International Renewable Energy Agency

ENERGY AS A SERVICE

INNOVATION LANDSCAPE BRIEF

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ABOUT IRENA

The International Renewable Energy Agency (IRENA) is an intergovernmental organisation that supports countries in their transition to a sustainable energy future and serves as the principal platform for international co-operation, a centre of excellence, and a repository of policy, technology, resource and financial knowledge on renewable energy. IRENA promotes the widespread adoption and sustainable use of all forms of renewable energy, including bioenergy, geothermal, hydropower, ocean, solar and wind energy in the pursuit of sustainable development, energy access, energy security and low-carbon economic growth and prosperity. **www.irena.org**

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DISCLAIMER

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1 BENEFITS

Through different services provision and revenue models, EaaS supports:

- deployment and operation of distributed energy resources and
- demand-side management

This unlocks demand-side flexibility.

SERVICES PROVIDED

ENERGY ADVICE	ENERGY ASSETS	ENERGY MANAGEMENT
No direct revenue model Driver sales for other services	Revenue through margins on hardware installations	Subscription based/ performance based contracts

2 KEY ENABLING FACTORS

- Digitalisation
- Time-of-use tariffs
- Revision of distribution system operator methodologies to account for demand-side flexibility

3 SNAPSHOT

➜ Smart meter penetration is 14% globally, 70% in China and the US, and 44% in the EU (2019).

➜ EaaS models with time-of-use pricing can reduce peak demand by 3–10%.

➜ EaaS models are emerging in many countries, including Australia, China, Finland, Ireland, Italy, Japan, Sweden, the UK and the US.

What is Energy as a Service (EaaS)?

The EaaS model offers various energy-related services to the consumers, rather than only supplying electricity.

ENERGY AS A SERVICE

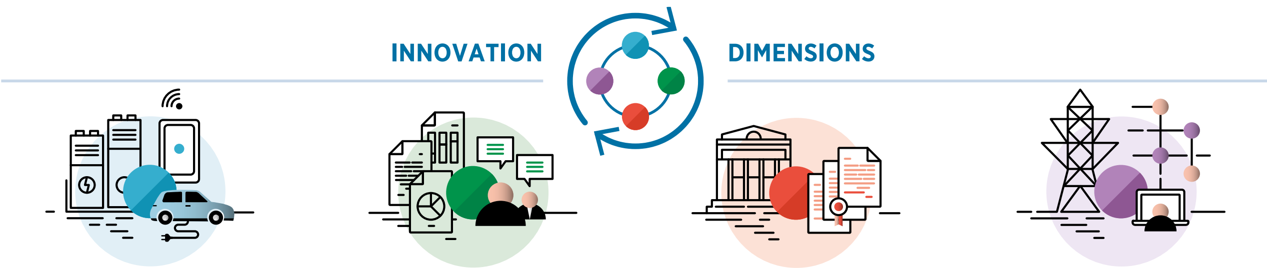
Increased deployment of distributed energy resources along with the widespread availability of smart devices has created room for innovative business models to emerge, shifting the value from selling kilowatt-hours to service provision.

ABOUT THIS BRIEF

This brief forms part of the IRENA project "Innovation landscape for a renewable-powered future", which maps the relevant innovations, identifies the synergies and formulates solutions for integrating high shares of variable renewable energy (VRE) into power systems.

The synthesis report, "*Innovation landscape for a renewable-powered future: Solutions to integrate variable renewables*" (IRENA, 2019a), illustrates the need for synergies between different innovations to create actual solutions. Solutions to drive the uptake of solar and wind power span four broad dimensions of innovation: enabling technologies, business models, market design and system operation.

Along with the synthesis report, the project includes a series of briefs, each covering one of 30 key innovations identified across those four dimensions. The 30 innovations are listed in the figure below.



ENABLING TECHNOLOGIES

1 Utility scale batteries
2 Behind-the-meter batteries

3 Electric-vehicle smart charging
4 Renewable power-to-heat
5 Renewable power-to-hydrogen

6 Internet of Things
7 Artificial intelligence and big data
8 Blockchain

9 Renewable mini-grids
10 Supergrids

11 Flexibility in conventional power plants

BUSINESS MODELS

12 Aggregators
13 Peer-to-peer electricity trading
14 Energy-as-a-service

15 Community-ownership models
16 Pay-as-you-go models

MARKET DESIGN

17 Increasing time granularity in electricity markets
18 Increasing space granularity in electricity markets
19 Innovative ancillary services
20 Re-designing capacity markets
21 Regional markets

