

# AESO Recommendation Paper Congestion Management Plan

Market Services

Stakeholder session

Sept 26, 2007

Reliable **Power**

Reliable **Markets**

Reliable **People**



# Introduction



- DOE policy intent is clear that the transmission system needs to be built to effectively operate congestion free.
- DOE does recognize, however, that congestion may occur under abnormal operating conditions.
- DOE regulations and policies such as the Transmission Development Policy (TDP) of 2003 provide a specific framework for congestion management (CM) rules development.
- This presentation introduces a standard approach to real-time congestion management aligned with DOE policy.

# Congestion Management - A Brief History



- Initial instructions in Transmission Development Plan
- Followed by rule requirements set out in 2004 T-reg
- AESO led team developed draft rules – December 2006
- ERC had concerns about alignment with policy
- New approach with key policy alignment

# Congestion Management Discussion



- DOE policy and regulations provided direction in several areas:
  - Transmission access- STS and trigger volume
  - Reverse merit order (RMO)
  - Transmission must run (TMR)
  - CM impact on pool price
  - No constrained down payments

# Transmission Access



- No transmission access rights or preferential treatment to incumbents
  - No trigger participant
  - Supply Transmission Service (STS) does not infer transmission rights and should not be used as a basis for curtailment

# Reverse Merit Order



- AESO is “to determine, according to relative economic merit, the order of dispatch of electric energy” and “real time congestion will be resolved by merit order re-dispatch, followed, if necessary, by pro rata curtailment”
  - Reverse merit order (RMO) must be utilized

# Reverse Merit Order



- Complies with government policy,
- Practical application and,
- Causes the least distortion to the pool price while sending correct price signals to most market participants.

# Transmission Must Run



- DOE policy provides the AESO some flexibility to enter into TMR contracts where they are a superior economic alternative and a shorter lead time solution :
  - TMR to be treated as an effective economic alternative to wires at the time of a constraint
  - CM protocol contemplates the AESO dispatching or directing TMR units on as required and proposes that timely use of effective TMR can prevent the need for further steps (for example, in local load pockets like the Rainbow area)

## Impact on Pool Price

- DOE policy states that “... real-time congestion arrangements should not alter or distort market prices.”
- Unconstrained pool price is optimal:
  - May be achievable in some circumstances (for example, using DDS service)
  - Constrain Down Dispatch Up as primary protocol sequence sends correct price signal to upstream generation and load while encouraging imports when appropriate

# No Constrained Down Payments



- DOE policy states that “constrained down payments will not be paid to generators”
  - Policy is consistent with the idea of no transmission access rights
  - Intent is to put new and existing users on an equal cost sharing footing

# 2007 CM Protocol



The System Controller will implement the following steps in order as required to the extent they are effective in relieving the constraint:

- Determine the effective generation and load able to relieve the constraint.
- Cancel directives to upstream generators, i.e., generators that generate into the constraint, to generate above their Maximum Capacity.
- Curtail opportunity services: curtail upstream IOS, downstream EOS and downstream DOS.
- Dispatch downstream contracted TMR or constrain on TMR in areas of local load pockets.
- Constrain off upstream energy using reverse merit order or pro rata when offer prices are equivalent, then dispatch up downstream generation using the energy market merit order.
- Curtail downstream DTS using prorata allocation.

