



## Self Assessment Towards Optimization of Building Energy

Deliverable 1.7

### **Business Case, Business Model and Financing**

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## EXECUTIVE SUMMARY / ABSTRACT / SCOPE

D1.7 aims at the definition and validation of the business cases, by extending and thoroughly describing the customer segments and use cases.

It is also analysing the market environment for SATO future exploitation. The Building Energy Management Systems (BEMS) market in 2020 was estimated in €3.1 billion and is projected to reach €7.1 billion by 2027, growing at a Compound Annual Growth Rate (CAGR) of 12.4% (from 2020 to 2027).

SATO's main customer segments include Building owners and occupants, as energy consumers, Buildings/ facilities managers, Grid operators and energy retailers, Energy equipment and appliances manufacturers, third party companies developing building energy assessment services, Energy consulting companies.

The added value of SATO platform and its systems are Energy Monitoring/ Efficiency/Flexibility, Self-assessment & Indoor Comfort Cloud platform for residential, Commercial and Industrial (C&I) buildings, Knowledge on users & building energy behaviour, reduced energy bills, customized demand-response contracts, Energy & electricity community together, Customer friendly control & pay system, Ease of use: Plug & Play, No initial installation costs for clients.

Drawing upon the forces of change in the market, this deliverable seeks to explore the ways in which SATO will be represented as viable solution across a diverse set of actors. Seven customer segments have been identified, for which, a designated business model has been crafted containing all the elements necessary, that would help SATO create and capture value. Specifically, the business models refer to building owners and occupants, who are looking for more control over their energy systems; Facility/building managers of commercial and industrial buildings who seek to optimise their coordination; grid operators and energy retailers who want to improve their operations; equipment and appliances manufacturers who are willing to improve the performance of their products; equipment and appliances retailers who seek to improve the product experience for their customers and target new ones; third party companies developing buildings that need to boost their operations and construction and energy consulting companies which need more accurate assessments of their buildings and provide accurate estimations for their clients.

To determine how SATO can be represented as a solution for the aforementioned segments, partners, activities, resources, channels, customer relationships, cost structure and revenue streams have been identified concerning the integration of SATO in each one's processes.

## 1. Deliverable description

This deliverable is divided in three sections.

The first one aims to give an overview of the Building Energy Management Systems market where SATO developments are placed by providing key figures regarding the market value and growth potential as well as the current trends and the policies/legislations that favour the adoption of BEMS.

The second part describes the customer segments of SATO and provides their specific characteristics such as each customer segments needs and pains, how SATO could alleviate them as well as the barriers identified that may hinder SATO's adoption. This analysis provides useful insights that could be used to create tailored messages when the times comes to reach them.

Finally, the third part describes the business cases for SATO by thoroughly the way the customer segments will use SATO and the business model that applies in each case to create revenues.

## 2. What is SATO

The building sector in Europe is a major energy consumer responsible for almost 40% of the total energy consumption, with almost 27% of the total energy consumption spent by residential buildings, while a 14% is consumed by the tertiary sector [1]. These figures put the sector in the epicentre of EU efforts for energy reduction measures. One of the efforts towards this direction is concentrated to minimize the gap between the predicted and the actual energy consumption in buildings, due to deviant predictions on the occupancy behaviour and the adopted energy management principles. This will be achieved by continuously assessing real-life energy performance from all energy systems and building equipment allowing to optimize the energy performance of both the building and the equipment used.

SATO EU project aims to address this challenge by implementing a cloud-based platform that can perform real-life self-assessment and optimization of buildings' energy resources. It addresses the building envelope and building equipment in the residential and tertiary sectors and can provide solutions that, independently of the building type, can provide Internet-of-Things (IoT) capabilities to new and legacy energy devices that are integrated into the SATO platform which will increase the smartness of buildings, allowing them to provide energy services, energy efficiency, indoor comfort and energy flexibility.

SATO will offer a modular architecture with a multi-layer structure that enables end-to-end interaction between users, smart software services, building automation equipment and building energy-consuming equipment and appliances. Through web-based and mobile applications, the SATO platform will enable users to visualize energy assessments in 3D BIM-based interfaces and use SATO energy management services to optimize the building energy resources in real-time.

To achieve these goals, technologies such as the IoT, cloud computing, and AI will be used. By bringing together the emerging ICT capabilities, SATO bridges the gap between a low digitalised building sector and a fully connected and enabled smart building environment, enabling automation and improved communication towards the fourth industrial revolution era.

### 2.1. The SATO Services

The SATO services are modular, self-contained, software functional units that continuously perform tasks which provide value to diverse receivers and actors. The main SATO services that will be implemented include:

- a) **Smart self-assessment.** This service will perform an all building and energy consuming equipment assessment. These assessments trigger possible self-optimization actions.
- b) **Smart self-optimization.** Using the results from the assessments this service optimizes the operation of building energy consuming devices and equipment in whole buildings.



- c) **User comfort.** This service balances the conflict between load reduction and user comfort considering user preferences, weather forecasts and user/building knowledge (provided by the SATO platform), to effectively control smart and automated legacy appliances and equipment that have a significant impact on energy resources and user comfort.
- d) **System flexibility.** This service maximizes available system flexibility to the grid while respecting all energy and comfort constraints, as specified by the user or learned from its past actions/preferences. The service will control equipment and appliances to make use of different storage capacities (thermal, Building-as-a-Battery (BaB), battery or bidirectional charging of electric vehicles), considering the existence of local generation, to provide the flexibility necessary for demand side management while minimizing any perceived discomfort by the end user.
- e) **Holistic aggregated control.** This service will aggregate different performance indices related to thermal comfort, visual comfort, energy consumption, and available flexibility to determine control actions that will minimize user discomfort, maximize user and grid requirements satisfaction, and provide available energy efficiency and flexibility.

These can be accomplished by integrating cloud-based data managing and computing resources with 3D Building Information Modelling (BIM) tools, IoT sensors and devices at the building level, to form a state-of-the-art building energy assessment and optimization platform. Figure 1 illustrates the SATO platform architecture and the interactions including infrastructure, assessments and services, interfaces and users/actors.

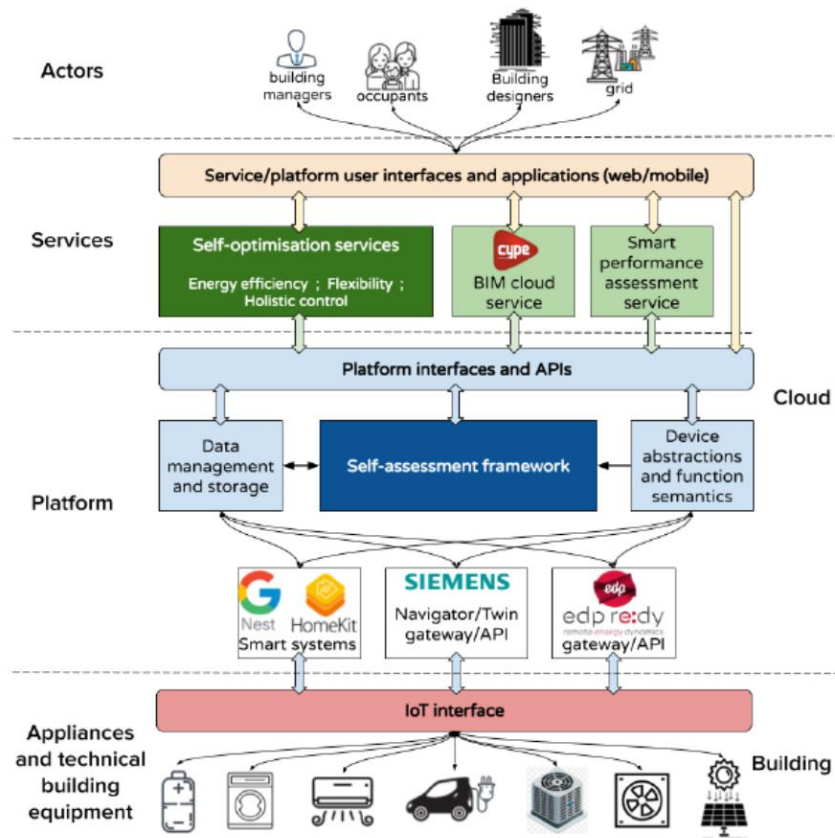


Figure 1 - SATO Platform Architecture

Moreover, the SATO software/ systems/applications/platform functions as identified in D1.1 and described in detail in D1.5 are mentioned also in the following table.

**Table 1 - Description and role of the identified platform functions**

Software/ systems/ applications/service and platform functions	Description
<b>SATO Platform</b>	Cloud based software/hardware that support data exchange with IoT enabled devices, Self-Assessment and Optimization (SA&O) and Smart Readiness Indicator (SRI) calculator
<b>SATO APP</b>	App-based interface that combines building equipment control and information services into user interaction services
<b>SATO APL</b>	Provides data for Self-Assessment Framework (SAF), for systems with short life cycles
<b>SATO BMS</b>	Provide data for SAF framework, for systems with long life cycles
<b>SATO Self-Assessment Framework (SAF)</b>	Automated real-time performance assessment displaying information on building and energy consuming equipment performance, considering the impact categories related to energy efficiency, energy flexibility, comfort and health and wellbeing. Compatible with SRI, whilst adding the ability to move from a theoretical to a real and dynamic building performance assessment
<b>SATO Self-Optimization Services</b>	Using the SAF results, optimizes the operation of energy consuming devices while safeguarding the needs of the occupant/user needs
<b>SATO Flexibility Management Services</b>	Provides demand side flexibility, and so, improves load balancing for DSOs and TSOs
<b>User comfort and holistic aggregated control services</b>	Balance the conflict between load reduction and user comfort considering user preferences; aggregate different performance indices related to thermal comfort, visual comfort, energy consumption, and available flexibility to determine control actions that satisfy multiple requirements.
<b>SATO BIM model</b>	Aggregated and disaggregated analysis and visualization of the assessments in non-residential buildings of the various applicable scales, setting locations and specifications of energy consuming equipment, sensors and actuators

### 3. Market overview

The global landscape on energy generation is in the middle of a transition. Power generation is shifting from centralized fossil fuelled generation towards decentralized renewable generation. The need for control over excessive energy consumption and efficient management of energy resources is gradually increasing which brings energy management systems to the centre of attention.

For the European Union in particular, the increase of energy efficiency and the decarbonization of the energy systems are two primary objectives [2]. In this regard, improving energy performance in buildings is one of the most important projects of the EU to reduce the effects of climate change and the

mitigation of CO<sub>2</sub> emissions to prevent the effects of global warming. This situation is gradually increasing demand for efficient management of energy resources that consequently helps the adoption of energy management systems to save energy and BEMS in particular, as the building sector in Europe is accountable for 40% of final energy consumption and 36% of the total CO<sub>2</sub> emissions [3].

### 3.1. The Building Energy Management Systems market

Building Energy Management System (BEMS) are sophisticated systems integrating hardware, software, and services with information and communication technologies for monitoring, automating, managing, and controlling the energy requirements of buildings. BEMS are microcomputer systems that automatically monitor and control energy-consuming electrical and mechanical equipment such as thermostats, HVAC, and lighting within a single building or a group of buildings to enhance energy-efficiency and comfort.

