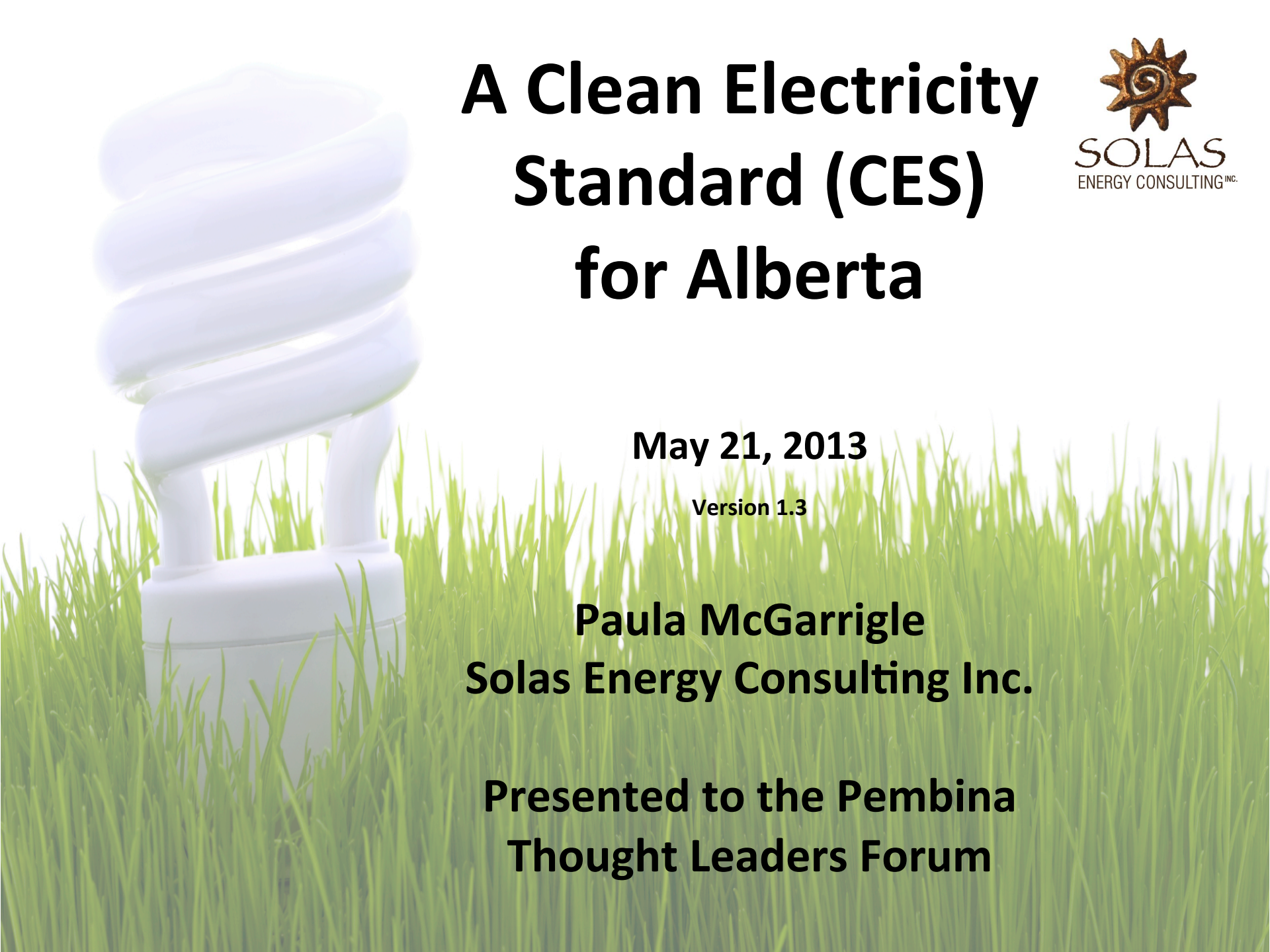

A Clean Electricity Standard (CES) for Alberta

SOLAS ENERGY CONSULTING INC.

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Version 1.3

Paula McGarrigle
Solas Energy Consulting Inc.

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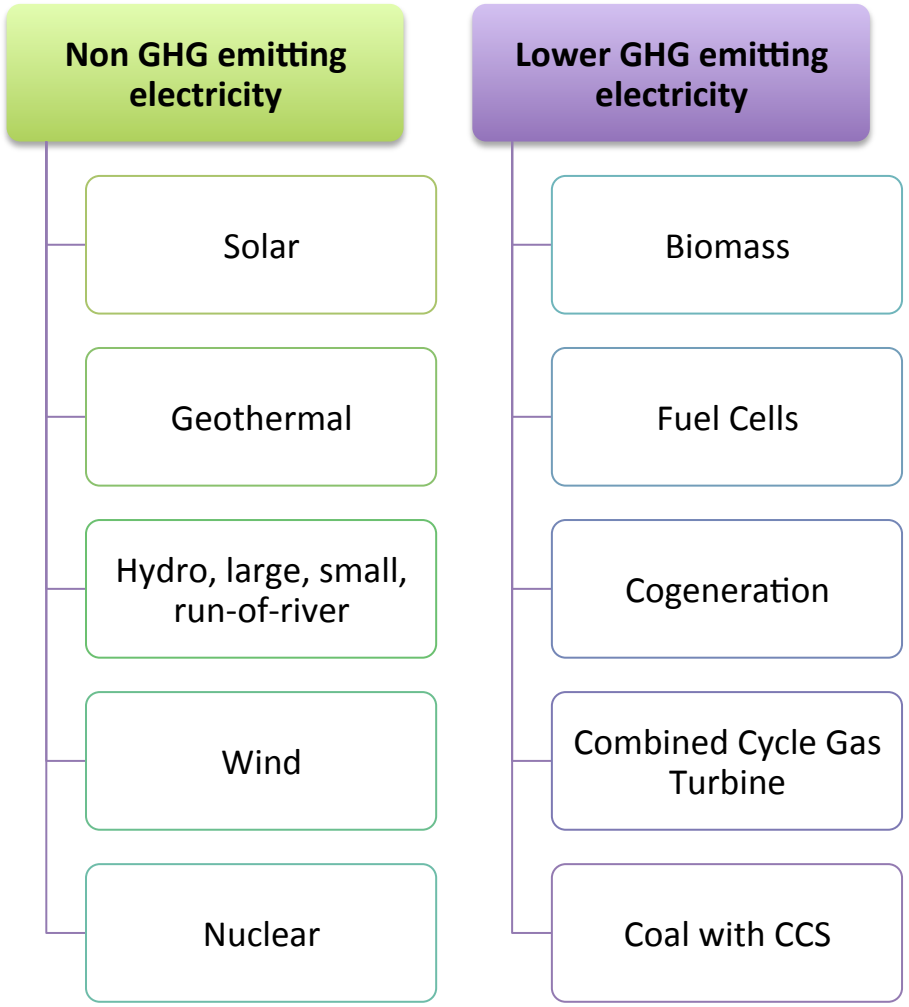
Presentation Purpose

