



## **iSolar Response to the Independent Electricity System Operator Conservation and Demand Framework Mid-Term Review – Dec 2022**

May 14, 2023

Further to iSolar's initial submission, dated January 30, 2023 (attached), to the *Conservation and Demand Framework Mid-Term Review – Dec 2022* ("Framework"), iSolar would respectfully offer additional observations and recommendations on the contribution its solar attic fan can have to the IESO's Conservation and Demand Management goals.

Since June 2021, there is a notable, welcome, and serious renewed commitment by the IESO and the Ontario Government to mitigate the anticipated supply shortfall beginning in 2026 or 2027. The commencement of this supply shortfall depends heavily on the whether the federal Canadian Nuclear Safety Commission ("CNSC") allows the 2000 MW/9-month license extension for the Pickering nuclear station to allow it to continue to operate until the end of air conditioning season in 2026. If the CNSC grants this renewal, the risk of supply shortfalls diminishes until 2027, buying Ontario additional time to find and implement conservation and demand solutions to mitigate the risk and impact of supply shortfalls in the near term. iSolar respectfully submits that attacking peak demand during the summer months by reducing the need for air conditioning is a simple and impactful solution which can be rapidly implemented in Ontario.

iSolar believes its solar attic fan is a partial, yet highly effective, solution proven to assist directly with the anticipated summer peak supply problem identified by the IESO and the Ministry of Energy in the Framework and the most recent Annual Planning Outlooks ("APOs"). Its Ontario patented retro-fit feature of being able to be inserted into and under existing residential roof vents makes it the perfect, easy-to-install CDM device.

As per the 2021 APO, Ontario's residential sector is expected to have over 50 TWh of net energy demand in 2026 and Ontario has been identified by the IESO as a summer peaking province with peak demands tending to occur during hot, humid days. It is understood that Ontario's summer 2026 peak supply issue identified in the Framework is driven in large part by our residential air conditioning load in a manner similar to extreme summer demand peaks recently experienced in California in 2022. One key answer to the problem Ontario's air conditioning load presents is through targeted CDM programs such as the incentivized use of iSolar's retrofit solar attic fan. This is particularly true in areas with increasing demand such as Southwest Toronto and Ottawa, as well as in areas where the automatic energy cost savings provided by iSolar's solar attic fan, would be most impactful.

iSolar remains very supportive of the commercial and industrial CDM programs which are geared to reduce almost 300MW of load at peak times. That being said, the question respectfully remains:

**Why are we not doing more now to reduce the need for residential air conditioning, which we know is a leading cause of peak load, when we can and should be pursuing this?**

The Framework outlines and predicts various residential CDM activities. Several worthy high-level **Recommendations and Next Steps** pertaining to these residential CDM activities are listed on page 2 of the **Executive Summary**:

- Adopt an enduring approach for post-2024 that better leverages CDM as a resource to respond to evolving system and customer needs while continuing to provide appropriate reporting and government oversight;
- Establish post-2024 CDM targets and budgets that reflect forecasted system needs; achievable potential; and
- Reallocate a portion of the current Framework's budget for research and development activities for post-2024 programs, including single- and multi-family residential programs and efficient electrification programs.

iSolar believes the IESO has correctly identified the recommended Next Steps (above) for dealing with the residential CDM programs but should be going further and faster, with Ministry of Energy support, to buttress these proposed CDM initiatives. Deferrals to implementation of residential CDM programs to 2024 and beyond are unfortunate, although we anticipate that work is already underway to advance such programs. iSolar is keen to work with the IESO and others to promote and advance this type of important research, which should be shared in the public domain.

Since 2018, the IESO's current program options were and remain limited. Current programs are restricted to income-qualified customers through the *Energy Affordability Program* and to First Nations through the *First Nations Community Building Retrofit Program* and the *First Nations Energy Efficiency Program*. Useful and helpful as these programs are, the IESO has correctly identified in the Framework that much more CDM needs to be done soon and that these programs ought to be supported by the Government of Ontario. iSolar respectfully submits that the elimination of mass-market residential incentive programs since 2019 was misguided and that updated residential programs should be implemented as soon as possible in the years ahead of the Pickering nuclear plant decommissioning in order to conserve energy, prevent supply shortages, and minimize the use of fossil fuels by implementing CDM programs targeting the peaks in energy demand, where these energy sources are most often called upon.

