



Alberta Demand Response Initiative Discussion Paper

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1.0 Introduction

Alberta's electricity market has had a significant volume of demand participation since its inception, but the degree of participation from load customers has not increased over time. Load participation is an important part of a healthy and functioning market, and government policy supports the goal of enhancing demand participation in the various elements of the electricity market.

The Demand Response Working Group (DRWG) was initiated in the fall of 2008 to examine barriers to demand response (DR) in the Alberta market. The working group conducted a review of numerous topics, including existing demand response, barriers to demand response and AESO requirements for reliability products. This paper is intended to capture the information gained from the working group and create a framework that will allow specific initiatives to proceed in a principled manner.

The AESO appreciates the work done by the working group and the valuable input received during the process. The resulting report is an AESO discussion document designed to further engage industry in the consultation process and does not necessarily represent a consensus view of the working group. All market participants, as well as working group members, are invited to provide feedback on this report.

The remainder of this paper is divided into several sections, with two main areas of focus. The first section of the paper outlines principles for the development of DR initiatives, which are based on government legislation and policy. The second examines types of DR initiatives in the context of these principles. As noted, stakeholders are invited to provide comments on this paper, particularly with respect to the market principles and whether specific initiatives fit within the Alberta market design. This document and potential DR initiatives are premised on the existing wholesale market design, and any fundamental market changes are considered outside the scope of this project.

This document is not intended to provide technical details or market design concepts on specific initiatives. Such details will be developed through further consultation and specific product level recommendation papers.

2.0 Demand Response Policy and Principles

The AESO's mandate is set out in government legislation, regulation and policy. At the highest level, the AESO has two overarching duties: operate the market in a manner that promotes the fair, efficient and openly competitive (FEOC) exchange of electricity, and provide for the safe, reliable and economic operation of the interconnected electric system. This requires that specific DR products, and rule changes to enable more demand response, must be evaluated for whether they do or do not support Alberta's policy framework and the AESO's mandate.

2.1 Electric Utilities Act (EUA)

As noted, the AESO has two key duties that must be recognized when examining demand response options.

Duty to Act Responsibly

16 The Independent System Operator must exercise its powers and carry out its duties, responsibilities and functions in a timely manner that is fair and responsible to provide for the safe, reliable and economic operation of the interconnected electric system and to promote a fair, efficient and openly competitive market for electricity.

Duties of Independent System Operator

17 The Independent System Operator has the following duties:

- (a) to operate the power pool in a manner that promotes the fair, efficient and openly competitive exchange of electric energy;
- (b) to facilitate the operation of markets for electric energy in a manner that is fair and open and that gives all market participants wishing to participate in those markets and to exchange electric energy a reasonable opportunity to do so;
- (c) to determine, according to relative economic merit, the order of dispatch of electric energy and ancillary services in Alberta and from scheduled exchanges of electric energy and ancillary services between the interconnected electric system in Alberta and electric systems outside Alberta, to satisfy the requirements for electricity in Alberta;
- (d) to carry out financial settlement for all electric energy exchanged through the power pool at the pool price unless this Act or the regulations made by the Minister under section 41 provide otherwise;
- (e) to manage and recover the costs of transmission line losses;
- (f) to manage and recover the costs for the provision of ancillary services;
- (g) to provide system access service on the transmission system and to prepare an ISO tariff;
- (h) to direct the safe, reliable and economic operation of the interconnected electric system;
- (i) to assess the current and future needs of market participants and plan the capability of the transmission system to meet those needs;
- (j) to make arrangements for the expansion of and enhancement to the transmission system;

(k) to collect, store and disseminate information relating to the current and future electricity needs of Alberta and the capacity of the interconnected electric system to meet those needs, and make that information available to the public;

(l) to administer load settlement;

(l.1) to monitor the compliance of market participants with rules made under sections 19, 20 and 24.1;

(m) to perform any other function or engage in any activity the Independent System Operator considers necessary or advisable to exercise its powers and carry out its duties, responsibilities and functions under this Act and regulations.

The EUA does not specifically address demand response, but it is clear that the duties related to promoting a FEOC market, providing a reasonable opportunity for the exchange of electric energy and establishing the merit order based on relative economic merit all impact the types of DR initiatives that can and should be pursued by the AESO.

2.2 Transmission Regulation and Policy Documents

In addition to the EUA, the ISO takes guidance from government regulations and policy documents. The Transmission Regulation, Alberta's Electricity Policy Framework and the Provincial Energy Strategy all provide guidance relevant to the DR discussion. The Transmission Regulation directs the ISO to develop a load curtailment plan to follow in the event of a supply shortfall:

18(2) Make rules to implement a load curtailment priority plan which, in the event of a generation supply shortfall, will provide for the interruption of service to customers in a priority ranking

The 2005 Electricity Policy Framework also commented on demand response in the electricity market in a number of contexts. At a high level, the DOE stated that demand response improves the efficiency of the market, and that further investigation should be undertaken to enhance demand response.¹

Demand response can significantly improve the efficiency of the market. Alberta has a significant amount of industrial demand response in comparison to other jurisdictions, though it is not clear if this resource is fully utilized under the current design. The Department recommends further investigation to determine specific rules that can be implemented to enhance and factor in demand response in the market.

The Framework made recommendations for load response in relation to improving short-term supply adequacy:²

4. Loads not bidding in: Loads are currently not required to submit bids into the energy market. Very flexible price responsive loads, while a generally good thing, can negatively impact the system operator's ability to maintain a supply-demand balance. There was discussion last year to require price responsive loads of a certain threshold MW amount to notify the ISO of their intended actions.

