

Assessing the Safety of Smart Meter Installations in British Columbia: Analysis of Residential Structure Fires in BC between July 2010 and June 2017



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Introduction

Purpose of Research

In June 2011, BC Hydro commenced implementation of its Smart Metering Program, which involved converting every residential property in British Columbia (BC) from legacy metering to wireless technology smart meters. This Smart Metering Program involves replacing existing electrical meters that are now becoming obsolete, with a comprehensive wireless smart metering system. In total, BC Hydro has installed 1.9 million smart meters to improve service and reliability for 4 million customers in the province.

This development in BC mirrors similar activity in other areas, with a general shift by utilities companies from around the world towards upgrading their electricity systems and adopting smart meter technology. It is predicted that by 2015, a total of 250 million smart meters will be installed worldwide [1, citing research undertaken by Pike Research, November 2009].

It is anticipated that BC Hydro's Smart Metering Program will modernize the electricity grid and pay for itself through reduced theft of electricity, energy savings, and operating efficiencies [1]. Electricity theft is an ongoing problem in BC and can result in structure fires due to tampering with household wiring and with electricity grid infrastructure. Smart meter installation provides an opportunity to identify and address safety issues such as an overloaded service and electrical bypasses. It is expected that electricity-related fires, including those due to marijuana grow operations, may decline with the installation of the smart metering system in BC.

A range of issues have been publicly discussed with respect to smart meters, the most recent of which has drawn links between these new devices and residential structure fires. As a result, two specific questions have emerged and underscore this report:

1. Has there been an increase in the frequency of residential structure fires in BC, specifically caused by electricity and that may be associated with the deployment of smart meters?
2. Has there been an increase in the frequency of residential fires in the province in the presence of a marijuana grow operation?

In order to respond to these two questions, the scope of this research involves:

- Undertaking an analysis of relevant documentation including BC Hydro's smart metering and Infrastructure Program Business Case [1], and the University of the Fraser Valley (UFV) Research Note entitled, "The Increasing Problem of Electrical Consumption in Indoor Marijuana Grow Operations in British Columbia" [2].
- Analyzing the Office of the Fire Commissioner's fire incident reporting data that covers a six year period from July 2010 to June 2017, and providing pre- and post-deployment analyses of the impact of smart meters on residential structure fires.

Data Analysis

Previous Research

Assessing the safety of smart meter installations in BC and residential structure fires is part of ongoing research and analysis conducted by the author with researchers at the University of the Fraser Valley (UFV). An initial dataset examined by the author in August 2012 listed 12,425 fires that had been reported to the BC Office of the Fire Commissioner (OFC) and had occurred in BC between July 2010 and June 2012, inclusive. Of these, 31.8% were residential structure fires (n=3,946). In October 2017, the dataset from July 2010 to June 2012 was revisited, capturing an additional 1,110 fires previously not reported at the time of the initial review. In addition, an additional dataset spanning July 2012 to June 2017 was obtained from the OFC database, to provide a cumulative updated review from pre-meter 2011 data to the most recent post-meter 2016 data available at that time. In October 2017, this data set was updated and expanded to June 2017.

Current Review

This most recent review expands the total number of fires to 46,661 of which 14,284 (30.6%) were residential structure fires. Table 1 demonstrates the reporting areas within BC that provided details about these residential structure fires, separated into two groups: (1) *pre-meters* (which included fires that occurred between July 2010 and June 2011); and (2) *post-meters* (2012: July 2011-June 2012, 2013: July 2012-June 2013 fires, 2014: July 2013-June 2014 fires, 2015: July 2014-June 2015, 2016: July 2015-June 2016 and 2017: July 2016-June 2017). For the purposes of this analysis, these two time periods have been compared to examine the broad impact of smart meters for fires. However, the author is aware that smart meters were not present in all residences from the start of the post-meter time period.

TABLE 1: FREQUENCY OF FIRES BY REPORTING AREA FOR THE PRE-METER AND POST-METER TIME PERIODS – BC DATA, JULY 2012 TO JUNE 2017

Frequency of Fires By Reporting Area - BC Data for Period July 1st to June 30th	Pre-meters	Post-meters	Post-meters	Post-meters	Post-meters	Post-meters	Post-meters	Post-meters	Post vs Pre-Meter
	2011	2012	2013	2014	2015	2016	2017	2012 to 2017 Change	Pre-meter to 2017 Change
Municipal areas	1,742	1,891	1,938	2,000	1,868	1,984	1,746	-7.7%	0.2%
Non-municipal - fire protection	122	134	113	127	131	104	98	-26.9%	-19.7%
Non-municipal - no fire protection	29	24	30	21	20	16	12	-50.0%	-58.6%
First Nations Band area	25	25	25	17	18	13	11	-56.0%	-56.0%
Total	1,918	2,074	2,106	2,165	2,037	2,117	1,867	-10.0%	-2.7%

The following analysis examines the frequency of fires in the pre- and post-meter groups, with a view to answering two main research questions:

1. What is the frequency of fires with respect to electricity?
2. What is the frequency of fires with respect to illegal activity associated with marijuana grow operations?

