The Math behind the Graphs

Figure 2:

Reserved For Allocated LTTR is the amount that is left after the auction is completed

Guide1: *In the current year, always auction up to 50% subject to any preloading*

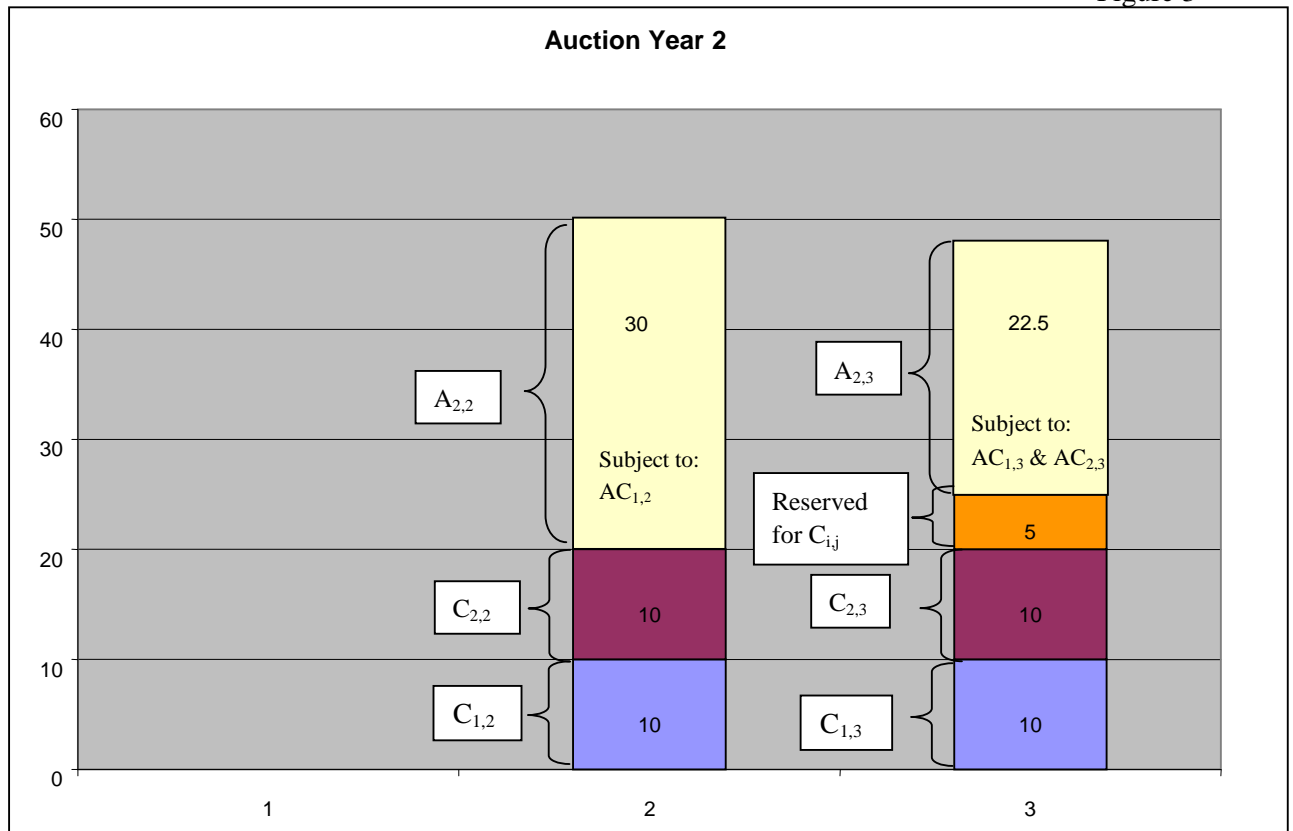
$C_{1,1}$	=	10	%	
Total available for $A_{1,1}$	=	$50\% - C_{1,1}$	=	40 % (Application of <u>Guide1</u>)
Total available for $A_{1,2}$	=	22.5	%	
Total available for $A_{1,3}$	=	20	%	

In the example in Figure 2, where $i = 1$, LSE’s have nominated LTTRs to be Allocated that are feasible using only 10% of the network, 40% of the system is available to be auctioned. The auction provides LTTR clearing prices which are used to value the Allocated LTTRs. An LSE with Allocated LTTRs must forgo a portion of their ARR\$ equal to the imputed value of their

Allocated LTTRs. If an LSE has insufficient ARR\$, their Allocated LTTRs would be reduced proportionately to the level where the value equaled their ARR\$.

