Small DER Market Participation Draft Recommendation

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Executive Summary

On Oct 14, 2020, the Alberta Electric System Operator (AESO), held a stakeholder session to identify issues and explore options for small distributed energy resource (DER) market participation, between 1-5 megawatts (MW) in size, in the energy and operating reserve markets. The AESO sought and received stakeholder feedback regarding the market participation thresholds and aggregation. This feedback was reviewed and helped inform the recommendations proposed in this paper.

This recommendation paper considers options and presents draft recommendations that would allow for improved electricity market participation by small DERs in the energy and operating reserve markets while considering the following:

- Market participation requirements need to consider fair, efficient and open competition (FEOC) principles.
- Changes must balance potential benefits of increased competition against the considerations for implementation and additional regulatory/compliance requirements for the AESO and market participants.
- Barriers to participation for small DERs should be reduced where possible and appropriate to do so.

Six areas for small DER participation in the energy and operating reserve market are examined. The issues explored and proposed recommendation are summarized below:

1. Issue: Whether to maintain the energy market offer submission requirement at 5 MW or reduce to a lower value. As DER penetration increases on the Alberta Interconnected Electric System (AIES), so does their potential impact on both system reliability and the FEOC operation of the market.

Recommendation: Maintain current offer submission requirement threshold in Section 203.1 of the ISO rules, *Offers and Bids for Energy,* at 5 MW and greater.

2. Issue: Whether to allow voluntary offer submission for small DERs between 1-5 MW. Prohibiting source assets with a maximum capability of less than 5 MW from competing in the energy market through the submission of offers if they wish to do so is a barrier to small DER participation in the energy market.

Recommendation: Allow voluntary participation in the energy market for small DERs 1 MW and greater.

3. Issue: Whether to reduce the minimum asset qualification thresholds in the operating reserve (OR) market from the current requirement of 15 MW for regulating reserve, 10 MW for spinning reserve, and 5 MW for supplemental reserve to a lower value. The asset size requirements to be capable of providing reserves in the OR market are a barrier to participation for small DERs.

Recommendation: Lower OR asset qualification thresholds to provide operating reserves for regulating reserve, spinning reserve, and supplemental reserve from the current requirement of 15 MW, 10 MW and 5 MW, respectively, to 1 MW.

4. Issue: Whether to require small DERs (1-5 MW) voluntarily participating in the OR market to must offer in the energy market if the OR market asset qualification threshold reduced to 1 MW.

Recommendation: Allow small DERs (1-5 MW) participation in the OR market without a requirement to submit offers in the energy market.

5. Issue: Whether to allow small DER aggregation in the energy market below 1 MW. The ability to aggregate for participation in the energy market is limited by the requirements of ISO Rules Section 501.10 *Transmission Loss Factors*. For DERs, the requirements of the Loss Factor Rule mean that such resources may offer either as individual source assets or as an aggregated source asset as long as the resources are downstream of a single substation and can be metered through a single measurement point on the transmission system. Minimum asset size requirements to submit offers into the energy market are a barrier to participation for DER with a maximum capability below 1 MW.

Recommendation: Discontinue exploration of aggregation options for small DERs in the energy market.

6. Issue: Whether to allow small DER aggregation in the OR market below 1 MW. If minimum size thresholds are reduced to 1 MW for the OR market, there may be a barrier to participation for assets under 1 MW as new technologies continue to emerge such as electric vehicles, and home & commercial energy storage.

Recommendation: Discontinue exploration of aggregation options for small DERs in the OR market.

1. Introduction

As discussed in the *AESO DER Roadmap*[1] DER growth and its integration with the Alberta interconnected electric system (AIES) will drive significant changes for the AESO distribution facility owners (DFOs), industry participants, and consumers in Alberta. The *AESO DER Roadmap* outlines a plan that will prepare Alberta for a future state that is characterized by a higher penetration of smaller, decentralized resources. The *AESO DER Roadmap* establishes four pillars of DER integration: reliability, markets, tariff, and regulatory and stakeholder engagement, and identifies corresponding activities that the AESO is undertaking to narrow the bridge between the current and desired future state of DER integration. The current and potential future growth of DERs in Alberta has the ability to impact AESO administered electricity markets. It is therefore important for the AESO, Alberta Utilities Commission (AUC), DFOs, and industry stakeholders to consider the extent to which DERs should participate in AESO administrated electricity markets.

The *AESO DER Roadmap* defines a DER as any distribution-connected resource that can potentially supply energy onto an electric distribution system. This definition contemplates two technology categories: distribution-connected generation (DCG) and distribution-connected energy storage. For purposes of this paper, all DERs between 1-5 MW, irrespective of the technology deployed, are herein referred to as “Small DERs”. DERs 5 MW and above are not considered in this paper as their market participation is clearly defined in the ISO Rules.

The projected growth of Small DERs in Alberta and their potential impact on the Alberta electricity markets has prompted the AESO to assess whether changes to the existing market design are required and propose recommendations for further consideration by industry stakeholders.

[1] *AESO Distributed Energy Resources (DER) Roadmap* (June 2020), available on the AESO website.

2. Background and purpose

2.1 Guiding Principles:

The AESO's DER Roadmap is being implemented in collaboration with stakeholders, to explore and manage the challenges and opportunities associated with the transformation of the AIES from the point of view of the AESO's mandate. The AESO must carry out its duties, responsibilities, and functions in a fair and responsible manner to provide for the safe, reliable and economic operation of the AIES and to promote a FEOC market.[2] The AESO considers that market efficiency is best achieved when many competitive resources participate and compete in the Alberta electricity markets. As the penetration of Small DERs increase in Alberta, the AESO needs to consider the extent to which these resources should participate in AESO administered markets, while maintaining FEOC principles. This necessitates a thoughtful assessment of the potential costs and increased regulatory burden associated with facilitating Small DER market participation, both for the AESO and market participants. In considering potential changes to the design of the Alberta electricity markets, the AESO must balance these factors against the potential benefits of implementing changes to the minimum-size thresholds for market participation and the aggregation rules to facilitate Small DER market participation and competition. The broad economic principles of market efficiency, cost and public interest must be carefully considered when evaluating the merits of potential changes to the existing market design.