- The case for a Clean Electricity Standard
  - Provide information
  - Answer questions
  - Receive feedback

- Part I
  - Rationale
  - The Clean Electricity Standard
    - What is it?
    - Why is it needed?
- Part II
  - Operationalizing the Clean Electricity Standard
    - How is it implemented?
    - Who does it affect?

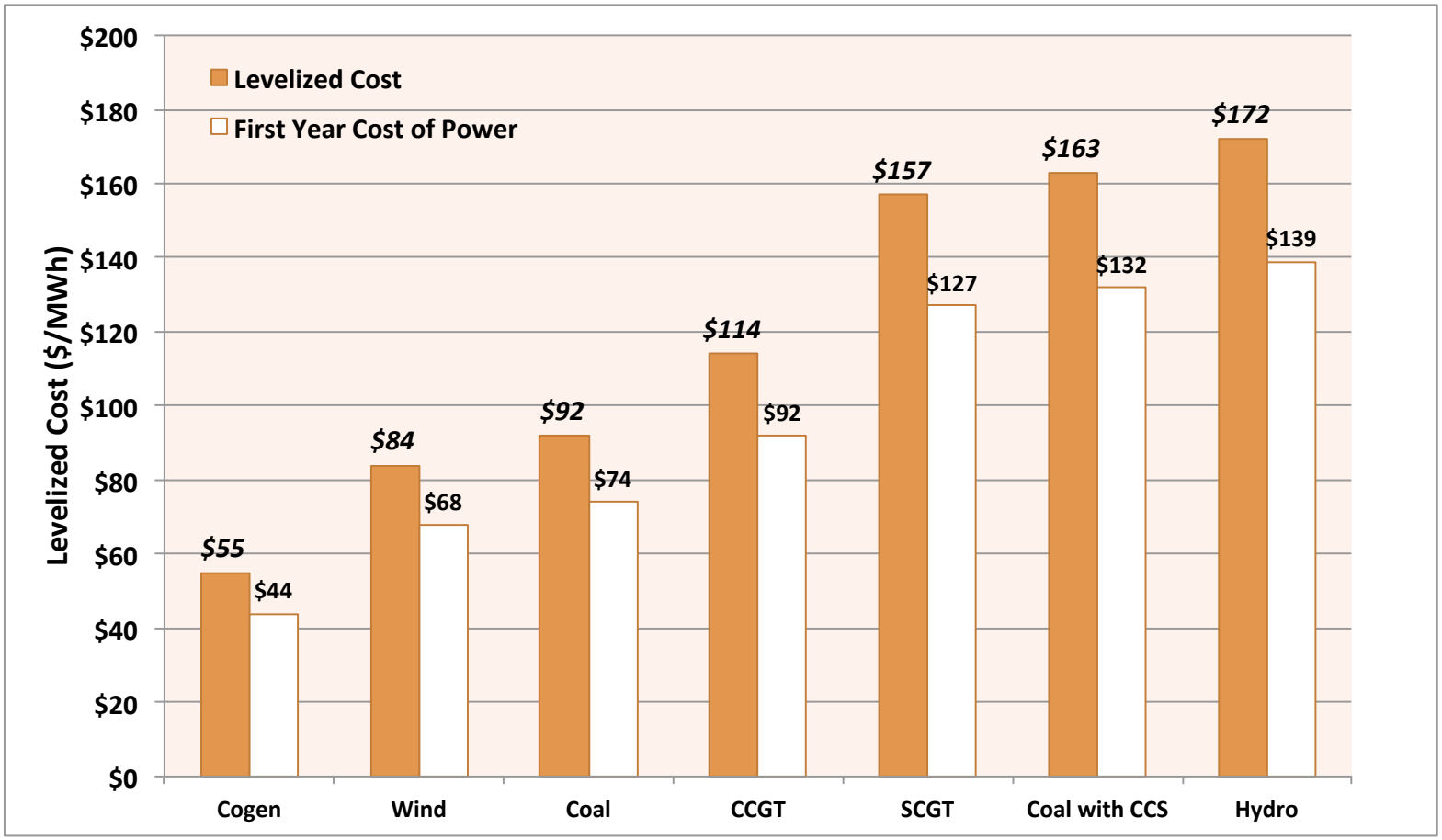
What is Clean Electricity?

- Clean Electricity refers to the greenhouse gas (GHG) intensity of the electricity.
  - Measured in Tonnes CO_2equivalent/MWh
- Multiple technologies can be considered clean electricity.
  - Emissions intensity compared to a standard.



