

Session 2 – Hidden Value Missing Money & Electricity Markets

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- Alberta Market
 - Market model has successfully delivered low price, reliable electricity.
 - “If it isn’t broken, don’t fix it”
 - ✓ Trying to focus on the “additional” value may lose sight of the success achieved in the framework.
 - “Bad markets are better than good regulation” (Kahn)
 - ✓ Always use markets as first choice in monetizing value within policy framework
- Discussion
 - Storage – supply alternative
 - Coal / Carbon policy – environmental

Tradeoffs – changing the objective

- Asking the market to do something it wasn't designed to do doesn't always work.



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Energy

- Real-time spot market
 - Interconnected grid
 - No capacity mkt / no load obligations
 - Dispatch for all demand in the province
 - Single pool price
 - High load factor / industrial

Ancillary Services

- Operating Reserves market
- Contract for other AS

Transmission Access

- Connections
- Planned by ISO, congestion free targets
- Allocated on dispatch
- Tariffs

- Energy
 - Reliability driven
 - Fuel neutral
 - Manage ramp with merit order / AS
- Ancillary Services, with separate market for OR
- Transmission unconstrained means less focus on non-wires / optimized
- Is it Missing?
 - Pay for ramp value?
 - Pay for GHG offset / renewable value?
 - Pay for Transmission deferrals?
 - Tariff – value for grid reliability product?

Where's the problem? Simply externalities or a case of missing money?

Climate Change

Energy

- Real-time spot market
 - Interconnected grid
 - Dispatch for all demand in the province
 - Single pool price

Ancillary Services

- Operating Reserves

Transmission

- congestion free
- Allocated on dispatch

Storage / Batteries

- What is the driver for AESO?
 - Alternative supply source? Developer Economics?
 - Shaped by Technology Fund pilot projects
 - Potential renewable mandate in future?
- What is the driver for the developer?
 - Brattle categories – Definite value for developer to capture – but maybe not directly from AESO market.
 - Energy Market Arbitrage, **AS**, **Reducing AS needs**, Reducing Production costs, Avoiding Gen Investments, Deferring of T&D, Increasing Customer Reliability, Increasing Power Quality, Integrating Intermittent Renewable Resources, Reducing Cycling of Conventional Gen, Reducing Emissions, Reducing Line Losses.

- Tradeoffs in evaluation
 - Want to ensure a level playing field for supply options – so don't want to introduce a “subsidy” for storage
 - Yet may in doing so not fully “value” storage on the grid
 - But how do we incorporate this in a model that is premised on unconstrained
 - Continued evaluation as there are tradeoffs
 - Solution may leave some value on the table – as NO model can pay for every piece of value without eroding the price signals in other areas – example paying for ramping changes energy price signals

What are the broader efficiency tradeoffs to consider?

- Starting in 2012 the AESO saw increasing interest in storage in Alberta, driven in part by Climate Change and Emissions Management Corporation (CCEMC) funding initiatives
- To-date 5 storage projects have applied to the AESO for connection
 - 2 were canceled (Suncor/Teck 3 MW battery and Turning Point Generation 150 MW pumped hydro)
 - 1 Compressed Air (Rock Mountain Power 150 MW)
 - 1 battery (AltaLink 14 MW)
 - 1 battery associated with a wind facility (10 MW of storage, not yet publicly visible in our connection queue)
- CCEMC will announce results from latest RFP early June 2015. (TransAlta, AltaLink and Enercon have made funding applications related to storage projects)