22 Time-of-use tariffs
23 Market integration of distributed energy resources
24 Net billing schemes

SYSTEM OPERATION

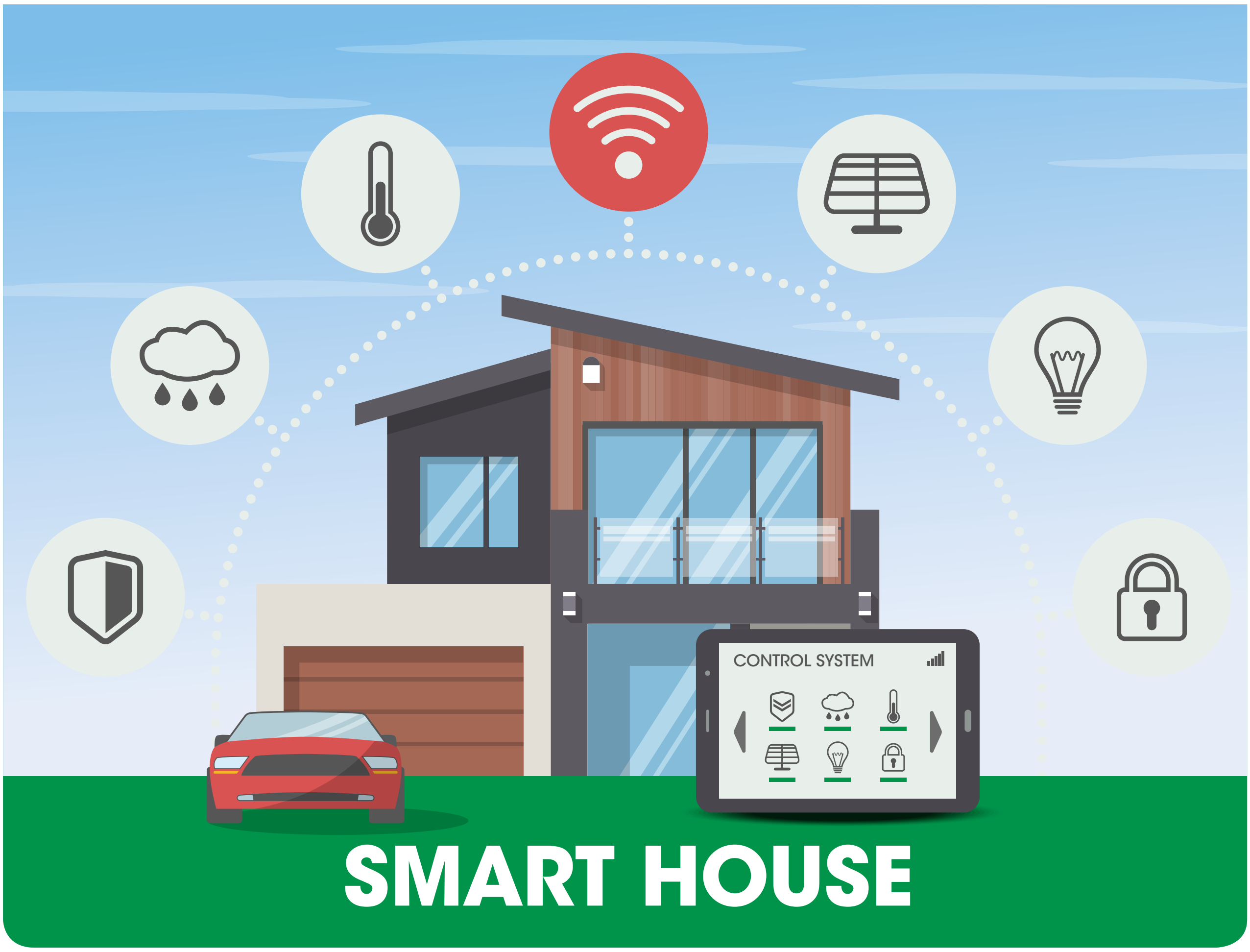
25 Future role of distribution system operators
26 Co-operation between transmission and distribution system operators

27 Advanced forecasting of variable renewable power generation
28 Innovative operation of pumped hydropower storage

29 Virtual power lines
30 Dynamic line rating

This brief provides an overview of the Energy-as-a-Service (EaaS) business model, a customer-centric business model that emerged to share and monetise the value created by increased digitalisation and decentralisation of the power system. The brief highlights different innovative services offered by energy service providers and their revenue models, as well as the impacts of these new business models on the deployment and integration of higher shares of variable renewable energy, like wind and solar.

The brief is structured as follows:



I. DESCRIPTION

The growing installation of distributed electricity generation and storage technologies, along with the widespread availability of "smart" devices, has created room for new business models to emerge in the power sector. The increase in digitalisation and smart metering has enabled the collection and analysis of large datasets that in turn enable automation. All of this provides the basis for the development of new energy-related services.

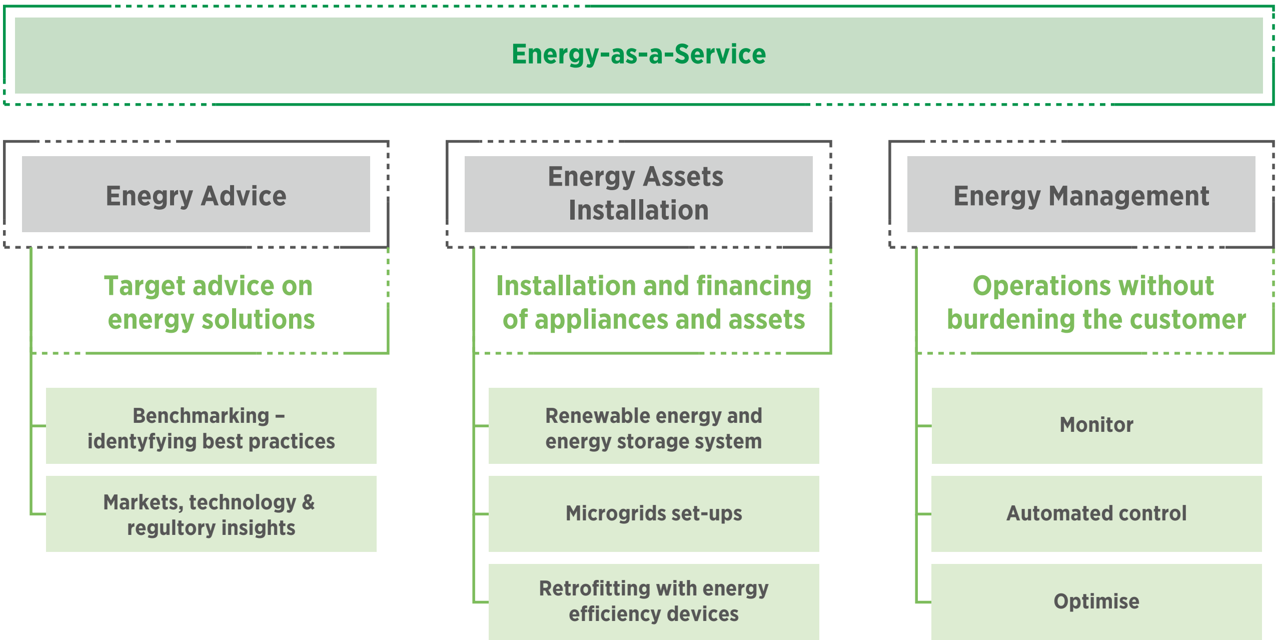
Digitalisation is essentially converting energy-related data into value for the power system. Electricity providers can assume a new role as an energy service provider (ESP), monetising the value created by the digitalisation of the power sector. This new role of energy providers has led to the development of innovative and customer-centric business models by both conventional companies from the energy sector and new actors entering the sector, such as information technology (IT) companies.

