

SENSIBLE

Making local energy storage work with storage-enabled business models

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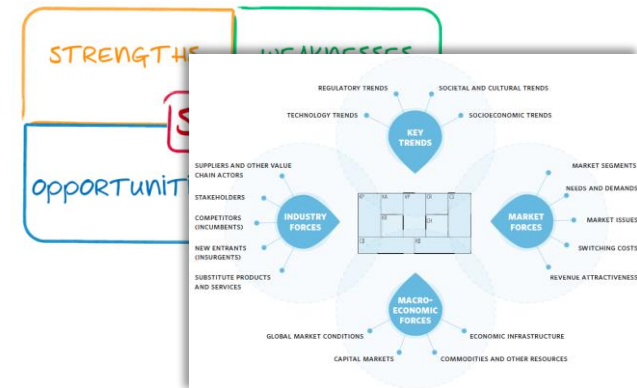
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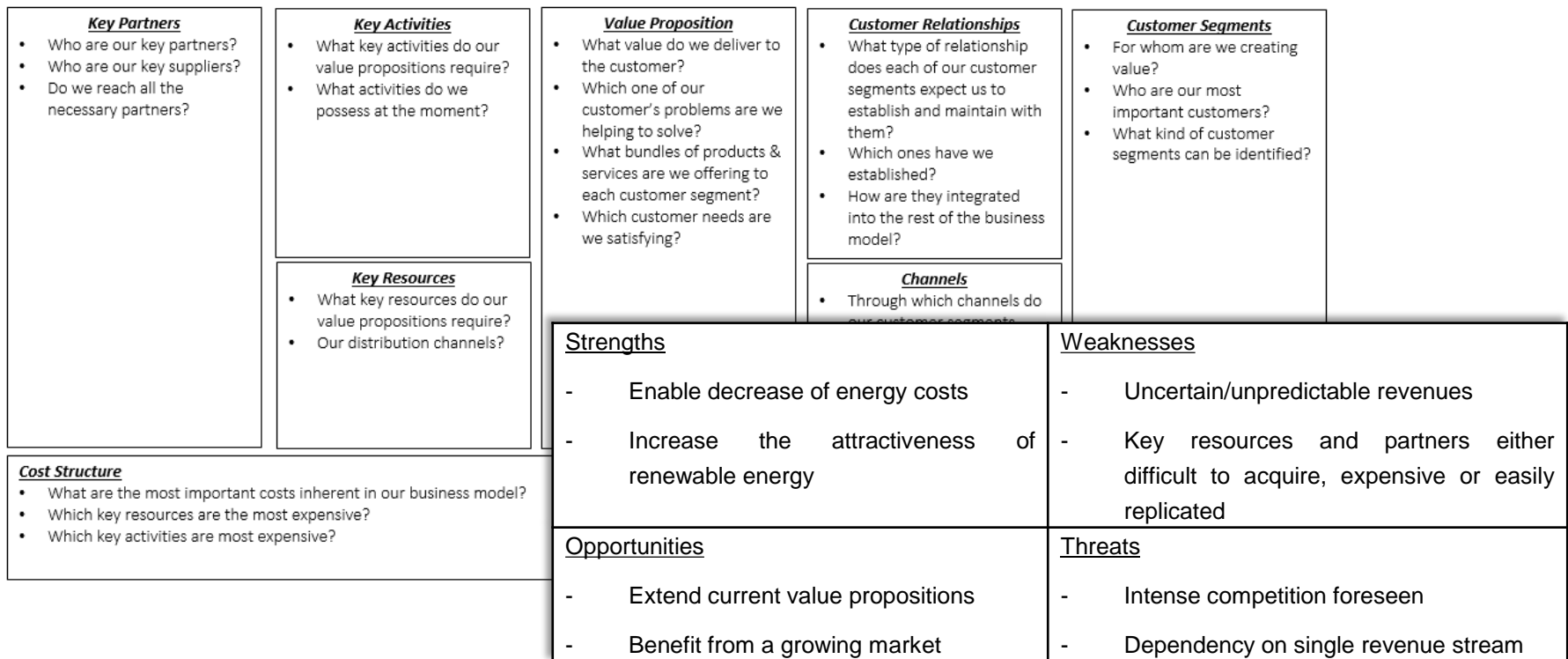
Agenda