¹ Alberta's Electricity Policy Framework: Competitive – Reliable – Sustainable. Alberta Department of Energy, June 6, 2005, pp 4-5.

² Ibid, Page 24.

Recommendation: The Department recommends there be a requirement for price responsive load above a certain threshold to notify the ISO of its curtailment strategy. Load will not be required to bid into the energy market. However, the ISO will explore products that encourage price responsive loads to bid into the energy market. This recommendation addresses the following STA issues that were identified in the Integrated Options Paper.

- Provides proper input into the ISO unit commitment assessment
- Improves system reliability
- Reduces wholesale price volatility
- Reduces the amount of needed installed capacity

5. Greater demand response: The current market design only promotes load response that is very flexible and can react quickly to prices.

Recommendation: Even though the current market design only promotes flexible load response that can react quickly to real-time price, demand response in Alberta is as good or better than most jurisdictions. While the Department and the ISO will continue to investigate ways to facilitate demand response, there is no immediate need to move to a DAM [Day Ahead Market] for this purpose.

The DOE paper also provides policy directives with respect to DR and long term resource adequacy.³

In competitive markets the interaction between sellers and buyers is critical to ensure efficient price discovery. Inelastic demand and a tight supply situation can create a sellers market whereby market participants may extract economic rents. This situation has been observed in electricity markets. In general, demand response may result in many positive benefits for wholesale electricity markets, including:

- Improve system reliability
- Reduce wholesale price volatility
- Reduce market power (means of market power mitigation)
- Reduce electricity consumption (environmental benefits) and
- Reduce the amount of needed installed capacity.

.....

Recommendations

The Department supports the facilitation of demand response and recommends further study and consultation with stakeholders to identify specific market rule impediments and to evaluate alternatives to improve demand response.

Finally, the Provincial Energy Strategy (PES)⁴ suggests that the province should:

... promote smart metering, smart grids and better consumption measurement in order to help Albertans better understand their consumption patterns and incent greener responses.

³ Ibid, pp 39-40.

⁴ Launching Alberta's Energy Future - Provincial Energy Strategy. Government of Alberta, December 11, 2008, page 38.

The policy suggests that the fundamental market design is to be maintained, and any DR initiatives will be examined in this context. The AESO's mandate to promote a FEOC market within the current market design context is a key criteria against which any options must be measured.

2.3 Demand Response Principles

The key principle any demand response initiative must adhere to is that it is consistent with the concept of a FEOC market. While FEOC is not explicitly defined by policy or legislation in the context of demand participation, this paper will outline principles for DR initiatives that are consistent with the AESO's interpretation of FEOC design principles. These principles include:

- Barriers to DR should be examined to determine if they can reasonably be removed or reduced.
- Product design should be consistent with the existing market structure and support the existing energy only real-time energy price signal.
- Reliability products (or any other AESO-procured products) should be open to participation by both generation and DR resources wherever technically possible.
- The market price signal should be visible and all competitors should respond to the same price signal whenever possible.
- The real-time energy price is the signal for loads to curtail in the energy market.
- AESO initiatives such as the operating reserve market redesign and wind integration should incorporate the objective of including demand response as part of the process.

The demand response principles listed above are intended to guide DR initiatives in the context of the existing wholesale market design. Market redesign is not part of the scope of this project, nor is implementing significant administrative burdens on load such as a mandatory must bid, must comply model. Although a must bid, must comply model is consistent with the principle that supply and load should face symmetrical rules, this represents a significant departure from the current market design and is beyond the scope of this discussion paper.

The next several sections provide greater detail into the principles highlighted above that will be used in evaluating potential demand response initiatives.

Remove Barriers

There are a variety of barriers that could reduce or preclude DR participation in the energy market or other markets, such as reliability markets. Barriers put in place to maintain system reliability should be maintained. Unintentional barriers, such as those created by market rules, will be reviewed, but equivalent rules for load and generation are a guiding principle. Separate rules will not be created for loads as a means of increasing DR participation.

Symmetric Rules

At a high level, a FEOC market is one where all participants can compete on a level playing field, and market rules are an element of the playing field. Given this, in order to promote the FEOC market the AESO should strive to ensure that there are symmetric rules for generation and load wherever practical. For example, generators and loads should face the same price signal and have access to the same options to mitigate price risk.

Product Design

An implication of fairness is that both loads and generators have the right to sell any product for which they meet the technical requirements. Any new products contemplated by the AESO will be, in principle, evaluated to determine if both load and supply sources can sell the product such that system needs can be met in an efficient and competitive manner.

The AESO's mandate to operate the system in a reliable manner is the key determination in developing technical standards. Openly competitive does not require that the AESO reduce technical standards to the point that the number of competitors is increased at the expense of system reliability.

If new products are designed, such as a wind following service, an important consideration will be whether or not existing products can meet the need, or whether the better solution is to create a new product. A new product with different technical standards could increase the number of potential suppliers, but it could also serve to fracture markets to the point where competitive outcomes are unlikely.

A related principle is that, where possible, products will not be created based on the cause of a system problem, but rather on the action that is required to resolve the problem. For DR products, this means that the products will be procured on the basis of what triggers the response (frequency, supply shortfall, etc) and the expected frequency of exercise, as opposed to different products for each cause of the triggering event.