# Comparison to Previous Protocol



December CM Plan	2007 CM Protocol
1. Determine the effective generation and load able to relieve the constraint	Step maintained – used to create effective TMR and system merit orders
2. Curtail upstream generators to STS levels	Directives to generators to generate above their MC cancelled. No STS curtailment.
3. Curtail upstream IOS and downstream EOS	Step maintained – import/export opportunity service cut before load (DTS)
4. Curtail downstream DOS	Step maintained – demand opportunity service cut before load (DTS)
5. Curtail upstream generator trigger volume	Step eliminated – no transmission access guarantee
6. Dispatch downstream contracted TMR	Step modified – Effective contracted TMR dispatched on first, then in-merit energy dispatched off.
7. Curtail downstream demand trigger volume	Step eliminated – no transmission access guarantee
8. Curtail upstream generation using prorata allocation	Step modified – upstream energy constrained off using RMO followed by pro rata allocation, then downstream generation dispatched up using energy market merit order. No constrained down payments to generators.
9. Direct downstream uncontracted TMR	Step eliminated – merit order dispatch always utilized. TMR dispatched as required for system.
10. Curtail downstream DTS using prorata allocation	Step modified – curtail using RMO, then prorata.

# Congestion Management Discussion



- Posted AESO Recommendation Paper Congestion Management Plan August 30, 2007
- Comments by Oct 2, 2007
- Stakeholder session September 26, 2007
- Rules process to follow
- Questions and comments Gordon Nadeau or Doug Simpson

# Overview of Policy Direction



- DOE policy and regulations provided direction in several areas:
  - Transmission access- STS and trigger volume
  - Reverse merit order (RMO)
  - Transmission must run (TMR)
  - Imports and Exports
  - CM impact on pool price
  - No constrained down payments

# Transmission Access



- AESO must manage constraints without any discriminatory access to one set of participants over another; No transmission access rights or preferential treatment to incumbents
  - No trigger participant
  - Supply Transmission Service (STS) does not infer transmission rights and should not be used as a basis for curtailment
- December 2006 Congestion Management (CM) protocol needs modification to remove STS and trigger participant steps

## Reverse Merit Order

- AESO is “to determine, according to relative economic merit, the order of dispatch of electric energy” and “real time congestion will be resolved by merit order re-dispatch, followed, if necessary, by pro rata curtailment”
  - Reverse merit order (RMO) must be utilized
- December CM protocol did not use RMO before pro rata curtailment

# RMO Impact



- The proposed reverse merit order (RMO) approach has several advantages:
  - complies with government policy
  - has the easiest practical application and,
  - As applied in the 2007 CM protocol, causes the least distortion to the pool price while sending correct price signals to most market participants.

# Transmission Must Run



- DOE policy provides the AESO some flexibility to enter into TMR contracts where they are a superior economic alternative and a shorter lead time solution
  - TMR to be treated as an effective economic alternative to wires at the time of a constraint
  - CM protocol contemplates the AESO dispatching or directing TMR units on as required and proposes that timely use of effective TMR can prevent the need for further steps (for example, in local load pockets like the Rainbow area)
- December CM protocol did incorporate TMR usage in the steps; new protocol more consistent in approach to TMR

# Imports and Exports



- Imports are to be treated as intra Alberta generators
  - DOE requested that import variable charges be removed coincident with the discontinuation of the STS variable charge for generators
  - Import Opportunity Service (IOS) will be dispatched in merit order, if effective
- Demand Transmission Service (DTS) has priority being a firm service and accordingly opportunity services including Export Opportunity Service (EOS) and IOS should be curtailed before DTS
- December CM protocol did appropriately curtail IOS and EOS before DTS in the protocol
- If the AESO adopts new transmission services that create different levels of curtailment priority for exports the CM protocol would need to be amended but the basic approach would remain the same.

## CM impact on Pool Price

- DOE policy states that “... real-time congestion arrangements should not alter or distort market prices.”
- Unconstrained pool price is optimal
  - May be achievable in some circumstances (for example, using DDS service)
- Congestion will always have some impact on pool price
  - Using Constrain Down Dispatch Up (CDDU) as primary protocol sequence sends correct price signal to upstream generation and load while encouraging imports when appropriate

# No Constrained Down Payments



- DOE policy states that “constrained down payments will not be paid to generators”
  - Policy is consistent with the idea of no transmission access rights
  - Intent is to put new and existing users on an equal cost sharing footing