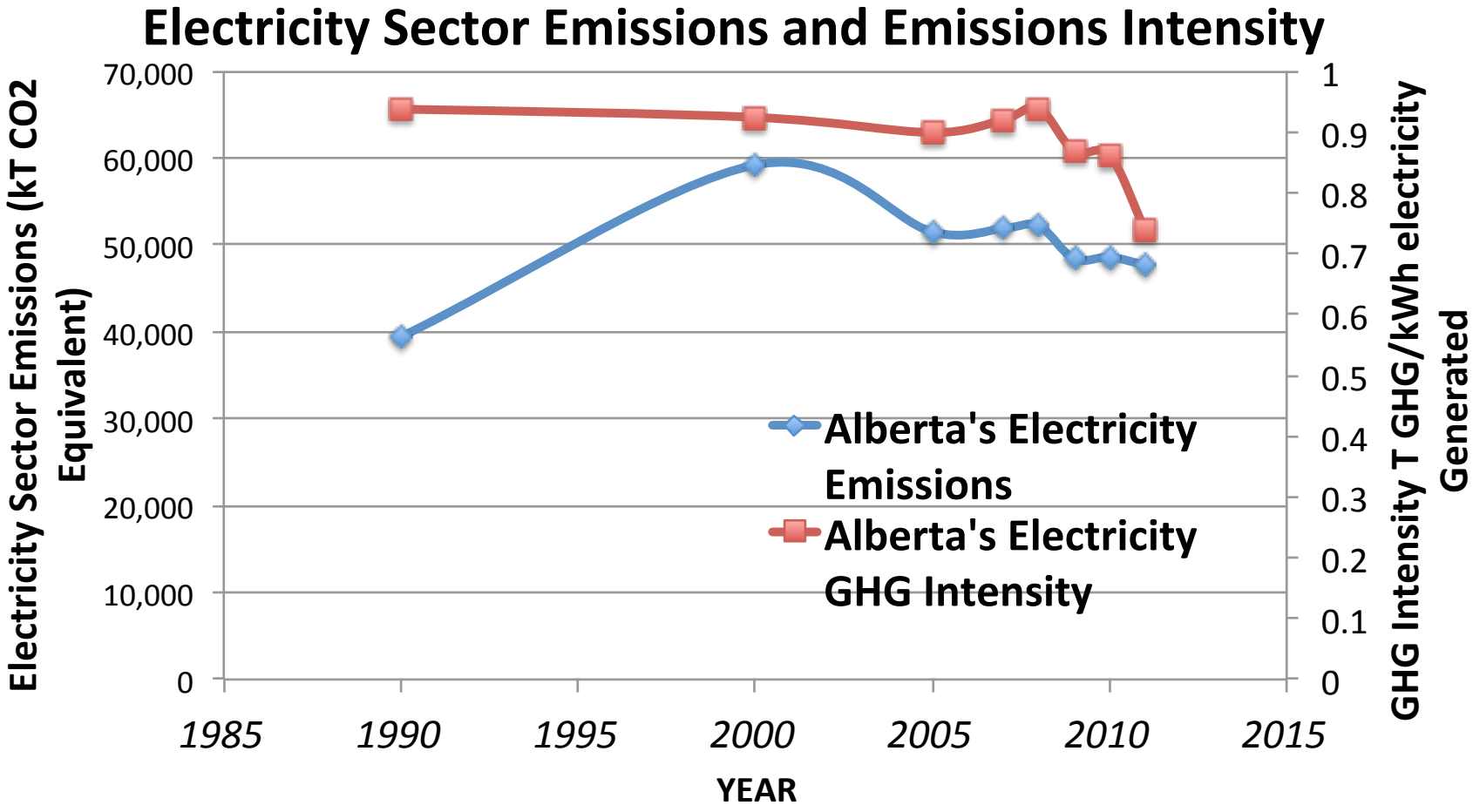
Is Clean Electricity More Expensive?

Alberta based generation levelized cost for new generation.
Transmission costs not included. Year 2016



