ONTARIO ENERGY BOARD

EB-2018-0287/0288

IN THE MATTER OF the *Ontario Energy Board Act*, 1998, S. O. 1998, c. 15, Schedule B;

AND IN THE MATTER OF a consultation regarding utility remuneration and responding to distributed energy resources

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Environmental Defence's Comments on Board Staff Proposals

Utility Remuneration and Distributed Energy Resources

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Introduction: Lower Bills with Distributed Energy Resources

Environmental Defence strongly supports this initiative. We believe there is a major opportunity to lower energy bills by implementing distributed energy resources (DERs) whenever they are more cost-effective than traditional energy resources. Energy efficiency is likely be best example because it can be a far less expensive alternative to installing new pipes or wires. Sometimes the best option is a combination of energy efficiency, storage, demand response or other DERs.

However, the current model of utility remuneration impedes these non-wire and non-pipe solutions to the detriment of customers. In some cases, utilities are not even allowed to implement those kinds of non-traditional solutions even though they are more cost-effective. In other cases, there are strong financial disincentives against implementing those solutions.

We see fixing this problem as the primary goal of these processes. It is the primary goal underlying these comments.

To lower bills with non-wire and non-pipe solutions, utilities must be *incented* and *required* to adopt those solutions whenever they are most cost-effective from a total system cost perspective.[1] This requires that the OEB ensure that proper price signals are sent to utilities and customers. Proper price signals are needed to ensure that interests are aligned. The entire regulatory framework needs to be re-analyzed from this perspective.

Distributed energy resources have significant environmental benefits, such as reduced carbon emissions. However, this is not a situation where environmental interests conflict with economic interests. Here they are aligned. If the OEB ensures that the right price signals are sent, we can lower emissions and energy bills at the same time. Although this requires important changes, this is worthwhile pursuing as a rare win-win scenario.

With this overall goal in mind, Environmental Defence makes the following specific recommendations regarding the proposals made by Board Staff:

1. Commission a report as soon as possible on the benefits and costs of distributed energy resources;

2. Provide a clearer focus on cost-effectiveness in the relevant guiding principle;

3. Emphasize the OEB's role in aligning incentives and sending proper price signals;

4. Focus on the best-interests of customers when defining the role for utilities and the OEB;

5. Clarify the objectives regarding asset utilization and stranded assets;

[1] The Canadian Manufacturers and Exporters advocate for a total system cost perspective. See Transcript, February 20, 2020, p. 22.

6. Include high-level rate design issues in scope;
7. Include natural gas utility remuneration issues in scope;
8. Include a special focus on electric vehicles;
9. Include unresolved connection issues in scope; and
10. Continue to include energy efficiency in scope.

Specific Recommendations

Expert input: Commission report on the benefits/costs of DERs

Environmental Defence recommends that the OEB move quickly to commission a report on the costs and benefits of DERs. If the regulatory framework is going to ensure the most cost-effective solutions, there must be an accurate and robust quantification of the benefits and costs of DERs. This can happen immediately. In specific, we recommend that the OEB retain Synapse Energy Economics to undertake this work. They are likely the foremost experts in this area.[2] Because they have already written extensively on the subject, they will likely be more cost-effective than other options. Furthermore, Board Staff have retained these experts with successful results in the past.[3]

It is critical to ensure that all DER benefits are accounted. DERs create a number of positive benefits that are not being property accounted for. For example, distributed generation can help to avoid or lower distribution and transmission costs. If those benefits are not accounted for, opportunities to lower energy bills though DERs will continue to be missed.

This is a classic example of the market failure associated with positive externalities. DER proponents are causing benefits to others that are not reflected in the prices faced by the proponents. As a result, a sub-optimal amount of DER is being implemented. Monetizing the benefits (i.e. the positive externalities) will ensure that economic efficiency and optimality are achieved.

Benefits should be accounted for even if they are not easy to calculate. Ignoring a benefit altogether is the least accurate approach. It assumes the benefit is worth $0. It is far better to make best efforts to quantify those benefits. Synapse Energy Economics describes this issue as follows:

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[2] Tim Woolf, Synapse Energy, *Benefit-Cost Analysis for Distributed Energy Resources,* Prepared for the Advanced Energy Economy Institute, September 22, 2014 (LINK).

