D6.6 – LEGISLATION FRAMEWORK

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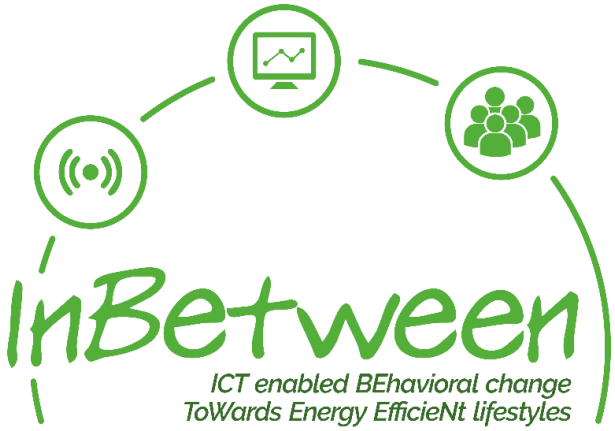

LEADER: VIL

DISSEMINATION LEVEL

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DISCLAIMER

The work presented in this document has been conducted in the context of the H2020 of the European community project InBetween (n° 768776). The partners in the project are: Rina Consulting S.p.A., Acciona Construcción S.A., AIT Austrian Institute of Technology Gmbh, Develco Products, The Interdisciplinary Center Herzliya, Institute Mihajlo Pupin, Vilogia S.A, Sonnenplatz Großschönau Gmbh. The content of this report does not reflect the official opinion of the European Union. Responsibility for the information and views expressed in the therein lies entirely with the author(s).

EXECUTIVE SUMMARY

This deliverable presents legislation framework which could impact specifically the project development for each partner as well as the overall InBetween business approach. It is part of the WP6, 'Exploitation and dissemination activities' and titled 'Legislation framework'. The report is a direct output of task 6.3, 'Legislation framework and adoption drivers/barriers'.
The main issues to be dealt with are the handling of personal data on the one hand, and the different energy prices scheme in each country.

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LIST OF ABBREVIATIONS

SEM: Smart Energy Manager

ICT: Information and Communications Technology

GDPR: General Data Protection Regulation

DPO: Data Protection Officer

USP: Unique Selling Proposition

ESCO: Energy Service Company

ToU: Time of Use

1 INTRODUCTION

The purpose of this document is to identify the regulations framing the activities of the InBetween project. Within D6.2, a Business Model and a preliminary Business Plan for the InBetween integrated platform have been built. To increase the marketing readiness of our solution, a study of the legal constraints applied to the development of Smart Energy Management Systems is essential.

The H2020 InBetween project focuses on the development of an ICT solution (platform with advanced energy services) and the development of its end-users interfaces (web and mobile application) to promote behavioral changes in energy use. The application took the name of SEM: Smart Energy Manager. SEM's deployment requires prior installation of sensors in the participants' households to collect energy data, and actuators to allow them to control their energy-consuming devices more efficiently.

Moreover, the tool deals with energy flows – especially electricity. Therefore, the project activities are subject to legislation concerning:

i) the handling of personal data (Chapter 2) and,
ii) the electricity market (Chapter 3).

Legislation constraints and incentives shall also be considered in the development of the marketing strategy for the InBetween results. Based on the current legal framework, the report analyzes a set of barriers and drivers influencing the market adoption of energy related European-wide ICT-services in Chapter 4 – Drivers and Barriers for Market Adoption. In the final Chapter 5 – Conclusions, the results of this deliverable are summarized.

2 PERSONAL DATA LEGISLATION FRAMEWORK

As specified in the Grant Agreement, the "Legislation framework" deliverable, was defined as "*…primarily devoted to the identification of the legislation framework **related to the handling of sensitive energy related data**, gathered within Task 4.2, and potential barriers for the overall inBETWEEN business approach considering involvement of several stakeholders offering advanced energy service. Namely, the task will seek for appropriate legal framework to solve the data privacy issues and their appropriate handling by the third parties as the sensitive data could be collected in one country and processed in completely another (given the provisions of cloud-based platform) **under different legislation applicable***."

The first proposal for the current General Data Protection Regulation was released by the European Commission already in January 2012. This document and later proposals were voted on by the European Parliament on 12 March 2014. Following this vote, the Council agreed to a common approach on a revised text on 15 June 2015. On 15 December 2015, the European Parliament voted to pass the new data protection rules, which were then published on 4 May 2016.

Soon before the redaction of the proposal, the GDPR, General Data Protection Regulation, entered into force in May 2016. Since that, Member States had 2 years to ensure that it is fully implementable in their countries, which became true on May 25th, 2018. It was a huge change as it was replacing 1995 Data Protection Directive which was adopted at a time when the internet was in its infancy. With the implementation of GDPR in the member countries of European Union, the biggest part of handling sensitive data within different countries got in detail regulated.

2.1 INBETWEEN PROJECT AND GDPR

At the start of the InBetween Project the individual European countries had still different legislation in place regarding handling of sensitive data, which was at that time a major challenge for a potential roll-out of the ICT-solution which InBetween is providing. The European Regulation in place at the proposal submission time, in 2017, was approved in 1995, the Data Protection Directive (Council Directive 95/46, 1995 O.J. (L 281) 31 (EC)).
On 25th of May 2018 however, the General Data Protection Regulation came into effect, and by this unifying most of the issues regarding dealing with sensitive and personal data (Commission Regulation 2016/679 of 27 Apr. 2016 on the Protection of Natural Persons with Regard to the Processing of Personal Data and on the Free Movement of Such Data, and Repealing Directive 95/46/EC (General Data Protection Regulation), 2016 O.J. (L 119) 1 (EU)). Thanks to this GDPR regulation, unified rules are now in place within European Union members. A potential roll-out to countries outside of the European Union would still need further investigation, as laws are currently changing rapidly due to world-wide social networks, cloud-computing and increased data processing capabilities (big data, digital crimes, etc.), leading to a current re-thinking, actualization and re-negotiation of international contracts and laws.[1]

2.1.1 What is GDPR? Is InBetween falling under the GDPR rules?

The General Data Protection Regulation (EU) 2016/679 is a regulation in EU law on data protection and privacy in the European Union (EU) and the European Economic Area (EEA). It also addresses the transfer of personal data outside the EU and EEA areas. The GDPR aims primarily to give control to individuals over their personal data and to simplify the regulatory environment for international business by unifying the regulation within the EU. Superseding the Data Protection Directive 95/46/EC, the regulation contains provisions and requirements related to the processing of personal data of individuals (formally called data subjects in the GDPR) inside the EEA, and applies to any company established in the EEA or—regardless of its location and the data subjects' citizenship or residence—that is processing the personal information of data subjects inside the EEA. It also applies to non-EU companies processing European personal data outside EU.[2] Information regarding

[1] See for example Case C-362/14, Schrems v. Data Prot. Comm'r (Oct. 6, 2015), http://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:62014CJ0362 or Case C-131/12, Google Spain SL v. Agencia Espan˜ola de Proteccio´n de Datos (AEPD), 2014 E.C.R. 317, http://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:62012CJ0131

[2] https://www.mintz.com/insights-center/viewpoints/2826/2015-12-general-data-protection-regulation-bullet-points-0

GDPR has been spread widely during the recent years, as it is a topic of importance of almost all companies within Europe. Data protection principles under the GDPR regulation can be summed up in 6 principles[3]:

- Lawfulness, fairness and transparency: personal data must be processed in a lawful, fair and transparent manner in relation to the data subject.
- Purpose limitation: personal data must be collected for a specific, explicit and legitimate purpose. This purpose must be clearly defined, and data collection limited to the time of the purpose completion.
- Data minimisation: the processing of personal data should conform to the "need-to-know" basis.
- Accuracy: during the personal data processing, inaccurate or incomplete data must be updated or removed. Data subjects have the right to request a deletion or rectification of incorrect data, in a delay of 1 month.
- Storage limitation: personal data must be deleted when no longer needed.
- Integrity and confidentiality: personal data must be kept safely, and protected against unauthorised and unlawful processing, as well as against accidental loss, destruction or damage, with appropriate measures.