The concept of BEMS plays a vital role in managing buildings' energy demand. With the introduction of cloud computing technologies, the functionality of BEMS has expanded beyond conventional energy analytics and energy visualization to include demand response and property management. Key benefits of BEMS driving its adoption include reduced cost by conserving energy; helps buildings obtain green certification; provides facility managers real-time visibility into energy consumption trends; easy identification of electrical anomalies; and reduced risk of power spikes, shutdowns and electrical equipment failure [4].

#### 3.1.1. Global & EU market share of BEMS

In 2020, during the pandemic, the global market for BEMS was estimated in €3.1 billion and is projected to reach €7.1 billion by 2027, growing at a CAGR of 12.4% (from 2020 to 2027). The US accounts for over 33.2%, while Europe accounts for 35.7% of the total market. [5] Other important geographic markets are China, Canada and Japan each forecasted to grow at 16.2%, 9.5% and 8.9% respectively over the 2020-2027 period. Within Europe, Germany is forecast to grow at approximately 12% CAGR while Rest of European market, is estimated to reach € 776.5 million by the year 2027 [5]. Other leading markets include Italy, which is expected to witness significant growth, Netherlands and France. [6]

#### 3.1.2. Market trends and drivers

Since global energy intensity has been declining continuously, this is gradually increasing demand for efficient management of energy resources that helps the adoption of BEMS. In addition, the growing government focus worldwide on stepping up investments in smart cities will benefit demand for BEMS as energy management in smart homes and buildings is the first step towards building energy efficient smart cities. Moreover, the ongoing migration to smart grids and the resulting grid operators' adoption of automated demand response (DR) technologies for efficiently managing energy demand is putting the weight on BEMS as a basic prerequisite to deploy DR technologies.

On the other hand, the building sector which is recognized as a core economic activity across Europe, is also characterized by low levels of innovation and digitalization. While other sectors have adopted new production and organization methods, this sector has been slow to adapt to the transition to a low-carbon and digital economy, which makes it vulnerable and therefore policies to address this issue are emerging to enhance energy transition [6]. Moreover, the same trends that have disrupted retail, transport and consumer electronics, which dictate the need for interoperability, virtualization, real-time capability and service orientation, are coming to the energy markets, In order for the energy management sector to transition towards this Industry 4.0 transformation, it would have to redefine the current architecture of its business and conceptualize new business models, so as to embody some of these aforementioned features and keep creating value.

What is more, for the first time, consumers have been placed at the heart of the renewed EU energy system that will provide them more flexibility and protection and in a stronger position in the supply

chain. This will allow them to take their own decisions on how to produce, store, sell or share their own energy. By unlocking both technological and social innovation, citizens can drive energy transition and reduce their energy costs [7].

Lastly, the current situation of record high electricity prices in combination with the surging demand for energy has not affected renewable energy generation companies but endorses their activity as wholesale electricity prices globally are linked with their production [8]. Besides, improving and increasing energy efficiency rates and digitalization of the building stock will run as a catalyst for economic recovery, which is both important to alleviate the negative effects of the Covid-19 pandemic and to set the conditions to achieve the European Commission's plans for climate neutrality.

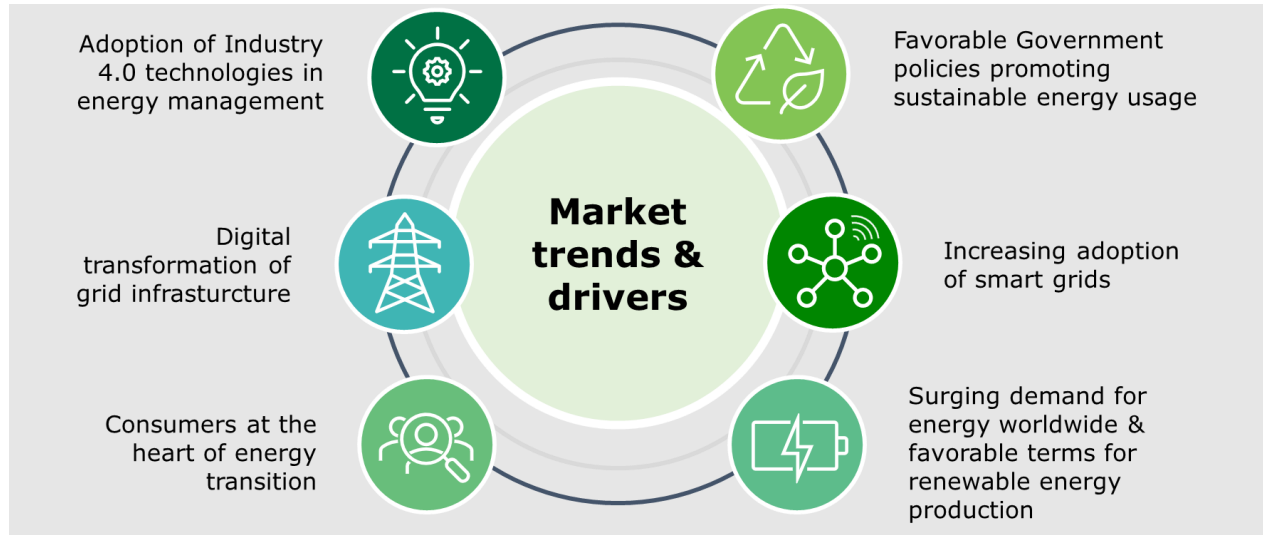


Figure 2 - BEMS Market trends and drivers [11]

### 3.1.3. Policies addressing buildings' energy efficiency

Almost two decades now in Europe, several decisive policies have been implemented to improve building energy consumption, to increase renovation rates and reduce energy imports, to create a healthier, efficient, and more sustainable urban environment. There have been several legislations and regulations set to help the EU to achieve the energy efficiency, and climate mitigation targets have been set. The Energy Performance of Buildings (EPBD [9]) is the central European policy addressing energy performance and energy renovation of buildings, where also the concept of a Smart Readiness Indicator [10] (SRI) was also introduced in the 2018 revision. In addition to the EPBD, the Renewable Energy Directive (RED [11]) and the Energy Efficiency Directive (EED [12]) contain important rules affecting the energy building market.

These directives are supported by the larger "Clean Energy for All" Europeans Package, which establishes the main 2030/2050 energy targets, including:

- The entire building stock (including residential) must be decarbonized by 2050,
- Energy efficiency should increase by 32.5% by 2030 compared to 1990 levels (EED),
- Renewable energy must exceed 32% of energy demand by 2030 (RED),
- CO<sub>2</sub> emissions should be reduced by 40% by 2030, compared to 1990 levels (EED),
- Member states must develop long-term energy renovation strategies (previously regulated under the EED and now moved to the EPBD), that contain an overview of the national building stock (identifying main building categories)

In December 2019, the European Commission presented the European Green Deal. Aiming at becoming the world's first climate-neutral continent by 2050, the European Green Deal set an ambitious target of an overall 50% reduction of CO<sub>2</sub> emissions by 2030, compared to 1990 levels. Moreover, in October 2020, as part of the Green Deal, the European Commission published the Renovation Wave Strategy which provides strategic action plan that aims to at least double the annual renovation rate by 2030, to foster deep energy renovation, which include also digitalization of the building stock and mobilize forces at all levels towards these goals.

Lastly, European Commission launched a public consultation on digitalising the energy sector as part of the preparation of a Commission Action Plan on the Digitalisation of the energy system. This action plan is expected to be published in the first semester of 2022 [13].

## 4. SATO Customer Segments

The identification and thorough research of the customer segments from the onset and understanding of their needs is important for SATO's business viability. To ensure appeal of SATO to the customer segments we should evaluate the prospect customer's environment, experiences and general context. These factors will contribute to how potential customers will respond to SATO services.

The SATO potential customer segments derived from the input provided by D1.1 - Role of Actors and Design of Stakeholder Framework on the actors of SATO and their roles and interactions, from D1.5 - Description of the Use Cases and Test Experiments, that provided detailed information of the use cases and how they could provide solutions for each customer segment, from workshops with partners to present, validate and refine the customer segments analysis findings and from extensive market research. Specific areas of interest have been analysed regarding the identification of the customer segments profiles and the topics to consider such as their needs and pain points, the way SATO can provide solutions for them and how they could interact with SATO, and lastly the identification of barriers and risks for the adoption of such solutions. All this information is important to better target and engage the different customer groups when the time for commercial exploitation for the SATO technologies come.

The targeted customers and users of SATO include:

1. Building owners and occupants, as energy consumers
2. Buildings/ facilities and energy community managers
3. Grid operators, energy retailers and aggregators
4. Energy equipment and appliances manufacturers and retailers
5. Third party companies developing building energy assessment services
6. Energy consulting companies

### 4.1. Building owners/occupants

Building owners/occupants are the main end users of the SATO platform that spend extended time periods in a building and their thermal comfort along with the energy impact of their behaviour is a crucial point of investigation for the achievement of energy efficiency. An occupant is an energy consumer who may have a direct control over their energy systems in a residential and potentially in a service building.

Table 2 - Customer Profile for Building owners/occupants

Customer profile	
<b>Customer pains &amp; needs</b>	<ul style="list-style-type: none"> <li>• Cannot assess the energy consumption of their apartment/building and appliances and want to have more information about the energy impact of their decisions</li> <li>• Want to reduce the high cost of their energy bill which does not always provide thermal comfort</li> <li>• Do not have control over the energy consumption of the apartment/building</li> <li>• Don't know how to handle energy waste and inefficiencies</li> <li>• They are aware of BEMS solutions, but they usually have high integration and running costs</li> </ul>
<b>How SATO will alleviate pains and create benefits</b>	<ul style="list-style-type: none"> <li>• Monitoring and assessment of real-life energy use that includes all energy consuming equipment</li> <li>• Holistic building energy analysis and efficiency</li> <li>• Holistic control approach to maximise user comfort and energy efficiency</li> <li>• Energy bills reduction</li> <li>• Tailored advice for behavioral change in energy consumption</li> <li>• Incentives and decision support to maximize energy savings and improve indoor comfort</li> <li>• Low-cost access to the service and ease of use</li> <li>• Seamless integration of SATO with traditional BMS and current smart home/device systems</li> </ul>
<b>Which SATO services will they use?</b>	<ul style="list-style-type: none"> <li>• SATO APP</li> <li>• SATO APL</li> <li>• SATO BMS</li> <li>• SATO Self-assessment framework</li> <li>• SATO Self-optimization services</li> </ul>
<b>Barriers &amp; risks for customers to adopt such solutions</b>	<ul style="list-style-type: none"> <li>• Complexity and lack of user awareness about new energy services and their benefits</li> <li>• Economic benefit for users is not yet fully validated</li> <li>• Smaller energy consumers (building owners/occupants) still lack incentives to adopt new hardware and software solutions like SATO</li> <li>• Target customers might also be conservative due to potential effects on their daily business or energy usage patterns</li> <li>• They cannot determine the ROI and consider payback period for the adoption of building energy management solutions may be too long</li> <li>• Data privacy and security concerns</li> </ul>

## 4.2. Facility/building managers of commercial and industrial (C&I) buildings

Buildings, facilities and energy community managers are responsible for supervising the building's operation mode and ensuring the functionality, comfort and safety of the buildings and facilities they run. They oversee the daily operations and maintenance of commercial, industrial, or residential

properties. They liaise with tenants and owners, coordinate and manage energy systems, maintenance, housekeeping, and security activities, and ensure the facilities meet regulatory standards and codes. The main drivers for building managers' actions are comfort-adaptive, energy-saving behaviors and the increase of property value. In the case of energy community managers, we include those aiming to reduce the associated energy costs and value strategies that provide flexibility and increase self-consumption.