That program discontinuance notwithstanding, one significant Opportunity identified by the IESO at page 34 of the Framework remains:

- *Residential HVAC (...air conditioning) is an underutilized resource that could be leveraged via demand response to address peak demand.*

iSolar, with emphasis, agrees.

Peter Love, former Ontario Power Authority Chief Energy Conservation Officer has suggested that residential AC is a key and significant contributor to causing peak summer demand for electricity, and that demand in Ontario continues to grow.

The IESO also identified in the Framework that weatherproofing, HVAC tune-ups, smart-home technologies, heat pumps, deep retrofits and targeted multi-family social housing offerings are options to incentivize more efficient energy use to residential customers. In addition to these opportunities and demand response electricity controls, which can coordinate residential AC on/off sequencing to more efficiently balance load, iSolar submits that the introduction of solar attic ventilation will be a significant contributor to lowering the AC load in the residential sector and have a significant impact on peak energy consumption in Ontario.

In line with the CDM opportunities identified by the IESO and Peter Love in the residential sector, iSolar believes that solar-powered attic ventilation should become a recommended part of the *Ontario Building Code* in order to maximize the implementation of this highly effective CDM tool. From the IESO Billing Study testing of 1033 homes in 2017, in the then Hydro One Networks Brampton franchise area (now Alectra), we know there were notable financial benefits found from lowering AC usage. iSolar subsequently undertook additional detailed data testing in 2022 on some of the same Alectra-service franchise area homes tested in 2017, which has reinforced and encouraged the need to undertake a full testing study on 100 homes, as soon as possible.

Removing attic heat is a simple and obvious solution to reducing AC runtime. Here is why: Currently, most Ontarians remove attic heat by passively ventilating their home attics, but those who have used *pro-active* ventilation have observed reduced AC runtimes, and other non-energy benefits such as improved home comfort, longer roof life, and mitigation of ice-damming. Further, traditional HVAC systems do not always evenly remove in-home heat accumulation, thereby causing AC systems to run unnecessarily. While only reduced electricity use is within the purview of the IESO, it is inescapable that Ontario needs solutions which automatically and proactively reduce heat in residential homes during peak hours and therefore conserve energy usage.

From a grid operation perspective, installation of residential, pro-active solar attic ventilation (which does not use domestic electricity) is really a perfect *automatic coincident peak reduction* in energy usage, ideal for a residential CDM program, which benefits not only the

homeowner/ratepayers, but the power system as a whole. The coincidence of the peak reduction is attributable to the following:

1. Sunrise triggers increased ambient heat increases;
2. Sun causing heat on the roof heats up the attic interior;
3. Sun/UV causes the solar attic fan to run and begins day-long extraction of hot attic air;
4. AC turn-on time is delayed;
5. AC runtime is reduced throughout the day;
6. Grid has to supply less electricity to each household; and
7. Provincial power supply is reduced as are the associated costs of meeting the peak.

Coincident peak reduction occurs both system-wide and in each house equipped with pro-active solar venting as it experiences a reduction in its AC load when the grid is not called on to serve as much power, as often. A cooler attic all day causes the AC to run less into the evening due to heat evacuation and less heat build-up. The obvious benefit is that this CDM tool is not dependent on active homeowner decision-making such as when to use the dishwasher, laundry facilities and other appliances which have a high energy demand; pro-active ventilation is automatic and activated near sunrise, operates during the daytime when UV light is at its peak and terminates soon after sunset. If the installations of these automatic Demand Response Solution devices were ubiquitous throughout Ontario, on hot summer days, our IESO control room grid operators would notice a decrease in actual peak power demand in the hundreds of Megawatts.

iSolar firmly believes that the IESO is moving in the correct direction and needs more support and a clear endorsement from the Ontario government to reinstate the effective residential CDM programs. This reinstatement should add pro-active solar attic ventilation to its CDM programs in southern Ontario, from Sault Ste. Marie, across to Sudbury, and over from North Bay to Ottawa. Research has demonstrated, and the IESO will discover, that the further south in Ontario that this type of CDM program is activated for pro-active solar ventilation, the more dynamic the reduction in peak power will be due to the variance in ambient temperatures during peak periods given that it is almost always hotter in Windsor than North Bay.

