Alberta Capacity Market Information Session

November 1, 2018

Approach for today

- The content for today represents the common themes stakeholders requested additional information on during the last set of feedback
- The material is meant to provide clarification to the rules and information documents issued
- Today's session won't answer questions related to
  - Market design alternatives
  - Comments related to the placement of information in Information Documents vs. Authoritative Documents

Please include those suggestions in your stakeholder feedback to the AESO on November 14, 2018

Agenda

- Asset Delisting: Thanh Nguyen
- UCAP for Self Supply: Shezana Assar
- Social surplus: Jenny Chen
- Load asset overview: Leon Weinstein, Caitlin Fulowski
- Asset Substitution: Leon Weinstein
- Energy Market non-thermal mitigation for assets: Derek Olmstead

Delisting

Thanh Nguyen

Delisting

- Delisting gives the market participant the ability to cease participation in the capacity, energy or ancillary service markets

	Temporary Economic	Temporary Physical	Permanent
Base		✓	✓
First Rebalancing		✓	✓
Second Rebalancing	✓	✓	
Test	Economic	Physical	None
Limitations	For no more than 2 consecutive obligation periods	For no more than 2 consecutive obligation periods	Request cannot be withdrawn
Outage requirements	Greater than 210 days	Greater than150 continuous days	
EAS participation	For no more than 5 continuous months	For no more than 7 months	Until physical retirement date

Economic Test – Avoidable Costs Examples

Avoidable Costs	Example of Acceptable	Example of Not Acceptable
Labour Expenses	Required to operate the asset	Associated with other assets or corporate
Administrative Expenses	Must be associated with the asset	Associated with other assets or corporate that can be reallocated
Fuel Availability Expenses	Fuel transportation charges based on usage	Multi-year contracts that are “take or pay”
Fixed Maintenance Expenses	Maintenance based on run hours of turbine	Maintenance performed regardless of asset’s availability and cannot be deferred
Fixed Operating Expenses	Costs associated with asset being online – road access costs that can be reduced when asset is not operational	Costs used regardless of asset’s availability – ongoing security requirements

Economic Test – Avoidable Costs Examples

Avoidable Costs	Example of Acceptable	Example of Not Acceptable
Taxes, Fees, Insurance	Incremental insurance costs associated with operation of asset – costs related to the number of hours the asset is online	Fixed insurance costs which are independent of asset operations – fixed costs regardless if asset was running
Carrying Charges	Spare parts sold as asset is not online	Spare parts bought and kept even though asset is not available
Asset-specific Corporate Level Expenses	Reduction in legal services costs due to shutdown of asset for an obligation period	If there are no change in legal services costs regardless of asset's availability
Costs Related to Performance Adjustments	Expected performance adjustments	

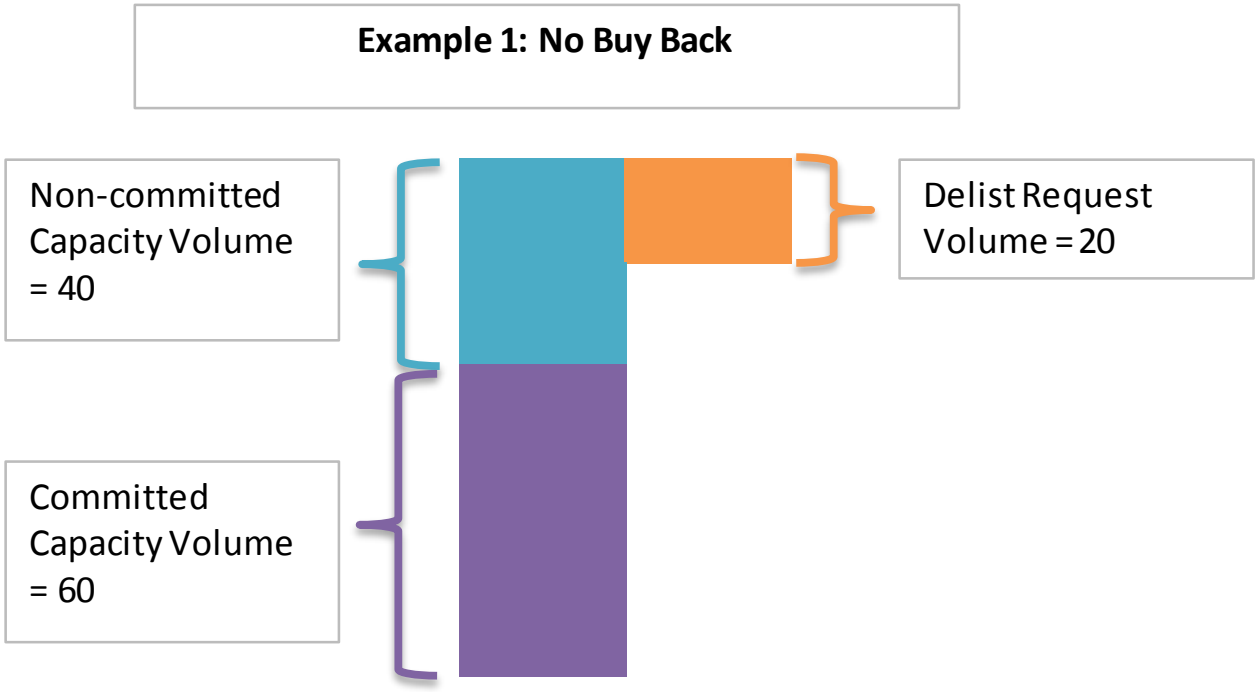
Physical Test

- Physical limitation that results in an planned or forced outage or derate for a period greater than or equal to 150 continuous days
  - Description of major repairs required to rectify physical or operational limitation
  - Order, decision, directive from regulatory authority specifically mandating the derating of the asset

Delisting with Capacity Commitment

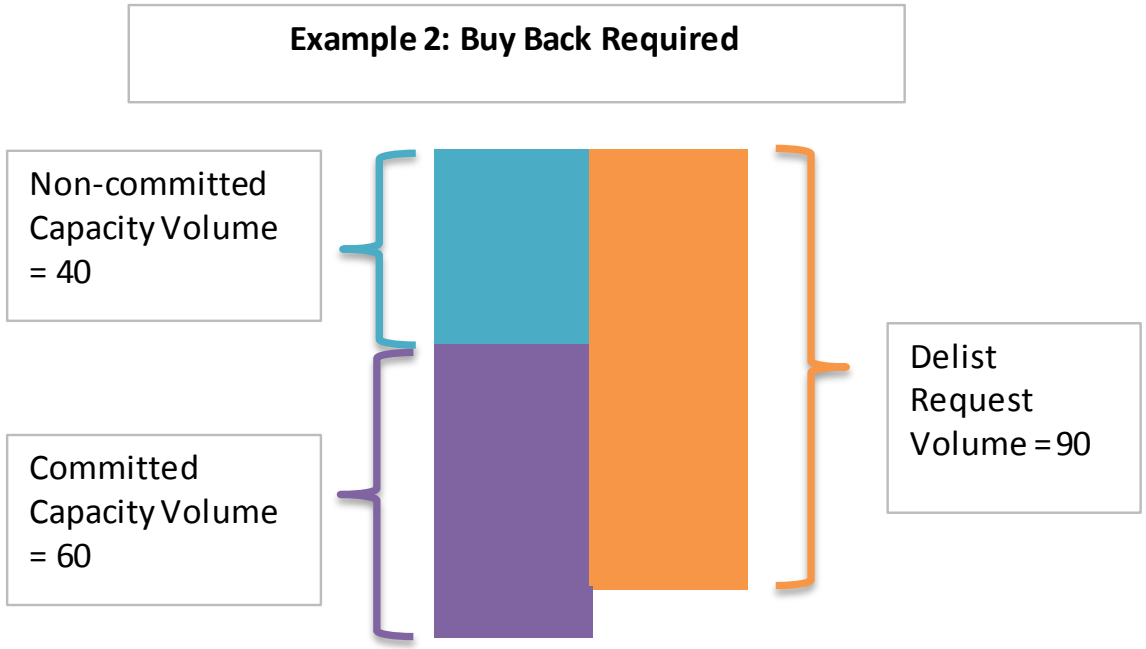
- In order to delist volumes that are capacity committed, the asset must:
  - Submit a delist request; and
  - Buy back the volumes that are capacity committed.

Delisting with Capacity Commitment



- Delist Request Volume < Non-committed Capacity Volume
- No buy back of capacity commitment required

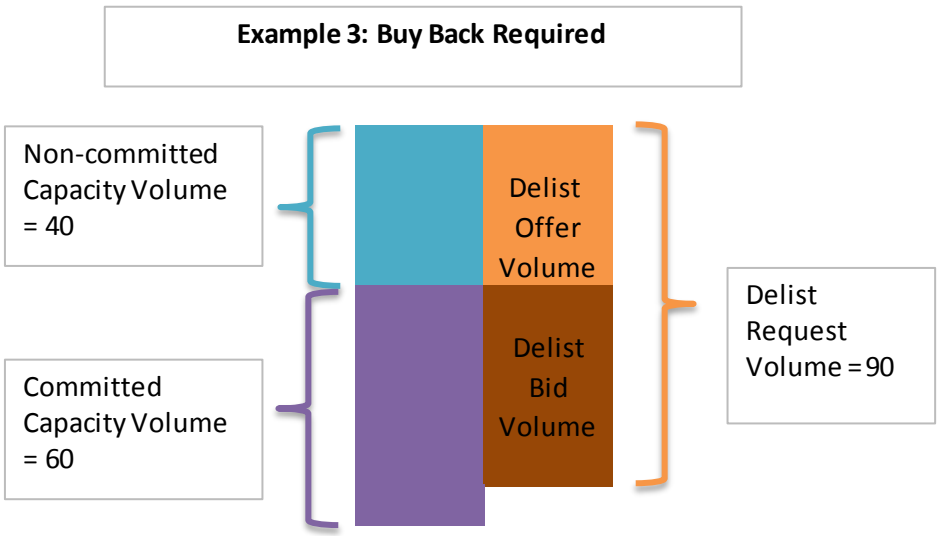
Delisting with Capacity Commitment

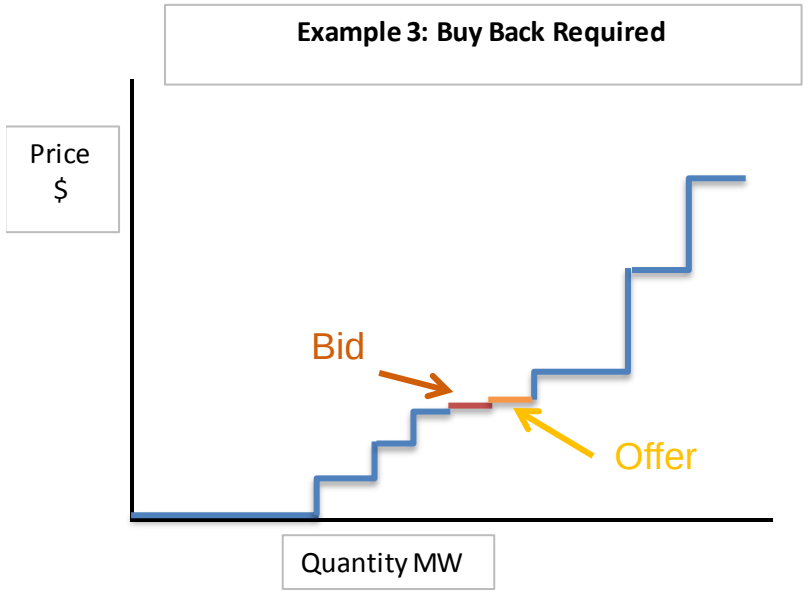


- Delist Request Volume > Non-committed Capacity Volume
- Buy back of capacity commitment required
- Buy Back Volume = Delist Request Volume – Non-committed Capacity Volume