Frequency of Fires with Respect to Electricity

As can be seen from examination of Table 2, in both periods of interest (pre- and post-meters) residential structure fires made up approximately one-third of the total fires reported during that time. With respect to the question about the impact of smart meters on the frequency of residential structure fires, the following points can be made about the main findings displayed in the table:

- There has been a decrease in electricity-related residential structure fires reported where the form of heat was electrical (11.0% decrease) and a considerable decline where electrical distribution equipment was the igniting object (21.9% decline). When looking at these same two categories post-meters from 2012 to 2016 inclusive, the change was a 10.0% and 25.4% decline, respectively.
- On a more specific level, electrical distribution equipment generally made up a very small percentage of the overall residential structure fires in both groups (pre-meters: 0.4% and post-meters: 2012 – 0.1%, 2013 – 0.4%, 2014 – 0.3%, 2015 – 0.3%, 2016 – 0.4%, 2017 – 0.1%). It is likely that these types of fires are most closely related to the meter base, which is directly relevant to the smart meters. While the table shows a 71.4% decrease this is 5 fewer fires.
- To further examine any potential negative impact of the smart meters for fire safety, the frequency of fires that occurred on an exterior wall where the igniting object was the electrical panel board/switchboard was examined. During the 2014 August review and data extraction, only 1 incident was recorded in this category, and has subsequently been corrected after further review. Therefore, in regards to the pre-meter and post-meter periods examined, the revised data reveals that no fires occurred on an exterior wall where the igniting object was the electrical panel board/switchboard.

TABLE 2: ELECTRICITY-RELATED FIRES – BC DATA, JULY 2012 TO JUNE 2017

Electricity Related Fires - BC Data for Period July 1st to June 30th	Pre-meters	Post-meters	Post-meters	Post-meters	Post-meters	Post-meters	Post-meters	Post-meters	Post vs Pre-Meter
	2011	2012	2013	2014	2015	2016	2017	2012 to 2017 Change	Pre-meter to 2017 Change
Total Residential fires	1,918	2,074	2,106	2,165	2,037	2,117	1,867	-10.0%	-2.7%
% residential	28.4%	30.5%	30.9%	32.3%	28.5%	31.2%	32.9%		
Form of heat is spark electrical (includes arc discharge)	172	170	171	179	180	197	153	-10.0%	-11.0%
% residential fires were form of heat was a spark, electrical	9.0%	8.2%	8.1%	8.3%	8.8%	9.3%	8.2%		
Electrical distribution equipment as igniting object	128	134	131	140	129	133	100	-25.4%	-21.9%
% residential where electrical igniting object	6.7%	6.5%	6.2%	6.5%	6.3%	6.3%	5.4%		
Electrical distribution equipment - panel board, switchboard (includes fuse, circuit breakers)	7	2	8	6	7	8	2	0.0%	-71.4%
% residential where electrical igniting object was panel board, switchboard (includes fuse, circuit breakers)	0.4%	0.1%	0.4%	0.3%	0.3%	0.4%	0.1%		
Fires where Fire Origin Area was an exterior wall and the igniting object was an electrical panel board, switchboard	0	0	0	0	0	0	0	0.0%	0.0%
% residential where origin area was an exterior wall and igniting object was an electrical panel/switchboard	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		

Frequency of Fires with Respect to Illegal Activity Associated with Marijuana Grow Operations

With respect to the question about the frequency of residential structure fires related to illegal activity associated with marijuana grow operations; the following main findings capture the results displayed in Table 1:

- Fires that were recorded as having been caused by an act or omission associated with illicit drug operations had declined by 85.7% over the period of interest. When examining post-meter change from 2012 to 2016 (inclusive), there was a decline of 78.9%.
- Fires where the igniting object was an electrical bypass (typically associated with theft of hydro associated with production of marijuana) declined from 8 fires in 2011 to 0 fires reported in 2016 and just 2 fires for the 2017 period.
- Fires where the igniting object was classified as a grow lamp and the activity was illegal declined from five fires in 2011 to only 1 fire reported for the 2017 period.
- Considering the limited number of fires caused by grow lamps where the activity was legal the data has been very stable (pre-meters: 2011 - 1 fire and post-meters: 2012 - 2 fires, 2013 - 0 fires, 2014 - 1 fire, 2015 - 0 fires, 2016 - 2 fires, 2017 - 0 fires). It is possible that the marijuana licensing regime has had an impact on this.