iSolar is fully supportive of the IESO's commitment to collaborations amongst relevant federal and other provincial agencies as well as the utility networks which can implement these programs in the best and most trusted manner with ratepayers. The IESO Opportunities identified on page 79 of the Framework are key to the success of meeting the challenges Ontarians face in the latter half of this decade. The IESO's call to explore the inclusion of mass-market residential programs, which are cost-effective and fill the gaps in the market, must be immediately pursued with vigor – and not be ignored. Using the *Save on Energy* brand to raise awareness of best practices in energy efficiency in our residences is prudent and commonsensical. iSolar's experience in the Alectra Brampton franchise area proves that citizens are ready to welcome and implement sensible CDM measures – *en masse*.

Most importantly, notwithstanding other capacity supply issues, there needs to be immediate recognition by Ottawa, Queens' Park and all market participants that residential demand responses are critical to deploy in order to "address mid-decade summer capacity needs" in Ontario.

All of which is respectfully submitted by,

**iSolar**, on behalf of **International Solar Solutions Inc.**

A handwritten signature in black ink, appearing to read 'Rita Middleton', with a long horizontal flourish extending to the right.

**Rita Middleton, CPA**

**CEO**



January 30, 2023

This Memorandum is a brief analysis authored by iSolar, which is meant to be a useful, helpful and practical response to these three December 2022 IESO papers:

- *Annual Planning Outlook (“APO”)*
- *Pathways to Decarbonization (“PTD”)*
- *2021-24 Conservation & Demand Management Framework Mid-Term Review (“MTR”)*

iSolar offers a practical application of its retro-fit conservation device – the solar attic fan – as a highly useful, simple residential conservation solution, which will contribute greatly to reducing air conditioning caused peak power.

## **PREMISE OF SOLUTION RECOMMENDATION**

### Increased Demand in Residential Sector

- The APO acknowledges the main drivers of increased demand in the residential sector, and their impacts on the Reserve Margin, which includes the anticipated continuation of work-from-home, resulting in higher daily household occupancy and air conditioner (AC) usage. This fact will exacerbate the summer peak demand capacity deficit outlined in the report.

### Request by Minister to develop options for additional and expanded CDM Programming

- The APO and PTD both stress that conservation programs continue to play a key role in achieving energy and peak demand savings, which are a cost-effective form of non-emitting resource acquisition.
- The PTD concludes the requirement for “accelerating current efforts to acquired new non-emitting supply including the implementation of recent conservation and demand management directives.” Both the Mid-Term Review and the PTD highlight the potential for the IESO to expand the scope of its future CDM programs post-2024. Adding an impactful program now (instead of waiting), that includes the low-risk solar powered ventilation solution, will minimize the capacity deficit risk anticipated in 2026. The PTD concludes: “expanding the use of CDM,

DERs and other innovative technologies are appropriate given the sale and pace of the challenge ahead”.

- The PTD stresses “successfully delivering the maximum potential savings would require increased, sustained investment in CDM programs” and that “storage and demand response are used as peaking resources with minimal output”.
- As noted in the MTR, “Under previous frameworks, CDM included a variety of mass-market programs targeting residential customers” and “...the results of the APS refresh exercise suggest that significant opportunities for cost-effective mass-market programs exist”.
- The PTD and MTR both reference, as their guideline, the cost-effective CDM potential identified in the 2019 Achievable Potential Study (“APS”) by Navigant (CLICK HERE). “Attic Ventilation Passive Mechanical” is a retrofit measure already referenced in this study – SEE TABLE C-1 – Page 256.

*Measure Name: Res*

*Measure Description: Solar Powered Attic Fan Solar Powered Attic Fan (per house)*

*Baseline Assumption: Passive attic ventilation*

*End Use Category: Ventilation and Circulation*

*Primary Utility Type: Electric*

*Replacement Type: NEW Only*

When referencing potential Residential measures, Navigant indicates that “most of the opportunity remaining in the residential sector are for retrofit-type measures...” (page 17)

In its summary on top residential measures, Navigant indicates:

“When contributions to summer peak demand potential are considered, the composition of the top contributing measures changes significantly. Only one of the top 10 contributors to 2038 summer peak demand savings is an LED bulb, whereas seven of the top 10 contributors to peak demand savings are measures related to space cooling and ventilation,...” (page 13)

- The MTR specifically mentions **opportunities that include “ventilation and air conditioning as underutilized resources that could be leveraged via demand response to address peak demand”**. The iSolar retrofittable ventilation solution noted below will help fill this opportunity gap.

