Single Schedule Market Pricing Issues

Phase 2 (Options) – Session 2
Load Pricing and Market Power Mitigation

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Toronto, Ontario

Market Options — Phase 2 – Session 1

- **July 27, 2017 - Stakeholder Engagement Session**

✓ Energy Congestion Price

✓ Energy Reference Price

✓ Energy Loss Price

✓ Ex Post vs. Ex Ante Pricing

✓ Intertie Congestion Pricing

✓ Supplier Pricing

✓ Operating Reserve Reference Price

✓ Operating Reserve Congestion Price

✓ Constraint Violations

✓ Out-of-market Operator Actions

✓ Multiple Interval Optimization

✓ Price Setting Eligibility

- **August 17, 2017 -- Stakeholder Engagement Session**

13. Mitigation Process
14. Timing of Application of Mitigation
15. Reference Levels for Mitigation
16. Pricing for Loads
17. Financial Transmission Rights
18. Make Whole Payments
19. Uplift

16. Pricing for Loads

- The current HOEP uniform prices:
  - Do not take into account transmission constraints or marginal losses
  - Are based on other assumptions differing from those used in the actual constrained schedule, such as ramp rates
- The shadow prices from the current constrained schedule:
  - Take account of transmission constraints, the cost of marginal losses and other assumptions of the physical dispatch
  - Are “raw” LMPs

Recap - Principal Issues

Recall that there are three principal issues that will drive the methodology developed for pricing load under SSM:

1. Whether the price charged to loads will include the marginal or average cost of losses and congestion
   a) Marginal –Prices developed from LMPs at **load nodes**
   b) Average – Prices developed from LMPs at **supplier nodes** (recovers only costs paid to suppliers for congestion and losses)

2. Whether load prices will differ for dispatchable versus non-dispatchable loads
3. The level of pricing granularity: nodal, zonal or uniform price

The list of options for load pricing is extensive. Consider them as branches of a decision tree.

Choice #1: How will loads be charged for the cost of losses and congestion?

Branches:

- Charge the **marginal** cost of losses and congestion
- Charge the **average** cost of losses and congestion

Choice #2: Will dispatchable and non-dispatchable load be charged prices with the same level of granularity?

Branches:

- Same pricing methodology
- Different pricing methodology

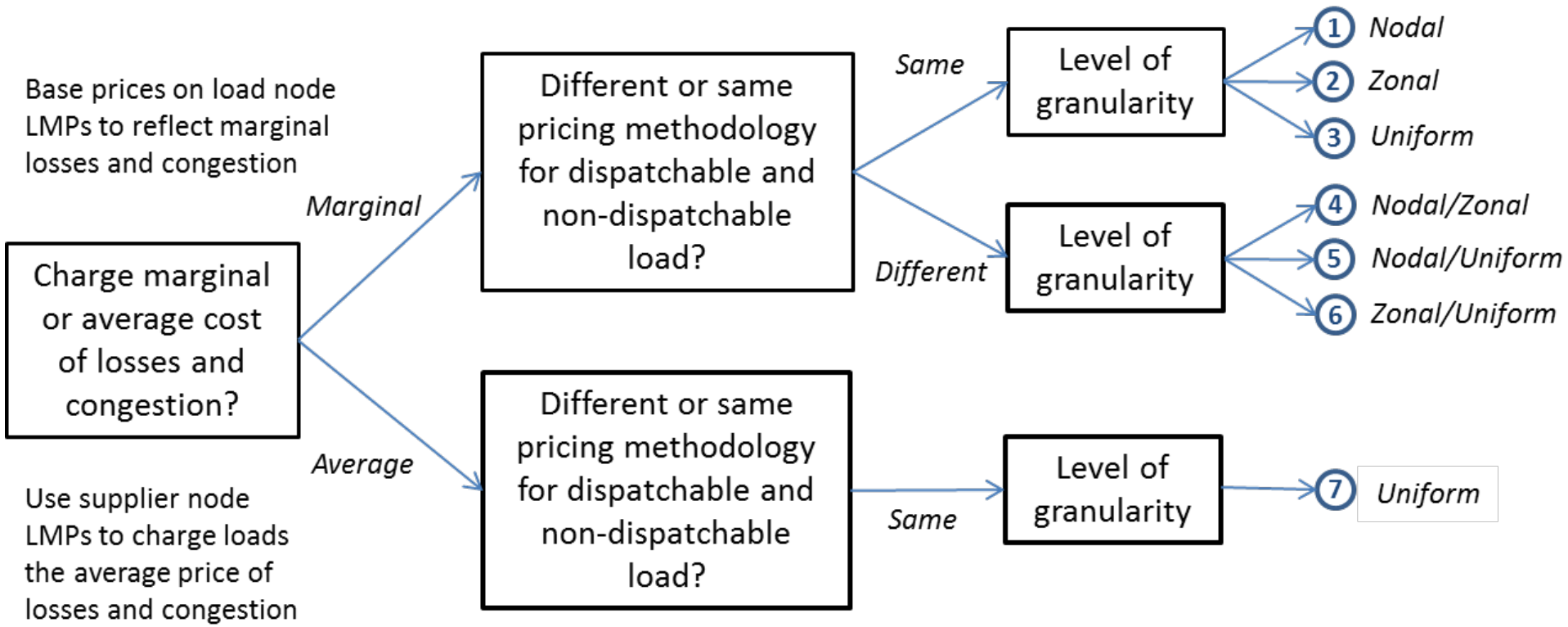
Choice #3: What will be the level of price granularity?

Branches:

- Nodal
- Zonal
- Uniform

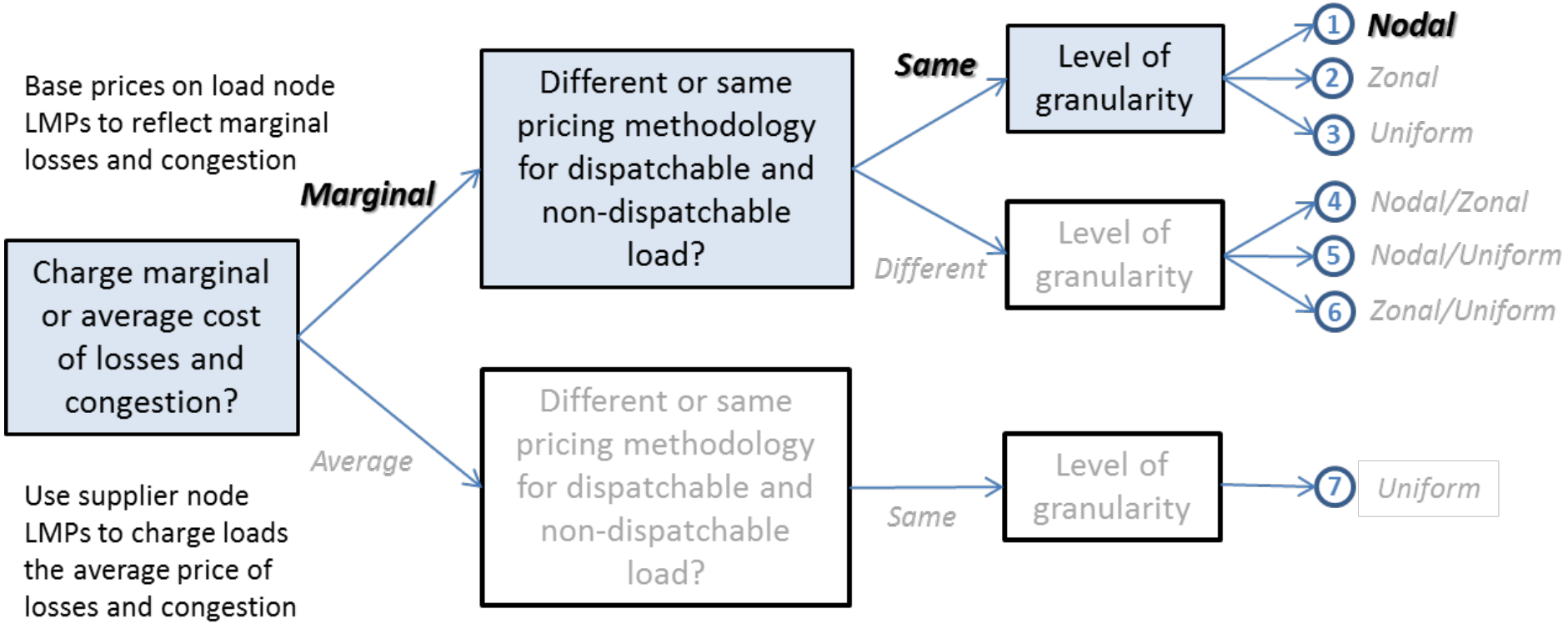
Pricing for Loads — Seven Options

Options for Load Pricing



Pricing for Loads — Option 1

Nodal for All Loads, with Marginal Congestion and Losses



Pricing for Loads — Option 1: Nodal for All Loads, with Marginal Congestion and Losses

