NEW BUSINESS OPPORTUNITIES

DSM AND ENERGY EFFICIENCY INITIATIVES

EDP GROUP 2018

CONTENTS

1. FRAMEWORK

In recent years, Energy Policies worldwide have reinforced the need to promote the improvement of energy efficiency and, in some cases, such as in Europe, set ambitious goals and introduce new challenges/opportunities for the business sector. The current framework – "Clean Energy for All Europeans", including a a reload of EU legislation (e.g, Energy Efficiency, Renewables and Energy Performance of Buildings Directives) - envisages to achieve the 2030 32,5% headline target on energy efficiency and to pave the way for further energy efficiency improvements beyond that date.

Under this framework, Portugal set the ambitious target of 35% minimum reduction of primary energy consumption in 2030 and Spain 39,6%, supported on the National Energy and Climate Plans (NECPs) - https://ec.europa.eu/energy/en/topics/energy-strategy-and-energy-union/governance-energy-union/national-energy-climate-plans.

These ambitious goals, combined with the market opportunities they induce, have led to the development of demand-side management initiatives, for instance in the fields of energy efficiency, fuel switching and load optimization. Additionally, the economic crisis experienced in southern Europe increased the appetite for energy savings that can be achieved through energy services.

Active promotion of demand side management is one of the top commitments of the EDP Group, along with the anticipation of customer needs. In this context, EDP adapted its organizational structures, business models and operational plans in order to strengthen its leading position and benchmark in the global energy market, by developing and offering their customers innovative products and services related to energy efficiency and distributed generation, supported on communication campaigns and partnerships with other operators in the industry.

EDP has assumed energy efficiency as one of the most material issues for the company's performance with high impact on our business, in line with its climate strategy.

Moreover, EDP considers innovation as a key element to energy efficiency improvement. Under this framework EDP Group implemented an innovation governance model based on 5 strategic areas: Cleaner Energy; Smarter Grids; Customer- Focused Solutions; Data Leap and Energy Storage.

In order to promote the deployment of energy efficiency, EDP also created synergies for increasing energy efficiency through the management of the distributed generation/storage/consumers.

In this respect, EDP assumed the following commitments:

Generate Economic Value		
Provide customers with continuous access to energy efficiency products and services: Reduce overall consumption by 1 TWh before 2020 (against 2014 levels).	Encourage partnerships in promising and unproved clean energy technologies, energy efficiency and smart grids research, by investing €200M in innovative projects by 2020.	Expand the installation of smart meters to more than 90% of EDP's low voltage power network delivery points in Iberia by 2030, utilizing new smart grid technology.

Moreover, on an Iberian level, three strategic objectives regarding the commercial activity were set in the Business Plan for 2016-2020: to maintain the energy market leadership, to be the preferred company to customers and to have oriented profitability.

In Brazil, as a strategic objective for 2020, EDP aims to achieve an excellent service to customers by improving supply quality, and thus ensuring high levels of customer satisfaction. EDP Brasil strategy further contemplates specific positions and developments to each of its business units. For Commercialization and Energy Solutions, the main strategy is to consolidate leadership position on the supply and services segment. This includes a set of activities focused on development of energy services offer with higher added value (Energy Efficiency, Distributed Generation, among others) and growth through the acquisition of an energy services company (APS – Soluções de Energia). For the regulated market, the National Electric Energy Agency (ANEEL) imposes to distribution companies the regulatory obligation to apply 0.4% of its net operational revenues in energy efficiency projects, according to specific criteria, and 0.1% for the National Program for of Electric Energy Conservation (PROCEL).

Antecipating the new energy paradigm, we are convicted that EDP is preparing its presence in a future where production, distribution and consumption will be increasingly decentralized. Therefore EDP provides a range of energy solutions oriented to the specific needs of the differents customers' segments, through a diversified offer of competetitve products and services.

Among these services, sustainable mobility is a key issue for society and one of EDP's priorities. This is one of the areas that will most affect the energy sector and will be essential for the decarbonization of transport, which currently accounts for about 24% of global CO2 emissions. For EDP, the decarbonization of the economy involves a significant increase in the penetration of production from renewable sources, followed by strong energy consumption electrification, in particular in the transport sector.

In the following chapters we detail this diversified offer (chapter 2) as well as the initiatives related to energy service provision (chapter 3), namely those that allow customers to change the amount and/or timing of use of electricity in response to supply conditions: smart grid paradigm, electric storage and other services.

In summary, the present document focus on customer solutions, which covers energy efficiency products and services offered by the supply companies (EDP Brasil, EDP Comercial, EDP España and EDP Serviço Universal), as well as projects and initiatives that are being developed by EDP Distribuição (distribution company in Portugal) and EDP Inovação (innovation company), regarding smart grids, electric storage, microgeneration and other services.

2. CLIENT-FOCUSED PRODUCTS AND SERVICES

Throughout its value chain, EDP makes available a wide variety of Energy Services related to its electricity and gas activities, ranging from the ashes and gypsum resulted from the electricity generation, to the decentrilized solar solutions offered by the supply companies.

Energy services are classified into ten categories, which were established within the EDP Group by taking into account the comprehensive concept proposed and developed by Bertoldi & Rezessy of the European Commission (Energy Services Guide for the EDP Group):

1. Energy analysis and audits.
2. Project design and implementation.
3. Energy management.
4. Monitoring and evaluation of savings.
5. Maintenance and operation.
6. Property/facility management.
7. Energy and/or equipment supply).
8. Provision of service (space heating/cooling, lighting, etc.).
9. Integrated energy systems[1].
10. Other energy services.

The set of measures envisaged in the European Commission's Winter Package of Dec 2016 "Energy Clean For All", in the downstream segment, retail and services, where Europe wants to strengthen customer protection, renewable energy penetration and energy efficiency targets and consequent reduction in emissions, are in total alignment with EDP's vision in the commercial business and business targets. Since 2009, EDP Comercial (EDPC) has been developing a strategy and enabling the organization to leverage the technological change and acess in the energy retail market to develop and commercialize innovative offers of decentralized generation, distributed storage and electric mobility with increasingly scale in the retail market.

In terms of business alignment via KPI's, EDP Group has implemented sustainability indicators for all companies, areas and employees since 2017, which in case of EDPC enables the development and achievement of the DSM and EE strategy and targets. Specifically, in addition to energy efficiency revenues (10%) and customer satisfaction (10%), the company's KPI still has an indicator of corporate sustainability performance (5% weight) and all areas and employees define the most appropriate to its area of work, with the validation of the sustainability and corporate center, in order to ensure alignment with the main drivers of value creation in the medium term. Energy Efficiency – EDPC top material issue – results of its strategic exercise of sustainability materiality with the top management and first line directors, focusing EDPC as a development platform of innovative business models and development of attractive DSM and EE value propositions for retail customers.

[1] New category, introduced by the EDP Working Group, when services cover more than one category.