Price Fidelity

Price fidelity is vital in order to maintain a FEOC market. In the Alberta energy market, there is a single price based on the marginal offer of the most expensive generator required to meet demand. If load begins to participate in the market via a bid, price could also be set at the marginal value of energy (value of lost load) rather than solely at the marginal offer from generation. The key principle is that programs designed to encourage DR in the energy market should not alter the fundamental economic decision that loads make to curtail. In essence, loads should curtail when the price of electricity is higher than the value of their lost load, and any DR programs should be focused on sending this signal to loads in a timely manner to allow the response.

Within the spot energy market operated by the AESO, this means that both loads and generators face the same real-time market price that settles on an hourly basis. Loads should have access to the same level of price certainty generators have, provided they participate in an equivalent manner. Openly competitive also suggests that wherever possible, consistent price signals should be given to all types of competitors, i.e. loads

and generators are compensated in the same manner for the same product. This allows a single basis for comparison between competitors and removes subjective decision making and AESO influence from the competitive process.

2.4 Demand Response Options

The remainder of this paper explores options to increase demand participation in the electricity market. Three general types of options are outlined in the paper.

- Section 3 - Energy market initiatives
- Section 4 - Reliability product initiatives
- Section 5 - Other product initiatives

Energy market initiatives are grouped as changes designed to increase the amount of demand that responds in the real time energy market as a result of a price signal.

Reliability products are products procured by the AESO where response is triggered by system events, and the response is required to maintain system reliability. The final grouping of other products is those products that are not strictly required for reliability purposes, but create a benefit such as enhancing the FEOC nature of the market.

3.0 Energy Market Initiatives

This section will examine several potential options for changes to the energy market designed to encourage more demand participation. For the purposes of this paper, the energy market is defined simply as the real-time energy market and does not include any other aspects of the market such as ancillary services. As such, this section outlines options to increase the amount of demand that responds to the real-time energy price signal.

In order to provide background for the specific initiatives described, existing DR in the energy market is described in section 3.1. Section 3.2 briefly discusses the types of barriers that exist for potential load participation in the energy market, and section 3.3 explores potential options that would reduce or eliminate barriers to greater participation.

The range of possible options explored in section 3.3 include paying loads the spot market price to curtail, increasing price certainty for loads when they curtail, removing barriers to participation within the current design, and rule modifications to increase the incentive to participate within the current structure. Options such as wholesale market redesign are not explored, as these options are beyond the scope of this paper.

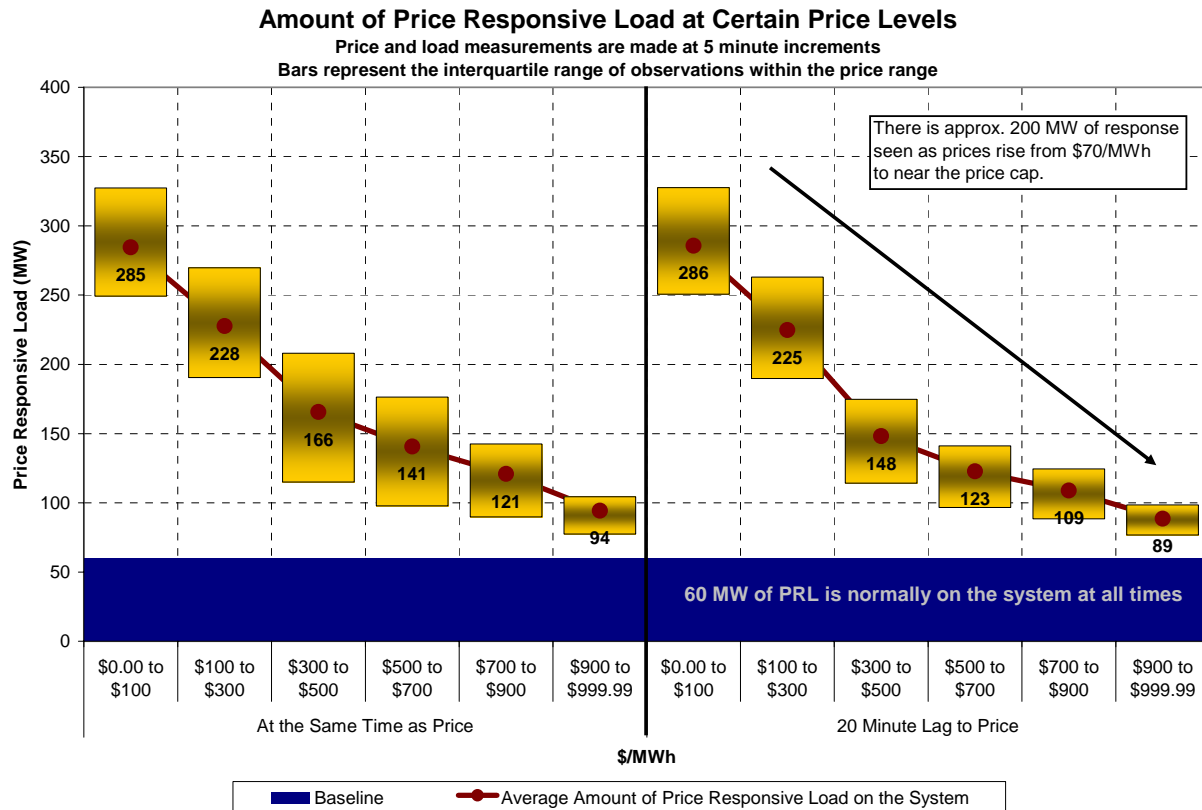
3.1 Existing DR in the energy market

Demand response is currently limited to several hundred MW in the energy market. This load responds in a voluntary fashion to the spot price signal. It does not submit a bid into the market, but rather responds to the real-time price signal when its operational conditions permit. Figure 1 illustrates typical levels of price responsive load actions during 2008. Approximately 200 MW of price responsive load was tracked by the AESO in 2008, with the majority of the responsive load curtailing below \$500/MWh.

