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Inhaltsübersicht / Sommaire

Trials and Tribulations of a Smart World

A Swiss Take on Privacy in Smart Metering

Rehana Harasgama* / Aurelia Tamò**

KEYWORDS Data Protection – Privacy – Smart Meters – Intelligente Stromzähler – Datenschutz

ABSTRACT This paper focuses on the implementation of smart meters and its privacy impacts. We outline the expectations and challenges of smart meters in today's society and illustrate various Swiss pilot projects. To conclude, the concept of Privacy by Design as a solution to privacy concerns related to the roll-out of smart meters is introduced.

ZUSAMMENFASSUNG Dieser Beitrag befasst sich mit der Einführung von intelligenten Stromzählen und deren Folgen für den Datenschutz. Entsprechend werden die Erwartungen und Herausforderungen intelligenter Stromzähler sowie einige Pilotprojekte präsentiert. Schliesslich wird das Konzept «Privacy by Design» als Lösungsansatz für datenschutzrechtliche Bedenken vorgestellt.

RÉSUMÉ Cet article traite de la mise en œuvre des compteurs intelligents (« smart meters ») en Suisse et de ses impacts sur la vie privée. Les auteurs exposent les attentes et les défis en lien avec les « smart meters » et examinent divers projets pilotes suisse. Pour conclure, ils décrivent le concept de « Privacy by Design » qui peut être considéré comme une solution aux problèmes de confidentialité liés à la mise en œuvre des compteurs intelligents.

I. Introduction

Today's energy market is complex. Various renewable and fossil energy sources must be managed by grid providers according to market demands. Since storing energy is not a trivial task and the demand for energy changes on a regular basis, smart grid operators rely on multiple data to anticipate the grid's energy flow. Smart meters help grid operators and utility providers to better grasp energy flows within households and companies. These smart meters record energy consumption data, process such data, and feed it to end-users, utility providers, or other interested parties.

In Switzerland the implementation of smart grids and smart metering architectures gained momentum in 2011 when the Swiss Parliament started debating the «Energy Strategy 2050». The introduction of smart meters and eventually a country-wide smart grid is interesting as it unites the social value of data. At the same time, however, it triggers concerns with respect to handling such (personal) energy consumption data. One of the goals is to use this information to save energy by educating users about how much devices consume when turned on, on stand-by, or turned off. On the other side, this kind of data processing allows energy players (suppliers, producers, or ICT-providers of energy solutions) to create user profiles and thus gain insight into their users' behaviour (and their users' private life).

While the smart energy market touches upon multiple regulatory issues,[1] this contribution deliberately restricts its focus on privacy and data protection. More precisely, this article looks at smart meters as opposed to smart grids as a whole. The reasons for choosing this narrow focus are, first, that smart meters collect data. In other words, this is where data protection issues start. Second, developing smart meters is where Privacy by Design plays an important role by enhancing the creation of priva-

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1 For further information see: Brigitta Kratz, Die Energiewirtschaft wird digital: Überlegungen zu Smart Grids aus regulatorischer Sicht, in: Gschwend/Hettich/Müller-Chen/Schindler/Wildhaber (Eds.), Recht im Digitalen Zeitalter, Zürich 2015, 225 et seqq.; Maarten Wolsink, The research agenda on social acceptance of distributed generation in smart grids: Renewable as common pool resources, Renewable and Sustainable Energy Reviews 16/2012, 822 et seqq.; Rolf Wüstenhagen/Maarten Wolsink/Jean Mary Bürer, Social Acceptance of Renewable Energy Innovation: an Introduction to the Concept, Energy Policy 35/2007, 2683 et seqq.

cy-friendly smart meters. With this in mind, public and personal interests will have to be balanced by enabling the implementation of smart meters in the energy sector while at the same time limiting the use of personal data legally and ethically to a certain degree.

