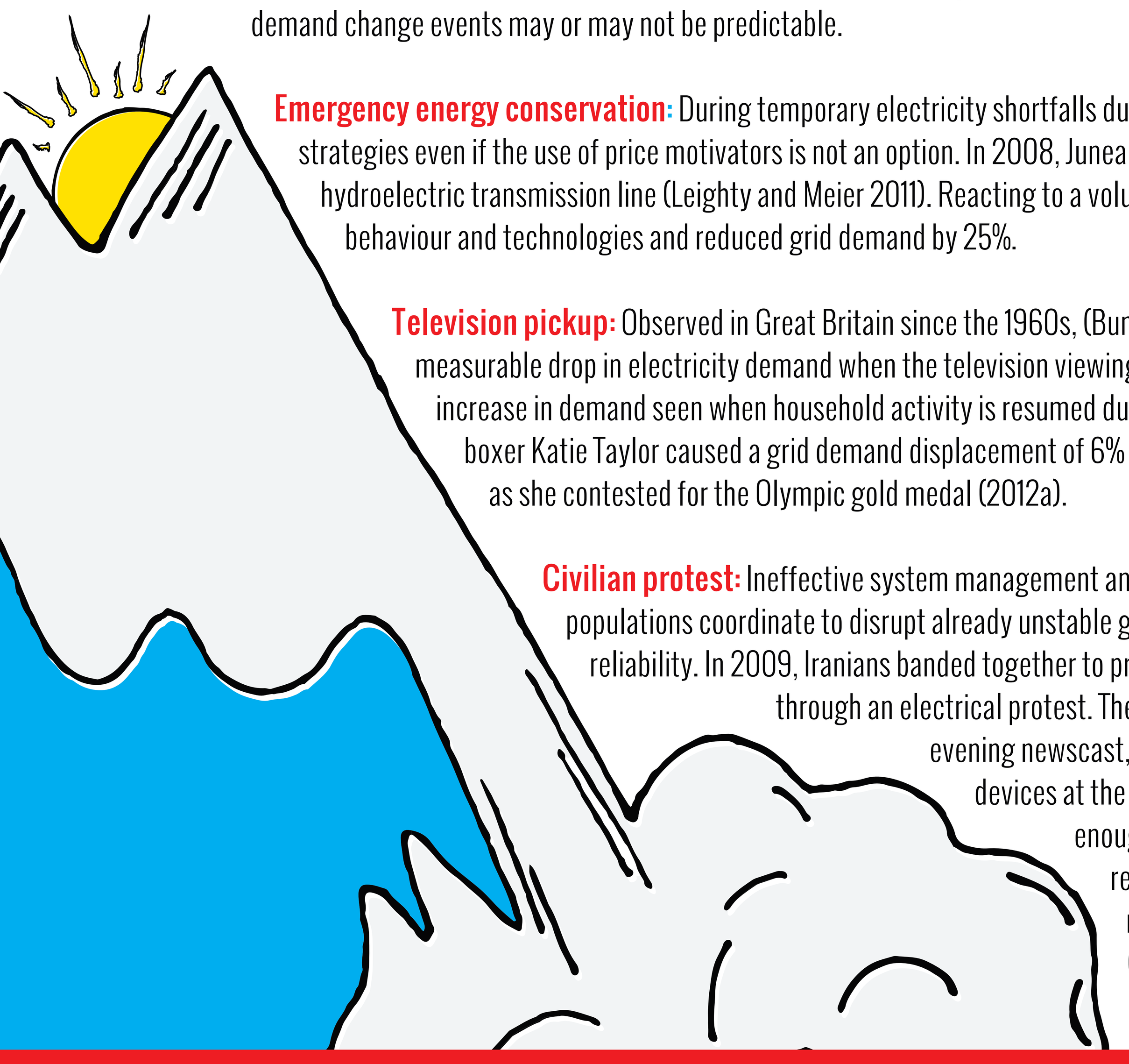
OTHER EVENTS CAUSE COORDINATED ELECTRICITY DEMAND CHANGES

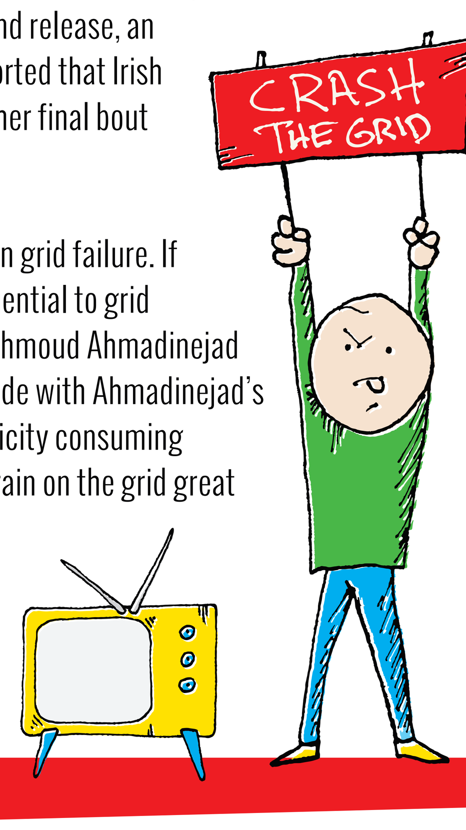
Mass synchronized behaviour can cause electricity demand change in the presense or absence of encouraged conservation. History has shown that these demand change events may or may not be predictable.



Emergency energy conservation: During temporary electricity shortfalls due to natural disaster or other crises, leaders may promote demand-control strategies even if the use of price motivators is not an option. In 2008, Juneau, Alaska residents avoided blackout when an avalanche destroyed the central hydroelectric transmission line (Leighty and Meier 2011). Reacting to a voluntary call from community leaders, citizens adopted energy efficient behaviour and technologies and reduced grid demand by 25%.

Television pickup: Observed in Great Britain since the 1960s, (Bunn and Seigal 1983) this mass passive action causes displacement, a measurable drop in electricity demand when the television viewing displaces other household activity, and release, an increase in demand seen when household activity