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## Introduction and Background

In August 2010, SaskPower commenced its Automated Metering Infrastructure (AMI) Program, a program designed to make use of new technology to improve the efficiency and effectiveness of metering customers' electricity usage. Between 2010 and 2011, SaskPower completed key project vendor procurements, and selected Sensus USA Inc. (Sensus) for the supply of the AMI technology, including smart meters, and Grid One Solutions Inc. (Grid One) for the installation in January 2012.

SaskPower's equipment delivery began in early 2012, as did laboratory and field testing activities. These activities continued through the fall of 2013 when full meter and module deployment commenced. A pilot project in Hanley, Saskatchewan began in the summer of 2012, where 400 smart meters were installed and tested. At the end of July 2014, close to 108,000 electric meters were installed, and 280 network sites had been commissioned.

Over a period of three weeks in the summer of 2014, in various parts of the Province, eight meters failed catastrophically, melting or burning, and in some cases damaging the sides of houses.<sup>1</sup> These incidents were considered sufficiently serious for SaskPower to halt the installation program. Shortly thereafter, the Government of Saskatchewan (the Government) ordered the removal of all of the Sensus smart meters.

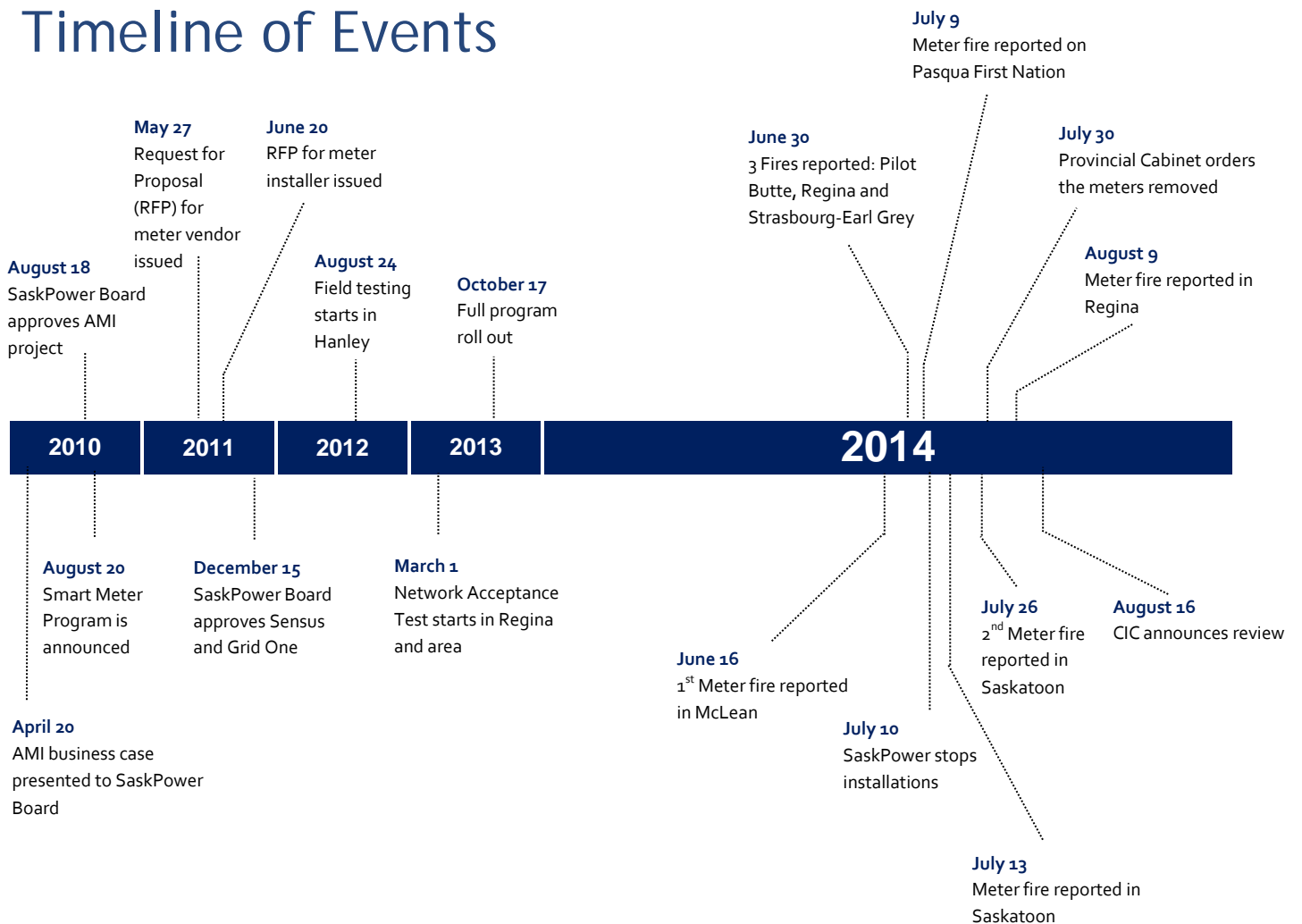
Public safety and transparency are of paramount importance to the Government. Under the direction of the Government, CIC conducted a series of independent third party reviews of SaskPower's Smart Meter Program, following the eight meter related fires. The reviews assessed the Smart Meter Program from legal, technical, and procurement perspectives as well as contract management.