PROS

- **Most efficient option**
- All loads pay the marginal cost of transmission congestion and losses for their specific location
- **Supports increased energy market participation/ competition from loads**

CONS

- **Large change to the current design of one uniform price for all internal load (not exports)**

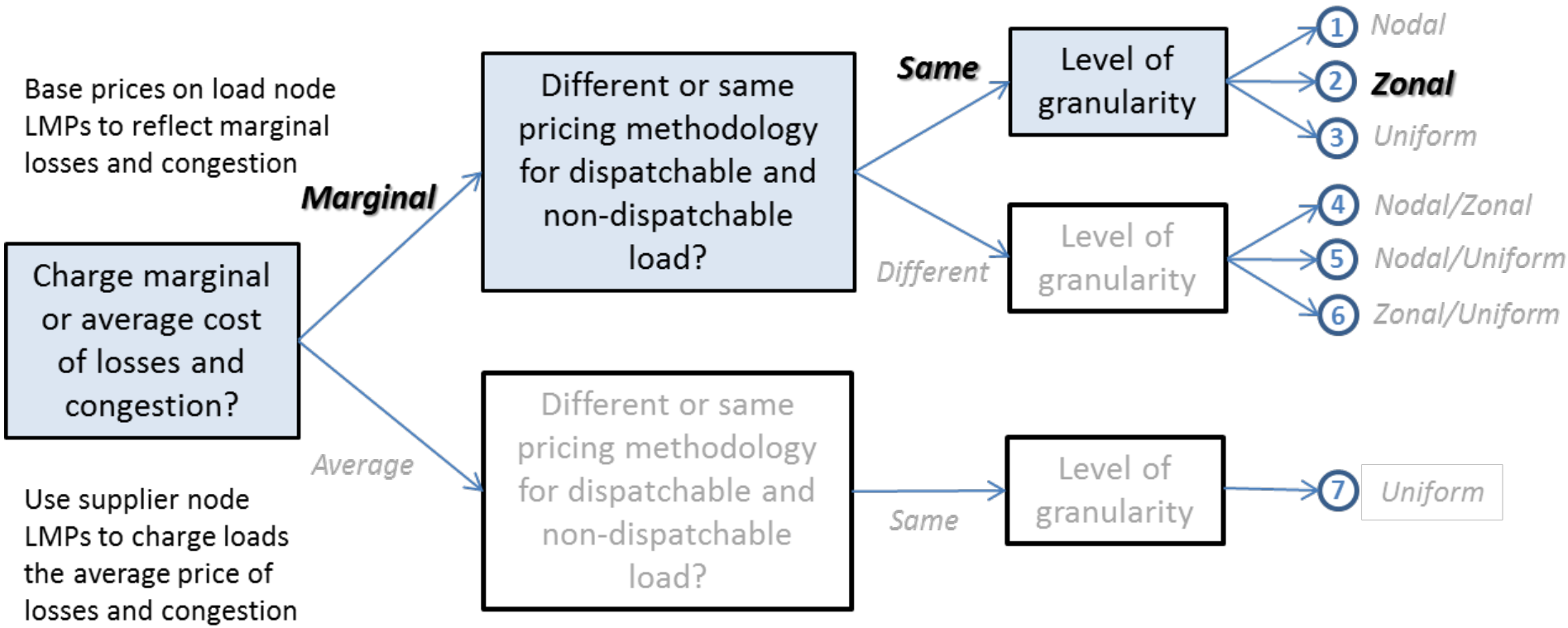
Option 1: Nodal for All Loads, with Marginal Congestion and Losses

CONSIDERATIONS

- Requires LMPs at all load locations
- Requires allocation of settlement residuals for congestion rents and marginal losses
  - This is a consideration for all but Option #7 (uniform price based on supplier LMPs)
- Metering requirements

Pricing for Loads — Option 2

Zonal for All Loads, with Marginal Congestion and Losses



Option 2: Zonal for All Loads, with Marginal Congestion and Losses

PROS

- **More efficient than uniform but less efficient than nodal**
- All loads pay the marginal cost of transmission congestion and losses for their zone
- Definitions of zones can be tailored to congestion patterns in Ontario
- **Supports increased energy market participation/competition from loads (but less so than nodal)**

Option 2: Zonal for All Loads, with Marginal Congestion and Losses

CONS

- Possible need for payments to elicit efficient participation by some dispatchable loads due to the potential difference between schedules and zonal settlement price
  - **Empirical question of whether these payments would be needed and, if so, how large they would be**
- Definitions of zones might need to be modified if congestion patterns change
  - Has not been an issue in U.S. ISOs
- **Change to the current design of one uniform price for all internal load**

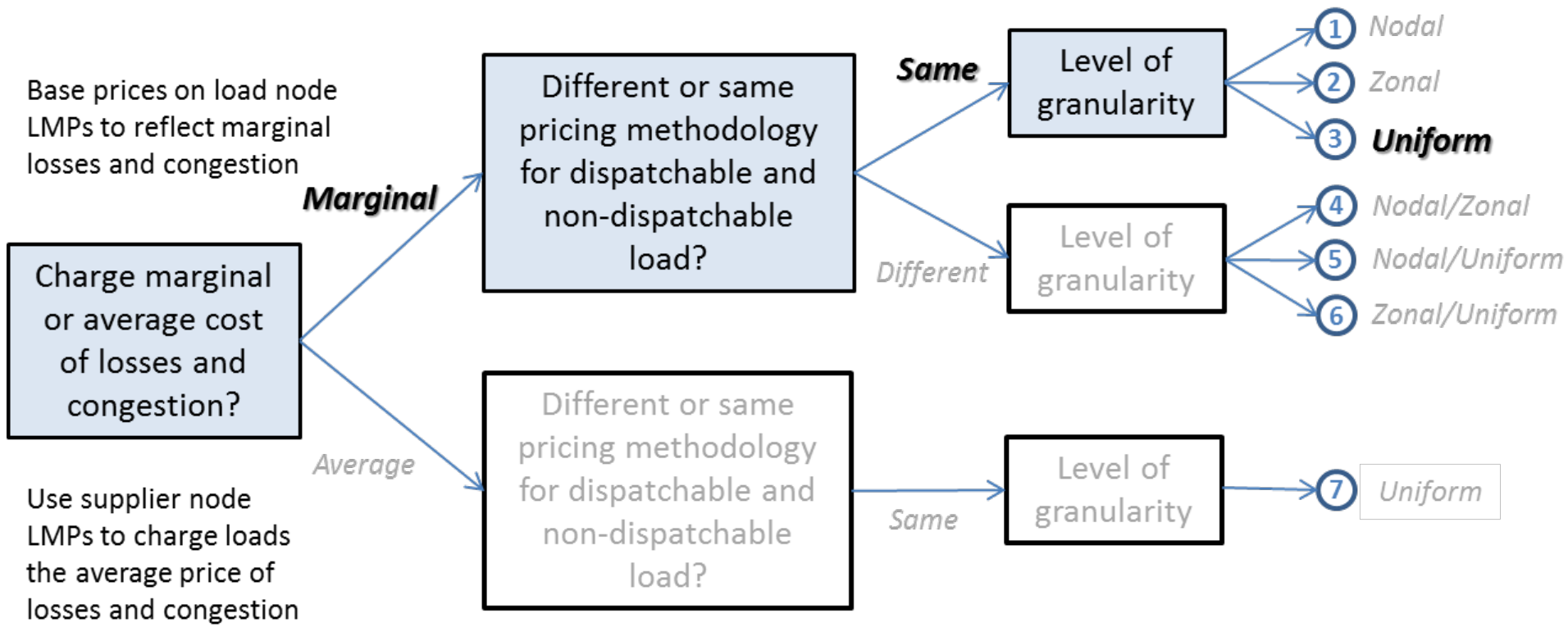
Option 2: Zonal for All Loads, with Marginal Congestion and Losses

