Tariff Design for Capacity Market and Bulk and Regional Transmission Cost Allocation

Industry Update

March 13, 2019

Public

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Agenda

Time	# min	Agenda Item	Presenter
9:00 am – 9:05 am	5 min	Housekeeping and overview of session	Matt Gray
9:05 am – 9:30 am	25 min	Tariff design consultation process	Doyle Sullivan
9:30 am –10:30 am	60 min	Update on tariff design for capacity market cost allocation	John Martin
10:30 am – 10:45 am	**15 min**	**Break**	
10:45 am – 11:35 am	50 min	Update on tariff design for capacity market cost allocation (cont'd)	John Martin
11:35 am – 11:55 am	20 min	Update on tariff design for bulk and regional transmission cost allocation	Doyle Sullivan
11:55 am – 12:00 pm	5 min	Next steps	Matt Gray

Tariff Design Consultation Process

Public

About the AESO's approach

- Legislation introduced to enable the capacity market prescribed that capacity market costs be allocated through the ISO tariff
- As a result the ISO tariff now has two parts:
  - Allocation of capacity market costs
  - Allocation of transmission system costs
- The AESO recognized the importance of keeping tariff signals aligned and decided to combine these matters into a single consultation

Consultation process

- Tariff Design Advisory Group (TDAG) launched August 2018
- Objectives:
  - AESO and industry to work together to develop recommendations for allocating costs of:
    - The capacity market
    - Bulk and regional transmission
  - AESO would then consider these recommendations when developing their filings
- Approach
  - Advisory group, working groups
    - Broad industry has opportunities to raise issues through TDAG representative or directly to the AESO
    - Industry-selected and AESO members
- Timelines
  - Capacity market cost allocation: Filing June 28, 2019
  - Bulk and regional transmission cost allocation: Filing March 31, 2020

Terms of Reference

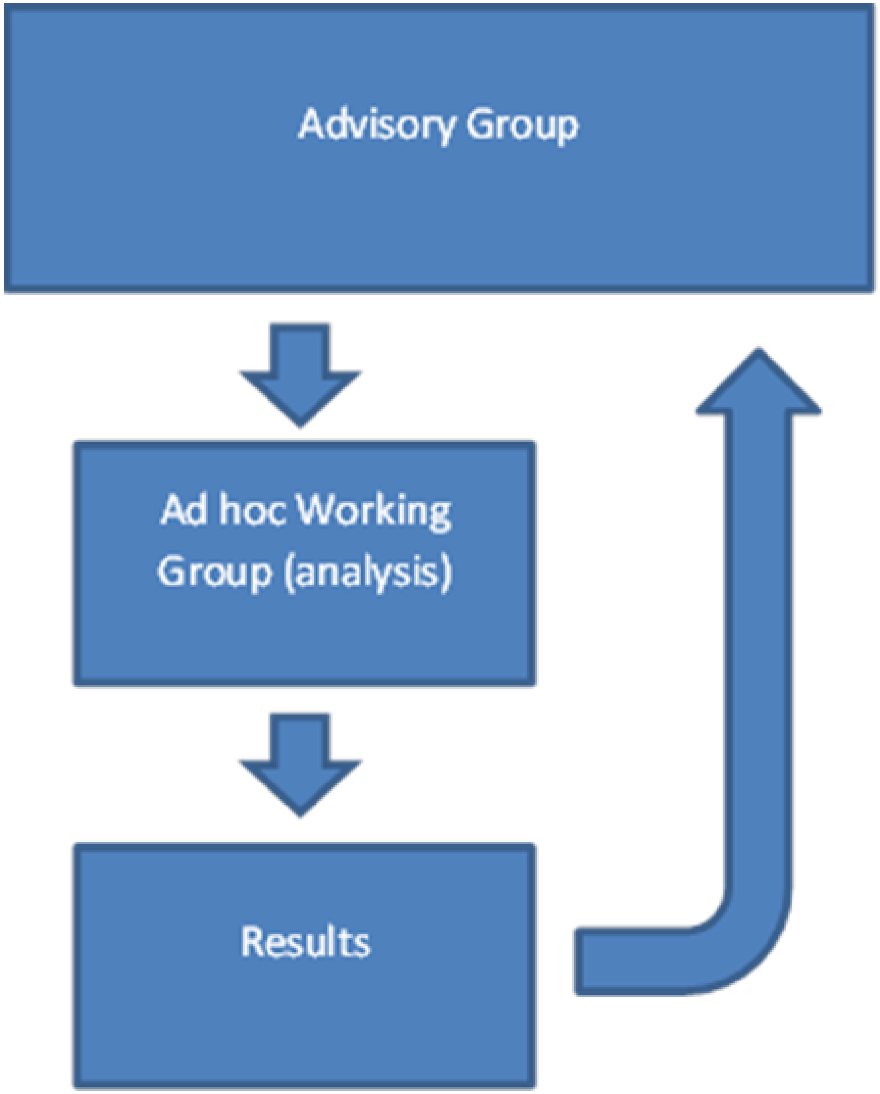
- Developed by TDAG
- Key attributes
  - Meeting the requirements of legislation
  - Identifying, developing and evaluating a comprehensive list of options for allocating capacity costs and bulk and regional transmission costs
  - Minimize the long-term costs of transmission and capacity, and optimize overall costs to consumers
  - Limit undue cross subsidization
  - Achieving consistency among tariff components (e.g., consistency across energy, capacity, transmission and distribution such that different tariff provisions remain aligned as much as possible)
- Added by TDAG members:
  - The fair distribution of costs, in a manner that provides incentives for economic efficiency (meaning for e.g., in the case of the capacity market cost allocation, incentives to reduce the volume of capacity that needs to be procured, and in the case of bulk and regional transmission cost allocation, incentives to reduce the amount of transmission infrastructure that will be required over time).

Scope

- Capacity market cost allocation: As prescribed by legislation
  - Single rate
  - Costs allocated using a Weighted Energy Method
- Bulk and regional transmission cost allocation:
  - Defining data requirements
    - Historical
    - Forecast
  - Defining the following rate design categories:
    - Functionalization;
    - Classification;
    - Allocation;
    - Billing determinants; and
    - Rates classes and development.
  - Application preparation
    - Alternatives and preferred solutions

Tariff Design Advisory Group Process

- Role of the TDAG is ultimately to develop recommendations for AESO's consideration
- To achieve this, the TDAG establishes work groups, directs their activities, receive updates and reviews and approves any working group recommendations for AESO's consideration



TDAG Membership

- 18 seats, plus 18 alternates
- ~75% load, ~25% other parties
- Industry-selected
- Members represent their peers, bring forward their concerns
- AESO participates on TDAG and working groups

Seats allocated	Stakeholder category
	Demand rate payers
4	Residential, farm and commercial consumers
2	Industrial consumers
2	Demand Response
2	Combined Load/Generation
2	Distribution facility owners
2	Representative at large
	Other interested parties
1	Transmission facility owners
1	Generation (includes renewable generation)
1	Energy Storage
1	Representative at large

Governance and Transparency

- Governance
  - Recommendations are developed by TDAG or by working groups
    - Typically by WGs, after analysis and discussion
    - Consensus or not
- Transparency
  - Posting TDAG materials to the website
  - Posting TDAG meeting notes
  - Publishing notices in AESO stakeholder newsletter

Questions?