[3] EB-2015-0029 / EB-2015-0049, L.OEBStaff.1: Tim Woolf, Synapse Energy Economics, et al, *Ontario Gas Demand Side Management 2016-2020 Plan Review*, Prepared for Ontario Energy Board Staff, July 27, 2015

> DER impacts should not be excluded or ignored on the grounds that they are difficult to quantify or monetize. Approximating hard-to-quantify impacts is preferable to assuming that those costs and benefits do not exist or have no value.[4]

One example is the challenge of quantifying the value of the risk-reduction benefits of DER from a project, portfolio, and resiliency perspective. These benefits are described by Synapse Energy as follows:

> Distributed energy resources generally result in reduced risk to the electricity system, relative to traditional supply-side resources. DERs can increase the diversity of the portfolio of electricity resources, reduce reliance upon fossil fuels with volatile prices, reduce planning risk by reducing load growth, reduce risks associated with current and future environmental regulations, and reduce risks associated with outages caused be storms and other unexpected events. Distributed energy resources also help to reduce risk through increased optionality and system resiliency. That is, through their distributed and small-scale nature, DER investments offer greater flexibility in helping the system cope with stress and respond to unanticipated changes in the future (relative to large, capital-intensive generation, transmission or distribution upgrades).[5]

These benefits are not as straightforward as some to calculate. However, they are just as important and can be estimated in a variety of ways, such as proxies.[6]

We believe a key objective for this process is to ensure that all the benefits of DERs are accounted for. For a list of those benefits and an example of a framework to account for those benefits, see appendix A and the report cited therein.[7]

The valuation of benefits is a technical task that will require expert input. We recommend that Synapse Energy Economics be retained to undertake this critical work as soon as possible.

Guiding principles: Clearer focus on cost-effectiveness

We recommend that the guiding principles focus more clearly on cost-effectiveness. A guiding principle is intended to be "a value, criterion or standard that will be used to compare different policy options and develop a preferred approach."[8] The relevant principle currently reads as follows: "The regulatory framework focuses on outcomes and promotes economic efficiency, cost-effectiveness, safety, reliability, service quality and long-term value for consumer."[9] This

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[4] Tim Woolf, Synapse Energy, *Benefit-Cost Analysis for Distributed Energy Resources,* Prepared for the Advanced Energy Economy Institute, September 22, 2014, p. 36 (LINK).
[5] *Ibid.* p. 47.
[6] *Ibid*. p. 45.
[7] *Ibid.*
[8] Staff Presentation, p. 9.
[9] *Ibid.*, p. 14.

principle as currently worded likely includes too many factors to actually assist in the comparison and selection of options.

We therefore suggest the following wording:

> The regulatory framework focuses on outcomes and promotes ~~economic efficiency,~~ the most cost-effective~~ness~~ solutions that are consistent with safety, reliability, service quality and long-term value for consumer

Instead of listing cost-effectiveness as one consideration among many, the proposed wording elevates cost-effectiveness to a primary criterion on which different solutions will be compared. We believe this wording retains the original intent behind the Board Staff proposal, while providing additional guidance in comparing and selecting different options.

Role of OEB: Align incentives and send proper price signals

We believe it is important to emphasize the OEB's role in ensuring that incentives are aligned and the right price signals are sent.[10] This is a core function of the OEB as an economic regulator. We recommend that Board Staff add this to the discussion of the OEB's role.

The regulatory framework always creates incentives and sends price signals – some intended and some unintended. The current framework incentivizes utility capital investments over other solutions, even when the alternatives are more cost-effective. This is an inappropriate price signal to utilities. As another example, the current framework is not sending the appropriate price signals to customers because it is not rewarding them for the benefits they provide to the system through DERs.

We agree with Board Staff that the OEB should not "pick technology or market winners and losers."[11] At the moment, the regulatory framework is implicitly picking technology because of the disincentives to DERs. A level playing field is needed.