ENERGY SERVICES

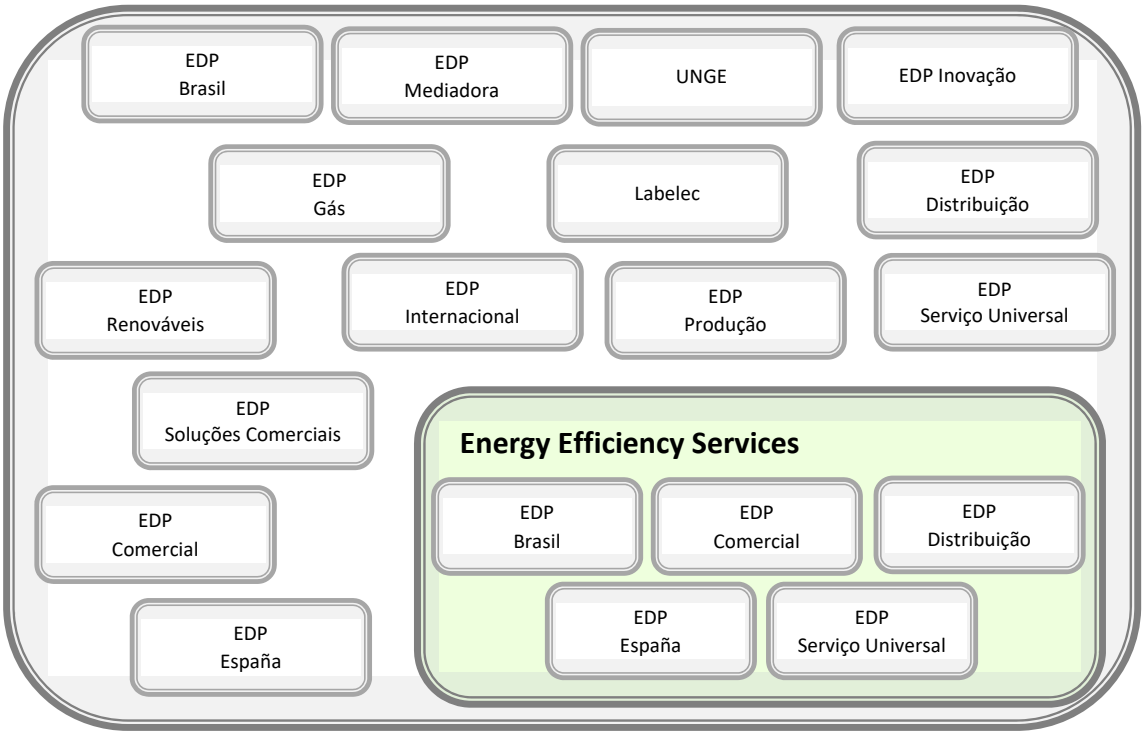

Figure 1- EDP Companies involved in energy services initiatives

The following subchapters approach refere to the Business Units that are involved in energy efficiency services.

2.1 BUSINESS UNITS

EDP Brasil

EDP Brasil plays a key-role in consolidating new energy services businesses, strengthening the development of both energy efficiency and distributed photovoltaic generation projects, as well as investments towards transmission, which ensures EDP Brasil's operations in all segments of the eletric sector.

In 2015, EDP established commitment of expanding portfolio in energy efficiency services through the acquision of APS – Soluções de Energia, which operates mainly in energy management systems and replacement of obsolete equipment for efficient devices. In 2016, the integration of the former APS, an energy efficiency company with 23 years of existence, was concluded. The successful process brought EDP Culture to the new associates, which are now part of EDP Soluções em Energia (Energy Solutions).

EDP Brasil has also entered the photovoltaic distribution generation market with the beginning of EDP Solar implementation. The new operation follows ANEEL Resolution no. 482/2012, which established rules so that consumers can generate their own energy with injection of surplus energy into the electric grid, in a credit compensation system for the consumer's favour. Along with EDP SOLUÇÕES EM ENERGIA

(Energy Solutions), EDP's branch for photovoltaic projects compose a business unit called SERVIÇOS (Services).

In 2018, through SERVIÇOS (Services), EDP signed an agreement with one of Brazil's major banks (Banco do Brasil) for the construction of a 5 megawatt-peak (MWp) solar plant, which will be responsible for providing 100% renewable energy for 58 branches of Banco do Brasil in the state of Minas Gerais.

In 2018, EDP Soluções em Energia (Energy Solutions) implemented energy efficiency projects which resulted in 84.74 GWh savings on energy consumption, averting 37.751 tCO2e on GHG emissions. Moreover, aligned with electric mobility, the Company has teamed up with BMW Group to build an electric vehicle charging corridor. The corridor was officially lauched in July 2018 and connects São Paulo to Rio de Janeiro, the two largest cities of Brazil.

In addition to the energy services offered by the services companies, EDP in Brazil also develops energy efficiency programs for low income customers and non-profit organisations, through its distribution companies – EDP São Paulo and EDP Espirito Santo. These programs are part of a legal obligation of Brazil's electric sector. Since May 2016, distributors have to allocate 0.4% of their net operational revenue to energy efficiency programs, on a yearly basis. Prior to that, the mandatory allocation percentage was 0.5%, according to the national regulatory entity requirements (ANEEL - National Agency for Electrical Energy). In 2018, EUR 6.87 million were invested in such initiatives, which led to energy savings of 9.6 GWh/year (São Paulo) and 7.44 GWh/year (Espírito Santo),

In total, both efficiency Program and energy solution projects undertaken by EDP Brasil ensured 103.95 GWh on energy savings for the customers.

In 2018, EDP Brasil enlarged investment towards transmission and distribution assets as expanded participation to 23.56% equity stake of CELESC, the largest energy comercialization and distribution company of Santa Catarina. As a result, EDP became the largest shareholder of the Company.

With regards to energy transmission, EDP Brasil invested EUR 72 million to expand the business, an increase of 836,9% in comparasion with 2017. The Company concluded the year of 2018 operating with 113 Kilometers of transmission lines in the state of Espírito Santo, and four other lines in process of construction. The line in operation was launched 20 months prior to the regulatory deadline, which corroborates EDP Brasil's excellence and high standard performance in executing investment commitments.

EDP Comercial

Since 2009, the organizational structure of the Commercial area has also made yearly reorganization steps to become a more competitive company, innovative and agile enough to take less time to market and lead the energy and service markets in the new energy transitions to new energy paradigm, in the retail market of new downstream, and meanwhile become the preferred company of customers.

During this period, from 2012 to 2018, EDPC has promoted several protocols (#12) with sectorial and business associations to promote Energy efficiency opportunities covering some of the more intensive processing industry as plastic, ceramic, chemistry, melting, textile and metallurgical as well as the fast-growing tourism sector.

In the new Business Plan for 2016-2020, EDPC has defined a set of strategic objectives for the B2C and B2B segments, regarding not only electricity but also new products and services aligned with smart grid

solutions and reinforced the commitment to develop the energy solutions offer as an important differentiator and additional source of revenues and profitability.

The 2020 targets have also been declined in annual targets and specific action plans and commitments of each company. Highlight for the 5 strategic priorities for 2018 for EDPC are: Focus on customer retention; Maintenance of high levels of customer satisfaction; Maintenance of the already high penetration rate of the dual Iberian offer; Increase in the penetration rate of services in Iberia; Extended supply of energy services in 3 geographies.

In 2018, numerous macro initiatives were maintained to boost the business, residential and innovative energy services offer, worth highlight:

In B2B, continued our effort to promote bundle offers, putting together electricity and energy efficient services. Some successful examples of this approach include Millennium BCP, Silvex, Universidade Nova de Lisboa -SBE and SLB -Sport Lisboa e Benfica.

Our portfolio of energy and efficient services continues to grow. In energy, we began negotiations with specific clients regarding new contract forms like Renewable PPA - Power Purchase Agreement, following the same approach of EDP in Spain.

To boost energy efficient services in SMEs EDPC launched a self-service digital platform – save to compete (http://www.edp.pt/save-to-compete) – that allows clients to design their own energy efficient solutions. Total amount of sales reached 8 M€ using this new channel in 2018. Partnerships with business associations was also reinforced and used as a channel to promote save to compete program. In 2018, Save to Compete program won the “Prémio 5 Estrelas” (Five Stars Award), regarding the category Energy Efficiency B2B (https://premio.cinco-estrelas.pt/vencedor/edp-2019/edp-save2compete/).

It is also important to mention the participation in the PPEC program, with 13 initiatives to reduce the energy consumption in B2B segment. This program represents a total sales amount of more than 10 M€ in energy efficient solutions.

To communicate all these new business strategies, we have been intensively using digital channels like our own website edp.pt, LinkedIn, YouTube, customized email marketing and google AdWords.

In B2C, the launching of the new commercial concept - the EDP Smart Home EDP - that brings together Solar Energy, Batteries, Electric Mobility and EDP Re:dy offerings which allows remote and convenient monitoring and remote control of energy production and consumption, and which positions EDP in the emergent new downstream energy market. This concept won the world energy retail award in Barcelona in 2017, which awards innovation in retail to the level of customer relationship and new models of energy retail.

The EDP Re:dy app won a prize at the World Summit Award 2017 - a competition launched by the United Nations to recognize the best creative applications and interactive content. The app was awarded in the “Environment & Green Energy” category.

Also, in B2C, main achievements in solar energy worth emphasize: with the installation of more than 20.000 solar energy systems, we managed to lead this emerging market with an 80% market share in solar. EDP launched last year, energy storage solutions associating lithium batteries with solar energy.

In 2018, EDPC has generated EUR 66.5 million (vs. 2017 = EUR 49.9 million) in energy efficiency services, including, for instance, energy audits and certifications, Save to Compete program and initiatives under

the Plan for Promoting Efficiency in Electricity Consumption (PPEC), promoted by the Portuguese Energy Services Regulatory Authority (ERSE - http://www.erse.pt). Please see EDPC's website with all offered products and services (https://www.edp.pt/).

