

INTEGRATED SMART GRID STRATEGY

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ABSTRACT

Utilities are re-inventing themselves to meet current regulations and to keep up with technological advancements. Strategies and business models must be aligned to provide sustainable business value. In order to manage the interdependencies of business models and strategies, a consistent framework is required. With the Smart Grid Compass[®], Siemens uses its global knowledge and experience to support its customers in overcoming these challenges such as:

- Decentralized generation, renewable integration and new regulations threaten traditional utility business models.
- Business models and smart grid strategies need to be aligned to provide sustainable business value.
- To manage the interdependencies of business models and strategies a structured, consistent framework is required.
- The Smart Grid Compass[®] bundles Siemens' global know-how and is therefore the perfect tool to navigate utilities to sustainable business models.

ÖZETÇE

Altyapı sağlayıcılar güncel regülasyonları karşılamak ve teknolojik gelişimleri yakalamak için kendilerini tekrardan keşfediyorlar. Stratejiler ve iş modelleri sürdürülebilir bir iş değeri ile bağlantılı olmalı. İş yapıları ile stratejilerin karşılıklı bağlılığını yönetmek için, tutarlı yapı gereklidir. Smart Grid Compass[®] ile, Siemens küresel bilgisini ve tecrübesini müşterilerinin bu aşğıdaki gibi zorlukların üstesinden gelebilmesi için kullanır:

- Dağıtılmış üretim, yenilenebilir enerji entegrasyon ve yeni regülasyonlar, altyapı sağlayıcılarının geleneksel iş modellerini tehdit eder.
- İş modelleri ile akıllı şebeke stratejileri sürdürülebilir iş değeri için uyumlu olmalıdır.
- Stratejileri ile stratejilerin harmonisi yönetmek için tutarlı bir yapı kurulması gerekir.
- Altyapı sağlayıcılarına sürdürülebilir iş modelleri için yol gösterilmesi gerekmektedir.

1. INTRODUCTION

The classical utility business environment has been undergoing massive structural change for the last 10 years due to changes in renewable energy policies, regulatory frameworks, market relationships and advances in technology. However, these changes under the rubric of Smart Grid not only create new challenges for utilities, they also provide opportunities for creating new and innovative solutions.

The challenge lies in navigating these changes through a comprehensive Smart Grid strategy that integrates technical

capabilities with business opportunities in a structured way to create sustainable business value. Key motivations for an Integrated Smart Grid Strategy include:

- **Direction** – There are vast differences in business objectives, corporate visions and strategic directions of various stakeholders and even among different departments of the stakeholders. The problem is made yet more complex by semantic ambiguity inherent in language that is used to communicate Smart Grid concepts.
- **Planning** – Utilities, municipalities, policy makers and regulators are carrying out planning activities on different levels of abstraction. Classical planning procedures are targeted at optimizing individual objectives of individual stakeholders or individual departments. This approach results in strategic focus on a given objective at the cost of other objectives. Mutual lack of clarity and certainty about the other party's intent and plans therefore gives rise to a degree of planning incoherence. Structured prioritization procedures are needed to balance individual objectives to ensure planning and operations in the entire company as a whole are also optimized in a technically complex Smart Grid environment.
- **Ecosystem** – The utility industry is moving from a simple business model to a complex multi-nodal network that has all the characteristics of a balanced ecosystem. New market entrants that offer innovative services, new third-party owned distributed energy resources and new roles for existing players, altogether, increase the complexity and diversity of the Smart Grid ecosystem. Inefficient management of complex transactional relationships between multiple parties increases the risk of system instability and financial losses.
- **Business Cases** – Vertical Smart Grid business cases geared towards a single objective often fail. For a positive business case, utilities need to plan Smart Grid activities across the board, have clarity about value generation potential and distribute the costs and generated value in a way that is beneficial for all.
- **Politics** – As customer satisfaction with energy availability, costs and perceived value becomes politically relevant, electricity is increasingly being seen as part of essential public services and more than a commodity. Consequently, municipalities in multiple jurisdictions around the world are actively seeking to acquire their local grids. In Germany the phenomenon of 'Rekommunalisierung', or re-municipalization of grids is driven by the utilities'

obligation to provide efficient public services ('Daseinsvorsorge'). The change in customer expectations and its political implications requires utilities and municipalities to navigate the Smart Grid space using a structured strategy.