Capacity Market Cost Allocation Tariff Development Update

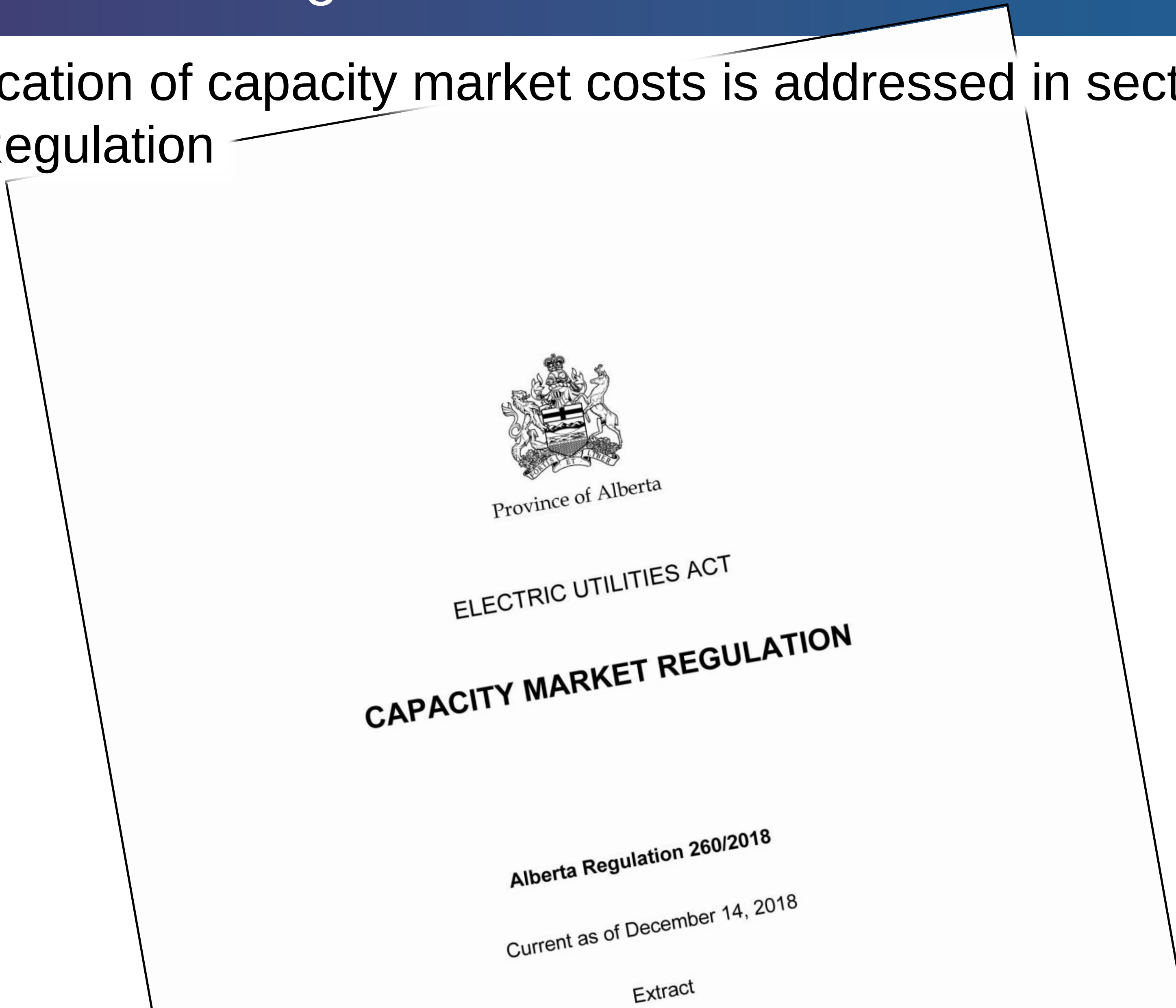
Public

Topics

- Requirements of *Capacity Market Regulation*
- Resource adequacy model and unserved energy
- Bookend scenario analysis
- Development of 400-hr on-peak time block
- Considerations for weights of time blocks
- Potential rate ranges
- Additional considerations for rates
- Terms and conditions considerations
- Allocation of capacity market costs to transmission losses
- Remaining work

Capacity Market Regulation was enacted in December after government consultation

- Allocation of capacity market costs is addressed in section 12 of Regulation



Province of Alberta

ELECTRIC UTILITIES ACT

CAPACITY MARKET REGULATION

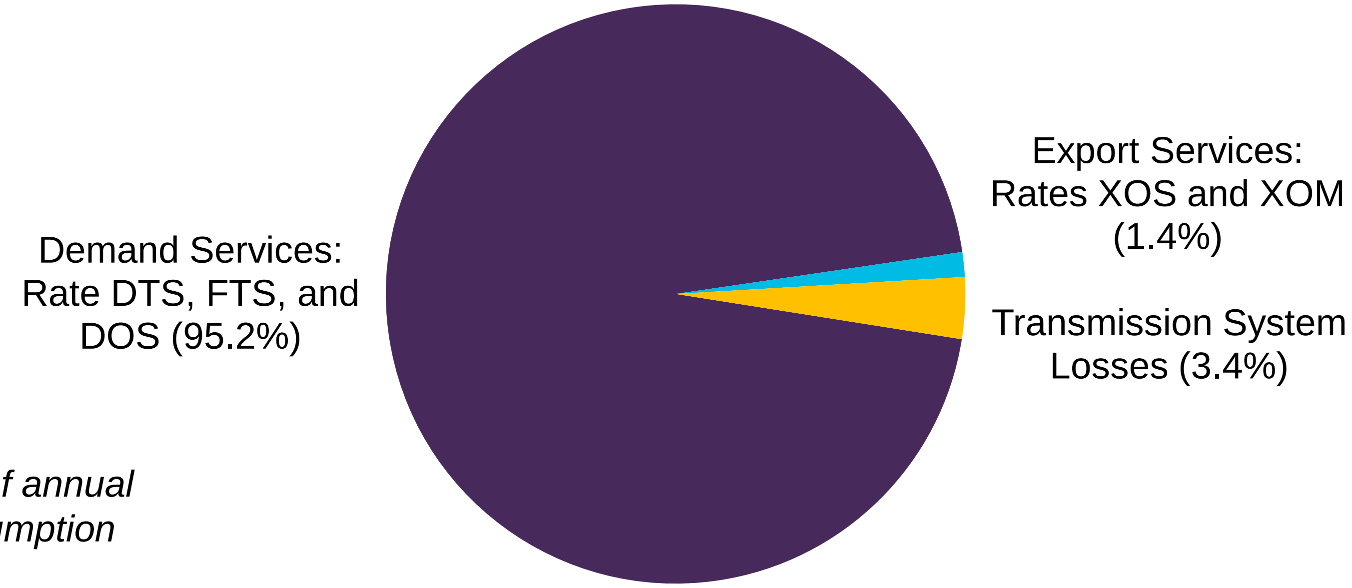
Alberta Regulation 260/2018

Current as of December 14, 2018

Extract

Costs must be allocated to all services that receive electricity from transmission system

