Introduction

In October 2018 the Government of Alberta directed the AESO to evaluate the Renewable Electricity Program (REP) and recommend how the program can build on its success and continue to maximize value for Albertans. The AESO will provide a recommendation report to the government by March 29, 2019. As part of this important work, we invite interested stakeholders to provide their views by completing this questionnaire and returning it to rep@aeso.ca by January 18, 2019.

Privacy

The AESO appreciates that feedback may include sensitive business information and expressly accepts this information in confidence to encourage fulsome and accurate participation. Profile information related to each response is being collected for the purposes of facilitating clarification and follow-up activities, as well as allowing the AESO to aggregate the results in a meaningful way. The AESO is a public body subject to the provisions of the *Freedom of Information and Protection of Privacy Act* ("FOIP Act"). Access to information rights granted under the FOIP Act are subject to mandatory exceptions to disclosure that prohibit access to certain third party information supplied explicitly or implicitly in confidence, when disclosure could reasonably be expected to, among other things, significantly harm the business interests of a third party or when disclosure would unreasonably invade an individual's privacy (FOIP Act, Sections 16 and 17 respectively). If third party information is requested under the FOIP Act, the AESO is required to notify each affected party and request representations regarding disclosure. Questions related to participation in this process can be directed to rep@aeso.ca.

Questionnaire

Please complete the following questions and send a copy to rep@aeso.ca. If a question is not applicable, please leave the field blank and proceed to the next question.

1. Tell us about yourself. This information will not be made public but the AESO may wish to contact you to discuss your responses. Please provide your name, email address, phone number, and the organization you represent.

Name: Patrick Bateman
Position: Director of Policy & Market Development
Organization: Canadian Solar Industries Association (CanSIA)
Contact: pbateman@cansia.ca, (613) 290-9818

2. What is your interest in responding to this questionnaire (i.e. are you a current asset owner, prospective developer, investor, association, interested party, etc.)?

The Canadian Solar Industries Association (CanSIA) is the national trade association that represents the solar energy industry throughout Canada. For further information, visit: www.cansia.ca.

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3. What is your general feedback on the Renewable Electricity Program, including the first three competitions (REP Rounds 1 – 3)?

CanSIA agrees that: *"the Indexed Renewable Energy Credit and the supporting commercial framework were cornerstones to that success* (of REP 1), *driving down cost and driving up interest in the competition*"[1].

Driving Down Strike-Prices:

- Long-term contracts awarded by competitive tender that provide revenue certainty for generators have enabled the lowest possible strike-prices for solar and wind electricity. However, it should be noted that "strike-price" ($/MWh) is not synonymous with unit cost of payments made by the AESO for purchasing environmental attributes from the generator ($/REC).
- In REP 1 - 3, $/REC is the difference between strike-price and power pool price capture. In theory, there will be instances where the lowest strike-price combined with a lower than average power pool price capture will lead to higher unit costs for AESO ($/REC) than would a higher strike-price and higher than average power pool price capture.
- Analysis estimates that solar electricity generation would have yielded a premium to the average annual power pool price of 34% had it been in operation from 2000 to 2018 (Please see Appendix 1). For illustrative purposes and based on these figures, solar electricity with a $64.3/MWh strike-price would have a lower unit cost for AESO ($/REC) than the awarded REP contracts in rounds 1 – 3 at $37/MWh.
- As the installed capacity of wind electricity generation in the province increases, so too will its discount to the average power pool price. This will not only impact the unit cost of payments made by the AESO in a given round, but also in all previous rounds.
- ***Future rounds of the REP program should consider market price capture during bid selection to move from a focus on driving down strike prices to minimizing the unit cost of payments made by AESO*** (see answer to question 6 for further details).

Driving Down Infrastructure Costs Paid by Load Customers:

- ***The requirement that facilities connect to the existing transmission or distribution system has minimized the costs of REP (as they relate to delivery to transmission- and distribution-load customers) and is a principle that should be maintained in the next round.*** (Distribution-Connected Generation (DCG) can further minimize the costs of delivery to transmission- and distribution-load customers by maximizing the use of existing infrastructure. The treatment of transmission tariff rates as that relates to DCG is discussed in answer to question 7).

Driving up Interest:

- As evidenced by the AESO Connection Queue and the responses to the Alberta Infrastructure procurement, there has been a significant number of solar electricity generation facilities initiated in Alberta that have been and will be eligible to participate in past and future rounds of the REP. ***If the next round of the REP considers market price capture during bid selection, these solar facilities will have the***

[1] Reference: Letter to AESO from Minister McCuaig-Boyd (October 5, 2018)

opportunity to compete with potential to lower the unit costs of payments made by the AESO for purchasing environmental attributes from the generator ($/REC).

4. Do you have experience developing renewable electricity projects in Alberta? If yes, please describe the project(s), including size, fuel type and location.

N/A

5. Are you interested in developing a renewable project in Alberta in the future? If yes, please describe the project, including size, fuel type, location and anticipated in-service date.

CanSIA members have 1,000's of MW of solar electricity generation facilities in the AESO Connection queue. (In addition, many are also developing wind energy and energy storage facilities in the province). Alberta's 30% renewable electricity target, and higher than average power pool pricing and low supply-cushion hours in summer-time, and favourable resource, siting and interconnection capacity availability have combined to create attractive long-term investment opportunities.

AESO can continue to drive solar industry investment in Alberta by sending early signals of the direction for future rounds of REP including evaluation criteria that considers the coincidence of solar electricity generation with higher than average power pool pricing and the province's lowest supply-cushion hours in summer-time during bid selection.