- **Perceived Value** – Integrating renewable energy into the grid involves considerable costs that have hitherto been mostly borne by the consumers through regulatory regimes like 'feed-in tariffs'. Such regulatory regimes in Germany and other European countries have caused rate increases for consumers without creating any increase in perceived value for the customers. Utilities and energy providers need to go the extra mile and focus on creating 'perceived' value with a high Quality of Service instead of limiting themselves to selling kWhs. The leap from providing kWh to providing value and comfort to the customers requires structured strategic planning to optimize business processes, create value for the customers and charge them at a tariff level they are willing to pay for.

There is clearly a need for a systematic approach that integrates and manages disruptive engineering innovation with business innovation. In the form of the 'Integrated Smart Grid Strategy', Siemens has developed just such an integrated approach that fully exploits the capabilities enabled by game-changing Smart Grid technologies in order to assist its partners.

2. CORE TOOLS

The Integrated Smart Grid Strategy utilizes two core tools:

- Smart Grid Business Model Framework
- Smart Grid Compass®

The tools are used in a synergistic manner to identify, refine and implement the strategic vision of the organization. The broad scope of the 'Integrated Smart Grid Framework' begins with first identifying potential future scenarios and covers issues such as evaluating business models, modeling organizational maturity, analysing capability-gaps, technological solutions, evaluating impacts of change, and finally, detailed implementation planning.

2.1. Smart Grid Business Model Framework

The Smart Grid Business Model Framework approach uses the open-source Business Model Canvas [1] to create a shared language for describing, visualizing, assessing, and changing business models. As business environments change, they mean paradigm shifts in the way of doing business and require new business models to describe them. The next big paradigm shift in the context of electric power industry is the 'Smart Grid' which is understood in the industry as the ideal future state which can be attained through gradual adoption of 'smarter' technologies.

The scale and complexity that will be introduced in an energy company's daily business by these new technologies necessitate an overall implementation plan built around a shared strategic vision. The Business Model Canvas, thus,

helps in capturing the business sense behind Smart Grid value propositions.

The Smart Grid Business Model Framework can be described as a canvas with nine basic building blocks with interdependent relationships showing the logic of how a company intends to make money. Figure 1 shows the generic Business Model Canvas:

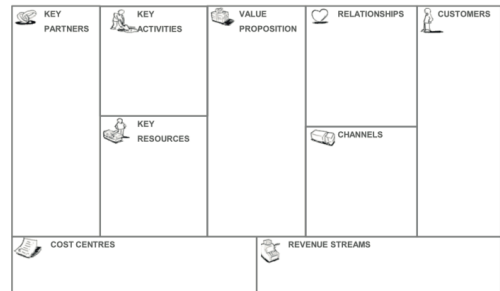


Figure 1: Business Model Canvas [1]

The nine blocks help the organization answer questions like what do we deliver to our customers, what exactly do we sell, what do we bundle/resell and what innovative combination of products/services can we potentially sell as value-added services? Completing the canvas with information about revenues, costs key resources and partners, an energy company will arrive at a strategic blueprint which is then implemented through Smart Grid Compass's organizational structures, processes, and systems.

Value Proposition – The Value Proposition describes the bundle of services or products that create special customer value for an organization. These value propositions can consist of:

- Unique offers to the customer with innovative pricing schemes
- Tailored products and services for different market segments
- Extension and improvement of existing services
- Different combination of services depending on customer motives (financial, environmental etc.)

Key Activities – The Key Activities describe the activities that are already in place and essential for successful operation of an organization. These activities help the company to create value, earnings and target the appropriate markets as well as retain customer segments.

Key Resources – The Key Resources concentrate on those resources which allow the energy firm/utility to create and offer value for a successful business model. Different customer segments and the demand of the changing markets can influence the prioritization of resources. A business model can involve different types of Key Resources:

- Physical and technical resources (such as devices and systems)
- Human and intelligent resources (such as branding, intellectual property rights, and human capital etc.)

- Financial resources

Key Partners – Key partnerships are alliances made with entities that are external to the organization. Following types of alliances can exist between a firm and its partners:

- Buyer/supplier relationships to support induction of new technology, acquisition of spare parts, maintenance contracts etc.
- Strategic alliances with non-competitors
- Financing sources
- R&D collaborators
- Regulating bodies and policy makers

Cost Structure – Cost Structure describes all costs incurred to operate a business model while creating and delivering Value Propositions, maintaining Customer Relationships, and generating Revenue Streams. Three major types of cost structures can exist:

- Fixed costs to operate and maintain the technical infrastructure
- Fixed costs to operate and maintain the business infrastructure
- Variable costs for R&D, transition to new technologies and expansion of products and services scope etc.