is resumed during show breaks . In 2012, EirGrid reported that Irish boxer Katie Taylor caused a grid demand displacement of 6% as Ireland collectively paused to view her final bout as she contested for the Olympic gold medal (2012a).

Civilian protest: Ineffective system management and high electricity demands can result in grid failure. If populations coordinate to disrupt already unstable grid systems, the result can be consequential to grid reliability. In 2009, Iranians banded together to protest the presidential reelection of Mahmoud Ahmadinejad through an electrical protest. The goal of the event, scheduled to coincide with Ahmadinejad's evening newscast, was to collectively turn on high electricity consuming devices at the same time in an attempt to cause a strain on the grid great enough to create a blackout. Although not reported by official sources, citizens noted cases of localized grid failure (Bordbar, 2009).



ELECTRICITY IMPACTS OF EARTH HOUR AND OTHER COORDINATED ENERGY DEMAND SHIFTING ACTIONS

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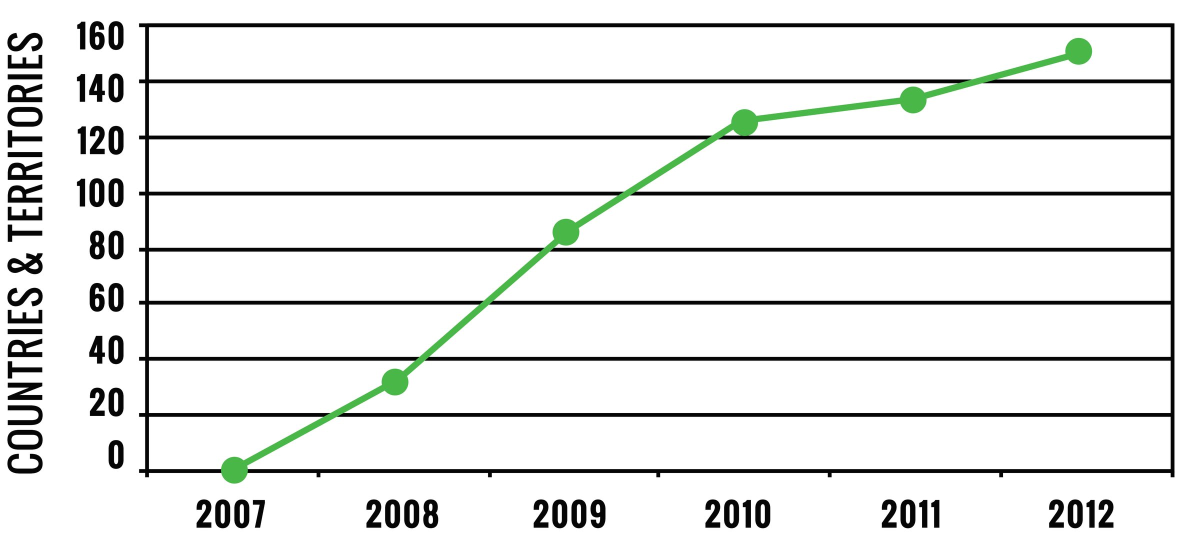
What is Earth Hour?