The reports prepared by PricewaterhouseCoopers (PwC) and Ritenburg & Associates (Ritenburg) are attached. The report prepared by CIC's independent legal experts, Robertson Stromberg LLP, will not be released in order to protect SaskPower's legal privilege in the event that future litigation is considered. However, a summary report of the legal review has been included.

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<sup>1</sup> A catastrophic failure has been defined by the consultants and industry as a meter which has burnt, melted, blackened, caught fire, arced, sparked or exploded/blown from the premise.

# Timeline of Events



# Advanced Metering Infrastructure (AMI)

Smart meters are widely used across North America and many parts of the world. They represent a generational shift in metering technology as power companies move to a more automated system that provides the operators with much more information on the performance of the power grid.

The shift to smart meters also represents a huge infrastructure renewal challenge. SaskPower's AMI Program consists of the replacement of SaskPower's existing electric meters with an AMI electric meter (smart meter) with a two-way AMI communication module, installed at a customer's home, farm or business.

AMI also includes a provincial communication network to deliver information from the smart meters to SaskPower, where it will be integrated into corporate systems for customer billing and other operational purposes. The key customer benefit associated with smart meters is that they record actual power usage details, so bills are based on actual electricity used, rather than estimates. Meter readings can be done remotely, eliminating the cost of manual readings.

This is accomplished through a wireless communications system, which takes measurements throughout the day. The data is transmitted over a secure network to a central data management system. This capacity allows the meters to detect power outages, meaning customers no longer have to call in to SaskPower when there is an outage. This remote communications ability also allows for a quicker transfer process for customers who move. Despite problems with a specific model of meter, smart meter technology is, in the long run, the best option for improving and expanding electrical infrastructure in the province.

## Scope of Review

The scope of the Review included:

1. SaskPower's due diligence exercised in the selection of the supplier of smart meters, including, but not limited to:
  - ▶ the factors used to evaluate the suppliers, measured against good practices;
  - ▶ compliance of technology with safety and measurement regulations;
  - ▶ compliance with SaskPower's internal policies;
  - ▶ consideration of company reputation and product history; and,
  - ▶ the ongoing supplier contract management.
2. SaskPower's due diligence exercised in the selection process for the contract of installation services, including, but not limited to:
  - ▶ the process used to evaluate installation service providers;
  - ▶ review documentation; including the request to the Ministry of Labour Relations and Workplace Safety regarding the qualifications of the installers;
  - ▶ the examination of smart meter installation programs in other jurisdictions;
  - ▶ compliance with SaskPower's internal policies; and,
  - ▶ the contract management oversight of meter installation work by Grid One, to ensure the safe installation of meters.