**Table 3 - Customer profile for Facility/building managers of commercial and industrial (C&I) buildings**

<b>Customer profile</b>	
<b>Customer pains &amp; needs</b>	<ul style="list-style-type: none"> <li>• Manually control buildings' energy systems, most of which in a daily basis</li> <li>• Cannot assess the energy consumption of their building, equipment and appliances</li> <li>• Cannot meet occupants comfort standards and at the same time optimize energy consumption</li> <li>• Want to reduce energy costs of the managed buildings</li> <li>• Meeting energy reduction obligations set by European and National policies</li> <li>• Reduction of CO<sub>2</sub> emissions from buildings use is not feasible without implementing costly building energy renovations</li> </ul>
<b>How SATO will alleviate pains and create benefits</b>	<ul style="list-style-type: none"> <li>• Balancing conflict between load reduction and user comfort considering user preferences, weather forecasts and user/building knowledge</li> <li>• Optimization of the operation of energy consuming devices and energy in buildings</li> <li>• Smart self-assessment of energy equipment and building performance by collection of data from sensors and actuators</li> <li>• Assessment of real-life energy use that includes all energy consuming equipment</li> <li>• Promotion of energy savings by keeping building/facility under constant monitoring</li> <li>• Detection of equipment that requires maintenance or repair to increase their performance</li> <li>• Exploit the full potential of building to create energy savings through energy efficiency strategies</li> <li>• Provision of the required Demand Response capabilities to grid operators required for Demand Side Management (DSM)</li> <li>• Holistic control approach to maximise user comfort</li> <li>• Help find building energy waste and inefficiencies and propose new control solutions</li> <li>• Control of the actuators in the buildings and the deployment of the optimization strategies</li> <li>• Tailored advice for behavioral change in energy consumption of building occupants</li> <li>• Deliver value to occupants through reduced energy bills</li> <li>• Achieve green energy certificate that increases property value</li> <li>• Provide an efficient and customer-friendly control system</li> </ul>

	<ul style="list-style-type: none"> <li>• Buildings running costs are kept separated from uncertainties and volatility created by commodity price fluctuations</li> <li>• Maximizing the use of renewables and optimizing carbon footprint in real time to help entity reach sustainability targets</li> <li>• Improvement of brand (for commercial/service buildings) through corporate social responsibility actions for energy consumption reduction</li> <li>• Detection of equipment requirements for maintenance and repair to increase building's performance</li> <li>• Seamless integration of SATO with traditional BMS and current smart device and energy systems</li> </ul>
<b>Which SATO services will they use?</b>	<ul style="list-style-type: none"> <li>• SATO APP</li> <li>• SATO BMS</li> <li>• SATO APL</li> <li>• SATO Self-assessment framework</li> <li>• SATO Self-optimization services</li> <li>• SATO Platform</li> <li>• SATO Open BIM tool</li> </ul>
<b>Barriers &amp; risks for customers to adopt such solutions</b>	<ul style="list-style-type: none"> <li>• Economic benefit for users is not yet fully validated</li> <li>• Smaller energy consumers (building occupants/tenants) still lack incentives to adopt new hardware and software solutions</li> <li>• Building occupants might be conservative due to potential effects on their daily business or energy usage patterns</li> <li>• Building managers may not be trained or have the expertise to implement energy optimization actions</li> <li>• Data privacy and security concerns</li> <li>• Conflicting interests in commercial property tenancy (tenants vs. owner vs. facility manager)</li> </ul>

### 4.3. Grid operators and energy retailers

This includes grid aggregators, energy providing companies, DSOs (Distribution System Operators) and TSOs (Transmission system operators). Additional information can be found at the business cases section (5.3.3 Business case #3 for Grid Operators)

Table 4 - Customer profile for Grid operators and energy retailers

Customer profile	
<b>Customer pains &amp; needs</b>	<ul style="list-style-type: none"> <li>• Want to minimize peak consumption and demand during peak periods</li> <li>• Electricity prices are volatile to the fluctuations in commodity prices and renewable energy generation</li> <li>• Want to take advantage of lower electricity prices to satisfy customers</li> </ul>
<b>How SATO will alleviate pains and create benefits</b>	<ul style="list-style-type: none"> <li>• Maximizing satisfaction of grid requirements and provision of energy balancing and flexibility services to DSOs</li> <li>• Provision of energy flexibility services for load shifting to a different time period that could create value for energy consumers</li> </ul>



	<ul style="list-style-type: none"> <li>• Deliver value to energy consumers through reduced energy bills</li> <li>• Provision of real-time optimized control of legacy and smart appliances, building equipment and vehicle-to-grid (V2G) charges and batteries</li> <li>• Reduction of peak consumption</li> <li>• Stabilization of the electric grid by implementation of load shifting strategies</li> <li>• Provide an efficient and customer-friendly payment and control system</li> <li>• Maximizing the use of renewables and optimizing carbon footprint in real time thus help reaching entities sustainability targets</li> <li>• Interface with multiple energy systems integrated</li> </ul>
<b>Which SATO services will they use?</b>	<ul style="list-style-type: none"> <li>• SATO APL</li> <li>• SATO BMS</li> <li>• SATO Self-optimization services</li> <li>• SATO Platform</li> <li>• SATO Flexibility management service</li> </ul>
<b>Barriers &amp; risks for customers to adopt such solutions</b>	<ul style="list-style-type: none"> <li>• Regulatory framework is not completely developed throughout Europe</li> <li>• Economic benefit for users is not yet fully validated</li> <li>• Building occupants might be conservative due to potential effects on their daily business or energy usage patterns</li> <li>• Data privacy and security concerns</li> </ul>

#### 4.4. Equipment and appliances manufacturers and retailers

Equipment and appliances manufacturers and retailers are increasingly producing energy-efficient products to reduce their environmental footprint and enable energy savings for the consumers through optimal energy performance. Monitoring and control may apply to new equipment but may not be available in old legacy systems and most equipment and appliance lack energy performance assessment. The following customer profiles separate manufactures from retailers due to their different goals.

##### 4.4.1. Equipment and appliances manufacturers

Table 5 - Customer profile for Equipment and appliances manufacturers

Customer profile	
<b>Customer pains &amp; needs</b>	<ul style="list-style-type: none"> <li>• Want to monitor their equipment or appliances for enhancement of energy performance</li> <li>• Want to offer energy assessment capabilities through their equipment and appliances to enhance buildings' energy optimization</li> </ul>
<b>How SATO will alleviate pains and create benefits</b>	<ul style="list-style-type: none"> <li>• Make legacy or new equipment smarter, creating the opportunity to exchange services and information with customers</li> <li>• Offering SA&amp;O and benchmarking capabilities for equipment and appliances</li> <li>• Data collection from all energy-consuming devices in the buildings and management through IoT</li> <li>• Reduce development costs and time for sensors manufacturing</li> </ul>

	<ul style="list-style-type: none"> <li>Offering high quality sensors for monitoring of equipment and appliances that will make their products more competitive</li> </ul>
<b>Which SATO services will they use?</b>	<ul style="list-style-type: none"> <li>SATO Sensors and actuators</li> <li>SATO Self-assessment framework</li> <li>SATO Self-optimization services</li> <li>SATO Platform</li> <li>SATO BMS</li> </ul>
<b>Barriers &amp; risks for customers to adopt such solutions</b>	<ul style="list-style-type: none"> <li>Integration costs and procedures are not yet known</li> <li>Manufacturers might be skeptical of the benefits and effectiveness of these new capabilities against potential effects on their daily business</li> </ul> <p>Data privacy and security concerns</p>

#### 4.4.2. Equipment and appliances retailers

Equipment and appliance retailers are also an important segment, that sells the products to end-users and want to provide added services such as indicating the best practices of operation but also advising users to when it is economically feasible to replace their products.

Table 6 - Customer profile for Equipment and appliances retailers

Customer profile	
<b>Customer pains &amp; needs</b>	<ul style="list-style-type: none"> <li>Want to monitor the performance of the equipment or appliances they sell to ensure high level of satisfaction and for warranty purposes</li> </ul> <p>Want to offer tips on best practices for operation and assess the financial feasibility to replace the equipment or appliance when its performance is lowering</p>
<b>How SATO will alleviate pains and create benefits</b>	<ul style="list-style-type: none"> <li>Make legacy or new equipment smarter, creating the opportunity to exchange services and information with customers</li> <li>Offering SA&amp;O and benchmarking capabilities for equipment and appliances</li> <li>Offering high quality sensors for monitoring equipment and appliances that will make their products more competitive</li> </ul>
<b>Which SATO services will they use?</b>	<ul style="list-style-type: none"> <li>SATO Sensors and actuators</li> <li>SATO Self-assessment framework</li> <li>SATO Self-optimization services</li> <li>SATO Platform</li> <li>SATO BMS</li> </ul>
<b>Barriers &amp; risks for customers to adopt such solutions</b>	<ul style="list-style-type: none"> <li>Integration costs and procedures are not yet known</li> <li>Training costs for employees</li> <li>Data privacy and security concerns</li> <li>Enhancing customer service responsibilities</li> </ul>

## 4.5. Third party companies developing buildings energy management services

Companies that develop building energy management services as a cloud-based application that supports data exchange with IoT enabled devices.

Table 7 - Customer profile for Third party companies developing BEMS

Customer profile	
<b>Customer pains &amp; needs</b>	<ul style="list-style-type: none"> <li>Building applications internally requires significant capital to support complex software stacks, regular updates to hardware and software, data centre and infrastructure maintenance</li> </ul>
<b>How SATO will alleviate pains and create benefits</b>	<ul style="list-style-type: none"> <li>Avoiding the cost, complexity, and inflexibility that often comes with building and maintaining a platform on-premises. Cost-effective and rapid development of applications</li> <li>Faster time-to-market for developers</li> <li>Provision of open access for developers to a large potential market</li> <li>Provision of standardized web-service REST interfaces and APIs that will use a common communication framework for a seamless integration of applications in the platform</li> <li>Reliable and scalable technical and business environment</li> <li>Sense of shared purpose towards the energy efficiency of existing and new buildings</li> </ul>
<b>Which SATO services will they use?</b>	<ul style="list-style-type: none"> <li>SATO platform</li> <li>SATO Self-assessment Framework</li> </ul>
<b>Barriers &amp; risks for customers to adopt such solutions</b>	<ul style="list-style-type: none"> <li>Migration from other cloud providers might be a complex procedure</li> </ul>

## 4.6. Construction and Energy consulting companies

Construction and Energy consulting companies can add SATO to their services to provide accurate assessments of energy management and buildings sustainability in their related projects.

