

# Eleven Business Opportunities emerging from the Energy Transition

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Traditional energy market players face a challenging situation, dismissing their long-established business models to instead embrace one of the multiple business opportunities emerging from the energy transition. This contribution builds on both the research work performed in the frame of the Swiss Competence Center for Energy Research, “SCCER FEEB&D,” and the executive training in Governing Energy Transitions (GET) to provide a structured overview of business development axes and business opportunities characterizing this phase of the energy transition. Based on a scientific literature review, market screening and collaboration with a Swiss utility company, eleven business opportunities, referring to independent value creation mechanisms have been identified and discussed.

## Introduction

In 2014, while developing the Swiss Energy Strategy 2050, the Swiss Confederation founded seven national competence centers for energy research (SCCER) with the aim of federating the main public and private actors of the Swiss energy sector and foster the development and implementation of innovative solutions enabling the achievement of the Swiss Energy Strategy 2050. The seven SCCERs address all domains of the energy transition investigating technological, social and economic aspects.

As a result of the collaboration between three competence centers, “SCCER FURIES” –focusing on the future electricity networks, “SCCER FEEB&D” –focusing on the future energy efficient built environment, “SCCER CREST” – focusing on the socio-economic perspective, a new project has been launched in 2017 to explore the coupling of the electrical grid at distribution level with other energy carriers (i.e. thermal and chemical). This project builds upon a pilot & demonstration project of smart grid solutions cofounded by the Swiss Federal Office of Energy and Romande Energie, one of the largest utility company and distribution system operators (DSO) in Switzerland. The smart grid demonstrator will be deployed within a district of a town in Switzerland between 2017 and 2020.

Responsible for the business model innovation activities within the “SCCER FEEB&D”, we contribute to explore the socio-economic aspects related to the implementation of multi-energy systems and smart grid solutions. With the overall objective of establishing guidelines supporting potential multi-energy systems stakeholders in the development of new business models, in 2017 we focused on the identification and classification of the new business opportunities emerging from the coevolution of the energy and digital transitions. In this light, the comprehensive and coherent vision of the energy transition, as well as the access to a variety of relevant stakeholders, offered by the executive training program GET has been particularly beneficial

to develop the conceptual representation of emerging business opportunities presented in this short paper.

## The context

The ambitious transition towards a more sustainable and carbon-free global energy system requires an unprecedented radical reorganization of the whole energy sector. A more rational conversion of available resources in energy systems and an increased adoption of renewable energy are the two fundamental pillars on which the energy transition is based upon.

Across the last decennium, the long-established energy market has been exposed to a concurrence of new trends continuously increasing in momentum: the liberalization and unification of markets; the increasing market penetration of decentralised energy systems based on renewable energy or favouring energy efficiency measures; the consequent highly uncertain regulatory framework evolution; the impact of the digitalisation; and last but not least, the global economic crisis (Schleicher-Tappeser 2012; Viral & Khatod 2012; Allan et al. 2015; Brunekreeft et al. 2015).

As a consequence, the energy sector and its stakeholders stand today at the eve of a challenging and exciting revolution: the way energy services are generated, delivered and traded is expected to change completely in the coming years.

At present, utility companies, the main actors of the energy market, are constantly losing profitability, and they are, therefore, striving to find appropriate ways to adapt to the undergoing transition. Many of the largest European utilities, amongst others the German E.ON and EnBW, the French EDF, the Italian ENEL, and the Swiss REPOWER, in the last years announced important reorientations of their activities mainly due to the fact that traditional business models no longer allow them to be competitive on the market.

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### Emerging business opportunities

At present, traditional utilities undertaking a reorganization, as well as new market actors, mainly orient their strategy towards four main business development axes: Energy Efficiency – the deployment of direct and indirect measures encouraging a more rational and/or sober use of energy resources; Electricity Markets – the exploitation of new opportunities arising from the transformation of the wholesale electricity markets; Smart Grids – the deployment of measures enhancing distribution grid flexibility, operability and controllability; Renewable energy – the exploitation of new opportunities arising from the market diffusion of renewable energy.

Based on a scientific literature and on a market review partly based on the insights provided by the GET program, each of the proposed strategic development axes has been analyzed and characterized by a number of new business opportunities emerging in the market. Each identified business opportunity is defined by a specific value creation mechanism and can potentially be exploited independently. An overview of the four business development axes and related business opportunities is depicted in Figure 1.

