

AESO 2017 and 2018 Preliminary Business Plan and Budget Information

Stakeholder Consultation

May 1, 2017

2018 Forecast Transmission Operating Costs

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Operating Cost Forecast Summary

(\$ millions)	2018 Forecast ¹	2017 Projected ²	2017 BRP ³	2016 Actual
Wires Costs	1,723.0	1,697.1	1,729.3	1,707.0
Ancillary Services	129.5	92.1	118.9	93.8
Transmission Line Losses	96.7	53.5	74.1	43.5
Other Industry Costs #	TBD	TBD	23.2	22.6
TOTAL	TBD	TBD	1,945.5	1,866.9
Pool Price (per MWh)	\$43	\$24	\$32	\$18

¹ Forecast : Cost estimates for AESO Board approval

² Projected: Update of previous cost estimates

³ 2017 AESO Budget Review Process (BRP) approved numbers

Includes transmission and energy market costs

2018 Forecast Pool Price

Pool Price Forecast

May to December 2017 and 2018

- Hourly pool price forecast is an integral input into calculating the forecast costs for ancillary services and transmission line losses
- AESO in-house generated hourly pool price forecasts from 2013 to 2016 for BRP forecasting purposes
- For the 2018 BRP, the May to Dec 2017 and 2018 hourly pool price forecast is obtained from the EDC Associates' Q1 2017 Update Report
- Decision to use the EDC forecast was due to competing AESO priorities for staff resources
- EDC is considered as a reliable industry information source

- Selected the EDC Climate Leadership scenario:
 - 2017 pool prices remain low due to marginal cost offer strategies and low natural gas prices
 - 2018 pool prices increase due to an anticipated return of strategic offer behaviors, implementation of a new carbon pricing mechanism and higher demand
- EDC forecast does not incorporate April 2017 announcement from TransAlta regarding retirement of Sundance 1 or mothballing Sundance 2 for up to 2 years (both effective Jan 2018)
- Transmission tariff rate riders ensure a timely correction to tariff rates to incorporate variances in cost forecasts, including from pool price variances

Pool Price Forecast

May to December 2017 and 2018 (continued)

- As of April 18, 2017, the forward market prices align to the EDC forecast

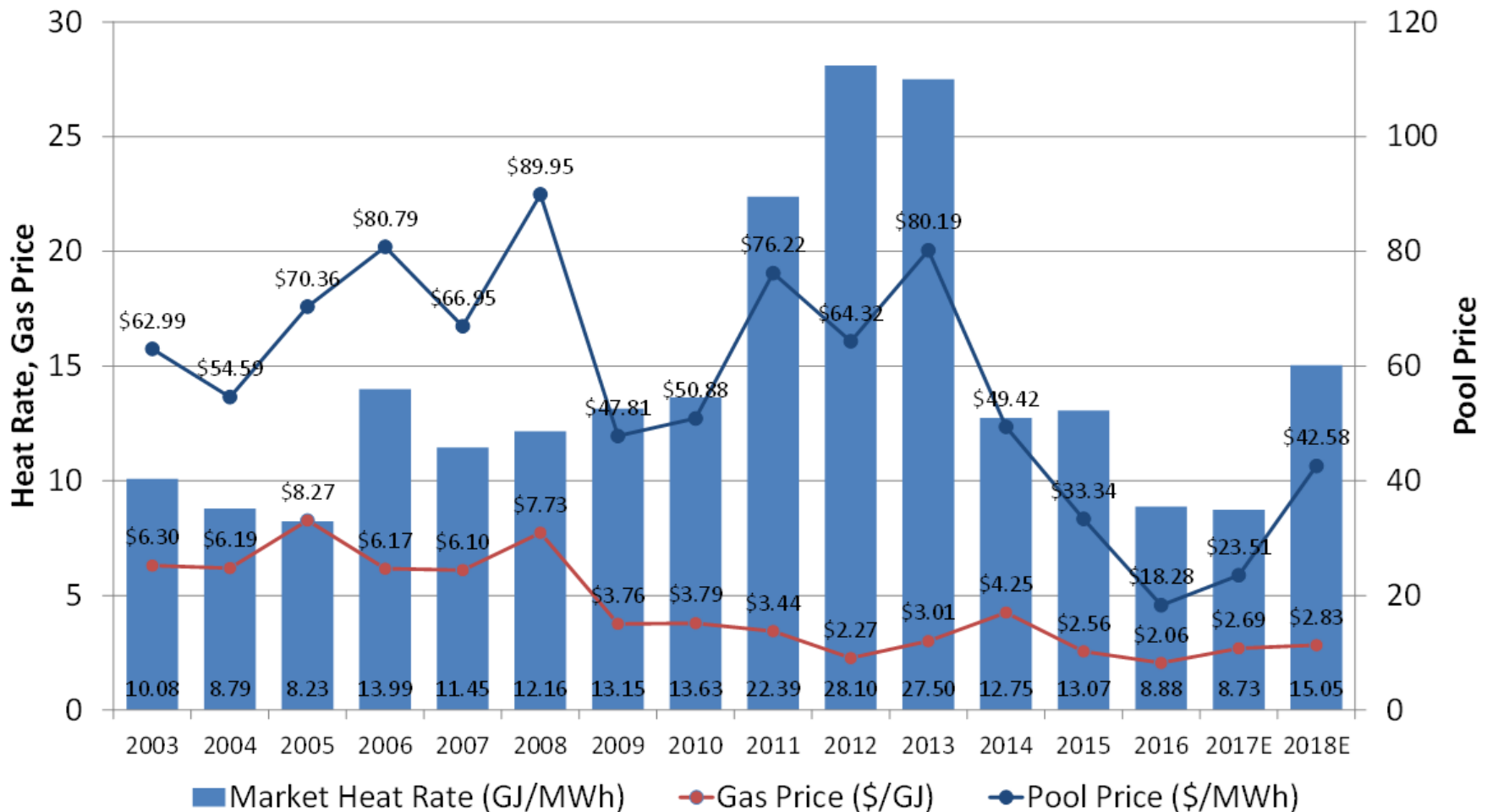
2017	EDC Forecast #	Forward Market # *	BRP	Projected
Average Hourly Pool Price (per MWh)	\$24.00	\$26.29	\$31.82	\$23.51
AECO-C Natural Gas Price (per GJ)	\$2.70	\$2.76	\$2.73	\$2.69