With increasing digitalisation in the sector, consumers are exploring avenues to optimise their consumption and better manage their electricity costs. The energy-related needs of consumers in the residential, commercial and industrial segments are changing. In the case of residential consumers, the availability of smart home devices has enabled continuous monitoring and control of electricity consumption.

ESPs are evaluating options not only to offer services that reduce the electricity bills for consumers, but also to provide them with more sustainable solutions for power supply. Some consumers may be willing to switch to self-consumption solutions and install distributed renewable generation technologies, such as solar rooftop photovoltaic (PV), possibly coupled with battery storage. Also, interest is growing in the adoption of smart devices that can operate, monitor, control and optimise local energy generation and consumption. Smart devices such as smart meters and smart thermostats for heating and cooling are already gaining popularity. Considering new consumer needs and the shifting power paradigm to a renewable-based decentralised and digitalised system, there is a need for an integrated approach to delivering new energy solutions and services.

Energy-as-a-Service (EaaS) is an innovative business model whereby a service provider (either traditional ESPs or new ones, such as information and communications technology (ICT) companies) offers various energy-related services rather than only supplying electricity (i.e., kilowatt-hours, kWh). ESPs can bundle energy advice, asset installation, financing and energy management solutions to offer a suite of services to the end consumers. The range of services that can be provided by an ESP is described in Figure 1.

Figure 1 Range of services offered by energy service providers



Source: Adapted from Edison Energy, 2016; Eneco, 2019

- **Energy advice:** ESPs are evolving into "trusted energy advisors" that can help customers formulate strategies tailored to their energy needs. The ESPs can use consumers' load data, electricity price forecasts, or historical data, as well as advanced energy modelling software to help customers benchmark their costs against the market to identify opportunities for optimising their energy consumption.

- **Energy assets installation :** ESPs can provide end-to-end services associated with the installation of on-site or off-site renewable energy projects and battery storage systems, such as engineering, procurement and construction (EPC). This service can extend to the installation of micro-grids, smart meters and energy-efficient appliances, to create opportunities for customers to save on electricity bills and generate revenue from self-generation of electricity, both on- and off-grid.

  Having established partnerships in place, in some instances, ESPs can facilitate access to finance for the EPC of renewable energy projects for end consumers.

- **Energy management:** ESPs can provide energy management solutions through monitoring, remote control and optimisation of the load, without placing a burden on the customer. Smart home solutions can be bundled as an integrated solution that includes monitoring, automated control and optimisation of the energy consumption, taking into account consumers' comfort. ESPs can also provide customers the option to choose their electricity supply sources (e.g., either renewable or conventional sources), and enable the customers to control their load based on information about electricity prices during all time intervals available.

Different energy services have different revenue models for the ESPs. Besides revenue models, customer lifetime value[1] is also an important metric that ESP assesses when offering a service. For example, only a few customers are willing to pay for insights and advice. Without such personal interaction, however, creating trust with customers can be difficult. Therefore, energy advice does not have a revenue model on its own, but contributes to an increased customer lifetime value because it is a driver for the sales of other services (such as energy asset installation and financing, energy management services).

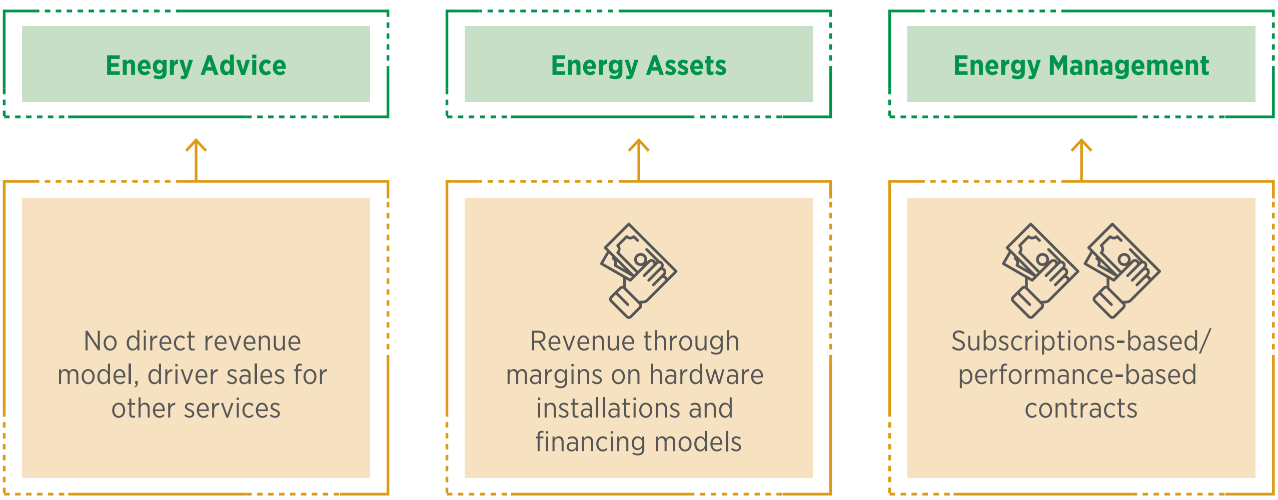
Energy asset services usually come with a one-time revenue opportunity for ESPs, mainly through margins on hardware, labour and financing schemes. The core business of ESPs lies in energy management services. For energy management service, ESPs can opt for a variety of revenue models ranging from a subscription-based model (fixed revenue contracts) to performance-based contracts (variable revenue contracts). Figure 2 highlights typical revenue models for companies providing Energy-as-a-Service.

Subscription-based models with fixed revenue contracts apply fixed monthly fees, so that the ESP absorbs the price and quantity risk. The ESP makes a profit when the total value of electricity consumed by its customers is lower than the contractual price paid. Therefore, the ESPs will make efforts to audit the existing systems and identify the potential for cost savings by installing energy-efficient or smart devices to monitor consumption at the customer end closely.

For example, Inspire, a US-based power retailer, offers a "Smart Energy" subscription model, with subscription plans starting at USD 39/month that include energy management services and 100% clean electricity. Being a flat monthly rate, the less energy the customers use, the more profit the company makes, thus enabling it to offer customers rewards for the energy-saving actions they take. The company aims to take the smart energy concept one step further by automating customers' home controls and decreasing energy usage on their behalf. This will allow customers to hand over their energy management decisions to Inspire (Inspire, 2020; Pyper, 2018).