There are no direct payments for loads choosing to curtail voluntarily. In 2008, price responsive loads were able to achieve an annual reduction of 15% to 20% in energy costs by selectively curtailing about 3% of their load. Also, it should be noted that some of the existing price responsive loads participate in reliability products such as the supplemental market and load shed service.

Load is also active in the forward energy market via purchases of contracts. Alberta's forward market provides load an option to fix energy costs prior to real-time, and this market is completely voluntary. Loads that participate in the forward market can retain the ability to respond to real-time price signals if the contract terms of their forward purchase allow the benefit of real-time curtailment to flow to the load, and loads are also free to sell this flexibility to a counterparty or third party aggregator. The AESO does not monitor or restrict these types of forward contracts, although participants can register forward positions for net settlement with the AESO in order to reduce credit requirements.

Figure 1 - Average Price Responsive Load in Alberta



3.2 Barriers to more DR in the Energy Market

A number of barriers were identified in the course of the working group discussions, including:

- There is no price certainty for loads that choose to curtail;
- Some loads cannot curtail without advance notice;
- There is insufficient financial incentive to curtail, i.e. loads are not compensated for the value they create by curtailing
- The signal for curtailment is currently limited to the real-time energy price; and
- The AESO does not have a baseline established for small customers on cumulative meters which limits the ability of aggregators to enter the market

Many of these barriers are reflective of the Alberta real-time, energy only market design. This design poses similar challenges for generators. Flexibility and rapid response are valuable in the Alberta market on both the load and supply side, and many of the options explored in section 3.3 amount to the development of products or rules to address this fundamental market feature.

3.3 Options to Increase DR in the Energy Market

3.3.1 Price Certainty

A lack of price certainty and the requirement to curtail with very little notice in the real-time energy market were identified as key barriers to increasing the amount of price responsiveness in the energy market. There are several ways these particular barriers could be reduced or eliminated including the options highlighted in the following sections.

Payments to Bids on the Margin

Payments to bids on the margin are basically equivalent to payments to offers on the margin that provide generators dispatched intra hour the certainty that they will at a minimum receive their offer price if the hourly price settles below their offer. In order to receive these payments, a generator must have an energy market offer, and it must comply with its dispatch. It should be noted that these payments create certainty only within the hour and do not create any certainty regarding total compensation over a longer period.

The AESO is willing to explore payments to bids on the margin, as this extends the same amount of price certainty to DR providers as exists for generators. This would require DR loads to submit a bid into the merit order and comply with dispatch instructions. This entails a loss of flexibility relative to the current behaviour of optional curtailment. In addition, a bid that is dispatched will set the market price at a higher level than the generator offer used to set market price when the load curtails voluntarily. If loads do not curtail to 0 MW or near 0 MW of consumption, this higher price represents a cost of submitting a bid.

Given that loads currently do not bid into the market, it is not clear if introducing payments to bids on the margin would actually increase demand participation in the market. The AESO is seeking feedback on whether there is a benefit to pursuing payments to bids on the margin, given that these payments would subject loads to a must comply obligation with respect to their bid.

Altering Settlement Rules

A key principle outlined earlier is that both load and supply are subject to the same price signal, and therefore the same settlement rules. If settlement rules were altered, such as decreasing the settlement interval from one hour to a shorter period such as 15 minutes, it would apply to both load and generation. This concept has benefits both for load participants in the energy market and supply participants, and there is no principle that suggests the settlement period cannot be changed. This is a very large IT undertaking and would be part of a larger system upgrade that cannot be implemented in a short timeframe.

New Energy Market Products

Energy market products designed to create greater price certainty for loads relative to generators cannot be created without violating the principles outlined in this paper. These products would either alter the nature of the energy only market design, or would create an uneven playing field between load and generation.

Load customers can create price certainty via contracts with retailers, generators, wholesale marketers or other load serving entities. One possible exception is an equivalent to long lead time energy directives for loads that are willing to curtail but need notice. This concept is explored in Section 5.2, but it should be noted that long lead time directives are a reliability backstop intended to ensure supply adequacy in light of a generator's physical limitations, as opposed to strictly an energy market product.

3.3.2 Insufficient Incentive

A variety of discussions centered on the lack of incentive for loads to participate in the energy market. Several specific examples of increasing incentives are examined below.

Pay Loads for the System Benefit They Create

Price responsive loads create a number of benefits for the market, including reducing price volatility, increasing both short and long-term reliability, and reducing the likelihood of out of market interventions.

The principles outlined earlier in this document reflect the position that curtailment decisions in the energy market should be made on the basis of internal decision making by loads. If a load values energy equal to or more than the spot market price, that load should consume the energy. Payments to loads that alter this decision process are inconsistent with the concept of a FEOC market given that generators do not receive similar payments.

Where private decisions and interconnection standards do not result in a reliable system, the AESO is obligated to procure services to ensure reliability, preferably through market means. However, only those services that are not supplied concurrently with decisions in the energy market should be compensated.