We believe the OEB's role is broader than "removing unwarranted barriers" as set out in the Board Staff presentation. We not only need to ensure that barriers are removed, but that the incentives and price signals inherent in the regulatory framework serve to decrease costs for customers.

Role of OEB and Utilities: Focus on best-interests of customers

The Board Staff report has not set out rigid roles with respect to the OEB and the utilities. Environmental Defence supports this position. We believe it would be problematic to limit the

[10] *Ibid*. p. 22.
[11] *Ibid*. p. 22.

proper role of the OEB and Utilities when it comes to DERs at this early stage. The reasons for this were outlined in our submissions of October 18, 2019:

> A major question in this process is the proper role for the utilities and the regulator. For example, many have discussed whether the utilities should be able to earn a regulated return for alternatives to traditional supply-side investments. In our view, utilities should be encouraged to implement innovative solutions that will benefit customers and lower bills. The Board should allow rate-regulated activities where that will benefit consumers and lower bills.
>
> For example, Enbridge should be allowed to move forward with a rate-regulated geothermal program if the Board finds that it will benefit consumers. Potential benefits include: increased cost-effectiveness vis-à-vis gas expansion, helping to develop a market, capitalizing on the Enbridge brand to expand cost-effective geothermal, benefiting from economies of scale, providing greater diversification, removing the disincentive faced by Enbridge regarding alternatives to gas expansion, and others. Whether or not Enbridge should engage in this market should be answered from a customer perspective, not based on abstract principles about the proper role of the utilities and regulators.
>
> Similarly, electricity utilities should be able to earn a return on DERs that can avoid infrastructure spending where that will benefit consumers. For example, the electricity utilities should be able to earn a return on a geographically targeted energy efficiency program that addresses a distribution system need at a lower cost than the traditional wires-based solution.
>
> These examples consistent with a framework that would require utilities to put out DER solutions to distribution needs to competitive bidding. But if there are no market-based solutions or bids for a specific problem, utilities should not be prevented from undertaking projects that will reduce costs and energy bills.
>
> Benefits for customers should be central. For example, some have argued that utilities should not be able to use their name when promoting DERs to customers as this would represent an unfair advantage over non-utility providers with weaker brands. We disagree. If a utility can benefit customers by promoting DERs, it should be allowed to do so. Fairness to competitors is important, but the interests of customers in keeping energy costs as low as possible is of the utmost importance.
>
> Some stakeholders might ask for an explanation of the market failure that justifies utilities earning a regulated return on DERs. A number of market failures are at play, including externalities, imperfect information, underdeveloped markets, and skewed incentives arising from rate regulated natural monopolies. However, we do not believe it is productive to delve into arcane debates about economic theory or the instances where abstract theory diverges from reality. It is clear that mechanisms are needed to align utility and consumer interests and to fill gaps where markets are underdeveloped.
>
> Regardless, we believe the details regarding the appropriate role of the utility and the regulator can only be determined later in this process in a comparison of various options to incentivize the implementation of cost-effective DERs. The roles of utilities and the

> regulator should be determined after examining the various options instead of being set in stone from the outset based on abstract principles.
>
> …
>
> Environmental Defence does not support a principle limiting the Board to the regulation of the natural monopoly components of the sector. It is not clear exactly what this would mean. Furthermore, it is not necessary for the principles to include such specific restrictions. We also believe this puts undue focus on abstract economic arguments that may not reflect reality. As noted above, and discussed during the stakeholder conference, there is evidence that customers could benefit from utilities undertaking non-wire and non-pipe measures to address distribution needs. Prohibiting them from doing so at the outset via a guiding principle would be antithetical to the purpose of this process.[12]

Objectives: Clarify need to avoid *new* assets at risk of becoming stranded

Before approving a capital project, it is critical that the OEB consider the possibility and risk that the asset will become stranded in the future. This risk is increasing due to climate change and transitions in the gas and electricity sector. We believe this should be reflected in the objectives.

However, once an asset is built, the most cost-effective solution may be to retire that asset before the end of its economic life. We should not avoid retiring assets when that is the most cost-effective option.