Performance-based contracts are variable revenue contracts, usually in the form of an energy savings performance contract. The customer and the ESP share the cost savings based on two main models: shared savings (where the savings are split according to a defined percentage), and guaranteed savings (where the customer is guaranteed a certain level of savings, being shielded from any performance risk). Performance-based contracts can also be a form of "creative financing" for capital improvement that makes it possible to fund energy upgrades from cost reductions (JRC, 2020). A facility owner can use an energy savings performance contract offered by an ESP to pay for today's facility upgrades with tomorrow's energy savings – without tapping into capital budgets (US DOE, *n.d.*).

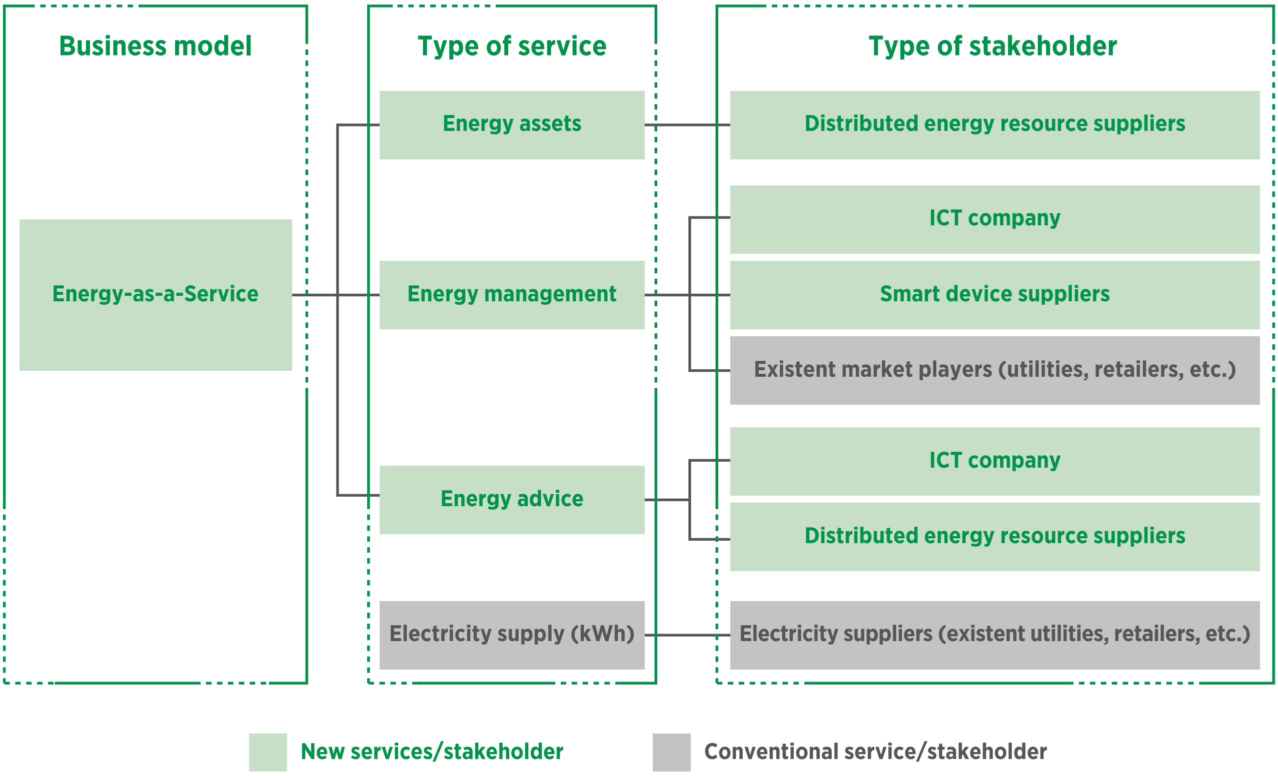
Figure 2 Revenue streams for Energy-as-a Service models



1 *Customer lifetime value represents the total amount of money a customer is expected to spend in your business, or on your products, during the lifetime of the customer.*

ESPs either are new actors that enter the energy market or can represent new roles that existing actors take up. To emerge as an integrated ESP and to remain competitive in the dynamic market conditions, existing players, such as conventional utilities or retailers, would have to gain different capabilities, which may be developed organically or acquired through partnerships with third parties. For example, existing market participants can partner with ICT companies to provide energy management solutions to customers. Figures 3 and 4 highlights key stakeholders that can collaborate to provide integrated energy services to customers.