- Business model framework
- Business model overview & demonstrations
 - 3 demonstrations
 - 11 technical use cases
 - 11 business models
- Business model analysis
- Energy market environment & connectivity
- Enabled market development



Business model framework

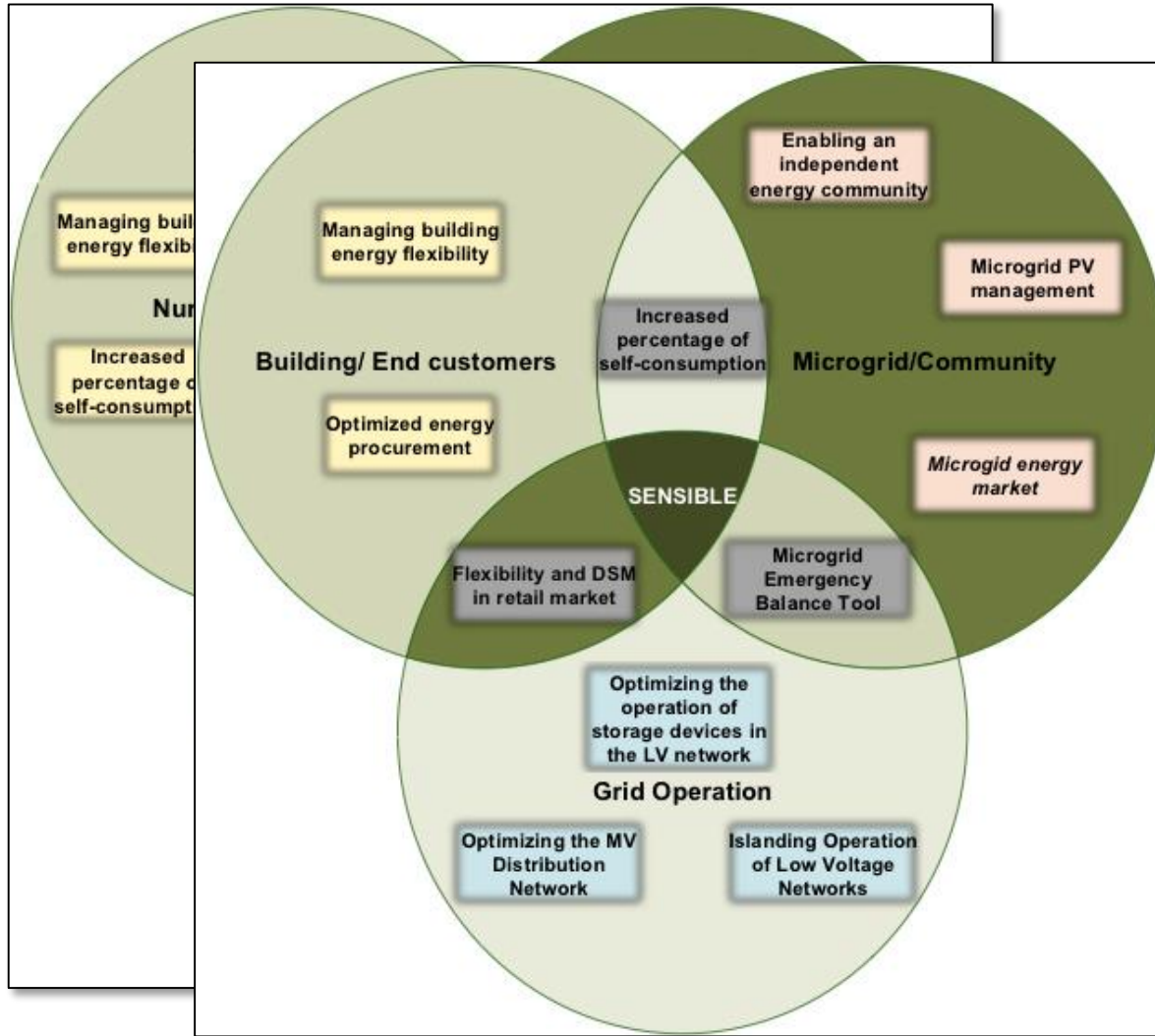
- Business Model Canvas
- SWOT



General storage business models

Business Model	Advantages	Disadvantages
Distribution Network Operator (DNO) Owned and Managed	DNO has full control of assets There may be lower costs of financing	The DNO takes on the full risk DNO may lack the skills and capabilities to operate the asset No incentive for transferring of profits to end user Shareholder may not appreciate the level of risk
DNO Contracts a Third Party	DNO still maintains operational control Third party may have greater expertise than the DNO in the area May be a lower cost of financing	Asset may be managed more efficiently Commercial risk is with the DNO and customers
Utility Company Managed	Utility company may have greater expertise in the area Utility company may have greater expertise than the DNO in the area	Often such projects are experimental in nature and are mainly focused on assessing the technical performance of equipment Benefits may not be transferred to the end user
Direct Sales and Leasing	DNO has no commercial risk This approach may be economically viable	Does not necessarily encourage innovation DNO has little control over the asset Third party may be exposed to changes in incentives
Community Energy Storage	Engages and involves the community in their energy futures Addresses issues of energy affordability	DNO has little control the asset Community may be exposed to changes in incentives

Use cases & demonstrations SENSIBLE business models



Business model overview

■ Key customer segments

	Business model \ customer	TSO	DSO	Supplier	BRP	Community	Prosumer	Consumer
NUREM- BERG	Managing building energy flexibility		X	X			X	X
	Increased percentage of self-consumption						X	X
	Optimized energy procurement			X		X	X	X