As GDPR is applicable to "activities of an establishment in the Union, regardless of whether the processing takes place in the Union or not", and "to the processing of personal data of data subjects who are in the Union", it is clear, that the **InBetween project activities are in full under the scope of this common regulation**, erasing all European-wide discrepancies existing before. The present report relates how this was considered within the project.

2.1.2 InBetween project personal data handling

The term 'personal data' is defined in Art. 4 (1) of GDPR**:**

"'personal data' means any information relating to an identified or identifiable natural person ('data subject'); an identifiable natural person is one who can be identified, directly or indirectly, in particular by reference to an identifier such as a name, an identification number, location data, an online identifier or to one or more factors specific to the physical, physiological, genetic, mental, economic, cultural or social identity of that natural person;"

➔ According to this definition, we can understand easily that InBetween is handling personal data such as name, address, client energy consumption data, occupancy, daily home usage patterns, of participants.

Art 9 of GDPR, "*Processing of special categories of personal data*", states that "*1. Processing of personal data revealing racial or ethnic origin, political opinions, religious or philosophical beliefs, or trade union membership, and the processing of genetic data, biometric data for the purpose of uniquely identifying a natural person, data concerning health or data concerning a natural person's sex life or sexual orientation shall be prohibited"*

➔ Besides, it is important to note that InBetween approach is not handling special categories of data, also known as sensitive data.

2.2 GDPR IMPACTS FOR THE INBETWEEN PROJECT

The GDPR regulation is affecting all project partners: from the Demo-site responsible project partners (here, VILOGIA and SONNENPLATZ), who are in strong contact with the project end-users - in this study case, we have social housing tenants for Vilogia, and family house owners and public building users for Sonnenplatz)- to the technical partners in their working procedures and system security.

As given by the GDPR regulation, bigger project partners have a DPO (Data Protection Officer) appointed in their company in order to guide them and to check with them that GDPR rules were applied.

The flow-chart below shows the basic prescriptions from the GDPR to ensure data protection in projects like InBetween. It can be summarized as follows:

1. Be transparent about the flow of Data
2. Minimize the amount of Data
3. Restrict the storage time of Data

[3] https://www.nibusinessinfo.co.uk/content/data-protection-principles-under-gdpr

4. Ensure the security of stored Data
5. Ensure that all related parties know about the sensitivity of personal data in order to take the appropriate measures.

This is also explained in the Figure below.

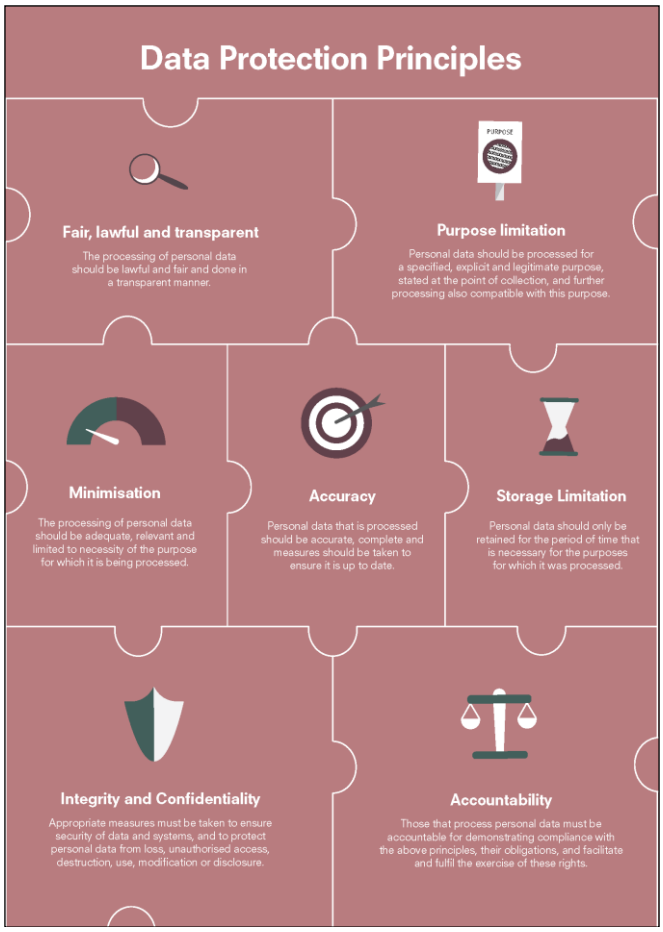
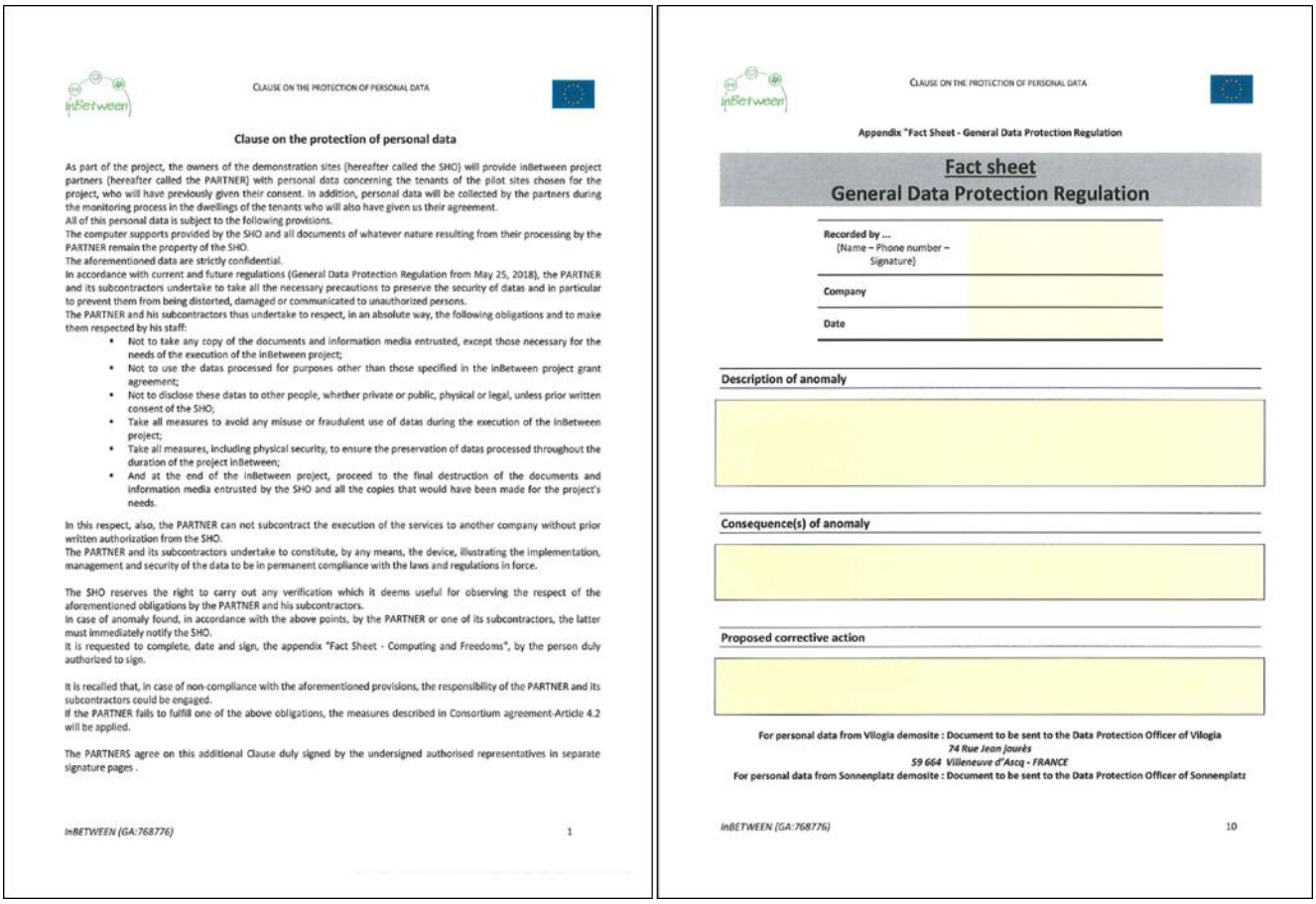