Taking into account the leadership of EDP in the electricity supply market in Portugal, as well as the growing market's appetite for Energy Efficiency solutions, EDP remains in an excellent position to lead this market for energy services (as the main Demand Side Manager enabler) and maintain at the forefront of business models innovation, continually developed in pilot tests, with the support of EDP Inovação and external suppliers for further dissemination in the market.

In addition, EDP has focused on the area of electric mobility, being a priority in the group's strategic agenda. Not only motivated by the responsibility of responding to customers' needs, but also by believing that, in the long term, mobility will be an important business growth vector. EDP also argues that a collective effort is needed to ensure that transport makes the necessary contribution to the decarbonization, through a growing electrification of the fleet.

- The EDP group's commitment to this area has been to raise awareness and promote electric mobility, now materializing this objective in the launch of ED.X, a counseling app that supports future users in the adoption of electric vehicles.
- In October, EDP also launched a new solution for customer charging stations in partnership with Efacec - EDP Wallbox, also available as a monthly subscription model, incorporates the edp re:dy system.
- One of the main issues that EDP has been addressing is shared parking in condominiums or other private shared spaces. In this sense, EDP is developing a solution that will make it possible to differentiate the consumption of electric charges from other consumptions, facilitating payment by each user.
- EDP is investing in a new network of fast electric charging stations for company fleets. This network, which will be complementary to the public infrastructure of loaders, represents an important step in the mobility strategy of the group and gives a clear response to the growing consumption needs and the challenges currently facing cities in urban planning.
- In the B2B plan, EDP has been addressing players in the area of shared mobility and feedback has always been in the sense that they want to increase the electrification of their fleets. And, therefore, EDP is also betting on the development of solutions for this segment.
- In the public network, according to the model defined by the management entity Mobi.e, in a fast charging station, the customer has paid since November 1 a component related to the use of the station (OPC tariff), to which is added the value of charged energy (CEME tariff) and the cost of taxes.
- The advantages of EDP's tariff, the most competitive in the market, are:
    - It is the simplest for the customer: it pays the same for the energy regardless of the time and day to which it charges;
    - For customers with an EDP energy contract at home, the CEME tariff has a discount of 25%;
    - In addition, and for customers with EDP Wallbox (home charging solution), we offer a flat rate plan for the house with a 20% discount in the empty period (night time, where the shipments are concentrated). Thanks to the incorporation of the re: dy consumption management app, EDP Wallbox ensures a more efficient management of loads. If you

opt for this solution, customers can save 36% in the face of electric charges away from home.

- For cards activated until the end of the year, EDP also offers the energy consumed in any fast charging station in the Mobi.e network until April 30, with a limit of 1500 kWh.

EDP Distribuição

In what concerns energy efficiency, EDP Distribuição, as the Portuguese Distribution System Operator, has a public obligation and a mission to promote energy efficiency, contributing to a more rational use of electricity, endogenous resources and reinforcing its position in terms of innovation and sustainability.

With that goal in mind, EDP Distribuição has established partnerships with Universities and Research Centres, namely to develop the smart grid concept, an essential axis of the European energy policy with demanding goals on emission reductions, energy efficiency, integration of renewable energies and a more proactive role of the final customers.

Regarding the InovGrid Project led by EDP Distribuição, it was recognised at international level, considered by the European Commission, Eureletric and the Joint Research Centre as the reference project out of over two hundred currently ongoing smart grid projects in Europe.

In the Business Plan for 2016-2020, EDP Distribuição has defined a set of strategic objectives, which include the investment in innovation to contribute, for instance, for sustainable mobility, smart grids and other products and services that promote energy efficiency and savings. EDP Distribuição prepared in 2016 the Development and Investment Plan on the National Distribution Network (High Voltage and Medium Voltage network) for the 2017-2021 period, which was approved by the Portuguese Government in June 2018. This plan includes EUR 30.9 million (primary costs) associated with the promotion of access to new services, which comprises the promotion of Smart Supervision, Operation and Telecommunication Systems, and Innovation, fostering the transition towards a smart grid..

In 2018, EDP Distribuição installed around 680,000 smart meters in end-user's facilities.

EDP Distribuição has also been promoting the improvement of its office buildings energy efficiency, taking into account national and EU policies, namely the 2012/27/EU Directive. Hence, as an energy efficiency measure, EDP Distribuição installed 243 kWp PV self-consumption production units . This measure reduces the building's energy depency on the electrical grid and its greenhouse gas emissions.

EDP Distribuição is also developing new projects regarding electric mobility "smart charging", which will not only help mitigating the challenges that arise from charging electric vehicles but also has the potential for reducing the cost and time frame of grid connection, allowing value stacking from system services and increasing the distribution grid utilization as well as renewable penetration.

EDP España

In Spain, Energy Efficiency activities have been carried out since 2010 by the Energy Services Company. The aim of this unit is to develop and coordinate the necessary mechanisms to achieve an appropriate positioning of the energy services business, allowing the Group to expand its commercial offer. Promotion of Energy Efficiency is namely encouraged through the website https://www.edpenergia.es/eficienciaenergetica/es/, which describes the activities undertaken by the Group and details the products and services offered by segments and technologies: optimisation and

consumption management, facilities management, distributed generation and integrated energy solutions.

During 2018, EDP Energy Services saved around 17.5 GWh, avoiding the emission of 4,250 tCO2.

In 2018 important sales values were reached with a turnover of 16.8 M €. For this result, we would highlight the Doy project, whose implementation will begin during the first quarter of 2019, with an amount of € 9.6 million, and the increase in business in Building, with a turnover in excess of € 5 million.

In 2018, important infrastructure projects were also implemented that allow us to look optimistically at 2019. On the digitalization front, we advanced with the use of the Save to Compete 2.0 platform to serve the SME market, we reformulated the offer focusing on products with more value and the technical commercial process.

An important highlight for the development of the self-consumption solar offer for B2B with the first sales in the last quarter of 2018.

EDP Inovação

EDP Inovação is the key promoter for innovation within the EDP Group. It was established in 2007 with the objective of creating an autonomous entity responsible for internal innovation activities as well as fostering stronger links with the interpreneurial ecosystem.

EDP seeks to integrate in it's business new technologies, processes and products, as well as innovative business models, in order to enhance competitiveness and create value for stakeholders. EDP Inovação follows an Open Innovation philosophy that engages and promotes adoption both from within and without.

Among the innovation tools that EDP Inovação has establisghed to foster and interact with startups lie the startup engagement program (EDP Starter), the acceleration program (EDP Open Innovation) and the venture capital fund (EDP Ventures). These act at different levels of startup's maturity in order to support them from inception to investment.

The Governance model for Innovation in the EDP Group is based on five strategic areas:

- **Client-focused Solutions**, addressing retail, and focusing on diversification, by channelling its innovation work towards a wider range of supply with innovative products and services and new business models and improved customer satisfaction and involvement. The solutions developed seek to transform EDP into an agile, customer-oriented company through intelligent pricing and aggregation systems, energy efficiency and increased electrification;

- **Smarter Grids**, focusing on the development of smart grid infrastructures and customer-focused applications and operations, to ensure that their central role in the energy system meets business needs. These new smart grids will have to address, in particular, energy efficiency improvement targets, with the growing integration of intermittent renewable sources, as well as the increasing penetration of electric vehicles and storage;

- **Cleaner Energy**, focusing on identifying and promoting the development of new energy generation methods through renewable sources or through reductions in greenhouse gas emissions and new technologies to improve the operations and efficiency of existing energy production assets;

- **Data Leap**, a cross-cutting area, which seeks to leverage the latest developments in Information and Communication Technologies (IT) to accelerate innovation in all business areas. Its main focus is the use of new ICTs, such as Big Data, Cloud Computing, Advanced Analytics and the Internet of Things and the identification of opportunities for operational optimization and business development through digital innovation and data use.

- **Energy Storage**, seeking to understand the rapid changes in energy storage technologies and their application to energy systems. The challenges of intermittent power, microgeneration, electric mobility and increased customer training require technological solutions that increase the flexibility of electrical systems in which supply and demand must be constantly balanced. Storage is therefore a key tool in addressing these areas throughout the energy value chain.

For each of these strategic areas there is an Innovation Workgroup operating under the sponsorship of EDP Group's Executive Board.