CONSIDERATIONS

- Relative efficiency of zonal vs. uniform or zonal vs. nodal depends on how the zones are defined
  - Empirical issue
- Requires allocation of settlement residuals for congestion rents and marginal losses residual
  - Consideration for all but Option #7 based on supplier LMPs
- Metering requirements

Pricing for Loads — Option 3

Uniform for All Loads, with Marginal Congestion and Losses



Option 3: Uniform for All Loads, with Marginal Congestion and Losses

PROS

- **No change to the current design of one uniform price for all internal load**
- No need to define zones or meter load within zones

Option 3: Uniform for All Loads, with Marginal Congestion and Losses

CONS

- **Less efficient than nodal or zonal**
  - **Loads will not be able to react to a price that includes the marginal cost of congestion and losses**
- Will require payments to elicit efficient participation by dispatchable loads due to difference between schedules and uniform settlement price
- **Does not support increased energy market participation/ competition from loads**
- Will likely result in the same or very similar uniform prices as Option #7 after crediting the marginal congestion and losses residual in calculating the uniform load price

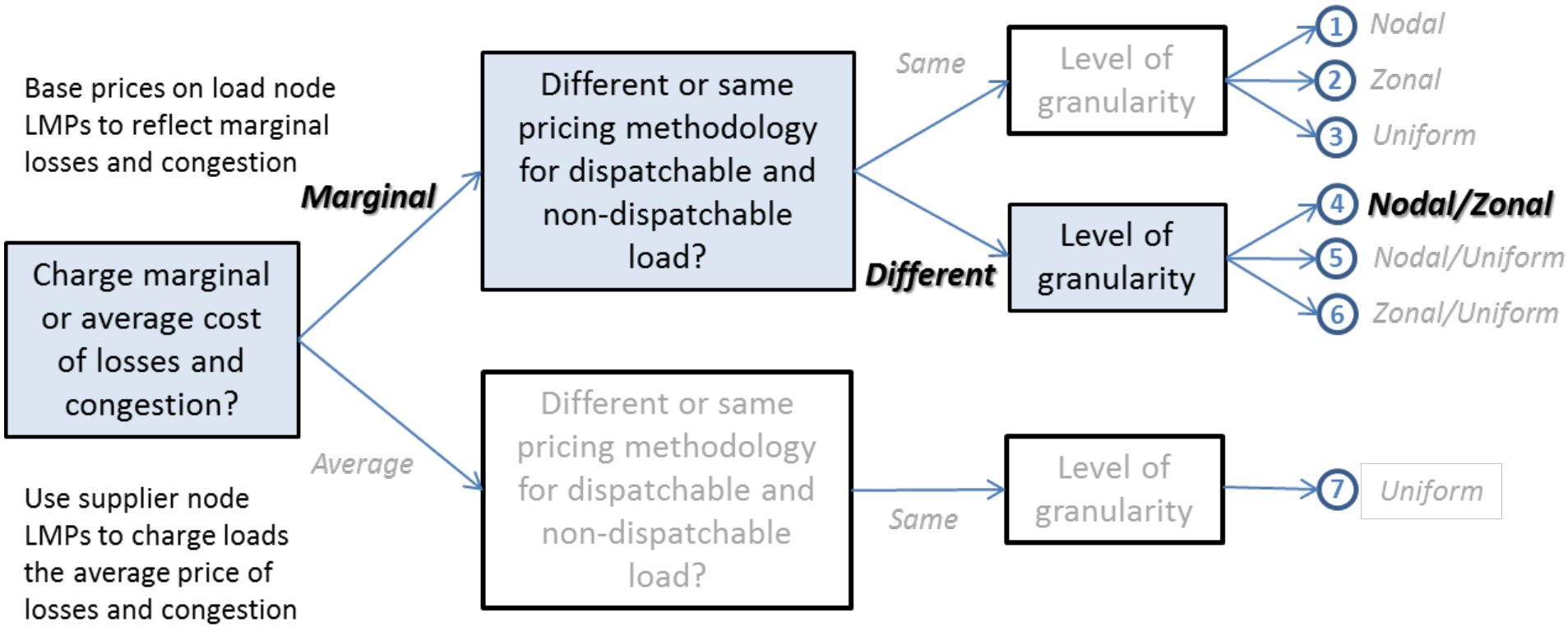
Option 3: Uniform for All Loads, with Marginal Congestion and Losses

CONSIDERATIONS

- Requires allocation rules for congestion rents and loss residual
  - Consideration for all but Option #7 based on supplier LMPs
- **Approach not used by U.S. ISOs**

Pricing for Loads — Option 4

Nodal for Dispatchable, Zonal for Non-Dispatchable, with Marginal Congestion and Losses



Pricing for Loads — Opt. 4: Nodal (Disp.)/Zonal (Non-Disp.), with Marginal Congestion and Losses

PROS

- **More efficient than *all zonal* but less efficient than *all nodal***
- Non-dispatchable loads pays the marginal cost of transmission congestion and losses for their zone
- Prices for dispatchable loads would include the marginal cost of transmission congestion and losses for their node

Opt. 4: Nodal (Disp.)/Zonal (Non-Disp.), with Marginal Congestion and Losses

CONS

- May need congestion hedges or some type of payment to elicit efficient participation by dispatchable loads
  - **Empirical question of whether this would be important**
- Change to the current design of one uniform price for all internal load
- Definitions of zones might need to be modified if congestion patterns change
  - Has not been an issue in the U.S. ISOs