Figure 1 - Data Protection Principles[4]

GDPR compliance has been a major point of discussion during the design of the InBetween processes: at the time of the implementation of GDPR throughout Europe, the project partners established and signed a special Annex to the Grant Agreement, with the clear aim of protecting the data collected and processed during the project (see Figure 2).

In addition, a process how to report a potential breach of the data protection rules has been set up (see Figure 2). This fact sheet reports the description of anomaly, its consequences and the proposed corrective action.

[4] https://privacyinternational.org/type-resource/data-protection-guide



CLAUSE ON THE PROTECTION OF PERSONAL DATA

Clause on the protection of personal data

As part of the project, the owners of the demonstration sites (hereafter called the SHO) will provide inBetween project partners (hereafter called the PARTNER) with personal data concerning the tenants of the pilot sites chosen for the project, who will have previously given their consent. In addition, personal data will be collected by the partners during the monitoring process in the dwellings of the tenants who will also have given us their agreement.
All of this personal data is subject to the following provisions.
The computer supports provided by the SHO and all documents of whatever nature resulting from their processing by the PARTNER remain the property of the SHO.
The aforementioned data are strictly confidential.
In accordance with current and future regulations (General Data Protection Regulation from May 25, 2018), the PARTNER and its subcontractors undertake to take all the necessary precautions to preserve the security of datas and in particular to prevent them from being distorted, damaged or communicated to unauthorized persons.
The PARTNER and his subcontractors thus undertake to respect, in an absolute way, the following obligations and to make them respected by his staff:

- Not to take any copy of the documents and information media entrusted, except those necessary for the needs of the execution of the inBetween project;
- Not to use the datas processed for purposes other than those specified in the inBetween project grant agreement;
- Not to disclose these datas to other people, whether private or public, physical or legal, unless prior written consent of the SHO;
- Take all measures to avoid any misuse or fraudulent use of datas during the execution of the inBetween project;
- Take all measures, including physical security, to ensure the preservation of datas processed throughout the duration of the project inBetween;
- And at the end of the inBetween project, proceed to the final destruction of the documents and information media entrusted by the SHO and all the copies that would have been made for the project's needs.

In this respect, also, the PARTNER can not subcontract the execution of the services to another company without prior written authorization from the SHO.
The PARTNER and its subcontractors undertake to constitute, by any means, the device, illustrating the implementation, management and security of the data to be in permanent compliance with the laws and regulations in force.

The SHO reserves the right to carry out any verification which it deems useful for observing the respect of the aforementioned obligations by the PARTNER and his subcontractors.
In case of anomaly found, in accordance with the above points, by the PARTNER or one of its subcontractors, the latter must immediately notify the SHO.
It is requested to complete, date and sign, the appendix "Fact Sheet - Computing and Freedoms", by the person duly authorized to sign.

It is recalled that, in case of non-compliance with the aforementioned provisions, the responsibility of the PARTNER and its subcontractors could be engaged.
If the PARTNER fails to fulfill one of the above obligations, the measures described in Consortium agreement-Article 4.2 will be applied.

The PARTNERS agree on this additional Clause duly signed by the undersigned authorised representatives in separate signature pages .

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CLAUSE ON THE PROTECTION OF PERSONAL DATA

Appendix "Fact Sheet - General Data Protection Regulation

Fact sheet
General Data Protection Regulation

Recorded by ...
(Name – Phone number – Signature)

Company

Date

Description of anomaly

Consequence(s) of anomaly

Proposed corrective action

For personal data from Vilogia demosite : Document to be sent to the Data Protection Officer of Vilogia
74 Rue Jean Jaurès
59 664 Villeneuve d'Ascq - FRANCE
For personal data from Sonnenplatz demosite : Document to be sent to the Data Protection Officer of Sonnenplatz

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Figure 2 - InBetween clause on the protection of personal data

During the design stage of the InBetween project, information and understanding regarding GDPR has been established and the process of data collection and handling designed in accordance with its definition. In accordance with GDPR, all the partners have agreed to take all the necessary precautions to preserve the security of data and to prevent them from being distorted, damaged or communicated to unauthorized persons. Below, the list of essential questions and measures in order to verify the correct handling, storing and deletion of data in accordance with the new European guidelines (Standard ISO/IEC 27001:2013) is reported.

Table 1 - List of GDPR security measures

MEASURE CATEGORY	MEASURE IDENTIFIER	MEASURE DESCRIPTION	RELEVANT ISO/IEC 27001:2013 CONTROL
Server/Database security	M.1	Database and applications servers should be configured to run using a separate account, with minimum OS privileges to function correctly.	A. 12 Operations security
Server/Database security	M.2	Database and applications servers should only process the personal data that are actually needed to process in order to achieve the purposes.	A. 12 Operations security
Workstation security	N.1	Users should not be able to deactivate or bypass security settings.	A. 14.1 Security requirements of information systems