Alberta WindVision Technical Overview Report – Solas Energy Consulting Inc. 2013

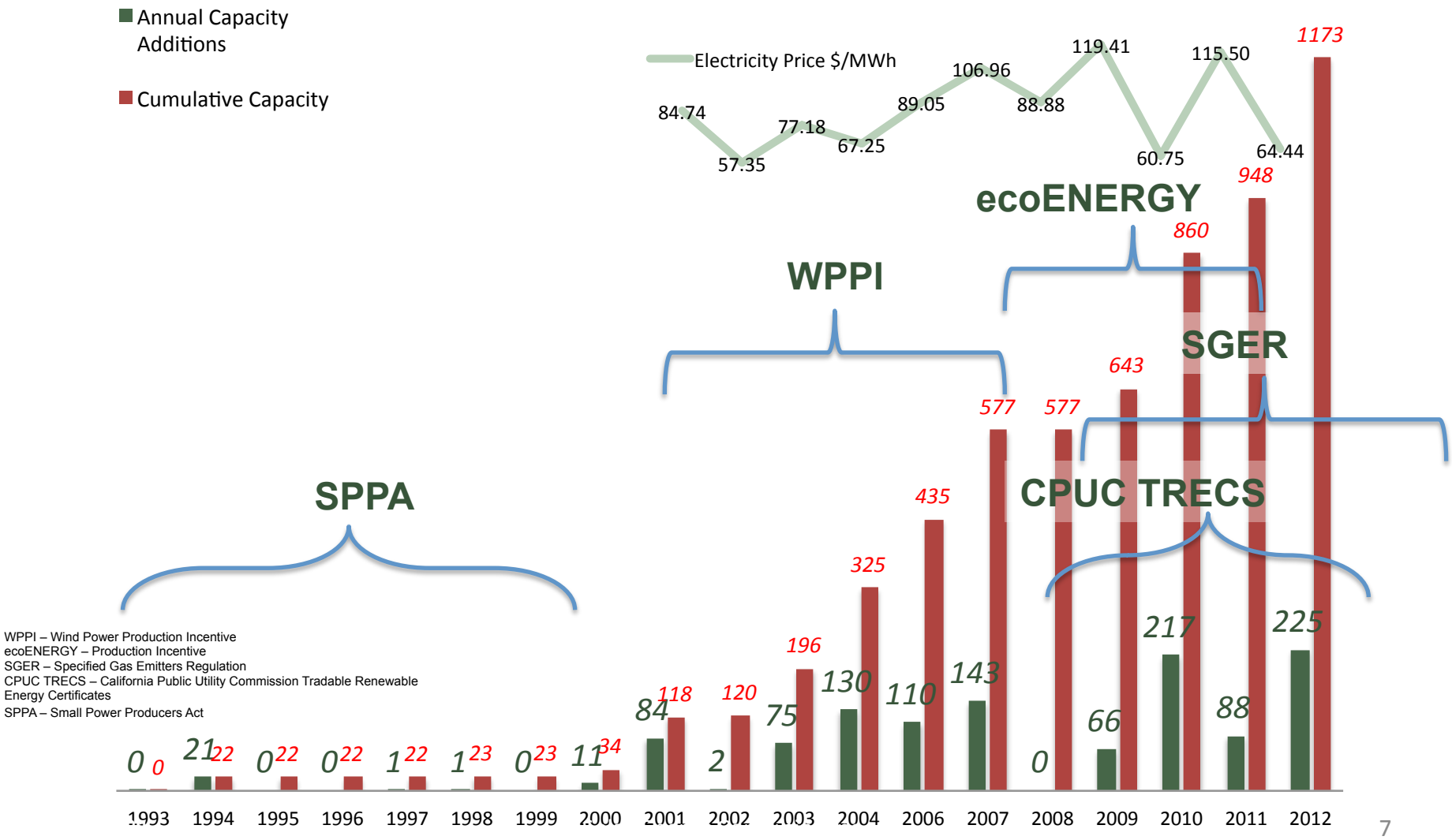
Alberta's Electricity GHG Emissions have reduced since 2000



Ref: National Inventory Report 2013

Emission reductions correlate with additional clean power. Programs have been critical for development of wind power.

Alberta Wind Power Capacity (MW)

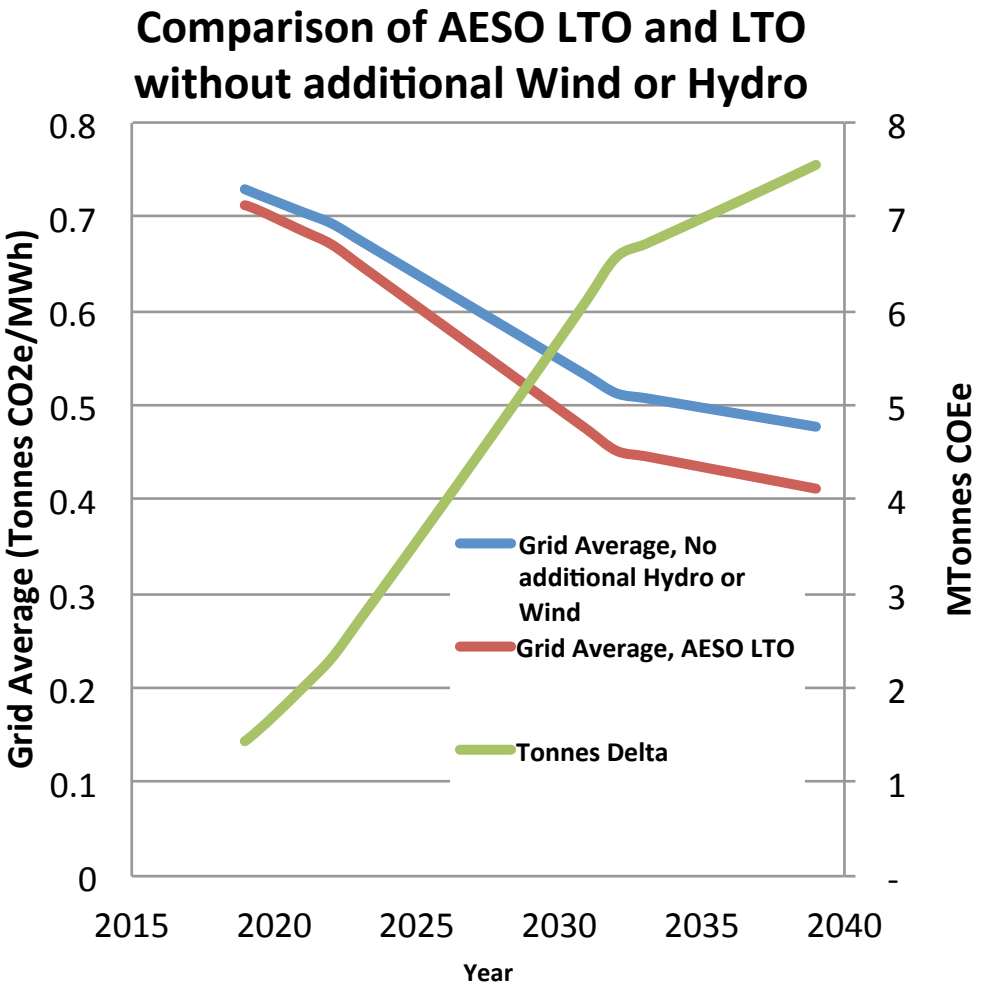


WPPI – Wind Power Production Incentive
ecoENERGY – Production Incentive
SGER – Specified Gas Emitters Regulation
CPUC TRECS – California Public Utility Commission Tradable Renewable Energy Certificates
SPPA – Small Power Producers Act

Changes in Alberta…..