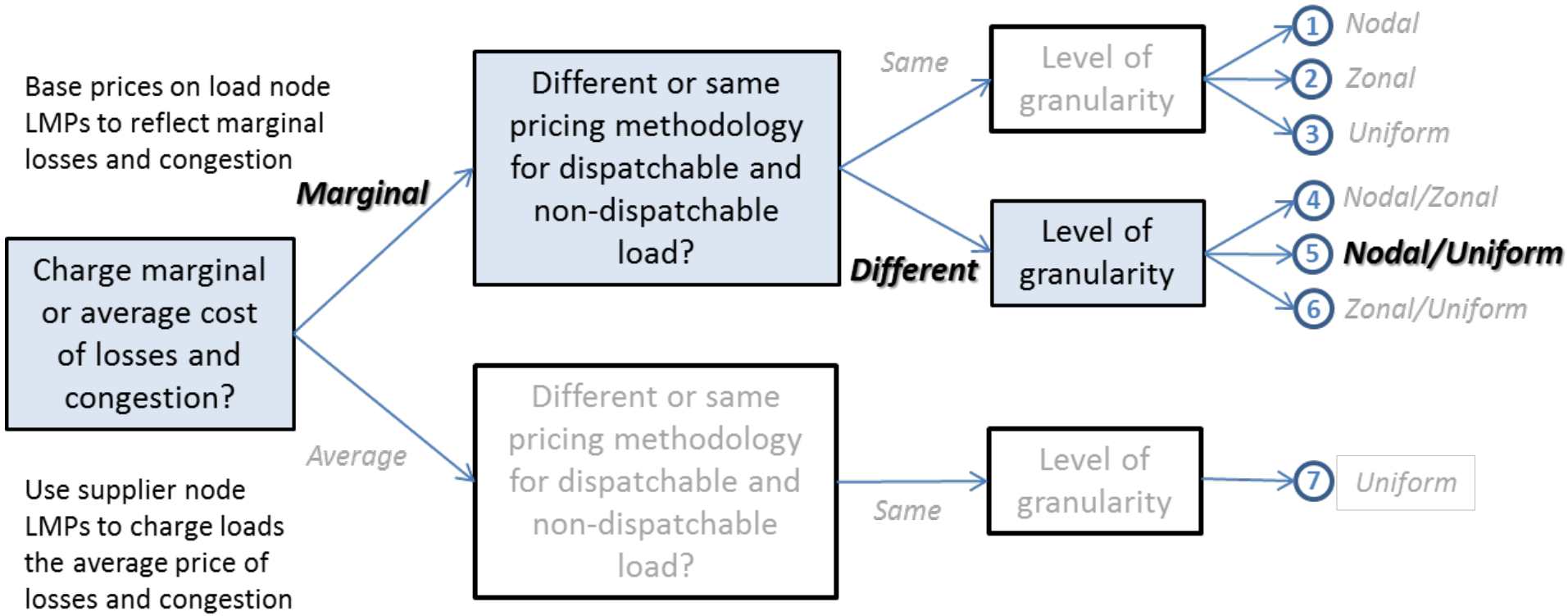
Opt. 4: Nodal (Disp.)/Zonal (Non-Disp.), with Marginal Congestion and Losses

CONSIDERATIONS

- Efficiency of this approach might depend the design of a congestion hedge or payment to address incentive issue for dispatchable load
  - Design of payment could effectively make this the same as Option #2 (all zonal)
- Requires allocation rules for congestion rents and marginal loss residual
  - Consideration for all but Option #7 based on supplier LMPs

Pricing for Loads — Option 5

Nodal for Dispatchable, Uniform for Non-Dispatchable, with Marginal Congestion and Losses



Pricing for Loads Opt. 5: Nodal (Disp.)/Uniform (Non-Disp.) with Marginal Congestion and Losses

PROS

- **Prices for dispatchable loads would include the marginal cost of transmission congestion and losses for their node**
- Less change to the current design of one uniform price for all internal load

Pricing for Loads — Opt. 5: Nodal (Disp.)/Uniform (Non-Disp with Marginal Congestion and Losses

CONS

- **Less efficient than nodal, zonal or nodal/zonal (but probably more efficient than all uniform)**
- **Limited support for increased energy market participation/ competition from loads**
- Would require congestion hedges or some type of payment to elicit efficient participation by dispatchable loads
  - Empirical question of the magnitude of such hedges/payments
  - If hedges or payments poorly designed incentive issues will likely distort participation by dispatchable loads
- **Complicated approach considering most load would continue to pay uniform price**

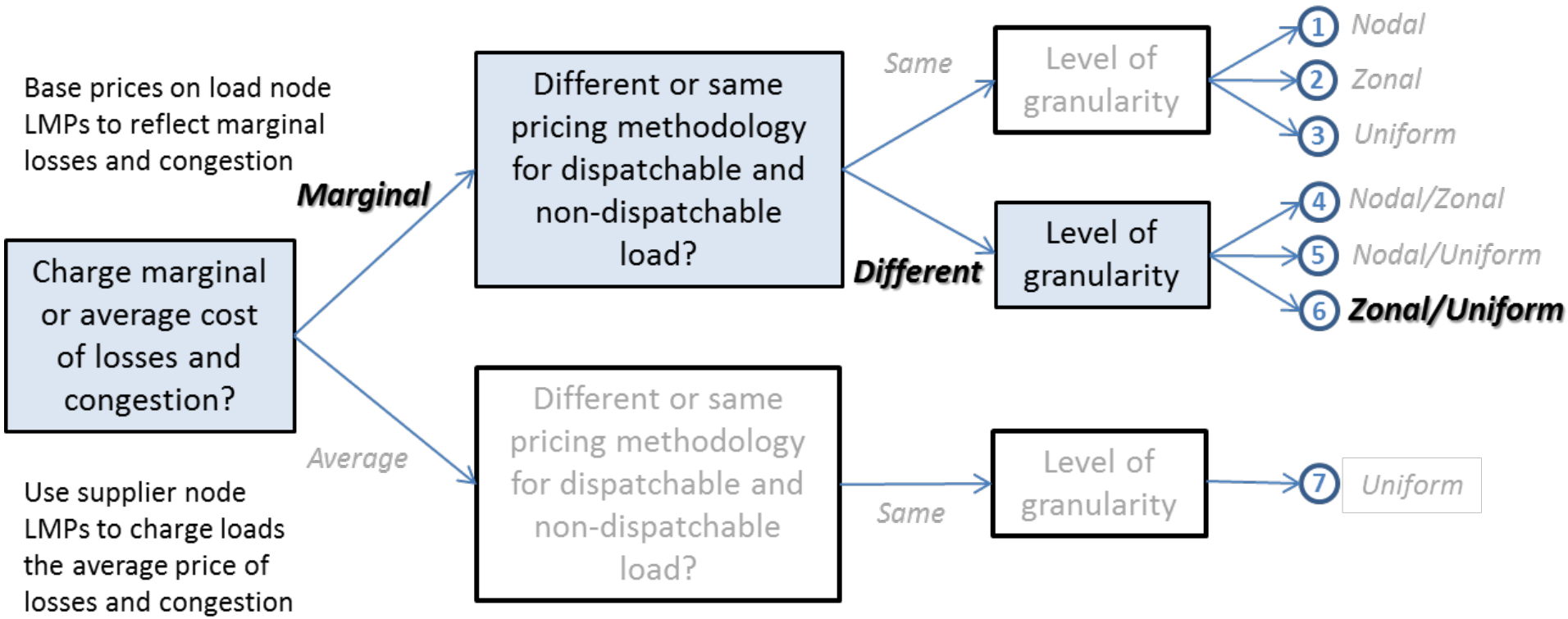
Pricing for Loads Opt. 5: Nodal (Disp.)/Uniform (Non-Disp.) with Marginal Congestion and Losses

CONSIDERATIONS

- Workability and efficiency of this approach depends on a congestion hedge or payment to address incentive issue for dispatchable load
  - Design of payment could effectively make this the same as Option 3 or 7 (all uniform)
- Requires allocation of settlement residuals for congestion rents and marginal losses
  - Consideration for all but Option #7 based on supplier LMPs
- **Approach not used in U.S. ISOs**

Pricing for Loads — Option 6

Zonal for Dispatchable, Uniform for Non-Dispatchable, with Marginal Congestion and Losses



Pricing for Loads Opt. 6: Zonal (Disp.)/Uniform (Non-Disp.) with Marginal Congestion and Losses

PROS

- **Prices for dispatchable loads would include the marginal cost of transmission congestion and losses for their zone**
- Less change to the current design of one uniform price for all internal load

Pricing for Loads Opt. 6: Zonal (Disp.)/Uniform (Non-Disp.) with Marginal Congestion and Losses

CONS

- **Less efficient than nodal, zonal or nodal/zonal (but probably more efficient than all uniform)**
- **Limited support for increased energy market participation/ competition from loads**
- Requires congestion hedges or some type of payment to elicit efficient participation by dispatchable loads
  - Empirical question of the magnitude of such hedges/payments
  - If hedges or payments poorly designed incentive issues will likely distort participation by dispatchable loads
- **Complicated approach considering most load would continue to pay uniform price**