2.2 Purpose and Scope of Work:

The *AESO DER Roadmap* identifies integration activities corresponding to each of the four pillars of DER integration: reliability, markets, tariff, and regulatory and stakeholder engagement. The integration activities corresponding to the markets pillar include an evaluation and assessment of options to facilitate increased DER market participation.

The purpose of this paper is to review the current and projected levels of Small DER participation in the energy and OR markets, identify existing barriers to market participation, consider the characteristics of Small DERs and their potential market impacts, assess potential changes to the ISO rules to facilitate increased Small DER market participation, including changes to the minimum-size eligibility thresholds and expanded aggregation, and propose recommendations. The feedback from the stakeholder engagement session held on October 14, 2020, was taken in account by the AESO in formulating the recommendations proposed in this paper.

The draft recommendations set forth in this paper are being shared to provide stakeholders an opportunity to provide their feedback. The AESO will consider all stakeholder feedback before finalizing the proposed recommendations. For clarity, the recommendations proposed in this paper do not constitute binding requirements on market participants. If the AESO determines that binding requirements are needed, the AESO will proceed with the development or amendment of authoritative documents[3] in accordance with the processes set out in legislation and established by the AUC.

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[2] *Electric Utilities Act,* SA 2003, c. E-5.1, ("EUA"), ss. 16(1) and 17(a)(b)(h).

[3] "Authoritative documents" is the general name given by the AESO to categories of documents made by the AESO under the authority of the Electric Utilities Act and associated regulations, that contain binding legal requirements for either market participants or the AESO, or both. Authoritative documents include the ISO rules, the reliability standards, and the ISO tariff.

Other DER Roadmap integration activities such as data gathering, forecasting, modelling, coordinated planning, operations, technical interconnection requirements, and the ISO tariff are considered beyond the scope of this paper. In addition, other market related initiatives such as energy storage long-term market participation are also considered out of scope. These initiatives are currently being addressed through other DER Roadmap activities and stakeholder engagements.

2.3 Stakeholder involvement:

On October 14, 2020, the AESO held a Stakeholder Session to identify issues and explore options for Small DER market participation in the energy and operating reserve markets. The AESO sought and received stakeholder feedback regarding the market participation thresholds and aggregation. This feedback was reviewed and helped inform the recommendations proposed in this paper. Although there was a general lack of consensus amongst stakeholders, several main themes emerged ranging from concerns regarding a level playing field, cost/benefit of changes, regulatory certainty, and timing regarding whether market changes were needed now or whether they could be deferred to a later date. Some stakeholders questioned whether any changes were necessary given the relatively small installed capacity or perceived interest of Small DERs increasing their participation in AESO markets, considering potential for increased costs and regulatory burden. This is reflected in the nature of the draft recommendations set forth in this paper which support the implementation of small incremental changes as opposed to significant market design changes.

The AESO will be conducting a stakeholder session on February 23, 2021, to explain the rationale behind the proposed recommendations described in this paper. The AESO will be soliciting feedback on the recommendation paper at that time.

3. Barriers to Small DER Participation in the energy and OR markets

The rules governing the operation of the energy and OR markets have been historically developed based on assets predominately being large 'utility' sized assets, and therefore need to be reviewed as they may create limitations or barriers to Small DER participation.

3.1 Energy market:

As the number of Small DERs in Alberta continue to proliferate it is important to consider whether changes to the energy market rules are necessary to maintain a fair, efficient and openly competitive electricity market. Section 203.1 of the ISO rules, *Offers and Bids for Energy,* sets out the obligation to submit offers to the energy market for each source asset with a maximum capability of 5 MW or greater, and prohibits the submission of offers for source assets with a maximum capability of less than 5 MW.[4] The minimum size eligibility threshold to submit offers in the energy market may pose a barrier for Small DERs as these resources are currently limited to indirect participation in the energy market. Passive participation in the energy market is limited to pool participant registration and settlement, allowing the market participant to operate their asset relatively independently while still receiving pool price for energy supplied to the AIES. In contrast, source assets with a maximum capability of 5 MW or greater participate actively in the energy market and are subject to AESO dispatches and directives.

[4] ISO Rules, Section 203.1, *Offers and Bids for Energy*, s. 3.

3.2 Operating reserve market:

For an asset to be qualified to provide reserves in the OR market, currently the asset must be capable of providing a minimum of 15 MW of regulating reserve.[5], 10 MW of spinning reserve[6], and 5 MW of supplemental reserve[7], for each individual product. As a result, Small DERs are currently unable to participate in the OR market.

3.3 Aggregation:

Aggregation of small assets to meet minimum size qualifications is a consideration for DER participation in the energy and OR markets. However, Section 501.10 of the ISO rules, *Transmission Loss Factors*, ("Loss Factor Rule") includes requirements that impact the aggregation of generating units, aggregating generating facilities, or both. Specifically, all generating units or aggregated generating facilities that submit offers in the energy market as a single source asset must connect to the transmission system at a single point of supply for system access service, which generally means at a single substation. Conversely, any generating units or aggregated generating facilities that submit offers in the energy market as separate source assets must connect to the transmission system at separate points of supply for system access service, which generally means at separate substations but could also be at a substation that is shared by one or more other system access services.