This contribution builds on our chapter[2] in «Big Data und Datenschutz – Gegenseitige Herausforderungen», published in 2014 by Rolf H. Weber and Florent Thouvenin. First, we provide a quick overview of the Swiss Energy Strategy 2050 which introduces smart grids and smart metering and we outline the expectations and challenges for the implementation of smart meters and smart grids in today's society (II.). Further, we briefly outline projects designed to achieve the goals of the Swiss Energy Strategy 2050 (III.). Additionally, the relevant Swiss privacy and data protection legislation with respect to the roll-out of smart meters is elaborated upon (IV.). Finally, we conclude this contribution by touching upon the concept of Privacy by Design which supports the development of privacy-friendly smart meters (V.).

II. The Swiss Energy Strategy 2050: Expectations & Challenges

In 2011 Switzerland's Federal Council and Parliament made the decision to gradually exit from nuclear energy.[3] This decision meant that the energy sector in Switzerland would have to change drastically in the future, which in turn lead to the adoption of the so-called Energy Strategy 2050.[4] The Swiss Energy Strategy 2050 plans to decentralize energy generation, foster renewable energy, stabilize power consumption, and introduce energy savings measures via market incentives, innovative tariff models, and stricter regulation. Therefore, the introduction of smart grids and smart meters plays an essential role in Switzerland's future energy market.[5]

Table 1 summarizes the most important expectations and challenges entailed by the introduction of smart meters and grids.

Stabilization of energy consumption and increased energy efficiency: One major goal when implementing smart grids and smart meters in Switzerland is the promotion of more energy-conscious behaviour amongst individuals and companies. Conscious behaviour will (hopefully) reduce overall energy consumption and promote a more efficient and economical use of energy by the public. However, promoting energy savings via smart meter is not a trivial task. Studies in Switzerland show that while energy-saving consciousness increases thanks to smart meters, the usage rate of smart meters drops over time as individuals become more accustomed to the smart meters and less curious about the energy consumption of devices.[6] In fact, data collected in the United States show similar results.[7] In other words, for energy saving goals to be accomplished, mechanisms must be found that encourage individuals to change their habits and have a long-term effect on energy consumption. Smart meters will enable the development of other innovative services.[8] Furthermore, with smart meters utility providers are able to sense «system overloads» and reroute energy «to prevent or minimize a potential outage»[9], when necessary.

Increased flexibility of energy production and variable tariffs: Smart meters enable utility providers[10] and consumers to constantly track how much energy they use, when they don't need any energy, and when energy is cheapest. Against this background, it is hoped that increased aware-

2 Rehana Harasgama/Aurelia Tamò, Smart Metering und Privacy by Design im Big Data Zeitalter: Ein Blick in die Schweiz, in: Weber/Thouvenin (Eds.), Zürich 2014, 117 et seqq.

3 In May 2011 the Swiss Federal Council took this decision in a closed meeting, online at: http://www.bfe.admin.ch/energie/0058/00589/00644/?lang=de&msg-id=39337, last visited March 25, 2016; see also the Federal Council's indirect counterproposal to the public initiative «Atomausstiegsinitiative» from September 2013, online at: https://www.admin.ch/opc/de/federal-gazette/2013/7561.pdf, last visited March 25, 2016.

4 Botschaft zum ersten Massnahmenpaket der Energiestrategie 2050 (Revision des Energierechts) und zur Volksinitiative für den gesonderten Ausstieg aus der Atomenergie (Atomausstiegsinitiative) vom 4. September 2013 (Botschaft Energiestrategie 2050), 7572, online at: https://www.admin.ch/opc/de/federal-gazette/2013/7561.pdf, last visited March 25, 2016; for more details on the Swiss Energy Strategy visit: http://www.bfe.admin.ch/themen/00526/00527/index.html?lang=de, last visited March 25, 2016.

5 Botschaft Energiestrategie 2050 (Fn. 4), 7575; see also Kratz (Fn. 1), 233 et seq.

6 Markus Weiss/Friedemann Mattern/Christian Beckel, Smart Energy Consumption Feedback – Connecting Smartphones to Smart Meters, ECRIM News 2013, online at: http://www.vs.inf.ethz.ch/publ/papers/beckel-2013-ercim.pdf, last visited March 25, 2016. The case study looked at several households in Zurich for over a year.