Pay Loads the Energy Market Price

Some working group participants suggested that DR suppliers should be paid the energy market price when they curtail. In effect, this alters the curtailment decision from cost avoidance to revenue creation. This concept does not fit within the guiding DR principles because a load would be incanted to curtail via an ISO rule or program, even if it valued the electricity at a higher price than the market price. This would influence prices, and it is not the AESO's mandate to influence market prices, but rather to ensure price fidelity.

Paying loads to curtail in an effort to reduce the overall average market price is inefficient. While it is true that loads as a whole may benefit for the short term if prices are temporarily reduced by selective payments to loads to reduce consumption, this is not a sustainable benefit. Generators respond to the overall price signal, and if prices

fall, less generation will develop, which will lead back to higher prices.⁵

Paying loads the energy price also creates a settlement imbalance that would require a form of uplift to resolve. Since load curtailment does not actually inject energy onto the system, total consumption would not equal the quantity notionally supplied.

Allow Bids at Prices Greater Than \$1000/MWh

One of the options FERC recommended for increasing DR was to allow bids for load curtailment at prices above the price cap. This could be implemented in a number of ways, but the key is that the lack of an economic incentive for curtailment can be resolved by allowing the price to rise to higher levels when there is insufficient generation to meet total demand. In this event, the market would be balanced by market means (demand side bids) rather than by out of market actions through AESO Operating Policies and Procedures.

The AESO is open to exploring this option, as it is largely consistent with the duty to promote a FEOC market. Although it creates different rules for load relative to generation, it does allow an improved price signal relative to a firm price cap and may mitigate the need for long lead time energy directives as outlined in section 5.2. The potential voluntary load curtailment product discussed later in this paper could be meshed with allowing bids greater than \$1000/MWh in order to encourage a higher volume of the load curtailment product as an in market product.

3.3.3 Aggregation and Baseline Methodology

The main barrier to aggregation identified in the working group sessions is that there is a lack of methodology in Alberta to allow small consumers on cumulative meters to benefit from curtailment. Other markets use a baseline methodology that allows loads to be compensated based on the estimated volume of load reduction. In Alberta, the lack of a baseline methodology means that small customers only avoid the average price⁶ when they curtail, rather than the hourly pool price.

Given the relatively short timeline for interval metering at smaller sites, and the amount of time and resources that would be required to create a baseline methodology, the AESO does not plan to pursue development of this option. The AESO is willing to work with aggregators to ensure that loads that curtail and have an interval meter can avoid the hourly pool price rather than the average price.

3.3.4 Signals Beyond the Spot Energy Price

Some work group participants suggested the range of signals for load curtailment should be expanded beyond the real-time energy market price. For example, load curtailment could be signaled to manage peak loading on the system when hot weather is forecast for the next day. Load curtailment could also be triggered when significant

⁵ The concept is conceptually very similar to a selective 'pay as bid' market design, and Alberta has taken a very clear design approach based on a system marginal price.

⁶ The average price in this case is likely a fixed price such as a monthly regulated price (for RRT customers) or an annual fixed price for customers with a contract.

generation is scheduled to be offline the next day. Both of these signals would be correlated with high prices, but the loads would not respond independently to the real-time price signal.

While other jurisdictions use these programs to manage either peak loads or anticipated high prices (or actual high prices in a mandatory day ahead market), these types of programs are not consistent with the principles outlined in this paper. The AESO provides information ahead of real-time to help both load and generation manage their individual decisions. The AESO does not have a mandate to participate in the market for the purpose of managing market outcomes and will not do so.

4.0 Reliability Product Initiatives

This section will examine several potential options for increasing the amount of load participation in services designed to ensure the reliability of the Alberta power grid. Demand response providers currently provide a number of reliability services under a range of compensation regimes, but there are a number of changes and/or new products that could increase the level of demand participation in this aspect of the market.

Section 4.1 provides a brief overview of existing DR participation in reliability products, and section 4.2 lists barriers that have been identified to further DR participation in the reliability sector of the market. Section 4.3 looks at three broad initiatives to increasing DR participation: altering technical standards, allowing aggregators and developing new products.

From the perspective of new products, three services have been identified that may be required to ensure reliability in the future: a ramping product (wind integration), voluntary load curtailment and transmission must run (TMR).⁷ Load shed service (LSS) has also been identified and is examined in section 5 of this paper.

4.1 Existing DR Supplying Reliability Products

Load currently supplies a number of reliability products, both those procured competitively and those supplied via tariff means. Table 1 presents a brief overview of the existing load response in reliability products.

4.2 Barriers to more DR Participation in Reliability Products

In order to participate in reliability products procured by the AESO, loads must meet specific technical standards. The technical standards may serve as barriers to enhanced demand side participation in reliability products. Examples of these barriers include:

- Technical standards prevent loads from participating in some markets
 - WECC standards do not allow loads to supply spinning reserves
- Aggregators are not allowed to sell reliability products in Alberta

⁷ The AESO has solicited load response as a source of TMR in previous RFPs as per the MSA recommendation in its TMR investigation.