Customer Segments – The Customer Segment identifies different groups of service consumers or companies that an organization wants to reach and serve. Groups of customers represent separate segments if the following differences exist between them:

- Communication channels used
- Relationship type depending on different consumption contracts
- Customer behavior and relocation frequency
- Geographical factors that impact costs
- Profitability potential

Customer Relationships – Customer relationships define the types of relationship an organization establishes with its Customer Segments driven by motivations such as:

- Customer acquisition
- Customer retention
- Diversifying portfolio and leveraging cross-selling potential

Communication Channels – Communication Channel describes how the organization communicates with its Customer Segments to deliver a Value Proposition. Communication Channels can comprise:

- Distribution, sales and account administration channels that interface with the customer, control systems or devices.
- Appropriate channels as part of the customer service experience, branding and selling new products and providing technical support services.

Revenue Streams – Revenue Streams are the cash flows that are generated from the organization's Customer Segments

through creating Value Propositions. A business model can involve different types of Revenue Streams.

- Revenues that are created on a recurring basis as a result of metered consumption.
- Revenues generated as a result of fulfilling short-term needs of utility partners, as well as for derivatives market contracts.
- Special regulatory incentives and rebates

2.2. Smart Grid Compass

The Smart Grid Compass® is a method to evolve an existing grid into a Smart Grid comprising Siemens' global experience in building, operating and maintaining electrical grids. Through the Smart Grid Compass® the knowledge, insights and experience of our leading engineers is formalized and aggregated to the benefit of our customers. Previous studies and research by Siemens [2], [3] and [4] in the domain of strategic grid asset management also provided the impetus for integrating these concepts in the Smart Grid space.

The Smart Grid Compass® Framework establishes a structured 360° view on the development of a utility of today into a utility of the future. The 360° view distinguishes four quadrants that represent the core business areas of an electric utility. Figure 2 shows the 5 quadrants of the Siemens Smart Grid Compass®.

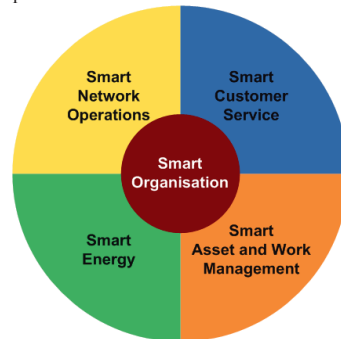


Figure 2: Smart Grid Compass®

The four quadrants are tied together by the smart organisation needed to implement the changes in the company structure to enable synergies of a smart grid roadmap and foster the change management within the utility. All business areas are typically executing business processes in order to achieve certain objectives such as system reliability, compliance to regulation etc. Those objectives are levered by an orchestrated use of different technologies in the field and require integration in order to profit from synergies between processes and technologies.

The Smart Grid Compass® takes care of these aspects with three consistently connected dimensions:

- **Business Objectives** – These are the major goals of any given business area and are achieved by the individual contribution of the business processes to these objectives. The Framework comprises four major objectives in each quadrant.
- **Business Process Capabilities** – Business Objectives can only be achieved by improving the corresponding Business Process Capabilities by enabling technological levers. The framework comprises up to eight major processes in each quadrant.
- **Technologies** – Technologies generally enable more sophisticated Business Process Capabilities and therefore add business value by contributing to Business Objectives.

These dimensions are connected by an Initiatives Catalogue that contains Project Blueprints originating from Siemens' experiences with projects and concepts in the Smart Grid environment. It is used to provide a connected view regarding process improvements made through leverage of technology achieving impact on objectives to build a Smart Grid Program on the experience of Siemens.

3. INTEGRATED SMART GRID STRATEGY

The execution method of the Integrated Smart Grid Strategy is carried out in 5 distinct phases:

1. **Understand Today's Model**
2. **Understand Smart Grid Roadmap**
3. **Understand Business Environment**
4. **Identify and Assemble Future Business Models**
5. **Setup Smart Grid Implementation Program**

The Integrated Smart Grid Strategy mainly uses Business Model Canvas [1] to first identify and refine the strategic vision of the company. This strategic vision in the context of prevailing business environment is then analysed and implemented with the help of Siemens' proprietary Smart Grid Compass®. The following sections provide brief details of the activities in each phase of the Integrated Smart Grid Strategy development.