Pricing for Loads Opt. 6: Zonal (Disp.)/Uniform (Non-Disp.) with Marginal Congestion and Losses

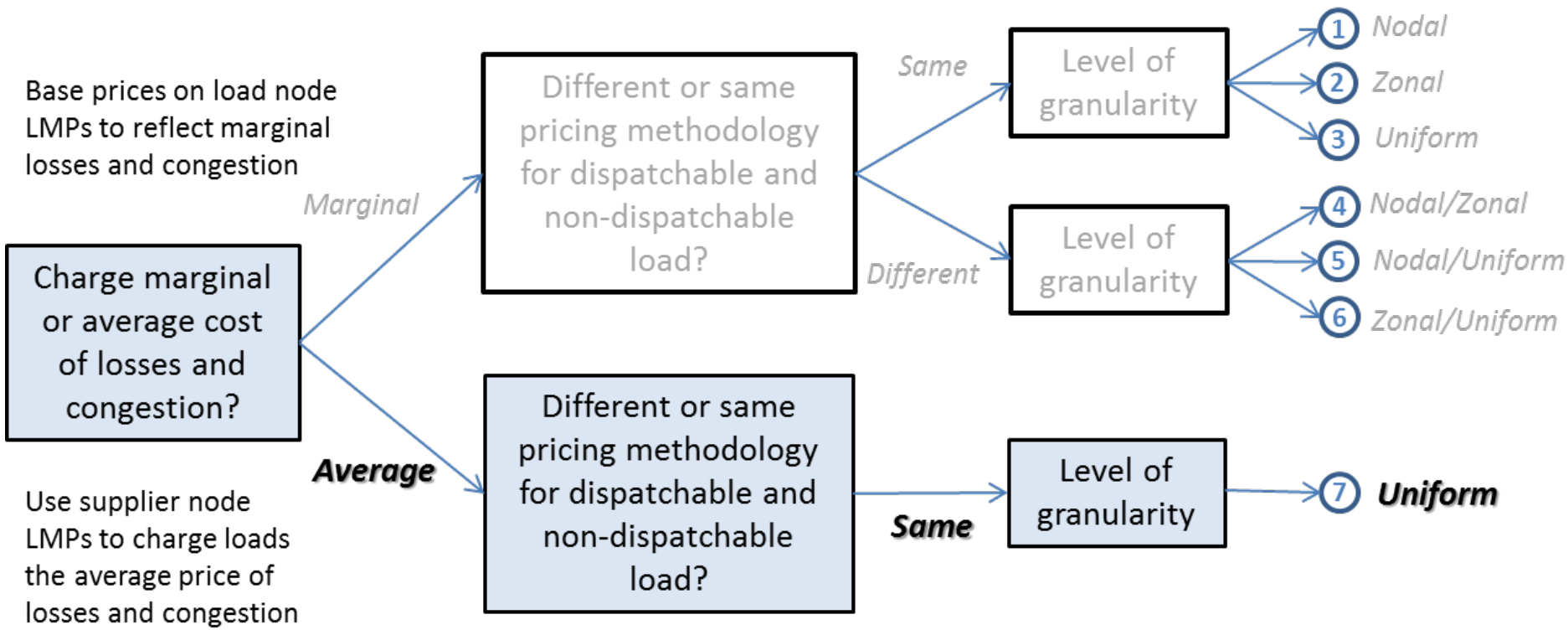
CONSIDERATIONS

- Efficiency of this approach might depend the design of a congestion hedge or payment to address incentive issue for dispatchable load
    - Design of payment could effectively make this the same as Option 3 or 7 (all uniform)
- Requires allocation of settlement residuals for congestion rents and marginal loss residual
    - Consideration for all but Option #7 based on supplier LMPs
- **Approach not used in U.S. ISOs**

Pricing for Loads

Option 7

Uniform for All Loads with Average Congestion and Losses



Pricing for Loads — Option 7: Uniform for All Loads, with Average Congestion and Losses

PROS

- **No change to the current design**

CONS

- **Less efficient than nodal, zonal or nodal/zonal**
  - No loads react to the marginal cost of transmission congestion and losses
- **Requires supplemental rules for payments to elicit efficient participation by dispatchable loads**
- **Does not support increased energy market participation/ competition from loads**

CONSIDERATIONS

- No settlement residuals
- **Approach abandoned by U.S. ISOs**

Load Pricing — Other ISOs

ISO	Dispatchable Load	Non-Dispatchable Load
PJM	Nodal	Nodal or Zonal
NYISO	None	Zonal
ISO New England	Nodal possible for large loads	Zonal Nodal poss. for large loads
MISO	Nodal	Nodal or Zonal
SPP	None	Nodal or Zonal
CAISO	Nodal	Zonal
ERCOT	None	Zonal

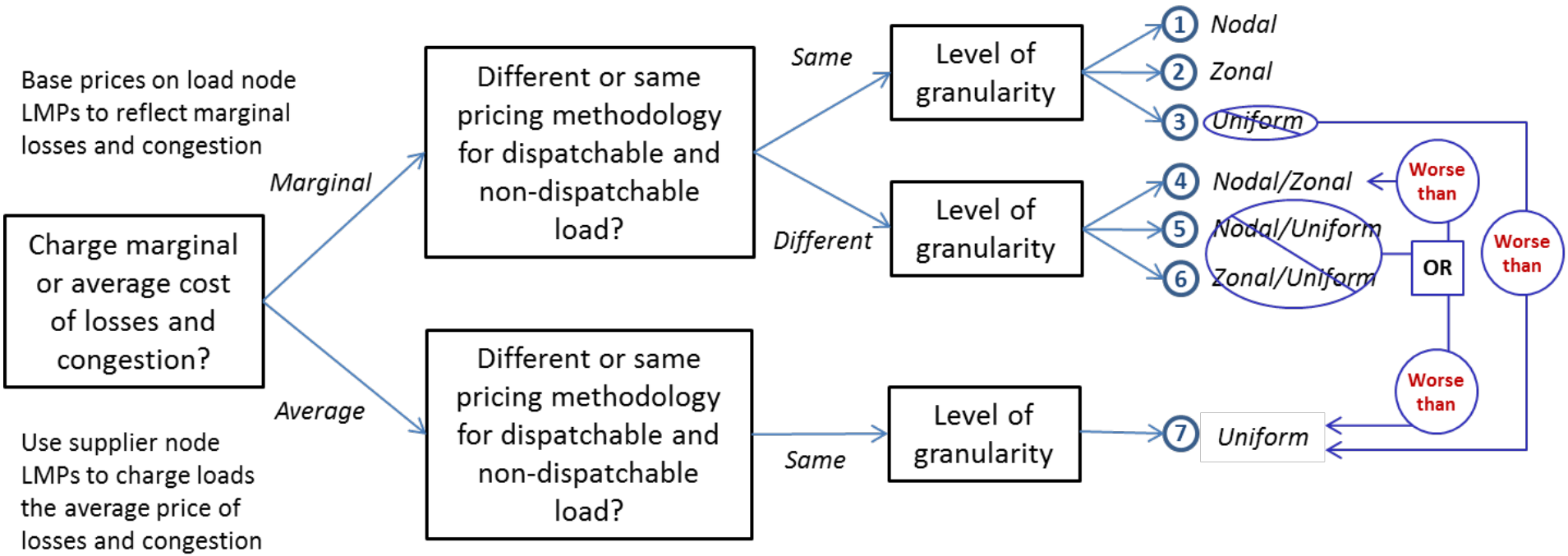
Load Pricing Summary Comparison

Option Description	Efficiency	Change to Current Pricing Policy	Incentive Issues	Used by other ISO's?	Other
1: All Nodal	Highest	Largest	No	Yes, but not required	
2: All Zonal	In the middle: dep. on zones, hedges, etc.	Moderate	In the middle: dep. on zones, hedges, etc.	Yes	
3: All Uniform	Least	Small	Yes, for dispatchable	No	Converges to #7
4: Nodal / Zonal	In the middle: dep. on zones, hedges, etc.	Moderate	In the middle: dep. on zones, hedges, etc.	Yes	
5: Nodal / Uniform	Lower than #4	Less than #2 and #4	Yes; fix could lead to #3	No	Unduly complex?
6: Zonal / Uniform	Lower than #4	Small	Probable ; fix could lead to #3	No	Unduly complex?
7: All Uniform (avg cong and losses)	Least	None	Yes, for dispatchable	No	