2018	EDC Forecast	Forward Market*
Average Hourly Pool Price (per MWh)	\$42.58	\$39.25
AECO-C Natural Gas Price (per GJ)	\$2.83	\$2.60

May to December 2017

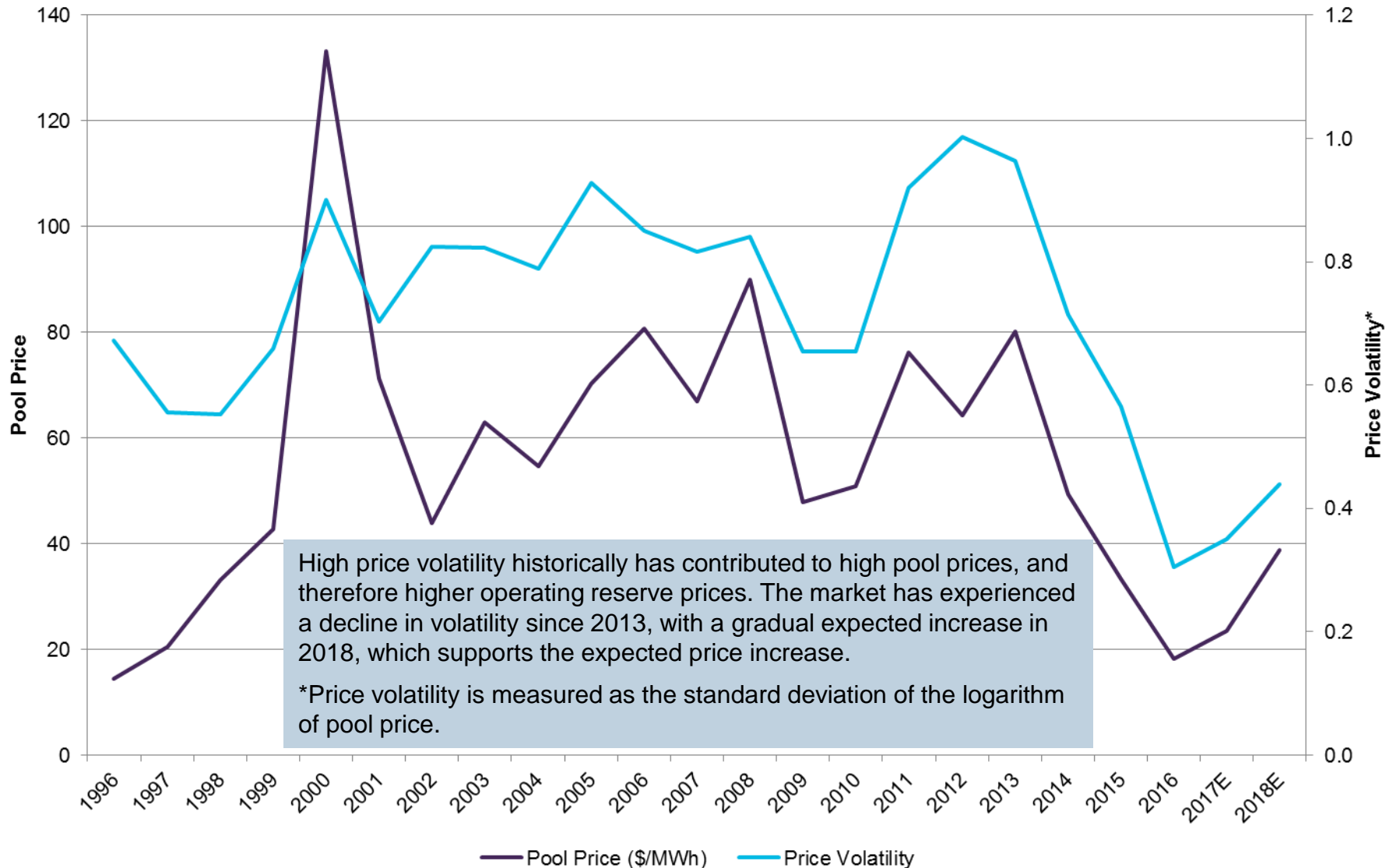
* Source: NGX (Apr 18, 2017)