Earth Hour is an annual mass effort to cease electricity consumption for a period of one hour. It does not aim to achieve measurable electricity savings, instead its objective is to call attention to the collective impact a community can make when its members voluntarily combine electricity conservation efforts. The initiative has experienced high growth over the past six years but has not been subject to external examination.

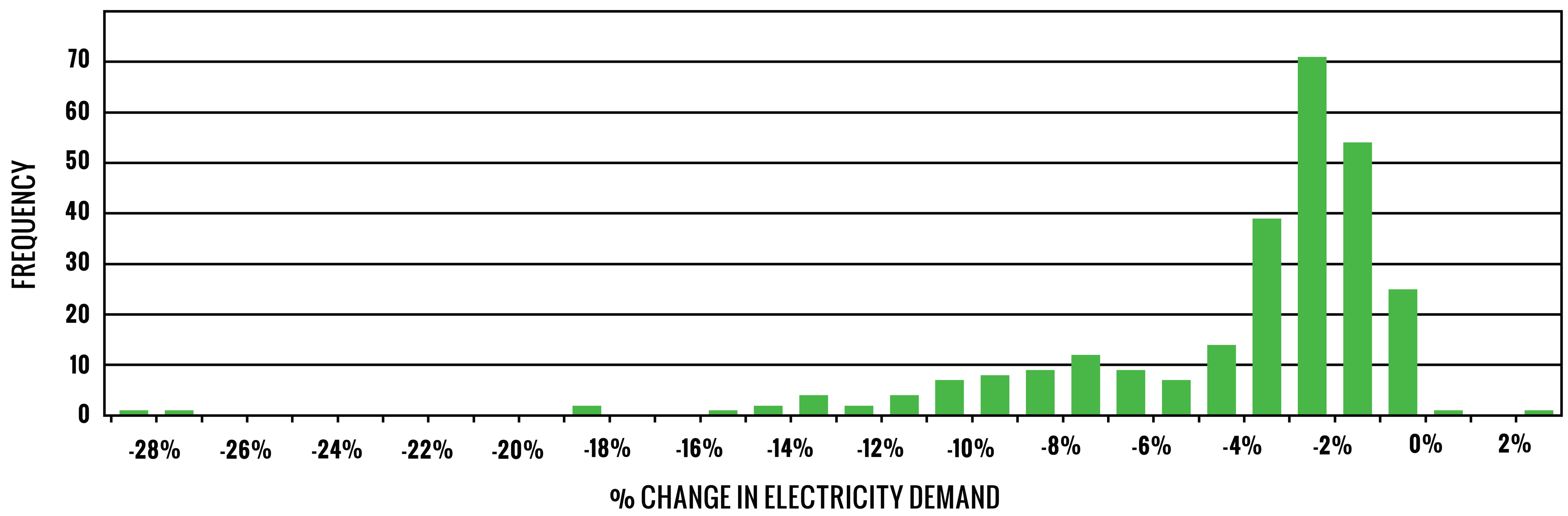
GLOBAL GROWTH OF EARTH HOUR PARTICIPATION (2007-2012)



Results

For the period of Earth Hour events studied, coordinated actions reduced electricity consumption an average of 4.0%. The events had a median reduction of -2.6% and a range of +2% (New Zealand) to -28% (Canada). These 274 measurements of observed changes in electricity demand covered 10 countries and spanned six years from 2007 through 2012. Australia, New Zealand, Indonesia, Qatar, United Arab Emirates, Israel, Ireland, Sweden, United States and Canada are the countries for which Earth Hour electricity demand shift documentation were found.

GLOBAL EARTH HOUR ELECTRICITY DEMAND CHANGE EXPERIENCES (274 CASES)



What can we learn?

1 Does Earth Hour illustrate how purposeful behaviour can quantitatively affect regional electricity demand?

2 Can the collective efforts of purposeful behaviour be a useful demand-control strategy during temporary electricity shortfalls or other crises?

3 Can these short-term electricity demand shift events lead to longer-term actions of sustained change in behaviour and investment?

Method

We compiled 274 measurements of observed changes in electricity demand caused by Earth Hour events in 10 countries, spanning 6 years. We conducted an online search of company records and press releases of electricity system operators, utilities and electricity distributors for Earth Hour electricity demand changes. Only demand shifts recorded in percentages were collected. For each data point collected, methodologies used to calculate reported electricity demand changes were identified and recorded.