Table 8 - Customer profile for Construction and Energy consulting companies

Customer profile	
<b>Customer pains &amp; needs</b>	<ul style="list-style-type: none"> <li>Cannot assess in detail the performance of potential energy systems in buildings to provide accurate energy consumption estimations for clients</li> <li>Cannot provide optimum energy renovation scenarios with high accuracy in the payback period to trigger investments</li> <li>Cannot get data in appropriate resolution from existing buildings to analyse performance of building and systems and recommend optimization actions/ measurements</li> </ul>

	<ul style="list-style-type: none"> <li>• Need to visualize and explain comparisons and advantages of different energy systems variants solutions to their customers</li> <li>• Difficult to explain and visualize the benefits of actions/ measures to their customers without real building data</li> <li>• Often cannot prove the success of implemented measures due to missing data</li> </ul>
<b>How SATO will alleviate pains and create benefits</b>	<ul style="list-style-type: none"> <li>• Assessment of energy refurbishment actions to trigger informed investment decisions in building stock renovation actions</li> <li>• Identify and integrate viable energy efficiency strategies into new construction or existing buildings</li> <li>• Trigger of energy renovation actions to close performance gap and achieve optimum energy efficiency of existing and new buildings</li> <li>• Push forward the digitalization and efficiency measures of existing and new buildings</li> <li>• Embrace a holistic green building approach in their projects</li> <li>• Usage of real data of existing building as a solid basis for identification of relevant actions/ measures</li> <li>• Use of BIM Model and Apps to visualise and explain energy savings potentials and optimization actions/ measures</li> <li>• Use SATO services to demonstrate the success of implemented actions/ measures</li> </ul>
<b>Which SATO services will they use?</b>	<ul style="list-style-type: none"> <li>• SATO platform</li> <li>• SATO BMS</li> <li>• SATO Self-assessment framework</li> <li>• SATO Self-optimization services</li> <li>• SATO Open BIM tool</li> </ul>
<b>Barriers &amp; risks for customers to adopt such solutions</b>	<ul style="list-style-type: none"> <li>• Economic benefit for users is not yet fully validated</li> <li>• Smaller energy consumers still lack incentives to adopt new hardware and software solutions like SATO</li> <li>• Energy consumers don't understand added value of solutions like SATO</li> <li>• Target customers might also be conservative due to potential effects on their daily business or energy usage patterns</li> <li>• They consider payback period for the adoption of building energy management solutions may be too long</li> <li>• Customers of energy consultants can feel threatened by solutions like SATO because it can uncover operational errors and optimization potential that they did not have recognized by themselves.</li> <li>• Today, the BIM model often cannot be used for the identification of optimization actions/measures.</li> </ul>

## 5. SATO Business Cases

Since the project is now at its initial stage and we are still unaware of all the capabilities of the services that SATO will offer in detail and its' full potential, the focus on this deliverable is the identification of the business cases and the potential business models we foresee with the aim to refine them during the last year of the project and present the final outcomes in D1.8 that is due in M36.

The business cases will describe the potential use of SATO services by the target customers described in Section 4 SATO Customer Segments, the value that SATO will bring to them by the use of the services, the financial model that is been identified for SATO to create revenues. Other elements that ensure a successful implementation of a business case such as the customer relationships and channels, the key activities and resources and the key partners to deliver the value proposition are defined as well.

### 5.1. Methodology

For the development of the business models and to facilitate discussion with partners during the workshops, the Business Model Canvas [14] methodology was used to define and communicate a business idea in an easy and coherent way. The Business Model Canvas offers a visual chart of 9 building blocks that describe products or service’s value proposition, infrastructure, customers, and finances and illustrates the potential connections for a business to align their core activities to successfully deliver value to potential customers, as shown in the following Figure.

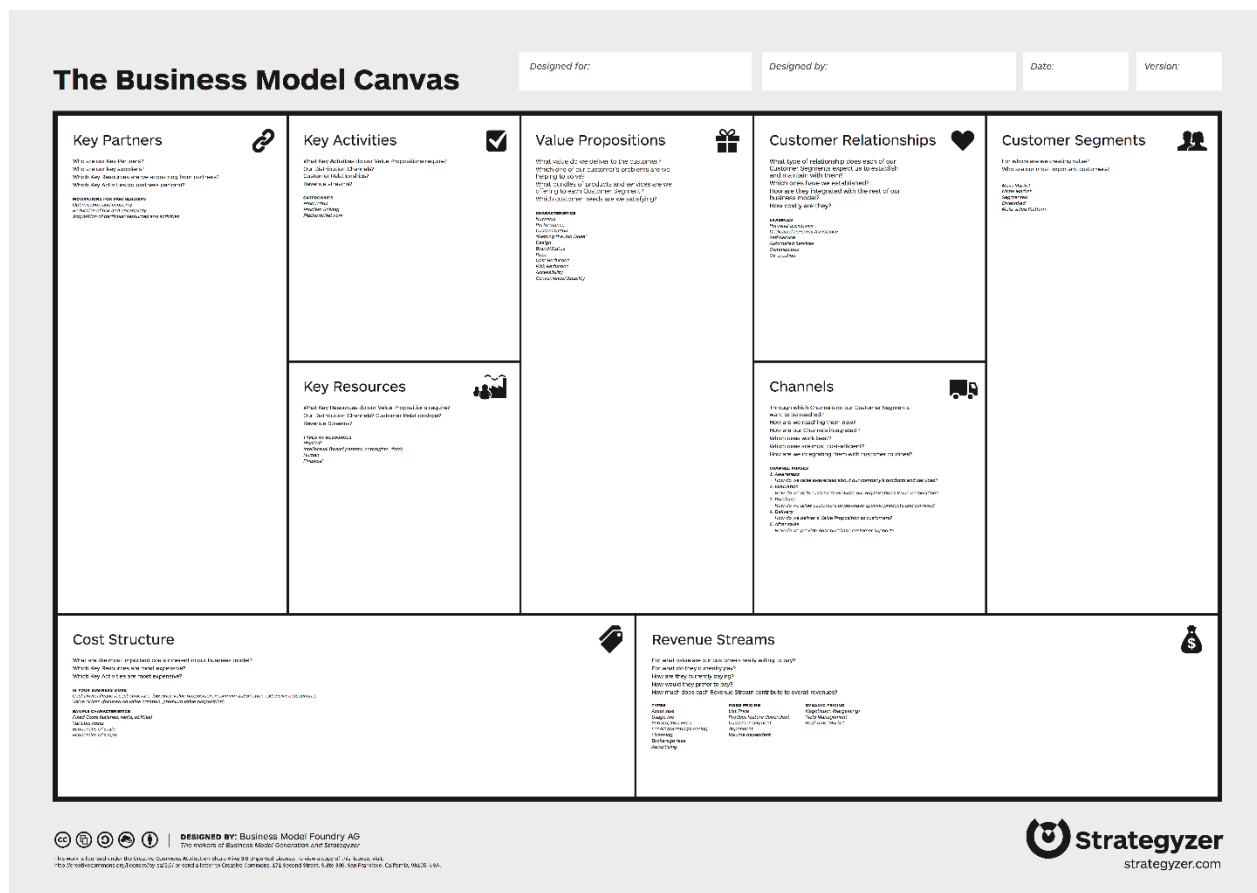


Figure 3 - Business Model Canvas template [14]

To define the specific details of each building block, specific questions should be addressed.

- The **Value Proposition** block answers to the questions of i) what values we deliver to the customer segments, ii) what products and services are we offering, iii) which customer needs are we satisfying.
- The **Customer Segments** block answers to the questions of i) for whom we are creating value and ii) who the most important customers are.
- The **Customer Relationships** block provide answers to the type of relationships our customers expect us to establish (e.g., personal assistance, self-service, automated services, communities, co-creations etc.).
- **Channels** represent the ways through which our customers want to be reached.

- **Key Partners** are those most important collaborators that help us deliver the product or service and here we also need to define the type of partnership to be established (e.g., strategic alliance, joint venture, buyer-supplier relationships etc.)
- **Key activities** represent the actions required to bring a product or service to the market and may include the technical development and production, operation and maintenance, IPR protection, marketing, customer support etc.
- **Key resources** describe the most important assets required to make a business model work and include categories such as i) physical (buildings, machines, raw goods, etc), ii) intellectual (brand, proprietary knowledge, patents, partnerships, etc.), iii) human (staff, creativity, experience, etc.) iv) financial (cash, credit, stock, etc.).
- **Cost structure** addresses the most important costs inherent to the business model.
- **Revenue Streams** define the value customers are willing to pay to acquire the product or service. Revenue streams could come in the form of asset sales, usage fees, subscription fees, leasing, licensing, brokerage fees, advertising, training etc.

### 5.2. SATO Value Proposition

In general, SATO platform will provide energy monitoring energy efficiency, energy flexibility, self-assessment and indoor comfort solutions for residential as well as for commercial and industrial buildings, as it could be applied to any building typology. Moreover, it will provide customized demand-response contracts based on customers’ energy constraints and preferences. It will bring the energy and electricity community together and will deliver value to customers through reduced energy bills.

Due to this high interaction between stakeholders, SATO is also built on business model based on platforms. The “Platform as a service (PaaS) [15]” Business model is selected due to its low search and transaction costs, ability to engage different kind of stakeholders while at the same time creating value for them, ability to coordinate online different levels of production, ability to deliver reports based on performance indicators automatically, and ease of change location as base.

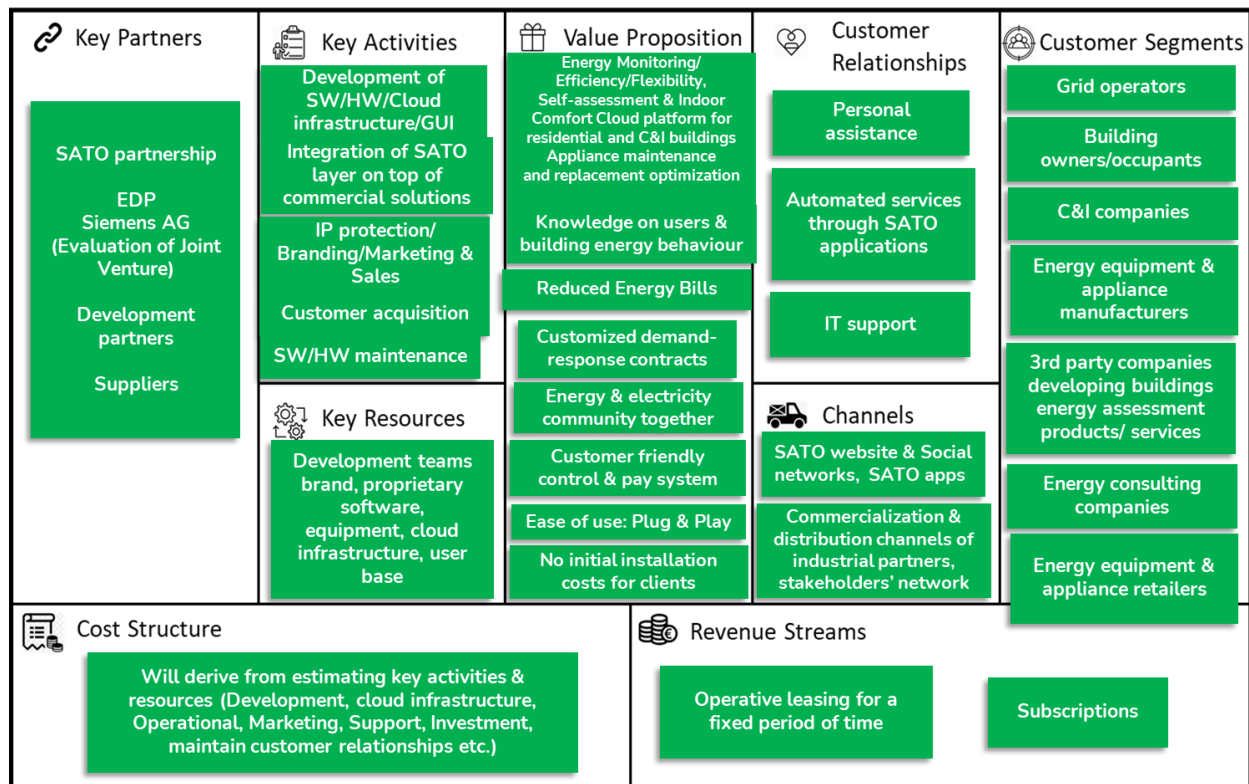


Figure 4 - General Business Model Canvas for the whole SATO platform

Through the range of products and services and the different value that each one of them creates, SATO could be offered to various customer segments and users such as Electricity grid operators, Building owners and occupants, Commercial and Industrial buildings and buildings/facilities managers (including the relevant energy communities), Energy equipment and appliances manufacturers and appliance retailers, Third party companies that develop buildings energy assessment products and services Electric vehicles fleet and charging station owners. Detailed analysis of the specific characteristics of each customer segment to reach has already been described in Chapter 4, SATO Customer Segments.