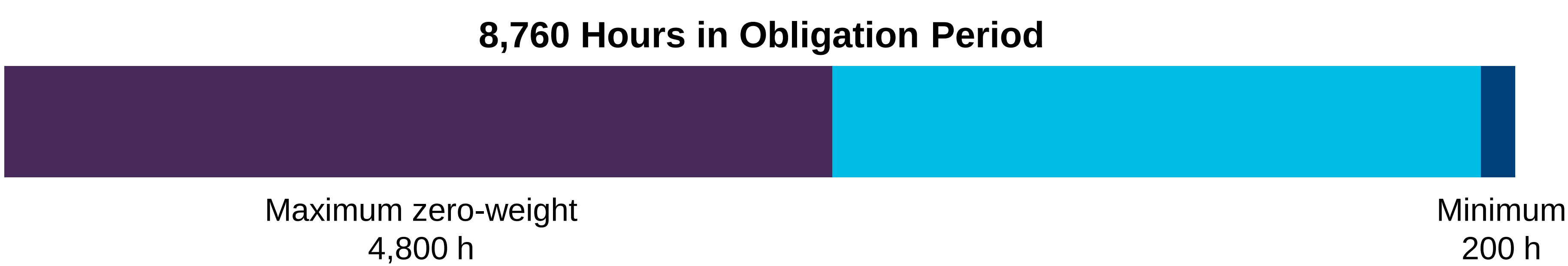
- Costs of capacity market for obligation period are to be allocated to all classes of system access service whose members receive electricity from transmission system and to transmission line losses [§12(4)]
  - Includes demand services and export services
  - Excludes isolated communities



Percentage of annual energy consumption

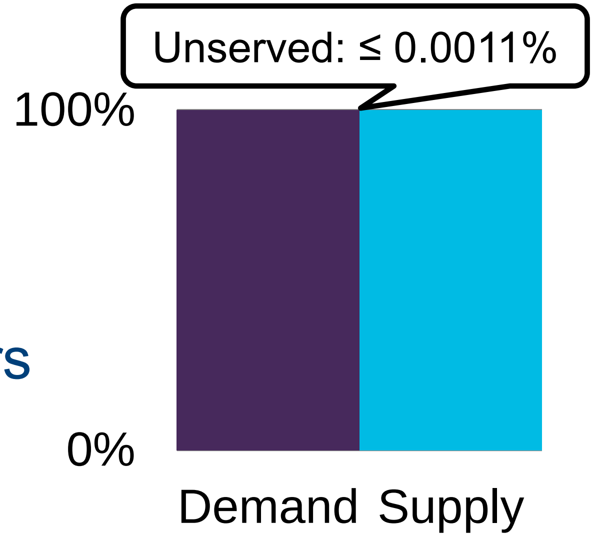
Costs must be allocated using weighted energy method over one set of time blocks

- AESO must establish one set of time blocks for obligation period, with each time block consisting of hours that are reasonably similar in anticipated contribution that demand for and supply of energy has on amount of capacity needed [§12(5)(b)]
- Each time block must contain at least 200 hours [§12(6)(b)]
- A time block that has weight of zero can contain no more than 4,800 hours in an obligation period [§12(6)(d)]



Costs must be allocated by assigning one weight to each time block

- AESO must assign weights corresponding to anticipated contributions that demand for and supply of energy in hours in time block have on amount of capacity needed in obligation period to meet resource adequacy standard [§12(5)(c)]
- Resource adequacy standard requires that normalized expected unserved energy (EUE) must be ≤ 0.0011% [§2(2)]
  - Percentage is amount of expected unserved energy divided by expected load for the obligation period [§2(1)(d)]
  - Unserved energy means amount of energy not provided to Alberta's electricity customers as a result of demand for energy exceeding available supply of energy [§2(1)(e)]



One rate must be derived for each time block

- AESO must derive one rate per megawatt hour for each time block for recovery of costs of capacity market [§12(5)(d)]
- Rate in $/MWh must use:
  - – Forecast of hourly energy in obligation period;
  - – Forecast of hourly transmission line losses in obligation period;
  - – Forecast of costs of capacity market for obligation period;
  - – Time blocks; and
  - – Weights.

$$\text{rate}_{\text{time block}} = \frac{\text{capacity market cost} \times \text{weight}_{\text{time block}}}{\text{sum of energy}_{\text{time block}} + \text{sum of losses}_{\text{time block}}}$$