Auctions for the next nine future years would be conducted for 22.5%, 20%, ... and 2.5% of network capacity, respectively, accounting for (ie preloading) any LTTRs in each year that had been sold in previous auctions.

Figure 3



*Note: Allocated values which have been awarded in previous years are persisted through each year. (ie. $C_{1,2}$ are the Allocated LTTR which were awarded in $C_{1,1}$)

Guide 1: For the prompt year, 50% of network capability, subject to preloading of previously awarded LTTRs and requested Allocated LTTRs, is available for auction.

Figure 3:

Preloaded into system based on previous Auctions/Allocations

$C_{1,1} = C_{1,2} = C_{1,3} = 10\%$ (Allocated values are persisted for 10 years)

$AC_{1,2}$ = Amount that cleared in year 1 for year 2

$AC_{1,3}$ = Amount that cleared in year 1 for year 3

Current Year:

$C_{2,2} = C_{2,3} = 10\%$ (Allocated values are persisted for 10 years)

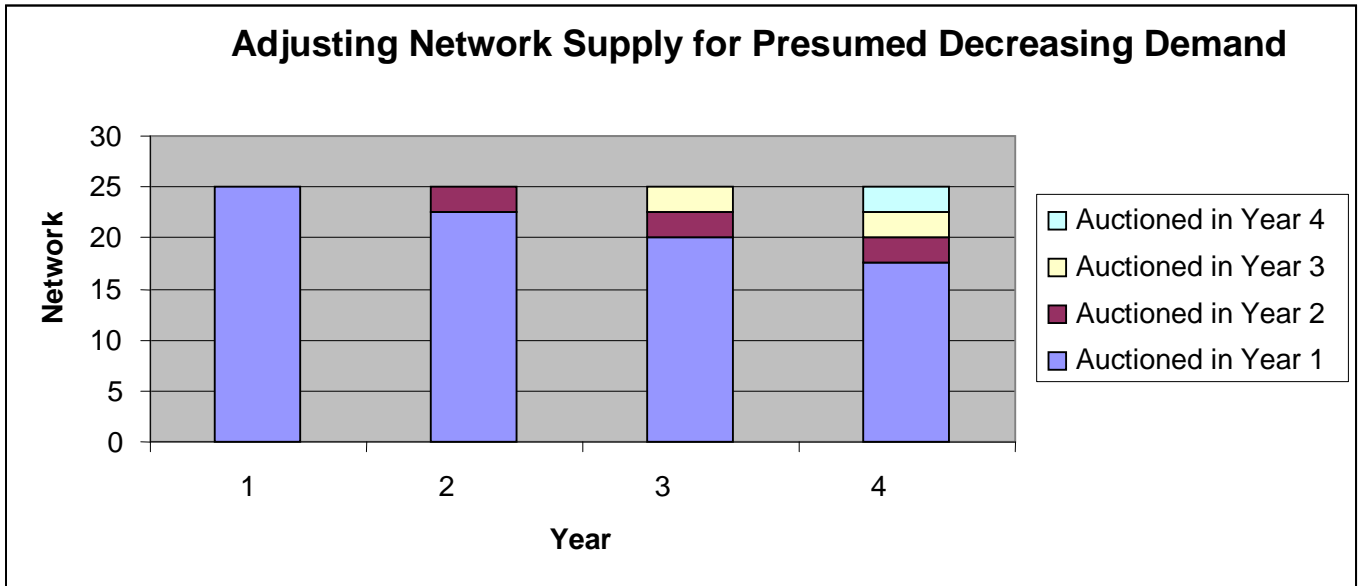
Total available for $A_{2,2} = 50\% - C_{1,2} - C_{2,2} - A_{1,2} = 30\%$ (Application of **Guide 1**)

Total available for $A_{2,3} = 22.5\%$ = **22.5%** (Subject to $AC_{1,3}$ & $AC_{2,3}$)

For year $i = 2$, new nominations for Allocated LTTRs are awarded, subject to new allocations plus previous being $\leq 25\%$ of the network. In this example, we assume that the new Allocated LTTRs consume an additional 10% of the network, such that total Allocated LTTRs are feasible using 20% of network capacity. Thus the total Allocated LTTRs are less than the 25% that could potentially have been allocated. The auction for $i=2$ is then conducted preloading the auctioned values from the previous year.