Actual and Forecast Prices and Heat Rate

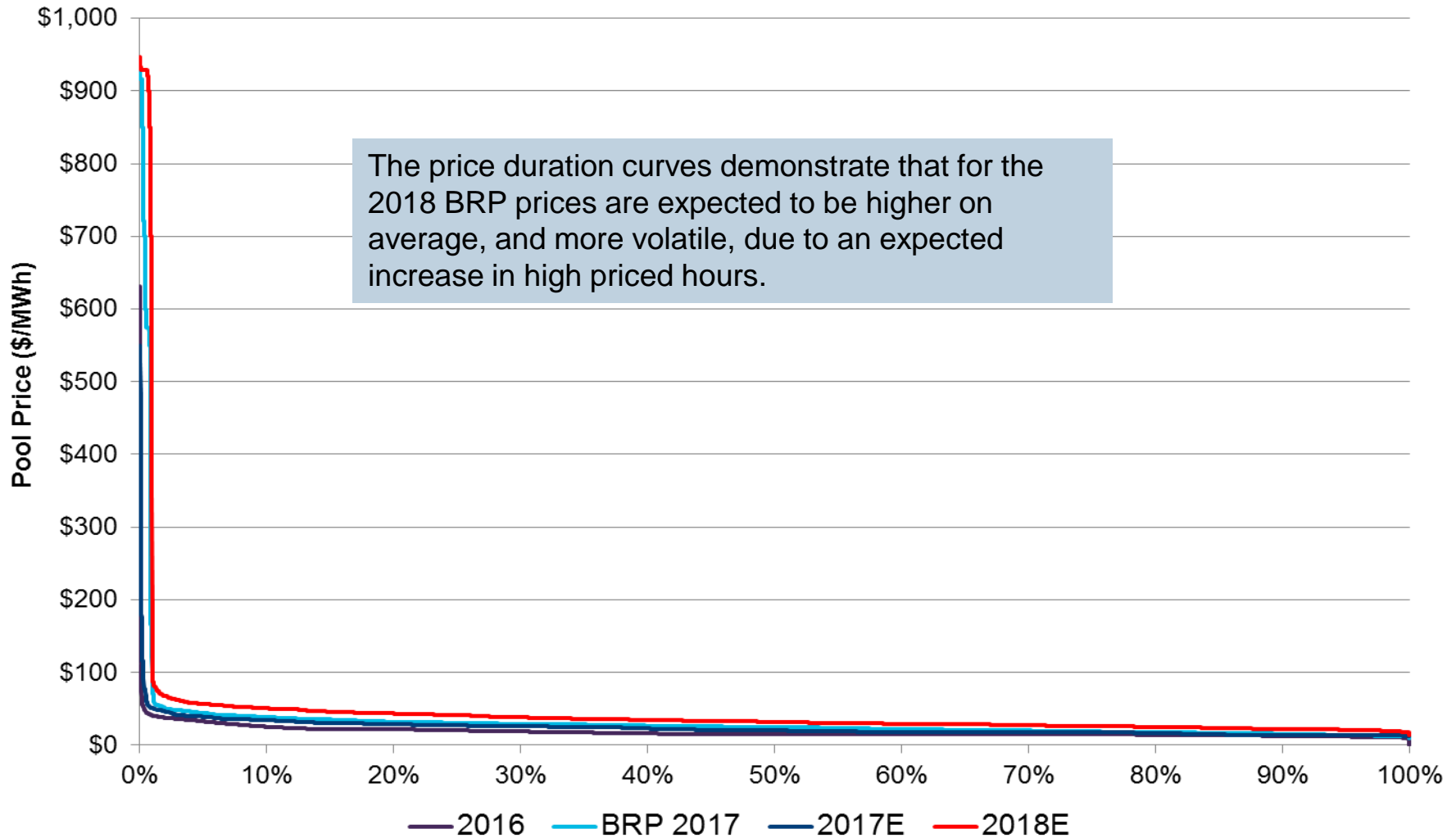


**2017E and 2018E represent the current 2017 projected and 2018 forecast based on the EDC pool price forecast

Historical and Year-to-Date Price Volatility



Pool Price Duration Curves



2018 Forecast Load

- 2017-2018 load forecast was prepared by the AESO for the purpose of the BRP and has considered:
 - Alberta GDP, population and labour predictions from the Conference Board of Canada Outlook (Nov 2016)
 - Historic normal weather patterns (11-year median temperatures)
- Alberta Internal Load (AIL) is expected to grow:
 - 3.7% from 2016 to 2017
 - 2.5% from 2017 to 2018

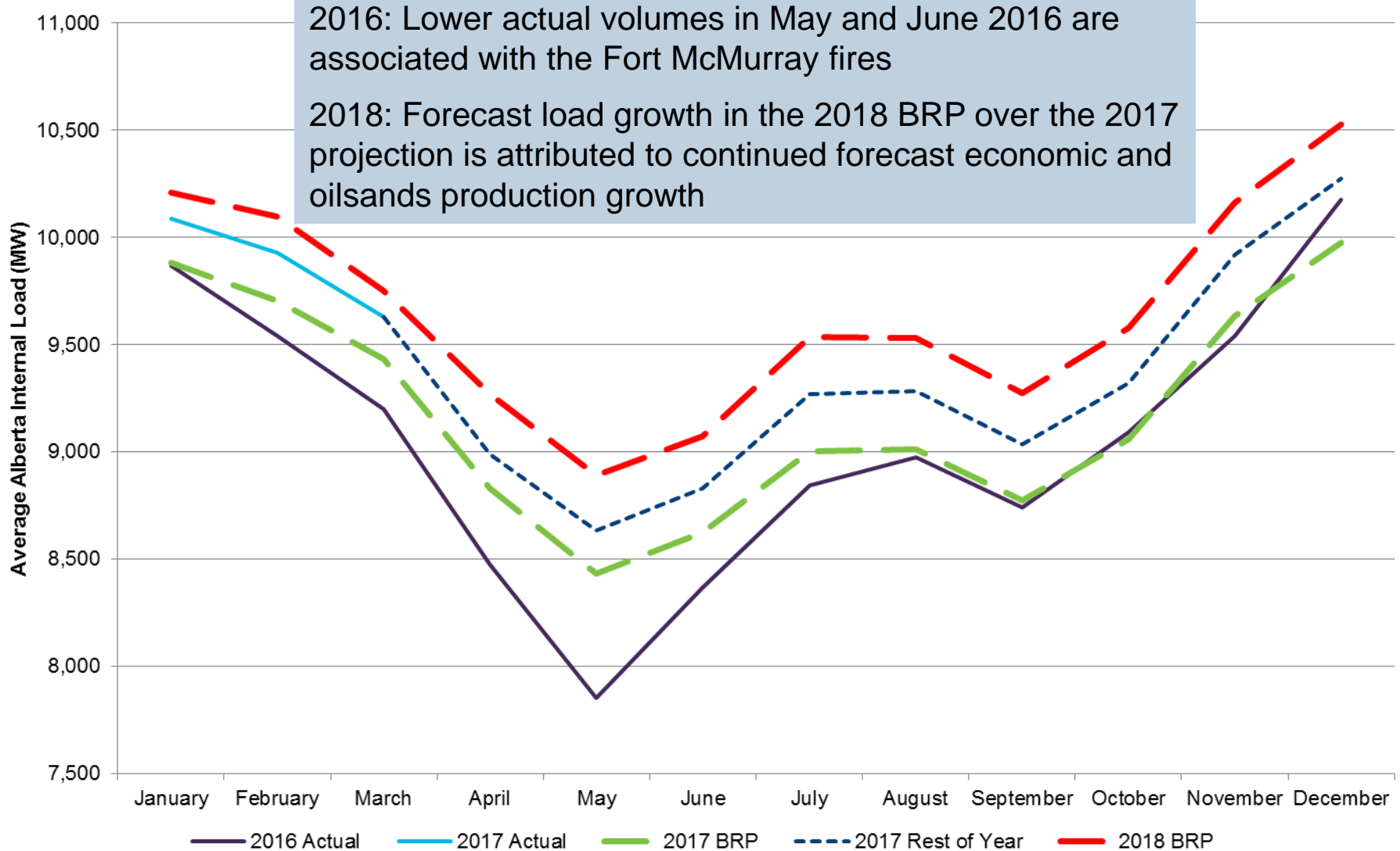
Load Forecast Assumptions (continued)