Figure 3 Key stakeholders and types of services provided under the EaaS model



Source: Adapted from KPMG US, 2015

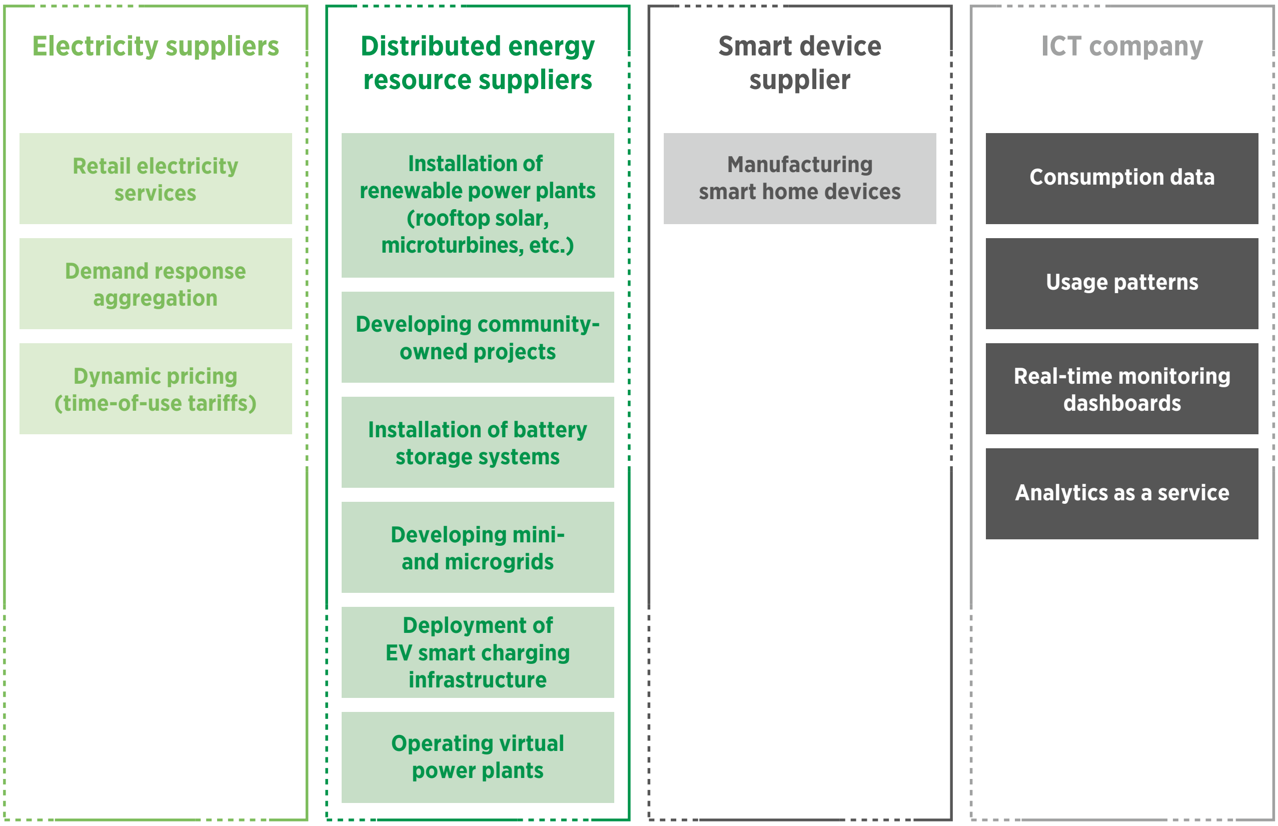
As illustrated in Figures 3 and 4, several stakeholders provide different services, which highlight that the value is delivered via a network of two or more actors involved. To provide integrated energy services under the EaaS business model, several such opportunities arise, as follows:

- **Energy management:** Aggregators of many smaller loads secure better prices on behalf of larger customer groups. Implementing dynamic pricing mechanisms, such as time-of-use tariffs, and providing continuous information to the user on spot market prices (where applicable) will encourage better consumption management. Smart home devices can be integrated with the utilities or conventional retailers through home area networks or home monitoring services sold by telecommunication firms. Increased visibility into consumption data can help utilities develop new energy management software.

  The data can be used by the power suppliers to proactively provide analysis and tailored recommendations to improve outcomes and customer satisfaction.

- **Energy advice:** Distributed energy resources have been widely deployed, and most utilities are mandated to purchase the power surplus. The integration opportunities revolve around identifying the resources, forecasting the available supply, managing storage and providing a physical connection to the grid. In addition to suppliers of distributed energy resources, suppliers of retail electricity can be integrated into providing these services. As with energy management services, visibility into consumer data can help tailor the advice to individual consumer needs.

Figure 4 Example of key services provided by different stakeholders



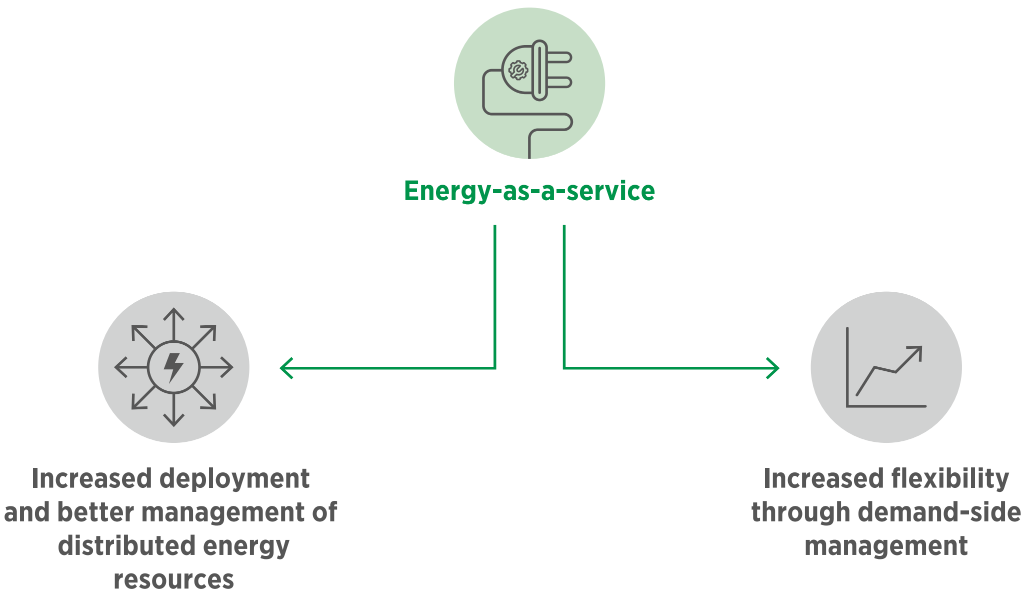
Source: Adapted from KPMG US, 2015

II. CONTRIBUTION TO POWER SECTOR TRANSFORMATION

Through different service provision and revenue models, EaaS supports distributed generation deployment and demand-side management.

This has a great impact on unlocking demand-side flexibility, which further enables the integration of high shares of VRE in the power system and smooth integration of distributed energy resources in the system.

Figure 5 Key contribution of EaaS models to power sector transformation



Increased deployment and better management of distributed energy resources

Energy asset installation services offered by ESPs facilitate the deployment of distributed energy resources, providing the necessary support to customers that wish to install renewable energy and energy storage systems. Also, a range of innovative energy services is emerging for consumers that cannot or do not want to install distributed energy resources in their residences.

For example, SolarCloud, an Australian company, offers solar energy to customers without requiring them to have their own installations, and customers can "transfer" the energy supply contract to their new address if they move. This service encourages consumers that are paying rent or that are not confident about making an investment in their house to still opt for clean energy supply. Customers can invest in solar PV rooftop systems that will be installed on commercial rooftops across Australia. The solar energy generated by these panels is used by businesses that pay a fee to SolarCloud, and the company in turn transfers the monetary benefits back to the panel owners (SolarCloud, 2020).