= 90 – 40 = 50

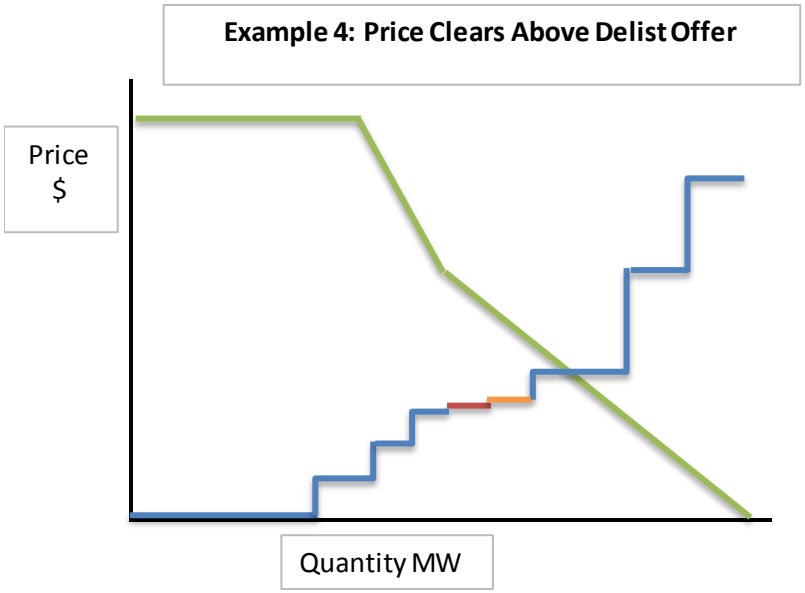
Temporary Economic Delisting with Capacity Commitment



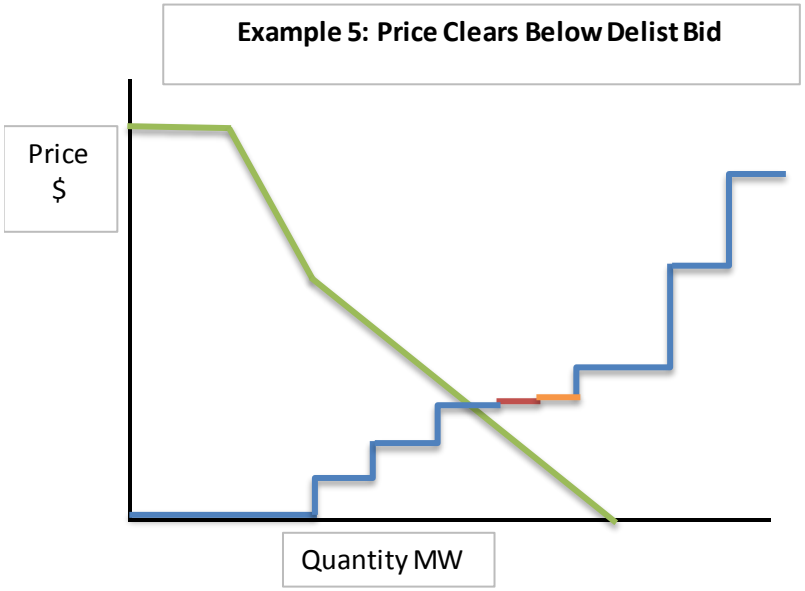


- Delist Offer to be submitted
  - Price equal to Approved Delist Offer Price
  - Volume equal to Non-committed Capacity Volume
- Delist Bid to be submitted
  - Price equal to Approved Delist Offer Price less one cent
  - Volume equal to difference between Delist Request Volume and Non-committed Capacity Volume

Temporary Economic Delisting with Capacity Commitment

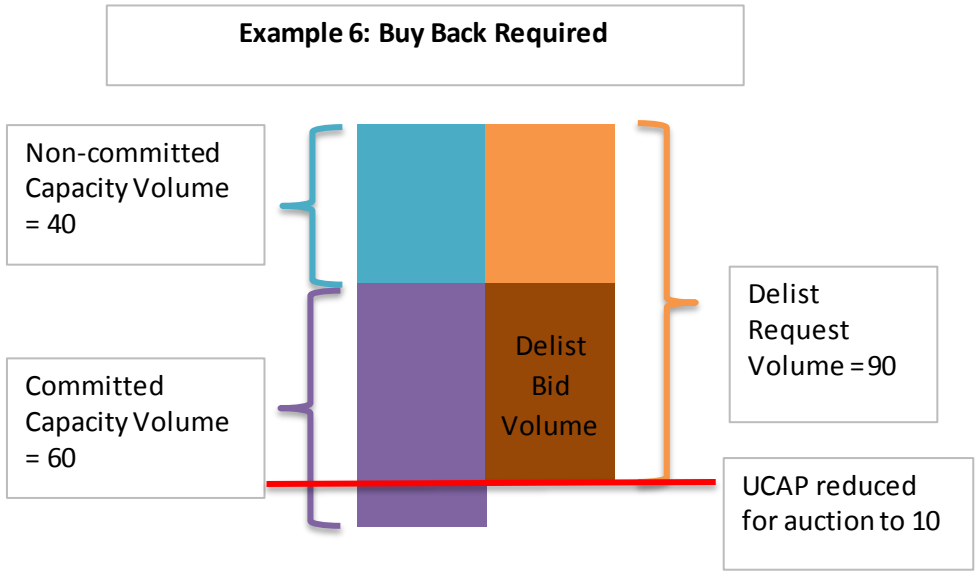


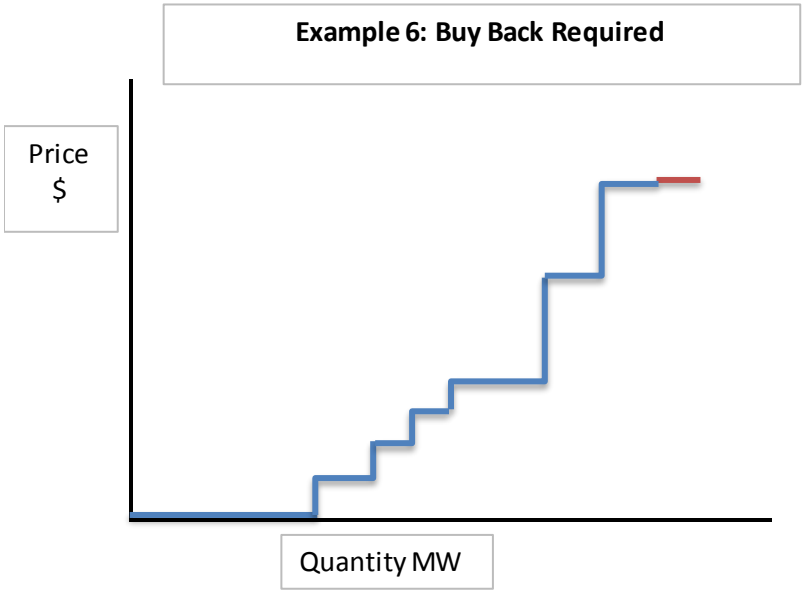
- Price Clears Above Delist Offer
  - Bid does not clear (retain capacity commitment)
  - Offer clears (additional capacity committed)
  - Asset does not delist



- Price Clears Below Delist Bid
  - Bid clears (capacity commitment bought back)
  - Offer does not clear (no additional capacity committed)
  - Asset delists

Temporary Physical Delisting with Capacity Commitment





- Delist Offer to be submitted
  - No delist offer required as UCAP reduced
- Delist Bid to be submitted
  - Price equal to price cap plus one cent
  - Volume equal to difference between capacity commitment and assigned UCAP

Questions?

UCAP for Self-supply assets

Shezana Assar

Agenda

- UCAP determination for self-supply assets dispatched gross-to-grid
- UCAP range methodology, translating gross to net limits for range

Background

- Applicability: Self-supply assets dispatched gross-to-grid
- UCAP determination through linear regression approach:
  - Why this approach: load at these sites vary independent of generation levels; generation dispatched does not match energy delivered to the grid at the net metering point
  - Linear regression of capacity asset's net-to-grid metered output relative to dispatch level over historical data set
  - Linear regression creates formulaic representation of this relationship in form of a line: $y = mx + b$

Where:

m and b are outputs of regression

y is the capacity asset's net-to-grid output

x is the capacity asset's gross-to-grid output

Gross to Net UCAP Translation

- Hourly availability factors calculated using historical hourly time weighted Available Capability (AC) declarations and Maximum Capability (MC)

$$\text{Hourly Availability Factor} = AC_h/MC_h$$

- Gross-to-grid UCAP calculated using average of hourly availability factors, multiplied by asset's MC