As a special provision in the Loss Factor Rule, generating units or aggregated generating facilities that submit offers in the energy market as separate source assets may be aggregated at a single point of supply for system access service if they are:

- Distribution-connected downstream of a single substation where an electric distribution system receives system access service;
- Connected to facilities of the City of Medicine Hat; or
- Part of the Suncor Fort McMurray, Imperial Oil Cold Lake, or Shell Scotford industrial systems, which are accommodated in the Loss Factor Rule in the configurations that existed at the end of 2016.

For distributed energy resources, the requirements of the Loss Factor Rule mean that such resources may offer either as individual source assets or as an aggregated source asset as long as the resources are downstream of a single substation and can be metered through a single measurement point on the transmission system. However, aggregation as a single source asset is not permitted if distributed energy resources are downstream of separate substations or are metered through more than one measurement point on the transmission system.

4. Jurisdictional review

Where relevant, the AESO looks to other jurisdictions' implementation of new technology and lessons learned to help inform market design decisions. In the case of Small DER, the Federal Energy

[5] ISO Rules, Section 205.4, *Regulating Reserve Technical Requirements and Performance Standards*, ss. 3(1)(a)(i).

[6] ISO Rules, Section 205.5, *Spinning Reserve Technical Requirements and Performance Standards,* ss. 3(1)(a)(i).

[7] ISO Rules, Section 205.6, *Supplemental Reserve Technical Requirements and Performance Standards*, ss. 3(a).

Regulatory Commission (FERC) issued Order 841[8] on February 15, 2018, requiring grid operators to revise their tariffs to remove barriers to the participation of electric storage resources in wholesale energy, capacity, and ancillary services markets. In addition, FERC Order 841 established a minimum size requirement for participation in energy markets that could not exceed 100 kW. On September 17, 2020, the FERC issued Order 2222[9] to further promote competition in electricity markets by removing the barriers preventing individuals DERs from competing on a level playing field in the organized capacity, energy and ancillary services markets.

Existing market rules regarding minimum capacity and minimum offer requirements to participate in organized wholesale electric markets vary across the various RTOs and ISOs, with most minimum asset size requirements ranging from 100kW to 1MW. As a general trend, RTOs and ISOs are implementing changes to reduce minimum size requirements across energy, capacity, and ancillary service markets. As noted, in determining the minimum size requirements for the energy and OR market in Alberta, the AESO will consider the benefits of implementing changes to facilitate the increased Small DER participation against the potential for increased cost and regulatory burden of such requirements.

Figure 1: Comparison of AESO Market Participation Requirements with Various US Markets

Energy Market	PJM	CAISO	NYISO	NEISO	AESO
Non-Aggregated Minimum Size Requirements	100kW	100kW	100kW	Resources 5 MW or greater connected to the transmission system must offer Smaller resources on the distribution system optional / settlement only	5 MW minimum size requirement. Resources 5MW or greater must offer; <5MW settlement only

[8] 162 FERC 61,127 United States of America, Federal Energy Regulatory Commission; 18 CFR Part 35 [Docket Nos. RM16-23-000; AD16-20-000; Order No. 841], *Electric Storage Participation in Markets Operated by Regional Transmissions Organizations and Independent System Operators*, issued February 15, 2018.

[9] 172 FERC 61, 247 Department of Energy Federal Energy Regulatory Commission; 18 CFR Part 35 [Docket No. RM18-9-000; Order No. 2222, Participation of Distributed Energy Resource Aggregations in Markets Operated by Regional Transmission Organizations and Independent System Operators, issued September 17, 2020.

Ancillary Reserves Market	PJM	CAISO	NYISO	NEISO	AESO
Minimum Asset Size Requirement(s)	100 kW	500 kW (in process of lowering to 100 kW)	100 kW	0.1 MW to 5 MW (pending asset configuration)	15 MW Regulating 10 MW Spinning 5 MW Supplemental

5. Considerations relating to DERs in Alberta informing AESO draft recommendations

5.1 Installed capacity of Small DERs in Alberta

The AESO publishes a monthly report on small distribution-connected generation resources in Alberta. This report contains data on the installed capacity and number of micro-generation sites and distributed generation sites with a nameplate capacity of less than 5 MWs. Figure 2 is an excerpt from the AESO's most recently published Micro- and Small Distributed Generation Reporting and shows that DERs currently comprise approximately 1.5% of Alberta's total 16,403 MW[10] maximum capability.

Figure 2: Small DERs in Alberta

December-2020	Micro-generation		Distributed Generation		Total	
	Number of Sites	Installed Capacity (kW)	Number of Sites	Installed Capacity (kW)	Number of Sites	Installed Capacity (kW)
Biomass	1	1,692	6	13,453	7	15,145
Co-gen	1	127	0	0	1	127
Gas	5	382	24	65,805	29	66,187
Gas Cogen	6	1,098	6	18,280	12	19,378
Hydro	1	73	4	8,900	5	8,973
Other	16	2,681	2	2,065	18	4,746
Solar	6,274	89,061	2	5,590	6,276	94,651
Solar/CHP/Battery Storage	1	105	0	0	1	105
Solar/Wind	34	284	0	0	34	284
Wind	55	1,359	24	29,425	79	30,784
Total	6,394	96,862	68	143,518	6,462	240,380

Some DERs may qualify as micro-generation pursuant to the *Micro-generation Regulation* provided the requisite criteria are satisfied, including the exclusive use of renewable or alternative energy (as these terms are defined in the *Micro-generation Regulation)*. Small DERs that qualify under the *Micro-generation Regulation* are further delineated into small and large micro-generation. Small micro-

[10] AESO Current Supply and Demand Report as of January 28th, 2021

generation generally refers to generation from a resource with a name plate capability of less than 150KW. These resources receive compensation through credits for generation supplied on-site and are exempt from the legislative requirement in subsection 18(2) of the *Electric Utilities Act*[11] which requires all electric energy entering or leaving the AIES to be exchanged through the power pool.