The identified business opportunities are formalized hereafter following the terminology and conceptualization proposed by Osterwalder and Pigneur (2010). Osterwalder and Pigneur defined a business model as “the rationale of how an organization creates, delivers, and captures value” and identified four main elements fully characterizing it: Value Proposition, Customers, Financial Viability, and Infrastructures. The analysis of the eleven business opportunities proposed below focuses in particular on the first three elements. Furthermore, as a result of the literature and market screening, for each business opportunity a list of references to relevant scientific publications and companies currently exploiting the business opportunity is presented. The market analysis focused on the European and US energy markets with the objective to spot innovative businesses emerging at the current stage of the energy

transition and is partly based on the study recently accomplished in the frame of the “SCCER FEEB&D” (Facchinetti & Sulzer, 2016).

### Energy Efficiency

<i>Reduce Demand</i>	
<b>Value Proposition</b>	Support the customers in a direct or indirect (e.g. formation, consulting) way to reduce energy consumption
<b>Customers</b>	Privates, Enterprises, Public bodies
<b>Financial Viability</b>	Share the revenues from energy savings with the customers
<b>Scientific references</b>	(Yushchenko & Patel 2016) (Qin et al. 2017) (Sorrell 2007) (Fang et al. 2012) (Suhonen & Okkonen 2013)
<b>Companies</b>	Oracle Utilities (previously Opower) (Int) Nest (Int) Siemens Building Technologies (Int) Alpiq InTec (CH)

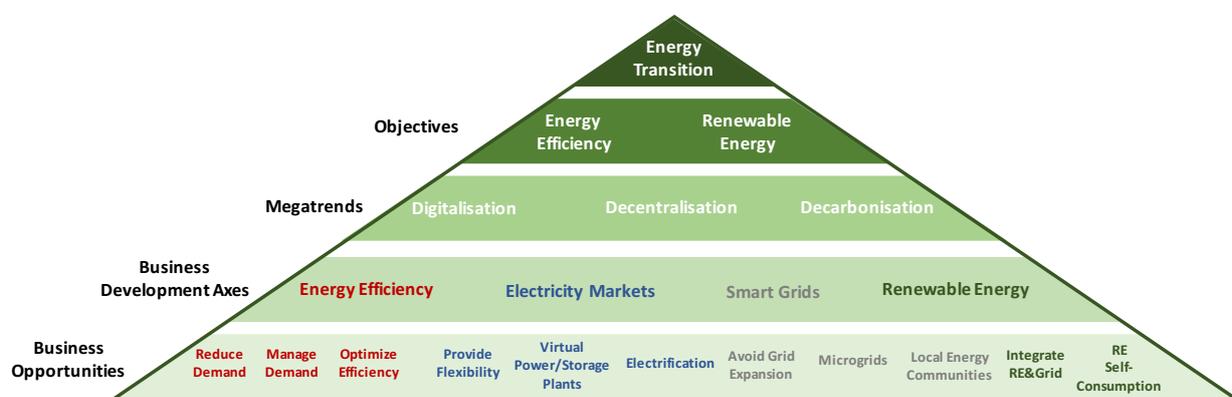


Figure 1– Business opportunities emerging from the Energy Transition

*Manage Demand*

<b>Value Proposition</b>	Support the customers in controlling and optimally shifting their energy demand
<b>Customers</b>	Privates, Enterprises, Public bodies
<b>Financial Viability</b>	Share the revenues from demand side management (reduce grid costs and capitalise on dynamic pricing)
<b>Scientific references</b>	(Goulden et al. 2014) (Behrangrad 2015) (Siano 2014) (Ali et al. 2017) (Martínez et al. 2015) (Good et al. 2017)
<b>Companies</b>	EnergyPool (Int) EnerNOC (Int) Entelios (DE) Itron (DE) Flextricity (UK)

*Optimize Efficiency*

<b>Value Proposition</b>	Optimize the energy conversion performance and capitalise on synergies on multi-energy systems
<b>Customers</b>	Privates, Enterprises, Public bodies
<b>Financial Viability</b>	Revenues from selling best practices and energy efficient solutions
<b>Scientific references</b>	(Mancarella 2014) (Capuder & Mancarella 2014) (Sepponen & Heimonen 2015)
<b>Companies</b>	EON (DE) NRG (US) Siemens Building technology (Int) Alpiq InTec (CH) Innowatio (Int)