Key activities to deliver SATO products and services include i) the development of software and hardware components, the cloud infrastructure and the applications graphic user interfaces, ii) the integration of SATO layer on top of commercial solutions such as the EDP Re:dy and Siemens Twin, iii) the protection of IP, iv) marketing activities and brand building to generate awareness about SATO and sales, v) customer acquisition and vi) maintenance activities. In that sense, the key resources include human resources, Intellectual Property, equipment and infrastructure and the user base.

The cost structure for the SATO platform consists of the main segments of any Platform as a Service (PaaS). Those segments are primarily linked with development costs. Software Engineers will need to develop the code and design the interface of the platform. Secondly with cloud infrastructure. The data this platform needs to combine and analyze to provide outcomes, need to be stored either in joint venture's infrastructure or in a host data center. The next step demands all operational, marketing, maintenance and customer support every business is entailed to, and the final is the starting capital, the amount that partners have to invest in this venture.

Regarding the revenue streams, two ways will be examined to generate revenues. First of all, through operative leasing, the user will be granted the exclusive rights to have access to the platform for a fixed period of time, as a way to reduce the initial costs for the potential user. Moreover, a subscription-based model will be also assessed, where there would be no personal ownership, but it would be more flexible from the customer's standpoint.

The definitive cost structure as well as the revenue streams will be further clarified during the demonstration phase of the project.

Customer relationships and channels have been defined in a high level in the Business Model Canvas, but it will be further defined and explored through the work that is been carried out in WP7 - Economic Evaluation, Exploitation and Replication and WP8 - Market Actors Engagement through Communication and Dissemination.

### 5.3. SATO business cases

Different business cases addressed to distinct customer segments and the value for each one of them respectively have been identified by analyzing the SATO offering. These business cases and the respective business models per case are presented in the following subchapters in this section, along with a description of the target customers and users per case, the way they will use SATO and the business models to create revenues for the SATO partnership.

#### 5.3.1. Business case #1 for Buildings Occupants/Owners

##### *Target customers*

SATO could be offered to buildings occupants that want to improve their energy bills and optimize energy consumption and efficiency without having to compromise their thermal comfort and indoor air quality, by providing them with incentives and decision support for cost reduction, comfort improvement and implementation of energy sustainable behaviours.

NOTE: It is not known yet if occupants will be direct customers (meaning that SATO will reach them directly or they could be introduced to SATO services through an energy retailer, for example). This will be defined later in the project when the SATO developments are tested and evaluated in the pilots, user feedback is collected and there is a more concrete view of the final product.

**How they will use SATO**

Through SATO APP and SATO APL, cloud-based tools, occupants will be able to visualize real time performance data and to control legacy energy devices and appliances. These tools will also send alerts and recommendations to the occupants for behavioural change in energy consumption to optimize their building energy performance. In this way, users could interact with the building and benefit from adequate indoor conditions while maintaining high levels of energy efficiency and reducing their energy bills.

**Business model**

The SATO services could be offered as a traditional B2C (business to consumer) business model either with a fixed monthly payment for the occupants or in a pay-per-use basis according to the number of systems and appliances being monitored and the frequency of data acquired and analysed. Moreover, since SATO could be a plug-and-play solution, it could be offered with a set subscription fee, after purchasing and installation.

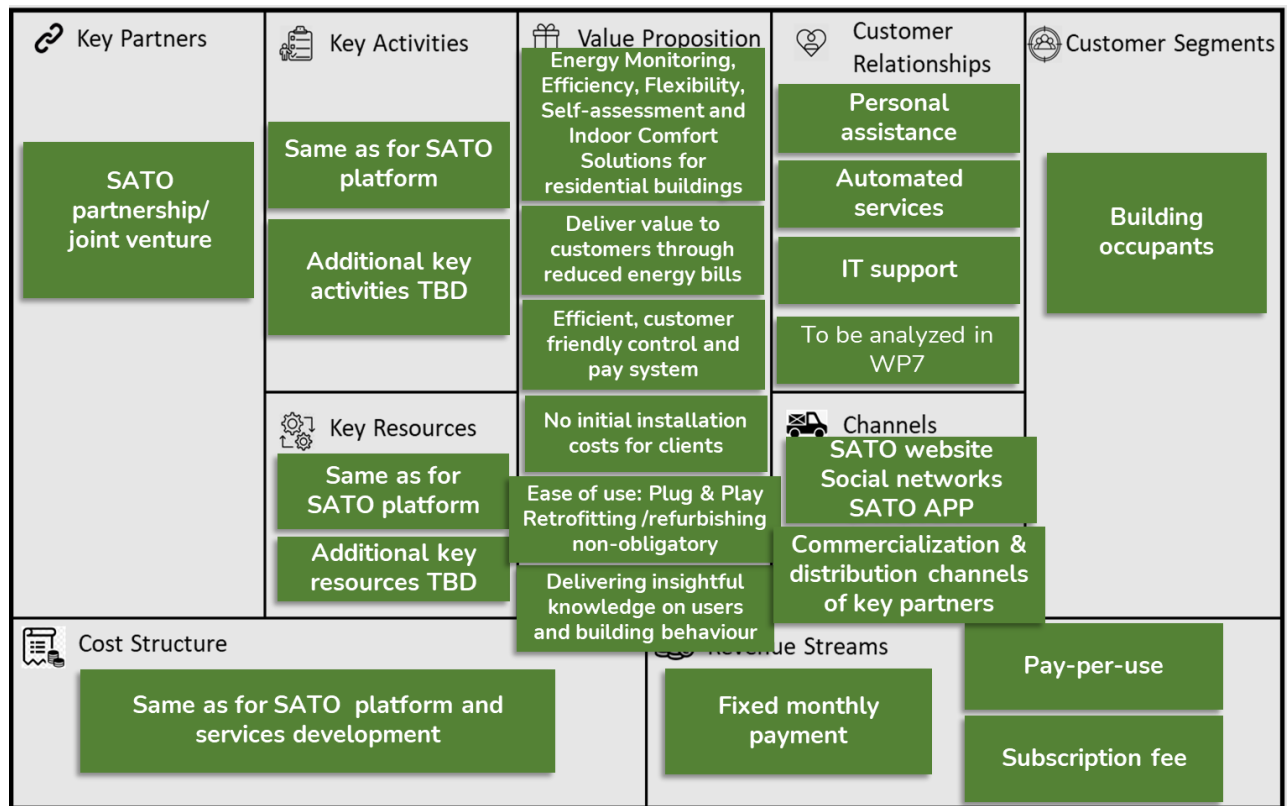


Figure 5 - Business model canvas for buildings occupants

**5.3.2. Business case #2 for Commercial and Industrial (C&I) companies**

**Target customers**

SATO could offer demand side management services to energy intensive industrial companies and big commercial customers using load shifting for IoT enabled energy management systems. The benefits are that they save on energy costs, they increase reliability by extending supply channels, deliver



benefits from the usage of broader usage energy and technology mix and generate extra income from the balancing energy market while creating value for their core business. At the same time, they will gain profit from reliable energy supply and long-term sustainability, and they could achieve a green certificate that increases the property value.

#### ***How they will use SATO***

The SATO platform can connect to existing C&I building management systems in place as plug and play with specific communication protocols that ensure interoperability, providing an easy to adopt solution. Building and facility managers of such companies will be the main users of SATO services. Through SATO APP the building manager may input their needs in SATO BMS and SATO APL, and SATO Self-Optimization Services adjusts the dynamic elements of building fabric, technical building equipment as well as legacy and smart appliances accordingly. Additionally, through the SATO BIM model and the SATO APP they will be able to detect any source of energy waste to implement corrective actions that are in comply with the buildings' energy requirements, leveraging on the SATO Self-Optimization services, without compromising indoor comfort and air quality. Moreover, they will receive information of the equipment or installation that requires maintenance or repairs to enhance their performance.

On the other hand, from the point of view of the grid operator, the facility manager could ensure that the systems provide the required Demand Response capabilities required for Demand Side Management using load shifting that basically moves a building's energy load in another period, as an energy cost reduction strategy. SATO BMS and SATO APL will be used to gather data (energy consumption and production) from the building and SATO Self-assessment framework will use this information to determine the available flexibility in building appliances and equipment. This information is then used by the Optimization framework to come up with the optimal time schedule of equipment and appliance operation, to modify the overall consumption picture to achieve savings in electricity charges.

Moreover, in cases when the C&I buildings have charging stations for electric vehicles, they can utilize the capabilities offered by V2G (vehicle to grid) as this technology helps in the storage of renewable energy and its' consumption in a different period. With V2G, the momentary electricity consumption spikes in the building can be balanced with the help of electric cars and no extra energy needs to be consumed from the grid leading to reduced energy costs. SATO flexibility service will control equipment and appliances to make use of different storage capacities, such as bi-directional charging of electric vehicles, to provide the flexibility necessary for demand side management.

#### ***Business model***

The SATO services could be offered in a B2B basis either with a fixed monthly payment or in a pay-per-use basis according to the number of energy systems and appliances being monitored and the frequency of data acquired and analysed. Additionally, a customer support fee could be applied that will be payable for support which falls outside the scope of the Service Levels Agreement. The average prices for support programs could be defined based on the Support Program Tier classifications ranging from basic to premium that could span from 15.6 percent for a basic level of support to more than 26 percent for a high-end premium program. Through SATO's online presence and key partners' contribution, the resolutions to the segment's pains, as discussed in SATO customer segment, will be presented. It will be a necessary process to attempt to bridge certain barriers, in regards with data concerns, and developing trust about the benefits of using the SATO platform.

The cost structure elements are similar to those presented in the SATO platform, the extent of which will be determined against the potential business environment. Similarly, the key activities have similar aspects, even though new activities are expected to be discussed in the future.