In addition to the REP, CanSIA is active in other AESO files such as the 2018 ISO Tariff Application, Capacity Market Rules & Implementation, Tariff Advisory Group and Distribution System Inquiry. AESO should continue to view these files from a coordinated perspective when considering how market signals can be best sent for solar electricity generation development.

6. If you completed question 5 above, what would you change about the Renewable Electricity Program? Specifically, what are the benefits and challenges presented by REP Rounds 1 – 3?

While CanSIA is not interested in developing a renewable project in Alberta in the future, we will provide feedback to this question on behalf of our member companies who are, as it relates to the Government of Alberta's direction to AESO to "*assess potential approaches—including bid selection criteria and payment mechanisms—that recognize the varied system benefits of different renewable projects (and) minimize market distortion*".

CanSIA views there to be four potential approaches to bid selection and payment mechanisms that recognize the varied system benefits of different renewable projects and minimize market distortion:

1. Volumetric Carve-Outs;
2. Market Factor Adjustment (MAF);
3. "Benchmark REC"; and
4. Zero-GHG Adder[2].

[2] Background and an overview is provided in the enclosed slide deck prepared by Dr. Blake Shaffer entitled "Options for Future REP Design" for a meeting between Br Shaffer, AESO, Alberta Energy and CanSIA in July 2018.

CanSIA believes that the "Market Adjustment Factor" approach is the most suitable for the next round of REP. In this approach, resources would be assigned an MAF which serves as a proxy for their anticipated discount or premium to the average power pool price and value in the capacity market.

(For illustrative purposes and based on the data in Appendix 1, wind = (1/0.77) and solar = (1/1.34). Bids would be ranked based on their market-adjusted price (i.e. strike-price * MAF) and the lowest project(s) would be selected. These projects would receive their strike price under contract. The benefits of this approach are that it is straight-forward and transparent in construct and provides revenue certainty for generators.

7. How do you think future REP rounds can/should incorporate other revenue streams available to developers (e.g. revenues available in the energy market, capacity market or other)?

As discussed in answers to questions 3 and 6, the next round of the REP program should select bids based on their anticipated lowest $/REC to minimize: the unit cost of payments made by AESO; and market distortions. The following treatment of energy market, capacity market and other revenue streams supports the achievement of these outcomes.

Energy Market:

- As discussed in answer to question 3, long-term revenue certainty minimizes strike-prices and is central to the success of REP. ***CanSIA recommends that the next round of REP continue to provide revenue certainty to generators through a CfD.***

Capacity Market:

- The Capacity Market will send a market signal to generate during low supply-cushion hours which is well aligned with the profile of solar electricity generation. However, at this point CanSIA members consider the capacity market an unknown since the rules are not yet final and nor is there operational experience in the Alberta market. Therefore, settling capacity market revenues within the CFD (i.e. strike price minus power pool price capture minus capacity market revenues received by generator) would result in a lower unit cost of payments made by the AESO ($/REC) due to adjustment for risk.
- ***For these reasons, CanSIA recommends that the MAF take into account the value of solar capacity but have the net-Capacity Product payments accrue to the AESO in the next round of REP to minimize the unit cost of payments made by AESO ($/REC) and market distortions.***

Other:

- Transmission tariff rates (including credits for DCG such as Fortis' Option M) are a valuable market signal for generators to locate proximal to load. Ancillary Services markets send a market signal for generators to provide grid support.

- The accrual of DCG Credits and Ancillary Services revenue streams to generators in future rounds of REP will decrease strike-prices thus narrowing the delta between strike-price and power pool price capture.
- ***CanSIA recommends that these revenue streams also accrue to generators in future rounds of REP to minimize: the unit cost of payments made by AESO ($/REC); and market distortions.***

8. Please provide any other general comments and/or feedback you feel would be helpful for the AESO to consider in our assessment of the Renewable Electricity Program.

N/A

Your feedback is very important to us and we thank you for your participation. A summary of responses will be posted on aeso.ca in Q1 2019.

Appendix 1: Price Premia and Discount, by year, for wind and solar in Alberta. (Source: Calculations by Dr. Blake Shaffer, Data: AESO.ca)

Plant	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Average (all years)
Solar	24%	22%	24%	23%	22%	14%	34%	40%	33%	24%	44%	41%	41%	73%	56%	61%	7%	11%	48%	**34%**
BUL2																-15%	-5%	-6%	-11%	**-9%**
BUL1																-16%	-5%	-6%	-10%	**-10%**
CRE3	13%	10%	0%	-2%	-9%	-3%	-16%	-15%	-18%	-4%	-23%	-34%	-36%	-36%	-30%	-34%	-8%	-10%	-15%	**-14%**
CR1		-5%	-3%	-7%	-7%	-4%	-16%	-20%	-18%	-7%	-26%	-29%	-44%	-32%	-33%	-33%	-9%	-13%	-18%	**-18%**
NEP1												-25%	-27%	-12%	-28%	-24%	-9%	-9%	-22%	**-19%**
OWF1															-28%	-33%	-10%	-11%	-19%	**-20%**
HAL1													-30%	-24%	-28%	-26%	-8%	-9%	-20%	**-21%**
SCR4												-42%	-27%	-15%	-26%	-26%	-8%	-8%	-21%	**-22%**
BSR1															-31%	-32%	-11%	-13%	-28%	**-23%**
IEW1					-14%	-7%	-19%	-20%	-21%	-10%	-27%	-31%	-46%	-40%	-40%	-38%	-11%	-14%	-22%	**-24%**
KHW1							-19%	-20%	-18%	-10%	-26%	-34%	-44%	-35%	-37%	-36%	-11%	-12%	-21%	**-25%**
AKE1				-11%	-12%	-9%	-20%	-24%	-22%	-12%	-27%	-40%	-52%	-41%	-40%	-41%	-12%	-15%	-26%	**-25%**
SCR2					-8%	-23%	-19%	-21%	-22%	-13%	-23%	-36%	-48%	-36%	-36%	-39%	-12%	-16%	-29%	**-25%**
GWW1							-24%	-21%	-19%	-11%	-25%	-34%	-47%	-35%	-35%	-38%	-11%	-14%	-23%	**-26%**
SCR3							-24%	-23%	-22%	-15%	-22%	-35%	-43%	-35%	-37%	-37%	-13%	-15%	-31%	**-27%**
CRR1													-42%	-37%	-33%	-35%	-9%	-13%	-20%	**-27%**
TAB1								-23%	-24%	-17%	-23%	-37%	-41%	-36%	-39%	-35%	-12%	-15%	-28%	**-28%**
ARD1											-16%	-34%	-49%	-38%	-39%	-40%	-11%	-15%	-25%	**-30%**
BTR1											-17%	-36%	-49%	-39%	-38%	-39%	-12%	-15%	-25%	**-30%**
IEW2											-30%	-33%	-45%	-40%	-40%	-38%	-11%	-14%	-23%	**-30%**