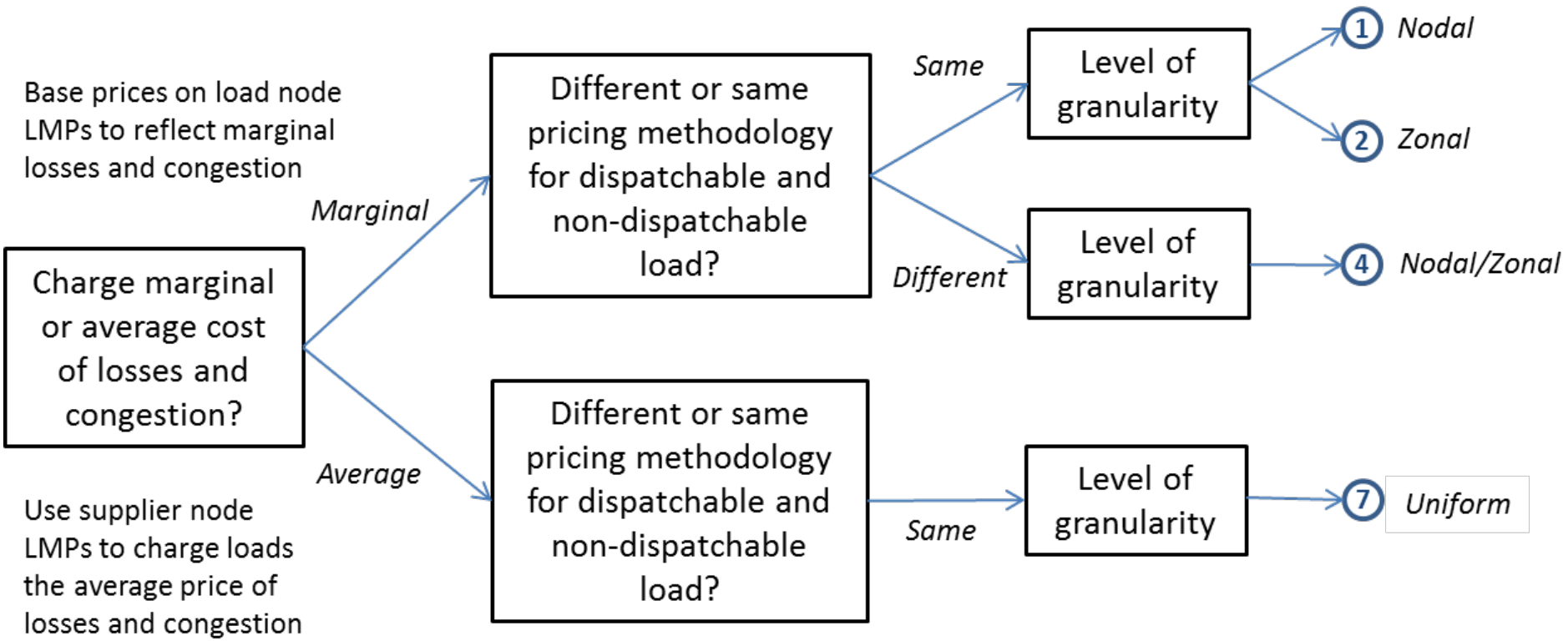
Load Pricing Reducing Options?

Option Description	Efficiency	Change to Current Pricing Policy	Incentive Issues	Used by other ISO's?	Other
1: All Nodal	Highest	Largest	No	Yes, but not required	
2: All Zonal	In the middle: dep. on zones, hedges, etc.	Moderate	In the middle: dep. on zones, hedges, etc.	Yes	
3: All Uniform	Least	Small	Yes, for dispatchable	No	Converges to #7
4: Nodal / Zonal	In the middle: dep. on zones, hedges, etc.	Moderate	In the middle: dep. on zones, hedges, etc.	Yes	
5: Nodal / Uniform	Lower than #4	Less than #2 and #4	Yes; fix could lead to #3	No	Unduly complex?
6: Zonal / Uniform	Lower than #4	Small	Probable ; fix could lead to #3	No	Unduly complex?
7: All Uniform (avg cong and losses)	Least	None	Yes, for dispatchable	No	

Load Pricing Reducing Options?



Load Pricing — Remaining Options?



Load Pricing Questions with Remaining Options

Empirical analysis can support evaluation of remaining options.

Option Description	Efficiency	Change to Current Pricing Policy	Incentive Issues	Used by other ISO's?
1: All Nodal	Highest	Largest	No	Yes, but not required
2: All Zonal	In the middle: dep. on zones, hedges, etc.	Moderate	In the middle: dep. on zones, hedges, etc.	Yes
4: Nodal / Zonal	In the middle: dep. on zones, hedges, etc.	Moderate	In the middle: dep. on zones, hedges, etc.	Yes
7: All Uniform (avg cong and losses)	Least	None	Yes, for dispatchable	No

Load Pricing Questions with Remaining Options

Potential empirical analyses to assess options. Suggestions?

QUESTION	RELEVANCE
How could load zones be defined for the IESO? How much dispersion in LMPs would be present within (or between) zones?	Smaller number of zones with immaterial LMP dispersion within zones facilitates Option 2
To what extent are dispatchable loads likely to be important supply for energy and/or reserves?	Make sure approach fits with likely role of dispatchable loads
How often is dispatchable load scheduled out of line with its willingness to pay?	If this occurs infrequently, then potential payments associated with Option 2 (Zonal) may be relatively small
Are there non-dispatchable loads that might be price responsive in the day-ahead market with nodal or zonal pricing? How material is this load?	Higher potential participation increases advantages of accommodating day-ahead price responsive load under Options 1, 2 or 4

17. Financial Transmission Rights

Financial Transmission Rights Background

The Ontario electricity market operates today without physical or financial transmission rights (FTRs) for internal transactions.

- Ontario does sell transmission rights at the interties

FTRs are a financial hedge against congestion charges.

- For example, with an FTR of 10 MW from location A to location B (a location could be a zonal or uniform aggregate), in each hour in which there is congestion between these locations the holder of the FTRs would be paid (or pay) the price of congestion from A to B (in $/MWh) multiplied by the volume of the FTR -- 10 MW in our example
- FTRs are purely financial – independent of actual consumption
- Intent is to preserve efficient marginal incentives while providing a hedge against congestion charges

Financial Transmission Rights History in U.S.

In the U.S., the development of financial transmission rights was essential for moving to SSM (i.e., LMP pricing for energy). The history of why LMP and FTR implementations were linked in the U.S. clarifies why the options for FTRs are different in Ontario.

- Prior to SSM, U.S. utilities bought and sold power from each another, requiring the movement of the energy into, out of and through transmission systems owned by others
- The "physical" right to move a certain amount of power over another transmission owner's system could be purchased in advance - yearly, monthly, or daily - at posted prices
- Purchasing "firm" transmission conveyed the right to a fixed amount of transmission capacity to move power from a source to a sink except when certain reliability limits were reached

Financial Transmission Rights History in U.S.

With a firm physical right from A to B a utility buying power at location A could schedule transmission so as to consume the power at location B in real time

- The quantity of these transmission rights was limited by the physical capacity of the grid
- Parties with firm transmission rights were given the opportunity (or required) to continue to pay for their rights and in return were *allocated* FTRs as an approximate replacement
- Least cost dispatch and SSM enabled more efficient use of the transmission system to move power from low cost supply sources to loads

Financial Transmission Rights History in U.S.