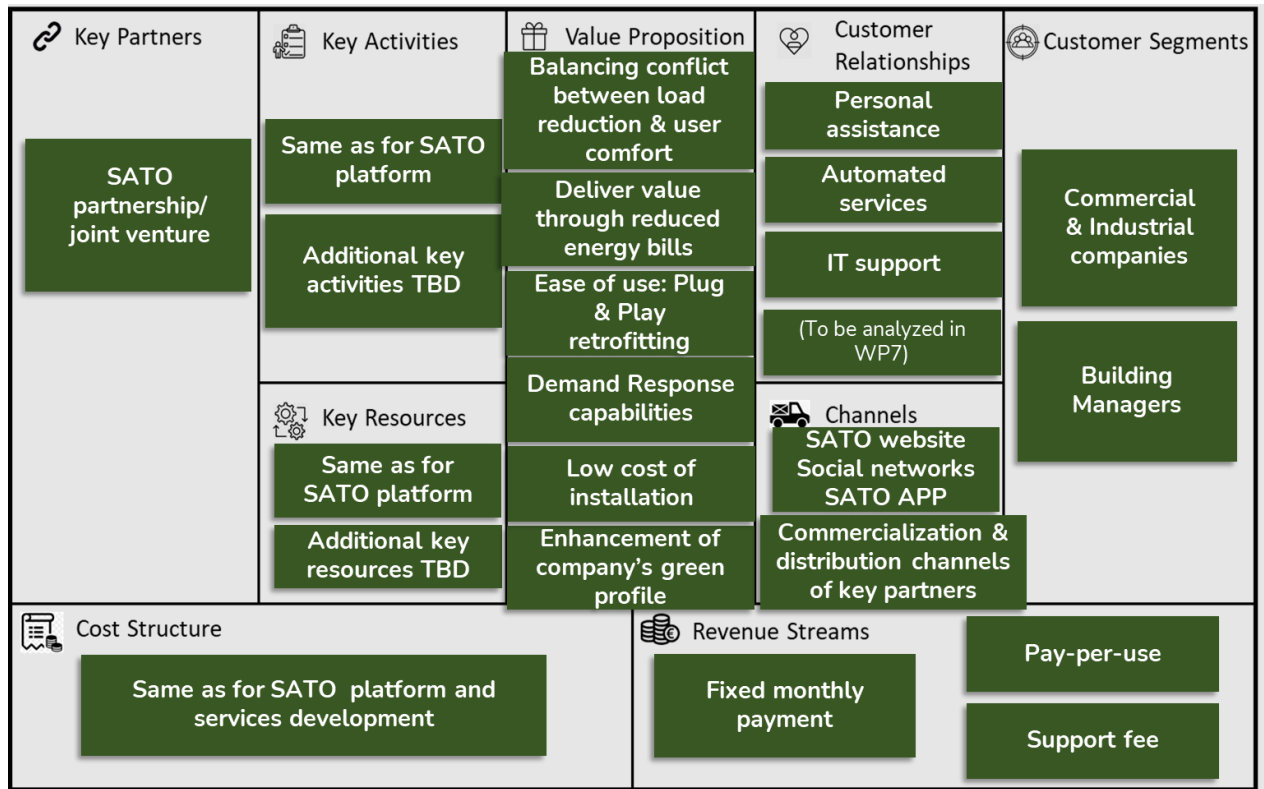


Figure 6 - Business model canvas for C&I companies

### 5.3.3. Business case #3 for Grid Operators and energy retailers

Grid operators and utilities have a problem to balance out supply and demand, to ensure a stable and reliable grid due to the volatility it has been created by the decreasing number of traditional power plants and the increasing number of electricity produced by renewable resources which are more unpredictable in production terms.

**Target customers**

SATO will be offered to the grid operators including as direct or indirect clients and users grid aggregators, energy providing companies, DSO (Distribution System Operators) and TSO (Transmission system operators). According to the identification and description of the role of the different actors of SATO in D1.1, section 4.1, there are specific benefits identified for each of the grid operators' actors that are summarized below. Energy Service Providers can balance loads and stabilize the electric grid, at the same time open new interaction possibilities with their customers. Energy Aggregators and Energy Service Companies (ESCOs) can offer new services maximizing the energy performance of buildings.

To help us understand the tradeoffs between the different actors of the electricity grid Figure 7 illustrates a simplified schematic of the energy market value chain that indicates the roles and relations among key stakeholders, which facilitates the description of benefits that SATO brings to each of them.

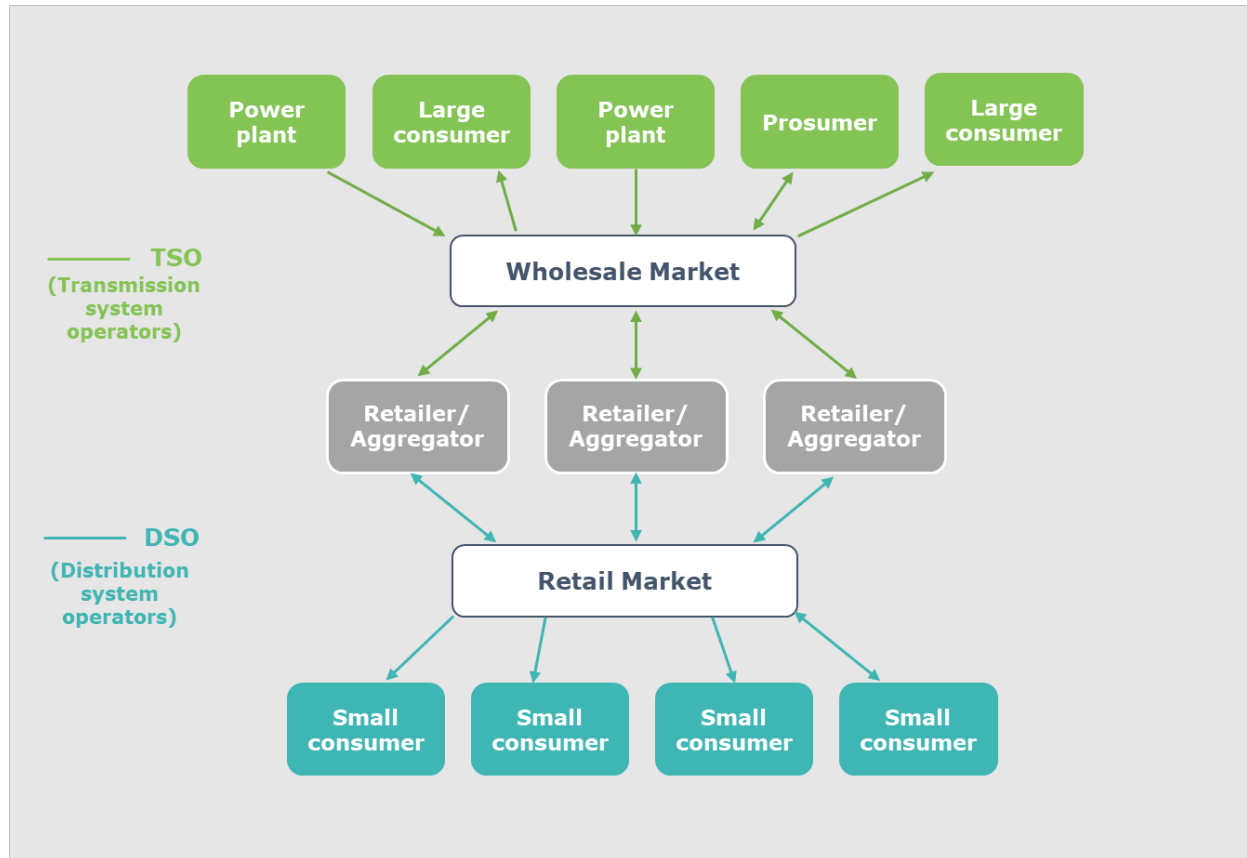


Figure 7 - Simplified schematic of the energy market value chain [16]

### **How they will use SATO**

An electric aggregator must negotiate with energy suppliers on behalf of the customers it represents. As such, an aggregator must act as the customer's agent. With SATO, aggregators will be able to provide energy balancing and flexibility services to DSOs. The integration of several SATO services will allow aggregators to reduce the electricity price, which is a consequence of the various flexibility events provided by the SATO platform. In addition, SATO will allow energy providers, that offer energy management and energy commercialization services to provide flexibility services (e.g., through the introduction of dynamic tariffs to consumers).

In the field of electricity transport, DSOs are responsible for the operation and the maintenance of the electric distribution grid. The SATO platform will allow DSO to obtain flexibility through the local market and guarantee the security and quality of supply. Moreover, the DSO can also detect problems at the low voltage level where there are greater control difficulties. Additionally, the TSO is responsible for transporting energy from energy producers to the distribution system, usually carried out at high voltage and very high voltage. The energy flexibility that SATO provides will allow the TSO to request more detailed information on the available energy flexibility which will result in a more efficient use of the energy flow and a more stabilized grid.

To summarize, grid aggregators can deliver value to customers through flexible services that leads to reduced energy bills and an efficient, customer friendly control system. Besides, the SATO platform will allow to customize demand-response contracts based on each specific customer's energy constraints and preferences. By using SATO aggregators can generate revenues by providing demand/response services to the customers, also receiving incentives from regulators, TSOs and DSOs, according to the specific regulations active in the market.

**Business model**

The SATO platform will provide energy monitoring, energy efficiency, energy flexibility, self-assessment and indoor comfort solutions for residential as well as for commercial and industrial buildings and will deliver insightful knowledge on users and buildings behaviour. Moreover, it will provide customised demand-response contracts based on customers’ energy constraints and preferences. It will bring the energy and electricity community together and will deliver value to customers through reduced energy bills with no initial installation costs.

The SATO platform and the related services will be offered through a Software-as-a-service model to customers through operative leasing, allowing for the use of the service for an agreed period of time against the payment of a fixed periodical amount, which will also cover the cost of the hardware components. Revenues for SATO could be obtained by providing consulting services to help customers plan and implement the SATO products and services. Key partners for the delivery of SATO are considered EDP and Siemens which in the forthcoming period of the project implementation in the pilots’ facilities will examine the services offered and evaluate whether a partnership would be beneficial. From the proposal phase already, both companies have expressed their willingness to evaluate the hypothesis of launching a joint venture company integrating the SATO layer on top of their existing platforms, which will be assessed according to the pilots’ validation.