## SOLUTION RECOMMENDATION:

### Solar Ventilation Solution

- Table 17 of the APO report anticipates a **capacity deficit in 2026/27 of 1,300 MW**. **Broad deployment of the retrofit solar powered attic ventilation solution (which can be considered an automatic demand response solution) would contribute significantly to the elimination of this deficit**, as clearly outlined below and in iSolar's independent **Research Summary** attached for reference – Pages 18 to 21.
- The PTD conclusions emphasize “galvanizing collaboration amongst stakeholders and Indigenous communities”, and the MTR references programming for income-eligible and on-reserve FN communities”. It should be highlighted that iSolar is already partnering with various First Nations communities and Federal funding agencies to provide a Healthy Homes Solution that includes attic and crawlspace ventilation, to address their critically important energy efficiency, health and environmental issues, including mold and radon gas prevention through solar powered active ventilation. It would be ideal to include the Ontario Government and IESO as additional partners in this initiative.
- The various benefits of the retrofit solar powered ventilation solution (including energy efficiency, decarbonization, sustainability, and promotion of healthy homes) are consistent with the MTR objective to expand recognized CDM benefits from the traditional avoided cost and program cost-effectiveness testing. iSolar has a **patented retrofit solution, that universally and easily fits under existing roof vents** and minimizes risk with no need to cut holes or remove shingles on participant homes. It is estimated that the solution will meet both cost effectiveness testing as well as other benefits noted.
- The PTD mentions customers driving the transition to energy efficiency and shift from fossil fuel-based energy, and the MTR stresses “a push for consumer-driven solutions... and includes both an increasing focus on achieving decarbonization goals and a desire for more flexible, tailored and customised CDM programs to meet local needs”. In the Alectra Brampton service area, iSolar's test participants in the 2017 IESO-sponsored 1,000 home Pilot liked our cost-effective and easily installed technology. Some of their testimonials can be viewed [HERE](#).
- The iSolar Ventilation Solution has already been significantly researched and tested for over a decade and exists as a Measure in the 2019 APS, referenced throughout the IESO documents. **The iSolar attic ventilation was also subsequently included in the Texas Public Utility Commission (PUCT) Technical Reference Manual (TRM) in 2020, and the Measure Savings Algorithm is included for reference in the attached Research Summary on Pages 22 to 29.** Given the IESO's focus on the Energy Affordability and First Nations (including RFNEEP) programs in the second half of the Framework, immediately utilizing the existing solar



ventilation measure in these programs, as a first step, **adoption of this technology would be an efficient and cost-effective step for the EAP Roundtable to take to achieve its objectives.**

- The MTR suggested allocating some of the current Framework budget for research and development and the inclusion of “single and multi family residential programs”. The solar attic ventilation solution would fit well into this allocation to help the IESO “leverage all feasible energy-efficiency opportunities in Ontario”. iSolar would welcome and seeks inclusion in any research and development program, such as Grid Innovation Fund (GIF).
- The MTR states a target of 440 MW of peak demand and 2.7 TWh of energy savings with an associated cost of \$692 million for the four-year term, equating to \$1.57 million/MW. As outlined below and as detailed in iSolar’s Research Summary provided, the broad deployment of our patented retro-fit solar ventilation solution meets that important cost-effectiveness measure.
- MTR speaks to enhancing its marketing of the Programs. iSolar already has a recognizable, credible and respected partner for its solar ventilation solution. Click [HERE](#) for a testimonial by Bryan Baeumler on the positive effects of the iSolar attic fan. Note that Bryan installed a new vent in the video clip but our patented product is in fact a retro-fittable solution... perfect for an Ontario Residential Conservation Program.

### **Estimates for iSolar Solution Ventilation Deployment**

Two to three (depending upon house size) of easily installed iSolar retrofit attic fans into residential roof vents will reduce heat build-up early in the day. As the sun becomes stronger and the day becomes hotter, the fans operate even more effectively – with this **automatic demand response solution** operating precisely at the *coincident peak times* that expensive gas power generation is IESO-dispatched to manage and supply the growing residential AC electricity demand/load.