- Provincial Regulations
  - Renewable Fuel Standards - existing
  - Provincial GHG Targets - may intensify
  - Alternative and Renewable Strategy – Work In Progress
- Federal Regulations
  - Coal Generation Retirements
  - Natural Gas Power Generation regulation pending

Federal regulations reduce grid emissions intensity. Hydro & Wind critical & contribute cumulative 104 Mt (2039)



- Federal Regulations drop emissions intensity as shown in AESO LTO.
- AESO LTO assumes:
  - incremental Wind and Hydro development
  - Repowering of end of life wind assets after 20 years
- Cumulative benefit of Wind and Hydro 104 MT by 2039.
  - ~ 7.5Mtonnes p.a. (2039)
  - Equivalent to 2.5 years of today's grid emissions.

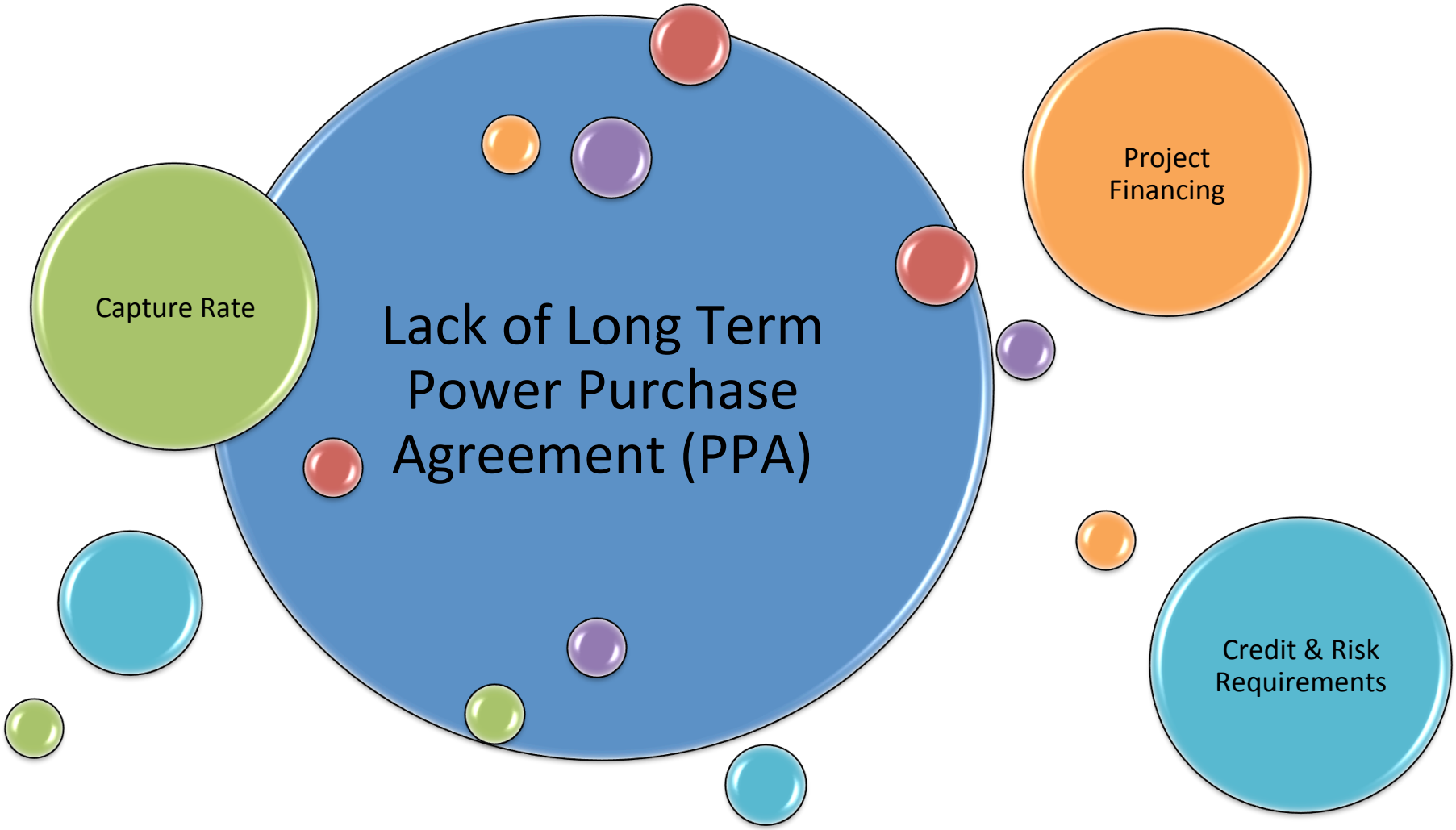
Unique Aspects of the Alberta Electricity Market

- De-regulated
- Fair Efficient Openly Competitive Regulation
- Energy Only Market
- Facility Based Emission Reduction Obligations
- Large coal generation base
- Few physical contracts
- Few long term contracts
- Transformational change pending
- ~7,000 MW of additional generation required with pending coal retirement, and demand growth

Three challenges in Alberta's Electricity Sector

- Cleaning the grid
  - Reducing emissions from our electricity sector
- Avoiding 'sole fuel' dependency in the grid
  - Reliance on a single fuel adds significant risk to all industrial sectors in the Alberta economy.
- Financing the growth
  - Balance sheet/ project financing for ~7,000 MW

What is the Problem?



A Potential Solution!

A mechanism is needed that is:

- ☑ Technology neutral,
- ☑ Revenue Neutral,
- ☑ FEOC compliant,
- ☑ Fits the existing market design,
- ☑ Compliments the Specified Gas Emitters Regulation,
- ☑ Produces predictable changes in the grid intensity,
- ☑ Transparent, and
- ☑ Simple to administer and understand.