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Options for future REP design

10 July 2018

Current REP design

- PROS:
  - Achieves lowest cost
  - Simple
  - Easy to communicate

- CONS
  - Does not recognize differences in value
    - Reliability, dispatchability, expected value of energy profile

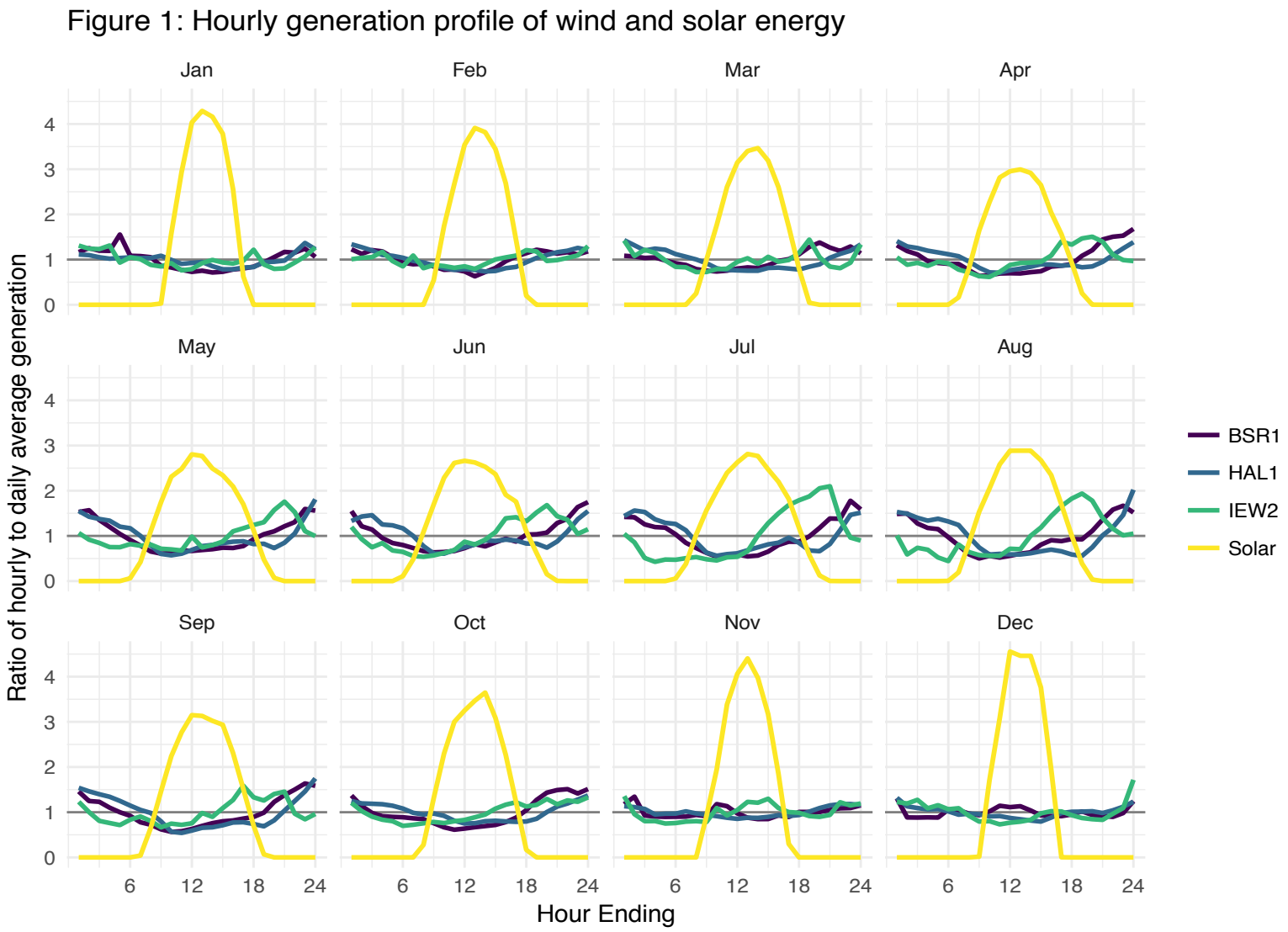
Spectrum of design options to recognize value