# 2007 CM Protocol



The System Controller will implement the following steps in order as required to the extent they are effective in relieving the constraint:

- Determine the effective generation and load able to relieve the constraint.
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- Dispatch downstream contracted TMR or constrain on TMR in areas of local load pockets.
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# Backup Slides



# 2007 CM Protocol during SOK Event- Examples



- The examples that follow summarize how the steps of the protocol would be followed in the event of an SOK limit violation. In these examples, assume that the limit has been exceeded by 50 MW. A reduction of 50 MW flow is required on the SOK cutplane while load remains constant. Assume that pre-constraint, the merit order was dispatched to block 6 Gen S at \$30. Example 1 does not have any effective contracted TMR. Example 2 has effective contracted TMR.

# CM Protocol Steps during SOK Event- Examples



<ul style="list-style-type: none"> <li>•Determine the effective generation and load able to relieve the constraint.</li> </ul>	<p>In both examples dispatching N gen down and S gen up is effective in relieving the constraint.</p>
<ul style="list-style-type: none"> <li>•Cancel directives to upstream generators to generate above their Maximum Capacity.</li> </ul>	<p>None available – step skipped, ineffective.</p>
<ul style="list-style-type: none"> <li>•Curtail opportunity services: curtail upstream IOS, downstream EOS and downstream DOS.</li> </ul>	<p>Assume no opportunity services in merit, step skipped, ineffective.</p>
<ul style="list-style-type: none"> <li>•Dispatch downstream contracted TMR or constrain on TMR in areas of local load pockets.</li> </ul>	<p>In example 1, 12 Gen N is contracted for TMR, however, dispatching it for TMR would only add to the congestion so it is not dispatched. In example 2, 12 Gen S is contracted for TMR and would be effective in relieving the constraint so it is dispatched.</p>
<ul style="list-style-type: none"> <li>•Curtail upstream energy using reverse merit order, then dispatch up downstream generation using the system merit order.</li> </ul>	<p>Using reverse merit order: Curtail – would direct down 20 MW from 5 Gen N, and then prorate 2 and 1 Gen N by 15 MW each to reach 50 to relieve constraint. Dispatch up – starting from 6 Gen S, which was the pre-constraint marginal block, dispatch up generation to replace the curtailed generation, i.e., 50 MW. Any northern generator encountered in merit would only add to the constrained flow so they are effectively curtailed as the replacement energy is dispatched. In example 1, this would result in 9, 10 and 11 Gen S being dispatched fully and the resulting SMP would be \$60. In example 2, where contracted TMR is effective, the approach is the same but the amount required to replace the constrained energy is offset by the effective TMR. Only 40 MW is dispatched up in 9 and 10 Gen S and the price goes to \$52. In many cases, the impact of TMR on price would be negated by the use of DDS, however, <b>DDS could not be used here because supplying it from the south would add to the congestion and it cannot be supply from the north because it is a constrained area.</b></p>
<ul style="list-style-type: none"> <li>•Curtail downstream DTS using prorata allocation.</li> </ul>	<p>Not required.</p>

# 2007 CM Protocol SOK Example 1



Pre-Constraint Merit Order

Block	\$/MW	MW	MW Dispatched /Curtailed
14 Gen S	150	50	
13 Gen N	110	50	
12 Gen X -TMR	100	10	0
11 Gen S	60	50	
10 Gen S	52	20	
9 Gen S	50	20	
8 Gen N	35	50	
7 Gen N	32	50	
6 Gen S	30	20	20
5 Gen N	10	20	20
4 Gen S	5	50	50
3 Gen S	0	50	50
2 Gen N	0	20	20
1 Gen N	0	20	10

No constraint. SMP is \$30 set by 6 Gen S.  
TMR unit not required.