Auctions for FTRs were primarily introduced to support the development of competition to serve retail loads (competitive entities serving loads have gone by different names, such as Load Serving Entities, Energy Service Companies, and Retail Cos)

- Some felt auctions were needed to keep incumbents from blocking the access of market entrants (e.g., competing LSEs) to FTRs
- Auctions enabled all competitive entities to change their FTRs as they changed the locations at which they were buying or selling physical power (if they wished to continue to transact bilaterally)
- Liquid markets for FTRs (i.e., auctions) also support financial trading in competitive electricity markets

Financial Transmission Rights Need in U.S. vs. Ontario

FTR implementation can be simpler in Ontario than in the U.S. (if used a all), without all of the features of U.S. markets, such as auctions.

- No need to replace physical transmission service
  - Means no complicated allocation process to replicate physical transmission rights

- Limited known need at this time to support (i.e., hedge the congestion for) bilateral purchases and sales of physical power (interties an exception)

Financial Transmission Rights Need in Ontario

FTRs are potentially relevant to Ontario in addressing incentive, efficiency and cost shifting issues identified for the load pricing options in the previous module and discussed in prior sessions

1. The incentive problems in designing an SSM to efficiently include dispatchable load
2. Potential cost shifts among loads with use of non-uniform pricing for loads

We also will discuss some ways to address these issues without FTRs, such as with make whole payments

The challenge to including dispatchable load in SSM:

1a. Arises if dispatchable load is paying a more granular price than non-dispatchable load

- Dispatchable load may choose to become non-dispatchable in order to pay a lower zonal price (than its nodal price)
- Load could have an incentive to appear to be dispatchable in order to pay a lower price (than its zonal or uniform price)

1b. Arises if dispatchable load paying a non-nodal price

- Dispatchable load paying a zonal or uniform price may incur actual or opportunity costs while following dispatch instructions

Financial Transmission Rights Tie to Load Pricing Issues

PROBLEM	Cost Shifts/ Incentive/Efficiency	Cost Shifts/ Incentive/Efficiency	Cost Shifts
OCCURS WHEN:	1a. Dispatchable loads pay more granular price than non-dispatchable	1b. Dispatchable loads pay non-nodal price	2. Nodal or zonal settlements for most load (i.e., not all uniform)
OCCURS IN LOAD PRICING OPTION:	Load Pricing Option 4	Load Pricing Options 2 or 7	Load Pricing Options 1, 2 or 4
POSSIBLY ADDRESS WITH:	FTRs, non-FTR hedges, Make Whole	Make Whole	FTRs, non-FTR hedges
DESCRIBED IN:	FTR Options A, B, D,E, F	FTR Options B, E	FTR Options A, B
	Doing nothing also possible : Option C	Doing nothing also possible : Option C	Doing noting also possible: Option C

Financial Transmission Rights — Six Options

A. Full FTR Allocation: FTRs allocated to all loads to address incentive and efficiency issue of dispatchable load and to offset the cost impact of non-uniform pricing for all load

B. Alternative (non-FTR) Mechanism: Payments and charges to loads so that the sum of the payment and their energy price is approximately uniform

C. No FTRs: No FTRs or other payment mechanism to address incentive or cost impact of change to non-uniform pricing

Financial Transmission Rights — Six Options

D. FTRs allocated to dispatchable loads (and possibly to loads responsive to price day-ahead) in locations with average LMPs higher than average zonal price paid by non-dispatchable load

E. FTRs allocated to all dispatchable load (and possibly to loads responsive to price day-ahead)

F. Payments to dispatchable loads (and possibly to loads responsive to price day-ahead) in locations with average LMPs higher than zonal price

Financial Transmission Rights — Other ISOs

All U.S. ISOs have FTRs.

- FTRs go by different names: e.g., congestion revenue rights (CRRs) in the CAISO; transmission congestion contracts (TCCs) in the NYISO
- Extensive experience in using FTRs to address incentive, efficiency and cost impacts of LMP without undermining marginal incentives

FTRs — Option A: FTRs for All Load

PROS

- FTRs provide a congestion hedge so that all load, on average, pays approximately the aggregated price
  - FTR payments do not depend on dispatchable load's consumption in each hour or interval (maintains efficient marginal incentives)
  - FTR payments soften changes in all load's energy costs from switch to SSM
  - Sum of hedge payments and energy payments over longer time period discourages dispatchable load from switching to non-dispatchable
  - Removes incentive for non-dispatchable load in low-price locations to identify itself as dispatchable in order to pay the lower price
- Would accommodate increases in dispatchable load and the use of FTRs, and the possible future introduction of competitive loads

CONS

- Requires method for fair allocation of FTRs to all load, i.e., no under - or over - allocation
- FTR allocation to hedge zonally priced load (or a combination of nodal/zonally priced load) to average price could be more complicated than it seems

CONSIDERATIONS

- This alternative fits with load pricing options in which all load pays either a nodal or zonal price, or a combination
- One time FTR allocation is made to all loads
  - Rules developed to accommodate new dispatchable loads without full reallocation
  - All loads allocated FTRs that would provide on average a uniform price – FTRs could result in a payment or a payout
- FTRs would be funded from congestion rents
  - Payments to FTRs for non-dispatchable load would raise or lower the average cost of power relative to the nodal or zonal energy price they pay

FTRs Option B: Other (Non-FTR) Approach

Alternative approaches to the incentive problems and cost shifting in the transition to LMP are likely possible, but should have attributes similar to an FTR.

- The sum of the (alternative) payment and the energy price to load should offset some loads paying higher prices and some paying lower energy prices in the shift to SSM
- Payment does not depend on load's consumption in each hour or interval (maintains efficient marginal incentives)

FTRs Option B: Other (Non-FTR) Approach

- Payment discourages load from switching to non-dispatchable or non-price responsive
- Also desirable for payment terms to discourage misrepresentation of provision of dispatchable demand in low-price locations
- Fair allocation of payment rights among all types of load, i.e., no under- or over-allocation
- Funding from congestion rents, marginal losses surplus or uplift

Advantage of FTRs is that the details have been worked through

FTRs Option C: No FTRs or Alternative Payment

PROs:

- Simple alternative
- Would result in little inefficiency with zonal pricing (Option 2 if immaterial dispersion in nodal prices within load zones

CONs:

- Would not address cost shifts in moving from uniform to nodal or zonal pricing
- Would not address incentive issues in a combined nodal/zonal load pricing system

FTRs Option D: FTRs to Disp. Load with High LMP

PROS

- FTRs provide a congestion hedge so that dispatchable load (and potentially also load that is price responsive day-ahead) at locations with high LMPs, on average, pays the aggregated price of non-dispatchable load at its same location
  - Hourly financial hedge is independent of consumption and maintains the efficiency of charging nodal prices
  - Sum of hedge payments and energy payments (over longer time horizon) discourages load from switching to non-dispatchable
- Would be compatible with limited increases in dispatchable load or future expansion of role of FTRs

Option D: FTRs to Disp. Load with High LMP

CONS

- Requires method for fair allocation of FTRs to dispatchable load, i.e., nor over-allocation
- One-time allocation of FTRs may not work with changes to the quantity and locations of dispatchable (and price-responsive) loads over time
- Dispatchable and price-responsive loads in locations with low LMPs not charged for their gain in moving from uniform to nodal pricing

Option D: FTRs to Disp. Load with High LMP

CONSIDERATIONS

- Funding from congestion rents
  - Remaining congestion rents reduce price of non-dispatchable load
  - Residual congestion rents need to be allocated differentially among load zones to mitigate cost impacts of zonal pricing for loads not receiving FTRs