EDP Serviço Universal

EDP Serviço Universal is the portuguese last resort supplier, and its main activities include the acquision of all the Special Regime generation (Renewables + Cogeneration) and in spot and future markets the real consumption of its customer's portfolio, as well as the supply of electricity to final customers, under regulated tariff.

According to these business principles, the company assumes as a fundamental pillar of its relationship with the customer the delivery of an exemplary commercial service (in accordance with the standards set by the quality of service regulation) and the ability to advise the client about the efficient use of electric power.

Providing information about market liberalization in Portugal, which is expected to be concluded by the end of 2020, will be maintained as a business commitment. Through the presence and remote contact, EDP Serviço Universal will provide all sort of clarification about how to move to the liberalised market and where the customer can find information about the commercial players available in the market.

Over the years, the customer has recognized the commercial quality of service and the company's commitment to do counselling on savings in energy consumption. This result is reported in the annual market research directed by EDP Serviço Universal Service and management information monitored by the Portuguese Energy Services Regulatory Authority (ERSE - www.erse.pt).

From 2014 to 2016, EDP Serviço Universal has generated EUR 744 thousands revenues in energy efficiency initiatives under the Plan for Promoting Efficiency in Electricity Consumption (PPEC), promoted by ERSE.

The investment in 2016 amounted to EUR 1.1 million and it is expected to reach EUR 690 thousands in 2017 and EUR 700 thousands in 2018.

2.2 PRODUCTS AND SERVICES

In 2018, the EDP Group generated around EUR 151 million revenues from energy efficiency products and services (+13% than in 2017).

Some of these products and services are described in the following subchapters, by energy services category, and main improvements during 2018 are highlighted.

For each category, a brief description on the type of products and services covered is provided, based not only on the comprehensive concept proposed and developed by Bertoldi & Rezessy of the European Commission, but also on EDP's reality in terms of services provided throughtout its value chain (Energy Services Guide for the EDP Group).

1. Energy Analysis and Audits

The company acts as a consultant in energy rehabilitation, provides energy analyses for identification of actions with improved profitability to obtain the desired reduction in energy consumption.

1.1 Energy audits (Portugal | B2C and B2B segments; Spain and Brazil | B2B segment)

Energy audits are made available by EDPC both for B2C and B2B segments. In Spain and Brazil this services is done only for B2B customers. A remote auditing was launched to fasten penetration of this basic initial service. In 2016, following the publication of the Royal Decree 56/2016 in Spain, a periodic conduct of energy audits in large companies was made mandatory. This has triggered the contracting of this type of services by EDP, resulting in 34 contracts to audit 546 installations that consume 408 GWhe and 79 GWht.

In 2018, Equipment Check-up was launched as an integral part of the Funciona service, with 6557 check-ups being carried out. The Lighting auditing service was called Lighting Check-up, and 7040 check-ups were performed with 53993 lamps installed.

1.2 Energy certification (Portugal and Spain | B2C and B2B segments)

Energy certification are available for both B2C and B2B segments in Portugal and Spain, with EDP quality assurance, which is mandatory when buying/selling real estate.

In Portugal, EDP is the market leader since 2012, with over 100.000 Energy Certificates issued to date, and maintained this leadership in 2018.

A gas certification service, aiming at facilitating gas contracting and subsequent promotion of the dual offer (electricity + gas) is also provided by EDP. In 2017 edp sold around 50.000 Gas certificates.

1.3 Improvement in power quality (Spain | B2B segment)

EDP identifies energy supply anomalies and alternatives to a better service supply, adjusting it to the requirements of the productive processes.

Also, EDP acts as a legal advisor to occurrences that affect the quality of supply.

2. Project Design and Implementation

This category includes the design of a project including demand management measures as a priority. Energy needs are covered by more efficient energy supply / equipment whenever economically feasible.

2.1 Efficienct Lighting (Portugal and Spain | B2B Segment)

EDP Comercial has developed an efficient lighting offer for B2B customers that guarantees companies the reduction of their costs, ensuring the maintenance of the luminous comfort levels of the installations.

Through the Save to Compete new platform, now it's possible for the client to simulate the annual redution potencial of each business electricity installation and choose between two different options: retrofit or replacement. Both solutions use more efficient and longer lifespan technologies, such as LEDs.

2.2 Advisory Energy Service (Portugal and Spain | B2B segment)

EDP acts as an energy advisor, allowing industrial and commercials customers to have a more rational use of energy, minimizing energy costs.

An on-site study is performed to understand the processes' requirements and to maximize fuel use efficiency.

Improving areas such as lighting, motors and variable speed drivers, climatization and heating and cooling processes are identified.

A detailed report is developed regarding the actual situation and the proposed measures. Assistance on measure implementation is provided.

In Spain, during 2018, the Customized Projects area analyzed 115 opportunities, for an approximate amount of 30 M€, being awarded 12 Projects for a total amount of 10.3 M€. Many of the open opportunities are related to electricity self-consumption projects due essentially to the regulatory change that took place in the last quarter of 2018.

2.3 B.O.T (Portugal and Brazil | B2B segment)

This service (Build, Operate and Transfer) includes the design, operation and maintainance of measures to achieve the final energy use defined in the energy contract.

3. Energy Management

The company acts as a consultant, providing energy demand management measures.

3.1 Energy management systems (Portugal and Spain| B2B Segment)

In Portugal, the "Gestão de Consumo" (an energy management system) is an energy service developed in-house that aims to simplify energy management for Industry and Commerce/Services sectors. Two innovative packs are available covering a set of services that simplifies regulatory, administrative and

operational requirements on energy management for customers. Companies may obtain online and in real time their electricity, gas and water consumption, perform historic analysis, consumption trends and benchmark analysis (https://gestaoconsumos.edp.pt/#login). This programme proposes 3 levels of services:

- **Light:** innovative, low cost service including electricity consumption (main electric meter);
- **Standard:** innovative service performing real time analysis of consumptions (electricity, gas, water and others), aiming at controlling, analysing, predicting and comparing partial inter-site consumptions within the company and carrying out national/international benchmarks;
- **Premium***:* Similar to the standard service, but customized to the client's business, with detailed models of analysis and advanced forecast of consumption, tariff simulation and personalised alerts in real time.

In Spain, a similar service is provided for the corporate and large customers segment – ACTIR platform. This service gives access to up-to-date information about customers contracts and was complemented in 2015 with "Óptima +". This service facilitates the energy management of the companies, through a system that allows the monitoring and supervision of consumption in real-time, receiving immediate consumption warnings for both active and reactive power.

In Spain, the Building service is a service focused on providing integral energy solutions for buildings in the tertiary sector, mainly Neighbourhood Communities. During 2018, a total of 569 bids were made, with 221 energy and services contracts between new contracts and renewals amounting to € 8.43 million. The portfolio managed by the area amounts to 413 installations. The installations, mainly centralised boiler rooms with a thermal power of 175 MW, consumed a total of approximately 199.1 GWh of natural gas during the year and provided heating and sanitary water services to more than 18,000 homes.

3.2 Energy management systems (Portugal and Brazil| B2B Segment)

In Portugal, there is a regulatory framework, the SGCIE (Sistemas de Gestão dos Consumos Intensivos de Energia - Intensive Energy Consumption Management System), that aims to certify and promote energy efficiency in the industry segment. This framework sets a compulsory certification for installations with consumption equal or higher than 500 tep/year.

In 2017, for communication purposes, EDP has built a new landing page in its website, with a interactive simulator that indicates to the client if it's a good opportunity and if it's mandatory.

An equivalent system is available in Brazil - SGE (Sistema de Gestão Energética – Energy Management (GE) System: control of the entire energy consumption (electricity, gas, water and others) aimed at reducing energy losses).

3.3 TRE (Portugal | B2B Segment)

EDP Comercial makes available an Operational Technician reponsible for the facilities (TRE - Técnico Responsável de Exploração), as well as for facilities well functioning and energy decision making.

4. Monitoring and evaluation of savings

The company acts as a consultant as part of an energy services contract.

5. Maintenance and Operation

The company acts as a consultant as part of an energy performance maintenance contract.

5.1 Funciona (Portugal and Spain | B2C and B2B segments)

After the success of this service in Spain in 2005, EDP launched it in Portugal in 2013. For the residential and business segments, EDP provides electricity and natural gas services regarding installation check-ups and repairs. It delivers technical assistance to the main kitchen appliances and urgent services whenever required. Together with equipment maintenance it contributes to the increase of the customers' safety , savings and comfort – **Funciona**.