Table 1 - Load Participation in Reliability Products

Program	Description	Volume
Load Participation in Supplemental Reserves (SUPL)	<ul style="list-style-type: none"> ▪ Participates in the supplemental reserves market ▪ Required to reduce consumption within 10 minutes of being directed ▪ Used in loss of supply shortfall situations (part of contingency reserves for the AIES) ▪ SUPL participants cannot participate in LSS (and vice-versa) 	Approximately 60 MW currently active in the market
Load Shed Service (LSS)	<ul style="list-style-type: none"> ▪ To support increased import capacity on the BC tie ▪ Load breakers tripped by relay if AIES frequency drops below 59.5 Hz (may occur when BC tie trips at high imports), also can be manually curtailed ▪ Used in supply shortfall situations ▪ LSS loads may be price responsive 	Approximately 100 MW contracted (Will vary depending on conditions)
Import Load Remedial Action Scheme (ILRAS)	<ul style="list-style-type: none"> ▪ Legacy product ▪ When armed, ILRAS aids in supporting increased import capacity on the BC intertie ▪ Armed only during supply shortfall procedures ▪ Load breakers are tripped by relay should the intertie trip with high imports ▪ Unavailable when there is lightning in the area 	200 – 400 MW (system emergencies only)
Demand Opportunity Service (DOS)	<ul style="list-style-type: none"> ▪ Temporary, interruptible class of transmission service that can apply to a load increase that exceeds a customer's DTS Contract Capacity ▪ Used in supply shortfall and transmission constraint situations ▪ Term, 1 hour, and 7 minute products available 	Approximately 100 MW (Will vary depending on conditions)
Voluntary Load Curtailment Program (VLCP)	<ul style="list-style-type: none"> ▪ Have agreed to be cut prior to firm load reductions ▪ Used in supply shortfall procedures ▪ Manual direction (phone) 	Kilowatts (Negligible)
Under-Frequency Load Shedding Scheme (UFLS)	<ul style="list-style-type: none"> ▪ Safety net for extremely large loss of generation ▪ WECC requirement ▪ Set at a variety of frequency levels 	Roughly 50% of load

4.3 Options to Increase DR Participation in Reliability Products

In order to increase DR participation, the key change is to alter technical standards such that more loads can participate in the market. As noted previously, technical standards cannot be relaxed to the point that reliability is compromised. Potential changes to technical standards include allowing aggregators to sell reliability products, altering technical standards to allow loads into more existing markets, and designing new products with the view that loads should be able to participate in the market. The timing for new products will be driven by system need. The AESO will provide the best information possible with regards to timelines, volume requirements and technical standards in advance of actual need.

4.3.1 New Products

As the need for new products is identified, the AESO will facilitate load participation to the greatest extent possible, with two important notes. First, new reliability products will not be created for the sole purpose of engaging load in demand response in the broader market. The AESO will only develop reliability products that meet a defined system need and are required to meet the reliability mandate outlined in the EUA. System requirements will dictate the technical requirements for new products. Minimum performance standards are required to ensure that reliability products actually deliver a solution to the system problem.

Ramping Product (Wind Following)

Wind capacity is expected to increase in Alberta. At some point, the amount of wind on the system may necessitate a new product in order to maintain grid reliability. Ramping requirements associated with wind variability have been identified by the AESO as a potential reliability issue in previous analysis.

This service may have similar requirements to supplemental reserves in that it will be required to respond in a given a timeframe, and may be potentially supplied by either load or generation. Load resources are a potential supplier of ramping service, particularly in the event that wind energy decreases more quickly than the system can handle. The technical standards have not yet been fully developed and will depend on ongoing system studies.

A wind following product may have significant energy content and would be employed when the energy market merit order dispatch is unable to keep up with the ramp rates imposed upon it by combined load and wind ramps. The market impact of using the energy content of an ancillary service to complement the energy market has not yet been fully explored but is being examined at this time.

A technical issue relating to the operational viability of an ancillary service for wind following is the need for reliable wind forecasting. The AESO is currently in the process of implementing a wind forecasting service, but it will take some time before sufficient experience is gained with this tool to adequately assess the need for and the exact type of ancillary service required and its technical and market parameters.

Voluntary Load Curtailment

Currently, there is a limited voluntary load curtailment program that has loads reduce consumption when the system is operating under OPP 801. The AESO has identified a need to expand this program in order to reduce the likelihood of firm load curtailments when there is a supply shortfall. Based on preliminary analysis, the AESO estimates that about 400 MW of voluntary load curtailment would meet the system needs.

Although the technical requirements, payment mechanism and other standards have not been explored at this time, this program would be limited to load participants because it is only for use when there is a supply shortfall.

The current voluntary load curtailment program is an out of market mechanism to balance supply and demand under OPP 801, but the AESO is open to exploring methods to bringing voluntary load curtailment into the market, provided there is sufficient interest from loads to justify developing the product. In order to bring voluntary load response into the market, it would be necessary to allow these load curtailments to change the system marginal price. In effect, it would amount to relaxing the price cap in the event the system was forced to curtail load.

Transmission Must Run

Transmission Must Run (TMR) is a reliability service that allows the system to operate reliably where there is insufficient transmission infrastructure to serve load. Provincial regulation dictates that TMR can only be a long-term solution in very specific instances, and as the transmission infrastructure is reinforced the volume of TMR required on the system is expected to decline in the future. Nonetheless, there may be instances of transmission congestion that need to be resolved temporarily with TMR, and load could potentially supply an equivalent service.

In order to supply TMR, a load in a location downstream from the transmission congestion would need to curtail its consumption in order to reduce flows on the path. Although new TMR agreements are not anticipated at this time, the AESO is open to allowing loads to compete for any TMR requirements that are identified.

4.3.2 Aggregators

Aggregators are currently not allowed to sell reliability products in Alberta, in contrast to other North American markets. This applies equally to load and generation, as generation owners are not allowed to aggregate assets in order to participate in markets that have minimum asset size requirements.