7 See for example Chris Mooney stating in the Washington Post that, even though 50 million smart meters have been installed in the US, energy consumption habits have not changed significantly, online at: https://www.washingtonpost.com/news/energy-environment/wp/2015/01/29/americans-are-this-close-to-finally-understanding-their-electricity-bills/, last visited March 25, 2016; cf. also Alexander Rossnagel/Silke Jandt, Datenschutzkonformes Energieinformationsnetz, Risiken und Gestaltungsvorschläge, Datenschutz und Datensicherheit 34/2010, 373 et seqq.; Ann Cavoukian/Jules Polonetsky/Christopher Wolf, Smart

Expectations	Challenges
Stabilization of energy consumption & increased energy efficiency	Privacy fears (especially with regard to granularity of data & resulting profiles on users)
Increased flexibility of energy production & variable tariffs	Data security – keeping user information safe
Digitalization of energy data – sinking costs	High roll-out costs & interperoperability

Table 1: Expectations and Challenges

Privacy for the Smart Grid: embedding privacy into design of electricity conservation, Berlin 2010, 279, online at: https://epic.org/privacy/smartgrid/SmartPrivacy.pdf, last visited March 25, 2016.

8 See below Section III. and Wilhelm Kleiminger/Christian Beckel/Silvia Santini/Christoph Woodtli/Martin Bühler/Thorsten Staake, Innovative Dienste mit intelligenten Stromzählern, Standby- und Kühlgeräteverbrauch aus Smart-Meter-Daten, Electro Suisse Bulletin 9/2014, online at: http://www.vs.inf.ethz.ch/publ/papers/wilhelmk-2014-vse.pdf, last visited March 25, 2016.

9 Cavoukian/Polonetsky/Wolf (Fn. 7), 278.

10 Of course, utility providers already today have access to aggregated consumption data needed for billing purposes. However, smart meters enable real time data.

11 Moritz Hartmeier, Smart Metering: Hintergrund und Stand der Technik, Departement für Informatik, ETH Zürich, 2010, online at: https://www.vs.inf.ethz.ch/edu/FS2010/DS/reports/ds2010_4_report_moritzhartmeier.pdf, last visited March 25, 2016; see also Daniel Philippen/Reto Dettli, Das Potenzial von Smart Metering in der Schweiz, Neue Studie im Auftrag des Bundesamtes für Energie, Bulletin 1/2010, 15-16, online at: http://www.bulletin-online.ch/uploads/media/article_144714.pdf, last visited March 25, 2016.

12 For example «Time-of-Use», «Critical-Peak-Pricing», «Real-Time-Pricing» etc., see: Schlussbericht des Bundesamtes für Energie (BFE) über Smart Metering für die Schweiz – Potenziale, Erfolgsfaktoren und Massnahmen für die Steigerung der Energieffizienz (Schlussbericht BFE 2009), November 17, 2009, online at: http://www.bfe.admin.ch/smartgrids/index.html?lang=de&dossier_id=06007, last visited March 25, 2016; see also Hartmeier (Fn. 11), 7 et seq.; Cavoukian/Polonetsky/Wolf (Fn. 7), 282 et seq.

13 Schlussbericht des Bundesamtes für Energie (BFE) über die Folgeabschätzung einer Einführung von Smart Metering im Zusammenhang mit Smart Grids in der Schweiz (Schlussbericht BFE 2012), June 5, 2012, 88, online: http://www.news.admin.ch/NSBSubscriber/message/attachments/27519.pdf, last visited March 25, 2016; Weissbuch Smart Grid, Verein Smart Grid Schweiz (VSGS), February 28, 2013, 43, online at: http://www.smartgrid-schweiz.ch/files/publikationen/weissbuch_smart_grid.pdf, last visited March 25, 2016.