1	2	3	4
Volumetric Carve-out	Market factor adjustment	Benchmark REC concept	Zero-GHG adder

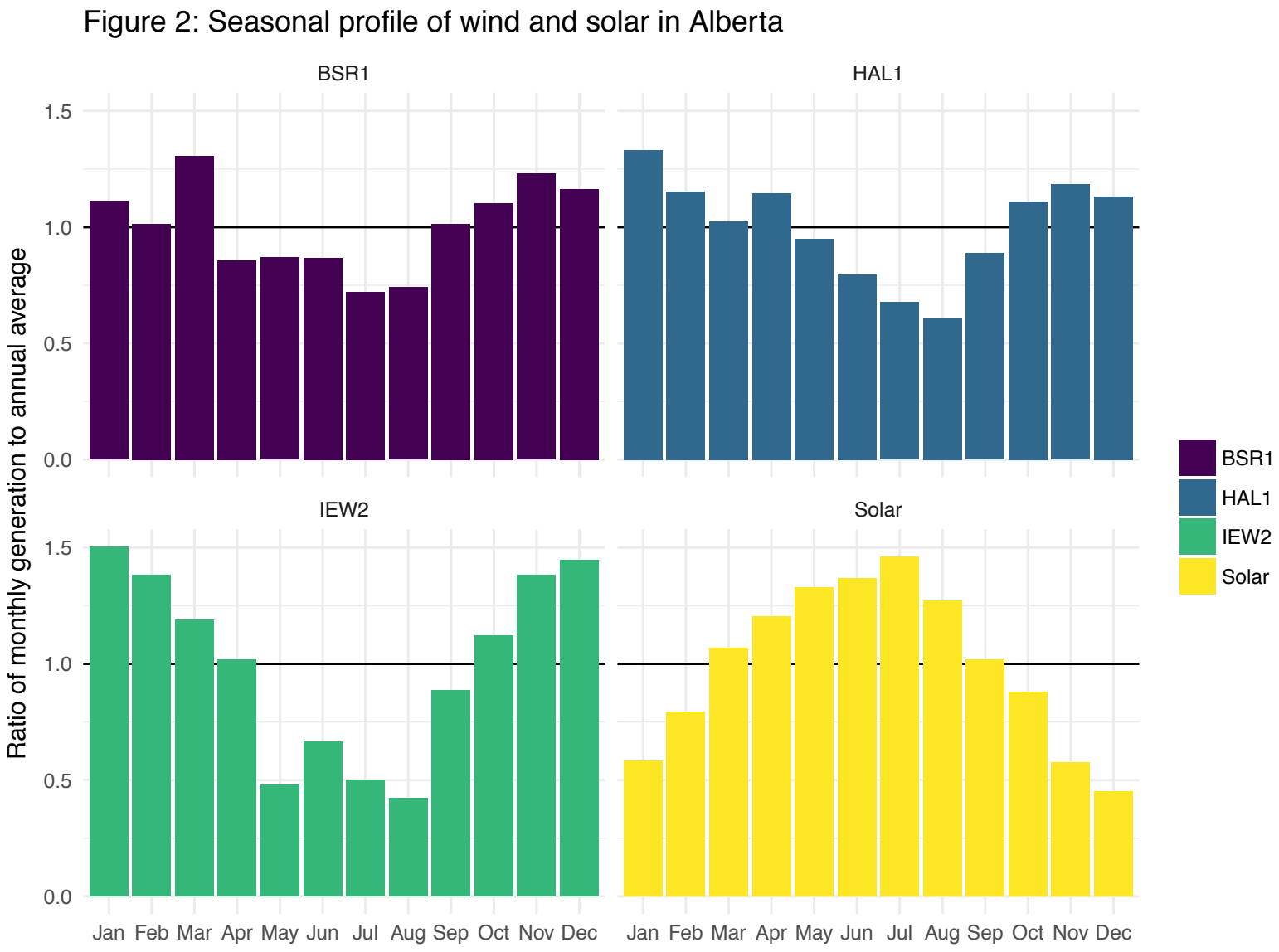
- *Less risk to developer*
- *Value determined by AESO/designer*