Similarly, Helen, a retail energy supply company in Finland, has built two large solar power plants and offers a solar panel to individuals for a rental fee. This enables consumers to be solar energy producers regardless of where they live. Such models enable the deployment of distributed renewable generation without significant upfront investment to end consumers.

Energy management service is also incentivising consumers to install distributed energy resources and, through demand response, to save on their electricity bills. Various utilities are adding this service to their portfolios. For example, EDP in Portugal has launched a smart home solution, "EDP re:dy", that enables customers to manage their home equipment and energy consumption through a smartphone app.

In addition to load management services that can adjust electricity consumption based on production of distributed energy resources, other innovative services have emerged. "**Battery-as-a-service**", for example, provides storage services to customers to "save" the surplus renewable energy generated into a virtual electricity account during periods of low demand, and then draw from the stored energy during periods of peak demand, or even allow friends or relatives in other locations to access it and use the electricity.

For example, E.ON has developed a "SolarCloud" for solar PV owners to store excess energy supply through a cloud solution. This virtual electricity account can be accessed for energy demand not only at home, but also in other places. The key advantage of power clouds is that consumers do not have to invest in a physical battery. The customers can also realise savings in their energy bills by avoiding peak use charges (E.ON, 2018). The German market alone had more than 1.6 million operators of solar systems in 2018. According to E.ON and based on data from Project Sunroof, a co-operation between E.ON and Google, another 10 million roofs in Germany are suitable for installing PV systems. Such services therefore have a great market potential.

Increased flexibility through demand-side management

Energy management models under the EaaS business model support demand-side management, thereby unlocking demand-side flexibility in the power system. ESPs can implement intelligent systems using real-time data gathered via smart meters to predict peak demand levels over the next few hours for a given facility, and set rules to trigger load shedding to optimise consumption during peak demand periods.

For example, BeeBryte, a France- and Singapore-based "**software-as-a-service**" company, provides cloud-based intelligence software that can monitor real-time load in large commercial and industrial facilities. The software can automatically switch loads like HVAC systems to battery storage based on time-of-use charges and delivers up to 40% savings in utility bills (BeeBryte, *n.d.*). The demand-side management software is essentially an energy efficiency device switching equipment on or off.

This will potentially evolve to more than on/off control to "control in steps" for better performance and reliability.

Finland's retail energy supplier, Fortum, offers a demand response service for residential customers that have electrical heating and/or water boilers. The company offers demand-side optimisations of heating data and real-time consumption data for a monthly fee (Fortum, 2020). Fortum has built a 1 megawatt virtual battery using the water heaters of 1 000 customers. The controlled residential water heaters, behaving as a battery, play an increasingly important role in maintaining energy system balance through demand-side management (Fortum, 2018).

ESPs can also enable non-automated demand management measures. For instance, retail energy suppliers can use devices that can help customers monitor the energy consumed by every appliance and provide guidance to customers on managing their consumption to reduce their electricity bills.

Potential impact on power sector transformation

EaaS solutions can provide cost savings by optimising energy consumption for categories of consumers including residential, commercial and industrial consumers. Some examples of the impact created by ESPs are described below.

- BeeBryte is a French start-up that uses artificial intelligence to predict a building's thermal energy demand in order to produce heating and cooling at the right times, maintaining comfort and temperature within an operating range set by the customer. This can result in **electricity bill reductions of up to 40%** with real-time control of batteries and HVAC in commercial and industrial buildings (BeeBryte, 2018). BeeBryte's business model is based on a share of the savings generated.

- Solarcity in New Zealand offers a "**solar-as-a-service**" model, where the company owns and manages rooftop solar installations in the customers' buildings. Solarcity also provides a battery to store electricity and smart plug systems that can control appliances based on the availability of solar energy. The company has installed more than 6 000 systems, generating over 9 million kWh of electricity, resulting in **total annual customer savings of nearly USD 1.7 million** (Solarcity, *n.d.*).

- ENGIE Insight, a US-based company, provides resource management programmes. ENGIE Insight estimates that implementing **energy efficiency measures can reduce average energy consumption in buildings by 18%**. The company uses data from meters and energy management systems to reduce electricity costs for clients. Between 2012 and 2017, ENGIE enabled an estimated USD 3.2 billion in savings for its customers (ENGIE, 2018).

Note: USD 1.7 million converted from NZD using an exchange rate of 1 NZD = 0.68 USD.

III. KEY FACTORS TO ENABLE DEPLOYMENT

Digitalisation of the power system at the distribution level

Most EaaS business models are based on analysing real-time information and data on consumers' energy usage as well as electricity market conditions. To gather real-time information, the deployment of enabling infrastructure such as communication infrastructure, advanced metering infrastructure and smart devices is necessary. Electricity appliances and devices equipped with appropriate sensors and hardware need to be deployed at the consumer end. Such devices can capture and transmit their consumption information and, possibly, allow for remote control or automated responses to electricity price signals. Standardised communication protocols for such appliances need to be developed.

Wider usage of smart meters and sensors, together with the application of the Internet of Things and the use of large amounts of data with artificial intelligence, have created opportunities to provide new services to the system (see the *Innovation Landscape briefs: Internet of Things* [IRENA, 2019b] and *Artificial intelligence and big data* [IRENA, 2019c]).

Implementation of time-of-use tariffs

Time-of-use tariffs are a key enabler for EaaS business models. EaaS providers can deploy a combination of assets such as solar PV, battery storage, smart devices and smart meters to optimise energy consumption as well as provide demand response services to system operators. During peak load hours, when tariffs are high, ESPs can reduce demand, either by increasing self-consumption from local generation sources, using distributed storage systems such as batteries or power clouds, or by moving shiftable loads such as water heating to a later time (see the *Innovation Landscape brief: Time-of-use tariffs* [IRENA, 2019d]).

Revision of distribution system operation methodologies to account for demand-side flexibility

Distribution system operators have conventionally invested in network reinforcement to reduce distribution network congestion that could occur during peak demand intervals. Thus, the rules under which distribution system operators plan and size their grids could be modified to allow these operators some freedom to decide whether to reinforce the grid or to use flexibility services provided by end customers via ESPs. Similarly, meeting peak load demand through locally stored or generated energy instead of transporting generation from a distant source may decrease grid congestion and defer network investments.