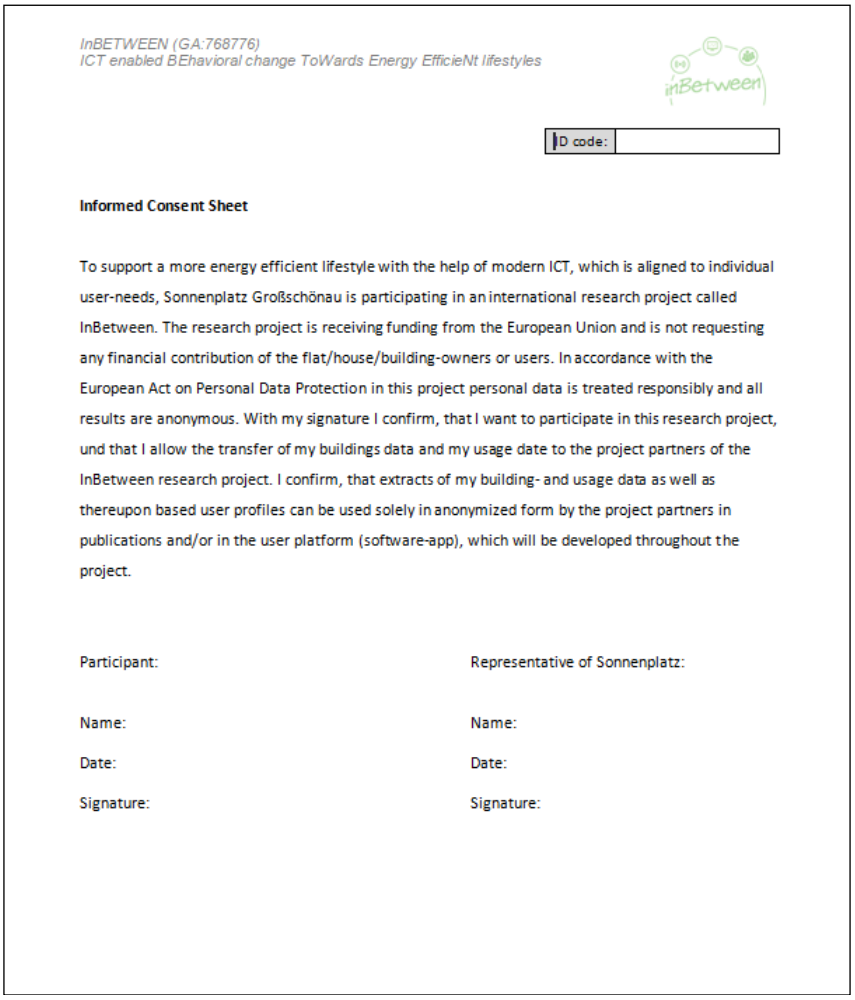
Workstation security	N.2	Anti-virus applications and detection signatures should be configured on a weekly basis.	A. 14.1 Security requirements of information systems
Workstation security	N.3	Users should not have privileges to install or deactivate unauthorized software applications.	A. 14.1 Security requirements of information systems
Workstation security	N.4	The system should have session timeouts when the user has not been active for a certain time period.	A. 14.1 Security requirements of information systems
Workstation security	N.5	Critical security updates released by the operating system developer should be installed regularly.	A. 14.1 Security requirements of information systems
Network/Communication security	O.1	Whenever access is performed through the Internet, communication should be encrypted through cryptographic protocols (TLS/SSL).	A.13 Communications Security
Back-ups	P.1	Backup and data restore procedures should be defined, documented and clearly linked to roles and responsibilities.	A.12.3 Back-Up
Back-ups	P.2	Backups should be given an appropriate level of physical and environmental protection consistent with the standards applied on the originating data.	A.12.3 Back-Up
Back-ups	P.3	Execution of backups should be monitored to ensure completeness.	A.12.3 Back-Up
Back-ups	P.4	Full backups should be carried out regularly.	A.12.3 Back-Up
Mobile/Portable devices	Q.1	Mobile and portable device management procedures should be defined and documented establishing clear rules for their proper use.	A. 6.2 Mobile devices and teleworking
Mobile/Portable devices	Q.2	Mobile devices that are allowed to access the information system should be pre-registered and pre-authorized.	A. 6.2 Mobile devices and teleworking
Mobile/Portable devices	Q.3	Mobile devices should be subject to the same levels of access control procedures (to the data processing system) as other terminal equipment.	A. 6.2 Mobile devices and teleworking
Application lifecycle security	R.1	During the development lifecycle best practises, state of the art and well acknowledged secure development practices, frameworks or standards should be followed.	A.12.6 Technical vulnerability management & A.14.2 Security in development and support processes
Application lifecycle security	R.2	Specific security requirements should be defined during the early stages of the development lifecycle.	A.12.6 Technical vulnerability management & A.14.2 Security in development and support processes
Application lifecycle security	R.3	Specific technologies and techniques designed for supporting privacy and data protection (also referred to as	A.12.6 Technical vulnerability management & A.14.2 Security

		Privacy Enhancing Technologies (PETs)) should be adopted in analogy to the security requirements.	in development and support processes
Application lifecycle security	R.4	Secure coding standards and practises should be followed.	A.12.6 Technical vulnerability management & A.14.2 Security in development and support processes
Application lifecycle security	R.5	During the development, testing and validation against the implementation of the initial security requirements should be performed.	A.12.6 Technical vulnerability management & A.14.2 Security in development and support processes
Data deletion/disposal	S.1	Software-based overwriting should be performed on all media prior to their disposal. In cases where this is not possible (CD's, DVD's, etc.) physical destruction should be performed.	A. 8.3.2 Disposal of media & A. 11.2.7 Secure disposal or reuse of equipment
Data deletion/disposal	S.2	Shredding of paper and portable media used to store personal data shall be carried out.	A. 8.3.2 Disposal of media & A. 11.2.7 Secure disposal or reuse of equipment
Physical security	T.1	The physical perimeter of the IT system infrastructure should not be accessible by non-authorized personnel.	A.11 – Physical and environmental security

2.2.1 Demosites partners

In the early stages of the project, demo-site owners had to enroll participants among tenants/inhabitants of Vilogia and Sonnenplatz demo sites. However, the participation in such a project involves the access to personal data, such as occupancy of one's home, energy detailed consumptions, daily habits, etc.
Thus, demo-sites responsibles/owners (VILOGIA and SONNENPLATZ) were the first and most exposed partners to GDPR application in the scope of this project, and they first had to understand their obligations that are mainly the following:

- **Make sure that all partners who would have to handle personal data of their demo-sites would do so according to GDPR**. The Consortium Agreement and the Grant Agreement already covered confidentiality rules, but it was not adapted for personal data. Hence, an **addendum to the Consortium Agreement** was written to cover specifically GDPR obligations and signed by all partners.
- **Obtain consents of tenants/inhabitants for participation to the project**. To do so, specific documentation including a project information sheet and a consent form was created. It was then submitted to tenants/inhabitants during face-to-face meetings, offering explanations of the project to make sure that participants were well aware of the ins and outs of their participation, their rights and their possibility to quit the project any time, and agreed for it. Along the project evolution, demo-site owners came back to participants with updated information. Particularly once the equipment to be installed were precisely defined, demo-site owners informed participants about it and asked for an updated consent.



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ICT enabled BEhavioral change ToWards Energy EfficieNt lifestyles

ID code:

Informed Consent Sheet

To support a more energy efficient lifestyle with the help of modern ICT, which is aligned to individual user-needs, Sonnenplatz Großschönau is participating in an international research project called InBetween. The research project is receiving funding from the European Union and is not requesting any financial contribution of the flat/house/building-owners or users. In accordance with the European Act on Personal Data Protection in this project personal data is treated responsibly and all results are anonymous. With my signature I confirm, that I want to participate in this research project, und that I allow the transfer of my buildings data and my usage date to the project partners of the InBetween research project. I confirm, that extracts of my building- and usage data as well as thereupon based user profiles can be used solely in anonymized form by the project partners in publications and/or in the user platform (software-app), which will be developed throughout the project.