- *More risk to developer*
- *Value incentive aligned*

Why value matters…



Why value matters…



Why value matters…

Figure 3: Hourly profile of prices

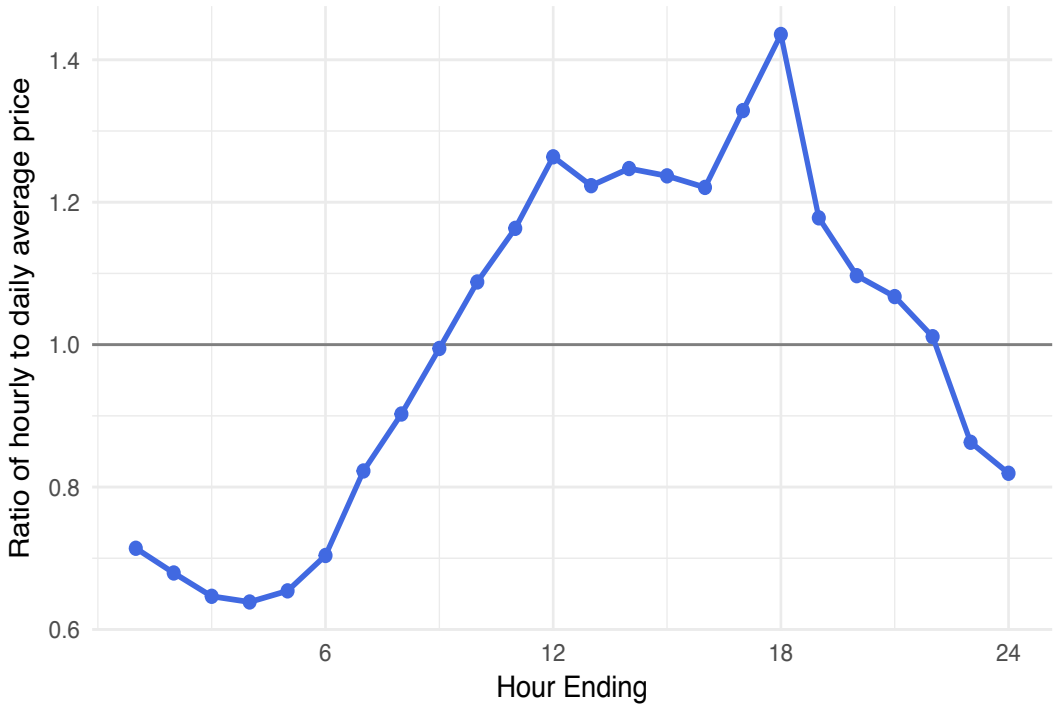
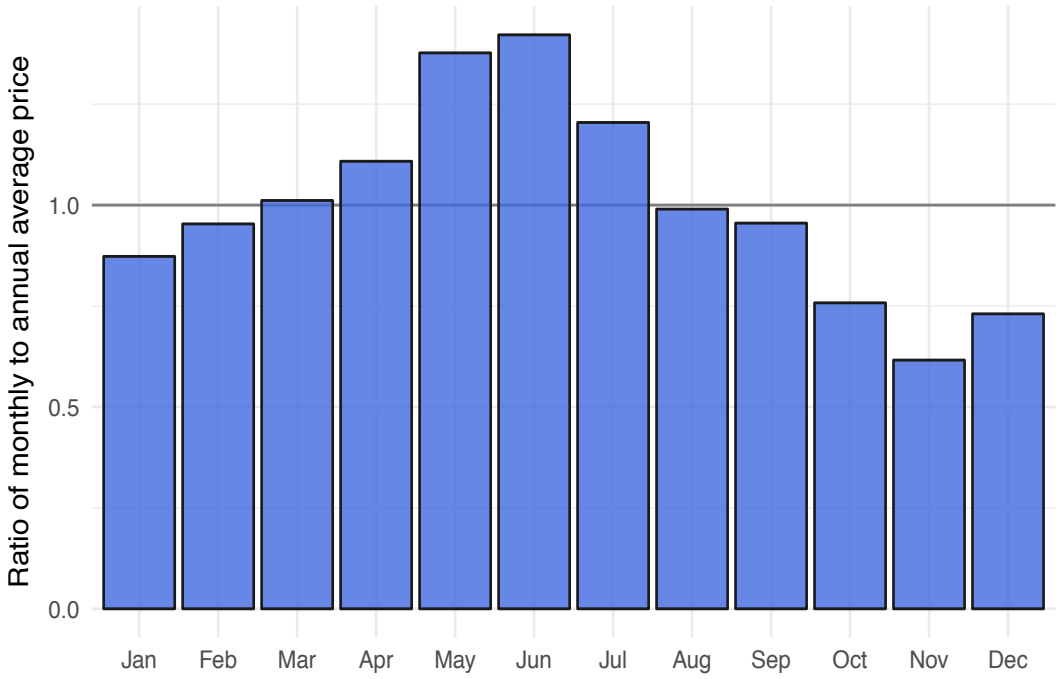


Figure 4: Seasonal profile of prices



Source: AESO.ca (average prices 2013-2016)