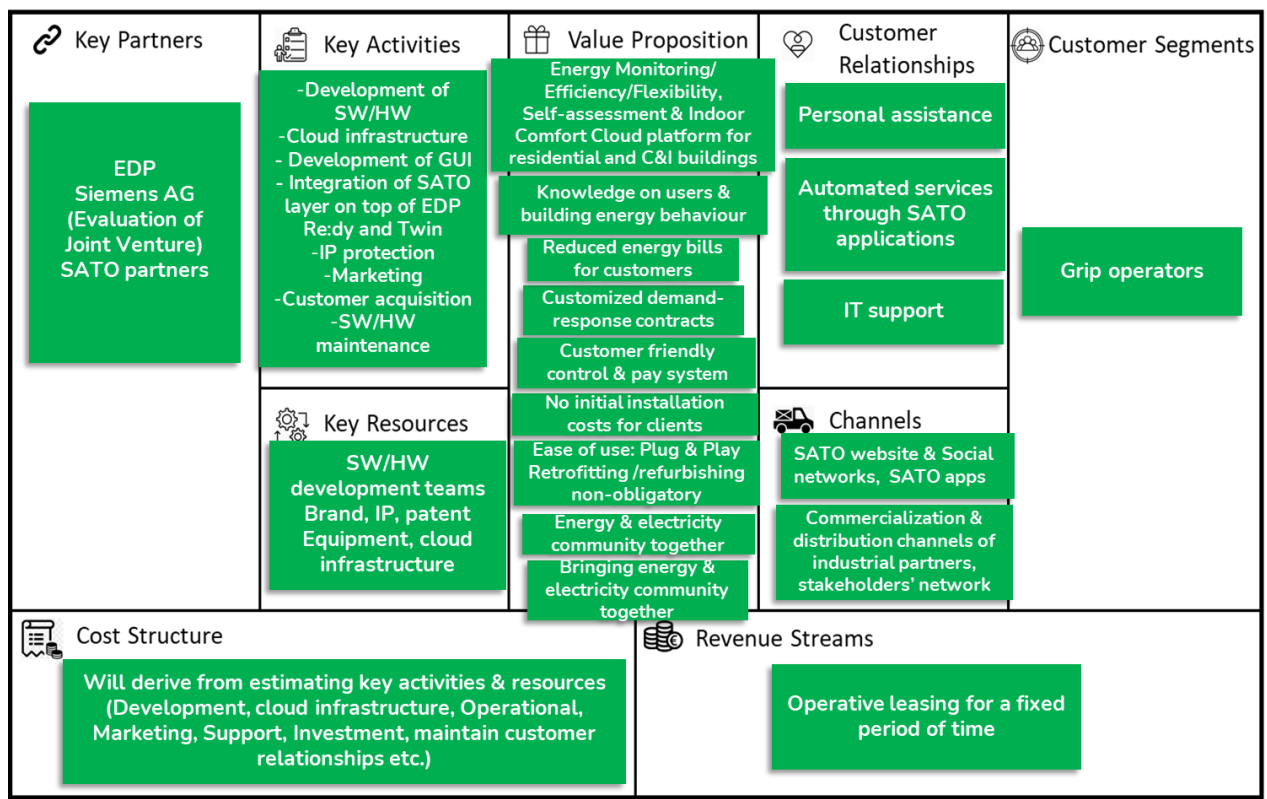


Figure 8 - Business model canvas for grid operators

**5.3.4. Business cases for Energy equipment and appliances manufacturers and retailers**

**5.3.4.1 Business case #4 for Energy equipment and appliances manufacturers**

Although modern smart devices and systems allow for remote monitoring and control, most systems cannot assess their energy performance. This inefficiency is even more prevalent in legacy equipment and appliances. Therefore, upgrading buildings, appliances and technical building equipment with energy

assessment capabilities is still a challenge that must be met to reduce the overall energy consumption of buildings and their equipment.

**Target customer**

The sensors and actuators with the enhanced capabilities that will be developed during the project, by EDP and Siemens, could be offered to manufacturers or retailers of energy equipment and appliances in an OEM business model. Manufactures can improve their energy performance capabilities through a ready to use quality sensor to cut down on lead time and research and development processes.

**How they will use SATO**

Energy equipment and appliances manufacturers could incorporate the sensors and actuators that will be developed in SATO into their products to offer not only monitoring and control but also energy performance assessment, through the SATO platform, of energy systems that will be able to reduce the energy consumption of the buildings that they are installed rendering them as more competitive products in the energy equipment market.

**Business model**

As mentioned above, this SATO product could be offered in an Original Equipment Manufacturer (OEM) business model and this could be an additional revenue stream for SATO that can charge the equipment and appliances manufactures with a license fee to embed and use the SATO sensors/actuators into their products and the various SATO services such as the Self-assessment framework, Self-optimization services, the SATO Platform and the SATO BMS. This will add monitoring, control and most importantly assessment equipment functionalities to the customers’ energy equipment and appliances. Simultaneously, SATO will benefit from the manufacturers and retailers’ channels and network to expand in the market.

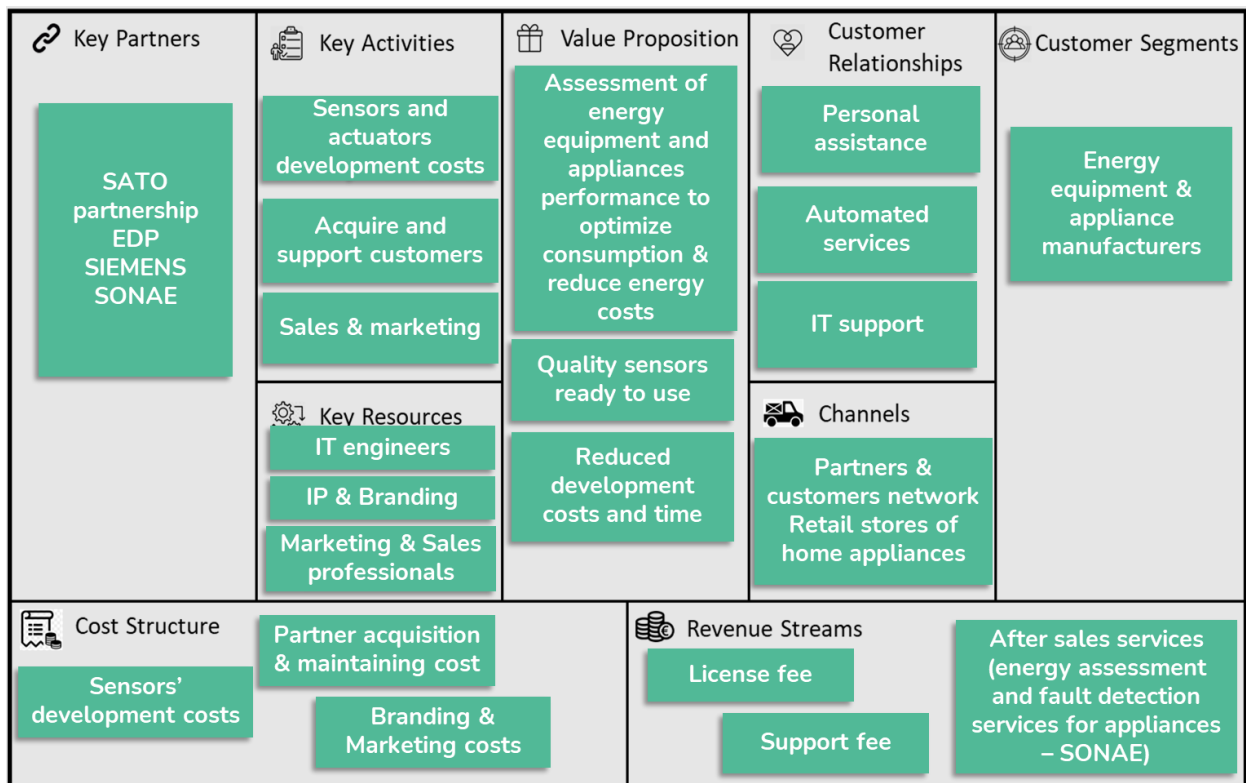


Figure 9 - business model canvas for Energy equipment and appliances manufacturers

### **5.3.4.2 Business case #5 for Energy equipment and appliances retailers**

Retailers are essentially actors who are engaging with customers. That being said, marketing is a core aspect of their activities. SATO could help them bridge the gap between smart and non-smart devices. Through SATO's capabilities, the device will acquire smart elements, essentially through its energy optimization. The benefits are that they increase their sales, improve customer experience by providing meaningful data to the customer regarding energy consumption and the appliance's operations. At the same time, they will gain profit from improving warranty existing structure, which is a core aspect of a retailer in physical devices.

#### **How they will use SATO**

One of the core elements of the retailer's business is marketing. Consequently, most of the activities of the retailers represent marketing activities and essentially how to maximise the customer's satisfaction. These activities involve bundling options to increase sales of appliances, optimising the warranties beyond the manufacturer's and improving the customer's experience and the lifecycle of his/her appliances through SATO's self-assessment framework and optimisations services.

#### **Business model**

The SATO platform will provide self-assessment and energy optimisation and ensure that the appliances perform at the optimal level. With the data, it would be easier to suggest ways to improve the current practices of operations, as well as when it would be the most economically feasible time to change appliances. Commercially, it could be offered by the retailer in the form of a bundle with an existing appliance, where the customer would purchase the platform and would then be required to pay a subscription fee to utilise SATO's services. This would be beneficial in increasing the sales for complementary products, essentially for non-smart devices.

Hence, the key activities would involve sales and marketing to increase the customer network and maintaining them. SONAE has expressed interest in developing innovative post-sale energy and equipment fault assessments, as well as contributing to a database of real-life energy performance of appliances. Therefore, under specific partnership agreements there could be an option of offering after-sales services through its consumer electronics business, to be tested with customers and respective home appliances acquired by Worten's (supplier of consumer electronics goods managed by SONAE) customers and functioning in their homes. As for the key resources, beyond the ones already discussed in the main business canvas, the network of stores also represents an integral asset of the retailer, as it increases the physical presence of SATO. Thus, bigger retailers with a considerable number of stores would be preferable. As it has been already discussed, marketing and sales professionals would also be a key resource in maximising the utility between SATO's platform and the retailer.

The cost structure is shaped through platform development costs. Logistics is a key cost component in this use case, as it is directly correlated with the retailer's network of stores. Moreover, partner acquisition and maintaining are also included in the cost structure. Finally, it involves branding and marketing costs. As for the revenue streams, SATO is expected to monetise its activities through the sales of the platform and the impending subscription fees.

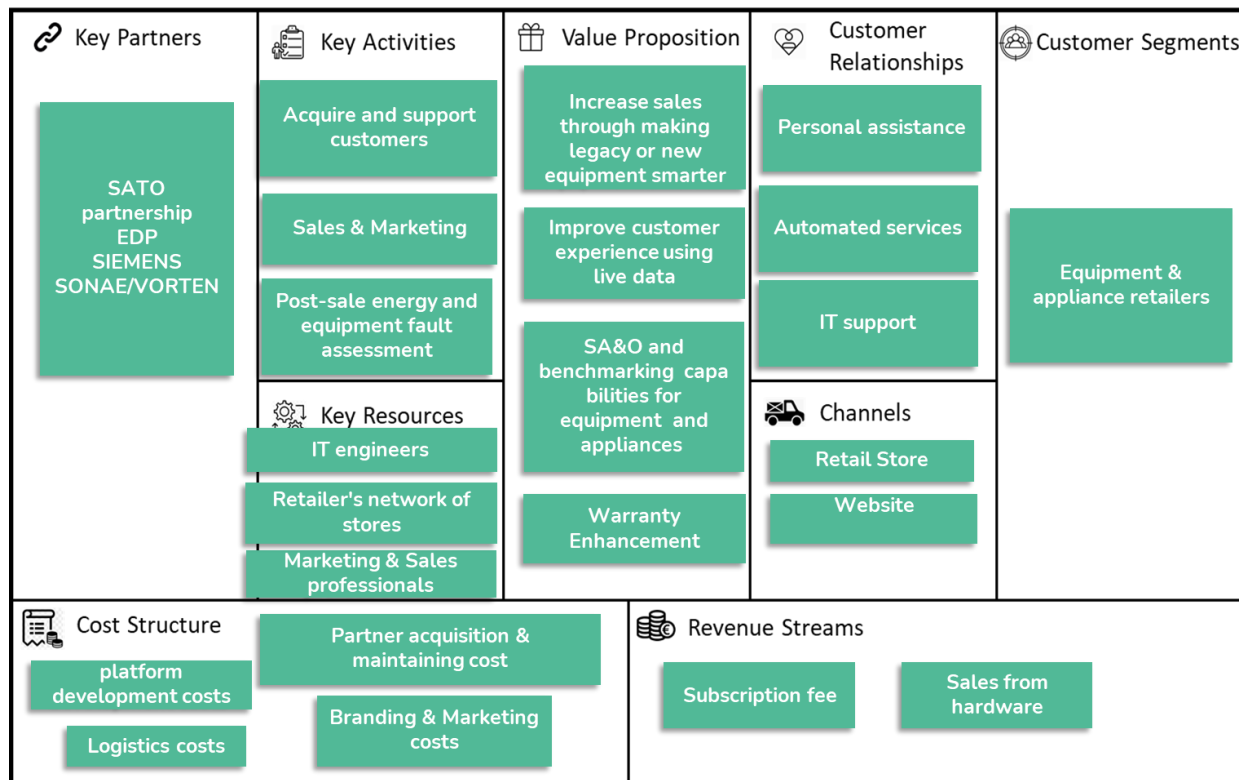


Figure 10 - Business model canvas for equipment and appliance retailers

### 5.3.5. Business case #6 for Third party companies developing buildings energy management services

SATO is based on an architecture relying on a strong principle of clear separation of concerns between layers, by establishing well defined interfaces at layer boundaries which guarantees a generic platform capable of supporting the creation of an open competitive market for third party development of energy assessment services for residential and service buildings. Organised around the idea of implementing interoperability between two existing building management platforms and modern smart systems, the platform serves as an aggregated data and control logic platform that enables the integration of all data sources from upgraded residential or service buildings energy systems and appliances. In this way, SATO will deliver a unified platform that enables an open market for development of energy management services.