NOTTING -HAM	Microgrid PV management					X	X	X
	Enabling an independent energy community		X			X	X	X
	Microgrid energy market	X	X	X		X	X	X
ÉVORA	Flexibility and demand side management in retail market	X	X	X	X	X	X	X
	Optimizing the MV Distribution Network		X				X	X
	Optimizing the operation of storage devices in the LV network		X					X
	Islanding Operation of Low Voltage Networks		X				X	X
	Microgrid Emergency Balance Tool		X	X			X	X

Analysis

The business models were evaluated based on

- Strengths, weaknesses, opportunities, threats (SWOT)

<p><u>Strengths</u></p> <ul style="list-style-type: none"> - Enable decrease of energy costs - Increase the attractiveness of renewable energy 	<p><u>Weaknesses</u></p> <ul style="list-style-type: none"> - Uncertain/unpredictable revenues - Key resources and partners either difficult to acquire, expensive or easily replicated
<p><u>Opportunities</u></p> <ul style="list-style-type: none"> - Extend current value propositions - Benefit from a growing market 	<p><u>Threats</u></p> <ul style="list-style-type: none"> - Intense competition foreseen - Dependency on single revenue stream

- Business environment analysis
- Value creation
- Demonstration results
 - Impacts, costs

Business environment

- The future energy mix
 - will be based on renewables
 - we become generation following instead of load following
 - the market bid/ask cannot be based on marginal cost of production
- The future resources portfolio is distributed which requires flexibility from the operational environment
 - sharing of energy and local independence becomes possible
- The future is market oriented so new structures and resources must be funded by market mechanisms

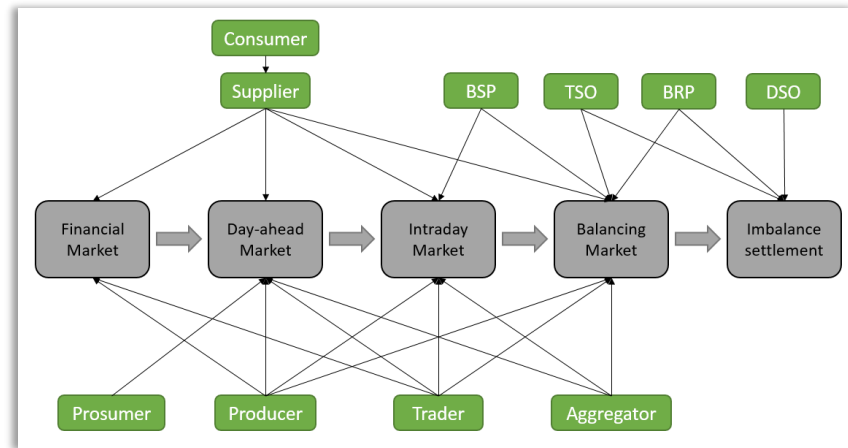
Energy market environment

Barriers and differences within EU

- Distribution between tax, network, energy costs
 - End-customers should be able to address network and tax components for full benefit
- Purchasing power
- Regulation
 - DSOs role in ownership of storage
 - Classification of storage and use in simultaneous services