- Load growth is expected due to:
 - Forecast economic and population growth
 - Oilsands production growth
 - Observed load growth in Jan and Feb 2017
 - Normal weather assumptions
- No impact of the 2016 fires in Northern Alberta to load growth (i.e. no lost load)

(GWh)	2018 Forecast	2017 Projected	2017 BRP	2016 Actual	2015 Actual
AIL* Volumes	84,607	82,540	80,553	79,560	80,257

* AIL – Alberta Internal Load

Load Forecast



2018 Forecast Wires Costs

Wires Cost Summary

(\$ millions)	2018 Forecast	2017 Projected	2017 BRP	2016 Actual	2015 Actual
Wires	1,717.6	1,691.7	1,723.9	1,702.0	1,560.8
Invitation to Bid on Credit (IBOC)	1.9	1.9	1.9	1.8	1.4
Location Based Credit Standing Offer (LBC SO)	3.5	3.5	3.5	3.2	3.7
TOTAL	1,723.0	1,697.1	1,729.3	1,707.0	1,565.9

- Wires costs are the amounts paid to TFOs in accordance with their AUC-approved tariffs and are not controllable costs of the AESO
- IBOC and LBC SO programs are long-term contracts that were initiated in 2001 and 2002 as incentives for generation to locate closer to major load centres

2018 Forecast Ancillary Services Costs

Ancillary Services Cost Summary

(\$ millions)	2018 Forecast	2017 Projected	2017 BRP	2016 Actual	2015 Actual
Operating Reserve (OR)	96.8	60.8	88.2	66.5	137.3
Load Shed Service for Imports (LSSi)	17.3	18.1	18.1	18.2	17.4
Contracted Transmission Must-run (TMR)	3.3	3.3	2.8	n/a	n/a
Conscripted Services (OR and TMR)	2.0	2.0	2.0	1.3	9.6
Reliability Service	2.9	2.9	2.9	2.9	2.1
Poplar Hill	2.8	2.8	2.8	2.8	2.6
Black Start	4.3	2.1	2.1	2.1	2.1
Transmission Constraint Rebalancing (TCR)	0.1	0.1	0.1	0.0	n/a
TOTAL	129.5	92.1	118.9	93.8	171.2
Pool Price (per MWh)	\$42.58	\$23.51	\$31.82	\$18.28	\$33.34
Gas Price (per GJ)	\$2.83	\$2.69	\$2.73	\$2.06	\$2.56

Refer to the Supplementary 2018 Forecast and Budget Information document for additional details including forecast methodologies and variance explanations.

Forecast Methodology

Operating Reserves (OR)

- Forecast OR costs is the sum of forecast hourly volumes multiplied by the hourly OR price

$$cost = \sum_{\substack{hour, \\ product}} volume * OR\ price$$

- **Volumes:** set by Alberta Reliability Standard requirements and dependent on forecast generation and load
- **OR price:** hourly price of operating reserves determined for each product type
- There are no changes to the methodology in preparing the 2018 forecast

2018 Forecast Transmission Line Losses Costs

Transmission Line Loss Costs Summary

- Transmission losses volumes are expected to remain consistent despite expected load growth due in part to transmission system enhancements

	2018 Forecast	2017 Projected	2017 BRP	2016 Actual	2015 Actual
Cost (\$ million)	\$96.7	\$53.5	\$74.1	\$41.3	\$75.8
Volume (GWh)	2,225	2,267	2,291	2,144	2,336
Pool Price (\$/MWh)	\$42.58	\$23.51	\$31.82	\$18.28	\$33.34

Forecast Methodology

Line Losses

- Forecast transmission line losses costs is the sum of hourly volumes multiplied by hourly pool prices

$$cost = \sum_{hour} volume * pool\ price$$

- **Volumes:** derived from an updated statistical model that utilizes forecast load, weather and calendar effects
- **Pool price:** hourly pool price provided by EDC

2017 and 2018 Preliminary General and Administrative Budget

General and Administrative Budget Process

- Amended process for 2017 Own Cost budgets
 - Preparation of January to June 2017 and approved in December 2016
 - Allowed for additional time for more details on the government's policy initiatives to become available
- For simplicity, 6-month budget was equal to half of 2016 approved G&A, interest and amortization budgets
- That approach allowed for continued focus on current initiatives with no material changes
- Currently prepared full 12-month budgets for 2017 and 2018 for presentation to stakeholders and AESO Board approval
- Recognize that only a significant change in assumptions will allow for any changes to the corporate budgets

General and Administrative Budget Considerations

- Ensuring reliability of AIES
- Focus on delivery of key corporate initiatives:
 1. Capacity Market development
 2. REP development and implementation
 3. CIP implementation
 4. EMS 3.0 commissioning and sustainment
 5. Fort McMurray West Debt Funding
 6. Long-term Transmission Plan
- Industry priorities, current and future workload assessments and an efficient delivery approach were the focus of an internal review to determine budget requirements
- Determined that the successful delivery of the key corporate initiatives while maintaining our high standards of reliability align to existing budget funding

Key Corporate Initiatives

Initiatives / Work Streams	2016	2017	2018
TRANSMISSION PLANNING			
Coal Retirement	√		
Renewable Electricity Project Connections		√	√
Connection Process Enhancements	√	√	√
MARKET STRUCTURE			
Review of Market Structure	√		
Consultation and Design of Capacity Markets		√	√
Start of Capacity Market Implementation (Rules, IT Systems, Contracts/Legislation)			√
RENEWABLE ELECTRICITY PROGRAM			
Assess Renewable Electricity Program	√		
Develop REP Structure and REP 1	√	√	
Implement REP 1 Auction		√	
Develop REP 2		√	√
Settlement and Commercial Management Assessments		√	√