Therefore, Environmental Defence recommends removing any references to the goal of ensuring that "underutilized and stranded assets are minimized."[13] Assets should be utilized only to the extent that doing so is the most cost-effective way of meeting customer needs, not as an objective in and of itself.

In its place, we recommend an objective of "Ensuring the risk of underutilized and stranded asserts is fully considered before capital spending on those assets is approved."

Issues: Remove references to "optimal use of assets"

We recommend that the references to "optimal use of assets" be removed because they are redundant and potentially confusing. For example, we suggest amending the following issue on the preliminary issues list as follows:

> How to encourage system planning and operation that ~~optimizes assets,~~ meaningfully considers all viable and practicable options~~,~~ and results in least cost/greatest value solutions?[14]

[12] Submissions of Environmental Defence, October 18, 2019.
[13] Staff Presentation, p. 32.
[14] *Ibid*. p. 49.

The reference to optimizing assets in this draft issue is unclear. It may simply be redundant as one of the considerations when determining the least cost solution. Alternatively, it could be taken as a suggestion that assets should continue to be used even when that is not cost effective, which would not be in the interests of consumers. Either way, we believe that wording should be removed.

Similar wording appears elsewhere. For example, the guiding principles speak of "optimal use of existing assets."[15] Again, the wording is either redundant, or suggests that the use of assets is a goal in and of itself, even if contrary to customer interests, which would be problematic.

Scope: Include high-level rate design issues

Environmental Defence does not believe rate design should be completely excluded from this process. We believe rate design issues should at least be included at a high-level. This is critical because rate design can be the best way to ensure that incentives are aligned and to eliminate externalities. For example, rate design will often be the best way to ensure that the prices faced by customers accurately reflect the costs and benefits of distributed energy resources.

However, we recognize that this process cannot determine all aspects of rate design. Including too many issues in scope would make this process unwieldy. We therefore recommend that rate design be included at a high-level. In particular, Board Staff, participants, and experts should have an opportunity to present different rate design options as the best solution to the problems that this process sets out to solve. If the Board decides that these rate design solutions should be pursued or explored, the details could be worked out separately. Foreclosing rate design as a solution to these issues could mean we end up with greatly inferior solutions.

Although residential rate design was reformed recently, Environmental Defence submits that it should be reviewed again in the context of DERs. For example, a number of stakeholders discussed the need to update residential rate design to ensure that electric vehicle owners are compensated for the services they can provide to the electricity system and receive the right price signals so they will charge their batteries at the most efficient times. A greater reliance on charges at the peak would encourage residential DERs that help to reduce system costs by shifting load off the peak, such as storage and electric vehicles. We believe a number of options should be explored, including a voluntary rate plan option and broader-based rate design changes.

The ongoing commercial and industrial rate design process will presumably remain separate, but it will have important impacts on distributed energy resources. There should be some connection between these processes. As an example of the important interactions between these processes, a coincident peak demand charge is being considered in the C&I rate design process which would avoid the need for DER capacity reserve charges. OEB staff described this as follows:

[15] *Ibid.* p. 13.

> [A coincident peak demand charge] is closely linked to cost drivers. … The intent is to eliminate the need for specialized charging for distributed generation or net metering since the underlying distribution rate is recovery from customers according to their use. The peak demand rate would reward customers for generation on-peak but also charge them for use when their generator was down for maintenance or repair.[16]

Environmental Defence made recommendations in the C&I rate design process that are very important for distributed energy resources more broadly. For example, it recommended changes to allocate as many costs as possible to a coincident peak demand charge, and as few as possible to fixed charges, while remaining consistent with the principle of cost causation. This would incentivize positive customer behaviour such as:

- Shifting load off the peak;
- Implementing distributed energy; and
- Implementing energy efficiency.

This would, in turn:

- Make the system more efficient;
- Lower costs; and
- Contribute to lower electricity bills.

Including rate design in this process at a high-level need not be onerous. In contrast, excluding rate design in its entirety could be quite problematic. We therefore recommend that Board Staff clarify that rate design is an appropriate topic for high-level discussions.