In the recent years, the main novelty in Portugal was the launch of the light audit as an alternative to the installation check-ups which identifies the bulbs with potential for replacement and informs the customer about the best options to reduce lighting consumption in their home by changing to the LED technology. This was promoted through a dedicated ATL advertising campaign that emphasized the savings component of the product. There were also introduced several new features in the technical assistance part: partial payment of the spare parts used in repairs and their price guarantee together with the payment through the EDP bill.

By the end of 2018, around 340,000 customers had joined the service (approx. more 40,000 customers than in 2017).

In Spain, EDP offers two modalities for small businesses, which include the revision and maintenance of air conditioning equipment and appliances (Funciona Luz and Funciona Clima).

It is expected that, by 2020, there will be about 1 million customers in the Iberian market using this service.

5.2 Integra (Spain |B2B segment)

Energy service developed to provide facilities maintenance and technical assistance to customers, available in two levels of services:

- **base**, that includes planned maintenance and access to online systems for real time control of electricity consumption;
- **premium**, that includes planned maintenance, technical assistance, access to electric generator if necessary and the online system for real time electric consumption control.

For 2015, the offer was revised, some features were adjusted, the price reduced and other options added, such as the Technical Exploration Officer. For EDP Comercial customers, this service can be paid in monthly instalments. In 2017, a new service variant for low-voltage installations was launched. It is called 'Integra BT' and it attracted 101 customers.

5.3 RECS (Portugal | B2B Segment)

EDP offers an integrated solution for building certification under the Regulation on Energy Performance of Buildings (RECS - Regulamento de Desempenho Energético dos Edifícios).

In a first phase, an energy audit is conducted to identify improvement opportunities. The management of the HVAC systems is done in order to guarantee an efficient operation of the systems and to issue the energy certificate.

In 2017, for communication purposes, EDP built a new landing page in its website, with a interactive simulator that indicates to the client if it's a good opportunity and if it's mandatory.

6. Property/Facility Management

The company acts as a consultant, increasing the knowledge of end customers as owners/managers of facilities.

6.1 Facilities refurbishment (Portugal and Brazil | B2B Segment)

EDP conducts construction and refurbishment projects of electric or natural gas installations to adjust to customers' business needs.

7. Energy and/or Equipment Supply

The company provides power (green) under specific schemes and/or installs equipment and/or replaces obsolete equipment with more efficient devices.

7.1 PPEC (Portugal | B2C and B2B Segments)

EDP participates in the Plan for Promoting Efficiency in Electricity Consumption (PPEC) since 2007, promoted by the Portuguese Energy Services Regulatory Authority (ERSE - www.erse.pt). Launched every two years, PPEC is a voluntary project based on a national tender in which all electricity related entities might participate, encouraging the implementation of measures for the adoption of more efficient habits and equipment by the different segments - residential, commercial and services, industry and agriculture. The programme considers either tangible measures (e.g. variable speed drivers, high efficiency motors, CFL and LED bulbs, etc.) or intangible ones (e.g., awareness of good practice in energy use, education projects in schools, etc.). EDP is participating actively in PPEC through EDP Comercial, EDP Distribuição and EDP Serviço Universal.

In 2016, a new competition was launched to be implemented in 2017-2018. The EDP Group had 19 measures approved (3 more than in the previous competition), representing 67% of the funding available (http://www.erse.pt/pt/planodepromocaodaeficiencianoconsumoppec/ppec17-18/Paginas/default.aspx). It is estimated that the implementation of these measures will allow for savings of roughly 1,157 GWh and a reduction of 428,105 tonnes of CO2, considering the lifetime of the equipment.

Table 1 – 2017-2018 PPEC Measures

Measures	# applications	Budget 2017-18 (€)	Savings (MWh)	CO2 avoided (t)
Intangible				
Education and awareness-raising project for Energy Efficiency, aimed at students and teachers of secondary education - TWIST 3.0 (EDP SU)		332,587	-	-
Energy Audits and Training for Energy Efficiency in Institutions of Social Solidarity (EDP C)	133	260,000	-	-
Tangible – Domestic sector				
Replace your light bulbs with LEDs (EDP C)		325,000	65,700	24,309
Smart multi-socket (EDP SU)		802,240	82,687	30,594
Heat Pumps for water heating and Flow Reducers II (EDP C)		436,200	38,503	14,246
Efficient Water Heater and Flow Reducers (EDP C)		247,500	26,784	9,910
Tangible – Commercial and Service sector				
Installation of LED traffic lights (EDP C)	18	499,492	71,699	26,529
Replacement of Halogen Spotlight with LEDs in Small Business (EDP C)		298,750	56,160	20,779
Efficient lighting solutions for public buildings (EDP C)	321	618,740	41,264	15,268
Public lighting with LEDs (EDP C)	82	844.100	58,867	21,781
Variable Speed Drives (EDP C)	32	289,842	24,894	9,211
Optimization of HVAC Systems in Hotels (EDP C)	27	370,403	26,409	9,771
Optimization of HVAC Systems in Public Buildings (EDP C)	113	372,903	26,409	9,771
Tangible – Industry & Agriculture sector				
High efficiency motors (EDP C)	132	896,767	127,666	47,236
Variable speed drives (EDP C)	139	1,131,.059	174,443	64,544
Consumption management systems - Load interruption and management (EDP C)	14	578,086	76,722	28,387
Implementation of energy efficiency solutions for compressed air systems (EDP C)	151	900,982	93,518	34,602
Integrated Energy Efficiency Solutions (EDP C)	115	757,153	79,384	29,.372
Replacement of T8 Fluorescent Lamps and Bells with LEDs (EDP C)	151	1,266,794	85,932	31,795

Four of the B2B measures are already closed and others have had a very positive evolution, namely Motors and Variable Speed Drives, being well on track to completion. The development of an application management platform along with the use of low-cost digital tools allowed for more efficient, transparent and Client-centered management.

7.2 Heat pumps and water heating systems (Portugal and Spain | B2C and B2C segment)

In B2C segment, EDP replaces obsolete water heaters with heat pumps, Intelligent Water Heaters, and Gas Instant Boilers which are much more efficient. Part of this services are leveraged in PPEC initiatives as showed in Table 1. In 2018 EDPC sold and installed over 2.300 efficient water heating solutions. In EDPC

website, detail information and a simulator are provided, where customers can assess the best solution for their specific needs and the potential generated savings.

The EDP Comercial, water heating integrated systems for companies focus on boilers, heat pumps and thermal solar systems.

All B2B solutions are composed by the following steps: design the system; replacement of the equipment's; optimization of the system use; and periodic maintenance.

7.3 Compressed air system (Portugal and Brazil | B2B Segment)

The optimization of compressed air systems includes integrated solutions in the several process phases: production, storage, treatment, distribution and use.

7.4 HVAC System (Portugal and Spain | B2C and B2B segments; Brazil | B2B segment)

Integrated solution for HVAC systems optimization, from the design to the system installation and maintenance.

In 2018, EDPC launched HVAC Systems for the B2C segment selling and installing over 582 systems in its second year running. Funciona Service at the same time created an Add On to address the maintenance needs for the HVAC B2C systems.

HVAC systems may have a high impact on energy costs of companies, typically between 30 and 40% of the electrical consumption of commerce and services buildings. All B2B HVAC integrated solutions are composed by the following steps: design the system; replacement of the equipment's; optimization of the system use; and, periodic maintenance. These optimization systems allow savings until 30% of the energy consumption and ensure comfort and safety for building users.

7.5 High Efficient Motors (Portugal and Brazil | B2B Segment)

About 77% of the industry's electricity consumption is used in electric motors. The motors are used in a wide range of applications, such as pumps, compressors and fans. The high percentage of electric power they consume makes them one of the main potentials for saving electricity. High-performance engines are thus an important technology in reducing power consumption. EDP Comercial installs more efficient motors, replacing obsolete ones.

7.6 Green Electricity (Portugal and Spain| B2C and B2B Segment)

By December 2018, EDP had 3.071 B2C green energy customers, and 889 B2B customers, representing a total annual consumption of 10.5 GWh and 30.6 GWh respectively.

The green electricity offer is available at EDP´s website for the residential market (for the normal and bi hours tariffs options) and corporate liberalized market (for the normal, bi and tri hours tariffs options). All customers receive annually, around May, a brochure explaining the origin of the green energy they consume – 55,4% for B2C clients and 55,3% for B2B clients - and promoting the 100% renewable option of Green Tariff for B2C and B2B.