3. Legal due diligence related to, but not limited to:
  - ▶ breach of contract, termination, and dispute resolution if performance or safety issues emerge;
  - ▶ payment terms and hold backs to protect SaskPower's financial interests in the event of problems; and,
  - ▶ SaskPower's ability to receive compensation recovery.
4. Assessment of the cause of the smart meter fires. CIC's legal consultant engaged an engineering firm on CIC's behalf.

## Selection of Independent Experts

In selecting independent experts to conduct the Smart Meter Review, CIC considered a number of factors including experience and industry knowledge, level of involvement in other SaskPower projects to ensure independence, and their level of credibility to ensure public confidence. Three firms were engaged to undertake the review.

PwC is a highly regarded, international accounting and consulting firm with extensive experience in procurement engagements of utility companies and smart meters. PwC was responsible for assessing the adequacy of SaskPower's due diligence, procurement, and contract management practices related to the Smart Meter Program; and compared to good practice, identifying weaknesses in SaskPower's procurement and contracting policies and procedures. PwC was asked to identify recommendations to enhance SaskPower's policies and procedures in the execution of both procurement and contract management going forward. PwC ran an evidence-based review, relying on documentation and interviews with key positions at SaskPower, Sensus, Grid One, and the Ministry of Labour and Workplace Safety, as well as drawing on the knowledge of PwC's smart meter specialists.

Saskatoon based, Robertson Stromberg LLP is one of Saskatchewan's leading law firms. They were selected to review the contracts between SaskPower and the vendors to advise on the strengths and weaknesses of the contracts and advise on possible legal options for SaskPower, including receipt of financial compensation.

Robertson Stromberg conducted extensive interviews with SaskPower, reviewed thousands of pages of SaskPower documentation, and reviewed external sources to develop a comprehensive understanding of this Smart Meter Project. Their investigation was widespread and thorough, including contacting the legal counsel and principal litigant in *Baker v. Sensus USA et al v. Alabama Power Company*.

After their preliminary findings were developed, Robertson Stromberg retained the services of Aird & Berlis, nationally recognized for their expertise in public sector procurement, for the purpose of gaining broader context against which the contractual and procurement analysis could benefit.

The full report prepared by Robertson Stromberg will not be released in order to protect SaskPower's legal privilege in the event that future litigation is considered.

After consulting with the Association of Professional Engineers & Geoscientists (APEGS), Regina-based engineering firm, Ritenburg and Associates Ltd. (Ritenburg) was selected to provide an independent assessment of the cause of the fires. Ritenburg was engaged through Robertson Stromberg in order to protect SaskPower's legal privilege in the event of future litigation.

In performing its work, Ritenburg examined meters that burned, and meters that simply quit for various reasons, including overheating. They reviewed manufacturers' information, contracts, UL/CSA standards and surveyed publicly available information. They also conducted personal interviews with SaskPower staff who were directly involved in the Smart Meter

Project. A number of questions were also electronically posed by Ritenburg, which were subsequently answered by the topic's corresponding SaskPower employee.

SaskPower was cooperative throughout the review process by providing the consultants with necessary documentation, making staff available to be interviewed, and being forthcoming with information.

## SaskPower's Settlement with Sensus

During the course of the Review, on September 8, 2014, SaskPower was able to negotiate an agreement with Sensus to recover \$47 million in costs. This included a cash refund of \$24 million for all meters that were already purchased, a credit of \$18 million for future meters, and \$5 million for research and development of a new meter designed specifically for Saskatchewan's conditions.