FEOC – Fair Efficient and Openly Competitive

What is CES trying to achieve?

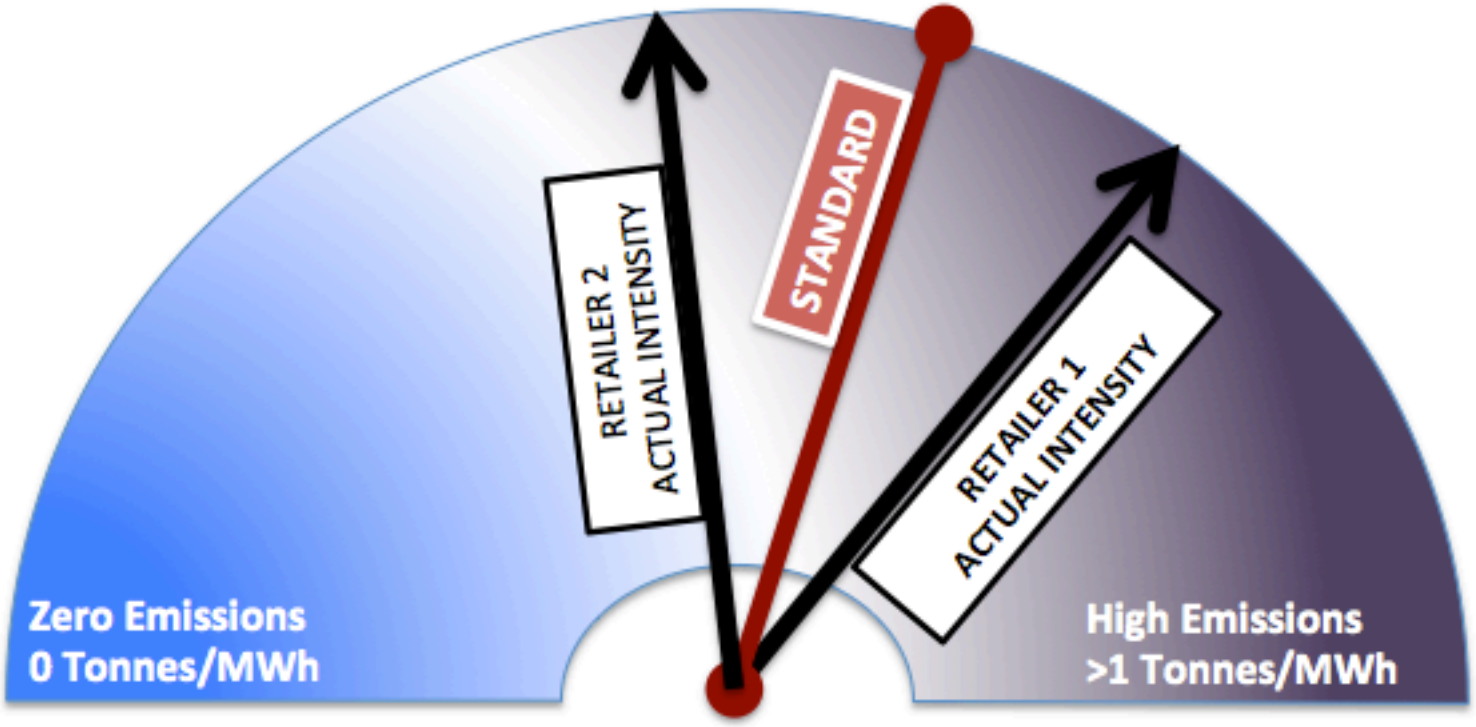
Alberta Electricity Market Challenges

- ❑ Cleaning the grid
- ❑ Avoiding 'sole fuel' dependency in the grid
- ❑ Financing the growth

CES Scorecard?