**Electricity Markets***Provide Flexibility*

<b>Value Proposition</b>	Offer the opportunity to valorise customer's flexibility in the energy markets
<b>Customers</b>	Privates, Enterprises, Public bodies
<b>Financial Viability</b>	Share the revenues from the flexibility valorisation
<b>Scientific references</b>	(Eid et al. 2015) (Eid et al. 2016) (Stinner et al. 2016)
<b>Companies</b>	Tiko (CH) Flextricity (UK) Entelios (DE) EnergyON (CH)

*Virtual Power Plants*

<b>Value Proposition</b>	Offer the opportunity to valorise decentralised energy systems in the energy markets
<b>Customers</b>	Privates, Enterprises, Public bodies
<b>Financial Viability</b>	Share the revenues from the energy trading
<b>Scientific references</b>	(Loßner et al. 2016) (Pudjianto et al. 2008) (Mancarella 2014)
<b>Companies</b>	Lichtblick (DE) Next Kraftwerke (DE) SUNVERGE (US) Kiwigrd (DE)

*Electrification*

<b>Value Proposition</b>	Offer electricity based alternatives for product and services traditionally based on fuels
<b>Customers</b>	Privates, Enterprises, Public bodies
<b>Financial Viability</b>	Revenues from selling electricity-based carbon-free and energy efficient solutions replacing fuel based solutions
<b>Scientific references</b>	(Kannan & Hirschberg 2016) (Bohnsack et al. 2014) (Kannan & Hirschberg 2016)
<b>Companies</b>	SBB (CH) Tesla (US) Sono Motors (DE) NRG (US) Repower (CH)

*Avoid Grid Expansion*

<b>Value Proposition</b>	Offer competitive alternatives to avoid transmission and distribution grid expansion
<b>Customers</b>	Grid owners, grid operator, Enterprises, Public bodies
<b>Financial Viability</b>	Savings from grid expansion cost avoidance
<b>Scientific references</b>	(Bussar et al. 2016) (Good et al. 2017) (Poudineh & Jamasb 2014)
<b>Companies</b>	Landys+Gyr (Int) Schneider Electric (Int) Trilliant (US)

*Microgrids*

<b>Value Proposition</b>	Offer customised, stand-alone electricity grid solutions
<b>Customers</b>	Privates, Enterprises, Public bodies
<b>Financial Viability</b>	Revenues from selling customised grid solutions
<b>Scientific references</b>	(Giraldez & Heap 2015) (Lasseter 2011) (Adil & Ko 2016)
<b>Companies</b>	ABB (Int) Schneider Electric (Int) Siemens (Int) GE (Int) RENEMIG (Int)

*Local Energy Communities*

<b>Value Proposition</b>	Offer customised solutions for local energy communities
<b>Customers</b>	Privates, Cooperatives, Enterprises, Public bodies
<b>Financial Viability</b>	Revenues from selling customised solutions for local energy communities
<b>Scientific references</b>	(Van Der Schoor & Scholtens 2015) (Koirala et al. 2016) (Kunze & Vancea 2017)
<b>Companies</b>	Clean Energy Collectives (US) Mongoose Energy (UK) Engytec (CH) CfR (UK) Jouliette (NL)

## Renewable Energy

<i>Integrate Renewable Energy and Grid</i>	
<b>Value Proposition</b>	Deploy renewable energy solutions and favour their integration into the distribution grid
<b>Customers</b>	Privates, Cooperatives, Enterprises, Public bodies
<b>Financial Viability</b>	Revenues from deploying renewable energy and/or enabling their grid integration
<b>Scientific references</b>	(Bussar et al. 2016) (Anaya & Pollitt 2015a) (Anaya & Pollitt 2015b) (Brunekreeft et al. 2015)
<b>Companies</b>	Yunicos (Int) E ON (DE) Enel Green Power (Int) OMNETRIC group (US) Younergy (CH)