## Key Findings

- ▶ Moisture and contaminants getting inside the meters were a major factor in the meter fires.
- ▶ There is no evidence to indicate the fires were the result of improper installation or hot sockets.
- ▶ SaskPower did not adequately consider the potential for significant meter failures resulting in damage to homes.
- ▶ SaskPower does not have two formal processes to distinguish between regular procurements and complex procurements (like those covered in the AMI Program). Complex procurements have additional complexities and should be managed by a different set of processes.
- ▶ Roles and responsibilities were not clearly defined to effectively identify initial risks, manage ongoing/added risks as incidents in other jurisdictions became public, complete adequate due diligence (i.e., assessment of product liability insurance needs), and manage the project.
- ▶ There were three critical points that, taken together, could have prompted SaskPower to re-evaluate the risk to customer safety throughout the Smart Meter Program.

## Summary of Review

Overall, the issues that arose in the Smart Meter Program (Program) can be linked back to SaskPower's approach to the project. SaskPower treated the Program as a complex initiative insofar as it engaged specialist advisors to augment in-house capabilities. However, good practice would suggest complex procurements should be managed by a different set of processes than typical procurements, with increased due diligence. SaskPower does not have two formal processes to distinguish between regular procurements and procurements of high risk goods and services (like those covered in the AMI Program). SaskPower followed their approved policies and procedures, which reflect a typical procurement. While SaskPower did exercise due diligence by closely following existing procurement policies and procedures, and preparing comprehensive legal contracts with its vendors, there were several areas that the consultants indicate SaskPower fell short in terms of good practice.

SaskPower's overreliance on external consultants led to an inadequate risk management process. The majority of procurement advice was provided by external consultants who tend to have a narrow focus, which excluded SaskPower's interest or accountability for public safety. This is evident by the fact that the potential for catastrophic meter failure was never identified as a possible risk. Therefore, SaskPower did not develop controls to respond to unexpected occurrences or issues. Had this occurred, the risks associated with the Program might have been appropriately identified and managed, triggering a different reaction and/or decision at critical points throughout the project. There are a number of activities SaskPower could have taken to improve risk management and customer safety activities.

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## Shortcomings in Product Design

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The portion of the CIC review conducted by Ritenburg concluded that there was no evidence to suggest a problem with either the sockets or the competency of the installation crews. There has been considerable public interest in SaskPower's use of "competent labour" for the installation of the meters. Of the eight fires, five were installed by journeyman electricians or journeyman linemen. Conditions such as high electricity loads, which can lead to hot sockets, were not present at the time of the fires, and Ritenburg believes it is unlikely that hot sockets caused the fires.

There are, however, shortcomings in the design of the Sensus Generation 3.3 Meters. There is evidence that this particular model does not seal properly to keep out moisture and contaminants, both of which could affect meter function. Precipitation levels at the site of several of the fires were unusually high prior to the incidents. Prior to SaskPower installing the meters, Sensus was working on a new model to correct the moisture issue. Features included a breather hole with a Gore-Tex filter, a drain hole at the bottom of the meter, a reduced number of moisture entry points, and improved insulation over the bus bars.

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## Additional Policies and Procedures Needed for Complex Procurements

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SaskPower management did treat the AMI Program as a complex initiative, which is evidenced by the fact that SaskPower engaged specialist advisors to augment in-house capabilities. However, SaskPower followed the same "Purchasing Policy & Procedures" used in non-complex, low-risk procurements. Good practice involves a differentiated process, with increased controls to handle complex procurement needs, based on the level of risk associated with the equipment or service and the amount of expertise required. Some of the key activities that would be expected in complex procurements were missed, such as more rigorous due diligence. SaskPower should have taken additional precautions, such as enhancing its risk management to better respond to critical points in the project.

The Smart Meter Program was the first large scale, multi-year project to take place on customers' premises in fifty years. Although SaskPower management believed the project to be complex, SaskPower's "Purchasing Policy & Procedures" are not designed to manage complex procurements any differently than routine procurements, including increased controls to better manage risk.

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## Critical Points

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The consultants identified three critical points in the Project that could have served as warning signs, requiring additional due diligence and, perhaps, changed SaskPower's course of action.