Identified categories for requirements

- Balance management
- Energy measurement
- Balance settlement
- Customer information management & billing
- Trading



New business models introduce new market players

- More transactive customer information management, balancing areas, trading frameworks
- Managing and handling energy measurement data between the market parties is affected
- End-customers should be able to address network and tax components for profitability

Business model value creation

Nuremberg demonstrator

- Maximize building self-consumption and optimize energy costs
- Enable higher penetration of renewable energy sources
- Provide power flexibility for grid operators and energy suppliers

Nottingham demonstrator

- Community cost linked to fuel poverty reductions
- Increased community resilience linked with energy security
- The development of self-consumption through renewables

Évora demonstrator

- Ensure the continuity of service through storage backup
- Improve the QoS (Quality of service) in terms of frequency and voltage profiles as well as losses reduction
- Promote the penetration of renewable energy

Enabled market development

Technology enablers

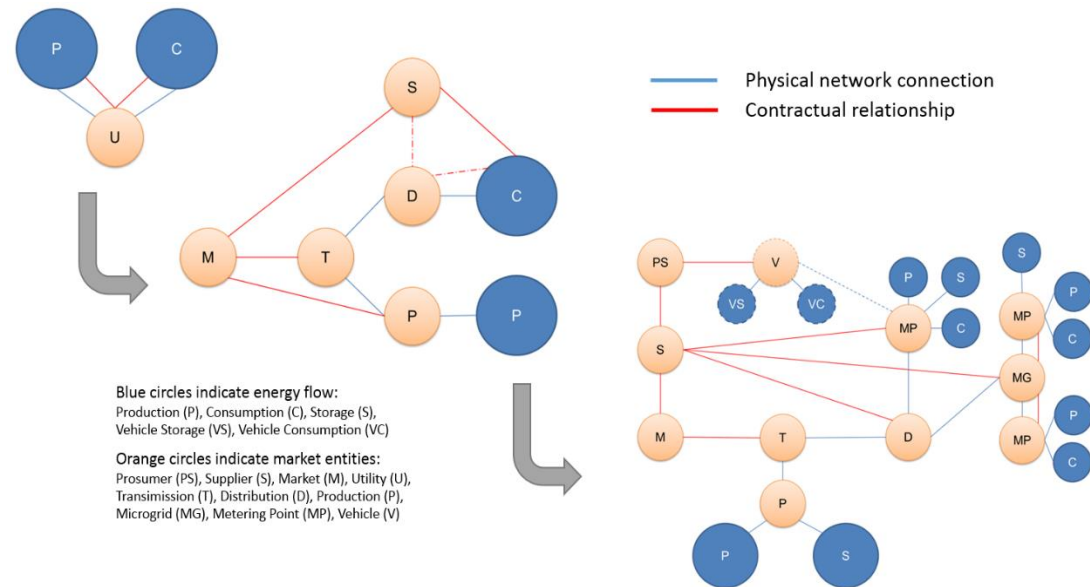
- Combination of different storage technologies can increase their combined value

Market enhancing business models

- The proposed business models and demonstrations guide the direction for shifting to a market model where the full value of resources can be exploited in trading

Local market and cross market enabling business models

- Enabling the evolution of energy markets into more efficient flow of value in the energy ecosystem



In conclusion

- Future
 - is market oriented
 - will value flexibility

- Diversity of
 - storage technologies
 - business models for application

SENSIBLE project deliverables

- **D5.1** Storage enabled energy business model framework for demonstration
- **D5.2** Storage enabled energy business models
- **D5.4** Energy market interaction of business models

Thank you!

Questions?

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