AESO Recommendations for Next Steps on Storage



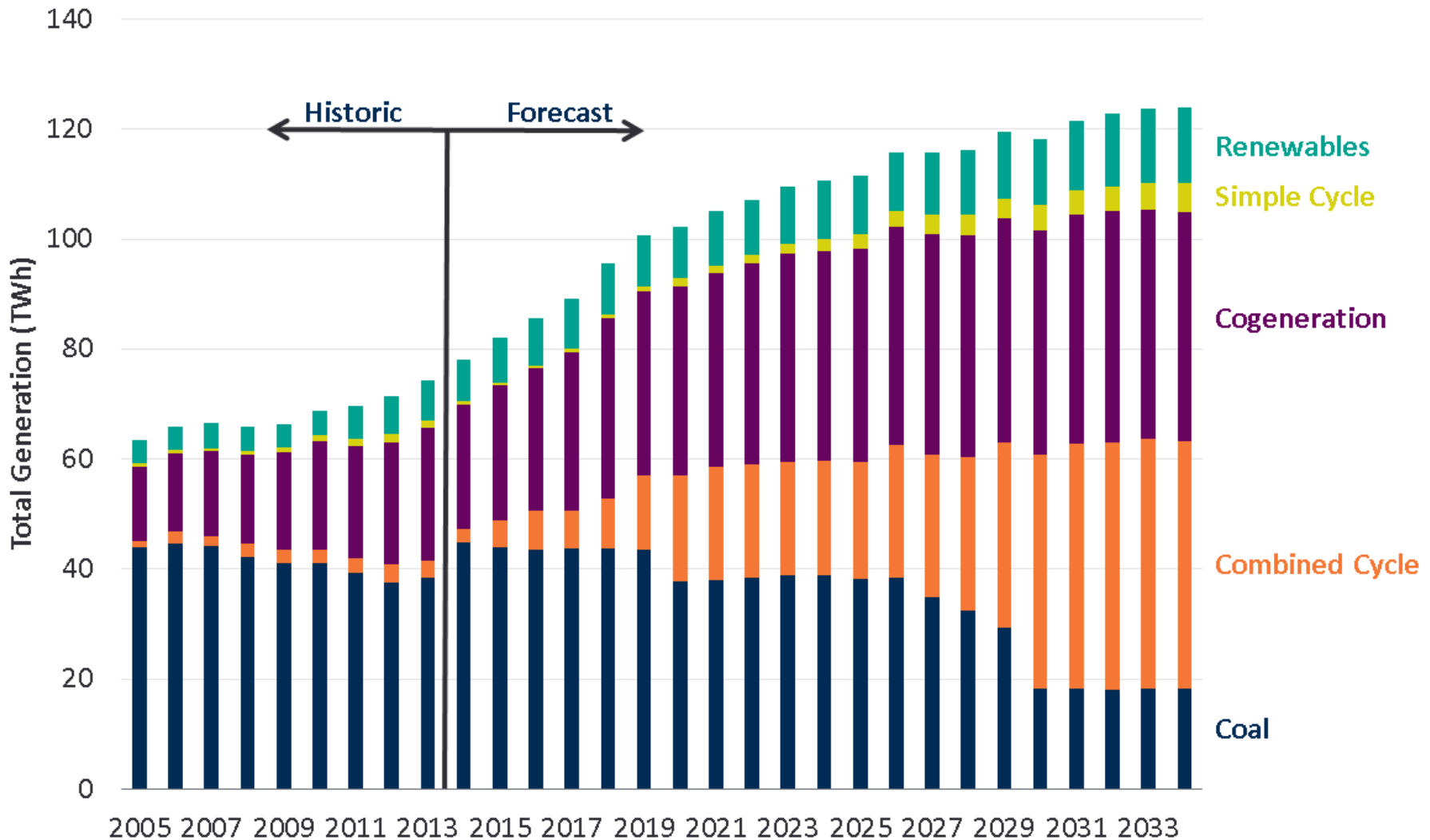
AESO Priorities are:

- Technical requirements for battery storage to connect and operate
- Tariff treatment
 - reflect nature of supply and load requirements
- Technical requirements for the provision of operating reserves
 - Maintain the minimum size requirement for regulating reserve (RR) (15 MW range) and for spinning reserve (SR) (10 MW)
 - Ensure no rule discrimination
- Recommendations are developed to be consistent with existing market structure and maintain technological neutrality. Ensure no barrier.