1. Correspondence from one of the proponents of the RFP process whose proposal was ultimately rejected in favor of Sensus. This correspondence raised the prospect that more due diligence should have been directed towards both Sensus and the product they offered. SaskPower consultants considered and, subsequently, dismissed the concerns raised by the proponent, concluding that their due diligence was adequate.
2. Litigation was initiated in 2010 in Alabama (Baker litigation) that alleged fault with the Sensus product that resulted in fires similar to those that occurred in Saskatchewan. While this litigation appears to have been dismissed by April 2011, there was no mention of this litigation by Sensus at the time it was negotiating its contract with SaskPower. SaskPower became aware of the Baker litigation in late March 2012; after the Sensus procurement contract was effective, but prior to any significant work orders being executed. This flag was dismissed by consultants as involving an earlier version meter and, thus, concluding that the litigation should not be of concern.
3. In August 2012 SaskPower became aware that PECO was dealing with issues related to overheating in meters provided by Sensus. Subsequently PECO announced the replacement of several thousand Sensus meters. We found that the implications of PECO's actions were clearly appreciated by the legal department. This concern was shared with other members of the team, who then visited PECO to learn more. However, one of the lessons available from that visit was the need to have the meters independently tested by UL, which was not done.

SaskPower became aware of these critical points and did take some additional steps, including increasing its efforts to detect faulty sockets, enabling an extra temperature sensor in the meters, and seeking assurances from Sensus that the meters were safe. The temperature sensors and remote reading function never did work properly and there were a large number of high temperature alarms, which SaskPower could not investigate due to the large volume. Even after more than 100,000 installations, SaskPower continued to read the meters manually.

According to PwC's report, good practice suggests that the PECO incident should have triggered an independent re-evaluation of the risk, which may have prompted a heightened level of caution while proceeding with the Smart Meter Program. However, no additional tests on the meters were ordered after the PECO fires became public. SaskPower did not conduct an independent due diligence assessment of Sensus, but relied on Sensus' representations of legal actions against them.

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## Insufficient Risk Management

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All three reports, PwC, Ritenburg, and Robertson Stromberg, maintain that SaskPower had insufficiently managed risk throughout the Smart Meter Program. PwC explains that because SaskPower's procurement policies inadequately address complex procurement management, the risks associated with the Program were not appropriately identified.

Although SaskPower did many things correctly in terms of good procurement process and adhering to policy and procedure, the Corporation's risk management process was found to be lacking. While SaskPower did identify a number of risks, it did not consider the risk of a wholesale replacement of the meters due to catastrophic meter failures. Had this risk



been identified, SaskPower may have undertaken more vigorous testing and included additional safeguards in its contract with Sensus.

According to Robertson Stromberg, the risk of a safety defect is one that can be more readily identified by engineers, or by specialists in meter procurement and deployment, but no such risk was identified prior to the completion of the major contractual documents.

SaskPower received expert advice that it should purchase small batches of meters through a “stepped procurement” process, install them gradually, and watch for problems. SaskPower instead purchased over 100,000 meters in a three-week period and initiated a full-scale installation program.

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## Unclear Project Leadership

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Leadership roles were not clearly defined to effectively manage risk, complete due diligence, and manage the contracts and vendor performance through the duration of the project. This led to unclear lines of accountability and inadequate risk assessment, communication, and follow up. Instead, critical positions were filled with external consultants whereby SaskPower overly relied on consultants to provide expertise in the areas of smart meter technology. Filling critical positions with external consultants was problematic as they lacked familiarity with SaskPower’s operating environment and did not share SaskPower’s interest or accountability for public safety.

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## Contract Development - Lacking Protection Against Product Failure

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Robertson Stromberg has indicated that the contracts with Sensus and Grid One were comprehensive in addressing business issues identified by SaskPower management. Robertson Stromberg noted that improvements could have been made if proper risk identification would have taken place across various areas of SaskPower (i.e., engineering, management, and legal). The failure to adequately identify the risks led to a disconnect between the procurement team and the contract drafters who failed to include specific protection against complete product failure.