Participant:

Name:

Date:

Signature:

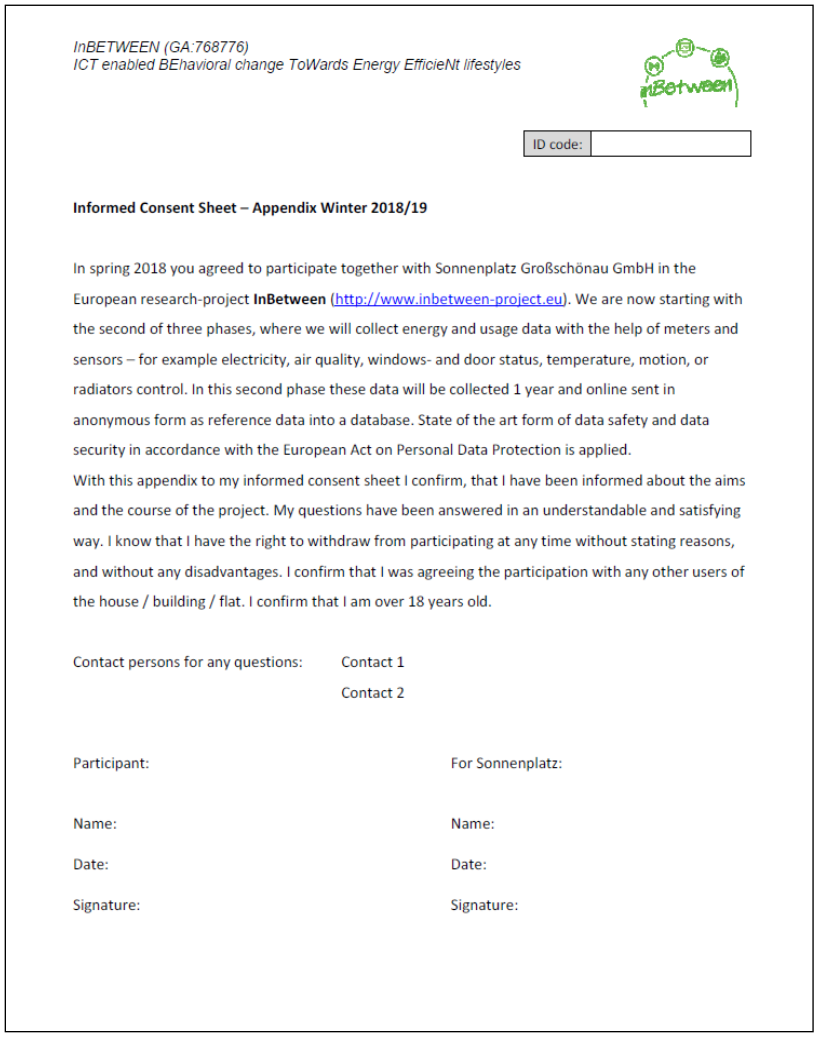
Representative of Sonnenplatz:

Name:

Date:

Signature:

Figure 3 - Example of an Austrian Informed Consent Sheet at the start of the project



InBETWEEN (GA:768776)
ICT enabled BEhavioral change ToWards Energy EfficieNt lifestyles

ID code:

Informed Consent Sheet – Appendix Winter 2018/19

In spring 2018 you agreed to participate together with Sonnenplatz Großschönau GmbH in the European research-project **InBetween** (http://www.inbetween-project.eu). We are now starting with the second of three phases, where we will collect energy and usage data with the help of meters and sensors – for example electricity, air quality, windows- and door status, temperature, motion, or radiators control. In this second phase these data will be collected 1 year and online sent in anonymous form as reference data into a database. State of the art form of data safety and data security in accordance with the European Act on Personal Data Protection is applied.
With this appendix to my informed consent sheet I confirm, that I have been informed about the aims and the course of the project. My questions have been answered in an understandable and satisfying way. I know that I have the right to withdraw from participating at any time without stating reasons, and without any disadvantages. I confirm that I was agreeing the participation with any other users of the house / building / flat. I confirm that I am over 18 years old.

Contact persons for any questions: Contact 1
Contact 2

Participant: For Sonnenplatz:

Name: Name:

Date: Date:

Signature: Signature:

Figure 4 - Example of an Austrian Informed Consent Sheet at stage 2 of the project

- **Communicate personal data on a need-to-know basis**. Indeed, the first personal data gathered were the replies to the initial survey, including participants' address, daily habits, energy invoices, etc. To protect participants, it was decided to pseudonymize data, by creating a code for each dwelling/house participating, instead of revealing the exact address. The code would have to be used as long as it would not hinder the project development.
- **Communicate connection data to participants safely**. To do so, different communication channels were used to provide separately login and password that would be used to access the Smart Energy Manager App.

2.2.2 Technical partners

In this project, as all operational data handled were pseudonymized, technical partners could proceed with their standard working procedures.

However, in the perspective of the deployment of the InBetween solution, technical mechanisms were established to provide secure collection, manipulation and storage of data. This entails use of secure communication protocols (https) for any external data exchanger as well as dedicated firewalls for the servers hosting InBetween services for data manipulation and servers for storing data.

Moreover, a flexible architecture was followed, and the necessary organizational steps were taken to ensure that all data related to an individual InBetween platform end user can be easily identified, isolated and deleted, if requested.

Certainly, it was also ensured that:

- Users can only access the data if they have a user name and password.
- Users can only access the data from the specific devices to which they are granted access according to the configuration of their user account, which corresponds to the devices installed in their own dwelling/house.

2.3 ACTIONS OF INBETWEEN TO ENSURE COHERENCE OF DATA HANDLING UNDER GDPR

As already described in section 2.2, different data collected was treated and made public in different ways, in line with the sensitivity of the data and on a need-to-know basis. Below the list of collected data throughout the project is reported, sorted by means of collection, and analyzed regarding the classification of data, accessibility of data, and processing rules.

Table 2 - List of Data collected by employees of demo-site owners in their function as link to end users

Description of data	*Classification*	*Accessible by*	*Way of processing data*
Name, Address	Personal Data	Demosite owner only	Not communicated
Household composition and age	Personal Data	Direct by Demosite owner, pseudonymized by all project partners and EC	Pseudonymization then used for project deliverables and implemented into the ontology
Typology and drawings of house	Personal Data	Direct by Demosite owner, pseudonymized by all project partners and EC	Pseudonymization then used for project deliverables and implemented into the ontology
All kinds of answers to the surveys and questionnaires throughout the project	Partially Personal Data	Direct by Demosite owner, pseudonymized by all project partners and EC	Pseudonymization then used for project deliverables and if needed implemented into the ontology

Table 3 - List of Data collected by Sensors

Description of data	*Classification*	*Accessible by*	*Way of processing data*
Real time occupancy	Operational Data	Direct by technical project partners, through the interface (App/Web) by the tenants/users	Operational Data is not linked to Personal Data, as it is pseudonymized and therefore linked to generated codes, and automatically treated by the system. Data is stored in Europe Access protected by a password and state-of-the-art IT-security measures
Real time consumptions	Operational Data		
Real-time temperatures	Operational Data		
Other real-time sensor values	Operational Data		

Table 4 - List of Data collected through the interface (Web/App)

Description of data	*Classification*	*Accessible by*	*Way of processing data*
Log-in Information: User-ID, Password	Log-in Data	Technical partners	Log-in Data is generated randomly according to state-of-the-art security recommendations. It is stored in a special database and treated by special service of the platform. It is not linked to Personal Data, as it is pseudonymized and therefore linked to generated codes, and automatically treated by the system. Data is stored in Europe Access protected by a password and state-of-the-art IT-security measures
Device Names, Device Description	Operational Data	Direct by technical project partners, through the interface (App/Web) by the tenants/users	Operational Data is not linked to Personal Data, as it is pseudonymized and therefore linked to generated codes, and automatically treated by the system. Data is stored in Europe Access protected by a password and state-of-the-art IT-security measures
Device Scheduling Information	Operational Data		
Actuation impulses	Operational Data		

2.4 GDPR IMPACT ON THE SEM COMMERCIAL EDITION

With SEM becoming a commercial system (i.e. present on the market), demo-site owners' / responsibles roles will probably disappear. In the InBetween project, in fact, the demo-site owners (Vilogia and Sonnenplatz) are responsible for the households equipped. The identified potential buyers of the InBetween solution, such as ESCOs, Smart Home Management Companies or Technology Providers (*see D6.2 – Flexible InBetween Business Models and Plan)* may not be responsible for the households they will buy the solution for. The responsibilities will be allocated to different entities. Depending on the set-up of the system, its roles and security measures might be nevertheless set up in two stages, as given now in the InBetween project. Therefore, technical managers of the platform could envisage:

- ➔ a B2B solution, in which one company is maintaining the platform and offering the services, while other companies are using the services, relaying the information to their customers or use it for internal purposes. In this case, the technical managers of the platform may not have to handle personal data if the business partner of the second stage is pseudonymizing data. In any case the business partner of the second stage has to handle personal data. In this configuration, 3 layers of stakeholders can be distinguished:
  - 1st layer: Service providers, developers and maintainers.
  - 2nd layer: Service managers. At this stage, the collected data will be pseudonymized and communicated to the "1st layer" without any indication on the end-users' identity.
  - 3rd layer: Customers, which are the end-users.