PROS

- FTRs provide a congestion hedge so that *all* dispatchable load (and potentially also load that is price responsive day-ahead), on average, pays the aggregated price of non-dispatchable load at its location
  - Hourly financial hedge is independent of consumption and maintains the efficiency benefit of responding to nodal prices
  - Sum of hedge payments and energy payments over longer time period discourages load from switching to non-dispatchable
- Removes incentive for non-dispatchable (and price-responsive) load in low-price locations to identify itself as dispatchable in order to pay the lower price
- Accommodates increases in dispatchable load (and price-responsive load) and the use of FTRs more readily than Option D

CONS

- Requires method for fair allocation of FTRs to all load, i.e., no under - or over - allocation
- One-time allocation of FTRs may not work with changes to the quantity and locations of dispatchable loads over time

CONSIDERATIONS

- FTRs allocated to all dispatchable loads
  - Dispatchable loads in low-price locations would be allocated FTRs that would raise the average cost of these loads to a level similar to the aggregated uniform (or zonal) price of non-dispatchable load at their location
- Funding from congestion rents
  - Remaining congestion rents reduce price of non-dispatchable load
  - Residual congestion rents need to be allocated differentially among load zones to mitigate cost impacts of zonal pricing for loads not receiving FTRs
  - Fair allocation of residual congestion rents among loads could amount to the same thing as-allocating FTRs to all loads (Option A)

FTRs — Option E: FTRs to All Disp. Load

- A further alternative (Option E.1) would be to define the FTRs so that they would only result in a payment, and never a charge. This is called an FTR option
  - Would encounter difficulties in accommodating increases in dispatchable load and the use of FTRs
  - Difficult to reduce the price of loads in high priced locations to average level while not charging loads in low priced locations for their price reduction in moving from uniform pricing to LMP
  - Would result in lower costs than today for some loads with low LMPs and higher average prices for all other loads

FTRs Option F: Alt. Payment to Disp. Load with High LMP

Alternative approaches to the dispatchable load (and potentially also price-responsive load) incentive problem are possible, but should have attributes similar to an FTR

- The sum of the (alternative) payment and the energy price to dispatchable load should be no-more than the average aggregated price of non-dispatchable load at its same location
- Payment does not depend on load's consumption in each hour or interval (maintains efficient marginal incentives)

FTRs Option F: Alt. Payment to Disp. Load with High LMP

- Payment discourages load from switching to non-dispatchable or non-price responsive
- Also desirable for payment terms to discourage misrepresentation of provision of demand response in low-price locations
- Fair allocation of payment rights to dispatchable and price-responsive load, i.e., no under- or over-allocation
- Funding from congestion rents, marginal losses surplus or uplift

Advantage of FTRs is that the details have been worked through

FTRs Summary Comparison

Option Description	Could Pair with Load Options:	Addresses Cost Shift Issue	Addresses Incentive Issue	Ease of expanding approach to more load	Other
A: FTRs for all load	1, 2, or 4	Yes	Yes	High	For non-disp load, the FTRs would allocate residuals among load zones
B: Alt. payment all load	Possibly 1, 2 or 4	Unknown	Unknown	Unknown	Probably inferior to other alternatives
C: No FTRs or payment	7 and possibly 2 if little within-zone LMP variation	No	No	High	A possible option if little within-zone LMP variation
D: FTRs for high LMP disp. load	4 and possibly 1.b and 2.b	Incomplete	Not for load in low LMP locations	Not as easy	Possibility if little disp. load; otherwise inferior to F
E: FTRs for all disp. load	4 and possibly 1.b and 2.b	Incomplete, but better than D	Yes	Better than D	Converges to A if FTRs differentially allocated among zones of non-responsive load
F: Alt payment for high LMP disp. load	4 and possibly 1.b and 2.b	Unknown	Unknown	Unknown	Might work for small amount of disp. load

Load Pricing and FTRs — Takeaways

Which alternatives will preserve the marginal incentives of SSM without resulting in large differences in average cost of power paid by different loads?

- Load pricing alternatives 1, 2 or 4, paired with an allocation of FTRs to all load, including non-dispatchable loads.

Which alterative would be the most adaptable to future changes in the quantity of price-responsive or dispatchable load?

- Load pricing alternative 1 or 2 with the allocation of FTRs to all load

18. Make Whole Payments

Make Whole Payments Background

With MCP and HOEP there are make whole payments (i.e., CMSC) to ensure that if generators offer their supply at cost, their profits will not be reduced by following dispatch instructions.

Under the SSM, these payments will be substantially reduced.

- No more payments because of inconsistencies between prices and schedules due to transmission congestion alone
- Remaining payments can arise for both energy and reserve schedules
- Discussion in this section excludes cost guarantees for unit commitments

Make Whole Payments — Background

Under SSM non-commitment related make whole payments will remain when schedules and prices are inconsistent due to:

- Operating restrictions of fast-start resources, particularly minimum loads
- Operator actions to maintain reliability
- Possible impact of multi-interval optimization on schedules
- Market administration following suspension or tool issues

Make Whole Payments Options

Make whole payments (as described on the previous slide) are a fundamental feature of a single schedule market design. There are two options:

1. Include make whole payments in the design for constrained up and constrained down suppliers
2. Include make whole payments for only constrained up suppliers

Make Whole Payments — Other ISOs

ISO	Constrained Up	Constrained Down
PJM	√	
New York ISO	√	√
ISO New England	√	√
MISO	√	√
SPP	√	√
California ISO	√	√

Make Whole Payments — Option 1

Provide make whole payments when there are inconsistencies between a participants' actual schedule and its expected schedule according to its locational price.

- This is the approach in all U.S. ISOs except for PJM, which is discussing changes

Make Whole Payments — Option 2

Provide make whole payments only to suppliers whose schedules are constrained up.

- Approach encourages constrained down units to chase price up to limits of dead band
- Relies on regulating units to balance system
- Approach incorrectly believed to reduce uplift
- Approach limits the ability of ISOs to make improvements to pricing because of possible impacts on regulation needs

19. Uplift

Uplift Background

Under the current system, costs and revenues falling into the uplift category are those for which no other payment or charge has been designed. Under SSM, uplift will occur for many of the same reasons as today:

- Make whole payments
- Penalties or failure charges
- Under-collection (e.g., due to default)
- Cost guarantees
- Ancillary service cost recovery (e.g., operating reserve costs)

Uplift SSM Changes

- Current uplift charges for CMSC and losses will no longer exist under SSM
- The congestion rent and marginal loss residuals previously discussed would be new components of uplift
  - Charges for marginal losses and congestion are included in LMP settlement prices
  - These charges result in **residuals** which will flow through uplift *and will be payments to load rather than charges to load (with limited exceptions)*
    - Residual congestion rents
    - Marginal losses residual
- Residuals occur in both the new day-ahead market (hourly) and in the real-time market (interval)

Uplift Options

Options for billing or distribution of **Congestion Rents and Marginal Loss surpluses**:

1. Per MWh of actual withdrawals by internal load
2. Per MWh of actual withdrawals by internal load and exports

These options apply only to congestion rents and marginal loss surpluses not allocated in other ways (e.g. congestion rents paid to FTR holders)

ISO	Allocate Marginal Loss Residual to Exports?
PJM	Yes
New York ISO	Yes
ISO New England	No
MISO	No
SPP	Yes
California ISO	No
ERCOT	N/A

Uplift — Option 1

Allocate some or all congestion rent and marginal loss residual per MWh of actual withdrawals by internal load

- Low charge or payment per MWh leads to little impact on efficiency
- Fair allocation of uplifts to internal loads that are disbursements
- Actual load cannot bypass uplifts when they are charges

Uplift — Option 2

Allocate some or all congestion rent and marginal loss residual per MWh of actual withdrawals by internal load and exports

- Low charge or payment per MWh leads to little impact on efficiency
- ISO-specific considerations impact decision of whether or not to include exports in allocation
- Actual load cannot bypass uplifts when they are charges