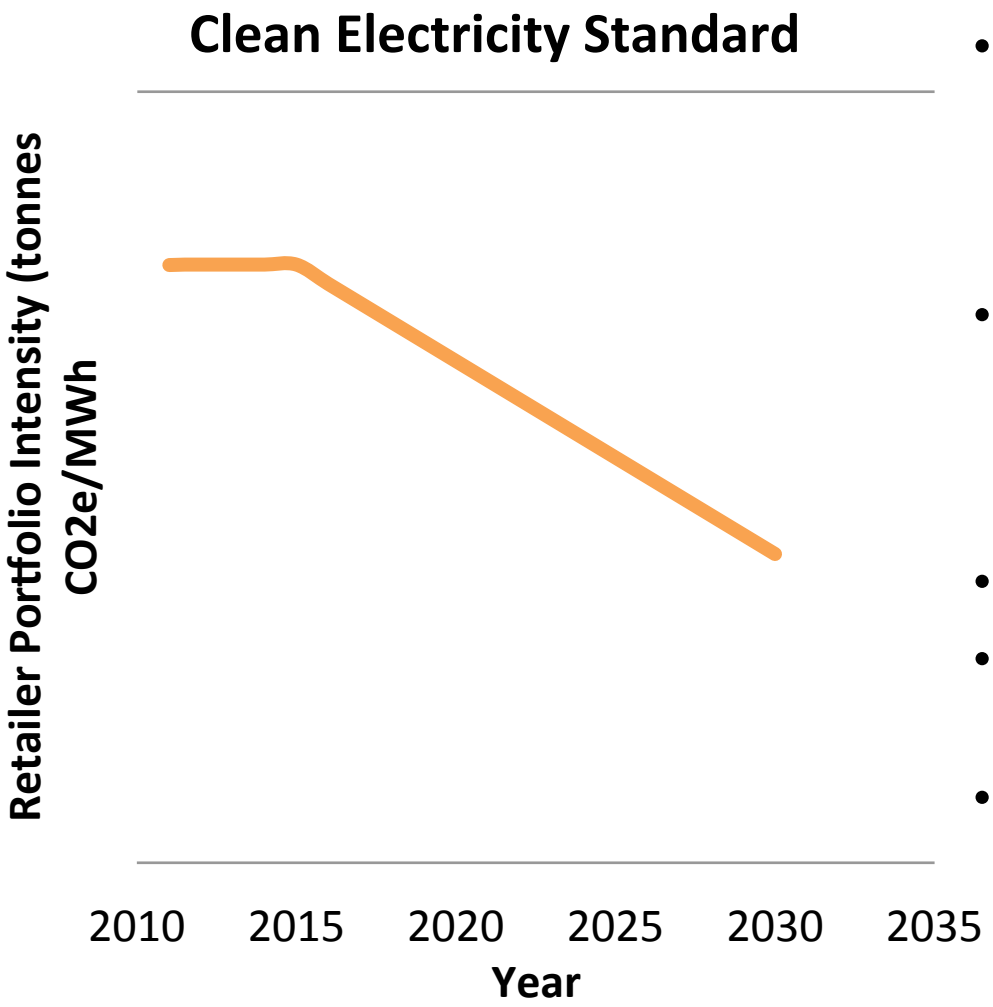
- ☑
- ☑
- ☑

Clean Electricity Standard (CES)



Pool Participant Portfolio Emissions Intensity and Comparison with Standard

Clean Electricity Standard



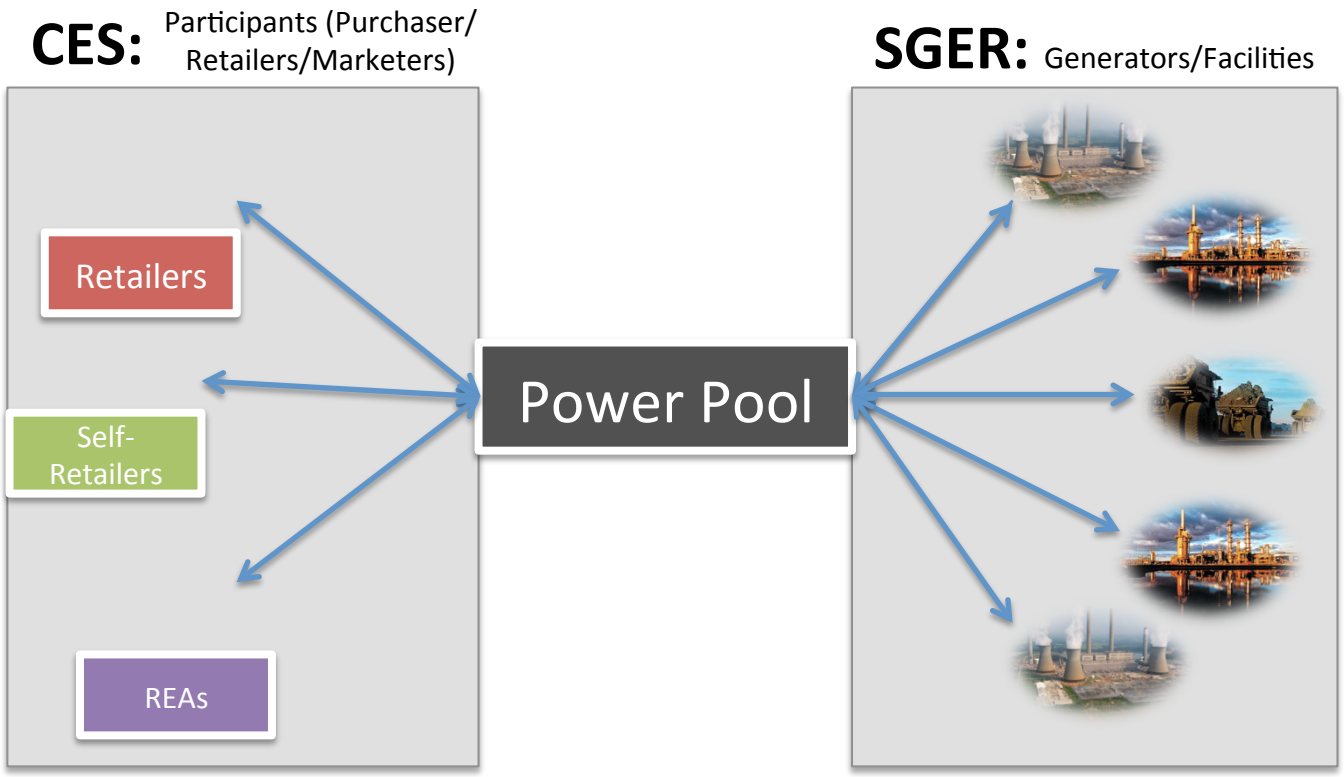
- Clean Electricity Standard would be set by the government on a portfolio intensity basis (Tonnes CO_2e/MWh)
- Standard would apply to Retailers in Alberta
  - Any one who purchases power to supply load
- Intensity level decreases over time.
- Retailers choice on generation technologies as part of portfolio.
- Retailers choose to comply as much or as little as desired.

Who is Regulated under CES?