In order to increase DR participation, the generic barrier that keeps aggregators from participating in the supply of certain products such that more loads can participate in the market can be removed. Technical standards cannot be relaxed to the point that reliability is compromised, but aggregation may be feasible within certain products.⁸

Details such as defining the maximum and minimum size of the aggregated resources,

⁸ Since generators are not allowed to aggregate in order to meet minimum size requirements for reliability markets, it will also be necessary to reexamine rules for the generation side of the market.

recognizing possible network conditions such as geographic restrictions to avoid violating occasional transmission constraints, IT standards, communication protocols and compliance monitoring need to be developed if this concept is to be pursued. A possible approach would be to first introduce aggregation for products that present a lower risk, in case of failure, to the reliable operation of the AIES and gradually phase in aggregation for higher value products as positive experience is gained with lower risk products.

This approach requires aggregators to assume the same responsibilities for meeting technical and other rules, such as responsibility for compliance, as individual service providers are required to meet.

4.3.3 Technical Standards

Supplemental Reserves

Supplemental reserves can be supplied by load, and several loads currently participate in this market. In order to provide Supplemental reserves, a load must be able to reduce its consumption by the contract volume within 10 minutes of receiving a directive. Further, the load must be able to hold its reduction for up to 1 hour, and upon the cancellation of the directive, restore its ability to supply reserves within 15 minutes.

The requirement to recover from a directive within 15 minutes has been identified as a barrier to greater load participation in the supplemental market. However, the standards for reserves are set by NERC/WECC, and the AESO is not in a position to alter the technical requirements.

Spinning Reserves

Under existing Western Electricity Coordinating Council (WECC) criteria the AESO is not permitted to allow load customers to provide spinning or regulating reserves. Section 1.A.2 of WECC Minimum Operating Criteria states that non-spinning reserve obligation can be met by load which can be interrupted in 10 minutes of notification, permitting load to provide one type of OR, supplemental reserves.

At this time WECC is in the process of obtaining approvals for new contingency reserve standards. In this new standard it states that a regulating or spinning provider requires a governor or other control system, which could open up these reserves to load providers. Should these standards be approved by WECC, the AESO will explore the opportunity of load customers providing spinning reserves using other control systems.

5.0 Other Products

Several additional potential initiatives were identified during the course of the working group sessions that do not fit clearly into either reliability products or energy market products. Several of these potential products were viewed as alternatives to out of market actions currently contemplated in ISO rules. Another product closely examined in the working group sessions was a disarmable load shed service that would allow greater utilization of the existing BC intertie capacity. This product could complement or replace the existing load shed service and ILRAS products. The final option included in this section would allow load to compete in a market currently restricted to generators.

5.1 Generation Outage Cancellation

Generators in Alberta are free to schedule their outages, and the AESO performs a role in coordinating outage schedules in order to maintain system reliability. The Generator Outage Coordination and Rescheduling Rule, which is currently before the Alberta Utilities Commission and therefore not yet in effect, contemplates giving the AESO the right to cancel a generator outage in order to maintain supply adequacy.

Demand response products, such as including loads in the outage coordination process, could potentially reduce the likelihood that a generator outage would be cancelled.

The AESO does not plan to pursue a demand response program that creates payments for loads willing to alter their outage plans. This implies a market for outage scheduling that does not exist and has a potentially negative impact on the voluntary coordination of outages. It should also be noted that the recent FEOC regulation requires loads 40 MW or greater to submit their outage schedules to the AESO. This information will allow the AESO to engage these loads in the voluntary coordination process, potentially facilitating better outcomes.

5.2 Long Lead Time Energy

Long lead time energy is energy that cannot be delivered to the grid within one hour. There are currently several generators that have self-declared long lead time energy. This energy could become subject to a long lead-time directive in the event that a short-term adequacy assessment performed under OPP 705 anticipates a supply shortfall.⁹

The existing voluntary price responsive load is accounted for on an estimated basis within OPP 705. If any load bid into the market, it would also be factored into the assessment. However to date, DR resources have not been considered as an option within a long lead time directive.

Conceptually, a long lead time directive could be given to load instead of to a generator. In this event, the load would receive advance notice of up to several hours for the curtailment, and compensation would be guaranteed at some level. While this concept is consistent with the market principles outlined in this paper, there are several

⁹ The Long Lead Time Rule is currently before the AUC and the rule is not yet in effect.

difficulties that suggest this is not a practical product for DR providers.

First, long-lead time directives can only be issued to generators (or loads) that have not voluntarily participated in the market despite the forecast of a supply shortfall. Second, to date a long-lead time directive has never been issued. The AESO does not anticipate frequent usage of this directive as the energy market price under emergency conditions should create sufficient incentive for generators to enter the market voluntarily. Third, if there are DR providers of long-lead time energy, compensation would likely need to be based on a pre-determined formula or contract price which likely could not be compared to the expected compensation created by a directive to a long lead time generator. In effect, a market solution would be indirectly 'competing' with a non-market directive.

Given that long lead time directives are expected to occur very infrequently, a specific DR product to avoid long lead time directives would be inefficient. Further, long lead time directives are a last step reliability backstop put in place by regulation. This does not support the creation of a product solely to avoid the use of a directive. It is more efficient to pursue a general voluntary load curtailment product, as outlined in the reliability section of this paper. The general product could serve the same purpose if the capacity was accounted for in OPP 705, and the technical specifications for the voluntary load curtailment product could also contemplate long lead time (1+ hours) dispatch.