➔ a B2C solution, in which the separation of data would be managed internally, and handling of personal data happens at the same place as operational data processing. In this configuration, 2 layers of stakeholders can be distinguished:

- 1st layer: service providers, developers, maintainers and managers. In this case, the responsibilities will be shared and different entities will manage the collected data separately.
- 2nd layer: customers, which are the end users.

In both cases of course all rules and requirements of GDPR are valid and must be respected in full. The clear recommendation of all project partners is paying special attention to this part of data security, as the project is linked to very private parts of everyday life, and a potential data-breach would have a drastic impact on any provider of this service.

3 ENERGY RELATED LEGISLATION FRAMEWORK

In addition to the data protection legislation, the activities in the InBetween project shall consider the energy legislation as well, that may impose constraints or provide incentives for the provision of the service.

The services developed and integrated to the platform are oriented to calculate electricity savings from heating/cooling systems and main electrical household devices (e.g. Consumption Data Analytics, Integrated Energy Demand Optimization, etc.). Therefore, the sensors and actuators installed at the Demo-sites monitor electricity consumption. For these reasons, the analysis in this chapter will focus on the electricity market regulation.

As mentioned in November 2016 Briefing of European Parliament "Understanding electricity markets in the EU", EU energy legislation is based on a 'target design model', where the ultimate goal is the achievement of **an increasingly interconnected European electricity market with convergent prices across the EU**.

A liberalized internal energy market for gas and electricity has been established through three legislative packages adopted in the 1990s, in 2003 and in 2009:

- ➔ Directive 96/92/EC on the common rules for the internal electricity market,
- ➔ Directive 2003/54/EC which enabled new electricity suppliers to enter Member States' markets and allowed consumers to choose their electricity supplier, and
- ➔ Directive 2009/72/EC which further liberalized the market.

However, the EU internal energy market has still some difference among the State Members, with different levels of flexibility. This is not only due to the different regional resources, but also to the different historical energy production focus of the different countries. An example of a market overview is reported in Figure 5 below, with the aim to show major energy production sources and energy flows.

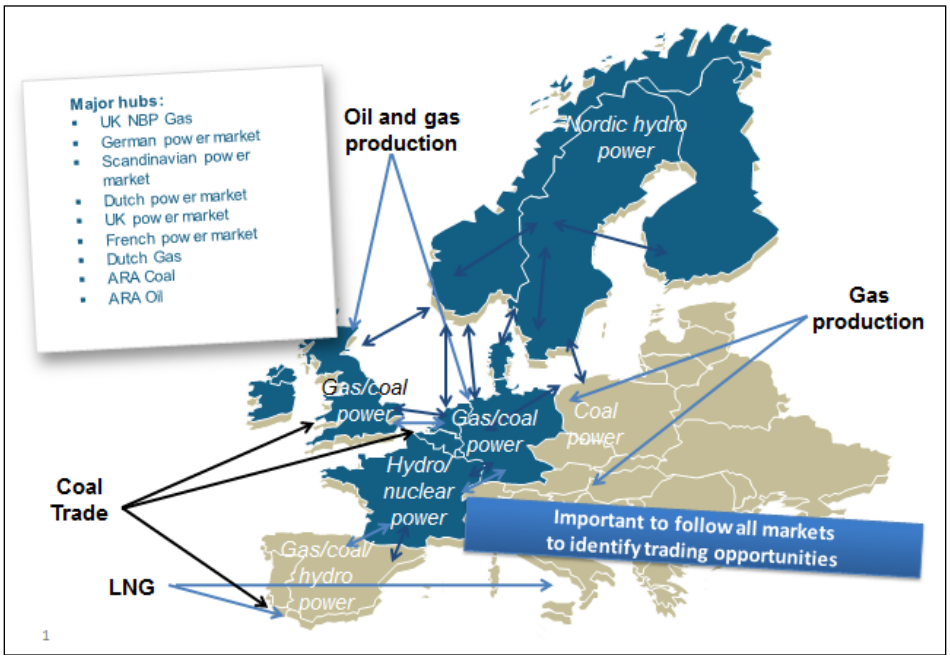


Figure 5 - Electricity Market Europe – production differences[5]

[5] http://www.ecman.com/EUEnergyMarkets.aspx

The deployment of electricity smart meters is an objective fixed in the Annex I to the Electricity Directive 2009/72/EC.[6] It requires the EU Member States to equip 80% of consumers with smart meters by 2020, and a target of 95% by 2022. The aim of smart meters is to develop demand-response solutions[7]. The current status of the installation is not completed yet. However, the process is ongoing and most of the territories will be equipped with smart meters in the coming years. Such evolution will help projects like InBetween to spread, provided that the communication with the smart meters is possible for external parties. Additional information related to this concept are reported in the following chapter "market adoption drivers".

When developing a tool which could be used in many countries, the real local market price implies today a very different customization schemes. Types of tariffs, different taxation, regional habits, local energy production, and lots of regional providers are the main differences to be considered. This creates many interrogations regarding the unit to be used when trying to calculate real money savings as an incentive for the customer. In the years to come, this might become easier. The unification of the Western electric grid is ongoing, and one of the aspect of this transition is the electricity price calculation. By developing an European "supergrid", the price differences between the countries will be based on the difference of their production mix.[8] This will help in the calculation of the energy savings, and could have a greater impact on the potential for energy savings.

Not only taxes on electricity vary from one country to the other, but different state aids exists in each country. [9] This can take the form of a percentage discount on the bill or a lump sum attributed to each family or person. According to the type and amount of the discount, it can decrease the appeal and attractiveness for energy savings.

Summing up, no real legal barrier was encountered for what concerns the energy services, but the various characteristics of the current energy markets within Europe make a pan-European solution rather complex to initiate and maintain.

[6] https://www.emissions-euets.com/internal-electricity-market-glossary/1439-smart-metering

[7] https://www.smart-energy.com/industry-sectors/energy-grid-management/smart-meters-and-demand-response-the-potential-impacts-for-utilities-and-consumers/

[8] https://www.magnuscmd.com/the-unification-process-of-the-electricity-markets-in-europe/

[9] to help vulnerable consumers paying their bills, as access to electricity is recognized as a need for vulnerable households to have heating in winter.

4 DRIVERS AND BARRIERS FOR MARKET ADOPTION

This chapter focuses on the factors influencing the possible roll-out of InBetween ICT Platform Solution handling Energy Related Data throughout Europe, keeping in mind the identified potential customer segments identified in *Task 6.1 – Flexible InBetween supporting Business Models* and described within the deliverable D6.1 Market Analysis and D6.2 Flexible business models and business plan for InBetween Platform – first release.