Same rate must be charged to all classes of system access service

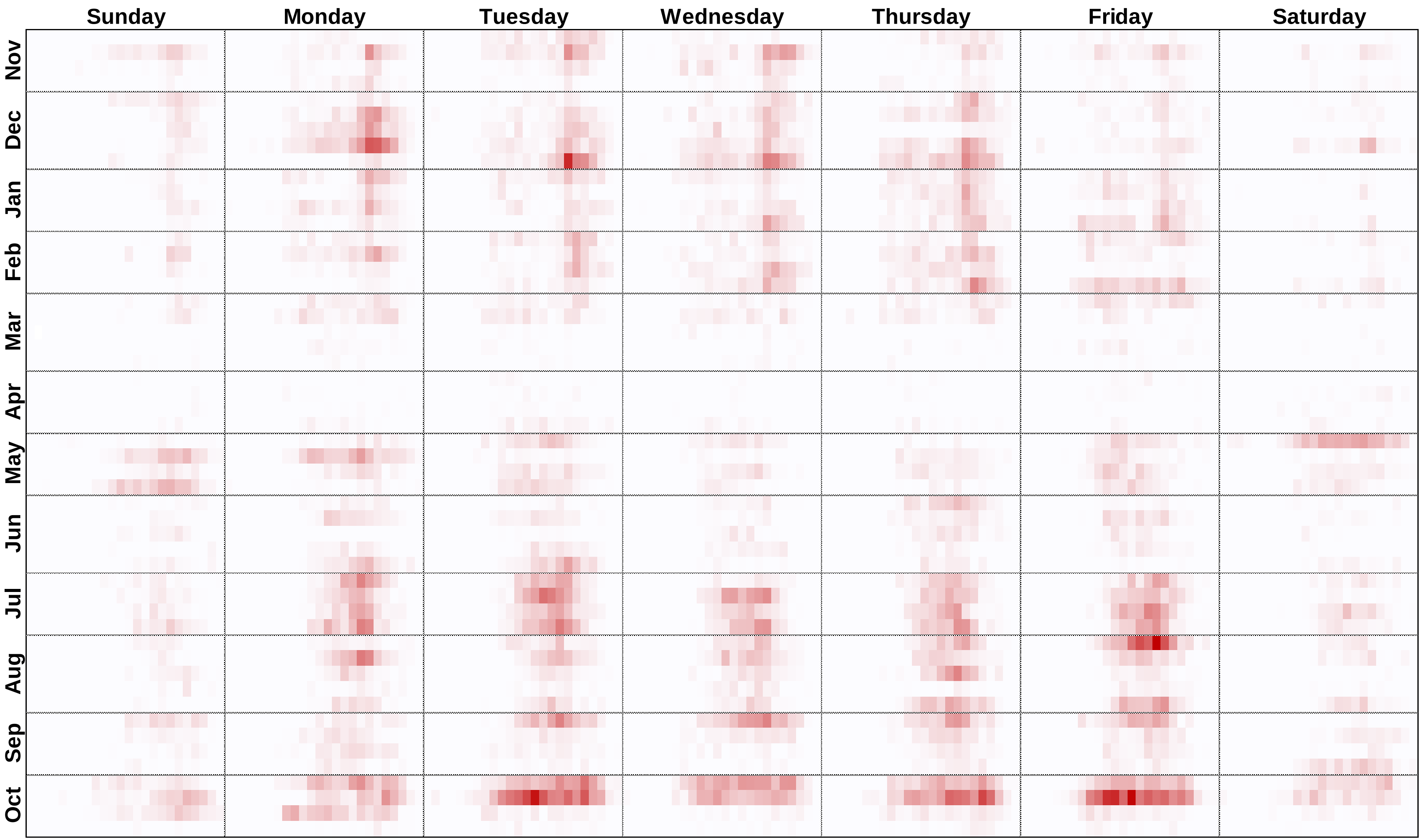
- Rate derived for each time block must be charged to all classes of system access service whose members receive electricity from transmission system and to transmission line losses [§12(5)]
  - Rate DTS, *Demand Transmission Service*
  - Rate FTS, *Fort Nelson Demand Transmission Service*
  - Rate DOS, *Demand Opportunity Service*
  - Rate XOS, *Export Opportunity Service*
  - Rate XOM, *Export Opportunity Merchant Service*
  - Transmission line losses

Working group used resource adequacy model to explore time blocks and weights

- Resource adequacy model (RAM) is a forward-looking probabilistic simulation model that uses hourly distributions and inputs of supply and demand variables to quantify the impact of capacity on supply adequacy

- Resource adequacy model identifies relationship between expected unserved energy and total installed maximum capability of assets that supply capacity

Expected unserved energy (EUE) is distributed throughout obligation period



Two bookend scenarios were created to examine impacts of different time blocks

Time Block	Feature	"Narrow Peak" Bookend	"Wide Peak" Bookend
On-peak	Hours	245 hours	1,242 hours
	Duration	3 or 2 hours, weekdays	6 hours, weekdays
	Schedule	20 weeks Jul-Sep, Oct, Nov-Jan	10 months May-Feb
	Load change	300 MW and 73,500 MWh reduction	59 MW and 73,500 MWh reduction
Mid-peak	Hours	3,739 hours	2,742 hours
	Duration	16 hours, weekdays	
	Schedule	Year-round	
	Load change	No change	
Off-peak	Hours	4,776 hours	
	Duration	8 hours, weekdays and 24 hours, weekends	
	Schedule	Year-round	
	Load change	15 MW and 73,500 MWh increase	

Resource adequacy model was re-run with load scenarios reflecting bookend changes

- Bookends resulted in moderate changes to minimum procurement volume
- Narrow peak bookend reduced minimum gross procurement volume by 37 MW compared to base analysis
  - Narrow peak bookend reduced occurrences of unserved energy in on-peak hours and did not materially affect monthly distribution
- Wide peak bookend increased minimum gross procurement volume by 34 MW compared to base analysis
  - Wide peak bookend shifted unserved energy from October and December to May without material reduction in occurrences of unserved energy

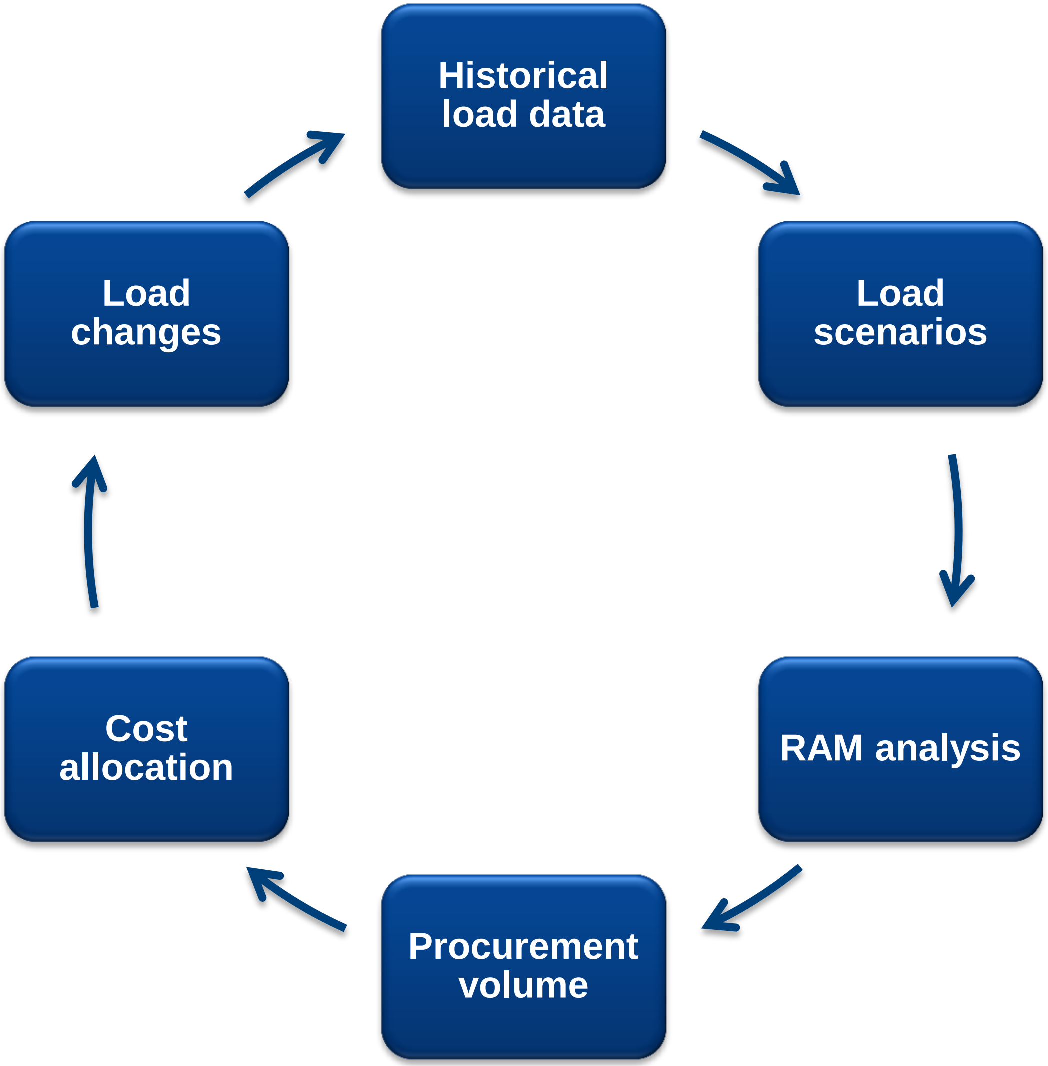
Bookend analysis results are directional and indicative and have caveats