Example 1 - Constraint Management without TMR

Block	\$/MW	MW Offered	MW Dispatched /Curtailed
14 Gen S	150	50	
13 Gen N	110	50	
12 Gen N -TMR	100	10	0
11 Gen S	60	50	10
10 Gen S	52	20	20
9 Gen S	50	20	20
8 Gen N	35	50	50
7 Gen N	32	50	50
6 Gen S	30	20	20
5 Gen N	10	20	20
4 Gen S	5	50	50
3 Gen S	0	50	50
2 Gen N	0	20	20
1 Gen N	0	20	10

Assume 12 Gen N is a northern generator under TMR contract. It is not dispatched for TMR since it would not be effective in managing the constraint.

Same load. 50 MW constraint. 50MW curtailed in 5 Gen N, and partial curtailment of 2 Gen N and 1 Gen N.

8 and 7 Gen N are not dispatched up and therefore show as being curtailed.

11 Gen S is dispatched up in the EMMO and sets SMP at \$60.



50 MW of northern gen, that was in merit before the constraint, are curtailed according to offer price.

Legend	
	Energy Market Dispatch Level
	TMR unit dispatched
	TMR unit not dispatched
	Not dispatched
	Curtailed amount (Tx Limiter)
	Dispatch Level

# 2007 CM Protocol SOK Example 2



Pre-Constraint Merit Order

Block	\$/MW	MW	MW Dispatched /Curtailed
14 Gen S	150	50	
13 Gen N	110	50	
12 Gen X -TMR	100	10	0
11 Gen S	60	50	
10 Gen S	52	20	
9 Gen S	50	20	
8 Gen N	35	50	
7 Gen N	32	50	
6 Gen S	30	20	20
5 Gen N	10	20	20
4 Gen S	5	50	50
3 Gen S	0	50	50
2 Gen N	0	20	20
1 Gen N	0	20	10

No constraint. SMP is \$30 set by 6 Gen S.  
TMR unit not required.

Example 2 - Constraint Management with TMR

Block	\$/MW	MW Offered	MW Dispatched /Curtailed
14 Gen S	150	50	
13 Gen N	110	50	
12 Gen S -TMR	100	10	10
11 Gen S	60	50	10
10 Gen S	52	20	20
9 Gen S	50	20	20
8 Gen N	35	50	50
7 Gen N	32	50	50
6 Gen S	30	20	20
5 Gen N	10	20	20
4 Gen S	5	50	50
3 Gen S	0	50	50
2 Gen N	0	20	15
1 Gen N	0	20	15

50 MW of northern gen, that was in merit before the constraint, are curtailed according to offer price.

Assume 12 Gen S is a southern generator under TMR contract. In this case it would be dispatched for TMR because it would be effective in relieving the constraint. Same load. 50 MW constraint. 50MW curtailed in 5 Gen N, and partial curtailment of 2 Gen N and 1 Gen N. 8 and 7 Gen N are not dispatched up and therefore show as being curtailed. 10 Gen S is dispatched up in the EMMO and sets SMP at \$52.

Legend	
	Energy Market Dispatch Level
	TMR unit dispatched
	TMR unit not dispatched
	Not dispatched
	Curtailed amount (Tx Limiter)
	Dispatch Level

# Purpose of Rule



- The purpose of this rule is to prescribe the means by which the ISO determines if a transmission constraint exists and if the ISO has made such determination, how the ISO must operate the transmission system and manage transmission constraints.

# New Definitions



- “**effective factor**” means a ratio, calculated by load flow studies, of the change in the flow on the constrained path corresponding to a change in an energy production, an energy consumption or energy flow on an interconnection;
- “**reliability criteria**” means the AESO Transmission Reliability Criteria, published by the ISO on its website;

# Transmission Constraint Curtailment Substitution



- Concept: A market participant may make arrangements to have another market participant provide transmission constraint curtailment in its stead, or a market participant may make arrangements to have one of its assets provide transmission constraint curtailment instead of another of its assets
- Not considered at this time; possible future enhancement if supported by stakeholders