- Retailers
- Self-Retailers
- Rural Electrification Associations (REAs)

- Based on settlement physical volumes with the AESO

Fit with Specified Gas Emitters Regulation (SGER)



Concurrent solution – complementary

Comparison of CES and SGER

SGER

- Focus on all **facility** emissions – **multi sector**
- Reduction of emissions intensity from **facility**
- Compliance through **facility emission reductions**
- Financial Compliance Alternative (**CCEMC**)
- Compliance funds used to stimulate **long term** emission reductions
- Tradable Units
- Offsets

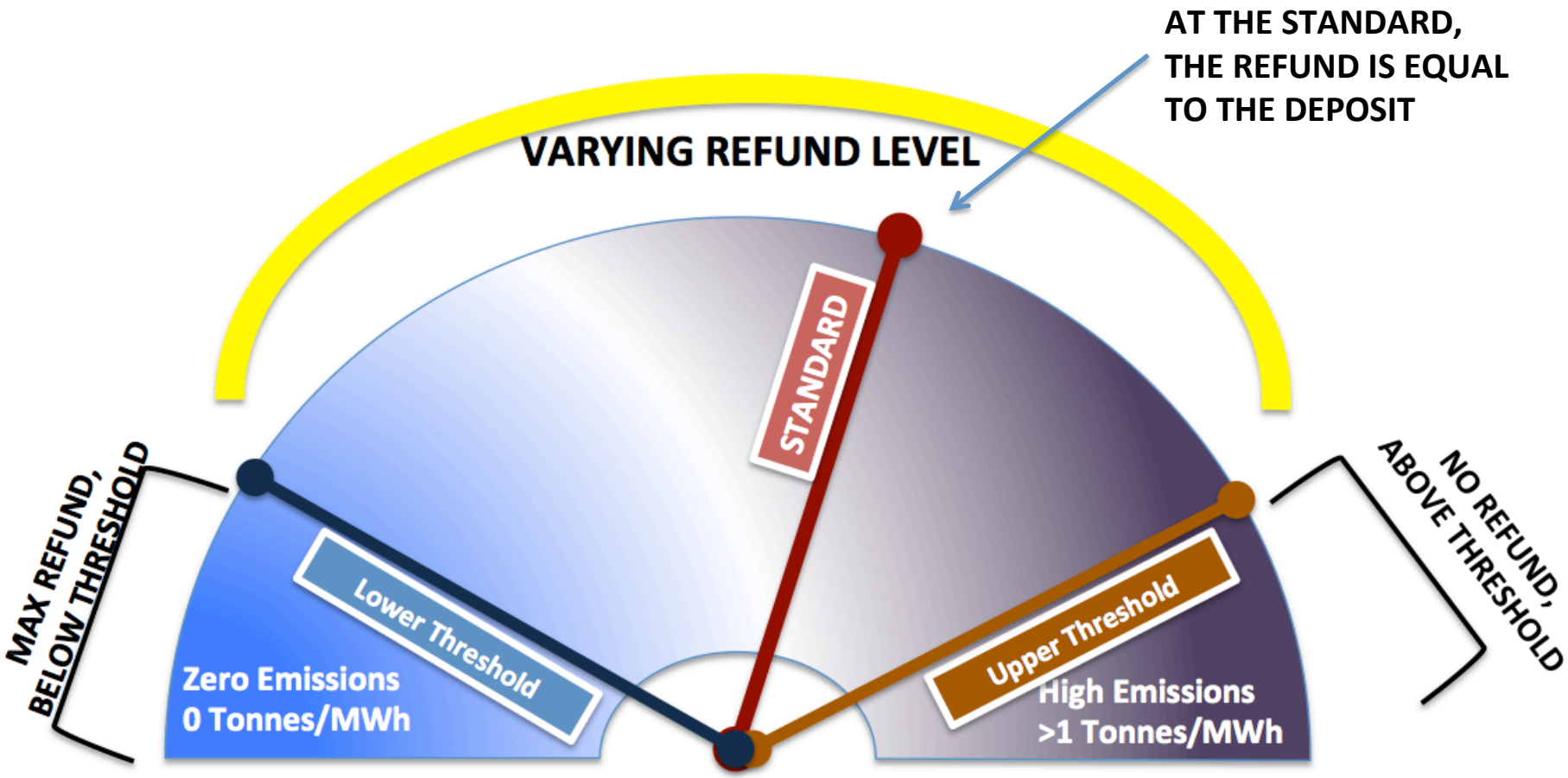
CES

- Focus on **retailer** portfolio intensity – **single sector**
- Reduction in emissions intensity of **portfolio**
- Compliance through **contracting for cleaner portfolio.**
- Financial Compliance Alternative (**Deposit**)
- Compliance funds used to stimulate **shorter term** market reponse
- No tradable units generated
- No Offsets

Achieving Compliance

- Each retailer will be required to **pay a deposit** to a fund at a set amount ($/MWh).
- At the end of the year, retailers who meet the CES will **receive a refund** equal to their deposit.
- For retailers with portfolio intensities **less than the CES**, will receive a **greater refund**.
- For retailers with portfolio intensities **more than the CES**, will receive a **less of a refund**.

Refund Varies based on Retailer Performance



Clean Electricity Standard with Upper and Lower Threshold

A Contextual Example: Bottle Recycling in Alberta

- A **deposit** is paid on the purchase of a beverage container
- Albertans return 82% of containers purchased for a **refund**
- Benefit: 390,000 cubic metres of landfill space saved
- Managing Agency funded entirely from deposit paid on beverage container purchases
- Deposit and refund system critical to **creating culture of recycling and improving environment**
- **Alberta's beverage container recycling industry in best in class in North America.**

Direct Benefits the CES

- ☑ Reduces grid intensity in Alberta
- ☑ Drives demand for low emitting generation
- ☑ Increases the diversity and amount of low emitting generation
- ☑ Uses market mechanisms to achieve reductions in grid intensity
- ☑ Provides long-term financing for low emitting generation
- ☑ Simple to administer

Intensity Target ($t CO_2e/MWh$)	Emissions (Mt CO2e)	Emission Reductions ($Mt CO_2e$)
0.78	63.7	
0.70	58.8	4.9
0.60	53.1	10.6
0.50	40.1	22.9
0.45	36.8	27.0

Questions?