Key Corporate Initiatives

Initiatives / Work Streams	2016	2017	2018
CRITICAL INFRASTRUCTURE PROTECTION (CIP)			
Design and Development	√		
Implementation of Internal Compliance Program		√	
Internal Sustainment Program / Continuous Improvement		√	√
WECC CIP Audit			√
EMS 3.0 IMPLEMENTATION			
Development of EMS 3.0	√	√	
System Commissioning		√	
Ongoing Sustainment		√	√
COMPETITIVE PROCUREMENT – Fort McMurray West Transmission Project			
Permit and Licence Decision; Pricing Adjustments	√	√	
Debt Funding Competition		√	
Project Technical Oversight		√	√
Ongoing Contract Management			√

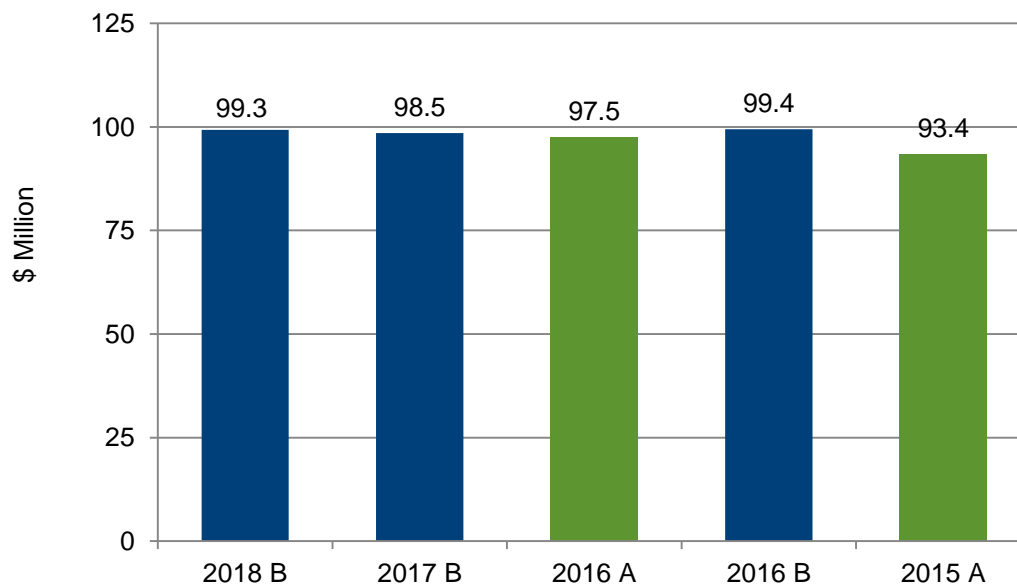
Other Budget Considerations

- Transmission resources are becoming more focused on connections (REP in particular) as opposed to the system NIDs which were addressed in recent AIES enhancements
- Transmission studies completed on an as-needed basis; may reduce early identification of issues
- With EMS 3.0 commissioning, anticipate capital costs to decrease in the future with expected increases in G&A to sustain the system (staff, consulting and IT costs)
- Operations continues to focus on implementing efficiencies; two new EMS CIP roles requested in 2018
- CIP resources added in 2016 are required to sustain CIP compliance; can not be redeployed
- Review of IT service-levels and rationalization of maintenance and licences
- Corporate-wide targeted approach to find best value while reducing costs for general expenditures

Own Costs Summary

(\$ millions)	2018 Budget *	2017 Budget *	2016 Actual	2016 Budget	2015 Actual
General & Administration	99.3	98.5	97.5	99.4	93.4
Interest	WIP	WIP	0.8	0.4	0.4
Amortization	WIP	WIP	24.3	24.4	26.0
TOTAL			122.6	124.2	119.8

* Preliminary



General & Administrative Costs

	2018 Budget *	2017 Budget *	2016 Actual	2016 Budget	2015 Actual
Staff Costs	67.1	65.3	66.4	66.1	64.8
Contract Services & Consultants	8.5	10.5	9.0	9.8	6.5
Administrative	3.9	3.7	4.3	4.9	4.1
Facilities	7.5	7.1	7.0	7.8	7.6
Computer Services and Maintenance	11.0	10.6	9.3	9.4	9.0
Telecommunications	1.3	1.3	1.5	1.4	1.4
TOTAL	99.3	98.5	97.5	99.4	93.4

* Preliminary

Differences are due to rounding

2017 and 2018 Preliminary Budgets

	\$ Million	
2016 Actual		97.5
Staff Costs	(1.1)	
Contract Services	1.5	
Administration	(0.6)	
Facilities	0.1	
Computer Services & Telecomm	1.1	1.0
2017 Preliminary Budget		98.5
Staff Costs	1.9	
Contract Services	(2.0)	
Administration	0.1	
Facilities	0.4	
Computer Services & Telecomm	0.4	0.8
2018 Preliminary Budget		99.3

Other Industry Costs

\$ Million	2018 Budget *	2017 Budget *	2016 Actual	2016 Budget	2015 Actual
AUC Fees – Transmission	12.7	11.8	12.1	12.0	12.0
AUC Fees – Energy Market	6.4	6.0	6.6	7.0	7.0
Regulatory Process Costs	WIP	WIP	1.6	1.6	1.7
WECC/NWPP** Costs	WIP	WIP	2.2	2.2	2.1
Total Costs			22.6	22.8	22.8

* Preliminary

** Western Electricity Coordinating Council / Northwest Power Pool

2017 and 2018 Preliminary Capital Budget

Capital Budget Historical

Capital Expenditures (\$ million)	2018 Budget	2017 * Revised	2017** Projected	2016 Actual	2015 Actual
Key Capital Initiatives	4.5	6.6	8.0	3.2	10.1
Other Capital Initiatives	7.5	4.0	4.1	2.6	3.5
Life Cycle Funding	6.5	6.4	6.7	7.2	3.1
Sub total	18.4	16.9	18.8	13.0	16.7
Special - MSR	-	-	-	2.3	4.6
Special - EMS	-	7.1	5.9	15.4	7.3
Special - SCC	16.0	2.9	6.8	0.7	-
Total	34.4	26.9	31.5	31.4	28.6
differences may exist due to rounding					