TABLE 3: ILLEGAL ACTIVITY-RELATED (MARIJUANA GROW OPERATION) FIRES – BC DATA, JULY 2012 TO JUNE 2017

Illegal Activity-related (Marijuana Grow Operations) Fires - BC Data for Period July 1st to June 30th	Pre-	Post-	Post-	Post-	Post-	Post-	Post-	Post-meters	Post vs Pre-
	meters	meters	meters	meters	meters	meters	meters	2012 to 2017 Change	Meter Pre-meter to 2017 Change
Total Residential fires	1,918	2,074	2,106	2,165	2,037	2,117	1,867	-10.0%	-2.7%
% residential	28.4%	30.5%	30.9%	32.3%	28.5%	31.2%	32.9%		
Act/Omission illegal operations/activities (e.g., grow ops, meth labs)	28	19	14	11	10	5	4	-78.9%	-85.7%
% residential fires where act/omission was illegal operations/activities (e.g., grow ops, meth labs)	1.5%	0.9%	0.7%	0.5%	0.5%	0.2%	0.2%		
Igniting object was electrical distribution equipment - electrical bypass (illegal operations)	8	6	3	3	3	0	2	-66.7%	-75.0%
% residential where igniting object was electrical bypasses (illegal operations)	0.4%	0.3%	0.1%	0.1%	0.1%	0.0%	0.1%		
Igniting object was grow lamps/lights (illegal)	5	1	2	0	0	0	1	0.0%	-80.0%
% residential where igniting object was grow lamps/lights (illegal)	0.3%	0.0%	0.1%	0.0%	0.0%	0.0%	0.1%		
Igniting object was grow lamps/lights (legal)	1	2	0	1	0	2	0	-100.0%	-100.0%
% residential where igniting object was grow lamps/lights (legal)	0.1%	0.1%	0.0%	0.0%	0.0%	0.1%	0.0%		

Locating Electrical Fires within the Broader Context for BC

To put these incidents within the broader context of residential fire activity in BC over the period of interest, it is important to examine the relative frequency of cooking related fires and fires that resulted from smoker's material, as displayed in Table 4. As indicated, fires caused by electricity are relatively infrequent compared to those resulting from commonplace activities such as cooking (approximately 29% of fires in 2011 and 2012; and 34.1% - 2013, 33.0% - 2014, 33.3% - 2015, 35.9% - 2016 and 35.4% in 2017) and smoking (approximately 17% of fires for pre-meters and post-meters).

TABLE 4: FREQUENCY OF COOKING FIRES AND SMOKER'S MATERIAL FIRES - BC DATA, JULY 2010 TO JUNE 2017

Frequency of Cooking Fires and Smoker's Material Fires - BC Data for Period July 1st to June 30th	Pre-meters	Post-meters	Post-meters	Post-meters	Post-meters	Post-meters	Post-meters	Post-meters	Post vs Pre-Meter
	2011	2012	2013	2014	2015	2016	2017	2012 to 2017 Change	Pre-meter to 2017 Change
Total Residential fires	1,918	2,074	2,106	2,165	2,037	2,117	1,867	-10.0%	-2.7%
% residential	28.4%	30.5%	30.9%	32.3%	28.5%	31.2%	32.9%		
Cooking equipment fires	561	592	716	715	678	759	661	11.7%	17.8%
% residential where cooking equipment was igniting object	29.2%	28.5%	34.0%	33.0%	33.3%	35.9%	35.4%		
Smoker's material fires	294	338	354	379	339	377	316	-6.5%	7.5%
% residential where smoker's material was igniting object	15.3%	16.3%	16.8%	17.5%	16.6%	17.8%	16.9%		

Conclusion

In conclusion, with respect to the two main research questions of interest, the following can be summarized:

- Available data does not indicate that there has been an increased frequency of residential structure fires associated with electricity since July 2010.
- Available data does not indicate that there has been an increased frequency of fires caused by electricity associated with illegal activity since July 2010. If anything, there is a large decline which may be related to the medicinal grow issue.

Both of these findings need to be interpreted with caution, given the very small numbers of events that occur in these categories. However, having drawn attention to this issue, it should also be noted that the analysis presented here includes all fires reported for the whole of BC over the time period of interest. As such, these are the best estimates available.

A final point worth emphasizing relates to the relative frequency of fires caused by electricity when compared to those that result from cooking and smoking. Without wishing to minimise any fire event, it is important to maintain perspective that these every day activities result in many more fires for BC than those caused by electricity.

References

- [1] BC Hydro, *Smart metering and infrastructure program business case*, 2012, BC Hydro: Vancouver, BC.
- [2] J. Diplock and D. Plecas, *The increasing problem of electrical consumption in indoor marihuana grow operations in British Columbia*, 2011, Centre for Public Safety and Criminal Justice Reserach, School of Criminology and Criminal Justice, University of the Fraser Valley: Abbotsford. p. 8.

Author Biographical Information

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