$$\text{Gross-to-Grid UCAP} = \text{Average Availability Factor} * MC$$

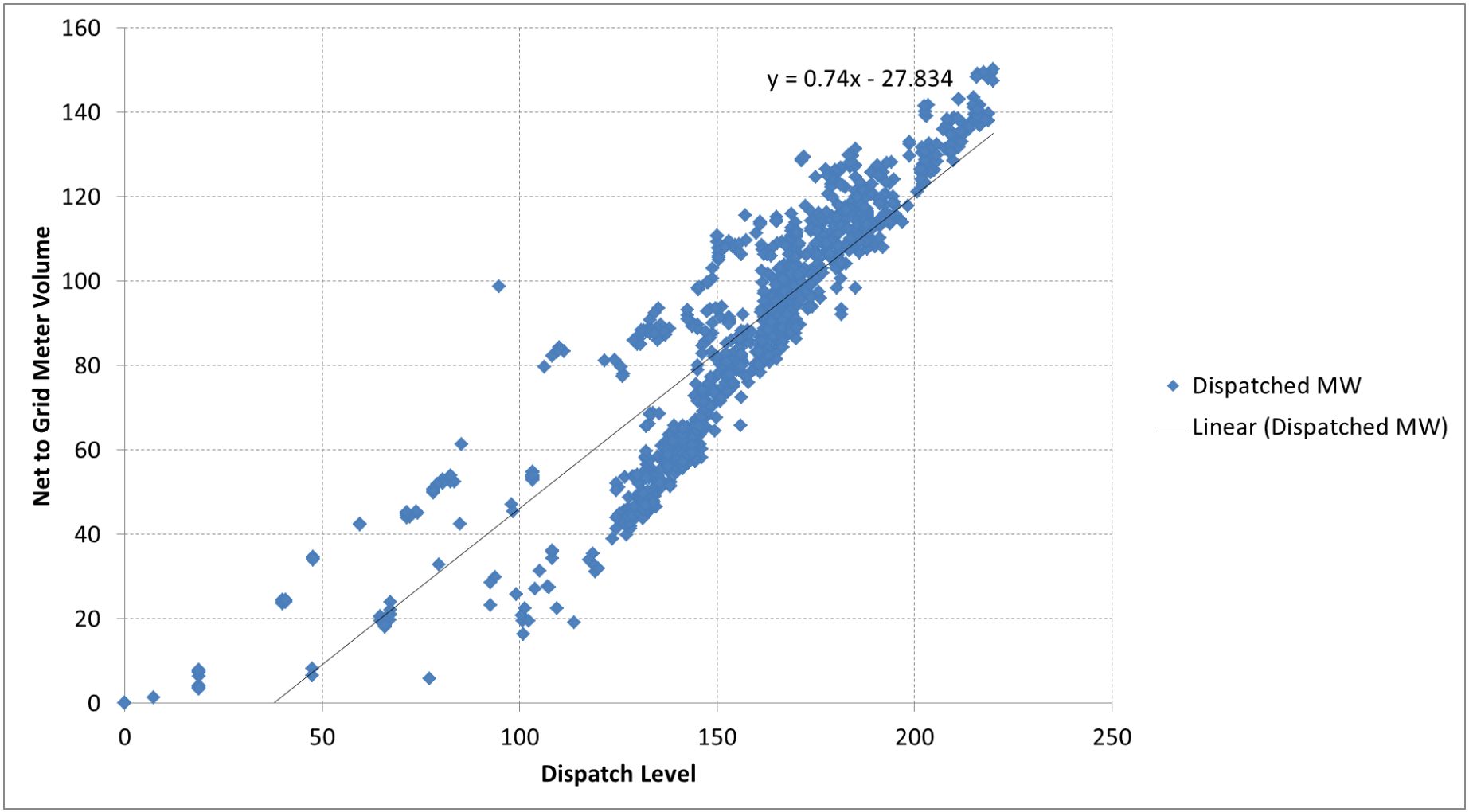
- Gross-to-grid UCAP value translated to net-to-grid UCAP using linear regression formula from earlier slide ($y = mx + b$)

Example 1: Linear Regression Approach

- Example below of capacity ABC1 with MC of 270 MW
- Table shows historical tight supply cushion hours, and observed metered energy, dispatch, AC, MC and availability factor
- AESO will perform a linear regression of Net-to-Grid Metered Volumes (A) and Dispatched MW (B) over the historical data set of 1250 hours

		A	B			
Tight Supply Hour	Period	Net to Grid Metered Volume	Dispatched MW	Weighted AC	MC	Hourly Availability Factor
1	2012/2013	114	161	193	270	= Weighted AC/MC = 71%
2	2012/2013	114	161	193	270	71%
3	2012/2013	113	161	193	270	71%
4	2012/2013	114	165	198	270	73%
5	2012/2013	115	165	198	270	73%
...						
1248	2016/2017	83	156	195	270	72%
1249	2016/2017	80	156	195	270	72%
1250	2016/2017	72	156	195	270	72%
					Average Availability Factor	70%

Linear regression example



Net-to-Grid UCAP Determination

- Linear regression formula: y = 0.74x – 27.834
- Hourly availability factors are averaged to create Average Availability Factor of 70%
- Gross UCAP = Average Availability Factor * MC
  = 70% * 270 MW = 188 MW
- Net UCAP = 0.74*Gross UCAP – 27.834
  = 0.74 * 188MW – 27.834 = 111 MW

UCAP Range for Self-Supply with Gross Dispatch

- Principles are same as other asset types– capacity market participant may elect a UCAP value within a range the AESO establishes
- Range does not apply to assets with new capacity, refurbished capacity, incremental capacity, a load asset, or an import asset
- Prior to each auction, AESO calculates 3 ranges on an asset-specific basis. Asset will receive maximum range established through these approaches:
  - The 5% range
  - +/- 2% multiplied by the assets maximum capability
  - +/- 1 MW of asset's UCAP

5% range approach

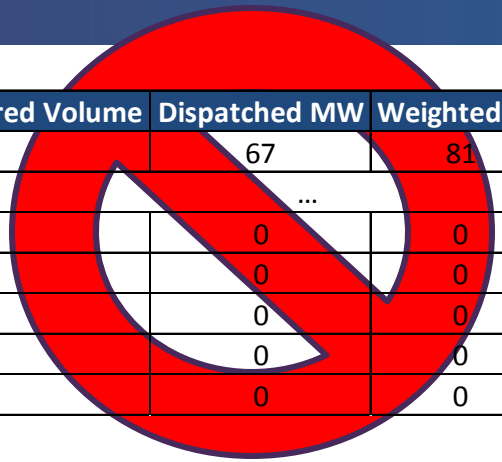
- Upper limit of 5% range:
  - established by removing 5% of hours in historical data set where the self-supply asset's availability factors were lowest – remaining data set averaged and multiplied by assets MC to establish gross upper limit for UCAP range
  - gross upper limit for UCAP translated to net UCAP upper limit using the linear regression formula y = mx + b
- Lower limit of 5% range:
  - established by removing 5% of hours in historical data set where the self-supply asset's availability factors were highest – remaining data set averaged and multiplied by assets MC to establish gross lower limit for UCAP range
  - gross lower limit for UCAP translated to net UCAP lower limit using the linear regression formula y = mx + b

Example 2 – UCAP Range for Self-Supply

- In previous example, hourly availability factors sorted from highest to lowest
- 5% of 1250 hours is 63 hours

5% upper range

Hour	Period	Net to Grid Metered Volume	Dispatched MW	Weighted AC	MC	Hourly Availability Factor
1188	2015/2016	24	67	81	270	30%
			...			
1246	2015/2016	0	0	0	270	0%
1247	2015/2016	0	0	0	270	0%
1248	2015/2016	0	0	0	270	0%
1249	2015/2016	0	0	0	270	0%
1250	2015/2016	0	0	0	270	0%



- 5% (63 hours) of lowest performing hours removed from data set
- Remaining availability factors averaged, and multiplied by MC to calculate gross upper limit for UCAP
- In this example, the average availability factor after you remove the 5% of lowest performing hours is 72.4392%.
- Gross upper limit translated to net using linear regression formula

i.e. gross UCAP upper limit 270MW * 72.4392% = 195.5858 MW

net UCAP upper limit = 0.74*gross UCAP upper limit – 27.834 = 0.74*195.5858 MW – 27.834 = 117 MW

5% lower range

Hour	Period	Net to Grid Metered Volume	Dispatched MW	Weighted AC	MC	Hourly Availability Factor
1	2013/2014	149	220	264	270	98%
2	2013/2014	147	220	264	270	98%
3	2013/2014	150	220	264	270	98%
4	2013/2014	148	219	263	270	97%
5	2013/2014	140	219	263	270	97%
63	2016/2017	138	208	250	270	93%

- 5% (63 hours) of highest performing hours removed from data set
- Remaining availability factors averaged, and multiplied by MC to calculate gross lower limit for UCAP
- In this example, the average availability factor after you remove the 5% of highest performing hours is 68.2257%
- Gross lower limit translated to net using linear regression formula

i.e. gross UCAP lower limit = 270MWs * 68.2257 % = 184.2094 MW

net UCAP lower limit = 0.74*gross UCAP lower limit – 27.834 = 0.74*184.2095 MW – 27.834 = 108 MW

Other range approaches

- +/-2% range
  - In previous example, MC = 270 MW
  - 2% of 270 MW = 6 MW – this range is applied to net UCAP
    - Net UCAP = 111 MW
    - UCAP upper range = 117 MW
    - UCAP lower range = 105 MW
- +/- 1 MW range
  - +/- 1 MW applied to the net UCAP of the asset
    - Net UCAP = 111 MW
    - UCAP upper range = 112 MW
    - UCAP lower range = 110 MW

Final Range Determination

	5% Range	+/-2% of MC	+/-1 MW of UCAP
UCAP Upper Limit	117 MW	117 MW	112 MW
UCAP Lower Limit	108 MW	105 MW	110 MW

- Capacity asset receives the maximum range from the 3 methodologies previously described
- UCAP upper limit = 117 MW
- UCAP lower limit = 105 MW

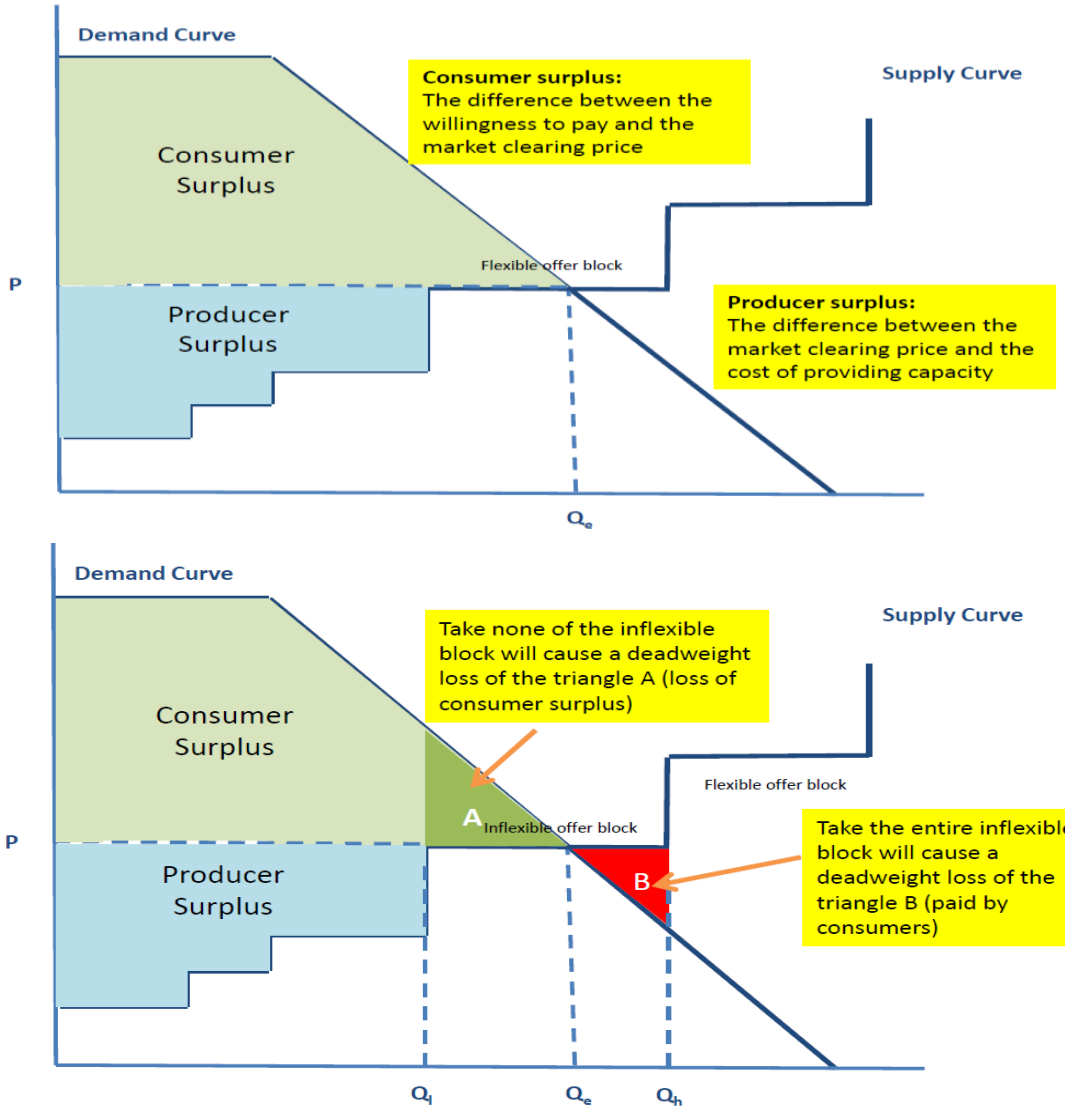
Questions?