5.3 Dispatch Down Service

Dispatch Down Service, or DDS, is an existing market product that is intended to reconstitute the system marginal price when out of merit energy is directed onto the system. Currently, DDS is used to offset Transmission Must Run (TMR) generation, but it is also planned that DDS would be used in the event of a long lead time energy directive.

Mechanically, DDS serves to reduce energy production from an in-merit plant by an amount equivalent to the energy produced out of merit. The generator reducing its production is paid for its foregone production by all generators in the market. Typically, DDS is paid a small discount to the pool price, not unlike products such as spinning reserves.

Conceptually, load resources could also provide DDS by agreeing to stay online when they would otherwise be offline. For example, if a load bid a 50 MW curtailment into the energy market, it could effectively reconstitute the pool price by continuing to consume even if the price went above its indicated bid.

Notwithstanding the above, loads do not appear to be an appropriate DDS resource. DDS is only dispatched when the system marginal price is below a 12.5 GJ/MWh heat rate (the Reference Price), and in order to sell DDS load would have to enter a bid to stop consuming power at prices lower than the Reference Price. There is no evidence that loads are willing to curtail at prices below this level, nor have loads submitted bids to the market in general. This outcome would be inefficient and contrary to the goals of the DDS market.

5.4 Load Shed Service

Load shed service (LSS) is currently procured by the AESO as a reliability tool designed to automatically curtail load when the system frequency drops below 59.5 HZ.

Typically, this type of frequency response would only occur as a result of a large generation or transmission contingency event that disrupted the supply demand balance. Loads contracted to supply LSS can also be curtailed under OPP 801 when there is a supply shortfall.

In addition to providing reliability benefits to the province, the existing LSS allows an increase in the available transfer capability (ATC) over the BC intertie for imports. The AESO currently has approximately 100 MW of LSS under contract. The program is approved for up to 150 MW. The existing LSS is available in all hours, which means that if the frequency dips below the 59.5 HZ trigger at any time, the contracted load is automatically tripped off the system.

The work group examined the option of increasing the amount of LSS procured in order to further increase the amount of transfer capacity available for imports on the BC intertie. This incremental LSS would have both reliability and energy market impacts since it would allow more import energy to enter Alberta both under emergency conditions and under normal operating conditions. In effect, LSS could act as an incomplete transmission substitute because it allows greater use of the BC intertie, though only in a single direction.

If additional LSS were to be procured, the current technical requirements for LSS would need to be changed to make the product 'disarmable'. Disarmable LSS simply means that under certain system conditions, the load will not be set to trip off even if frequency dips below the trigger point. This flexibility is required in order to avoid creating reliability threats under export conditions. This disarmable LSS has been identified as LSSi within the DRWG sessions.

LSSi is consistent with the principles for demand response programs in this paper in that it supports reliability as well as the FEOC development of the market by allowing more competition from import energy. The technical standards required for LSSi to be effective will require response times of about 12 cycles (0.2 seconds), which limits the scope of potential providers to load participants. However, if other types of providers such as generation fast ramp or batteries can meet the technical standards for LSSi, potential suppliers of LSSi would not be restricted to loads.

LSSi could be competitively procured via a number of mechanisms, including through a long term contract process as is currently done, through an auction process similar to the existing operating reserve market, or through an auction designed specifically for LSSi. The AESO plans to put out a recommendation paper shortly that will address options for increasing intertie capacity, both for imports and exports. This paper will discuss product design, contestability, cost prudence and other key issues for products such as LSSi designed to increase import capabilities, as well as similar issues for products designed to increase export capabilities.

6.0 Conclusions and Next Steps

The Demand Response Working Group provided valuable information from a variety of perspectives that will be used to set priorities for the next steps in increasing demand participation in the electricity market. This document establishes principles that will be used in the development of new products and market rules, subject to stakeholder feedback. It also provides an indication of potential initiatives that must be prioritized.

Within the context of the Alberta market design and the principles of a FEOC market, the opportunities to increase demand participation in the energy market are primarily related to removing barriers. As outlined in Section 3 of the paper, payments to bids on the margin could be introduced, provided there is sufficient interest from loads. Settlement intervals could also be shortened to improve the price certainty for price responsive loads. Finally, as metering technology is rolled out to smaller customers, the barrier to participation by cumulative meter customers should be eliminated. The remainder of the potential energy market initiatives do not fit within the Alberta market design or the principles outlined in this paper.

In the reliability sector of the market, increasing demand participation will require reducing existing barriers and considering load capabilities when designing new products. Technical standards for reliability products are dictated by system needs, but some standards such as prohibiting aggregated loads from selling products will be revisited with the goal of allowing greater participation. New products such as wind following will consider potential load side participation from the design stage as a principle. Voluntary load curtailment was also identified as a potential product that could benefit the market in a number of ways, and could be implemented in a manner consistent with the market design.

Load participation in products that support the market, rather than reliability, was also explored. These potential areas include DDS to reconstitute the energy price, long lead time energy, generation outage coordination and load shed service. Of the potential products, only load shed service is consistent with market principles.

The AESO is seeking feedback on the DR principles outlined in this document, as well as comment on the appropriateness of the specific DR initiatives discussed. As noted previously, feedback on specific design elements for individual products or initiatives is beyond the intended scope of this document. The intent at this point is to determine what principles should be used to evaluate DR initiatives, which initiatives are consistent with the principles, and finally, which initiatives should be prioritized. Development of recommendation papers for specific products, rule changes and market enhancements will follow upon identification of priorities.