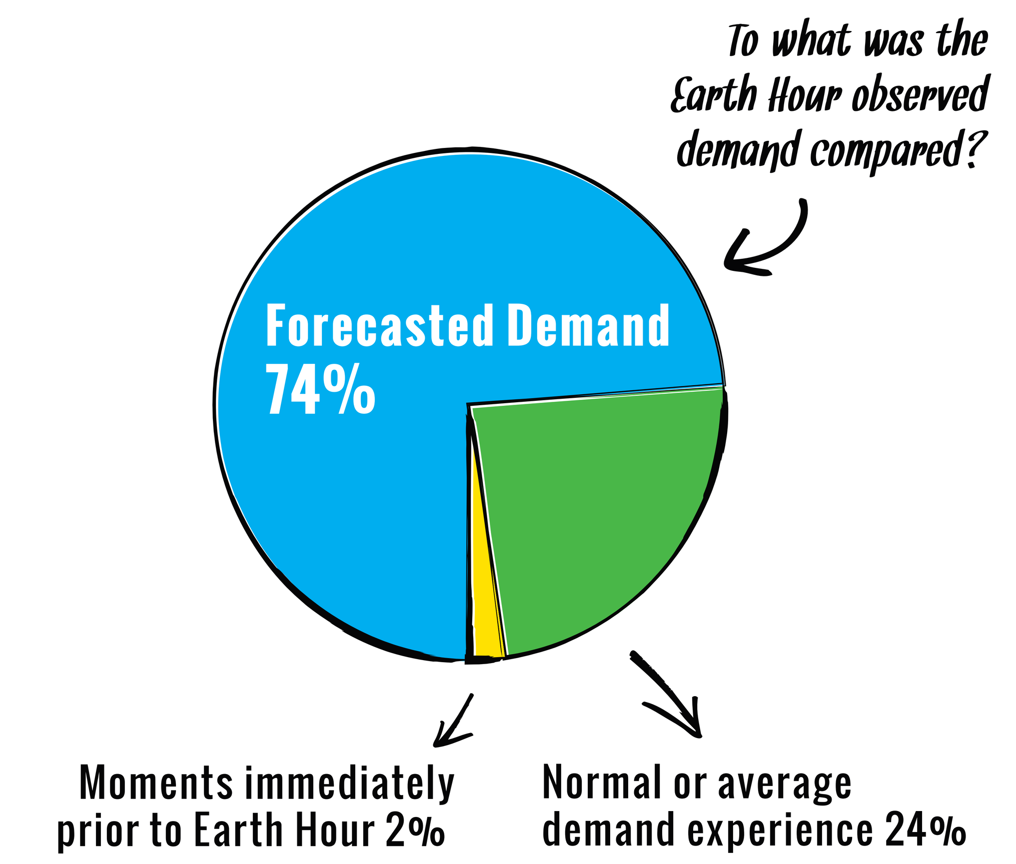
COUNTRIES WITH REPORTED EARTH HOUR DEMAND SHIFTS (2007-2012)