Large micro-generation generally refers to generation from a resource with a name plate capacity of at least 150 kW but not exceeding 5 MW. The service providers for these resources must exchange through the power pool the electric energy supplied by these sites. In the case of large micro-generation, compensation is determined at pool price for each settlement interval in the billing period (unless otherwise agreed to with associated retailer). Energy market participation for large micro-generation is currently limited to registration and settlement.

5.2 Potential Impact of Increased Small DER participation on the energy market

The dispatchable resource characteristics and operational behavior of Small DERs must be taken into consideration when assessing the potential benefit of requiring Small DERS to submit offers in the energy market and the likely impact on the energy market price signal. Figure 3[12] summarizes the dispatchable and non-dispatchable resource characteristics for several Small DER asset types.

Figure 3: Dispatchable and Non-dispatchable Resource Characteristics

Resource	Dispatchable		Renewable	Storage
	Up	Down		
Simple-cycle	✓	✓		
Combined-cycle	✓	✓		
Wind		✓	✓	
Solar		✓	✓	
Run-of-river hydro	✓	✓	✓	
Biomass	✓	✓	✓	
Geothermal	✓	✓	✓	
Battery	✓	✓		✓
Pumped hydro	✓	✓		✓
Compressed air	✓	✓		✓

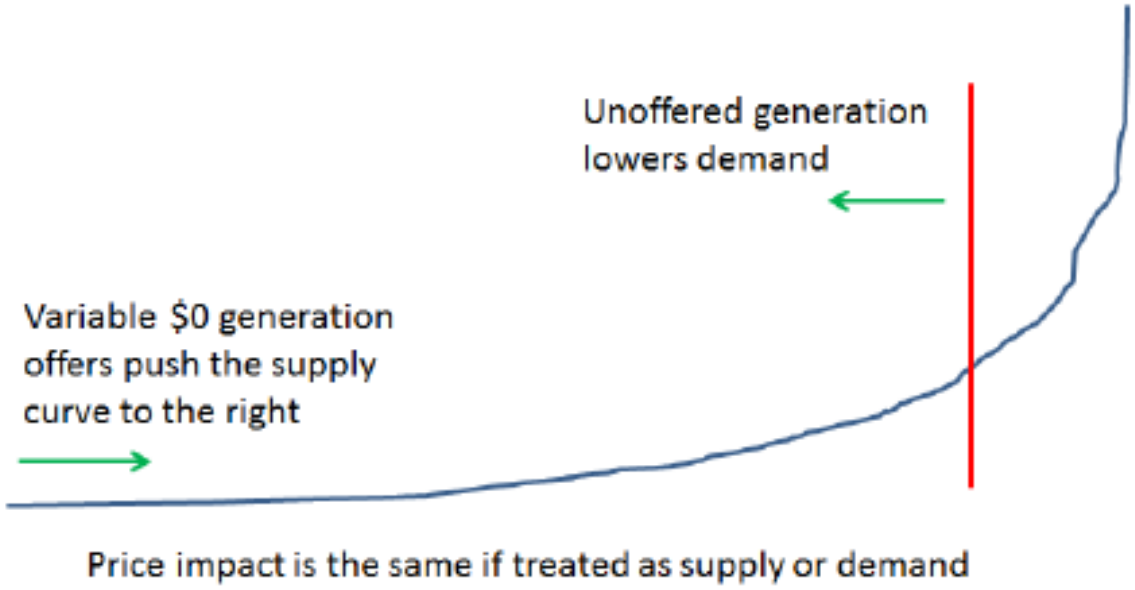
As the AESO contemplates potential changes to the energy market rules intended to facilitate Small DER participation and increase competition, it is important to consider the characteristics and behavior of renewable variable resources. The limited ability of variable renewable resources to respond to price

[11] *Electric Utilities Act,* SA 2003, c E-5.1, ss. 18(2).

[12] AESO Dispatchable Renewables and Energy Storage Report (Sept. 2018), available on the AESO website.

signals minimizes the potential benefits that may otherwise result from increasing Small DER participation and competition in the energy market. The zero-dollar cost of fuel for wind, solar, and run-of-river hydro resources, together with the built-in incentive for market participants to obtain environmental offset credits for renewable generation, increases the likelihood that these assets will most frequently submit zero dollar offers. The potential benefits of requiring Small DERs to submit offers in the energy market may be negligible if zero-dollar offers are frequently submitted as the supply demand equilibrium and resulting price signal would remain unchanged from their current passive participation. As a result, facilitating increased Small DER participation in the energy market may result in quite modest or negligible impacts to competitive outcomes. Figure 4 illustrates the price impact of unoffered zero-dollar generation on the supply demand equilibrium:

Figure 4: Equilibrium Price Impact of Unoffered Zero Dollar Generation



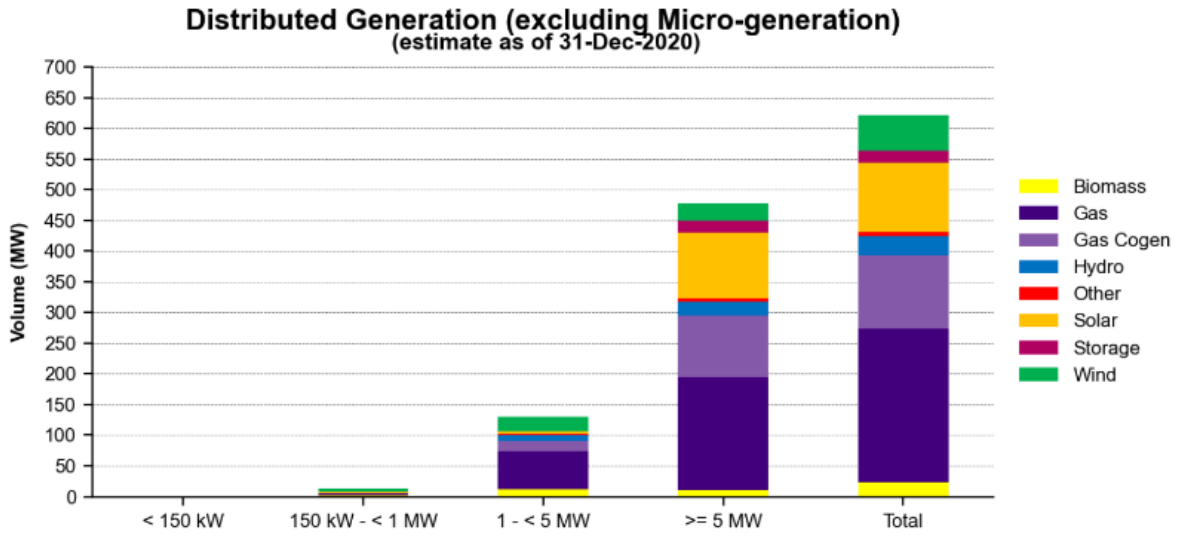
Currently small renewable DERs participate passively in the energy market and are generally treated by the AESO as negative demand. As generation from these assets increases, it reduces system demand by the output volume and, conversely, as output decreases, system demand increases by the same volume. Regardless of whether the energy is offered into the bottom of the supply curve or included in system demand, the real-time equilibrium price impact is the same. At the current and forecasted capacity, requiring small, non-controllable, renewable variable energy resources with a zero-dollar fuel cost to submit offers into the energy market is unlikely to result in any benefit to the short-term or long-term price signal. It is notable that small wind and solar resources currently account for approximately 51% (~124 MW of the total 240 MW) of Small DER capacity installed on the AIES.

In contrast to renewable variable resources, traditional thermal resources (i.e., gas generation) are theoretically price responsive and have the ability to more accurately reflect the marginal priced unit, thereby potentially influencing the short and long-term price signal. Requiring the submission of offers for Small DERs that are controllable and price responsive may therefore benefit the energy market by providing increased competition.

Figure 5 displays the installed capacity of distributed generation by asset class, excluding those assets that qualify as micro-generation under the *Micro-Generation Regulation*. Gas and gas cogeneration with an installed capacity of 1-5 MW were chosen for further analysis to assess price responsiveness in the

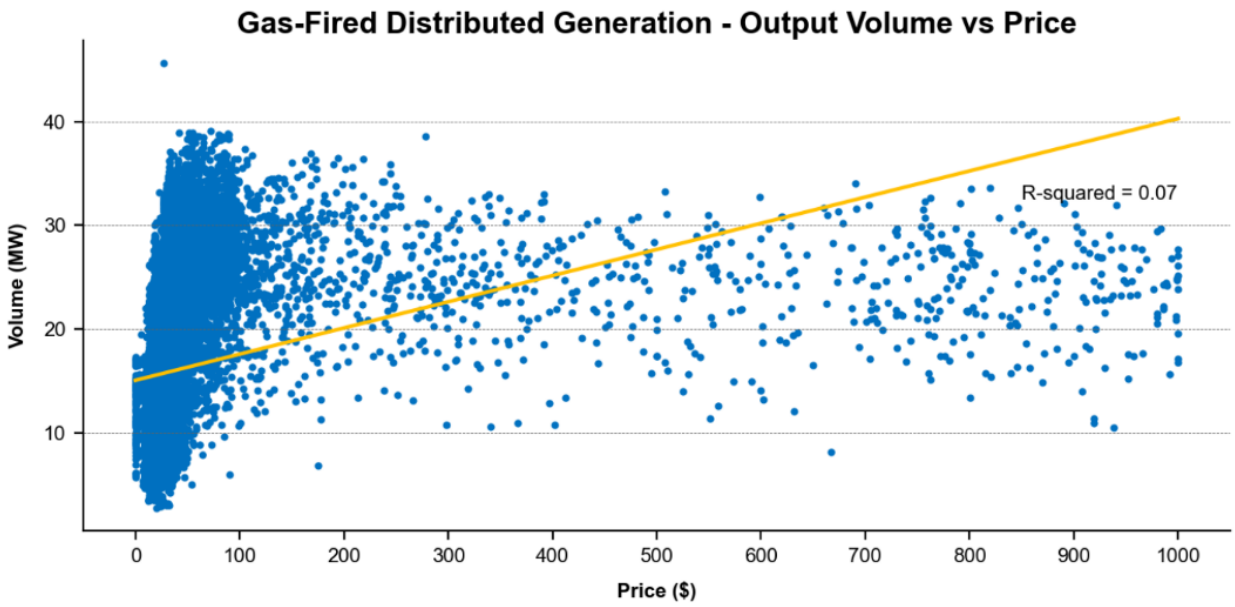
energy market. The characteristics of these asset classes, including non-zero fuel costs and the ability to dispatch both up and down, increase the likelihood that requiring offer submissions for these Small DERs will result in meaningful competition and improved price fidelity in the energy market as they have the ability to both respond and potentially influence the energy market price signal.

Figure 5: Distributed Generation (excluding Micro-Generation) in Alberta



The relationship between gas and gas cogeneration 1 – 5 MW and the energy market hourly pool price was examined to assess the potential benefits of lowering the minimum size threshold for the submission of offers to the energy market. The historic relationship between pool price and small gas generation output 1 – 5 MW was examined to determine the price responsiveness of this asset class. Figure 6 compares the relationship between gas and gas cogeneration 1 – 5 MW combined output and the settled hourly pool price for every hour between January 1st, 2016 and December 31st, 2020.