Definitions:

Key Capital Initiatives – Most critical projects that the AESO believes must be completed within the timeframe identified

Other Capital Initiatives – Other projects that have more flexibility in planning or delivery so timing is not as critical

Life Cycle Funding – Hardware replacements (end of useful life) and recurring software upgrades and leasehold improvements

* 2017 Revised – Spent to date (March actuals) plus estimate to complete in current year

** 2017 Projected – As provided in the 2017 Business Plan and Budget Proposal (Nov 2016)

Capital Budget 2017

\$ million	2017 Updated *	2017 BRP Projected	Change
General Capital	16.9	18.8	(1.9)
Major Projects	10.0	12.7	(2.7)
Total	26.9	31.5	(4.6)

* Incorporates Jan to March 2017 actuals and 9-month estimate

Category	Change
1. CIP Implementation	0.5
2. Interties	(0.3)
3. IT & Cyber Security	(1.0)
4. SCADA/WAN	(0.4)
5. Reliability EMS (real time congestion forecasting)	(0.2)
6. SCC Expansion - Major	(3.9)
7. EMS Implementation – Major **	1.2
8. Various	(0.5)
Variance	(4.6)

** Total EMS project cost estimated to be under budget by \$2.2 million

Capital Budget 2018

- Initial assessment of \$34.4 million for 2018 capital budget

\$ million	2018 BRP	2017 Updated *	Change	
General Capital	18.4	16.9	1.5	A
Major Projects	16.0	10.0	6.0	B
Total	34.4	26.9	7.5	

A - Mainly due to reliability programs (EMS and Other)

B - Mainly due to System Coordination Centre (SCC) Expansion Construction Phase in 2018 offset by EMS Implementation Phase completion and SCC design activities in 2017

Capital Budget 2017 and 2018

Capital Expenditures (\$ million)	2018 Budget	2017 Revised ²	2017 Projected ¹	2016 Actual	2015 Actual
Key Capital Initiatives					
1. Reliability (EMS ³ elements)	0.3	0.0	0.5	-	6.0
Reliability (other - non EMS elements)	0.1	0.0	0.4	0.7	0.4
2. Critical Infrastructure Protection	0.5	0.6	0.1	0.3	0.3
3. IT & Cyber Security	2.0	1.7	2.7	1.7	0.6
4. MSR ⁴ - Sustainment	-	3.0	3.0	-	-
5. Market Evolution	1.2	0.1	0.1	-	2.1
6. Intertie Framework	-	-	0.3	-	0.4
7. AESO Website Replacement	-	-	-	0.6	-
8. Technology Solutions ⁵	0.5	-	-	-	-
9. Facilities	-	1.0	1.0	-	-
Total Key Capital Initiatives	4.5	6.4	8.0	3.3	10.1
Other Capital Initiatives	7.5	4.0	4.1	2.6	3.5
Life Cycle Funding	6.5	6.4	6.7	7.2	3.1
SubTotal Capital	18.4	16.9	18.8	13.0	16.7
Major - EMS	-	7.1	5.9	15.4	7.3
Major - MSR	-	-	-	2.3	4.6
Major - SCC⁶	16.0	2.9	6.8	0.7	-
Total Capital	34.4	26.9	31.5	31.4	28.6

Differences may exist due to rounding

¹ As provided in the 2017 Business Plan and Budget Proposal (Nov. 2016)

⁴ Market System Replacement & Reengineering (sustainment activities only)

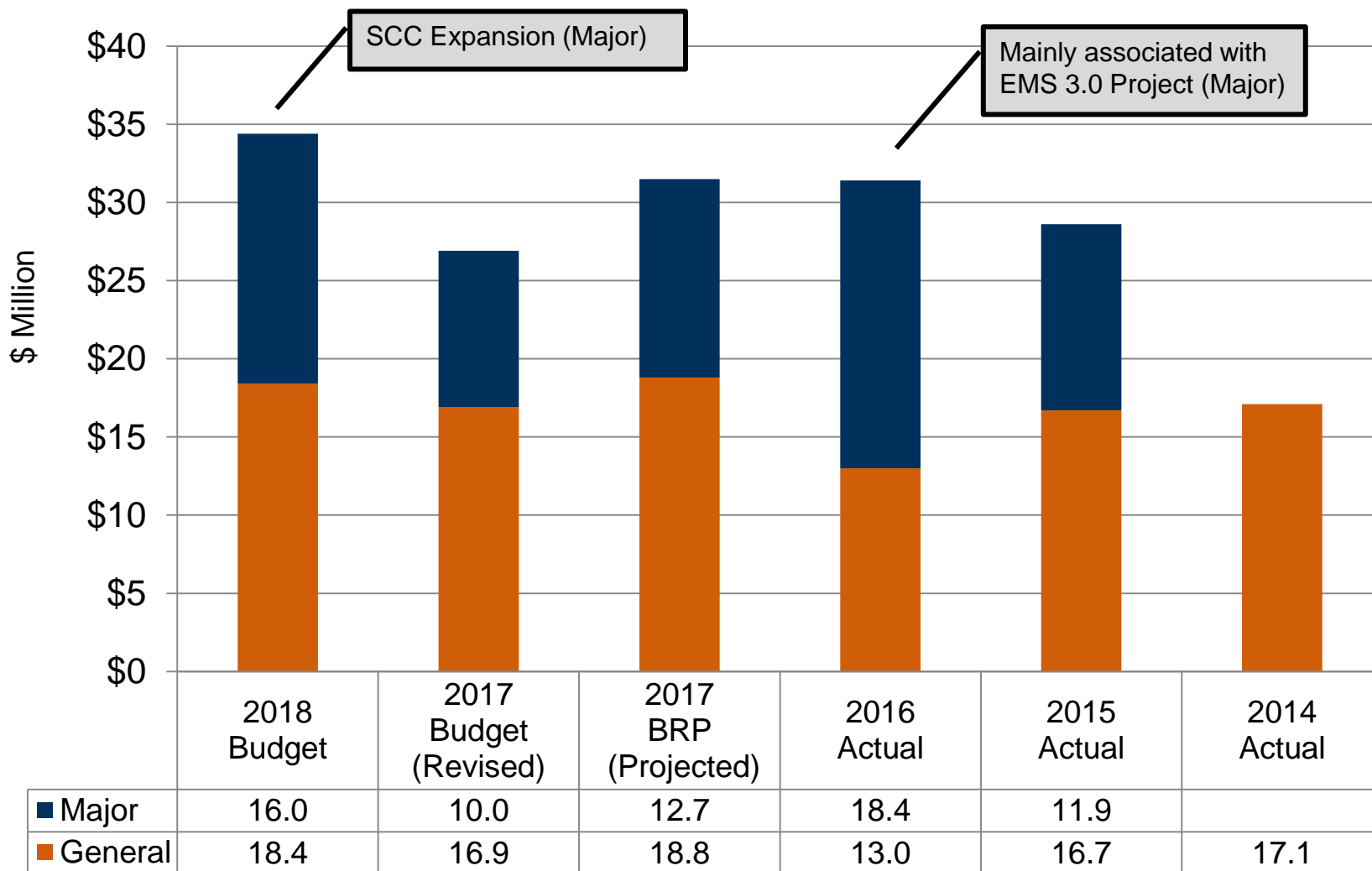
² March 31, 2017. Spent plus estimate to complete for current year