An average Ontario home will use two of iSolar’s retrofit 20WSPF-FLEX units (total 40 Watts) and will experience a **consumption reduction of 450 kWh/year**, perfect for a new utility conservation program.

Refer to Page 21 of Research Report for support of estimates noted below, which is conservatively based upon many years of independent testing, including a CCHT/UOIT study; years of in-situ testing; the 2017 IESO/Alectra EM&V pilot; and the most recent mini-test that included attic temperature and air conditioner cycling sensors.

For an estimated **3 million homes (just 60% of Ontario homes) over four years**, that is up to:

- **~1.3 million MWh of annual residential consumption reduction**, or
- **~1,300 MW of daily peak generation reduction** at any point in time equivalent to avoiding running or building two large natural gas plants or nuclear reactors.

## Financial Benefits

The financial annual benefit to Ontario's *power grid* will also be substantial:

- avoided **peak power savings of up to \$225 million** annually, depending on the summer temperatures [source: *Power Advisory LLC*];
- **470,000 tonnes of GHG emissions are avoided** as the avoided power will be gas-fired, (assuming 0.36 tonnes/MWh);
- additional associated **emissions savings ranging from \$24 million to \$80 million**, (assumed carbon price of \$50 to \$170/tonne).

Bottom line: Ontario can also avoid building another fleet of gas plants (eg. 2 ½ Portlands Energy Centres at 550 MW each) or about two nuclear reactors indefinitely, if this simple technical advance is deployed. It could also be advocated that the units should be incorporated into the Ontario Building Code.

The financial benefit to Ontario *residential homeowners* over the units' 20 year limited warranted life span is to lower summer electricity costs by **~\$75 - \$150** - each year. Other direct benefits include a longer roof life, with better winter attic ventilation, resulting in less risk of ice damming and unhealthy mold from stagnant air, and increased home comfort. And, even the smallest residential customer may participate in a positive solar program sponsored by our IESO and provincial government.

This attic vent conservation program will also answer promised government commitments to lower ratepayer electricity bills. Solar attic fans can help achieve a **5 - 10% residential bill reduction**.

## Recommended Ontario Implementation Program Rollout

Given that the retrofit (low risk) solar attic fan solution has already been extensively independently tested (CCHT/UOIT; numerous in-situ tests over the years; 2017 IESO/Alectra EM&V Pilot; and the recent summer 2022 mini-test that included attic temperature and AC cycling sensors), iSolar recommends immediate action with a conservative phased-in approach.

### OPTION 1

An initial roll out could include a limited test Program whereby 1% of Ontario residential homes are outfitted with the retrofittable solar attic ventilation. This **1% rollout (50,000 homes)** of this **low-risk automatic demand response solution** would equate to a savings of approximately **24 MW or 24,000 MWh**, costing less than \$30 million with an annual peak electricity savings to Ontario of approximately \$4.1 million and the creation of more than 40 direct jobs.

## OPTION 2

On a slightly larger scale, a **10% rollout (500,000 homes)** would equate to a savings of approximately **215 MW** or **215,000 MWh**, costing approximately \$245 million with an annual peak electricity savings to Ontario of approximately \$37 million and the creation of more than 200 jobs.

As noted in the attached Research Summary, If retrofittable solar attic ventilation were to be installed more broadly (in 60% of eligible Ontario homes – 3 million homes) through an IESO-administered LDC conservation program over a 4-year period (2023 – 2026), it could be completed at an installed cost of approximately \$1.5 billion (or **\$1.2 million/MW**), with payback estimated at ~6.5 years from installation.

Societal benefits include:

- increased job creation (**at least 1,200 new jobs**),
- significantly **reduced daily peak gas generation in the amount of up to 1,300 MW**
- associated avoided new facilities build and carbon contribution,
- less peak-related stress on the provincial transmission and distribution system managed by HONI and LDC power grids;
- ratepayers will benefit from reduced residential AC costs, while doing their part to reduce stressful power loads on the grid.

Thank you for providing and allowing the opportunity for Ontarians to actively participate in the IESO's initiatives.

Respectfully,

Rita Middleton, CPA-CA  
**CEO, iSolar Solutions**

Professor Peter Love  
**Director, iSolar Solutions**