14 Rossnagel/Jandt (Fn. 7), 374; Vincent Mottier, Datenschutz bei Smart Metering, Vertrauen als entscheidender Faktor für den Erfolg intelligenter Stromzähler, Elektro Suisse Bulletin 10/2010, 19, online at: http://www.bulletin-online.ch/uploads/media/1-article_146207.pdf, last visited March 25, 2016; Elias Leake Quinn, Smart Metering & Privacy: Existing Law and Competing Policies, May 9, 2009, 9 et seqq., online at: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1462285, last visited March 25, 2016.

15 Mottier (Fn. 14), 19 et seq.

ness for energy consumption directly incentivizes users to adjust their consumption habits accordingly.[11]

Furthermore, a bigger volume of smart meter and grid data means higher predictability in the future which can result in a more precise and effective execution of public duties. Moreover, smart meters enable energy suppliers to know exactly how much energy is used at a certain time of day. This information allows energy providers to vary energy prices depending on the demand and supply ratio. By indicating at which time of the day energy is the most affordable, utility providers are able to dynamically change the price of energy depending on the traffic on the grid.[12]

Digitalisation of energy data – sinking costs: Additionally, the digital collection of energy data can reduce the overall costs of collection, processing, and usage of energy data. The costs of someone actively reading the tracking device – as is the case today – will become redundant as the data can be automatically pushed from the smart meter device to the persons concerned (producers and/or users).[13]

These expectations are confronted with various challenges mainly stemming from cost and privacy considerations.

Privacy fears with regard to granularity of data and resulting user profiles: Privacy advocates fear that the introduction of smart meters and the amount of data collected by these meters could impede end-consumers' privacy. Smart meter data will allow inferring whether a person is at home or how many people live in a household (through real time measurement of energy consumption), what kind of and how many electronic devices are in use, and so on.[14] Therefore, the data collected by smart meters will be able to provide deep insights on private activities and enable the creation of personality profiles. For this to be possible, however, the data would need to be tracked 24/7. This, for example, could be avoided by limiting the amount of time a smart meter can legally collect and transfer end-consumer data.[15]

Data security – keeping user data safe: The automatic collection and processing of data further entails data security challenges as datasets could be hacked, leaked, or

lost. It is therefore key that data security measures (technical and organizational) are implemented.[16]

High roll-out costs: Other challenges that arise are related to the costs of a roll-out and the interoperability of the employed technology. Although politicians and utility providers alike argue that the roll-out of smart meters in Switzerland will effectively cut costs in the future, the initial roll-out of smart meters will create high costs, especially where existing meters are replaced by smart meters even though they are still fully functional.[17]

III. Swiss Smart Metering Projects

To achieve the goals set in the Federal Council's Energy Strategy 2050, various smart metering (pilot) projects have been launched. Some of these projects focus on visualizing the energy consumption of individual devices. The project «e-vision»[18] provides end-users with a real-time visualization of their energy consumption and costs thereof. Through a web-based online application the consumption data and patterns can be retrieved by the user. Similarly, the project «myStrom»[19] visualizes consumption data. Besides controlling energy consumption, the software included in the myStrom switch allows to remotely switch devices on and off. The goal of the myStrom project is to empower users with data on the energy consumption of individual devices and, with this knowledge, to optimize their energy consumption. myStrom monitors the real-time consumption of devices additionally allows to remotely control them. Therefore, users monitoring the consumption patterns can switch off devices remotely and thereby lower the overall energy consumption of their household. Launched by the biggest telecommunication provider in Switzerland, Swisscom, «Quing Home»[20] enables users to control devices in their home by remotely switching them off, similarly to myStrom. Another project by Swisscom that monitors and visualizes heating energy consumption of a household is «tiko»[21]. Heating consumption data is measured by a control module that is installed on the heating system – a boiler. The control module consists of an integrated meter and a switch to measure the data and communicate it to the tiko platform where the data is formatted for the user. The tiko system can also be programmed so as to inform users by text or email when unusual heating consumption patterns appear.