⁵ Primarily load forecasting tool replacement

³ Energy Management System

⁶ System Coordination Centre Expansion

Capital Spend Historical and Budgeted



Capital Budget

Other Capital Initiatives – Summary

- Other application or infrastructure upgrades
 - Reliability EMS
 - Integration of Renewable Electricity Program
 - Sustainment program
 - Reliability other (non EMS)
 - System Enhancements Program
 - Business technology solutions
 - Records management
 - Loss factor tool
 - Financial system
 - Various other

Capital Budget

Life Cycle Funding - Summary

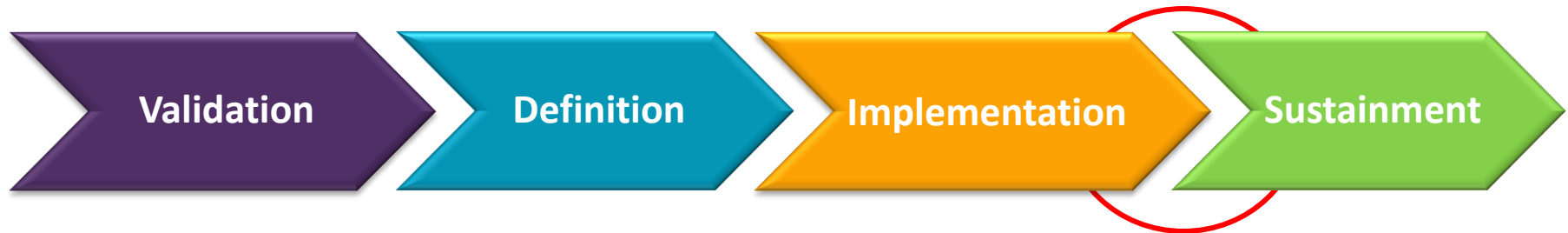
- Ongoing investment in general infrastructure
 - Communications
 - Database
 - End-user computing
 - Enterprise services
 - Monitoring
 - Network
 - Non-project capital
 - Servers
 - Storage

Major Capital Projects

Major Capital Projects

EMS III Program – Implementation

- Multi-phase/year initiative to upgrade the Energy Management System (EMS) infrastructure and application to vendor supported version

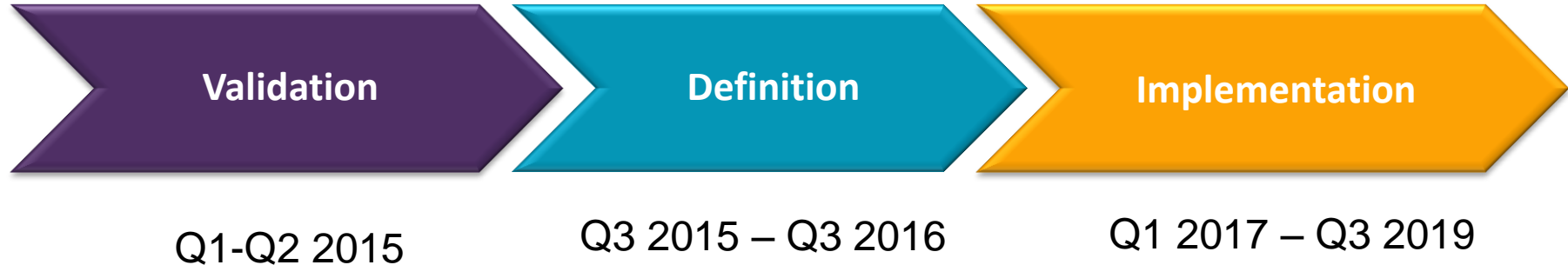


- Implementation phase initiated in Q4-2015 and expected to complete on or before Q4 2017; budget estimate \$31.7M
- Sustainment and optimization phases to follow; related costs become part of the ongoing general capital program (costs included in slide 38)

Major Capital Projects

SCC Expansion Program – Implementation

- Expand the System Coordination Centre (SCC) to accommodate the increase in staffing levels required to support new services and new control room applications/tools