3.1. Understand Today's Model

The first phase in the Integrated Smart Grid Strategy has three steps:

1. **Identify Building Blocks** – In the context of the Business Model Canvas, the first step helps the utilities answer the question: What core services are being delivered with which core products being sold? Most utilities deliver kWh but sell it under different angles (TOU prices, variable prices for kWh from green energy). Diversification in the product space together with bundling of energy management and home automation technologies creates further possibilities for utilities to enter into partnerships. Utilities across the world are increasingly working with partners to bundle enabling technologies/products of their partners

with their own services to enhance product and services offerings as part of their business models.

2. **Perform SWOT Analysis** – Identify the strengths and weaknesses of the organization to assess current performance sustainability. Assess the opportunities and threats to the current business model to identify the impact of potential future changes on business processes and operations. The results of the SWOT analysis are used to identify the areas/domains that require a 'call to action'.
3. **Understand Smart Grid Vision** – This step involves understanding the organization's existing corporate vision and strategy around Smart Grid and developing one if necessary.

3.2. Understand Smart Grid Roadmap

The second phase in the Integrated Smart Grid Strategy has three steps:

1. **Identify Technologies to be deployed** – This involves carrying out a technology inventory to identify existing technologies/assets and their levels of technical sophistication. Based on the organization's business objectives, a technology roadmap with a timeframe is developed to identify which technologies need to be deployed.
2. **Identify Business Capabilities to improve** – This step involves identifying which business capabilities need to be improved in accordance with the organization's objectives. The capability gaps between current sophistication and desired sophistication are bridged by a list of precise actions or 'initiatives' that are catalogued together with their required technology deployments. As a result of this step, the organization will also have a clear idea on how the 'initiatives' will improve its Quality of Service.
3. **Identify new Value Proposition Elements** – This step involves identifying core services that could be created to improve perceived value. Deploying new technologies and improving process sophistication opens the door for creating new core services like energy and/or comfort management. Engineering the perceived value for the customer in order to create customer participation incentives also allows a utility to create flexibility and optimize its generation and distribution. In other words, the utility offers a Value Proposition element (e.g., comfort or reduced complexity) to its customers, who, in return, allow it to use this load flexibility for improved grid management, and thus, creating the Value Proposition element for the utility itself. Identifying multiple Value Proposition elements this way will allow the utility to improve existing and create new core services.

3.3. Understand Business Environment

The third phase of the Integrated Smart Grid Strategy allows a utility or organization to gather a complete and thorough understanding of its existing business environment. This phase has four steps:

1. **Understand Key Trends** – This step carries out a predictive analysis of the future to identify the prevailing trends in technology, regulatory environment, societal and cultural developments and socioeconomic conditions.
2. **Understand Industry Forces** – This step undertakes a competitive industry analysis to determine primary industry movers, their relative strengths, stakeholders, suppliers, competitors and new entrants to the market.
3. **Understand Market Forces** – Market analysis is carried out in this step to identify market segments, determine the needs and demands of the market and evaluate any market impeding issues. Crucially, this step also involves determining if there are new market segments and whether the market is struggling to meet the needs of these new market segments. Selling an innovative product or service to customers improves the perceived value and consequently creates switching costs and exit barriers for customers allowing the utility to sustain and improve its market share.
4. **Understand Macroeconomic Forces** – This step involves studying macroeconomic indicators such as global market conditions, fuel prices, economic infrastructure of the area, local economic outlook and availability of capital etc.

3.4. Identify and Assemble Future Business Model

The fourth phase in the Integrated Smart Grid Strategy takes the results of the previous phases to identify and assemble future business models in four sequential steps:

1. **Brainstorm Ideas** – This step involves identifying new value proposition elements by evaluating potential services or products for customers. An example of a Value Proposition ‘element’ is a product or service that a utility offers to its customers while its own primary and underlying motivation constitutes a separate Value Proposition element. For example a utility offering heated water as a service to its customers in exchange for being able to control their water heating loads in order to manage peak loads,
2. **Create Scenarios** – This step involves developing scenarios by categorizing different Value Proposition elements and determining which combination creates a ‘win-win’ situation for all parties. A certain combination of Value Proposition elements targeted at a certain market segment using certain resources constitutes a scenario with its own cost drivers and revenue streams. Multiple scenarios are created in this step for comparison and refinement in later steps.
3. **Apply Blue Ocean Strategy** – The Blue Ocean strategy [5] takes its name from the concept that a market with intense competition is akin to a shark-infested ocean that is always red as a result of competition, carnage and bloodletting. A successful company reinvents the market and moves into an area where it has no competition – thus ‘blue ocean’. This step of the fourth phase carries out a refinement exercise on each of the created scenarios to identify ‘blue oceans’. The goal of this exercise is to identify for each scenario all potential cost sources that could be eliminated, as well as all possible sources of additional value creation without negatively influencing existing Value Propositions.
4. **Assemble Business Model** – The final step in this phase involves assembling the final business model to select the products to be sold and services that need to be delivered at a specified Quality of Service in order to generate forecasted revenues with anticipated cost structures. By reducing all possible costs and adding on new potential value sources, the final innovative business model will essentially create a new ‘blue ocean’ business model for the utility.

3.5. Setup Smart Grid Implementation Program

The fifth and final phase in the Integrated Smart Grid Strategy takes the results of all the previous phases to create a fully executable Program Plan ready to be handed over to the Program Management Office. This phase is a singularly unique Siemens offering as it bridges the oft-ignored industry knowledge gap between what a utility should do and how should it go about doing it. Using its vast project and program management expertise, Siemens has been able to create finely detailed execution blueprints for its partners in four steps:

1. **Quantify Impact and Cost** – This step determines the impact on a KPI level by calculating benefits delivered from the program as well as the scope of investment requirements for reaching KPI targets down to an initiative level.
2. **Optimize Scenario** – This step helps the utility determine the scope of the program and evaluate how far along the suggested program implementation it is willing to proceed. The Value Pack structure used by Siemens bundles together technology deployments with process improvement measures in discrete packages that allow a utility to halt program implementation at any time after a given Value Pack if desired. This added flexibility in Program design allows a utility to easily optimize its Program scope. Additionally, this step includes aligning the designed Smart Grid program with the utility’s existing CAPEX (capital expenditures) plans to leverage activities/assets/budget commitments mandated externally from the Smart Grid program, e.g., by the regulatory requirements, to create additional business value. Alignment of Smart Grid program design with the utility’s existing CAPEX plans is a necessary condition for efficient utilization of monetary resources.
3. **Finalize Business Case** – After the selected scenario has been reviewed and approved by all stakeholders, the business case is finalized to help the utility reach a go/no go decision regarding the Program. With a positive business case built on reasonable cost and benefit analyses, this step enables the utility to start a stakeholder engagement campaign in order to secure Program approval.
4. **Kick start the Program Management Office** – The final step of the last phase involves creating the detailed

Program Plan for execution. The level of detail necessary for this includes precise description of needed roles, their qualifications, total number of hours per year and per role as well as determining in deep detail the exact nature of all activities to be performed, the responsible role allocations and the available time frame for each activity. The program blueprint that contains this level of detail can be handed over to the Program Management Office (PMO) for kick-starting the Smart Grid Program.

4. CONCLUSION

Since the last few years, technical and engineering innovation has clearly outpaced innovation in business models which remain wedded to conventional ways of doing business. In many organizations, there is insufficient understanding of their current business models to know whether these business models hinder or promote new opportunities. Many energy companies and utilities around the world are already cautiously evaluating various Smart Grid technologies, mostly in small-scale pilot projects. Given the broad range of an energy company's activities and the vast range of available technologies, the task of integrating these technologies with the organization's mission, objectives and overall vision becomes quite complex. Further adding to this complexity are the radically new capabilities inherent in new Smart Grid technologies that are far in advance of existing infrastructure around which legacy business models have been constructed.

In the Smart Grid vision of Siemens, an organization can only achieve its business objectives by developing robust business models, creating detailed roadmaps for realizing these models, and formulating a concrete implementation plan in a structured process that aligns its strengths and its business objectives with technological possibilities. Such a massive change in business processes and technological capabilities of an organization must also navigate potential complexities that might arise in the future as a result of changes in business environment, regulatory mechanisms, and energy efficiency goals etc. Therefore, the Integrated Smart Grid Strategy requires periodic 'refresher' sessions with the utility's Program Management Office to track Program progress.

Built around an iterative value management approach, the Integrated Smart Grid Strategy also uses Siemens' Top+ methodology to track target achievement over the course of the entire program for each initiative.

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