While the projects e-vision, myStrom, Quing Home, or tiko primarily focus on individuals and their contribution to energy saving, the project «FlexLast»[22] automatically feeds the overall energy capacity of the grid into an account and adapts the consumption of energy depending on the grid's energy dips and peaks. FlexLast is a collaboration between IBM, BKW (the electricity utility provider of the Canton of Bern), Migros (a major retailer and supermarket chain in Switzerland), and Swissgrid (the Swiss grid operator). Together IBM, BKW, Migros and Swissgrid tested a system on Migros' refrigerated warehouses that relies on a buffer to balance fluctuation of the availability of renewable energy. Migros provided data on the warehouse temperatures and consumption, BKW and Swissgrid data on real-time energy flow, and IBM developed software and algorithms that «optimize the balance between production and consumption of energy. Simply put, when the sun shines and the wind blows, the air conditioning units in the warehouse will run full blast. When renewable energy is not available, they will run at a lower level or shut down completely»[23].

Another project is called «iSMART»[24]. In this project, BKW installed smart meters in participants' basements to track their electricity consumption and provide them with feedback thereof. In addition to the visualization, the software enables users to remotely control appliances within a household and to automatically decide when

16 Quinn (Fn. 14), 9 et seqq.; David Krebs, «Privacy by Design»: Nice-to-have or a Necessary Principle of Data Protection Law?, JIPITEC 2013, 2 et seqq., note 20, online at: http://www.jipitec.eu/issues/jipitec-4-1-2013/jipitec4krebs, last visited March 25, 2016; Rainer Knyrim/Gerald Trieb, Smart metering under EU Data Protection Law, International Data Privacy Law, March 1, 2011, 1 et seqq., online at: http://idpl.oxfordjournals.org/content/1/2/121.full.pdf+html, last visited March 25, 2016.

17 Schlussbericht BFE 2012 (Fn. 13), 85 et seq.; Hartmeier (Fn. 10), 10; Weissbuch Smart Grid (Fn. 13), 42 et seq.

18 See: http://www.groupe-e.ch/de/e-vision, last visited March 25, 2016.

19 See: https://mystrom.ch/en/, last visited March 25, 2016.

20 See: https://www.swisscom.ch/en/about/medien/press-releases/2012/12/20121203_MM_Haussteuerungssystem.html, last visited March 25, 2016.

21 See: https://tiko.ch/, last visited March 25, 2016.

22 Schlussbericht FlexLast – Erzeugung von Sekundär-Regelenergie durch ein dynamisches Lastmanagement bei Grossverbrauchern, Technische und betriebswirtschaftliche Betrachtung, February 24, 2014; see also: http://www.zurich.ibm.com/news/12/flexlast.html, and interactive infographic: http://www.zurich.ibm.com/flexlast/infographic_en/, each last visited March 25, 2016.

23 See: http://www.zurich.ibm.com/news/12/flexlast.html, last visited March 25, 2016.

24 See: http://www.bkw.ch/fileadmin/user_upload/4_Ueber_BKW/Downloadcenter/UEber_BKW_Gruppe/2011_jb_en.pdf, 17, last visited March 25, 2016; Oliver Krone/Maurus Bachmann, Smart Market aus Sicht der Schweiz, in: Smart Market, Berlin 2014, 179.

devices must be switched off or on. «Depending on the power situation at any given time (e.g., prevalence of wind or sun, high or low tariff), washing machines, sun blinds, lamps and other such equipment will automatically switch on and off in order to keep electricity costs down»[25].