#### **Target customers**

In that sense, SATO platform could be offered to third-party companies that develop building energy management services as a cloud-based application that supports data exchange with IoT enabled devices, self-assessment and optimization (SA&O). It introduces standardized web-service REST interfaces and APIs that will use a common communication framework for a seamless integration in the platform.

#### **How they will use SATO**

Third party companies developing buildings energy management services are basically the customers that will be offered access to the SATO platform, which is a cloud-based environment where they can develop, manage and deliver their applications, while SATO partnership will provide the underlying infrastructure.

**Business Model**

This platform as a service model (PaaS) could offer to third party companies a platform ready to use, avoiding the development costs of it and focusing only on the development of their service, while offering them an environment where they can build and run their applications and provide it to a pool of users already available, as potential customers, without having the costs and efforts of their acquisition. The commission model could be an effective revenue model where SATO could monetize every time a user pays for a service or product. Another way to create revenue streams is by applying subscription fees or by taking a percentage form specific term-based licenses with the developing companies.

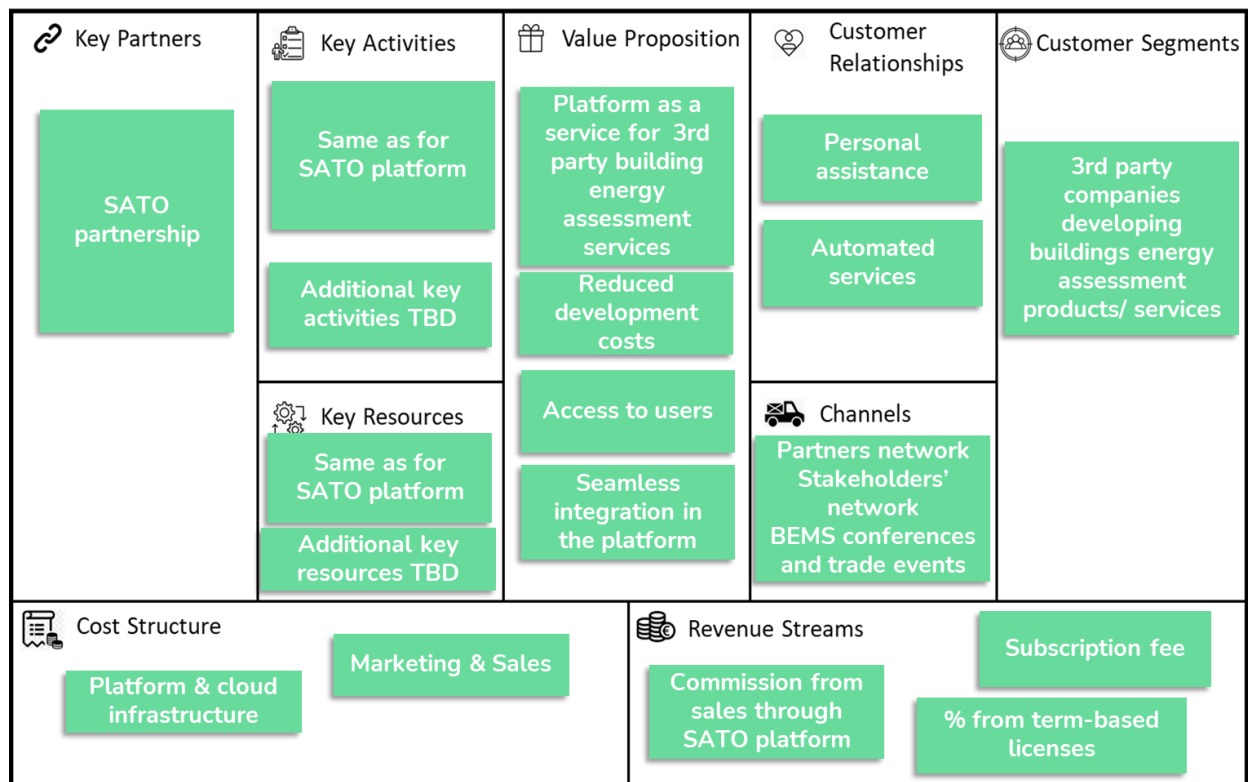


Figure 11 - Business model canvas for developers of energy management services

**5.3.6. Business case #6 for Energy consulting companies**

More and more companies worldwide are embracing a green building approach for their properties to achieve energy efficiency, reduction of carbon footprint and increase in value by green certification. Building’s construction and energy sustainability consulting companies are aware that this is also an opportunity for their business and services offered.

**Target customer**

SATO will offer its’ energy assessment and optimization capabilities to the knowledge of buildings construction and energy consulting companies that work in the field of energy efficiency, renewable energy generation and green sustainability of buildings. To trigger energy efficiency measures that could optimise energy performance and reduce the carbon footprint of their customers in the long term in their energy consulting projects.

**How they will use SATO**

Buildings construction and energy consulting companies could use the SATO platform and especially the SATO Self-Optimization and Self-Assessment services to provide consulting to potential customers that want to proceed in energy management and efficiency projects in new and existing buildings. With SATO such companies can identify actions and measures in an automated and fact-based way helping to reduce



engineering costs and improve quality of consulting services. SATO will help to trigger informed decisions of energy efficiency or energy renovation actions for their customers and promote green certificates and buildings’ sustainability. Additionally, they can use SATO to prove the success of implemented actions and measures to their customers.

**Business Model**

SATO services could be offered in various ways to create revenues that include energy consulting companies paying per project or per service used. Otherwise, there is the option that energy consulting companies pay SATO subscription fees to use the service or term-based licenses could also be applicable. Lastly, SATO partnership could create revenues from delivering training to potential users of the platform and its’ services.

Besides that, EKAG that is a SATO partner and experienced consulting company in the field of energy efficiency, renewable energy, building physics and green sustainability is interested to contribute to the development and use the developed assessment and optimization platform in future projects and incorporate the new knowledge into its customer consulting services to push ahead the smartness and efficiency of existing and new buildings.

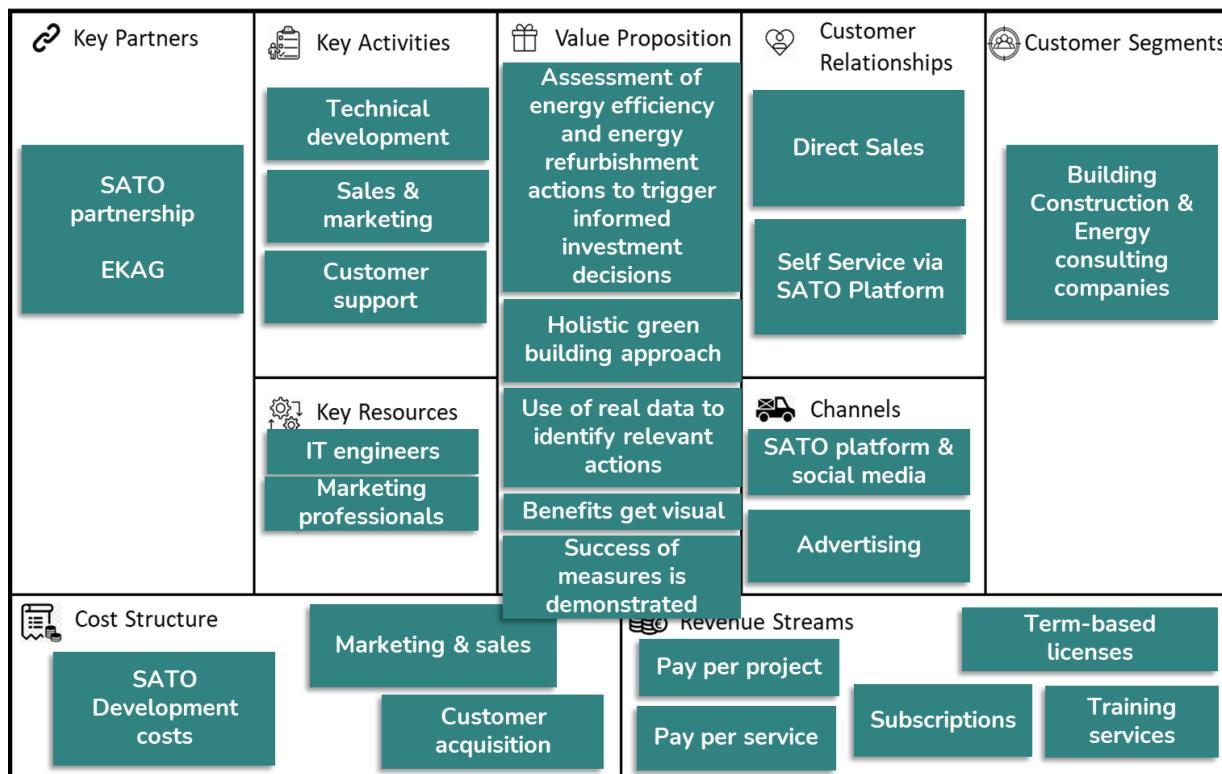


Figure 12 - Business model canvas for energy consulting companies

**6. Conclusion**

The SATO platform is a well designed technological innovation making simple and attracting its components to the customer asegments and its end-users.

The main busines cases so far, reveal the fact that most of the customer segments will beenefit from SATO platform in the everyday life and activities. Services and applications such as a connection to existing C&I building management systems in place as plug and play with specific communication protocols that ensure interoperability, or flexible services that leads to reduced energy bills and an efficient, customer friendly control system, or a cloud-based environment where an electricity related company can develop, manage and deliver their applications are identified as breakthrough innovations

that add value for the customers not only cost wise but by upgrading the quality of their activities as well.

The project's following technical and demonstration activities will offer important information about user's reactions through the engagement with the SATO services, the performance of SATO platform during the pilots, and its' cost structure. These future activities will help us define SATO's final business models which will be validated in WP7 and will be reported in the second version of this Deliverable (due on M36).

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