Figure 6: Gas-fired Small DERs – Output Volume vs. Price



There is a negligible correlation between total combined output and pool price. As pool price increases, the total combined generation does generally increase. However, at each individual settled price there is significant variability as to whether the same or similar pool price will incent generation levels at the same price but on a different day. Potential explanations for the lack of price responsiveness or correlation to the energy market price signal are likely attributable to the initial reason why the resources were constructed. Although the pool price is an important consideration in operational decisions, it may not be the primary reason for the operation of the asset. Other factors may determine, or influence operational run times, including environmental regulation compliance (flare gas), environmental economics (credits or penalties), cogeneration efficiencies (heat), reliable back-up power, voltage, wires cost avoidance, as well as DFO tariff incentives such as coincident peak calculations.

Potential risk to reliability and AESO market operations:

While any substantive conclusion regarding the relationship between the short-term energy market price signal and daily output of gas-fired distributed generation (in Figure 6) is largely indeterminant, the lack of transparency and operational coordination resulting from indirect participation in the energy market has the potential to negatively affect both AESO market operations and reliability, as the number of these resources increases on the AIES. The inability to predict or forecast the daily operations of this subset can have negative implications on short-term price signals (incorrect price forecasts), net variable demand, and long-term build signals (long term adequacy metrics). However, this is not currently considered a reliability issue given the current level installed capacity, subject to achieving visibility through other means and setting out required technical standards. Small gas generation (<5 MW) currently accounts for approximately 35% (~85 MW of the total 240 MW) of Small DER installed capacity, representing approximately 0.52% of Alberta generation maximum capability.

To determine whether to lower the minimum asset size threshold for market participation, the AESO must assess the amount of Small DERs passively participating in the energy market currently, as well as assess the risk of inaction should future inventories of small non-participating assets continue to grow.

Figure 7 represents the historical growth rates by asset type and size for DERs in Alberta between 2016 and 2020. Growth over the past five years has predominately been for Small DER with a nameplate capacity of less than 1 MW or greater than 5 MW. By fuel type, the asset class with the most growth has been renewable energy, largely driven by solar photovoltaics.

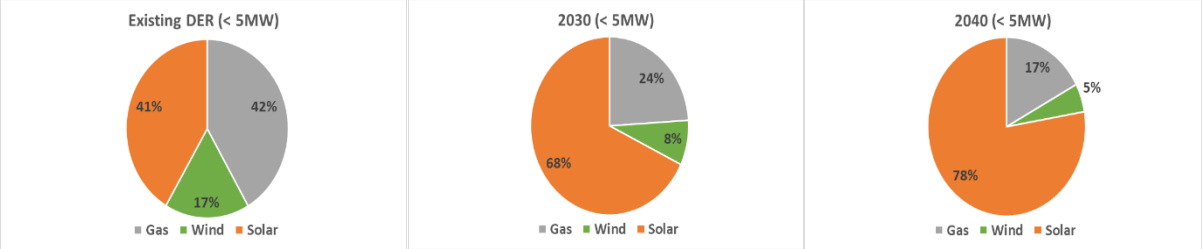
Figure 7: DER Installed Capacity Growth Rates 2016-2020:

Asset Type	2016	2017	2018	2019	2020
Biomass	-4.8%	0.0%	-31.9%	0.0%	7.2%
Gas	9.1%	0.6%	3.7%	-1.3%	1.7%
Gas Cogen	2.2%	1.3%	3.4%	11.1%	-0.3%
Hydro	0.0%	0.0%	0.0%	40.2%	0.0%
Other	-25.8%	0.0%	0.0%	3.4%	51.2%
Solar	68.4%	129.4%	44.8%	38.3%	160.5%
Wind	-1.0%	-8.7%	1.3%	1.4%	-1.6%

Asset Size	2016	2017	2018	2019	2020
< 150 kW	53.9%	52.2%	67.6%	59.0%	24.1%
150 kW - < 1 MW	81.6%	13.6%	27.1%	25.8%	41.1%
1 - < 5 MW	3.1%	4.8%	7.8%	10.0%	13.0%
>= 5 MW	2.8%	1.7%	-1.5%	1.6%	30.6%

The AESO is currently forecasting that historical growth trends on the distribution system will continue with solar and wind projects outpacing the growth of small gas generating units over the next 20 years. By the year 2040, < 5MW Solar is expected to grow from ~95 MW to ~712 MW, while < 5 MW gas generation is expected to grow from the current ~85 MW to ~158 MW of installed capacity.

Figure 8: Existing and Forecast <5 MW DER Installed Capacity [13]



The risks to reliability and operations from increased DER need to be considered when assessing if Small DERs should be required to directly participate in the energy market. To properly assess the magnitude of these risks, the forecasted capacity of controllable and non-controllable Small DERs must be considered. Non-controllable DERs with variable fuel, regardless of size, will continue to increase net demand variability, regardless of whether these resources participate in the energy market. Requiring controllable Small DERs, such as gas fired generation, to submit offers in the energy market would assist with market operations, however, the benefits of increased participation would likely be minimal given the low forecasted growth rate of gas fired generation when compared to renewable generation.

6. Recommendations to facilitate Small DER participation in the energy market

The AESO considered two options to facilitate increased Small DER participation in the energy market. Both options could be implemented with only minor amendments to Section 203.1 of the ISO rules, *Offers and Bids for Energy*. The first option is to lower the minimum-size threshold requirement to submit offers to the energy market from 5 MW or greater, down to 1 MW or greater. An alternative approach is to allow for the voluntary submission of offers below the current 5 MW or greater threshold.