- High load factor of Alberta system results in unserved energy being distributed throughout most of year with limited opportunity for unserved energy redistribution to reduce procurement volume
- Resource adequacy model is probabilistic tool that was specified for annual aggregate results and was not intended to provide exact forecast of hourly unserved energy
- Resource adequacy model indicates higher probability that unserved energy will occur during weekdays rather than weekends and during on-peak hours rather than off-peak hours

Bookend analysis led to discussion of objectives for cost allocation rate design

- Implement requirements of *Capacity Market Regulation*
- Recover costs of capacity market
- Provide appropriate price signals that reflect all costs and benefits
  - Load response to price signals should reduce procurement volumes in future obligation periods
  - Price signals should align with those from energy market and transmission tariff
- Achieve fairness, objectivity, and equity that avoids undue discrimination and minimizes inter-customer subsidies
- Provide stable and predictable rates
- Ensure rates are practical, understandable, and billable

Load response to 2021-2022 rate will impact 2024-2025 procurement volume



Re-examination of time blocks suggested on-peak block of about 400 hours

- Bookend analysis suggested narrow-peak approach would reduce future procurement more than wide-peak approach
- Industrial loads can curtail in no more than 400 hours without impacting production capability
- Daily on-peak periods should be of short duration to enable loads to reduce without significantly disrupting daily activities
- Consistent daily start and end times and consecutive months in time blocks facilitate response by load
- Hours in time blocks should be “reasonably similar” in expected unserved energy contribution to capacity needed
  – Examined as count of hours with unserved energy contribution greater than threshold needed to capture number of hours

Examination of “reasonably similar” hours suggested on-peak time block

HE	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Sum
Nov	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**6**	**3**	2	1	0	0	0	**12**
Dec	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	4	**13**	**10**	5	3	0	0	0	**38**
Jan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**10**	**2**	1	0	0	0	0	**13**
Feb	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	**6**	**7**	2	0	0	0	0	**17**
Mar	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Apr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
May	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	2	2	1	0	0	0	0	0	0	**8**
Jun	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	3	3	1	0	0	0	0	0	**8**
Jul	0	0	0	0	0	0	0	0	0	0	0	0	7	11	12	**19**	**18**	**14**	2	0	0	0	0	0	**83**
Aug	0	0	0	0	0	0	0	0	0	0	0	1	2	1	6	**8**	**8**	**6**	3	0	0	0	0	0	**35**
Sep	0	0	0	0	0	0	0	0	0	0	0	0	4	5	3	**6**	**6**	**6**	2	1	0	0	0	0	**33**
Oct	0	0	0	0	0	0	0	1	4	5	9	9	10	8	7	**9**	**9**	**9**	8	10	8	3	0	0	**109**
Sum	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**4**	**6**	**12**	**11**	**24**	**25**	**29**	**45**	**51**	**74**	**38**	**21**	**12**	**3**	**0**	**0**	**356**

– *Count of hours with unserved energy contribution greater than 0.0638% per hour*
– *On-peak: HE18 to HE19, weekdays, November to February, and HE16 to HE18, weekdays, July to October*

Examination of “reasonably similar” hours also suggested mid-peak time block

HE	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Sum
Nov	0	0	0	2	0	0	6	14	19	18	15	19	17	16	17	16	20	-	-	20	17	10	4	1	272
Dec	2	2	2	1	0	4	8	13	16	18	18	19	17	19	18	19	20	-	-	21	20	17	18	3	317
Jan	2	0	1	0	0	1	5	13	19	17	18	18	16	17	15	19	20	-	-	19	18	19	13	3	293
Feb	2	0	0	1	0	1	4	14	18	16	17	17	17	19	17	18	18	-	-	19	19	15	12	1	282
Mar	0	0	0	1	1	1	3	12	12	11	13	14	18	15	14	15	13	18	9	12	15	13	4	2	216
Apr	0	0	0	0	0	0	1	3	7	11	11	13	10	11	10	6	6	8	6	3	2	7	1	0	116
May	0	0	0	0	0	1	1	10	12	20	20	18	20	21	21	20	20	18	19	16	12	14	9	1	273
Jun	0	0	0	0	0	0	0	1	4	16	19	20	21	20	21	21	21	20	15	15	10	9	2	1	236
Jul	0	0	0	0	0	0	0	0	4	16	20	20	20	20	20	-	-	-	20	20	18	15	5	1	259
Aug	0	0	0	0	0	0	0	2	2	10	20	19	20	21	22	-	-	-	22	20	19	16	5	1	264
Sep	0	0	0	0	0	0	3	10	12	17	17	20	19	21	20	-	-	-	19	20	19	10	2	1	272
Oct	1	1	0	0	2	4	10	16	18	17	15	18	18	17	17	-	-	-	18	19	19	16	13	7	300
Sum	**7**	**3**	**3**	**5**	**3**	**12**	**41**	**108**	**143**	**187**	**203**	**215**	**213**	**217**	**212**	**134**	**138**	**64**	**128**	**204**	**188**	**161**	**88**	**22**	**3100**

- *Count of hours with unserved energy contribution greater than 0.0007% per hour*
- *Mid-peak: HE08 to HE23, weekdays, year-round, excluding on-peak hours*
- *Off-peak: HE23 to HE07, weekdays, and all-day weekends, year-round*