Auction clearing and social surplus

Jenny Chen

Social Surplus

- Social surplus is the sum of consumer surplus and producer surplus
- Social surplus is maximized when market clears at the intercept of the supply curve and the demand curve
- When the marginal offer block is inflexible, deadweight loss occurs
  - Maximizing social surplus is achieved by minimizing the deadweight loss.

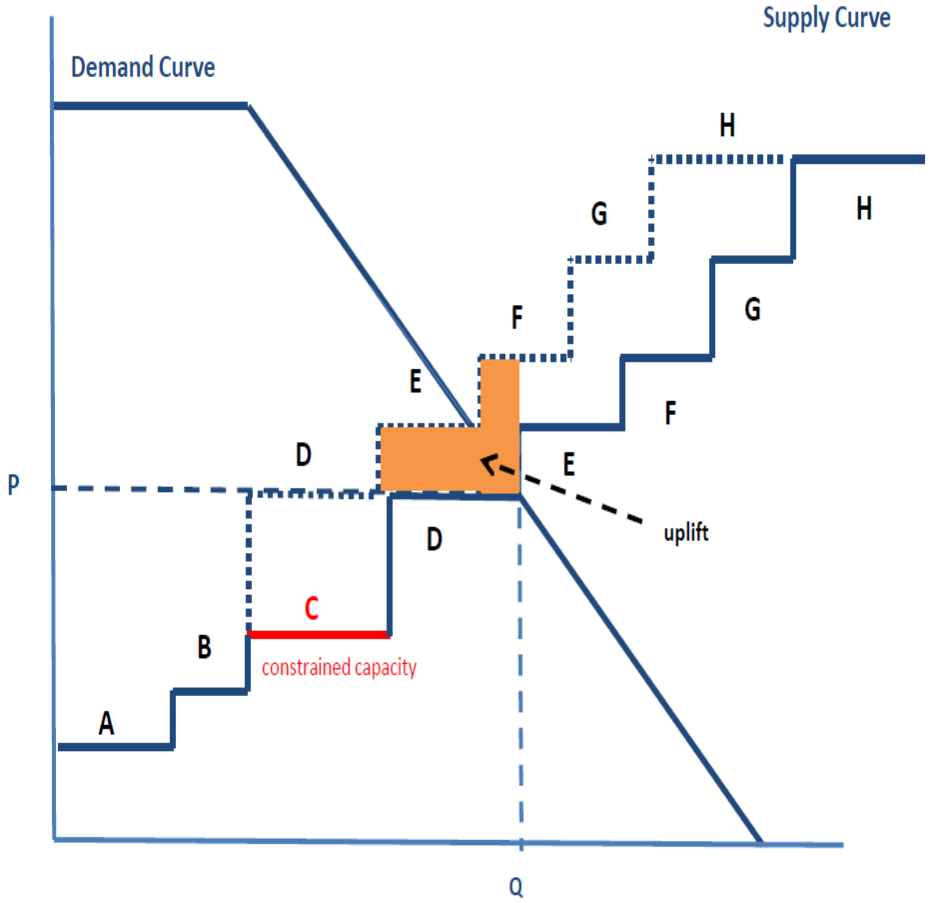


“Tie-Breaking”

- When more than one capacity block with the same offer price may provide the same social surplus, the market clearing process will:
  - Clear flexible blocks before inflexible block, if there’s still a tie
  - Prorate the same priced flexible blocks (draft ID Tables 1-4)
    - Randomize to determine whether a prorated block to be rounded down or up so that the objective of maximizing social surplus is met (draft ID Tables 2)
  - If inflexible blocks are needed, clear smaller inflexible blocks before larger inflexible blocks (draft ID Tables 3 & 4)
  - Inflexible blocks with the same volume and price are determined by a random draw (draft ID Table 4)
- A inflexible block maybe chosen before a flexible block only when not doing so will fail to meet the objective of maximizing social surplus (draft ID Table 5)

When Transmission Limits are Expected – Market Clearing Price and Volume

- Market clearing price and volume are determined by the 'unconstrained clearing', at price P and quantity Q.
- Assuming C is the capacity behind the transmission limit and expected to be undeliverable, A, B, D, E, F are cleared:
  - Since the offer price of E and F are higher than P, uplift payment will be to E and F
    - ✓ Uplift payment to E is the difference between E's offer price and P multiplied by E's cleared volume
    - ✓ Uplift payment to F is the difference between F's offer price and P multiplied by F's cleared volume
  - The selection of offers to achieve unconstrained clearing will follow the maximization of social surplus principle



Questions?

Load asset review

Leon Weinstein, Caitlin Fulowski

Alberta Capacity Market
Load Participation

Agenda

- Load Participation in the Capacity Market
- Qualification Requirement
- UCAP for loads providing Guaranteed Load Reduction
- Performance for loads providing Guaranteed Load Reduction
- UCAP for loads providing Firm Consumption Level
- Performance for loads providing Firm Consumption Level
- Load testing

Load Participation

- Load will be eligible to participate on the supply-side of the capacity market through two approaches:
  - **Firm Consumption Level (FCL):** those resources that can reduce consumption to a predetermined level
  - **Guaranteed Load Reduction (GLR):** those resources that can reduce consumption by a predetermined level

- Loads performance will be measured similarly to all other capacity assets though:
  - Ability to reduce consumption during delivery assessment periods (EEA's)
  - Ongoing consumption during the obligation period

Demand Response Qualification

In the qualification application the load must provide some of the following information:

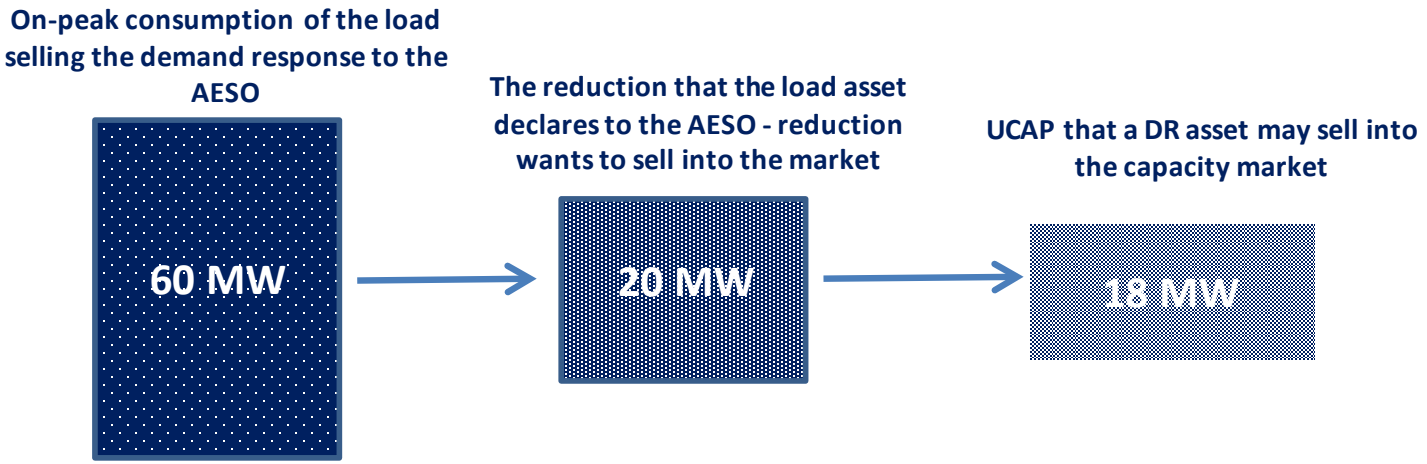
- Evidence that the demand response (DR) asset is, or will be, a retail or self-retail asset belonging to a valid pool participant
- The type of DR, either
  - Guaranteed Load Reduction (GLR) or
  - Firm Consumption Level (FCL)
- Description of how the asset will achieve the required demand response, including
  - How much load reduction the asset will achieve when required
  - A description of the communication method by which the pool participant will instruct and control the load reduction when it receives a dispatch

UCAP Determination
Guaranteed Load Reduction (GLR)

New GLR asset UCAP determination

Determination of UCAP for a load asset providing Guaranteed Load Reduction *with no performance history*

- GLR asset declares the reduction it is willing to sell in the capacity market
- The AESO applies a 9% derating factor to the declared value
  - Once performance data is available the AESO will determine an Alberta specific class average for load
  - Ex. A load that consumes on average 60 MW during on-peak hours declares a load reduction of 20 MW
  - The AESO will determine the UCAP value of the GLR asset as 20 MW * 91% = 18 MW



UCAP determination for GLR with performance data

Determination of UCAP for a load asset providing Guaranteed Load Reduction – with performance history

- Availability Factor of the load will be calculated over 1250 tight supply cushion hours
- Availability Factor determined as:
  - Available Capability /Maximum Capability x Maximum Capability
  - Maximum Capability is the claimed reduction by the GLR asset
  - Ex. Claimed reduction by the GLR asset is 50 MW
  - 50 MW x 85% = 42.5 MW GLR asset may sell this amount into the next auction

Historical Data Set (Hours)	Available Capability (MW)	Maximum Capability (MW)	Availability Factor
1	18	20	0.9
2	16	20	0.8
3	20	20	1
…	…	…	…
…	…	…	…
…	…	…	…
1248	20	20	1
1249	15	20	0.75
1250	12	20	0.6
Availability Factor			85%

Performance Assessment
Guaranteed Load Reduction (GLR)