# Recommendations

PwC made several recommendations including:

- ▶ The risk assessment processes should be strengthened in SaskPower’s “Purchasing Policy & Procedures” to clearly require a more thorough consideration, documentation, and evaluation of risks during the development of a procurement strategy, as part of project planning, and monitored for new or changing risks.
- ▶ Roles and responsibilities regarding risk management, encompassing each enterprise risk category, especially safety risk, should be clearly identified in the “Purchasing Policy & Procedures”, and assigned at the outset of the project for the duration of the procurement and subsequent contract management.
- ▶ A specific role should be defined and assigned in a complex procurement that provides for each of the following:
  - strategic procurement advice;
  - identification of all risks and requirements associated with the procurement of higher risk goods and service; and,
  - support to the contract owner in managing vendor performance and risk for the duration of the contract.

- ▶ A single point of accountability should be assigned in a complex procurement that would bring together the inputs and findings of all of these individual roles and responsibilities, and would ensure that risks are evaluated as a whole during the procurement process and subsequently throughout the lifetime of a contract.
- ▶ SaskPower should consider enhancing their “Purchasing Policy & Procedures” to provide guidelines for identifying the risk level of procurement and clear steps to manage both routine and complex procurement needs.
- ▶ SaskPower should consider formalizing a Process Safety Management Program, assigning responsibility for the Program, and integrating it into the procurement and contract management policies, procedures, and processes.
- ▶ SaskPower should continue to build and enhance vendor and contract management capabilities and procedures – including assigning a single contract owner responsible for vendor performance, and a specific governance process for managing risk.

Ritenburg made several recommendations including:

- ▶ Documentation of customer sites to help assess the factors which can impact smart meter performance (i.e., taking photos of the socket and premises before and after installation of the new meter).
- ▶ Detailed analysis of any returned meters to identify trends or problem areas (i.e., location, condition, etc.).
- ▶ Detailed documentation of the fires should be incorporated into a single safety and technical report in order to monitor trends and problems with certain types of meters. SaskPower has prepared several reports related to the eight meter fires, but they have not been consolidated into a single document, nor have they been finalized.
- ▶ SaskPower should ensure that the meters’ full capabilities are tested (i.e., temperature alarms) and working in small rollouts (stepped procurement) prior to implementation including the communications system.
- ▶ Existing Sensus (Generation 3.3) meters should be replaced as soon as possible, and no later than the end of winter, prior to the spring thaw and rains. This is due to the close relationship between the previous meter fires and precipitation levels.

Robertson Stromberg made several recommendations including:

- ▶ Given that no one involved in the AMI project was alert to the risks that would flow from a safety defect, advice from risk management consultants should be sought for projects such as the smart meter initiative in order to establish processes and procedures to better identify and manage associated risks.
- ▶ Consideration should also be given to the possibility of allocating risk through the use of product liability insurance, which would be purchased by the vendor to protect the buyer, or SaskPower in this case.
- ▶ Roles and responsibilities with respect to risk management and for how to deal with external legal counsel should be more clearly defined and understood.

## Next Steps

Cabinet has reviewed the reports and has directed:

- ▶ CIC to evaluate the effectiveness of the recommendations outlined in the reports and work with SaskPower to manage the implementation of those recommendations considered appropriate;
- ▶ CIC to consider the recommendations outlined in the report and determine if they can be implemented more broadly across the Crown Sector; and,
- ▶ SaskPower to remove all remaining Sensus smart meters no later than March 15, 2015.

As part of its settlement agreement with SaskPower, Sensus will develop a meter to suit Saskatchewan's conditions. It is already working on a new, more waterproof generation of meters. At that time, SaskPower and the Government will determine if they are satisfied that a new generation meter is safe and reliable, and only then will resume the smart meter installation program.