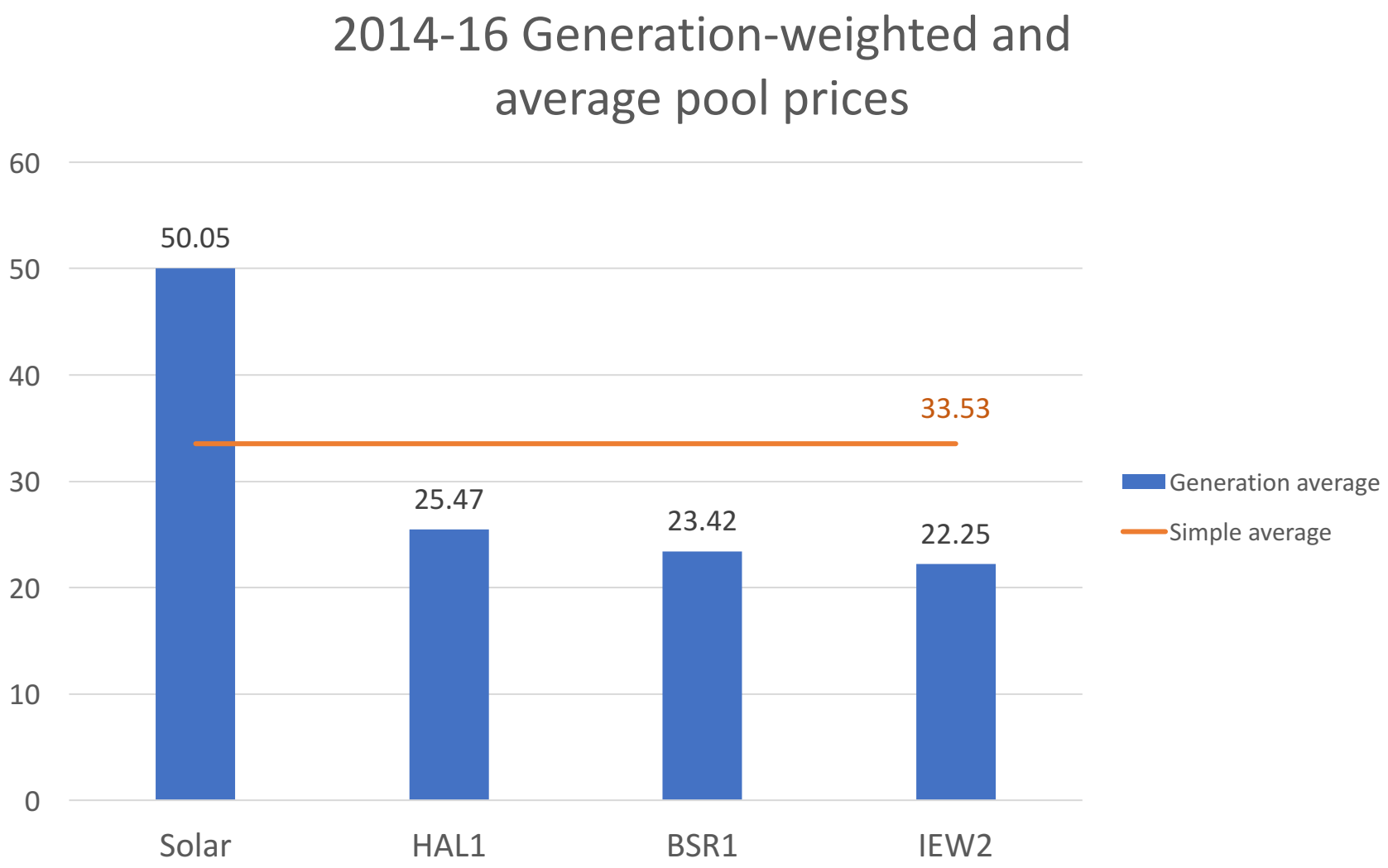
Why value matters…

Table 1 - Simple average and generation-weighted prices ($ per MWh)

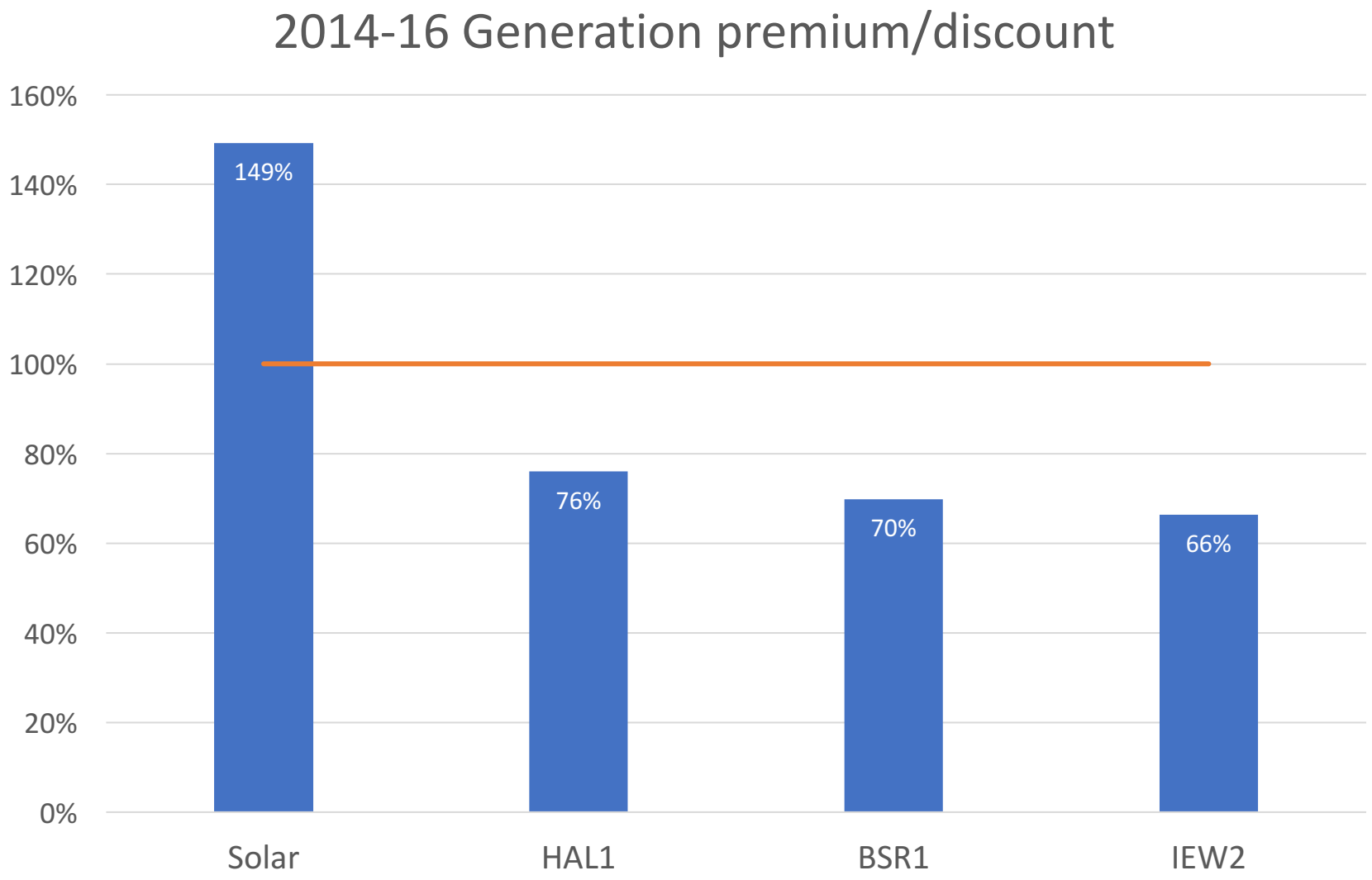
	Simple average	Solar	HAL1	BSR1	IEW2
2013	80.19	139.08	60.35	n/a	47.95
2014	49.42	77.20	35.50	31.63	29.89
2015	33.34	53.55	24.82	22.73	20.65
2016	17.83	19.39	16.09	15.90	16.20

Note: 2016 data is through November. BSR1 data begins in Apr 2014.