GLR Availability Assessment

Availability Assessment for Load Asset providing Guaranteed Load Reduction

- The Average Available Capacity volume for the GLR asset during the 250 tightest supply cushion hours in the obligation period as declared in the Energy Trading System
- Assessment Volume for GLR asset
  - ***Assessment Volume = (∑ Availability Volume – Capacity Commitment x hours)***

Historical Data Set (hours)	Capacity Commitment (MW)	Availability Volume (MW)
1	10	15
2	10	12
3	10	8
4	10	0
…	…	…
…	…	…
…	…	…
248	10	6
249	10	10
250	10	10
250	10	**∑=2502**

Assessment Volume = (∑=2502 – 10 * 250) = 2 MW

GLR Delivery Assessment

Assessment Volume (MWh) = Delivery Volume - (Capacity Commitment Volume * Balancing Ratio)

- Delivery Volume (MWh) = Delivery Baseline - consumption of electricity during the delivery assessment period

Where : **Delivery Baseline = standard day baseline x adjustment factor**

Standard day Baseline is meant to estimate the load asset's most recent, typical consumption patterns

- Standard day baseline is formed by averaging consumption of the load, in the same hour ending as the delivery hour, for the 10 most recent business days prior to the delivery assessment period or
- If the delivery hour falls on a weekend average the 5 most recent weekend days or holidays prior to the day with the delivery hour

Adjustment Factor is meant to align the standard day baseline with the conditions on the day with the delivery assessment period

- The adjustment shifts the standard day baseline by a fixed amount
- The adjustment window for the standard baseline is the 3 hours window occurring one hour before the delivery assessment period.
- The adjustment is limited to a minimum of 80% or a maximum of 120%

Delivery assessment for a Guaranteed Load Reduction asset

Delivery Assessment Period occurred on April 30, 3-4 p.m. a business day therefore the AESO will use a 10 day baseline

- The AESO will calculated the *standard day baseline* by averaging the load consumption in the 10 prior days during the same hour as the delivery assessment hour (dark yellow). The *standard day baseline* for the GLR load is 18.42 MWh (average consumption of cells in bright yellow).
- Standard day baseline excludes days where the load asset was on an outage, received a dispatch or a directive, or reduced load for a delivery assessment periods

Date/Day			1-2 p.m.	2-3 p.m.	3-4 p.m.	4-5 p.m.	5-6 p.m.	6-7 p.m.	7-8 p.m.
11-Apr	Wednesday	Day 1	16.70	17.17	16.54	16.85	16.70	15.90	16.06
12-Apr	Thursday	Day 2	23.71	24.53	23.71	23.71	22.89	22.07	21.26
13-Apr	Friday	Day 3	12	11.25	12	11.7	12	21.75	21
14-Apr	Saturday	Weekend	15.86	16.31	15.71	16.01	15.86	15.11	15.26
15-Apr	Sunday	Weekend	11.69	12.02	11.58	11.80	11.69	11.13	11.24
16-Apr	Monday	Load dispatched	16	18.3	12.51	12.52	12.56	16.56	16.89
17-Apr	Tuesday	Day 4	15	15.75	15	16.05	15.9	15.6	15
18-Apr	Wednesday	Day 5	15.75	16.2	15.6	15.9	15.75	15	15.15
19-Apr	Thursday	Day 6	21.75	22.5	21.75	21.75	21	20.25	19.5
20-Apr	Friday	Delivery assessment	15.75	16.2	8.2	8.1	11	10	15.15
21-Apr	Saturday	Weekend	12	11.4	11.7	11.25	11.7	22.5	21.45
22-Apr	Sunday	Weekend	25.2	23.85	25.2	24	23.7	23.25	21.75
23-Apr	Monday	Day 7	24.6	24.3	24.6	23.85	23.25	20.7	20.25
24-Apr	Tuesday	Day 8	24	23.85	23.25	23.25	21	20.25	18.75
25-Apr	Wednesday	Load forced outage	12	17	0	0	0	0	0
26-Apr	Thursday	Day 9	15.75	15	16.05	15.9	15.9	16.05	15.9
27-Apr	Friday	Day 10	15.6	15.9	15.75	15	15.15	15.75	15
28-Apr	Saturday	Weekend	23.25	25.2	24.6	23.25	21	19.5	18
29-Apr	Sunday	Weekend	9.36	9.54	9.45	9	9.09	9.45	9
Standard Day Baseline			**18.49**	**18.64**	**18.42**	**18.40**	**17.95**	**18.33**	**17.79**

Delivery Assessment for a Guaranteed Load Reduction asset, cont.

Delivery Baseline = Standard day Baseline * Adjustment factor

- The adjustment factor is calculated as A ÷ B, where:
  - A = average actual consumption during the adjustment window hours preceding the delivery assessment period; and
  - B = average actual consumption during the adjustment window hours on the most recent 10 non-holiday weekdays or 5 weekend holiday days prior to a delivery assessment period
- The adjustment factor = 18.77 / 15.90 = 1.18
- The Standard day baseline of 18.42 * 1.18% = the Delivery Baseline of 21.74 MWh

Assessment volume = delivery volume – (capacity commitment x balancing ratio)

- Delivery Volume = delivery baseline - metered energy
- Assume the load was consuming 6.74 MWh during the delivery assessment period and the balancing ratio = 1.0 and the capacity commitment is 10MW
- The Assessment volume = 21.74 - 6.74 – 10 = 5 MWh

	First 3 of 4 hours prior Delivery Start Time				Delivery Assesment period
	11-12 p.m	12-1 p.m	1- 2 p.m	Average Load	3-4 p.m
Standard Baseline	12.2	17	18.49	15.90	18.42
Day-of Event	18	18.6	19.7	18.77	X
Adjustment Factor					Adjusted Baseline
Adjustment Factor Calculation	**Avg load day-of /Avg load baseline 18.77/15.9 = 1.18**				3-4 p.m 18.42 *1.18
Adjusted delivery baseline					**21.74**

*All figures are in MWh

UCAP Determination
Firm Consumption Level (FCL)

UCAP determination for Firm Consumption Level (FCL) with consumption history

Determination of UCAP for a load asset providing FCL with consumption history in AB

- The AESO calculates the Qualified Baseline for the load asset during the most recent 250 tight supply cushion hours
- FCL asset declares its FCL or the predetermined level to which it will reduce consumption
- The AESO applies a 9% derating factor to the declaration until Alberta specific information becomes available
- The difference between the Qualified Baseline and the FCL is the maximum amount of capacity the FCL asset may sell into the auction. For example:
  - A load with a Qualified Baseline of 60 MW declares an FCL level of 20 MW will be eligible to sell 40 MW of capacity
  - The AESO will allow the load to sell: (60 MW- 20 MW) = 40 MW UCAP * 9% = 36.4 = 36MW UCAP
- The value the AESO will use to determine the qualified baseline in each tight supply cushion hour will be the average of :
  - The asset's metered load in the 15 most recent business days prior to the day with the tight supply cushion hour if the hour falls on a business day
  - The asset's metered load in the 10 most recent business days prior to the day with the tight supply cushion hour if the hour falls on a non-business day
  - In both cases above: plus any AS directive volumes and energy market dispatched volumes greater than 0 MW

Firm Consumption Level determination of qualified baseline – a one hour example

Illustrative: Qualified Baseline determination – single hour adjustment

Date/Day			1-2 p.m	2-3 p.m	3-4 p.m	4-5 p.m	5-6 p.m	6-7 p.m	7-8 p.m
03-Apr	Tuesday	Day 1	22.3	23.1	23.9	23.1	22.3	19.9	19.1
04-Apr	Wednesday	Day 2	20.0	19.5	11.6	10.2	19.8	23.5	17.6
05-Apr	Thursday	Day 3	24.6	25.4	24.6	24.6	23.9	20.7	20.7
06-Apr	Friday	Day 4	12	13	13.5	11.7	12	22	19
07-Apr	Saturday	Weekend	23.55	23.85	24.3	23.85	23.25	22.5	21.75
08-Apr	Sunday	Weekend	23.25	25.2	24.6	23.25	21	19.5	18
09-Apr	Monday	Availability hour	15.75	15	16.05	15.9	15.9	16.05	15.9
10-Apr	Tuesday	Day 5	15.6	15.9	15.75	15	15.15	15.75	15
11-Apr	Wednesday	Day 6	21	21.75	22.5	21.75	21	18.75	18
12-Apr	Thursday	Day 7	23.25	24	23.25	23.25	22.5	19.5	19.5
13-Apr	Friday	Day 8	12	11.25	12	11.7	12	21.75	21
14-Apr	Saturday	Weekend	23.55	23.85	24.3	23.85	23.25	22.5	21.75
15-Apr	Sunday	Weekend	23.25	25.2	24.6	23.25	21	19.5	18
16-Apr	Monday	Delivery hour	15	15.75	15	16.05	15.9	15.6	15
17-Apr	Tuesday	Day 9	15.75	16.2	15.6	15.9	15.75	15	15.15
18-Apr	Wednesday	Delivery hour	21.75	22.5	21.75	21.75	21	20.25	19.5
19-Apr	Thursday	Day 10	12	11.4	11.7	11.25	11.7	22.5	21.45
20-Apr	Friday	Day 11	25.2	23.85	25.2	24	23.7	23.25	21.75
21-Apr	Saturday	Weekend	24.6	24.3	24.6	23.85	23.25	20.7	20.25
22-Apr	Sunday	Weekend	24	23.85	23.25	23.25	21	20.25	18.75
23-Apr	Monday	Day 12	15.75	15	16.05	15.9	15.9	16.05	15.9
24-Apr	Tuesday	Day 13	15.6	15.9	15.75	15	15.15	15.75	15
25-Apr	Wednesday	Day 14	23.25	25.2	24.6	23.25	21	19.5	18
26-Apr	Thursday	Day 15	23.25	23.55	23.25	23.25	22.5	22.2	21.45
Tight Supply Cushion Hour			**18.8**	**19.0**	**18.6**	**18.0**	**18.3**	**19.7**	**18.6**

FCL qualified baseline calculation example

In the example from previous slide, on April 27th there was a tight supply cushion hour that took place between 5-6 p.m.