The prices that are produced during the current auction for $A_{2,2}$ will be used to Value the Allocated LTTR of the current year $C_{2,2}$. The $C_{1,2}$ Allocated LTTR, would already have been valued based on the $A_{1,2}$ auction results.

3. Determining ARR Dollars



3.1 Determining the ARR Dollars Available in Each Year to Fund Allocated LTTRs

LTTRs for a given future year will be sold through multiple auctions. In the example above, LTTRs for year 4 will have been auctioned at four separate times – i.e. when the year represented 4, 3 2, and 1. The revenues from each of these auctions are combined to become the pot of ARR dollars available for distribution in year 4.

As we conduct multiple Auctions, we would have multiple sources of ARR in a given year.

	Year 1	Year 2	Year 3	Year 4
Auction Y1	ARR _{1,1}	ARR _{1,2}	ARR _{1,3}	ARR _{1,4}
Auction Y2	0	ARR _{2,2}	ARR _{2,3}	ARR _{2,4}
Auction Y3	0	0	ARR _{3,3}	ARR _{3,4}
Auction Y4	0	0	0	ARR _{4,4}

ARR_{y,x} is the Auction Revenues for the auction conducted in year (y) for year (x)

The table above shows how the Prices will be reflected in each future auction.

$$\text{Total ARR}\$_1 = \text{ARR}_{1,1}$$

$$\text{Total ARR}\$_2 = \text{ARR}_{1,2} + \text{ARR}_{2,2}$$

$$\text{Total ARR}\$_3 = \text{ARR}_{1,3} + \text{ARR}_{2,3} + \text{ARR}_{3,3}$$

$$\text{Total ARR}\$_4 = \text{ARR}_{1,4} + \text{ARR}_{2,4} + \text{ARR}_{3,4} + \text{ARR}_{4,4}$$

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We will calculate the total ARR\$s for year by aggregating all of the ARR\$ produced by each auction.

- The “Total ARR\$” is distributed to all eligible entities
- LSE’s ARR\$ “bucket” is based of the share of the distribution of the “Total ARR\$”
- The Value of the Allocated LTTR will be determined by the auction in which the LSE was Allocated LTTRs. The value is $P_{y,x}$ where “y” is the year the LSE received the Allocated LTTR.

Example

Year 1

Total ARR\$_1 = ARR_{1,1}

Results of Year 1 LTTR Auction/Allocation

LSE Peak Load MW	100.0
Allocated LTTR Request	35.0
Allocated LTTR Award	35.0
Available ARR \$	7.2
Forgone ARR \$	7.2
Net ARR \$	0
Percent of ARR Revenues Forgone	100.0%

Year 2

ARR_{1,2}{ Auction Held in Year 1, for Year 2 }

Assume the value of the ARRs received in year 2 is \$1.52

ARR_{2,2} {Current Auction Held }

Assume further, that the value of ARRs distributed to the LSE that are attributable to the AC_{2,2} auction is \$4.76

$$\begin{aligned} \text{Total ARR}_2 &= 1.52 + 4.76 \\ &= 6.28 \end{aligned}$$

Finally, assume that the value of the LSE’s allocated rights C_{1,2}, based on prices imputed from the AC_{1,2} auction, is 1.52. This will be the amount of the Forgone ARR\$, assuming that the LSE hasn’t nominated for Allocated LTTR in year 2.

LSE Peak Load MW	100.0
Allocated LTTR Award	35.0
Available ARR \$	6.28
Forgone ARR \$	1.52
Net ARR \$	4.76
Percent of ARR Revenues	76%

Note: If the LSE did nominate Allocated LTTR in year 2 then, the value for those LTTRs would be assessed by AC_{2,2} and the appropriate forgone ARR\$ would be calculated

Exhibit 1

In the initial settlement period the cost of the LTTR can not exceed the LSE’s Budget.