In Spain, more than 1 million customers were supplied with "green" electricity: all domestic customers in the liberalized B2C market and some of the B2B customers.

7.7 EDP Solar Energy (Portugal, Spain and Brazil | B2C and B2B segments)

In 2018, EDP Comercial launched a new solar energy ATL campaign with the aim to increase the access to electricity production by self-consumption, with monthly payments starting at € 19,90, over a period of 36 months.

In addition, customers who subscribe to EDP solar energy are also entitled to exclusive offers of a solar energy plan, that allows to have 10% discount on the electricity they consume from the grid at night, and to EDP re:dy, for only € 19,90, which allows customers to monitor the production of their solar system, know how much they are saving and manage their energy consumption from home (https://www.edp.pt/particulares/servicos/solar-energy).

EDP Solar Energy Solutions enable companies to produce and consume their own electricity and reduce bills. Solar Energy is captured by a set of photovoltaic panels that transform it into energy power. When there is extreme production, it is sold to the grid.

EDP Comercial makes available to its B2B customers in Portugal different payment methods. The innovative as a service option boosted sales during 2018, with a total amount of 8 M€ sold (https://www.edp.pt/corporate/servicos/solar-fotovoltaico/).

In Brazil, EDP Soluções em Energia also provides solar energy solutions to all types of consumers - residential, commercial or industrial - offering distributed generation and self-generation PV systems, through leasing or saling contracts. The solutions can be installed in the customer's consumption site or remotely, through solar farms. In 2018, EDP completed the construction of one of the largest photovoltaic systems to supply a shopping center in the South of Brazil (1.33 MWp), started the installation of two other PV plants totalling 8.3 MWp, to serve consumers of the same segment in the modality of self-production, and signed an agreement with Banco do Brasil to build a 5 megawatt-peak (MWp) solar plant, which will be responsible for supplying 58 branches of Banco do Brasil with 100% renewable energy in the state of Minas Gerais.

7.8 Voltage Level Increase (Portugal and Brazil | B2B Segment)

The voltage level increase involves the installation of a voltage transformation station and its connection to the existing electric facility. EDP offers this service, so customers have access to appropriate electricity supply, in accordance to their energy needs.

7.9 Efficient Lighting (Portugal and Brazil | B2B Segment)

Efficient lighting solutions for small and medium-sized enterprises, allowing them to reduce costs and, at the same time, ensuring the maintenance of lighting comfort levels. Costumers may opt for the following two solutions: replacing light bulbs with more efficient ones and replacing the entire lighting system.

In December 2018, the PPEC initiative “Replace your light bulbs with LEDs” for the B2C segment was launched with an ATL campaign. In only one month over 100.000 lamps were sold.

In July 2018 it was launched the online sale of LED bulbs on the website edp.pt and sold another 6.317 bulbs.

8. Provision of Service

The company guarantees the supply of an energy service that will generate lower cost to the customer.

8.1 Re:dy (Portugal and Spain | B2C segment)

This domestic electricity consumption monitoring and active management service was first launched in Portugal in 2013. Two years later, it was made available in the Spanish market. It allows customers to monitor, control and manage household consumption in real-time, namely remotely turn on and off appliances, schedule tasks, automate the working and control the consumptions of electric appliances from anywhere, via an internet portal and smartphone (iOS and Android) – https://www.edp.pt/particulares/servicos/redy-en/.

The operation of edp re:dy is made possible by a set of hardware - re:dy Box, re:dy Plug, re:dy Meter, re:dy Switch and re:dy plug A/C - an application in the EDP servers where the service is configured, and a set of mobile applications for remote access.

Some of the energy efficiency features available are:

- Scenario programing according with the users needs habits and away periods.
- Individual equipment control and energy consumption analysis.
- Alert that helps the client to eliminate waste of energy.
- Advice on the best tariff and optimized contracted power.
- Reception of monthly personalized consumption analysis reports.
- Air conditioning remote IR control

The redy offer was reviewed, the interfaces of the mobile application and energy report reformulated and several communication initiatives were launched.The edp re: dy, in addition to being sold by itself, is offered to customers in bundle with solar energy, batteries and electric mobility solutions to control the energy production or consumption associated with the electric car. At the end of 2017, a total of more than 9,000 edp re-dy clients was achieved in Portugal.

8.2 Set of energy services for B2B segment

Power factor correction*	Thermal-Heat recovery	Variable speed drivers	Solar Hot water production	Public Lighting (LED)
Portugal, Spain and Brazil	Portugal	Portugal, Spain and Brazil	B2B segment in Brazil	B2B Portugal and Brazil

* inclusion of a new approach which consisted in the rental of the Battery to EDP Comercial that managed the consumption of the installation and guarantees the exemption of the reactive payment during the contract period.

9. Integrated Energy Services

The company acts as a consultant in areas related to energy supply and the installation of more efficient equipment and/or the rehabilitation/refurbishment of buildings, including the integration of all the above energy services categories.

9.1 Save to Compete (Portugal and Spain| B2C and B2B segment)

In 2017, following the needs of business decision makers and the new Marketing trends, EDP focused on the re-launch of *save to compete* program, now with an innovative self-service platform, in which each consumer can easily access to the company energy efficiency opportunities. They can simulate and create their own proposal and even upload it already signed.

This is a new paradigm shift for the energy efficiency services sales in SMEs market. This program already saved 27 million euros to the companies and avoid 100 thousand tons of CO2 emissions.

In 2018, Save to Compete program launched two new products, Operational Technician responsible for the facilities (TRE - Técnico Responsável de Exploração) and Maintenance of Transformer Stations (MPT – Manutenção de Postos de Transformação).

The platform won the "Prémio 5 Estrelas" (Five Stars Award), regarding the category Energy Efficiency B2B in 2018 (https://premio.cinco-estrelas.pt/vencedor/edp-2019/edp-save2compete/).

9.2 Cuota Ahorro (Spain | B2B segment) and E:ficient (Brazil | B2B segment)

In line with the Save to Compete concept, through Cuota Ahorro in Spain and E:ficient in Brazil EDP makes a complete facilities' assesment, implements the energy efficiency projects and invests on customers' facilities. A part of the generated savigs is used to pay EDP's invesments.

9.3 Energy Efficiency Programme – PEE (Brazil | B2C and B2B segment)

Among the initiatives carried out under the PEE programme, the project "Boa Energia nas Escolas" (Good Energy in Schools) consists of training teachers from the public network of São Paulo and Espírito Santo so that they can share with their students the information on the safe and efficient use of energy. For this purpose, it includes distribution of educational kits with materials to be used in the classroom.

Through the PEE, EDP São Paulo benefits local communities by promoting the exchange of electric showers for solar heating systems, as well as distributing kits with six LED lamps - actions that make up the Good Solar Energy Programme.

For the past nine years, the project generated energy savings of 9 GWh/year, equivalent to the consumption of 4 thousand families. It also should be noted the Solidarity Efficiency project, which consists of replacing inefficient bulbs of residential customers with LED lamps and counts on a mobile unit (Led Truck) as a trading post. More than 12.5 residences were contemplated, and one lamp was donated to a charity association for every 80 bulbs replaced.

In Espírito Santo (Brazil), an agreement was signed with the State Government to carry out energy efficiency projects in the Department of Roads and State Highway (DER), the State Secretariat of Education

(Sedu) and public schools. Replacements of 10,607 light bulbs were carried out by LED technology, which allowed an annual saving of approximately 455 MWh - enough to supply 2.4 thousand residential units. An agreement was also reached with the State Public Ministry (MPES) for the modernization of the system's lighting and air conditioning. The 2,231 light bulbs were replaced by LED technology, plus six air-conditioning units replaced by more efficient models. As a result, MPES started to show savings of about R$ 119 thousand (93 MWh in energy) per year.

10. Other Energy Services

The company acts as a consultant in areas related to energy supply and the installation of more efficient equipment and/or rehabilitation/refurbishment of buildings not covered by the above categories.

Electric Mobility (Portugal, Brazil and Spain| B2C and B2B Segments)

EDP decided to assume, in a pioneering way, a set of commitments to promote electric mobility over the next few years. The objectives now outlined are in line with the conviction that combating climate change and decarbonizing the economy will involve greater penetration of renewables and the electrification of consumption, particularly in the transport, heating and cooling sectors.