Working group examined weights starting with unserved energy in each time block

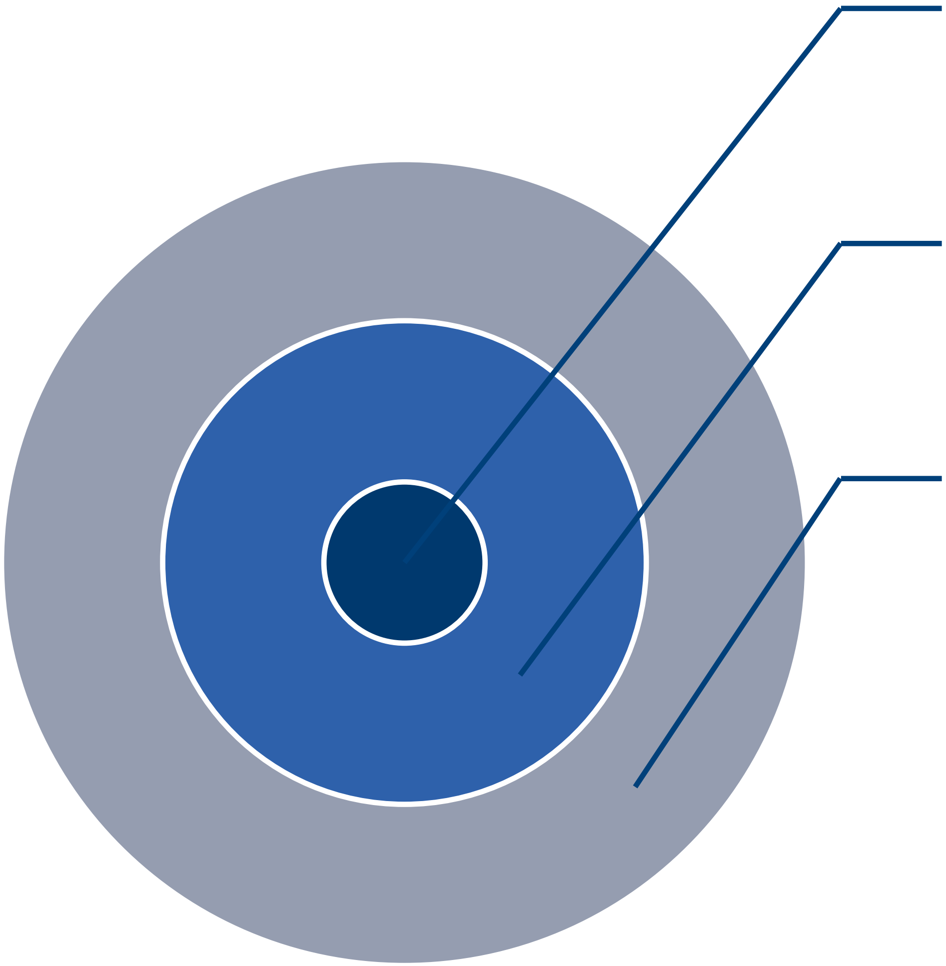
- *Capacity Market Regulation* requires that one weight be assigned to each time block corresponding to the anticipated contribution that demand for and supply of electric energy in each hour has on amount of capacity needed in obligation period

Time Block	Hours	Sum of EUE	EUE per Hour	Weight	Potential Ratio
On-peak	411	26.43%	0.064%	0.77	4
Mid-peak	3,573	57.41%	0.016%	0.19	1
Off-peak	4,776	16.16%	0.003%	0.04	0
Total	8,760	100.00%		1.00	

Working group provided additional considerations for weights

- Industrial loads generally curtail at about $250/MWh delivered cost of electricity
- In hours in which industrial load has historically curtailed, pool price has typically averaged $500-600/MWh
  - Ratio of 14:1 compared to pool price in hours that would be in mid-peak time block
- Costs should not be allocated to off-peak time block as there is minimal unserved energy in off-peak hours and abundant capacity
- Too high an on-peak rate in too few hours will encourage capacity market bypass
- Too low an on-peak rate will not encourage load to respond

Working group and AESO continue to explore possible rate designs



Target: Time blocks and weights recommendation

Time blocks and weights options being examined in more detail

All possible compliant options for time blocks and weights

Working group has initially focused on weights with ratios of 12:1:0 to 16:1:0

- Working group examining relatively high on-peak rate and $0 off-peak rate based on little EUE in off-peak hours

Time Block	Hours	Potential Rate Range in $/MWh				
		4:1:0	8:1:0	12:1:0	16:1:0	20:1:0
On-peak	411	$50-150	$75-226	$91-272	$101-302	$108-324
Mid-peak	3,573	$12-37	$9-28	$8-23	$6-19	$5-16
Off-peak	4,776	$0	$0	$0	$0	$0
Average	8,760	$8-24	$8-24	$8-24	$8-24	$8-24

- Based on range of capacity market costs from $0.5 billion to $1.5 billion for first obligation period

Working group has identified additional considerations to be examined

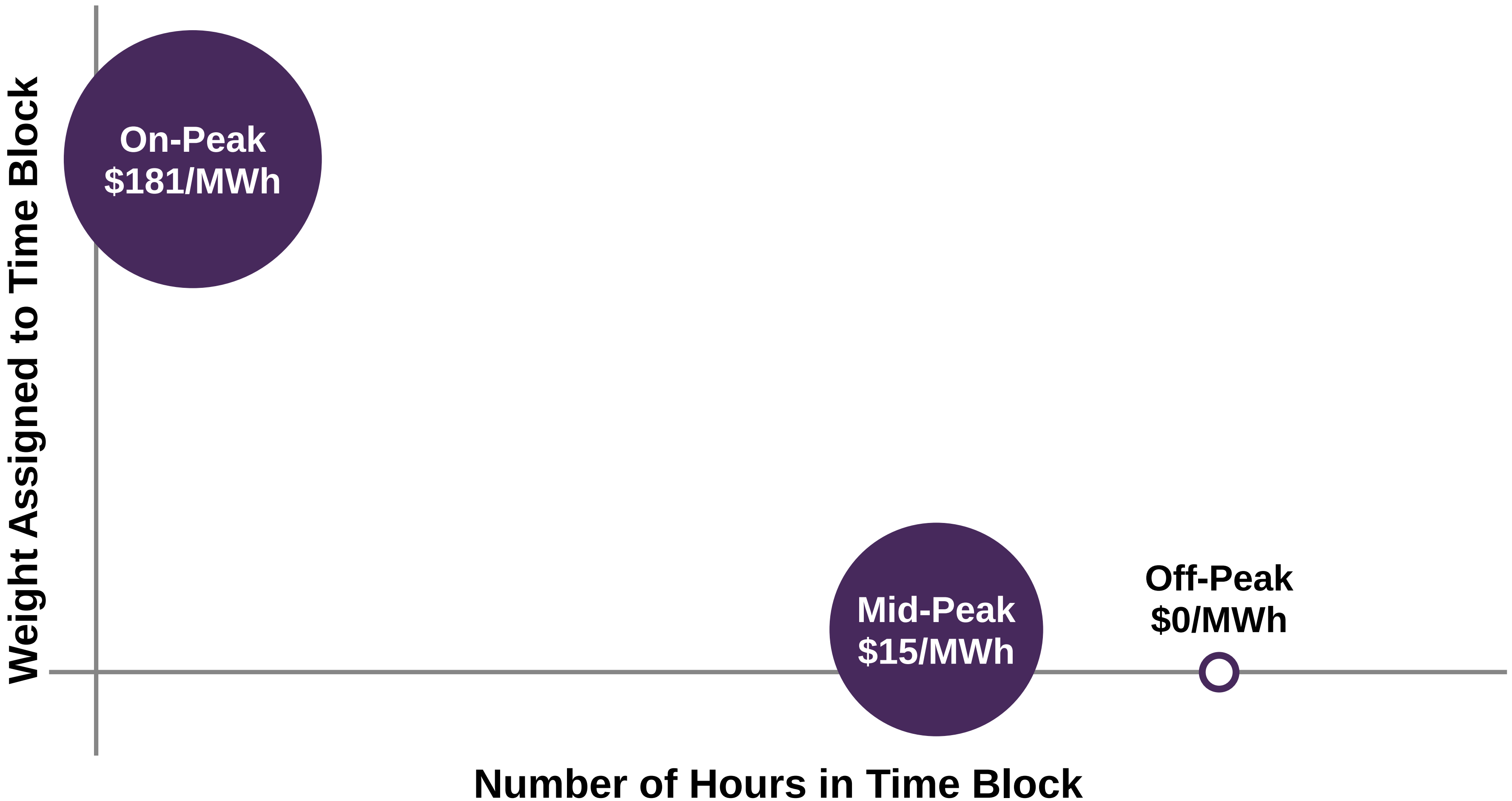
- Rates in on-peak hours in some options may be higher than necessary to generate a response from load
- Rates in on-peak hours need to be high enough to generate a response that may reduce future capacity requirement
- High rates in on-peak and mid-peak hours may encourage loads to participate as demand resources in capacity market
- High rates in mid-peak hours may have effect of reducing exports that would otherwise be economic
- Unserved energy in off-peak hours is small but not zero, suggesting low rate in off-peak hours be considered
- Non-zero rate in off-peak hours may allow rate in mid-peak hours to be lower