NOTE: ARR Budget is an estimate of the Annual ARR \$

	Assumed	Assumed	Assumed	Assumed	(D/B) x 100	A - A x E	B - B x E	max(G,0)
	A	B	C	D	E	F	G	H
LSE	ARR Allocator Peak Load MW used to Allocate ARRs	ARR\$ Budget	Cost of LTTR	Forgone ARR\$	% of Budget	New ARR Allocator	ARR\$ Distribution	Final ARR\$ Distribution
LSE1	100	90	25	25	27.78%	72.22	65	65
LSE2	150	45	-10	0	0.00%	150.00	45	45
LSE3	300	240	135	135	56.25%	131.25	105	105
LSE4	250	200	200	200	100.00%	0.00	0	0
LSE5	150	45	0	0	0.00%	150.00	45	45
LSE6	100	90	0	0	0.00%	100.00	90	90
total		710		360				350

*Note: ARR\$ Budget is the Value of the Auction plus the value of the Allocated LTTRs using prices imputed from the auction.

In subsequent years it is possible for the cost of the LTTR to exceed the ARR\$ Budget

	Assumed	Assumed	Assumed	Assumed	(D/B) x 100	A - A x E	B - B x E	max(G,0)
	A	B	C	D	E	F	G	H
LSE	ARR Allocator Peak Load MW used to Allocate ARRs	ARR\$ Budget	Cost of LTTR	Forgone ARR\$	% of Budget	New ARR Allocator	ARR\$ Distribution	Final ARR\$ Distribution
LSE1	100	90	25	25	27.78%	72.22	65	65
LSE2	150	45	-10	0	0.00%	150.00	45	45
LSE3	300	240	135	135	56.25%	131.25	105	105
LSE4	250	180	200	200	111.11%	-27.78	-20	0
LSE5	150	45	0	0	0.00%	150.00	45	45
LSE6	100	90	0	0	0.00%	100.00	90	90
total		690		360				350

In the above example LSE 4 doesn’t have enough ARR\$ Budget to cover the Cost of the LTTR. As a result the % of the Budget is 111.11%. The ISO will reduce the monthly ARR Allocation of the LSE in the monthly auctions until \$20 shortfall reimbursed through foregone monthly ARRs. If monthly ARR\$s are not sufficient, balance must be paid in cash.

Exhibit 2

List of Examples: (Brief description): Example Illustrating Scaling.

Example 1: Nominated “Allocated LTTR” LSE Sink in Congested Zone

Using the assumptions for LTTR allocation, a LSE can only nominate up to the Zonal Load Factor multiplied by the LSE’s Peak Load. In this example the maximum the LSE can nominate is 56 MW

Example 2: Nominated “Allocated LTTR” LSE Sink in Relatively Uncongested Zone

The sink is located in a relatively uncongested Zone. Using the assumptions for LTTR allocation, a LSE can only nominate up to Zonal Load Factor multiplied by the LSE’s Peak Load. In this case, the LSE doesn’t have enough ARR \$ to receive their full nomination.

Example 3: Nominated “Allocated LTTR” LSE Sink in Relatively Uncongested Zone + Counterflow Nomination

Building on Example 2, the LSE has nominated 30 MW from ME -> VT adding a counterflow nomination from NEMA -> VT allows the LSE to receive its nomination

Example 4: Nominated “Allocated LTTR” LSE Sink in Congested Zone + allocation of cost over 3 yrs

Using Example 1 as a base case, in this example we examine how over time the ARR \$ forgone would change, even though the MWs of LTTR allocated stays the same. This example uses the annual average historical Day-Ahead Congestion Components Reported

Description of ARR Stages

Stage 1 – ARRs are initially assigned based on 1) energy deliveries pursuant to Excepted Transactions and 2) load ratio share of the capability of every New England generator and tie line source (with adjustments to generation and load associated with Excepted Transactions).

Stage 2 – Any of the initially assigned ARRs that have a negative value in the associated FTR Auction are eliminated to assure that no negative revenues are allocated. The remaining ARRs are subjected to a SFT) to assure that the transmission system can support the awarded set of ARRs under normal system conditions and to assure that the ARR payments do not exceed the auction revenues.