Along with the strategic objectives of achieving more than 75% renewable installed capacity in 2020 and reducing its specific emissions of CO2 by 75%, EDP is now committed to achieving a 100% electric fleet (light-duty vehicles) by 2030, which will require a strong investment in the renewal of its car fleet. This transition, already started, will now be accelerated and will allow the reduction of the CO2 emissions of the current fleet, consisting of close to 4000 service vehicles, by 70%.

At the same time, EDP is also committed to continuing developing new commercial offerings and solutions that promote the electrification of transport, including electric vehicle charging infrastructures.For residential customers this solution includes:

- Supply of green electricity with premium tariffs;
- Supply and installation of solutions for electric vehicles (EV) charging station for B2C and B2B;
- Additional innovative services including re:dy for managing consumption of EV and charging tariffs, and access to other mobile applications in development, access to the mobi-e card for charging in public charging stations;
- A specific webpage with relevant information to help customers overcome the initial barriers of this new paradigm of sustainable transportation: n to help customers overcome the initial barriers of this new paradigm of sustainable transportation: https://www.edp.pt/particulares/servicos/electric-mobility.

Since 2016, several digital campaigns to promote the concept were developed and the number of autopartners, summing up by now 13 partnerships.

In 2017, the emphasis was on boosting electric mobility in Portugal, especially through initiatives in partnership with 13 automobile manufacturers and the development of Fast Loading Stations.

EDP Comercial has 10 fast chargers connected to the public network Mobi.e, located in some cities across Portugal and in the highway that connects Lisbon to Oporto.

Moreover, for business customers, EDP makes available a simulator for the comparison of the total cost of ownership of 3 types of vehicles – 100% electric, plug-in hybrids and combustion models. This analysis allows customers to have a real perspective on their total fleet costs.

In Spain, for the B2B segment (Companies and large customers), the PARK-e service includes the integration of combined solutions for electric and/or natural gas vehicle, as well as projects to industrial installations. In terms of charging points, both mono and multi points are available.

We are actively contributing to accelerating this transition to sustainable mobility and are electrifying all our fleet (target to reach 100% of electric light duty vehicles by 2030) and developing new offers and commercial solutions to our clients (including deploying charging infrastructure). To advance on I&D and create the best possible offers we are also partnering with global organizations, municipalities and entities from other sectors, with innovative and potentially scalable pilots.

- We understand that EDP plays a central role in creating and streamlining mobility solutions, which is a central priority in EDP's strategic agenda, for three main reasons:
  i. Our customers now have electrical mobility needs and look to EDP as the natural partner to solve those same needs;
  ii. We believe that, in the long term, mobility will be a very important business growth vector;
  iii. We understand that it is a social responsibility for EDP to dynamize and bet on electric mobility, for the environmental benefits that it entails.
- In this sense, EDP is materializing a set of initiatives aiming at accelerating the development of new projects in this area:
  i. EDP is actively involved in the deployment of public charging infrastructure in Portugal and Spain. In Portugal, EDP has 8 fast charging stations within the Mobi.e network, located in the different cities of the country (Lisbon, Évora, Aveiro, Viana do Castelo, Valença, Vila Real and Antuã). In Spain we already have 80 charging stations installed and have participated, together with the main charging infrastructure managers, in the European project CIRVE, which promotes the development of a network of forty fast recharging points along the main Spanish corridors. In Brazil, EDP implemented a new 430-kilometre corridor (Presidente Dutra Highway linking Rio de Janeiro to São Paulo), with six new fast-charging stations for electric vehicles.
  ii. EDP already has a set of services for residential and business customers that include:
    a. Tariff for electric vehicles with special discounts. Today we have already (i) 2 energy tariffs for our customers - electricity and gas mobility plan (with 10% discount on electricity at night + up to 5% discount on gas) green electric mobility plan (10% discount on electricity at night and energy produced through renewable sources) and (ii) Wallbox as-a-service offer - installation of the EDP charging station in the customer's home with potential integration with the Re:dy service;
    b. Re:dy, app-based system for monitoring and managing electricity consumption of home and electric vehicle;

c. In order to respond to the consumer needs that are beginning to emerge, and knowing that loading remains a barrier, we will launch a new solution for customers' homes, which will solve the cargo management issue and will be available in two modes;

d. At the same time, we want to solve the difficulty of loading in condominiums and we are already working on a solution that can also be used in shared parking lots by companies. In the case of condominiums, for example, this solution will make it possible to differentiate the consumption related to the VE charging from the remaining electricity consumption of the condominium as a whole and facilitate payments between the respective parties.

ii. We are also developing new solutions to facilitate the adoption of electric vehicles that include:

a. A counseling app that simulates a true electrical experience. In essence, this app (developed within EDP) will help users realize the benefits of adhering to electric mobility in economic and environmental terms, and will allow the experience to be adapted to their day-to-day life with real information on frequency of charging or battery available;

b. Rapid charging stations for fleets, which as it grows will create a network complementary to that of the public loading, responding to a need for cities to clear loading points for what is an atypical use of fleets.

iii. We strongly believe in the potential of this market, both in the B2C segment and in the B2B segment, for example in support of fleet electrification with integrated fleet solutions, charging infrastructure and power supply.

iv. Internally, we also want to be at the forefront of electrification, and so we have an internal commitment to different initiatives in this area, including:

a. Commitment to have a 100% electric fleet by 2030;

b. Development of new offers and commercial solutions that promote the energy transition;

c. Accession to the EV100 initiative.

v. For EDP this is a global opportunity, so our ambition goes through both the markets where we already meet and new markets.

EDP is also actively engaged in several international partnerships and initiatives:

- Participating as a founding member of the Transport Decarbonization Alliance (TDA), which aims to bring together entities from the 3Cs (Countries, Cities / regions and Companies) as major drivers of sustainable, low carbon mobility, with a view to accelerating the global transformation of the transport, towards a net-zero emissions mobility system before 2050 and therefore contribute to the Paris objectives.
- Within the World Business Council for Sustainable Development (WBCSD), on a multisector program addressing business solutions and guidelines to the Transforming Urban Mobility.

Moreover, ninety per cent of the growth of global fleet of passenger vehicles is set to take place in developing and transitional economies. Ensuring people and freight are mobile as efficiently and safely is an essential component of the energy transition.

An whilst advancing the access to sustainable energy agenda, SEforALL is also developing the nexus of energy and transport in the urban environment to support the design and development of a line of work that provides value and impact, that helps deliver multiple SDG benefits including human health, productivity, and economic development in fast-growing cities in developing countries.

- The centerpiece of the vehicle efficiency accelerator is a partnership of the International Energy Agency (IEA), United Nations Environment Program (UNEP), International Transport Forum of the OECD (ITF), International Council on Clean Transportation (ICCT), Institute for Transportation Studies at UC Davis, and the FIA Foundation, aiming at reducing emissions and doubling vehicle efficiency by 2050.
- Also, following inputs from key partners including Sustainable Mobility for All (World Bank); FIA Foundation; Islamic Development Bank; SLOCAT and BMZ, SEforALL will target the fast-urbanizing cities of Africa and Asia and the challenges and opportunities for providing energy efficient mass transport for those who are most exposed to polluted modes of transportation.

Electric Mobility in EDP Distribuição - Project MOBI.E

Portugal has been promoting an integrated strategy for Electric Mobility in order to ensure that this is a real alternative to internal combustion vehicles, contributing effectively for the decarbonization of the environment, and EDP Distribuição as been an important player in order to achive this goals.

In 2010, the Portuguese Government started the Program for Electric Mobility, aimed to define and regulate the electric mobility services and activities, and establishes a nationwide Network of Electric Vehicle Charging Points – Project MOBI.E.

EDP Distribuição participates since 2010 in the Project MOBI.E, as an Operator of Electric Mobility (EDP MOP) and its main responsibilities are to install, explore, make available and maintain a Pilot Network of Electric Vehicle Charging Points. Currently EDP MOP operates about 1.000 Charging Points nationwide.

In 2017 EDP Distibuição participated in the replacement of the first 200 Charging Points of 3,7kW for new Charging Points of 22kW, which will upgrade in power and technology the MOBI.E network.