4.1 POTENTIAL CUSTOMER SEGMENTS

In particular, as reported in deliverable D.6.2, customers potentially interested in purchasing smart application and smart devices can be:

- **Residential users.** Individual customers are responsible for managing energy consumption using electronic equipment installed in homes or based on consumption recommendations provided by power retailers or companies entering the energy sector. They are the ones who use and pay for the energy provided. The InBetween platform enables users to manage their energy in an efficient way via a mobile (and also web-based) platform.
- **Construction and Smart home automation companies.** These organizations show great interest in measures and applications finalized to obtain consistent energy management optimization combined with costs reduction. In particular, construction companies/property developers are looking for cost-effective services for energy efficiency to be installed directly in new buildings. The InBetween platform is able to meet needs of construction and smart home automation companies in a way that shows, supports and controls smart devices and energy consumption.
- **Energy Service Companies.** Many ESCOs provide energy services to residential sector. They are mainly interested in methodologies and solutions to manage better the energy consumption associated contracts. They offer their customers the opportunity to reduce and optimize their energy consumption by installing systems and equipment, and by proactively managing energy consumption.
- **Social housing association/Municipalities.** Social housing associations and municipalities own large amount of social housing and buildings of different size and purpose and, as public entities, they are particularly keen to minimize the normally scarce resources they have to allocate and make economic savings in return. As policy makers, they are entitled to create and use different regulations and standards for use within their jurisdiction that will improve energy efficiency.
- **Technology providers.** They could benefit from the InBetween platform, since it allows the effective integration of their products with other vendors.

Concentrating on potential buyers of the solution except residential users (subject covered in WP3 deliverables), the following market adoption drivers and barriers were identified.

4.2 MARKET ADOPTION DRIVERS

4.2.1 Unified legal framework regarding handling of personal data

As described above, the handling of personal data within European Union is now unified, thanks to the GDPR. This context allows a better cooperation between European companies, since their way of processing data is the same. The GDPR rules don't prohibit any commercial activities dealing with personal data but asks companies to organize the way of processing sensitive data with respect for the rights of any citizen and its own privacy.
Each company should by example appoint a DPO that will frame the development of the activities linked to the installation and exploitation of the InBetween solution. Since GDPR forces companies to include the privacy layer in their activities, the trust of end-users in structure and organizations that will commercialize the InBetween solution will therefore increase over time.

4.2.2 Choose your USP: comfort vs savings vs security

InBetween is offering a variety of services, which are not limited to energy savings. Therefore, InBetween providers can choose the USP they want to advertise and promoted: a focus on energy efficiency and technology to attract technology-loving people, a focus on comfort to tempt people striving for better or smarter living conditions, and/or a focus on security

to get a market share in the rising market of security services. All three groups of services are in line with big needs and trends in our society: Security, Comfort and Wealth (by energy and money savings). Offering multi-thematic solution will enlarge the potentiality to reach wider target groups.

4.2.3 Smart Meters becoming compulsory in European Member states

Based on the European regulation 2009/72 EG by 2020 in total 80% of all households must be equipped with smart meters. This regulation led to related country-by-country regulation, ensuring that the overall goal will be met with all types of energy meters (mainly electricity and gas). Germany was passing the related "Gesetz zur Digitalisierung der Energiewende" (Law for Digitalisation and Energy Transition) in 2016. In Austria the related laws are „Elektrizitätswirtschafts- und –organisationsgesetz"and „Gaswirtschaftsgesetz" (Law for electricity business and organisation), which require 80% by 2020 and 95% by 2022.
Smart meters allow a better communication of consumption data, which will be more exploitable by the platform.[10] The smart meters are equipped with radio transmitters, and associated with a sensor, it is possible to obtain instantaneous consumption data.
As an example, the Linky smart meter deployed overall France is equipped with a radio transmitter that can be used to:

- adapt energy demand according to the offer,
- adapt the tariff at the right moment,
- control the demand when high-consumption devices are detected,
- show the user's consumption via a tablet.[11]

4.2.4 Increasing awareness of energy saving measures

A deep interest into the subjects related to environment, and more precisely to energy wastes and the ways to avoid them, has gained within the European population last years. 93% of the EU citizens consider the climate change as a serious problem.[12]
The energy Efficiency Directive (2012/27/EU) established measures to help the EU to reach its 20% energy efficiency target by 2020. It was amended in 2018 (2018/2002) to update its content to 2030 and beyond, and forces EU countries to save energy by 0.8% each year from 2021 to 2030. [13]
More global topics related to energy and climate change are often at the top of the news. During 2019, Greta Thunberg became a spokesperson with her speech at the European Parliament in Strasbourg. She has a large audience over Europe and participates in the awareness of the citizens about their ability to change their behaviour.

4.2.5 Load shifting with the increasing demand

The worldwide electricity consumption is supposed to increase by 50% until 2050 compared to 2010.[14] This increasing demand will affect the public distribution network highly, and ESCOs are willing to find solutions that could help to shift the loads at the most favorable moment. The InBetween services developed within the project offer these possibilities, especially the *"Integrated Energy Demand Optimization"* service.

The trend of electric vehicles will also boost the development of Smart Energy Management Systems as InBetween. The main issue with electric vehicles is that they could cause peak loads when charging at the same time. A coordination of the load shifting could help to overlap this issue, thanks to advanced energy services provided by platforms as InBetween.

[10] https://build.com.au/smart-meters-and-home-automation

[11] https://smartintegrationsmag.com/objets-et-modules-domotiques-pourront-se-connecter-au-compteur-linky/

[12] https://ec.europa.eu/clima/citizens/support_en

[13] https://ec.europa.eu/energy/en/topics/energy-efficiency/targets-directive-and-rules/energy-efficiency-directive

[14] https://www.eia.gov/todayinenergy/detail.php?id=41433

4.2.6 The need to increase the attractiveness of buildings

Smart Home Management Systems are interesting features in buildings. They can help property managers to sell or rent apartments and houses to new customers, since the future occupants will benefit from an entirely-equipped household. The new occupants will have the ability to monitor their consumption from the moment they enter in the new dwelling. They will live into a brand-new environment which already integrates upgraded solutions that will heighten their comfort. This can be a plus when considering buying or renting a house.

4.2.7 New perspectives to engage users with energy

The development of smart home management systems has risen the last years.[15] More and more initiatives are willing to offer these solutions with new features differentiating them from already existing solutions.

For example, the building engineering office Elithis conceived an Energy-Plus High-Rise in Strasbourg, France, named *"Danube Tower"* mixing offices and housing solutions. The tower is equipped with photovoltaic solutions on its façade (BIPV – Building Integrated Photovoltaics) and on its roof, for a total PV area representing 1233 m² and 219.1 kWp.
The dwellings are equipped with a digital energy coach named "ALAD'HUN" (Adaptive Learning Assistant Device for Home Usage Neutral) developed by the start-up Vesta System, which advises and alerts the inhabitants regarding their energy consumption via a tablet disposed in the house. The promise made by Elithis is a "zero-euro bill" and they coupled the digital coach with a rewarding package to engage tenants into proper energy behavior. This package will convert the energy savings of the tenants into a local currency, called "Stücks", which will stimulate the circular economy of the region.[16]

To the building scale, the need to align the consumption peak with the production time can be solved thanks to Smart Energy Management Systems. The increasing demand for integrating the renewables can be analyzed as a driver for the adoption of InBetween solution.