Stage 3 – The ARRs allocated to NEMA LSEs in Stage 2 are removed and replaced by an initial assignment of Stage 3 ARRs defined by certain qualifying long-term contracts (“NEMA Contracts”) for delivery to points in NEMA

Stage 4 – A set of Stage 4 ARRs are defined for all NEMA LSEs based on their Stage 2 allocations, with those of LSEs holding NEMA Contracts being adjusted to account for ARRs allocated to them in Stage 3. A final SFT is conducted with only the Stage 4 ARRs being subject to reduction. The fourth stage of the allocation determines the final allocation of ARRs for a given auction.

Example 1: Nominated Allocated LTTR- LSE Sink in Congested Zone

LTTR Allocations:

Load Factor CT = 56%

Max Allocated LTTR MW nomination allowed: 56 MW

Sink Zone	Source Zone	A	Allocated LTTR Requests Adjusted for Interface Limits & SFT	LTTTR Auction Held	B	C	D	E	Stage 1 ARR MW Allocation	Stage 2 ARR MW Allocation	F	G	H	I	J	Reconfiguration Auction
		Allocated LTTR MW Nominated			ARR \$/MW						Gen Distribution by Zone	ARR MW	Stage 1 ARR \$	Stage 2 ARR \$	Value of Allocated LTTR	
CT	CT	0			\$ -	25%	25	\$ -			\$ -	\$ -	0.0%	-	-	
CT	ME	25			\$1.76	10%	10	\$ 17.60			\$ 17.60	\$ 44.0	49.4%	-	25	
CT	NEMA	25			\$0.67	12%	12	\$ 8.04			\$ 8.04	\$ 16.8	18.8%	-	25	
CT	NH	0			\$1.25	12%	12	\$ 15.00			\$ 15.00	\$ -	0.0%	-	-	
CT	RI	0			\$1.12	6%	6	\$ 6.72			\$ 6.72	\$ -	0.0%	-	-	
CT	SEMA	0			\$1.29	19%	19	\$ 24.51			\$ 24.51	\$ -	0.0%	-	-	
CT	VT	0			\$0.76	4%	4	\$ 3.04			\$ 3.04	\$ -	0.0%	-	-	
CT	WCMA	0			\$1.18	12%	12	\$ 14.16			\$ 14.16	\$ -	0.0%	-	-	
TOTAL		50			\$ 0.89		100	\$ 89.07			\$ 89.07	\$ 60.8	68.2%	-	50	

Summary Table:

LSE Peak Load MW	100.0
Allocated LTTR Nominated	50.0
Allocated LTTR Award	50.0
ARR\$ Budget	89.1
Forgone ARR \$	60.8
Net ARR \$	28.3
Percent of ARR Revenues foregone	68.2%

Example 2: Nominated Allocated LTTR LSE Sink in Relatively Uncongested Zone

LTTR Allocations:

Load Factor in VT = 69 %

Max Allocated LTTR MW nomination allowed: 69 MW

Sink Zone	Source Zone	A	Allocated LTTR Requests Adjusted for Interface Limits & SFT	LTTR Auction Held	B	C	D	E	Stage 1 ARR MW Allocation	Stage 2 ARR MW Allocation	F	G	H	I	J	Reconfiguration Auction
		Allocated LTTR MW Nominated			ARR \$/MW		Gen Distribution by Zone	ARR MW			Stage 1 ARR \$	Stage 2 ARR \$	Value of Allocated LTTR	% of ARR \$	Scaled LTTR MW Award	
T	CT	0			\$ (4.36)	25%	25	\$ (109.00)			\$ -	\$ -	0.0%	-	-	
T	ME	50			\$ 2.52	10%	10	\$ 25.20			\$ 25.20	\$ 126.0	282.3%	17.71	17.71	
T	NEMA	0			\$ (2.87)	12%	12	\$ (34.44)			\$ -	\$ -	0.0%	-	-	
T	NH	0			\$ 1.10	12%	12	\$ 13.20			\$ 13.20	\$ -	0.0%	-	-	
T	RI	0			\$ 0.31	6%	6	\$ 1.86			\$ 1.86	\$ -	0.0%	-	-	
T	SEMA	0			\$ 0.23	19%	19	\$ 4.37			\$ 4.37	\$ -	0.0%	-	-	
T	VT	0			\$ -	4%	4	\$ -			\$ -	\$ -	0.0%	-	-	
T	WCMA	0			\$ (0.31)	12%	12	\$ (3.72)			\$ -	\$ -	0.0%	-	-	
OTAL		50			\$ 0.45		100	\$ (102.53)			\$ 44.63	\$ 126.0	282.3%	17.71	17.71	