The UDME - Unit for the Development of Electric Mobility in EDP Distribuição, is involved in several projects at national and European level, as well as other activities:

- Sharing Cities Project: an European project that started in 2016, which involves 3 lighthouse cities, Lisbon, London and Milan, and intends to test a new approach to creating smart cities. Promoting international cooperation between industry and cities, the project seeks to develop affordable solutions that result in commercial solutions with high market potential for smart cities. UDME actively participates in the work package that intends to install new electric mobility solutions, both on public roads and in private spaces, and monitor the behavior of the different electric vehicles that circulate around the city, and supply charging points already existing in the Mobi.E network, and the new loaders installed under this project.
- Suscity Project: The Suscity project is already in its third year of implementation and focuses on the development and integration of new tools and services to promote the efficiency of urban resources with minimal environmental impacts by investing in the modeling of urban systems and data

representation supported by the collection and "big data" processing, having as study area a pilot zone in the Lisbon Expo.

In this context, UDME has contributed with its knowledge, technical information and data from the Charging Points of the MOBI.E network, which have already allowed results of the impact of the Electric Mobility on the load profile at the EDP Distribuição network in the pilot zone, and simulation programs for different consumption scenarios are being developed to evaluate the future impact of these solutions on the energy distribution network.

- Other initiatives and activities of UDME: In addition to these more relevant projects, UDME collaborates in several initiatives to promote Electric Mobility, both within the EDP Group and in partnership with public and private entities nationwide. UDME also supports other management areas of the EDP Group and external entities on the definition of regulation related to Electric Mobility, as well as in the connection of Services and Systems to obtain and supply data of the Electric Mobility Network.

3. SMART GRID PARADIGM, ELECTRIC STORAGE AND OTHER SERVICES

The traditional electrical system architecture is characterized by a unidirectional flow of energy from few centralized production sites to many users, which it is not suitable for a massive integration of distributed small/medium power renewable generation plants.

With the commitment to achieve 75% of clean installed capacity by 2020 and the goal of reduce CO2 specific emissions by 75% until 2030 (vs. 2005), EDP is facing the challenge of balancing energy production and consumption in real time. Consequently, EDP is preparing to advance into a new power model, where electrical grids are expected to radically change their behavior, becoming “smarter”.

These new smart grids will have to cope with the integration of unpredictable and intermittent renewable sources, as well as the increasing penetration of electric vehicles and storage.

In the following sections we include some details of initiatives that EDP set-up.

3.1 INOVCITY/INOVGRID

Portugal

InovGrid is an innovative project aiming at the implementation of a new set of technologies fostering the transition for a new operation paradigm of distribution networks. This approach will contribute for the improvement of service quality, losses reduction and the integration of new resources into distribution network. Besides, it is a key enabler for an increase in energy efficiency by customers, which is the most important value driver.

The first pilot was carried out in Évora between 2009 and 2012, with the installation of about 30,000 smart meters, enabling a more active behaviour of customers towards a reduction of energy consumption. In this project it was achieved a reduction of consumption of 3.9% in customers with smart meters when compared with a control group.

After having installed about 450.000 smart meters in 2016 and 600.000 in 2017, EDP Distribuição installed more 670,000 smart meters in 2018 in several Portuguese municipalities. By the end of 2018, a total of more than 1,900,000 customers have smart meters installed (around 31% of the total number of customers).

For most of these customers, billing is based on actual consumption and they have access to detailed information that allows greater control over their consumption's habits. In addition, it enhanced the capacity for implementation of energy efficiency services by market agents, with potential impact on their energy bills and in developing of new business models.

The implementation of other innovative systems in 2018, such as 4,200 DTC (distribution transformer controller), contribute respectively for the improvement of network supervision, the reducing of technical and commercial losses and the improvement of service provided to municipalities, giving them more information and performance tools for improving energy efficiency.

As of 2018, EDP Distribuição is leading the InteGrid project, financed by the EU and promoting a demonstration of smart grid, storage and system integration technologies with increasing share of renewables.

Spain

Pola de Siero, in Asturias, was the first EDP InovCity in Spain.

In 2015, charging points for electric mobility, public lighting and a 5kW PV painel under construction were some of the developments occurred in 2015.

The charging points to electric vehicles can be used by anyone, through a card that EDP makes available in its website. Thus, it is possible to know which of the closest charging points are free for use.

The effcient lighting are equipped with presence sensors, flow regulation and telemetering point by point.

The InovGrid project in Spain ends in April 2018 with the replacement of meters by smart meters. This milestone is reached not only before the deadline set in the legislation, but also has expanded the range of customers from the legally established 15kW to 50kW, so it can be said that "100% of customers of EDP HC Energy are digitized".

3.2 ENERGY STORAGE AND OTHER INITIATIVES

Energy Storage

Technical storage pilot solution testing with commercial batteries in residential settings to identify performance deviations against those reported by manufacturers and implement control strategies for batteries linked to photovoltaic panels.

Redox

Development of a 30 kW battery with Spanish technology, for commercial and industrial use, and testing in real an environment on the Asturias low voltage power grid.

V2G – Vehicle to Grid

Development of a demonstrator to test the V2G solution, acquire technological knowledge and assess the challenges and opportunities offered by V2G technologies. The V2G charger is installed at EDP's headquarters and different use cases will be performed. The potential to use electric vehicles as a stationary vehicle to support renewable penetration and grid stability will be key drivers.

Storage of MV Power in Évora

A pioneer project in Portugal, consisting of an electric power storage system, with the functions of a backup for the University of Évora and network management support, notably through its features of grid voltage control and loss reduction, contributing to improve its energy efficiency. An effort was made, through tests and implementation of added functionalities, to ease the adaptation of this project into other case studies of grid management support. An example is its integration on the H2020 SENSIBLE.

SMARES

Design, manufacture, testing, validation and certification of smart, modular energy storage technology with an advanced management system based on a multi-level converter with output power of up to 6 MVA at 20 kV for use in systems powered by renewable sources, such as offshore wind farms..

STOCARE

Demonstration pilot project to define and specify a storage system with a battery connected to the grid, incorporated in a wind farm. The project aims to identify critical aspects related to real-time system maintenance operations and to evaluate the technical capacities for increasing the flexibility of the plant's operations.

2nd life batteries

The project aims at evaluating the potential to re-use batteries from electric vehicles for stationary applications. Among the several project objectives, it is critical to analyse and validate its technical performance in different stationary use cases, its economical viability and understand the supply value chain. The project is using used car modules from Nissan Leaf and it is being tested at EDP's laboratories in Labelec.

Distributed Generation with Storage

A project carried out jointly with the Federal University of Santa Catarina (UFSC), Brazil, for the use of distributed urban generation with decentralized photovoltaic solar systems and short-term storage. The initiative also evaluates auxiliary services for grid stability and impacts, as well as enabling new business models through distributed solar generation.

Incident Forecasting

It was in 2018 that the development phase ended and a phase of testing and validation of the project "Incident Forecasting in the National Distribution Network" was started. This project, started in 2017 and developed in partnership with a Portuguese company SmartWatt (communication in development of optimization solutions for the energy sector) is an application of machine learning algorithms with the objective of, based on the meteorological forecasts, to provide a The forecast of the number of incidents in the High and Medium Voltage network by geographic area, based on the associated risk level. The data,

based on various sources of information, were sent to EDP Distribuição of an innovative solution with no data to support decision making, contributing to the immediate improvement of quality of service through the optimized installation of non-terrain resources.

Low Voltage grid monitoring tool

EDP Distribuição started in 2018, together with an external partner, the development of a BT network monitoring solution based on the application of IoT sensors and cloud computing. The pilot project aims to gain knowledge in this part of the network where it is likely that in the coming years will be the major challenges, namely the increase of electric vehicles, proliferation of prosumers, or asset management. The main Use Cases considered were real-time BT fault detection, power quality measurement, correct BT asset register mapping and energy balance.

Other initiatives

Virtual Power Plant

Also, EDP Distribuição participated on the SuSTAINABLE project, financed under the FP7 framework. This project developed the concept of the Technical Virtual Power Plant (TVPP). Under this concept, benefits associated with changes to consumption patterns were evaluated, regarding technical losses reduction, deferred network reinforcements, increase on the hosting capacity of a MV network and voltage profile (www.sustainableproject.eu/).

LisCool Nedo project

EDP Inovação is participating in a project that will test different DSM (Demand Side Management) solutions, using a Daikin new cold storage technology. The equipments to be tested are installed at LNEG's and CM Lisboa premises and the aggregation platform technologies are being developed with Next Kraftwerke and Daikin/Efacec.

DOMINOES

H2020 project aiming at the creation of a platform for demand response services in the distribution network through the use of local energy markets. This project foresees the participation of prosumers in these markets, providing flexibility for the network operator or as a source of other market services, including the ability to trade energy between them with possible use of Blockchain technology.