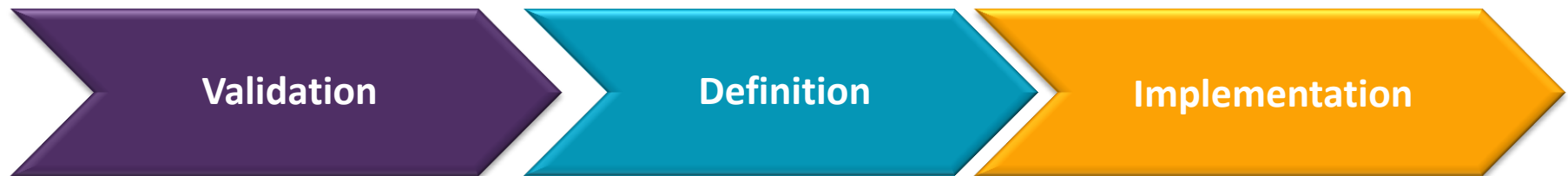


- Implementation phase initiated Q1 2017
- Activities include: detailed design, permits, award of contract, construction, commissioning, closeout
- Target completion Q3 2019; cost estimate for phase \$21.9M

Major Capital Projects

Market Systems Transition - pending

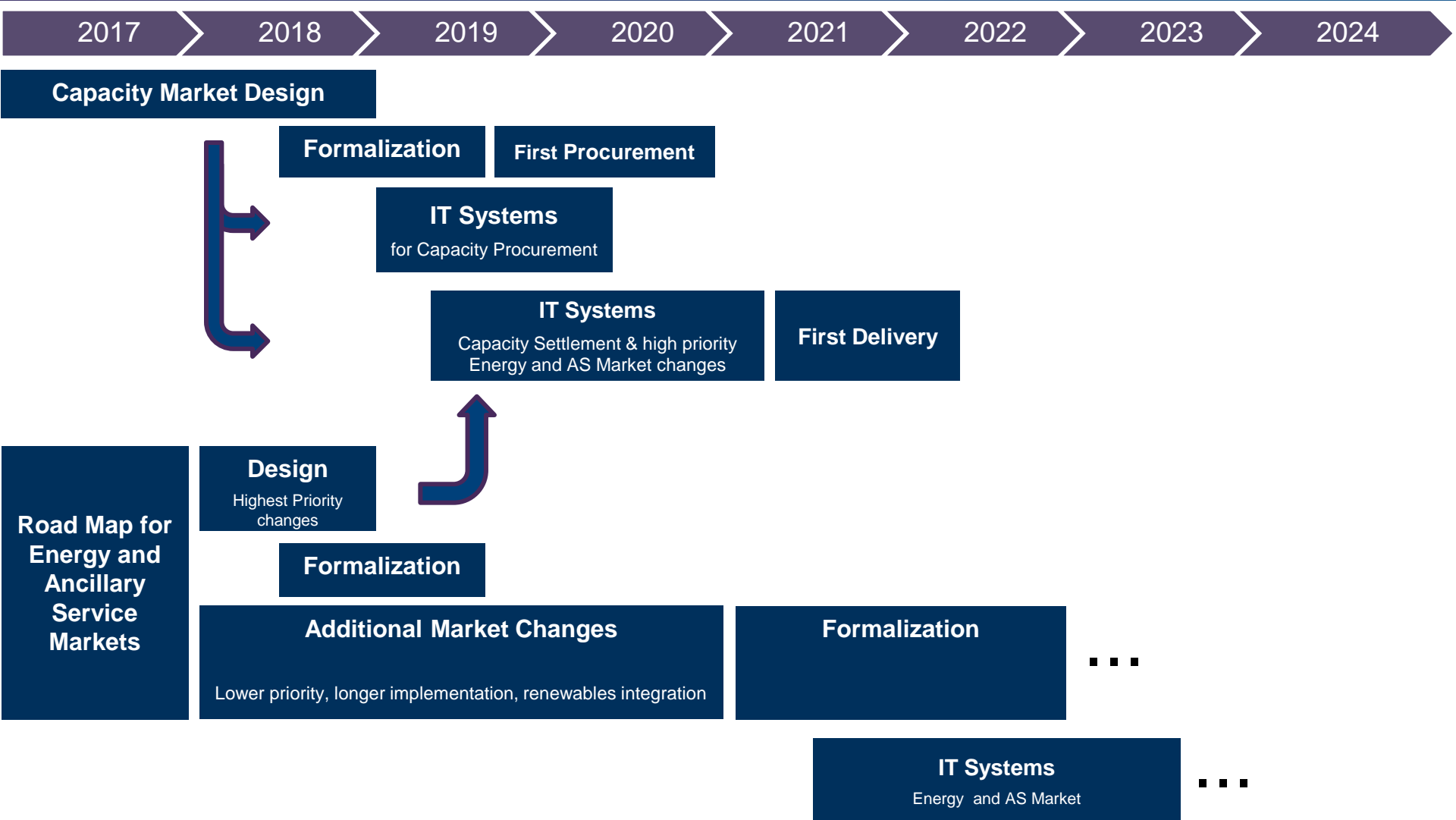
- Multi-phase/year initiative to transition the AESO's existing market systems to support Climate Leadership Plan requirements



- Scope includes capacity market, energy market and ancillary services market changes as well as the lifecycle needs of the legacy market systems - ball park timing 2018 to 2023
- Possibility that required validation/definition phase activities could advance into the second half of 2018; depends on the progress/status/findings of related design, consultation and ISO rules development activities planned for 2017 and 2018
- To be included in 2019 BRP (2018 process) or approved as part of a separate BRP process depending on timing

Major Capital Projects

Expected MST* Development Roadmap



* MST – Market Systems Transition

Management Controls and Contingency

Management Controls and Contingency

Results of Forecast	Related Budget Process
If the forecast is <u>below or in line</u> with the previously approved budget amount	At management's discretion, any under-budget amounts will be used to advance future year business priorities or will be accumulated in the deferral accounts
If the forecast is <u>above</u> the previously approved budget amount and the amount is determined to be a 'manageable variance'	Management would request approval from the AESO Board and subsequently issue a stakeholder communication
If the forecast is <u>above</u> the previously approved budgeted amount and the amount is in excess of a 'manageable variance'	Management will review the new funding requirements with stakeholders, followed by a request for approval from the AESO Board

A '**manageable variance**' is a forecast to actual variance that would be:

- Less than 10% of budgeted general and administrative expenditures
- Less than 20% of budgeted capital

Thank You