4.2.8 Adaptability of the user interface

The Android interface and Web interface designed in the project are in fact independent of the platform and can be adapted according to the end-user's preferences. It offers many possibilities for new buyers to develop their own interface and gives room for several companies selling the same services in different variations and under different brands.

4.3 MARKET ADOPTION BARRIERS

4.3.1 Different pricing scheme and Taxation on Electricity in different EU member countries

Even though the energy market has been opened to competitiveness inside EU market (see chapter 3), the pricing rules still depend on national rules and on which ESCO is chosen by the end user. Prices can be on a fixed rate basis or can be ToU (Time-of-Use) tariff, in which the price of the kWh consumed depends on the moment of the day. We can distinguish different types of ToU tariffs[17]:

- Static ToU: divided into time blocks (the most common is day and night tariff), the tariff is determined in advance and remains constant. You can also add a seasonality parameter, which offers a different tariff according to the winter/summer period.
- Real-time pricing: the tariff is adapted to the real-time consumption during the day. This pricing is dynamic and is calculated on a basis going from a high granularity (15 minutes) to a low granularity (1 hour). On his electricity contract, the consumer agrees on a wholesale price, plus a margin.

[15] https://www.fortunebusinessinsights.com/industry-reports/home-automation-market-100074

[16] http://www.elithis.fr/wp-content/uploads/2017/09/Dossier-de-presse-Tour-Elithis-Danube-Septembre2017VF.pdf

[17] https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2019/Feb/IRENA_Innovation_ToU_tariffs_2019.pdf?la=en&hash=36658ADA8AA98677888DB2C184D1EE6A048C7470

- Variable peak pricing: this tariff mixes static and dynamic pricing, where the different block times of pricing are defined in advance, but the pricing for the on-peak time depends on the market conditions.
- Critical peak pricing: in a few days during the year, the rate of electricity prices increases.

This pricing distribution is contracted between the consumer and the electricity supplier, and may be fixed according to national grid rules. Regarding the possibility to shift the loads of energy demand, the market lacks of harmony to have an impact.

The taxes applied to the electricity prices also depend on national laws, and their rate on the bill isn't at the same level from one country to another.

4.3.2 Maintenance

Manual work is needed, with technicians having to adapt to different countries, ESCOs, economic evolutions. The maintenance of the system might cause some difficulties, since the technicians will have to deal with different countries. Each country should have its own maintenance unit to answer the requests of the buyers. The electrical standards are also different in each country. Furthermore, many price comparison platforms exist throughout whole Europe, and the need of updating the tariffs will ask backup work for platform maintainers. They show the possibility of coping with this topic, and digitalization will further greatly reduce the efforts of manual maintenance for large-scale roll-outs.

4.3.3 Limited room for money savings

Every electricity bill is composed of consumption tariff and taxes. Solutions such as InBetween are used to have an impact on the consumption of the end users but can only impact the taxes indirectly. Some taxes are calculated according to the consumption, whereas some taxes are completely independent of the consumption. Our end users may reduce their total consumption, but the difference of economic savings might not reflect their efforts. On the other hand, as described in WP3 deliverables, not only money is a motivational factor for the InBetween service, and for larger companies the sum of savings will add up to large amounts of money.

Also, the investment costs when buying a Smart Energy Management System must be correlated with the energy savings possibly made by the end users. As the ones that will benefit from the money savings might not be the buyers of the solution (as an example, if ESCOs decided to equip their customers with this system), it can impact on the buying decision.

4.3.4 Languages

The entity that will commercialize the InBetween system will have to deal with many different countries inside the EU.
The buyers can adapt the content to their customers, but when it comes to technical issues; it will demand the maintenance unit to be trained to solve the issues in the local language. This language barrier could hinder the efficiency of the system. As this barrier is given to all kinds of companies, big efforts are going into developing automatic instant translation tools without the need of human assistance.

4.3.5 Data Transfer outside of European Member States

While the GDPR is largely expected to facilitate cross-national data transfer within the EU, it is unlikely to have a direct significant impact on data transfer outside the EU or between inside-ERA and outside-ERA research institutions. The issue of data transfer outside the EU remains open. For data transfer between EU and US research institutions, the Court of Justice of the European Union (CJEU) overruling the EU-US Safe Harbour regulation generates additional uncertainty.[18]

4.3.6 Connectivity issues of Devices

During the installation of the devices InBetween was impacted by the various standards of different hardware producers, making it complicated and difficult to integrate existing hardware into new developed systems. Despite of the fact, that the used Gateway from Develco is able to communicate with various wireless data transfer protocols (Zigbee, Bluetooth, WLAN,

[18] See EPRS - European Parliamentary Research Service, Scientific Foresight Unit (STOA), PE 634.447, July 2019 "How the General Data Protection Regulation changes the rules for scientific research"

etc.), still a piece of software had to be developed for each and every new device, which InBetween partners needed to connect to the platform. This may not be a legal barrier, but definitely acts as an obstacle for a large-scale rollout of the service, as either existing hardware needs to be ignored, or needs to be individually integrated into the platform.
On the other hand, by the end of 2019 major players in the smart home market announced to establish a common standard which would effectively tackle the above described issue: Apple, Google, Amazon and the Zigbee Alliance (Samsung, Philips, Ikea, Somfy, and others) take part in the Project "Connected Home over IP"[19]. This project aims to simplify development for manufacturers and increase compatibility for consumers. It shall end in a royalty free, open-source approach which shall become widely accepted so that different appliances can interact and develop the expected synergies.[20]

4.3.7 Low valorization and understanding of energy

Potential buyers have to find their end users. Energy is a sensitive topic which demands a lot of understanding: as it is not something material, it is difficult to make understand that the control of the consumption also depends on the consumer. When it comes to make energy savings, it is also necessary to understand how is organized the electricity market, and how oneself can adapt its contract to its habit, for ToU tariffs by example. Also, many devices are primarily needed in the everyday life, and some high-energy devices like fridges can't be turned on/off.
Most of the time, people equip their home with smart home management systems for security and comfort reasons. Energy is a secondary subject for them, since it will ask them to change some of their habits. Changing energy habits is often perceived as a loss of comfort and is a great barrier for the development of energy-oriented Smart Home Management Systems.

[19] https://www.theverge.com/2019/12/18/21027890/apple-google-amazon-smart-home-standard-zigbee-connected-ip-project

[20] https://www.connectedhomeip.com/

5 CONCLUSIONS

With the implementation of GDPR in 2018, data protection within Europe was harmonized. This had an impact on the InBetween project as a research project as well as an Energy-Services-Provider-Platform. The effects of the GDPR on the InBetween project and the undertaken actions to align the project to comply with these rules are shown in Chapter 2. The personal data treatment respects the transparency and confidentiality as well as purpose and storage limitation (energy data). The data collected for the project are all related to energy and have been pseudonymized (see Tables 2, 3 and 4).

Big efforts have been made to conform the energy market in Europe, with the aim of offering competitive pricing and innovative services for users. Despite this, the energy market in Europe still quite diverse and complex, due to different taxation in different countries, different end-user consumption & production habits, and to different services offered from local providers (see chapter 3 for more details).

This current barrier for pan-European providing of Energy Services will however be likely to get smaller over time, thanks to digitalisation, harmonization and automation as main drivers. An overview of identified barriers and drivers for a market adoption of energy platform service providers can be found in chapter 4. The strength of the InBetween solution relies on its adaptability and its inscription into the smart grid context at the household scale (demand-response meters, shift loading). However, the maintenance and language barriers will have to be addressed in order to reach a wider market. and the harmonization of the electricity market could allow a greater impact on the spending power of the end users.