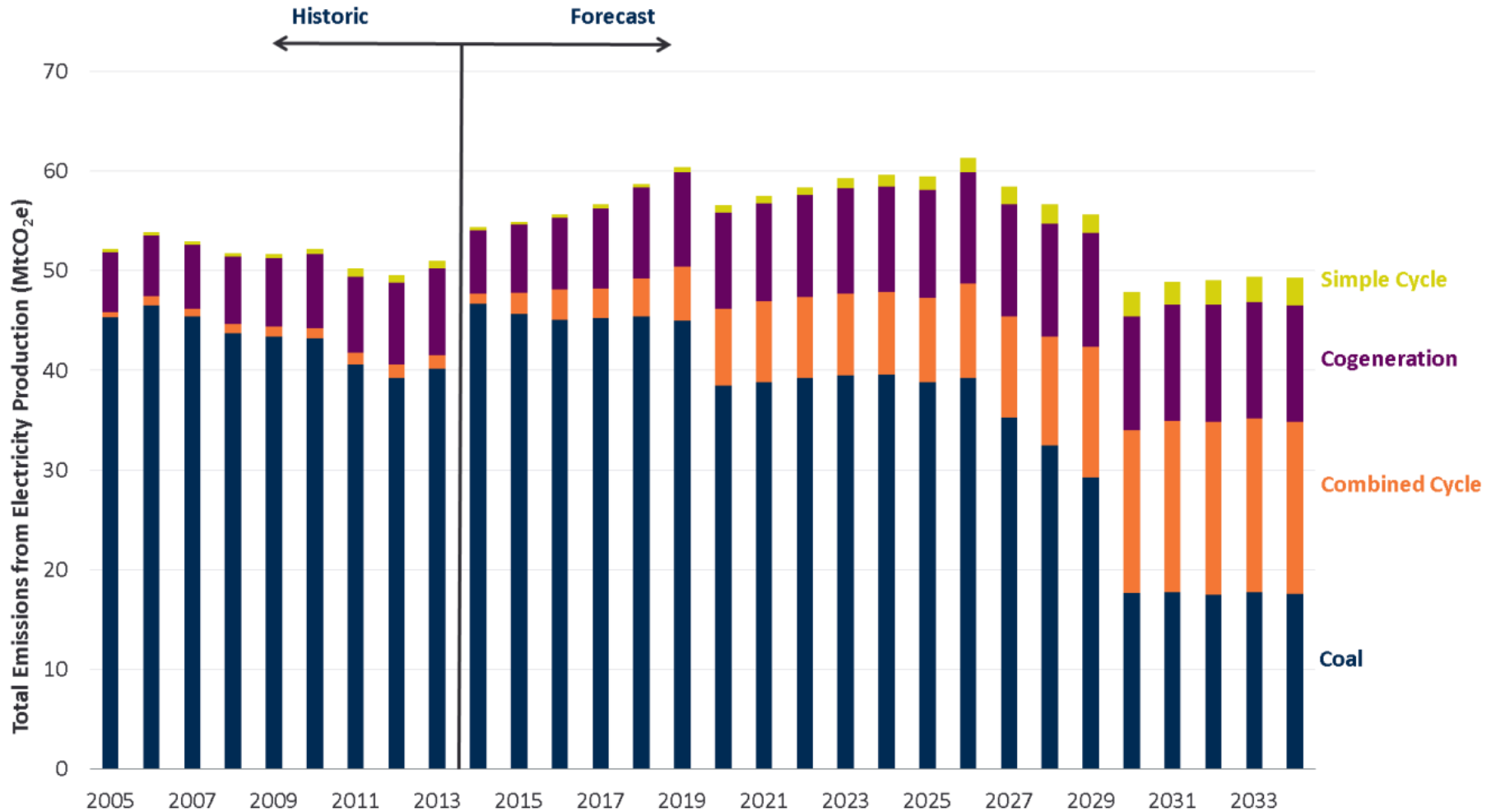
- Electricity market is fuel neutral and does not dispatch or plan based on environmental considerations.
- Policy focused on technology improvements
- Is this a problem?
 - Data shows limited impact in electricity sector, though aware of social license questions related to oil (aka Keystone pipeline)
 - Coal phasing out through Fed regulations; but it is an issue if other “fossil fuels” replace coal?
 - If climate change initiatives introduced separately, how would we implement? Would we be guided by other market examples?
 - Renewable Portfolio Standards?
 - Carbon Tax ?

Projected Annual Electricity Generation

Coal is diminishing

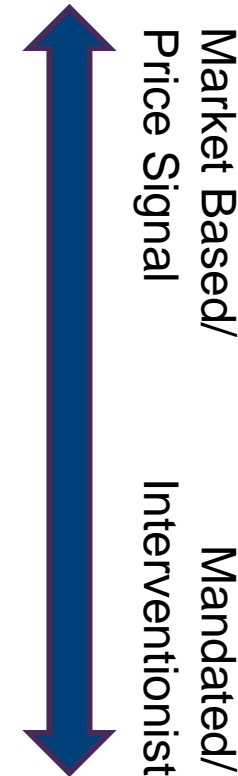


Projected Annual Emissions from the Electricity Sector Remain Relatively Constant



What to do? Policy external to Electricity.

- Environment objectives often external to electricity, however have a large impact
- Spectrum of policy options to consider:
 - Price on carbon
 - Cap and trade
 - Offset programs
 - Time-of-use pricing
 - Feed-in-tariff
 - Prohibitive emission intensity standard (Fed Reg)
 - Efficiency as a resource
 - Renewable Standards
- Still question of HOW to implement
- Options are “interventionist, increasingly so in market” vs “favor market approach”



- Very Market Based
 - Where is the missing money in the production of electricity and associated ancillary services?
 - Operating reserves a function of system need – Why would we introduce new products? What impact would this have on the energy market pricing?
 - All fuel types could argue that there is value not compensated in un-optimized system (ramping, baseload, etc)
 - Can climate change objectives remain an externality to the market – with impact only on fleet and possibly pricing of carbon
 - Change in policy (Fed and Provincial) possible
 - Elimination of fossil fuels by end of century?
 - GHG targets / coal mandates?

Maybe leaving more questions than answers.

Thank you