Scope: Include natural gas utility remuneration issues

Board staff have asked whether this process should take a holistic view and look at gas utilities in addition to electric utilities. Environmental Defence strongly supports this. There are lessons that the gas sector can learn from the electricity sector, and vice versa. Also, including gas in this process will support regulatory consistency.

The gas sector presents important and unique opportunities when it comes to distributed energy resources as an alternative to traditional supply infrastructure. For example:

1. DER in the gas sector provide diversification away from fossil fuels and mitigates risks associated with future environmental regulation;

[16] EB-2015-0043, Staff Discussion Paper, March 31, 2016, p. 25.

2. Natural gas energy efficiency programs have historically been more cost-effective than electricity sector energy efficiency programs;[17]

3. Natural gas energy efficiency programs are underfunded in comparison electricity sector programs;[18]

4. The natural gas sector produces far more greenhouse gasses than the electricity sector;[19]

5. Natural gas DERs provide additional benefits to Ontario's economy because they replace spending on out-of-provide gas with spending on Ontario-based energy contractors and made-in-Ontario energy;

6. Avoided cost calculations in the gas sector are not complicated by the surplus baseload issues in the electricity sector; and

7. There are fewer natural gas utilities, creating economies of scale.

The gas sector also presents similar challenges as the electricity sector when it comes to utility remuneration and similarly perverse disincentives to cost-effective non-traditional solutions. For example, heat pumps are often cheaper than natural gas expansion to new communities after considering all the relevant capital and operational costs.[20] However, Enbridge has a strong incentive to pursue gas expansion over the heat pumps because it only earns a return from the former. Enbridge should be incentivized to pursue or facilitate heat pump projects where they are more cost-effective than gas expansion and new pipelines should not be approved where it is established that heat pumps would be more cost effective.

Improvements to the utility remuneration regulatory framework could apply equally to the gas sector and the electricity sector. Gas should be included, at least at a high-level.

Scope: Include special focus on electric vehicles

Environmental Defence strongly believes this process should include a working group or a similar process for focused attention on electric vehicles. We described the reasons for this in our submissions of October 18, 2019:

> The expansion of electric vehicles is going to have a massive impact on our electricity systems, cities, and buildings. This expansion is likely necessary to meet carbon reduction targets as part of our efforts to avoid catastrophic climate change. Of all the DERs, electric vehicles will likely have the most impact. This deserves special focus.

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[17] EB-2015-0049: Exhibit K6.2; Transcript Vol. 6, p. 124, lns. 7-18.
[18] EB-2015-0049: Exhibit K6.2.
[19] EB-2015-0049: Exhibit K6.2.; Exhibit M.GEC.EP.3, p. 1; Exhibit M.GEC.ED.12, attachment 1 p. 17; Transcript Vol. 6, p. 123, lns. 3-8; Transcript Vol. 4, p. 16, lns. 8-12.
[20] EB-2016-0004, Evidence of Dr. Stanley Reitsma, Ontario's Low Carbon Future: Geothermal Heat Pumps, March 21, 2016 (LINK).

This consultation process presents an opportunity to examine electric vehicles from a coordinated and holistic perspective. Electric vehicles also need to be addressed in other processes, such as rate hearings relating to investments in infrastructure required for electric vehicles. However, a working group would help to ensure those processes are coordinated and provide high-level guidance and proactive attention to this important issue.

A focus on electric vehicles is also mandated by government policy, including the Made-in-Ontario Environment Plan. The Environment Plan calls for carbon reductions of at least 2.88 Mt CO2e by 2030 from electric vehicles.[21] It also calls for electric vehicle uptake to be facilitated by improved rules and the removal of regulatory barriers relating to charging infrastructure.[22] Of course, the OEB is not the only entity responsible for ensuring that these targets are met, rules are improved, and barriers are removed. But it has an important role to play.