To establish the qualified baseline for that hour

- The AESO will average the load asset's metered volume during the previous 15 days prior to the day with the tight supply cushion hour, using the same hour ending (5-6 pm) as the tight supply cushion hour
- Excluding any days from the calculation of the qualified baseline where any of the following occurs:
  - Delivery hour – in the previous slide, delivery hours (highlighted in the orange rows) occurred on April 16th and 18th; the AESO excludes these two days from the calculation
  - Availability hours – an availability hour occurred on April 9th, highlighted in green, therefore the AESO also excludes this day from the calculation;
  - Weekend days and holidays as the tight supply cushion hour occurred on a business day. Weekends are highlighted by the grey rows above

- In the hours where the FCL load asset reduced consumption due to a dispatch or a directive the AESO will add back to the metered energy the dispatch amount

For the purposes of calculating the qualified baseline for an FCL the AESO will use 18.3 MWh

Performance Assessment
Firm Consumption Level

FCL Availability Assessment

Availability Assessment for a Load Asset Providing Firm Consumption Level

- After the obligation period the AESO will create a Look-back Baseline for each availability assessment hour
  - The methodology of creating a Look-back baseline mirrors the methodology of the Qualified Baseline
- The availability volume equals the difference between the Look-back baseline and the Firm Consumption Level

Assessment Volume = ∑Availability Volume – (capacity commitment x hours)

Historical Data Set (hours)	Capacity Commitment (MW)	Availability Volume (MW)
1	10	15
2	10	12
3	10	8
4	10	0
...	...	...
...	...	...
...	...	...
248	10	6
249	10	10
250	10	10
250	10	∑=2502

Assessment Volume =

(∑ = 2502 – 10 * 250) = 2 MW

FCL Delivery Assessment

Assessment Volume = delivery volume – (capacity commitment volume x balancing ratio)

- where delivery volume is equal to the Qualified Baseline minus metered energy

FCL Delivery Volume Evaluation	MW
Qualified Baseline	100
Firm Consumption Level	25
Capacity Commitment	75

	Example 1	Example 2	Example 3	Example 4
Metered Volume (MWh)	5	30	70	130
Ancillary Service	0	0	0	0
Balancing Ratio	1	1	1	1

Delivered Volume FCL = Qualified Baseline - Metered Energy - OR

Delivered Volume (MWh)	95	70	30	-30

Assessment Volume= Delivery volume - (Capacity Commitment * Balancing Ratio)

Assessment Volume	20	-5	-45	-105

Load Testing

The AESO will conduct a physical testing on load assets if during an obligation period

(a) there were no delivery hours ; and

(b) the asset did not reduce consumption in response to an energy market dispatch or AS directive to reflect the full UCAP of the load

- The physical test involves reduction of consumption by the UCAP amount and maintaining the reduction for 1 hour

Questions?

Alberta Energy Market
Load Participation

Offers and Restatements

Offers

- Maximum capability for load will be determined as follows:
  - For GLR: maximum capability equals the declared guaranteed load drop volume in the capacity market for an obligation period
  - For FCL: maximum capability equals the qualified baseline as calculated by the AESO minus the declared FCL for an obligation period
- “Must offer” applies to:
  - GLR: all assets with a capacity commitment
  - For FCL: all assets with a capacity commitment and with a maximum capability equal to or greater than 5 MW
- “May offer” applies to
  - For FCL: all assets with a capacity commitment and a maximum capability greater than 1 MW **and less than 5 MW**
- Load that doesn’t have a capacity commitment is not required to offer in the energy market but may continue to bid
- All participants with a load asset that offers in the energy market will be required to request 7 price-quantity pairs from the AESO and offer through the Energy Trading System (ETS).

Restatements

- The “acceptable operational reason” definition has been revised to consider load assets, including the following changes:
  - Load sink assets were added to subsection (i), (ii), (iii) , and (v), to align with generating source assets
  - Subsection (viii) is a new subsection that specifically applies to load, and allows load assets to restate their available capability to their capacity commitment volume.
    - For example, if a load asset has a maximum capability of 50 MW and a capacity commitment of 45 MW, they may restate their available capability to 45 MW at any time with an acceptable operational reason.
- An AOR is required for all restatements for load assets

Energy market delivery requirements
Guaranteed Load Reduction (GLR)

GLR: energy market delivery requirements

- A dispatch to a load asset providing GLR is an instruction to reduce consumption from the current consumption level by a specified volume
  - Reduction level is measured as the change in dispatch volume, i.e. the previous dispatch volume minus the new dispatch volume
- Load assets will be subject to the same ramping requirements as a generating source asset
- Load assets will be subject to the same steady state requirements as a generating source asset
- Allowable dispatch variance for GLR:
  - For a 0 MW dispatch:
    - Lower ADV Limit = available capability
    - Upper ADV Limit = no limit
  - For a dispatch greater than 0 MW
    - Lower ADV Limit = available capability minus dispatch volume
    - Upper ADV Limit = instantaneous real power consumption at the instruction time of the dispatch, plus the change in dispatch (previous dispatch – new dispatch), plus the dispatch tolerance

Note: the tolerances here apply to the energy market, the capacity market delivery assessments will be based on actual metered energy relative to the capacity commitment

GLR Example 1

MC = 50 MW

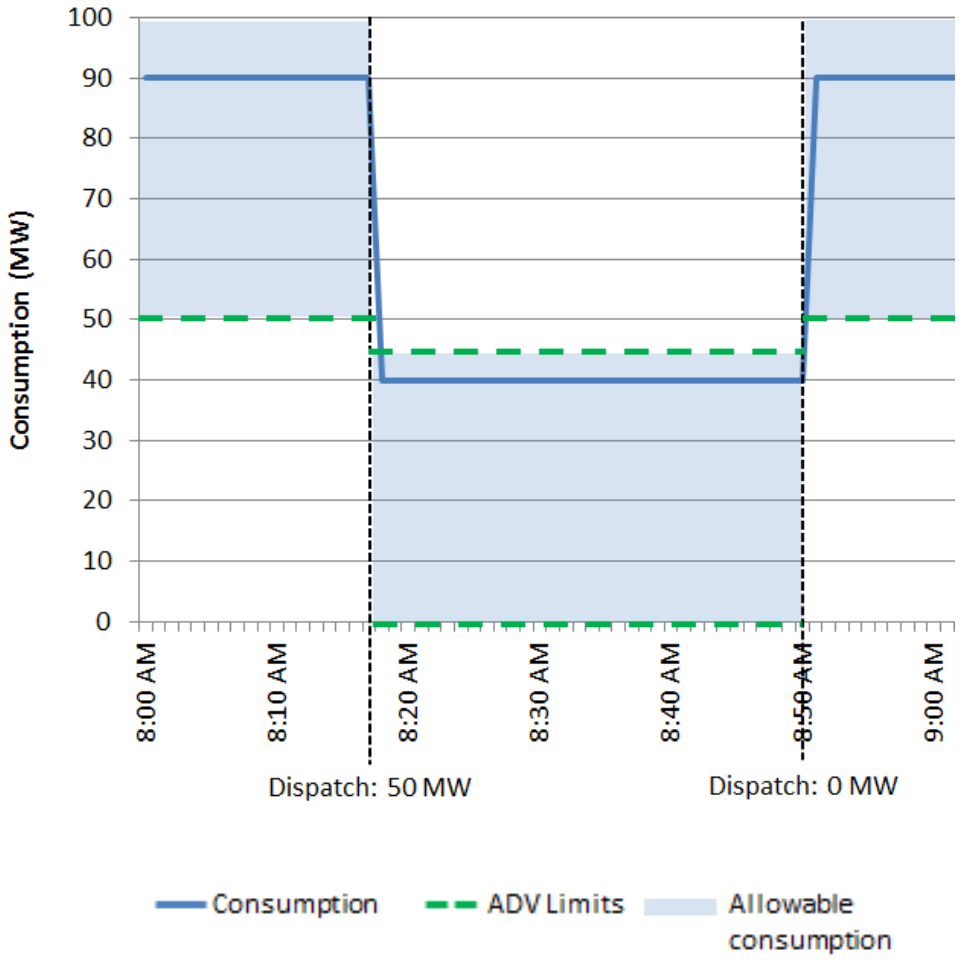
AC = 50 MW

Dispatch 1:

- Dispatch at 8:17 am = 50 MW
- Consumption at dispatch instruction time = 90 MW
- Change in dispatch = 0 MW – 50 MW = -50 MW
- Upper ADV = 90 MW + (-50 MW) + 5 MW = 45 MW
- Lower ADV = 50 MW – 50 MW = 0 MW
- Consumption drops to 40 MW

Dispatch 2:

- Dispatch at 8:50 am = 0 MW
- Consumption at dispatch instruction time = 40 MW
- Change in dispatch = 50 MW – 0 MW = 50 MW
- Upper ADV = no limit
- Lower ADV = 50 MW



GLR Example 2

MC = 50 MW

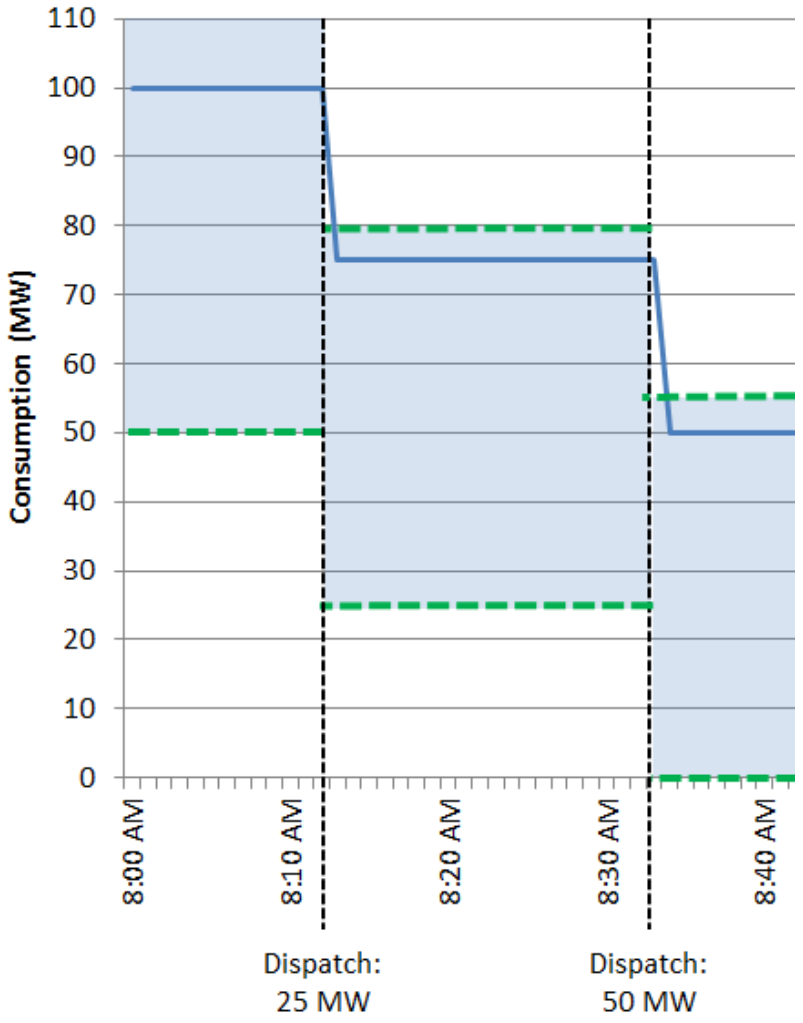
AC = 50 MW

Dispatch 1:

- Dispatch at 8:13 am = 25 MW
- Consumption at dispatch instruction time = 100 MW
- Change in dispatch = 0 MW – 25 MW = -25 MW
- Upper ADV = 100 MW + (-25 MW) + 5 MW = 80 MW
- Lower ADV = 50 MW – 25 MW = 25 MW
- Consumption drops to 75 MW