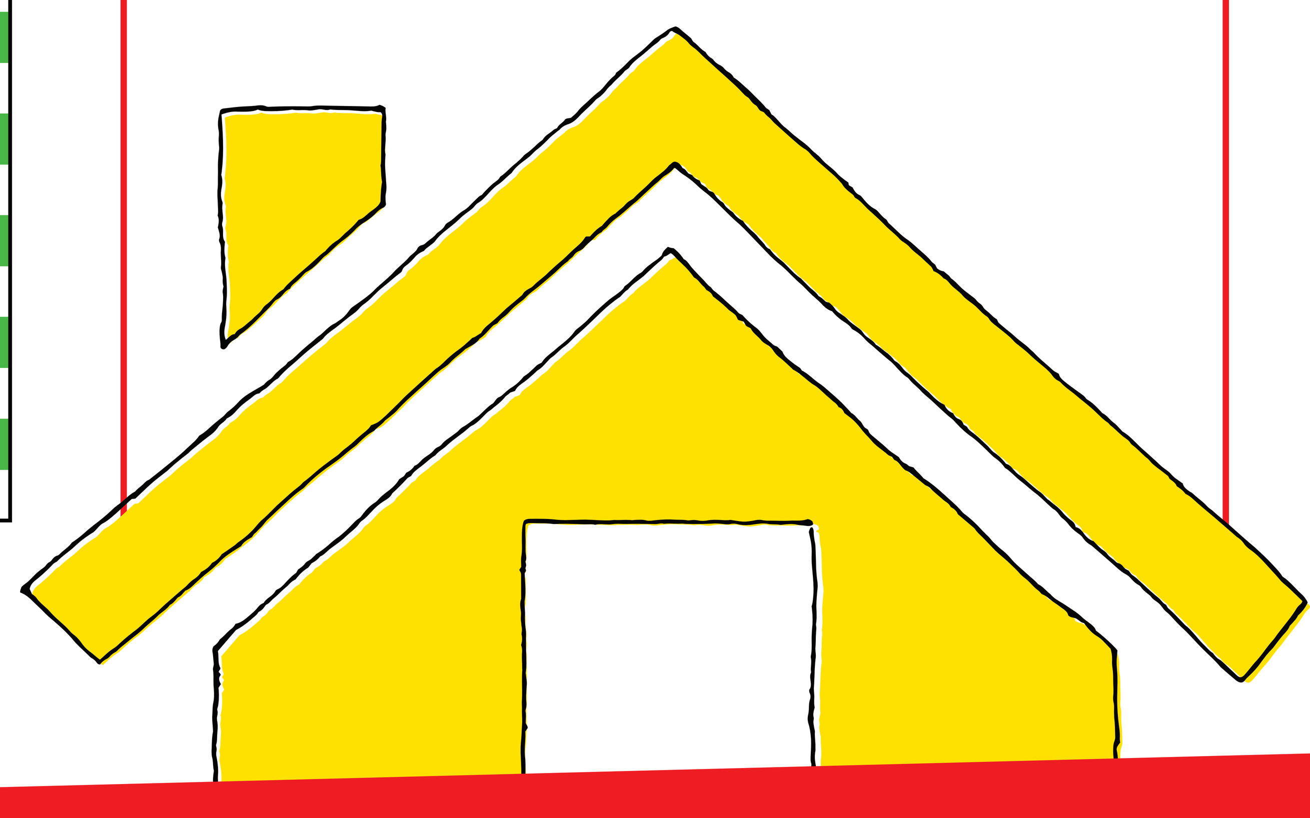
Country	# of Events	Average % Electricity Demand Change
Australia	18	-6.6%
Canada	231	-3.9%
Indonesia	3	-3.9%
Ireland	1	0%
Israel	4	-5.3%
New Zealand	5	-3.6%
Qatar	1	-10.0%
Sweden	2	-2.3%
United Arab Emirates	1	-2.4%
United States	8	-1.8%
Total	274	-4.0%

DEMAND CHANGE METHODOLOGY

Methodology used to calculate percent electricity demand change were available for 97% of the reported Earth Hour data points. However, the methodology used by reporting entities was widely variable, highlighting that a consistent methodology used to calculate individual behaviour-caused electricity demand changes is needed. The recommended methodology is one that compares a given electricity demand increase or decrease to the projected electricity demand. Projected demand should be forecast with system operator tools that consider appropriate equivalent experienced days and adjust for temperature, cloud cover and other major weather events and holidays.

METHODOLOGIES USED BY REPORTING ENTITIES TO CALCULATE EARTH HOUR PERCENT ELECTRICITY DEMAND CHANGE





Conclusion

Mass purposeful behaviour undertaken by Earth Hour participants can quantitatively affect regional electricity demand for periods of one hour. This supports the notion that short-term mass individual energy behaviour change can result in measurable shifts in electricity demand at the grid level. This Earth Hour data, along with anecdotal evidence from other events that cause coordinated reductions or increases in electrical demand, illustrates the importance of short-term behaviour on grid demand. 1

Mass electricity reduction is possible without the use of price motivators. This may prove to be important to industry leaders and policymakers in the days and hours leading up to an electricity shortage when the electricity price has not yet increased. More research should also be done to determine how short-term behaviour change can be applied during times of temporary electricity shortfall or other crises. 2

Extending these efficiency gains beyond the Earth Hour is a challenge that can be addressed through policy that encourages longer-term behaviour changes and investment in energy efficient technology. The single-hour goal of Earth Hour is great - participants cease all possible electricity consumption for a period of one hour. While this level of energy conservation is unsustainable, a primary goal of the Earth Hour event is also one of the most significant factors that influences long-term residential energy use and conservation - consumers' awareness and understanding of their own energy usage (Steg, 2008). More research must be done to determine if Earth Hour conservation behaviour is persistent. 3

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