Why value matters…



Why value matters…



Market factor adjustment

- Projects are assigned “market factors adjustments” **pre-auction** based on expected value relative to a baseline
- E.g. (purely illustrative)
  - Pincher Creek wind = 0.7
  - Non-Pincher wind = 0.8
  - Solar = 1.5
- Bids are selected based on a ranking of **prices / MFA**
- Winning bids are **paid their offer price** in a standard CFD

Benchmark REC

- Proponents bid for a CFD that pays:

  Fixed price – Floating benchmark price

- This differs from current REP that pays:

  Fixed price – Floating actual price

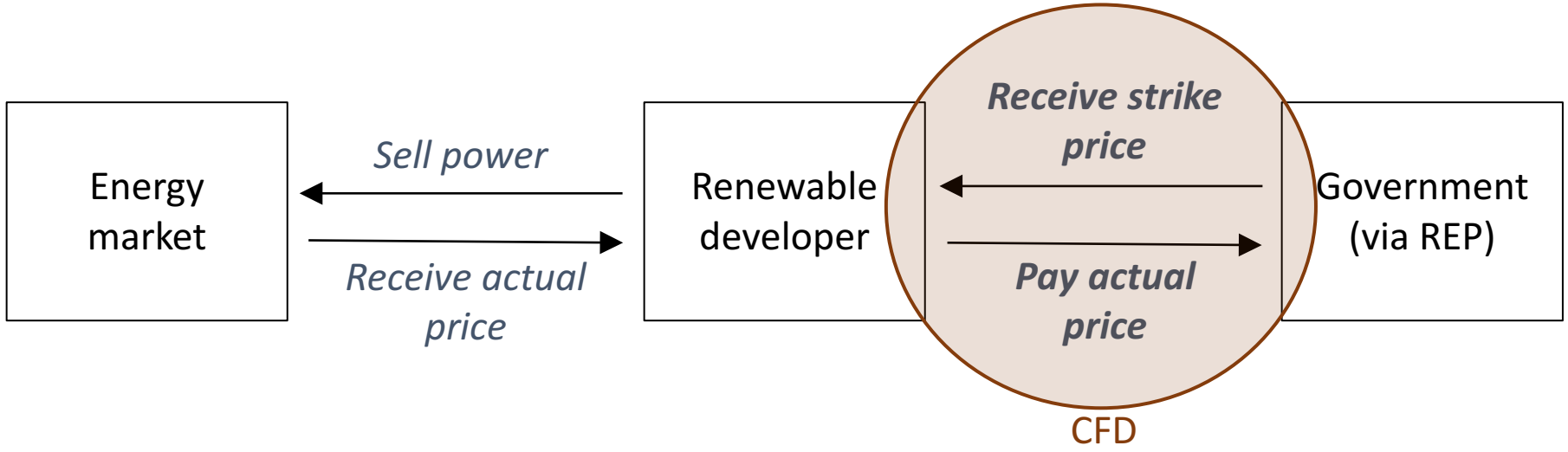
- Can split the Benchmark REC contract into two pieces:

  Fixed price – Floating actual price

  +

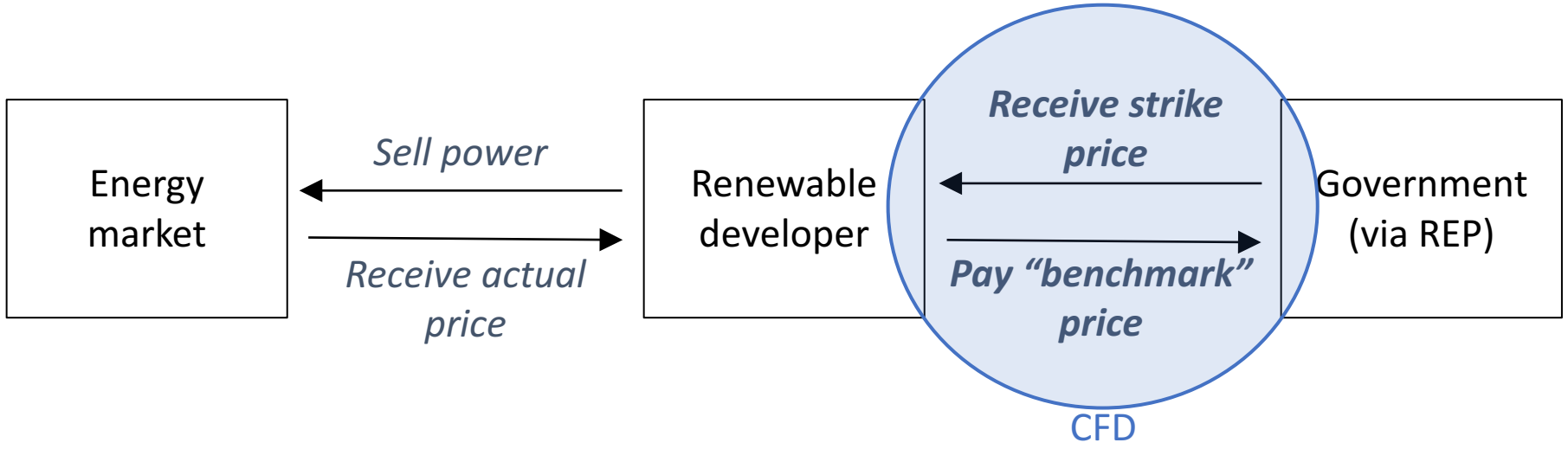
  Floating actual price **– Floating benchmark price**