For example, battery storage systems deployed by end consumers could store excess energy produced from renewable sources such as solar PV or be charged using grid electricity when it is relatively cheap. Batteries can then be discharged during peak time intervals to fulfil demand. Through the EaaS model, ESPs can close the gap between the needs of distribution system operators and the flexibility that potential distributed energy resources and consumers can provide. However, the distribution system operators need to be aware of and consider this option in their operation and planning procedures (see the *Innovation Landscape brief: Future role of distribution system operators* [IRENA, 2019e]).

IV. CURRENT STATUS AND EXAMPLES OF ONGOING INITIATIVES

The current role of conventional electricity retailers is changing to one of energy services companies for all types of consumer. ESPs in large economies such as Australia, China, Europe and the United States are investing in smart grid and smart metering systems. These use advanced data analytics to enable consumers to optimise energy consumption. Some key indicators for the growth of EaaS business models are provided in Table 1.

Table 1 Key facts about EaaS business model development

Indicators	Key facts
Countries where EaaS models have been implemented	Australia, China, Finland, Ireland, Italy, Japan, Sweden, UK, US
Smart meter global market size	Estimated revenue of USD 20.7 billion (2020), growing to USD 28.6 billion by 2025, at a compound annual growth rate of 6.7%[1]
Smart meter penetration (% of meters that are smart meters)	Global: 14% (2019)[2] China: 70% (2019)[3] US: 70% (98 million smart meters) (2019)[4] EU-28: 44% (2018), growing to 71% by 2023[5]
Investments made in EaaS models	~ USD 14.3 billion[6]
EaaS initiatives at national level	India: The Government of India has established a National Smart Grid Mission, operational since 2016, planning the roll-out of smart meters for all customers by 2027[7], with the aim of launching 250 million smart meters by 2024. The agency conducted 11 Smart Grid Pilot Projects across the country (5 000 to 35 000 customers). South Africa: The South African National Energy Development Initiative has implemented 10 pilot-scale smart grid projects[8].
Average peak reductions with EaaS models	3–10%[9] (with time-of-use tariffs)

[1] Bloomberg, 2020
[2] Scully, 2019
[3] Research and Markets, 2019
[4] IEI, 2019
[5] Kochanshi *et al.*, 2020
[6] Smart Energy International, 2016
[7] India Smart Grid Forum, *n.d.*; Government of India, 2020
[8] Smart Energy International, 2017a
[9] Government of UK, 2016

Examples of VPL projects

Case study	Location	Energy-as-a-Service	Description
Choice	Australia	- Energy advice - Energy management	The company Choice provides a service that scans the prices of all retailers every quarter and helps customers save costs by switching to the cheapest electricity supplier. The company also helps customers secure funding for on-site solar PV facilities to generate savings in electricity bills. The price comparison tool has helped customers save over 50% on their electricity bills (Hitchick, 2018).
Crnogorski Telekom	Montenegro	• Energy assets installation • Energy management	Montenegro's leading telecom company has signed a 10-year contract with Ericsson to design, implement and manage lithium-ion batteries and power infrastructure solutions for the telecom company's sites (Ericsson, 2018). This is expected to reduce Crnogorski Telekom's total cost of energy infrastructure ownership by 40%.
EDP	Portugal	• Energy advice • Energy asset installation • Energy management	EDP has launched a smart home solution, "EDP re:dy", enabling the customers to manage their home equipment and energy consumption through a smartphone app (Smart Energy International, 2017b).
Fortum	Finland	• Energy management	Fortum, a retail energy supplier, offers a solution that enables solar PV owners to use the excess energy generated from their solar PV systems to charge electric vehicles (EVs). The excess solar energy is absorbed by Fortum's cloud-based charge-and-drive network, and the amount of energy contributed is credited to the distributed energy resource owner's Charge & Drive account. The owner can use the account at any of Fortum's 400 charging points across Finland (Fortum, 2018).
Google Nest	US	• Energy management	Google Nest focuses on smart homes and automation. Google Nest has introduced new software that will help customers manage consumption when enrolled in a "time-of-use" tariff plan. As such, the thermostat can reduce consumption during periods of peak demand, thereby increasing cost savings (Mooney, 2016; Nest Labs, 2016).
Neura	US	• Energy management	Technology company Neura uses artificial intelligence to understand the behaviour of the residents in a home and to control the smart home devices accordingly. The technology can save energy consumption by turning off lights and televisions, and adjusting the heating/cooling temperature based on residents' behaviour patterns (Neura, *n.d.*).
Stem	US	• Energy management	Stem helps commercial and industrial customers reduce their energy bills by using energy stored in customer's batteries during periods of peak demand. The company combines battery storage with cloud-based analytics systems and artificial intelligence to identify the best time to draw energy from battery storage (Stem, 2017). Stem helps customers maintain a consistent level of energy usage and thus control their demand charge.
Uplight	US	• Energy advice • Energy management	The company Uplight provides a set of over 20 solutions, from behavioural energy efficiency and dynamic rates enrolment to an e-commerce marketplace and automated device control. It guides customers to the best individualised actions available to save energy, which in turn helps utilities shift load during peak periods. For example, during summer heat waves, the utility Consumers Energy achieved load shift of more than 74% when relying on Uplight's residential demand response programme. Uplight also offers EV owners EV-specific rates and charging at ideal times through a variety of self-serve and targeted recommendations (Uplight, 2020).