IV. Privacy Matters: How Swiss Law Deals with Smart Metering Data

The main question when dealing with smart meters from a privacy point of view is the question as to whether the data collected by smart meters is in fact protected under Swiss (privacy) law. In Art. 13 (2) the Swiss constitution[26] guarantees a right to privacy and informational self-determination. This right entitles subjects to decide themselves with whom and when they want to share what kind of personal information; and this right is reflected in the national Data Protection Act (DPA).[27] The Swiss DPA applies if personal data is processed (Art. 3 [a] DPA). Does energy consumption data (e.g., the metadata when and how long a person showers, watches television, etc.) classify as personal data under data protection law? The qualification of data as personal data depends on whether a piece of data identifies an individual or at least makes a person identifiable.[28] Therefore, we would argue that certain energy consumption data can be qualified as personal data if for example the smart meter data is connected to an identifiable household in a specific neighbourhood.[29] However, it is not only the specific pieces of data alone that pose the greatest threat to privacy in this realm but the ability to create personality profiles by aggregating various pieces of data on an identifiable individual.

The applicability of data protection law implies that especially the fundamental principles stated in Art. 4, 5, and 7 DPA have to be observed when processing smart meter data. Therefore, when introducing smart meters developers must comply with the principles of proportionality, purpose limitation and transparency and ensure data minimisation and appropriate data security measures in the technology itself. Purpose limitation can be ensured by implementing basic user profiles and usage rules in the system as well as by making sure that potential data transfers can only be approved and data can only be received by a pre-defined group of persons. This means roles have to be defined when processing smart meter data so as to make sure that only those who need to use data to fulfil their job are able to access, use and transfer such data. Finally, this means that there should not be any default settings allowing unlimited access, use and transfer of smart meter data within the system. The principle of transparency entails the clear and complete notification of the public as to what the purpose of a smart meter is, what data will be collected, to whom data will be transferred to and their right to information. The integrity and confidentiality of the data are paramount in this case. Additionally, only the collection and use of data necessary to the purpose of the smart metering features, such as gathering energy data for billing purposes, are permitted. Furthermore, data should – if possible – be anonymised before it is transferred to another party.[30]

So far, Switzerland has not implemented specific legislation on smart grids and smart metering systems. However, some players in the energy sector have committed to a self-regulatory system of rights and obligations by introducing the Swiss Smart Metering Code and the Swiss Handbook on Smart Metering which also consider privacy within the design of smart metering systems. Both state that data subjects should at all times remain the owner of the data collected by smart meters and at the same time give their consent to collect and process smart meter data, thereby ensuring compliance with data protection regulations at all time, irrespective of whether sensitive data or personality profiles are actually processed in these meters.

V. Privacy by Design: Countering the Tribulations of a Smart World

As indicated above, smart energy infrastructures that employ smart meters and measure energy consumption

25 See: http://www.bkw.ch/fileadmin/user_upload/4_Ueber_BKW/Downloadcenter/UEber_BKW_Gruppe/2011_jb_en.pdf, 17, last visited March 25, 2016.

26 Federal Constitution of the Swiss Confederation of 18 April 1999, SR 101.

27 Federal Act on Data Protection of 19 June 1992, SR 235.1.

28 Botschaft zum Bundesgesetz über den Datenschutz (Botschaft DSG), March 23, 1988 (BBl 1988 II), 444 et seq.

29 Schlussbericht BFE 2012 (Fn. 13), 62; Susanne Leber, Datenschutz bei digitalen Stromzählern, die Aufgaben der Elektrizitätsunternehmen Teil 1, Bulletin 9/2011, 58 et seq., online at: http://www.bulletin-online.ch/de/themen/recht/artikel-detailansicht/news/5184-datenschutz-bei-digitalen-stromzaehlern.html, last visited March 25, 2016.

30 Federal Data Protection and Information Commissioner (Eidgnössischer Datenschutzbeauftragter, EDÖB), Der Einsatz von digitalen Stromzählern, online at: http://www.edoeb.admin.ch/datenschutz/00625/00724/index.html, last visited March 25, 2016.

data in real-time affect end-consumers' right to privacy and data protection. With every household connected via smart meter technology to the smart grid infrastructure, vast amounts of data about end-consumer devices and consumption patterns will be generated. This information enables data mining algorithms to determine when an individual resides in his home, how many persons live in a household, which devices are used, when and whether or not a home is protected by an alarm system.[31] The possibility to retrieve such patterns regarding lifestyle and routines – thus creating personality profiles – increases not only the economic value of such data for companies but also the potential for infringement of an individual's right to privacy and especially data protection.