Dispatch 2:

- Dispatch at 8:33 am = 50 MW
- Consumption at dispatch instruction time = 75 MW
- Change in dispatch = 25 MW – 50 MW = -25 MW
- Upper ADV = 75 MW + (-25 MW) + 5 MW = 55 MW
- Lower ADV = 50 MW – 50 MW = 0 MW
- Consumption drops to 50 MW



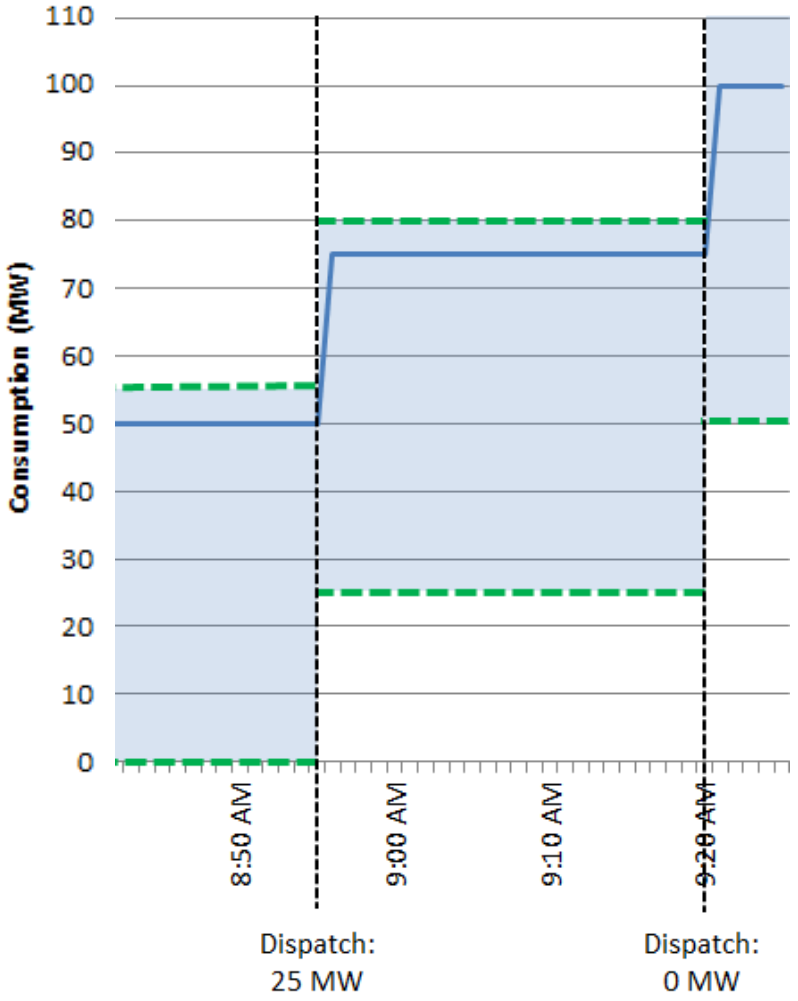
GLR Example 2 (Continued)

Dispatch 3:

- Dispatch at 8:55 am = 25 MW
- Consumption at dispatch instruction time = 50 MW
- Change in dispatch = 50 MW – 25 MW = 25 MW
- Upper ADV = 50 MW + 25 MW + 5 MW = 80 MW
- Lower ADV = 50 MW – 25 MW = 25 MW
- Consumption increases to 75 MW

Dispatch 4:

- Dispatch at 9:20 am = 0 MW
- Consumption at dispatch instruction time = 75 MW
- Change in dispatch = 25 MW – 0 MW = 25 MW
- Upper ADV = unlimited
- Lower ADV = 50 MW



Energy market delivery requirements
Firm Consumption Level (FCL)

FCL – energy market delivery requirements

- A dispatch to a load asset providing FCL is an instruction to reduce consumption to a specified maximum level.
  - The maximum level of consumption is calculated as the qualified baseline minus the dispatch volume plus the dispatch tolerance.
- Load assets will be subject to the same ramping requirements as a generating source asset
- Load assets will be subject to the same steady state requirements as a generating source asset
- Allowable dispatch variance:
  - For a 0 MW dispatch:
    - No limits on consumption
  - For a dispatch greater than 0 MW
    - Lower ADV Limit = 0 MW
    - Upper ADV Limit = qualified baseline, minus the dispatch volume, plus the dispatch tolerance

FCL Example 1

MC = 20 MW

AC = 20 MW

Qualified Baseline = 50 MW

FCL = 30 MW

Dispatch 1:

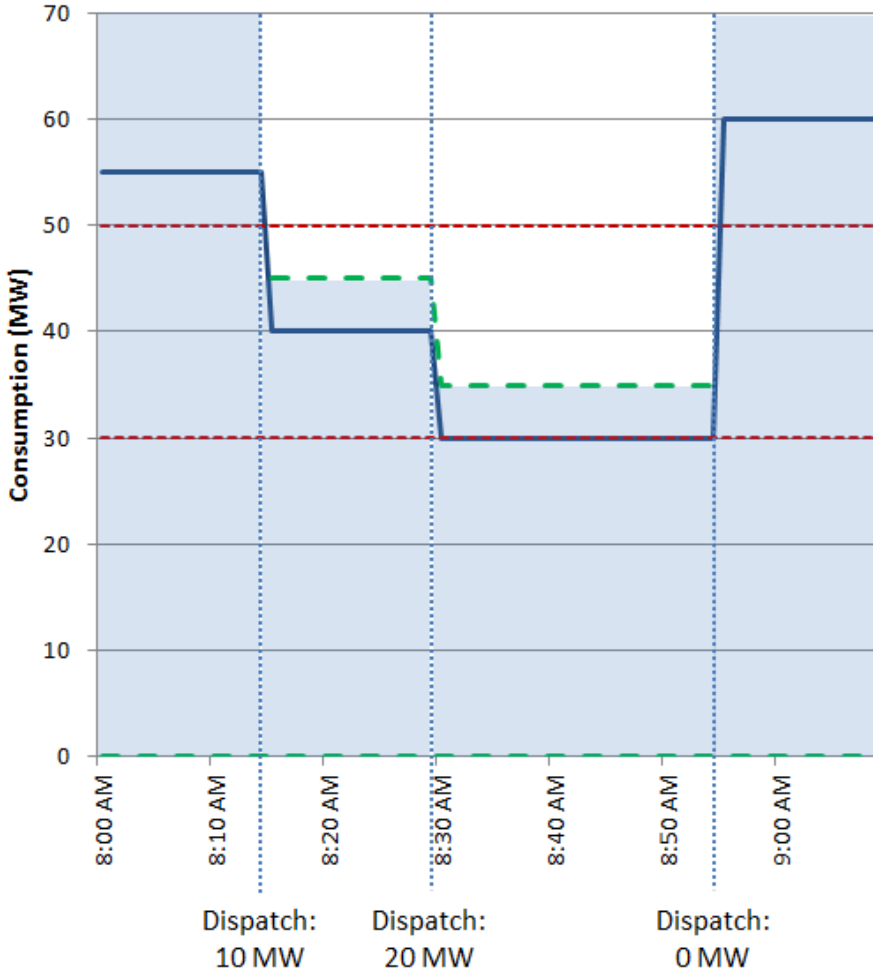
- Dispatch at 8:14 am = 10 MW
- Upper ADV = 50 MW – 10 MW MW + 5 MW = 45 MW
- Lower ADV = 0 MW
- Consumption drops to 40 MW

Dispatch 2:

- Dispatch at 8:29 am = 20 MW
- Upper ADV = 50 MW – 20 MW + 5 MW = 35 MW
- Lower ADV = 0 MW
- Consumption drops to 30 MW

Dispatch 3:

- Dispatch at 8:54 am = 0 MW
- ADV = no limits on consumption



Questions?

Asset substitution

Leon Weinstein

Introduction

- The purpose for asset substitution and the timeline
- Eligibility to participate in asset substitution
- The mechanics of asset substitution

Purpose and timeline for asset substitution

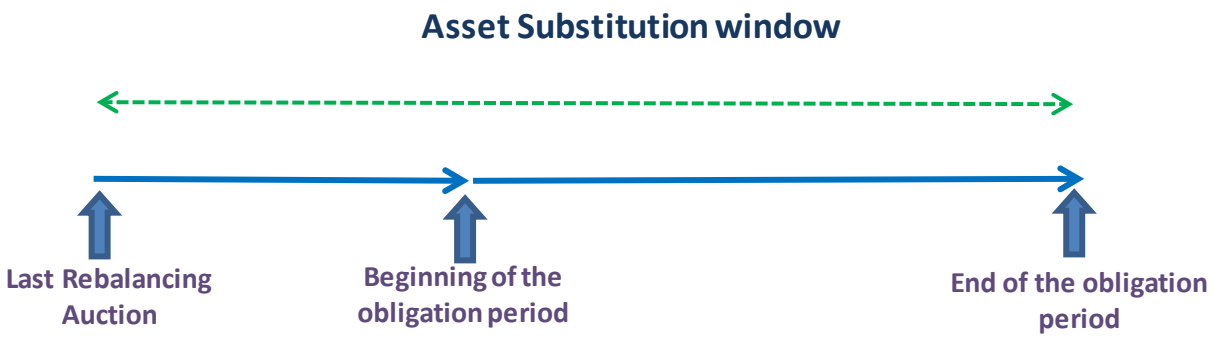
Asset substitution is a risk mitigation mechanism to allow a capacity market participant to reduce the under-delivery adjustment risk in advance of a delivery assessment period

A capacity market participant may substitute some or the entirety of its capacity commitment for:

- Minimum of one settlement interval (an hour)
- Maximum of entire obligation period

Asset substitution window opens after the final rebalancing auction

Illustrative: Asset Substitution window



Eligibility to participate in asset substitution

An asset may provide substitution volumes for it's UCAP that has not cleared in the base or rebalancing auctions

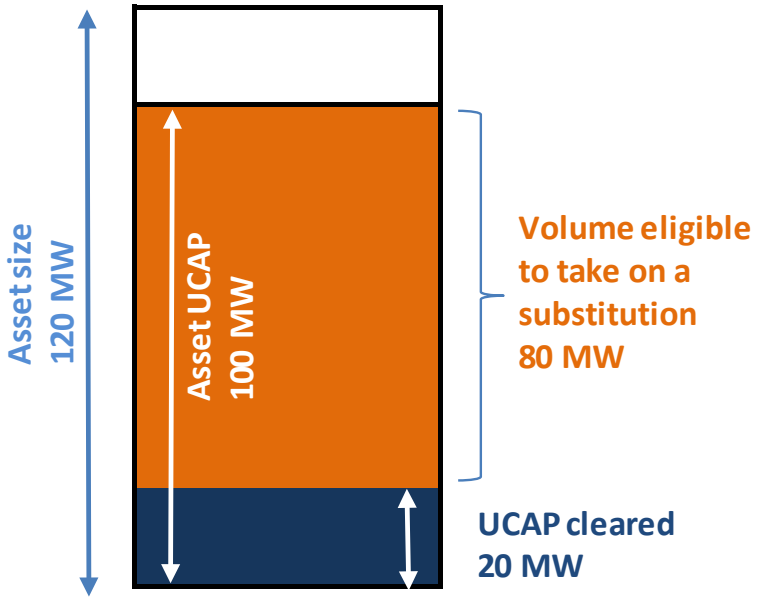
Capacity Asset A has a UCAP of 100MWs and an obligation volume or 20MWs, it can provide 80 MW towards asset substitutions