V. IMPLEMENTATION REQUIREMENTS: CHECKLIST

TECHNICAL REQUIREMENTS

Hardware:

- Widespread adoption of distributed generation sources, energy-efficient devices and energy storage batteries
- Smart meters (required to provide real-time/near to real-time data on power consumption and production)
- "Smart home" gateways (energy boxes) and smart appliances for energy management, necessary for enabling the two-way and real-time interaction with the distribution grid

Software:

- Software that can respond to electricity price signals and that automatically adjusts consumption according to customers' preferences
- Aggregation software – timely communication between the aggregating agency and the smart meters based on service requirement, smart appliances and the energy storage systems
- Weather, energy and price forecasting software that can predict power generation and future prices to allow cost optimisation for the energy consumed
- Energy management software supported through artificial intelligence

Communication protocols:

- Common interoperable protocol for co-ordination among distribution network operators, the consumer and the ESP

REGULATORY REQUIREMENTS

Retail market:

- Time-of-use tariff, and other regulations that enable demand response management for consumers
- Regulations that enable ESPs to implement innovative pricing models and that provide customers the ability to choose the level of service based on their needs (prices could be decoupled from units of electricity sold to incentivise utility providers to promote energy management efforts at the customer end)
- Design incentives for customers and power suppliers to invest in smart meters and smart devices

Distribution system operators:

- Revise distribution system operators' methodologies to account for demand-side flexibility when operating and planning the system expansion
- Incentivise distribution system operators to support the roll-out of smart metering solutions, including innovative ICT infrastructure models

STAKEHOLDER ROLES AND RESPONSIBILITIES	**Policy makers:** • Promote innovations and deployment of decentralised power systems
	Regulators: • Ensure that consumer rights are respected by stakeholders in EaaS models • Provide incentives for consumers and prosumers to provide demand response and ancillary services to the distribution system operator
	Energy service providers: • Increase awareness among customers regarding the latest energy management technologies and provide guidance to customers on choosing solutions that fit their needs • Create end-to-end solutions, starting from energy procurement to consumption management, that will meet a variety of customers' needs • Increase awareness among consumers about the benefits of being an active participant in the energy market. Ensure access to simple and reliable information to consumers.
	Distribution system operators: • Procure market-based flexibility services from distributed energy resources via ESPs • Securely share consumer and grid-related data with third parties as per applicable data privacy and sharing norms
	Consumers: • Become an active consumer by responding to price signals (where markets are in place) to reduce cost on the final bill • Increase level of service provided to the distribution system operator via demand-side management and ancillary services provided to the distribution system operator

ABBREVIATIONS

EaaS	Energy-as-a-Service
EPC	engineering, procurement and construction
ESP	energy service provider
EV	electric vehicle
HVAC	heating, ventilation and air conditioning
ICT	information and communications technology
IRENA	International Renewable Energy Agency
IT	information technology
NZD	New Zealand dollar
PV	photovoltaic
US	United States
USD	United States dollar
VRE	variable renewable energy

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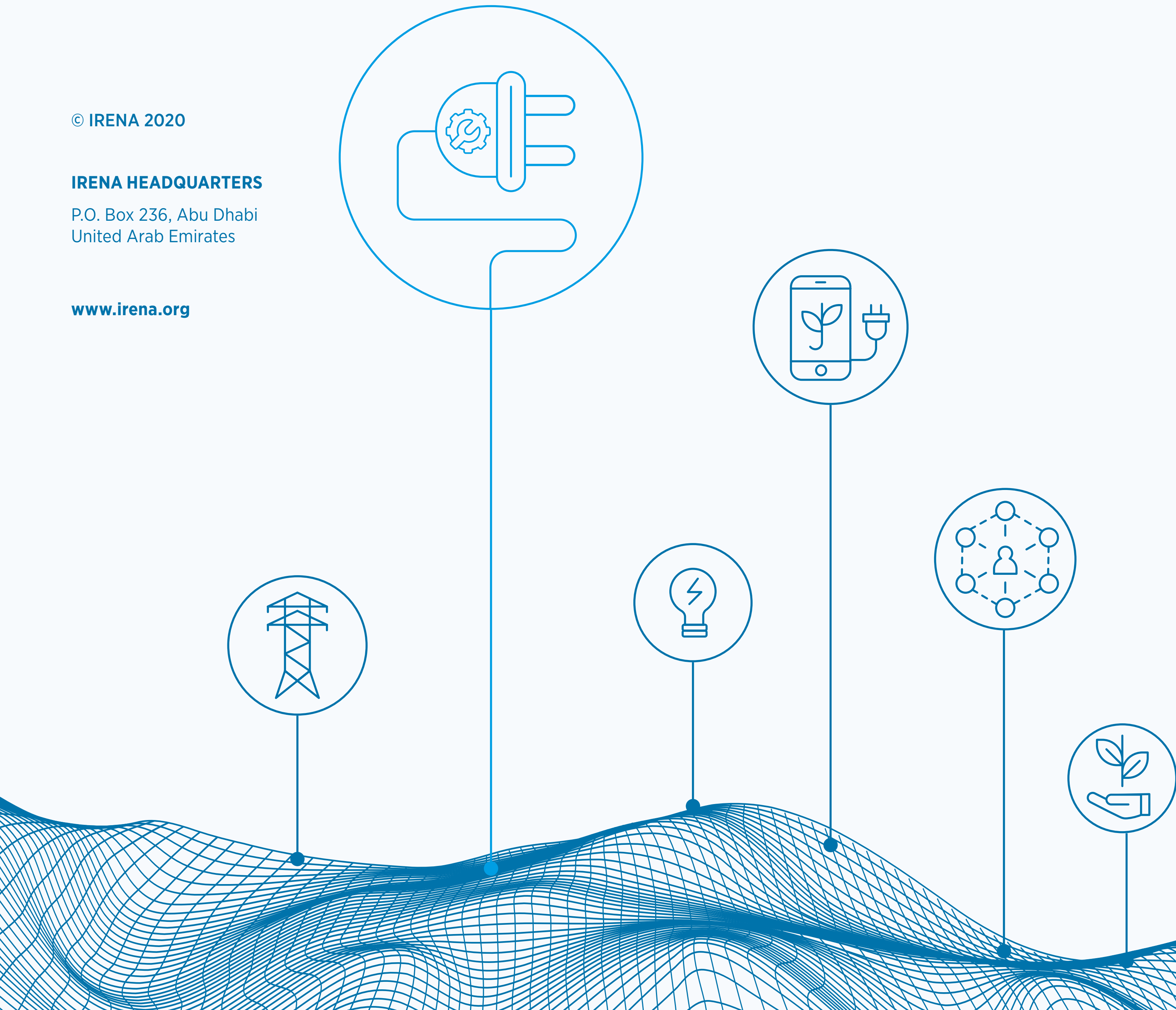

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