<i>Renewable Energy Self-consumption</i>	
<b>Value Proposition</b>	Deploy solutions promoting the self-consumption of local renewable energies
<b>Customers</b>	Privates, Cooperatives, Enterprises, Public bodies
<b>Financial Viability</b>	Revenues from offering self-consumption solutions and/or sharing cost savings from avoided energy supply from the grid
<b>Scientific references</b>	(Bussar et al. 2016) (Palizban & Kauhaniemi 2016) (Stinner et al. 2016)
<b>Companies</b>	Tiko (CH) Yunicos (Int) Schneider Electric (Int) Tesla (US) SonnenBatterie (Int) Victronenergy (NL)

## Combining business opportunities

The identified business opportunities can be combined in order to exploit potential synergies and thus create value propositions relying on multiple value creation mechanisms. The compatibility potentials between the identified business opportunities have been investigated on a qualitative basis considering the findings obtained from the literature review, the market screening and based on the collaboration with Romande Energie. In particular, two utility's managers responsible for business innovation activities have been involved in series of workshops and a semi-structured interview aiming to analyze and enhance the developed conceptual framework including the utility's perspective.

As a result of such qualitative analysis, the combination of business opportunities bearing a high level of compatibility have been grouped into clusters. The results of such assessment are presented in Figure 2: four different clusters of highly compatible business opportunities are presented with different colors.

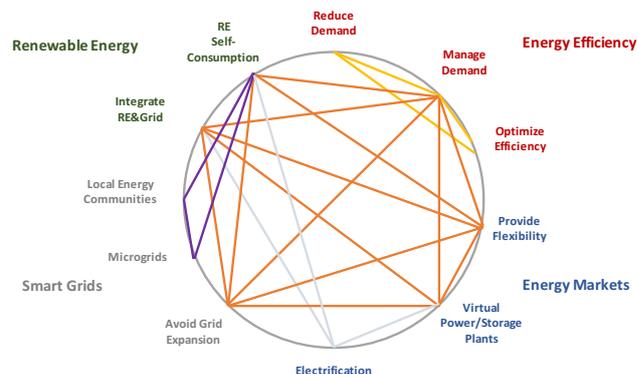


Figure 2 – Clusters of compatible business opportunities

Four clusters are named after the business opportunity, which characterizes the cluster in the best way: Optimize efficiency (yellow cluster), Provide flexibility (orange cluster), RE self-consumption (purple cluster), Electrification (light grey cluster). The clusters are briefly described below.

### *Optimize Efficiency*

The focus of this cluster lies on the development of products improving the performance of energy systems by means of the following three integrated measures: energy efficiency optimization, integration of load control solutions, and demand reduction. This cluster is mainly oriented to the business development axe *Energy Efficiency*.

### *Provide Flexibility*

Flexibility is a key aspect for the energy systems of the future and it is not a surprise if this cluster relates to all different business development axes. The electricity mar-

kets are expected to valorize in the future the flexibility potential related to the demand side (*Energy Efficiency* axe) and the decentralized renewable production side (*Renewable Energy* axe) by means of the available new flexible grid solutions (*Smart Grids* axe)

#### *RE self-consumption*

The increase of self-consumption of locally produced renewable energy is expected to have a crucial role in fostering energy transition. On the one hand, the combination of renewable energy production and energy storage solutions, and on the other one hand, new organizational forms, such as local energy communities and district level aggregators, clearly offer an interesting playground for the development of new products and services.

#### *Electrification*

This cluster mainly associates the business development axes *Electricity Markets* and *Renewable Energy*. The increased share of renewable energy generation in the future is expected to be mostly electricity-based (i.e. wind and PV). Combining this tendency with the trend towards the electrification of several sectors (e.g. home automation, mobility), innovative products and services are expected to flourish from this cluster of business opportunities.

#### **Conclusions**

Traditional energy market players are facing a challenging situation: dismiss their long-term established business models to instead embrace one of the multiple business opportunities emerging from the energy transition. This contribution builds upon both the research work performed in the frame of the Swiss Competence Center for Energy Research “SCCER FEEB&D” and the executive training GET to provide a structured overview of business development axes and business opportunities, characterizing this phase of the energy transition. Based on a scientific literature review and a market screening, eleven business opportunities, referring to independent value creation mechanisms have been identified. Furthermore, a qualitative assessment in collaboration with Romande Energie, a Swiss utility company, has been performed to investigate the most interesting combinations of such business opportunities in the perspective of creating innovative products and services fostering the energy transition and potentially successful in the market. The proposed conceptual framework aims to provide an orientation within the vast number of opportunities that is expected to characterize the energy markets in the forthcoming decades.

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