Working group has identified additional considerations to be examined (cont'd)

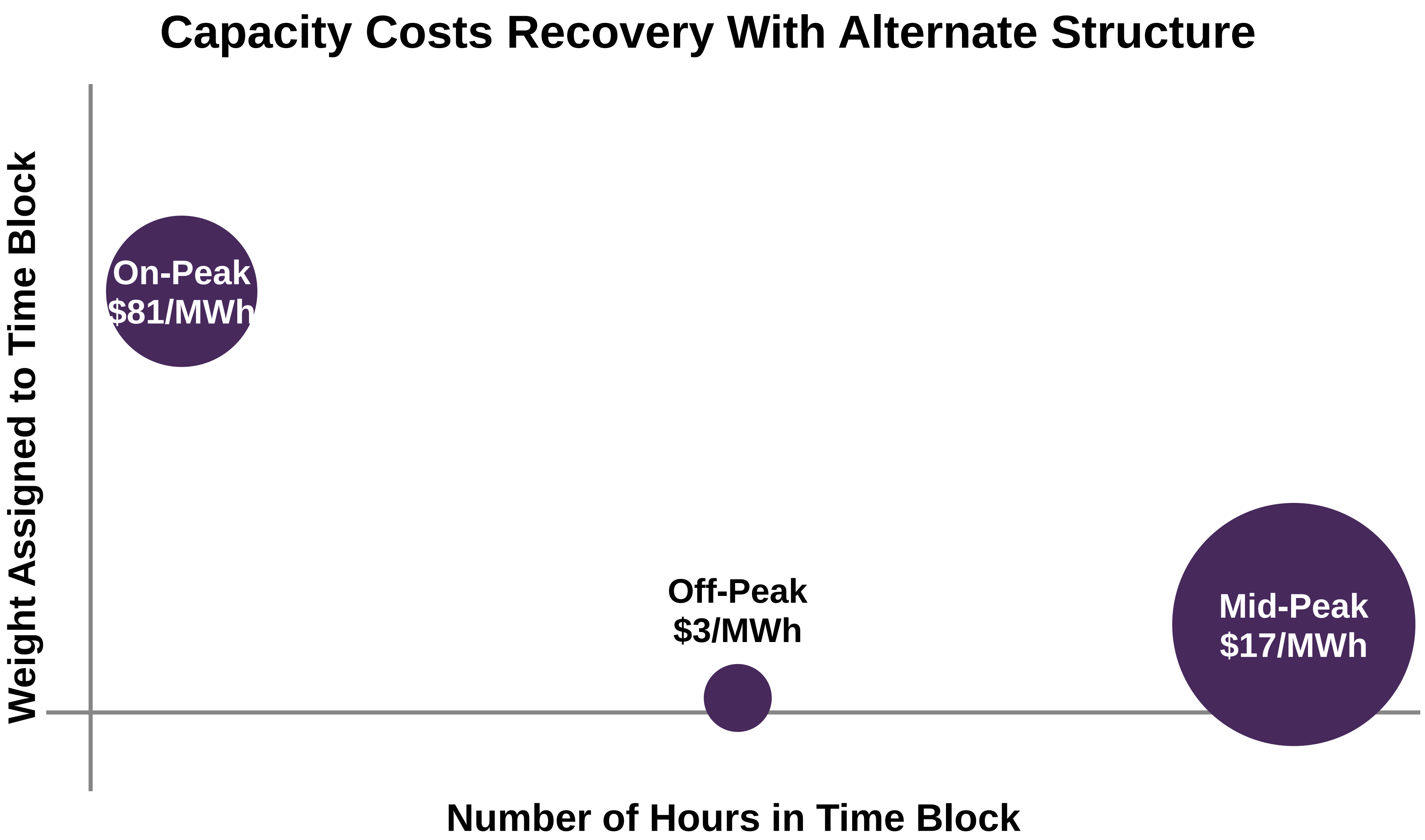
- Establishing fourth time block for weekend daytime hours or for other hours could also allow rate in mid-peak hours to be lower
- Need to balance all considerations to optimize cost allocation rate
  - Don't create flat rate to avoid risk of too high an on-peak rate, which would result in no response from load
  - Don't create too high an on-peak rate that pays more than needed to generate response from load
- Need to consider alignment with other price signals from energy market and transmission tariff
- Need to examine impacts at individual consumer level

Time blocks and weights must balance multiple considerations

Capacity Costs Recovery With 12:1:0 Weight Ratio



Time blocks and weights must balance multiple considerations (cont'd)



Working group is also considering terms and conditions that should be included in tariff

- Terms and conditions specific to rate may address wide variety of details relating to use of rate
  - Where rate is applicable
  - Qualification requirements for rate
  - Any minimum or maximum application periods
  - Limitations or modifications to volumes or charges in rate
  - Termination requirements
  - Curtailment requirements or capacity restrictions
  - Riders which apply to rate
  - Incentives such as bonuses or discounts
  - Penalties that apply in event of non-compliance with any terms