A step towards privacy and data protection as well as increased trust in such (technological) systems while simultaneously allowing (technological) innovation and the harnessing of (personal) data for various products and services is the concept of Privacy by Design (PbD). The fundamental idea of PbD is to promote privacy when developing information technologies or connected infrastructures from the start and accounting for data protection when defining organizational processes within an entity.[32] By doing so, privacy is legally, technologically and organizationally integrated at the very core of a technology such as smart meters. PbD provides end-to-end security within a system and allows data subjects to transparently understand how their data is being used.[33] PbD or data protection by design will soon – to come into force in 2018 – be part of the new European Data Protection Regulation (Art. 23). Switzerland also – after having evaluated current privacy legislation – found that the concept of PbD must become an integral part of data protection in the future.[34] Therefore, by considering PbD when designing smart metering systems privacy can be promoted from the very beginning, thereby increasing end-users' trust in these systems and using technology to enhance privacy rather than looking at technology as an impediment to privacy. Furthermore, privacy would be integrated in the organizational structure of smart metering and, therefore, would increase awareness of all stakeholders.

VI. Conclusion: Where Do We Go From Here?

The wide implementation of smart meters brings high expectations and manifold challenges as society moves forward to a smarter world: high expectations for an energy-aware society and energy-efficient system; challenges due to privacy intrusions and the constant monitoring of end-users via these systems. Yet, the benefits and positive expectations should not be scattered by the potential misuse of end-user data and their trust. Pilot projects creating smart meters and smart metering systems as well as the commercial applications thereof should be encouraged in a privacy-friendly manner. Only by testing new technologies can their full potential be harvested and the challenges posed faced and overcome. Nonetheless, guiding principles, in particular when fundamental rights such as privacy are concerned, should be complied with. Data protection law provides such guidance and newer approaches such as PbD further foster taking privacy into account at the very beginning of smart metering projects. In fact, PbD is on the rise and with that the potential to introduce privacy-friendly and trustworthy systems into smart meters and smart grids increases. Thus, it is important that legislators and smart meter providers alike have the obligation to ensure that privacy is accounted for from the start when developing these systems; they have to ensure data security measures that are «state of the art» and provide high transparency to the users to gain their acceptance before introducing smart meters country-wide.

To conclude, we would like to quote Cavoukian, Polonetsky and Wolf who argue that for a smart world to function, a concept of smart privacy has to be adopted: SmartPrivacy «represents a broad arsenal of protections, encapsulating everything necessary to ensure that all of the personal information held by an organization is appropriately managed»[35].

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31 Mottier (Fn. 14), 19 et seq.; Quinn (Fn. 14), 9 et seqq.

32 Ann Cavoukian, Privacy By Design in Law, Policy and Practice, A White Paper for Regulators, Decision-makers and Policy-makers, August 2011, 3, online at: https://www.ipc.on.ca/images/Resources/pbd-law-policy.pdf, last visited March 25, 2016.

33 Ann Cavoukian, Privacy by Design, The 7 Foundational Principles, Implementation and Mapping of Fair Information Practices, 1 et seq., online at: https://www.iab.org/wp-content/IAB-uploads/2011/03/fred_carter.pdf, last visited March 25, 2016.

34 Bericht des Bundesrates über die Evaluation des Bundesgesetzes über den Datenschutz, December 9, 2011, 350 et seq., online at: https://www.admin.ch/opc/de/federal-gazette/2012/335.pdf, last visited March 25, 2016; see also the statement of the EDÖB, Bericht zur Erfassung von Payloaddaten im Rahmen der Google Street View Fahrten, January 2011, online at: http://www.edoeb.admin.ch/datenschutz/00683/00690/00694/00695/index.html?lang=de, last visited March 25, 2016.

35 Cavoukian/Polonetsky/Wolf (Fn. 7), 276.