Summary Table:

LSE Peak Load MW	100.0
Allocated LTTR Nominated	50.0
Allocated LTTR Award	17.7
ARR\$ Budget	44.6
Forgone ARR \$	44.6
Net ARR \$	0
Percent of ARR Revenues foregone	100.0%

Example 3 – Nominated Allocated LTTR LSE Sink in Relatively Uncongested Zone + Counterflow Nomination

LTTR Allocations:

Sink Zone	Source Zone	A	Allocated LTTR Requests Adjusted for Interface Limits & SFT	B	C	D	E	F	G	H	I	J	Reconfiguration Auction	
		Allocated LTTR MW Nominated												ARR \$/MW
T	CT	0	Allocated LTTR Requests Adjusted for Interface Limits & SFT	\$ (4.36)	Stage 1 ARR MW Allocation	25%	25	\$ (109.00)	Stage 2 ARR MW Allocation	\$ -	\$ -	0.0%	-	-
T	ME	35		\$ 2.52		10%	10	\$ 25.20		\$ 25.20	\$ 88.2	197.6%	34.60	34.60
T	NEMA	15		\$ (2.87)		12%	12	\$ (34.44)		\$ -	\$ (43.1)	-96.5%	14.83	14.83
T	NH	0		\$ 1.10		12%	12	\$ 13.20		\$ 13.20	\$ -	0.0%	-	-
T	RI	0		\$ 0.31		6%	6	\$ 1.86		\$ 1.86	\$ -	0.0%	-	-
T	SEMA	0		\$ 0.23		19%	19	\$ 4.37		\$ 4.37	\$ -	0.0%	-	-
T	VT	0		\$ -		4%	4	\$ -		\$ -	\$ -	0.0%	-	-
T	WCMA	0		\$ (0.31)		12%	12	\$ (3.72)		\$ -	\$ -	0.0%	-	-
OTAL		50		\$ 0.45				100		\$ (102.53)	\$ 44.63	\$ 45.2	101.2%	49.42

Summary Table:

LSE Peak Load MW	100.0
Allocated LTTR Nominated	50.0
Allocated LTTR Award	49.4
ARR\$ Budget	44.6
Forgone ARR \$	44.6
Net ARR \$	0
Percent of ARR Revenues foregone	100.0%

Example 4: Nominated “Allocated LTTR” LSE Sink in Congested Zone + allocation of cost over 3 yrs

Price Table:

		ARR \$/MW based on annual average Day-Ahead Congestion Components Reported		
Sink Zone	Source Zone	2003	2004	2005
CT	CT	\$ -----	\$ -----	\$ -----
CT	ME	\$ 1.76	\$ 2.34	\$ 6.88
CT	NEMA	\$ 0.67	\$ 0.32	\$ 1.49
CT	NH	\$ 1.25	\$ 1.35	\$ 5.46
CT	RI	\$ 1.12	\$ 0.88	\$ 4.67
CT	SEMA	\$ 1.29	\$ 0.88	\$ 4.59
CT	VT	\$ 0.76	\$ 0.93	\$ 4.36
CT	WCMA	\$ 1.18	\$ 0.81	\$ 4.05

Summary Table:

	2003	2004	2005
LSE Peak Load MW	100	100	100
Allocated LTTR Nominated	50	50	50
Allocated LTTR Award	50	50	50
ARR\$ Budget	89.1	78.9	333.5
Forgone ARR \$	60.6	66.5	209.3
Net ARR \$	28.3	12.4	124.2
Percent of ARR Revenues foregone	68.2%	84.3%	62.6%