The topics to be addressed could include:

- **Infrastructure Readiness:** Electric vehicles require investments in electricity distribution infrastructure to ensure the system can handle the increased electricity demand. Steps are needed to ensure the system is ready for this and to ensure that all customers have the opportunity to convert to electric vehicles without barriers from their local distribution company.
- **Rate Design:** Rate design has an important role to play in facilitating the uptake of electric vehicles by ensuring that it is cost-effective to refuel.
- **Charging:** Pursuant to the Environment Plan mandate, the OEB should continue its work to facilitate electric vehicle uptake via improved rules and the removal of regulatory barriers relating to charging infrastructure. The LDC's also should be encouraged to develop and/or facilitate solutions to gaps in the charging market, such as customers with on-street parking.
- **Generation and Transmission Capacity:** Electric vehicle adoption will also impact generation and transmission capacity needs. Steps to address these impacts should be coordinated with other OEB work in this area.
- **Rules, Incentives, and Performance Measures:** The importance of this issue warrants specific rules, incentives, and performance measures to promote best practices across all of the LDCs.

The uptake of electric vehicles is increasing quickly. Work is needed now to sure the regulatory framework and electricity system are facilitating this process and not putting up unnecessary barriers.

Scope: Include unresolved connection issues

Environmental Defence recommends that this process address connections issues that are left unresolved by the DER Connections Review. The DER Connections Review is meant only to address the lowest-hanging fruit. That makes sense for the DER Connections Review because it

[21] Government of Ontario, *Made-in-Ontario Environment Plan*, p. 24 (The 2.88 Mt CO2e reductions are intended to be primarily from electric vehicles, but also include other low carbon vehicles "in small part." See p. 23.)
[22] *Ibid.* p. 33.

is intended to make quick progress. However, the wider Responding to DERs process should be able to examine some of the big items that may not have been achieved in the DER Connections Review.

Unnecessary connection barriers are a drag on efficiency and an undue cost for consumers. If customers are continuing to face some of these barriers after the DER Connections Review is complete, the Responding to DERs process presents an opportunity to make more progress to the benefit of consumers.

Scope: Keep energy efficiency included

Environmental Defence strongly supports the Board Staff approach of including energy efficiency within the scope for this process and explicitly noting where it may not be relevant.[23] Energy efficiency has the essential characteristics of a distributed energy resource because it shifts or reduces load and can be used to avoid traditional supply-side infrastructure investments.[24] Of all the DERs, energy efficiency likely has the greatest potential to reduce overall system costs. It is essential that utilities be incentivized and required to implement non-wire and non-pipe solutions when those solutions are more cost-effective, even when they need to be a combination of energy efficiency and other DERs. All of these DERs need to be considered in concert so they can be deployed in concert.

Conclusion

We thank the Board for the opportunity to make these comments. We hope this process will help incentivize utilities and customers to innovate and make energy less expensive for all Ontarians. As detailed above, we believe this is more likely if Board Staff adopts the following recommendations:

1. Commission a report as soon as possible on the benefits and costs of distributed energy resources;
2. Provide a clearer focus on cost-effectiveness in the relevant guiding principle;
3. Emphasize the OEB's role in aligning incentives and sending proper price signals;
4. Focus on the best-interests of customers in defining the roles for utilities and the OEB;
5. Clarify the objectives regarding asset utilization and stranded assets;
6. Include high-level rate design issues in scope;

[23] Transcript, February 20, 2020, p. 95-96.
[24] National Association of Regulatory Utility Commissioners, *NARUC Manual on Distributed Energy Resources Rate Design and Compensation*, 2016 (LINK), pp. 45 & 49-50.

7. Include natural gas utility remuneration issues in scope;
8. Include a special focus on electric vehicles;
9. Include unresolved connection issues in scope; and
10. Continue to include energy efficiency in scope.