Asset substitution does not transfer the obligation from the original obligation holder – it allows another asset to deliver volumes on behalf of another asset

The original commitment always remains with the seller

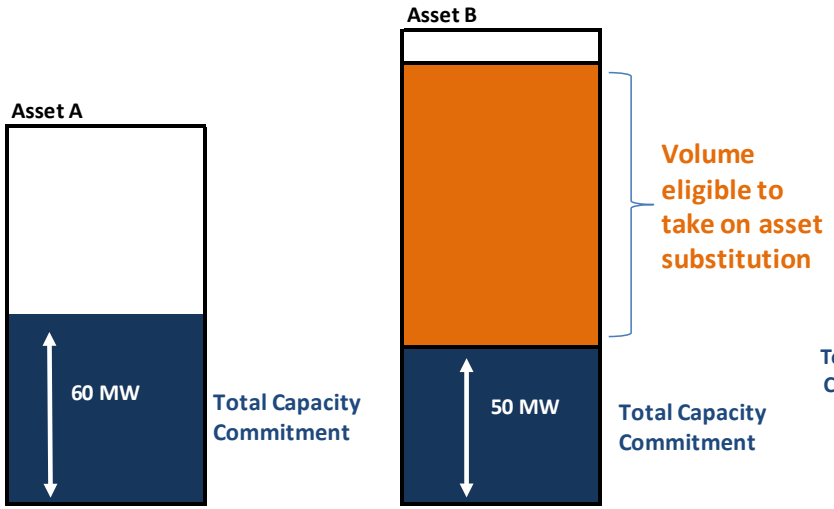
Volume eligibility for asset substitution

Asset A



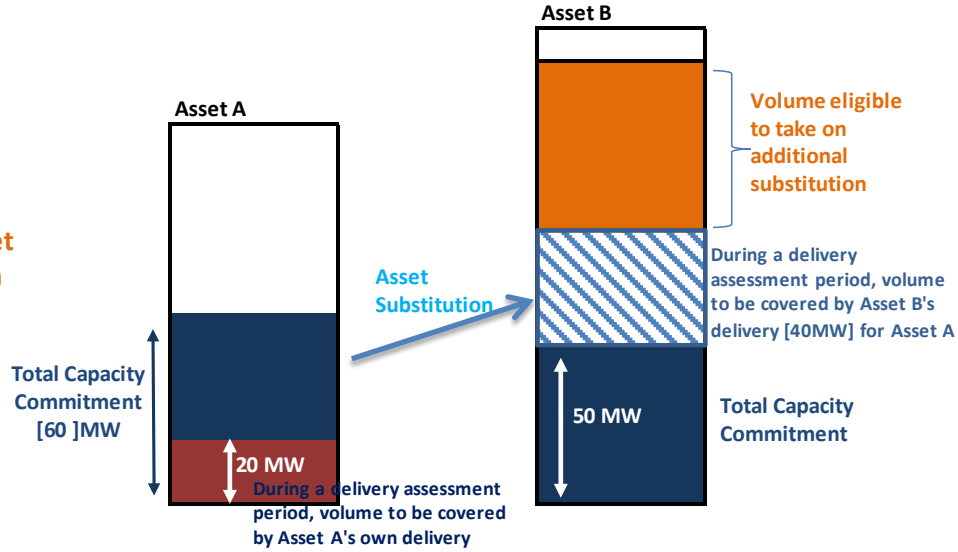
Mechanics of asset substitution

Pre- asset substitution and delivery assessment



Asset A has a capacity commitment of 60 MW and Asset B has a capacity commitment of 50 MW

Post- asset substitution and delivery assessment



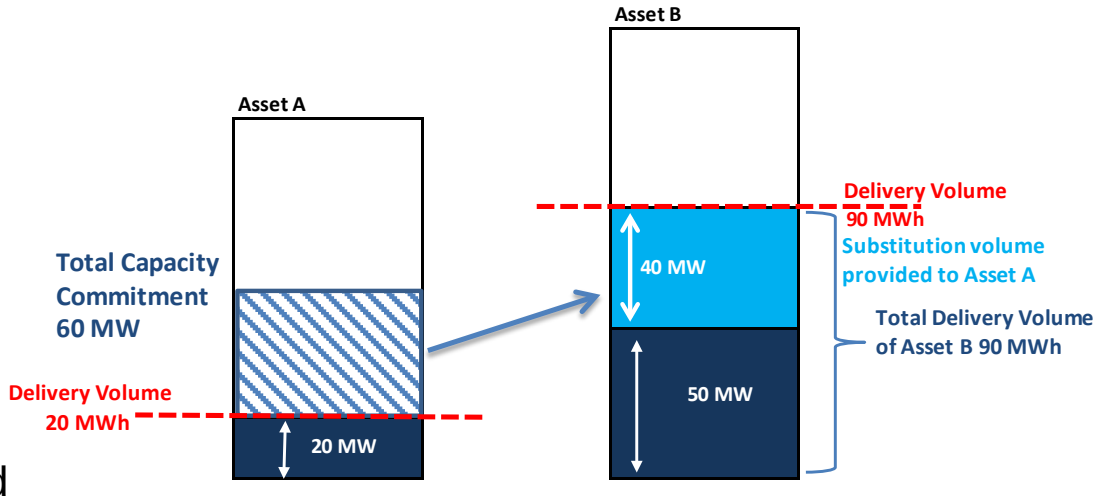
Post Asset substitution, Asset A still has a capacity commitment of 60 MW:

- 20 MW is covered by Asset A's production,
- 40 MW is covered via substitution by Asset B

The mechanics of asset substitution, cont.

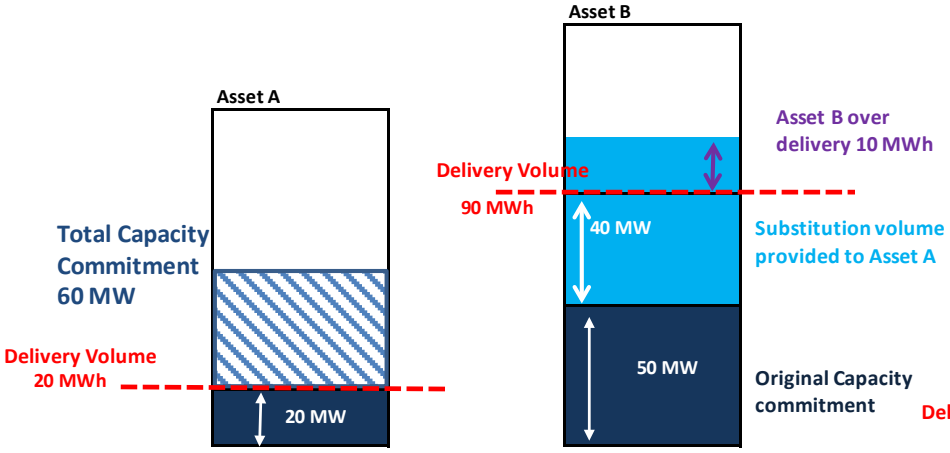
- In a delivery assessment hour, Asset A needs to deliver 20 MWh in order to avoid under-delivery performance assessments
- Asset B needs to deliver 90 MWh in total
  - 50 MWh to cover its own capacity commitment volume and
  - 40 MWh to cover the capacity commitment volume that was substituted over from Asset A
- If Asset B does not deliver the 40 MWh that it has substituted from Asset A, Asset A's performance and settlement are impacted as Asset A still has a capacity commitment to deliver 60 MWh

Post-asset substitution volume assessment during a delivery hour

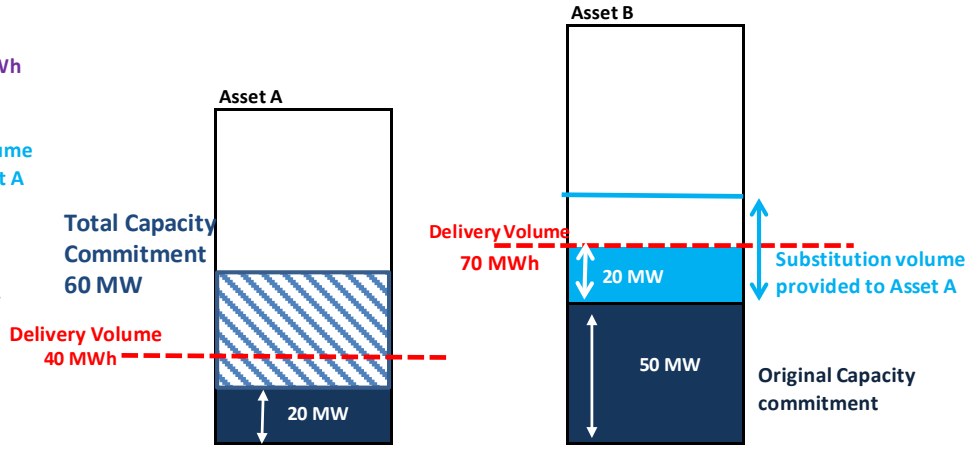


Asset substitution settlement

- An over-delivery example:
- If Asset B delivers 100 MWh during the delivery assessment period and Asset A delivers 20MWs
  - Asset B will cover its own obligation of 50 MWh and 40 MWh that was substituted over from Asset A.
  - The 10 MWh of extra generation will be counted towards Asset B over-delivery volume



- An under-delivery example:
- If Asset B delivers 70 MWh during the delivery assessment period and Asset A delivers 20MWs
  - Asset B will cover its own obligation of 50 MWh and 20 MWh that was substituted over from Asset A.
  - Asset A will be assessed 20 MWh of under delivery adjustment as Asset B's generation did not cover the full substitution volume



Questions?

Energy Market Mitigation – Non thermal assets

Derek Olmstead

Energy Market Mitigation – non thermal assets -- clarifications

- Overview
  - Mitigation of non thermal assets needs to recognize water management while addressing market power
- Implementation
  - Rule outlines details of mitigation
    - *Offer at 3 x 30 day RAPP or offer into AS market*
    - *Must read with ID – provides additional guidance*
    - *Business practices related to AESO bids included in ID*
    - *Water management addressed by ability to offer into ancillary services market, aligned with competitive market and AESO bid practices plus the ability to offer at cap in energy market if following these steps*
    - *Volumes set at maximum quantity that was qualified under Section 205.4, Section 205.5, Section 205.6 (to ensure capacity is offered)*
      - *Clearing is not required by rule to offer at energy market cap*

Questions?