AESO considers that *Regulation* does not permit penalties or incentives

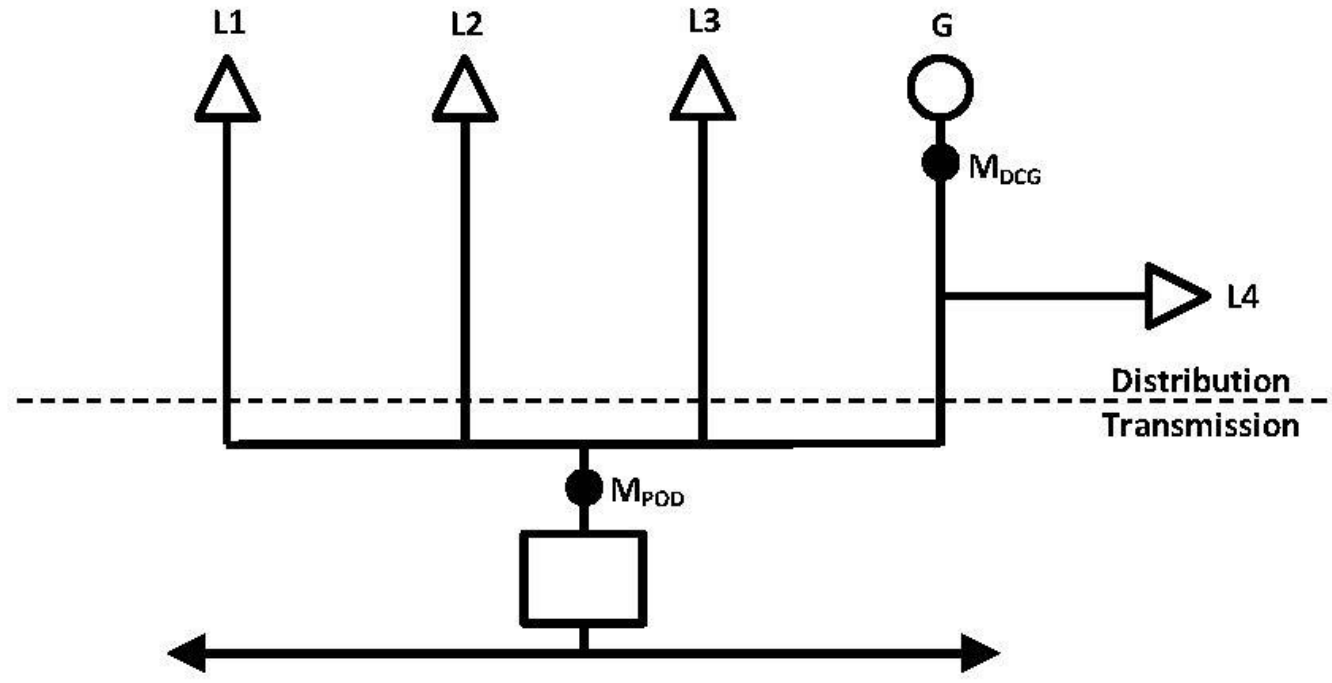
- AESO position is that penalties or incentives cannot be applied to loads at self-supply sites or other subsets of classes of system access service
- Penalties or incentives that apply only to certain loads would effectively change rate for those loads, which is not consistent with requirement in *Capacity Market Regulation* that a single rate per MWh for each time block is to be charged to all classes of system access service whose members receive electricity from transmission system
- Implementing a penalty or incentive through deferral account allocation would also be prohibited, as discussed in Decision 21735-D02-2017 regarding the AESO 2015 Deferral Account Reconciliation (issued March 14, 2017)

AESO considers that measurement points may differ for capacity market

- AESO position is that capacity market costs can be allocated at different measurement point than point of delivery (POD) used for transmission settlement of system access services
- *Electric Utilities Act* requires that rates “must reflect the prudent costs that are reasonably attributable to each class of system access service”
- As AESO is procuring capacity on behalf of all non-self-supply loads in Alberta, capacity market costs would be reasonably attributable to all non-self-supply loads

AESO proposes to “gross up” metered volumes to adjust for distributed generation

- System access service metered volume = M_{POD}
- Distribution-connected generation metered volume = M_{DCG}



- Cost allocation volume = $M_{POD} + M_{DCG}$

Cost allocation will require true-up for variances of volumes from forecast

- Capacity market cost allocation rate will be determined after capacity procurement volume and clearing price are known, using forecast of hourly load volumes
- Variances of actual load volumes from forecast will result in imbalances that will be addressed through deferral account rider
- If deferral account balances are small, preferred approach would be prospective rider applied over a future period
- Historical variances of load volumes will be examined to confirm appropriate approach

Allocation of costs to transmission line losses will not affect loss factor calculations

- Cost allocation rate will be used to allocate capacity market costs in each time block to transmission losses
- In *Transmission Regulation*, “costs of transmission line losses” includes costs of capacity market allocated to transmission line losses under *Capacity Market Regulation* [§1(3)]
  - Costs of transmission line losses equals costs of losses in the energy market plus capacity market costs allocated to losses
- Loss factor provisions in *Transmission Regulation* remain unchanged

Working groups will continue work after pause during March

- AESO will be focused on tariff proceeding during March
- Hourly unserved energy from RAM analysis for second obligation period (November 2022 to October 2023) will be provided to working group
- Further discussion of working group additional considerations
- Consideration of aggregate impact of prices from capacity market cost allocation, energy, and transmission tariff, to extent possible
- Examination of impact on individual consumer bills
- AESO will file application for capacity market cost allocation tariff methodology in late June 2019

Questions?

Update on Bulk and Regional Transmission Cost Allocation

Public

Current Work

- Bulk and regional transmission tariff work currently constrained by preparation for 2018 tariff proceeding and by capacity market cost allocation
- Some study and data requirements have progressed in documenting precise data requirements for studies
  - No studies completed at this time
  - AESO considering consultants to assist with jurisdictional tariff review, other tariff design options (including interruptible and opportunity services) and statistical and analytical support

Future work

- Working group will be doing a full tariff design review to determine functionalization, classification, rates and rate classes, and allocation
- AESO will file a general tariff application by Q1 2020 resulting from TTWG and TDAG work on transmission tariff design

Next steps

- Capacity market cost allocation
  - Written feedback process
    - Matrix issued March 14, 2019
    - Please submit completed matrices to tariffdesign@aeso.ca by April 10, 2019
    - Submissions will be distributed to TDAG members for consideration
    - All submissions will be posted “as received” and on attribution basis
  - TDAG and WG discussions will continue
  - Filing June 28, 2019

Next steps (cont'd)

- Bulk and regional transmission cost allocation
  - TDAG and WG discussions will continue
  - Filing March 31, 2020
- Information related to stakeholder engagement on capacity market cost allocation is posted on AESO website (link)
  - Path: Rules, Standards and Tariff ► Stakeholder engagement ► ISO Tariff Design for Allocating Costs of Capacity Procurement and Bulk and Regional Transmission

Thank you