The stakeholder feedback compiled from the stakeholder session held on October 14, 2020, revealed a lack of consensus among stakeholders with respect to whether the minimum-size threshold should be reduced. Most stakeholders agreed that any recommendations proposed by the AESO should be consistent with the FEOC operation of the electricity market and provide regulatory certainty. Stakeholders also agreed that the potential benefit of implementing changes to the design of the energy market must be carefully balanced against any potential for increased costs or regulatory burden. The AESO's recommendations and rationale are provided below.

6.1 Recommendation: No reduction to minimize-size threshold for offer submission

The AESO recommends maintaining the current minimum-size threshold requirement of 5 MW or greater to submit offers in the energy market. The *AESO DER Roadmap* acknowledges the importance of balancing the potential benefit of increased Small DER participation against the potential for increased market participant costs and regulatory burden. Lowering the minimum-size threshold requirement to submit offers in the energy market would directly increase costs for Small DER owners (perhaps

[13] Preliminary 2021 LTO - estimates subject to change: will be available on the AESO website

inadvertently creating a barrier to entry) and therefore should only be considered if it sufficiently increases the FEOC operation of the electricity market, or necessary for the reliability of the AIES.

The current installed capacity of Small DERs does not significantly alter competitive outcomes in the energy market. Currently, most Small DERs connected to the AIES show limited responsiveness to the hourly energy market price signal. Requiring the submission of offers for intermittent, renewable Small DERs would provide limited value from a competition perspective as their zero-dollar fuel cost and limited dispatchability would likely result in zero dollar offers and little or no change to the real-time supply demand equilibrium.

Small DERs with non-zero-dollar fuel costs and full dispatchability, such as gas and gas cogeneration, show little correlation between price and output of generation (see Figure 6). This suggests that the energy market price is not necessarily the predominant signal used when making commercial decisions to construct and operate these assets. Other factors that may influence commercial decision making include waste heat, voltage support, back-up power, environmental regulations, and distribution tariff credits.

Although market and operational visibility may become a concern if the offer submission threshold remains at 5 MW and Small DER penetration on the AIES exceeds projected forecasts, the AESO is currently assessing alternative solutions through other *AESO DER Roadmap* initiatives which could help address this situation.

6.2 Recommendation: Allow voluntary offer submissions for Small DERs

The AESO recommends that Small DERs with a maximum capability of 1 MW or greater be permitted to voluntarily submit offers in the energy market. Allowing Small DERs to voluntarily submit offers in the energy market would provide benefits such as, increased price certainty and potential eligibility for payments on the margin.

At the stakeholder session held on October 14, 2020, concerns were raised that the benefits of allowing voluntary offer submissions for Small DERS may not be commensurate with the potential cost and effort required to submit offers, and therefore voluntary participation may be limited. The AESO acknowledges that allowing voluntary offer submissions in the energy market may not lead to a significant increase in competition. However, this change could be implemented without costly changes to current IT systems (i.e. ADAMS, DT, and ETS), provided the minimum threshold is 1 MW and the system is not required to dispatch in fractions, as the lowest minimum non-zero whole number the AESO can currently accept without IT changes is 1 MW.

Increasing the potential for competition in the energy market by lowering barriers to participation for Small DERs, without requiring significant or costly changes, is consistent with the FEOC operation of the energy market and therefore in the public interest.

7. Recommendations to facilitate Small DERs in the OR market

As the number of distribution connected resources continue to grow across North America, many jurisdictions have adapted their market rules to allow for greater participation in OR markets. For an asset to be qualified to provide OR in Alberta, it must be capable of providing 15 MW regulating reserve (RR), 10 MW spinning reserve (SR), and 5 MW supplemental reserve (SUP). The minimum asset size requirements to qualify to provide OR in Alberta present a barrier to entry for Small DER participation. The FERC has mandated minimum size thresholds (Figure 1, US Market Comparison) of 100 kW;

however, the AESO is currently not considering a reduction to the minimum size thresholds below 1 MW. The AESO's IT systems do not currently dispatch in fractions and as such, lowering the threshold below 1 MW would be a significant change.

The AESO will be conducting an OR Market Review in 2021 and will initiate further stakeholder consultation on minimum size threshold changes. A review of technical and operating requirements and the potential for DER aggregation for the purpose of enhanced participation of Small DERs in the OR market may be reviewed at that time.

7.1 Recommendation: Reduce minimum asset capability qualification requirements

The AESO recommends reducing the minimum asset capability requirements for qualification in the OR market for regulating, spinning and supplemental reserves from 15 MW, 10 MW and 5 MW, respectively, to 1 MW. A recent AESO technical study suggests the minimum asset capability requirements for qualification in the OR market could be significantly lowered and has concluded that it is technically feasible to significantly lower the minimum size thresholds across all operating reserve products.

The predominant concern raised by stakeholders at the Stakeholder Session held on October 14, 2020 regarding potential changes to facilitate Small DER participation in the OR market was that any changes must preserve a level playing field that maintains the fair and equal treatment of all participants. The AESO acknowledges these concerns and it is expected that Small DERs are subject to the same or similar compliance obligations. Individual OR product performance standards will need to be reviewed as current tolerance bands for OR directives and dispatch could be equal to the size of the directive or dispatch for Small DERs. Small DERs intending to participate in the OR market will still be required to meet appropriate technical and SCADA standards/requirements for the purposes of qualification.

The recommended changes to reduce the minimum asset capability requirements for qualification in the OR market for regulating, spinning and supplemental reserves can be implemented without significant or costly changes to current IT systems (i.e. ADAMS, DT, and ETS). Implementing these changes will lower barriers to Small DER participation thereby increasing competition the OR market, which is consistent with the FEOC operation of the OR market.