Index REC design



Net Payoff: Receive strike price

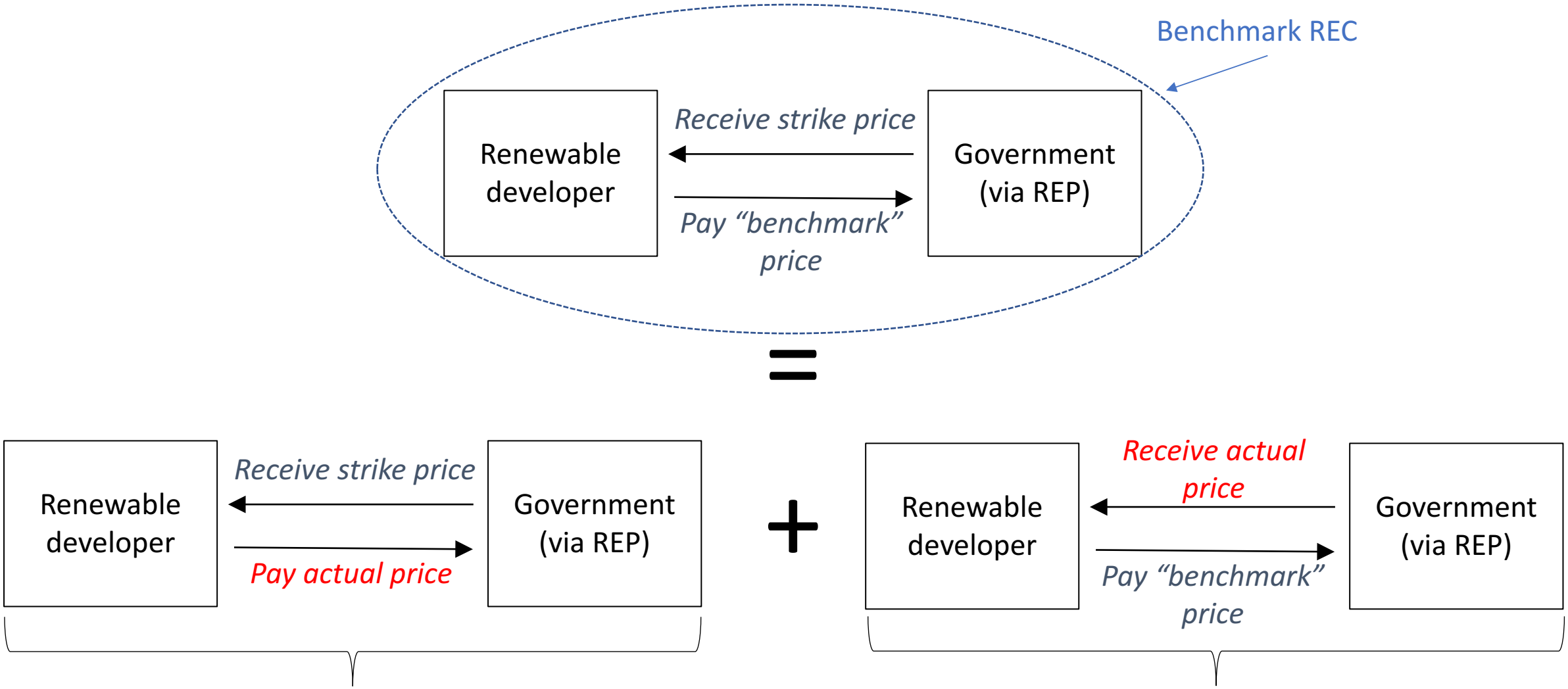
Benchmark REC design



Net Payoff: Receive strike price + (Actual – Benchmark)

Incentive mechanism!

Benchmark REC design: Breaking it into 2 components



Part 1: This is just the Indexed-REC

Part 2: New "incentive" mechanism

Benchmark design considerations

1. Composition
   - By RE-type
     - Does not recognize value differences *across* types, just within types
   - All RE
     - Recognizes differences across types; more variation between actual and benchmark

Recommendation: Past REP winners establish the benchmark

- Clear
- Minimizes incomplete information
- Incentivizes diversity in resources/greater system value

Benchmark design considerations

2. Benchmark time period
   - Daily
     - Does not recognize value differences *across* seasons, just within days
   - Monthly
     - Recognizes differences across hours and differing demand days in a month
   - Annually
     - Recognizes seasonal differences in profiles

Recommendation: Annually, with payments trued up by rolling average

- Recognizes important seasonal variation
- True up mechanism allows for shorter-period interim payments

Trade-offs

- More risk on developer => higher WACC => higher bid price

- Less risk on developer => less incentive alignment => lower value

Question of risk allocation.

- Are consumers (via AESO) better placed to manage risk around *value* of projects?
  - e.g. transmission, storage policy, coordination, future auctions
- Or are developers?
  - e.g. Design considerations, blade:rotor ratios, tilt/rotate, siting decisions, etc.