Appendix A
Benefits of Distributed Energy Resources

Table 18. Illustrative Benefit Valuation Options

Party Impacted	Benefits				Valuation Method		
	Benefit Category			Specific Benefits	Monetization	Proxy	Multi-Attribute
Utility Customers	1	Load Reduction & Avoided Energy Costs	a	Avoided energy generation	yes	---	---
			b	Avoided line losses	yes	---	---
			c	Wholesale energy market price suppression	yes	---	---
	2	Demand Reduction & Avoided Capacity Costs	a	Avoided generation capacity costs	yes	---	---
			b	Avoided power plant decommissioning	yes	---	---
			c	Wholesale capacity market price suppression	yes	---	---
			d	Avoided distribution system investment	yes	---	---
			e	Avoided transmission system investment	yes	---	---
	3	Avoided Compliance Costs	a	Avoided renewable energy and energy efficiency portfolio standard costs	yes	---	---
			b	Avoided environmental retrofits to fossil fuel generators	yes	---	---
	4	Avoided Ancillary Services	a	Scheduling, system control and dispatch	yes	---	---
			b	Reactive supply and voltage control	yes	---	---
			c	Regulation and frequency response	yes	---	---
			d	Energy imbalance	yes	---	---
			e	Operating reserve - spinning	yes	---	---
			f	Operating reserve - supplemental	yes	---	---
	5	Utility Operations	a	Financial and accounting	yes	---	---
			b	Customer service	yes	---	---
	6	Market Efficiency	a	Reduction of market power in wholesale electricity markets	---	---	yes
			b	Animation of retail market for DER products and services	---	---	yes
			c	Customer empowerment	---	---	yes
	7	Risk	a	Project risk	---	yes	---
			b	Portfolio risk	---	yes	---
			c	Resiliency	---	yes	---
Participants	8	Participant Non-Energy Benefits	a	Participant's utility savings (time addressing billing, disconnection, etc.)	---	yes	---
			b	Low-income-specific	---	yes	---
			c	Improved operations	---	yes	---
			d	Comfort	---	yes	---
			e	Health and safety	---	yes	---
			f	Tax credits to participant	---	yes	---
			g	Property improvements	---	yes	---
	9	Participant Resource Benefits	a	Other fuels savings	yes	---	---
			b	Water and sewer savings	yes	---	---
Society	10	Public Benefits	a	Economic development	---	---	yes
			b	Tax impacts from public buildings	yes	---	---
	11	Environmental Benefits	a	Avoided air emissions	yes	---	---
			b	Other natural resource impacts	---	---	yes

[25] Tim Woolf, Synapse Energy, *Benefit-Cost Analysis for Distributed Energy Resources*, Prepared for the Advanced Energy Economy Institute, September 22, 2014, p. 45 (LINK).

System-Wide Benefits of Distributed Energy Resources by Type

Table 6. Possible Benefits of DERs to All Customers

Party Impacted	Benefits				Resources			
	Benefit Category			Specific Benefits	Energy Efficiency	Demand Response	Distributed Generation	Distributed Storage
Utility Customers	1	Load Reduction & Avoided Energy Costs	a	Avoided energy generation	G	S	G	S
			b	Avoided line losses	G	S	G	S
			c	Wholesale energy market price suppression	G	G	G	S
	2	Demand Reduction & Avoided Capacity Costs	a	Avoided generation capacity costs	G	G	G	S
			b	Avoided power plant decommissioning	G	G	G	S
			c	Wholesale capacity market price suppression	G	G	G	S
			d	Avoided distribution system investment	G	G	S	S
			e	Avoided transmission system investment	G	G	G	S
	3	Avoided Compliance Costs	a	Avoided renewable energy and energy efficiency portfolio standard costs	G	S	G	S
			b	Avoided environmental retrofits to fossil fuel generators	G	G	G	S
	4	Avoided Ancillary Services	a	Scheduling, system control and dispatch	N	N	N	N
			b	Reactive supply and voltage control	G	G	G	S
			c	Regulation and frequency response	G	G	G	S
			d	Energy imbalance	G	G	S	S
			e	Operating reserve - spinning	G	G	G	S
			f	Operating reserve - supplemental	G	G	G	S
	5	Utility Operations	a	Financial and accounting	G	S	S	S
			b	Customer service	G	S	S	S
	6	Market Efficiency	a	Reduction of market power in wholesale electricity markets	G	G	G	S
			b	Animation of retail market for DER products and services	G	G	G	G
			c	Customer empowerment	G	G	G	G
	7	Risk	a	Project risk	G	G	G	G
			b	Portfolio risk	G	G	G	G
			c	Resiliency	G	G	G	G

N = Never ***S = Sometimes, it depends on the characteristics of the asset***
R = Rarely ***G = Generally***

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[26] *Ibid.*, p. 21.