7.2 Recommendation: Allow participation in the OR market without requiring the submission of offers in the energy market for source assets below 5 MW

Section 203.1 of the ISO rules, *Offers and Bids for Energy* states that source assets with a maximum capability of 5 MW or greater are required to submit offers into the energy market. As discussed above, the current minimum asset capability requirements for qualification in the OR market are at least 5 MW. Participation in the OR market is voluntary, whereas, participation in the energy market is mandatory for all source assets with a maximum capability of 5 MW or greater. Consequently, those voluntarily participating in the OR market are also required to submit offers in the energy market.

As discussed in previous sections, the AESO recommends that the requirement to submit offers in the energy market remain at the current minimum size threshold of 5 MW or greater and the minimum asset capability requirement for qualification in the OR market be lowered to 1 MW. The combined effect of these two recommendations is that Small DERs voluntarily participating in the OR market will not be required to submit offers in the energy market.

After considering this issue, the AESO recommends allowing participation in the OR market without requiring the submission of offers in the energy market for source assets below 5 MW. The ISO rules do not require concurrent bids and offers in the energy market when participating in the OR market. Introducing a requirement for Small DERs to participate in the energy market while concurrently participating in the OR market would increase regulatory burden and may be viewed as a barrier to participation. This recommendation increases competition in the OR market without unnecessary mandatory participation in the energy market.

An argument could be made for mandatory energy market participation as the operational and market visibility of Small DERs would be enhanced with concurrent participation in both markets through the submission of available capability (AC) restatements. However, compliance monitoring of the OR market is primarily performed using SCADA and Maximum Authorized Real Power (MARP). Small DERs participating in the OR market will be required to provide this data, consistent with other providers.

8. Recommendations to facilitate Small DERs and aggregation

On their own, Small DERs are often unable to participate in the energy and OR markets due to minimum asset size requirements. For Small DERs that wish to actively participate in the electricity markets the only options are to expand their on-site infrastructure or aggregate resources together in order to meet the minimum MW size thresholds required by the markets.

8.1 Recommendation: Discontinue review of aggregation options for Small DERs in the energy market

The AESO recommends discontinuing further exploration of aggregation options for Small DERs in the energy market. It is anticipated that the recommendation to allow voluntary participation in the energy market for Small DERs 1 MW and greater will address the need for most DERs that are capable and willing to compete in the energy market. Although aggregation for the purpose of satisfying minimum asset size thresholds may facilitate small resource participation below 1 MW in the energy market, stakeholders did not identify this as a priority that the AESO should continue to pursue. Until such time as there is more interest from stakeholders in pursuing increased options for aggregation in the energy market, further exploration of aggregation options will be discontinued.

8.2 Recommendation: Discontinue review of aggregation options for Small DERs in the OR market

The AESO recommends discontinuing further exploration of aggregation in the OR market. The recommendation to lower the OR minimum asset qualification thresholds to 1 MW will significantly reduce the need for aggregation in the OR market for most Small DERs. However, as new technologies continue to emerge such as electric vehicles, and home & commercial energy storage, extending OR market participation below 1 MW may be warranted in the future. The pace and priority will be driven by a blend of technology monitoring and stakeholder interest in this endeavor. The AESO will be conducting stakeholder sessions in 2021 regarding OR Market Design.

9. Conclusion

The *AESO DER Roadmap* presents a proactive plan to prepare the AESO for a future state characterized by higher penetration of DERs on the AIES. Significant market design changes are not required at this time as the installed capacity and forecasted growth rates of Small DERs in Alberta are not expected to adversely impact the reliability of the AIES or the FEOC operation of the electricity market. Accordingly, the AESO is recommending the implementation of the following small incremental changes to the energy and OR markets to reduce existing barriers to participation for Small DERs:

i. Maintain current offer submission requirement threshold in Section 203.1 of the ISO rules, *Offers and Bids for Energy,* at 5 MW and greater. At this time, there is limited benefit proceeding with an amendment to this rule. This recommendation considers the limited benefit from increased transparency and direct participation with the cost of participant rule compliance and AESO implementation associated with facilitating Small DER market participation.

ii. Allow voluntary participation in the energy market for Small DERs 1 MW and greater. This change is consistent with FEOC operation of the markets (removing barriers to entry, increasing competition) and fairly straight forward to implement. Inclusion of Small DERs below 1 MW are not recommended at this time as the limited benefit from increased participation from assets under 1 MW would not support the IT system changes for such a change.

iii. Lower the asset qualification thresholds to provide operating reserves for regulating reserve, spinning reserve, and supplemental reserve from the current requirement of 15 MW, 10 MW and 5 MW, respectively, to 1 MW. The implementation of this change will be included in the OR Review initiative.

iv. Allow Small DER participation in the OR market without a requirement to submit offers in the energy market. This recommendation increases competition in the OR market without unnecessary mandatory participation in the energy market.

v. Discontinue exploration of aggregation options for Small DERs in the energy market. It is expected that the recommendation to allow voluntary participation in the energy market for Small DERs 1-5 MW will enable most DER that are capable and willing to compete in the energy market the opportunity to do so. Further exploration may be initiated if stakeholders identify the need and priority to proceed.

vi. Discontinue exploration of aggregation options for Small DERs in the OR market. The recommendation to lower the OR asset qualification thresholds to 1 MW will significantly reduce the need for aggregation in the OR market for most Small DERs. Further exploration may be initiated if stakeholders identify the need and priority to proceed.

Looking forward, the AESO will need to continue to monitor Small DER volumes to guide future decisions around market participation thresholds. However, these DER market participation recommendations are expected to effectively promote a FEOC market and provide market certainty while managing the scope of the proposed changes.

10. Next Steps

1. Stakeholder session to allow an opportunity for clarifying questions on the recommendation paper and share feedback – Feb 23, 2021.
2. Stakeholders provide written feedback – March 17, 2021
3. AESO response to stakeholder feedback and final recommendation – April 2021
4. ISO rule development process to be coordinated with other market initiatives.