

# The Role of CSR in Smart Grid Implementation



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IMSD  
Final Project  
08 July 2010



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## Thank You

We would like to thank Andres Luque, Sofie Choff Rodriguez, Dr. Oliver Raabe, Alexander Schuller, Andreas Reinhardt and all the other interviewees and individuals that provided their unique insights, care, and time to facilitate our study. We hope this study respects your intentions and furthers our joined cause for a more conscientious and sustainable world.

## **The Role of CSR in Smart Grid Implementation**

### **1. Introduction to the paper**

The aim of this paper is to identify the critical Corporate Social Responsibility (CSR) factors that have to be considered when private utilities implement the smart grid. For this purpose we have situated the smart grid within conceptual frameworks of CSR, sustainability, privatization, green niche theory and conscious consumerism. We drew upon literature from various disciplines such as technical, socio-technical, environmental, historical and political to provide us with different points of view about the issues concerning the smart grid.

The benefit of engaging with existing theory is that it not only provides us conceptual lenses, but also allows us to learn from previous analysis and conclusions drawn within those themes that are relevant to the smart grid. This conceptual engagement is complimented by empirical data and second hand research into two specific smart grid projects from two different continents; MeRegio in Germany and Boulder from the United States of America.

This study is divided into six main sections following the introduction. The first section describes the problems with the current electrical grid and the solutions provided through the smart grid. Secondly, we illustrate how the smart grid contributes to sustainability. Thirdly, we build the argument that CSR is important to a successful introduction of smart grids. The following section engages with existing theory to highlight the points of concern in relation to smart grid and draws connections to CSR. Next, we present our two case studies of Boulder's SmartGridCity and Baden Wuertenberg's MeRegio. Finally, we make three recommendations aimed at private electric utilities, to facilitate the introduction, participation, and mainstreaming of the smart grid.

#### **A. "Success" in terms of the smart grid**

Due to the smart grid being so new and still within the initial phases of implementation, quantitative data reflecting its success or failure was inaccessible<sup>1</sup>. "Success" evidently will refer to many different outcomes depending on the particular stakeholder. We will present in section 2.2 and 3 what the smart grid is designed for: to manage bottleneck demand stress, reduce CO<sub>2</sub> emissions (through renewables and increased efficiency), and to reconfigure consumption patterns. According to these missions, the success or failure refers to achieving or failing to achieve these objectives. Specifically in relation to the private utilities, who are one of our personal and main stakeholders whilst crafting this paper, it is obviously their mission to have foremost a technologically sound, sustainable and reliable smart grid, that can enter into a commercial market. They desire this in order to achieve the future goal of transferring this up-to-now relatively small and isolated service into the mainstream management of electricity provision. We will explain how their mission is therefore highly dependent upon consumer participation and the ability to shape and address the regulatory bodies that encompass it.

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<sup>1</sup> There *is* quantitative data in terms of how many smart grids there currently are, how many meters are in place, and how many people were connected to the smart grid in comparison to those desired participant forecasts. The quantitative data we would need in this case though is e.g., a study of smart meter of brand A showing that 6/10 users consult their consumption patterns 7/7 days, where as 7/10 with smart meter brand B consult their meter daily. This data has not yet been released/ or been made

Thus a “success” for the scope and aim of this paper would be 1) to create a responsive consumer society that conforms to price signals, where a failure is the smart grid consumer’s lack of participation by not reacting to price signals, and 2) to create a functional model that can be transposed onto a national scale.

## **B. Main findings**

As addressed in the previous paragraph, the main findings are rather qualitative, and conclude that smart meters are not sufficiently engaging the active participation of the smart grid users. We found that it is imperative to the success of the smart grid that utilities are proactive in interacting with the consumers and that CSR conceptualization and tools are an effective way to facilitate implementation. In relation to success no.2, the utilities that provide the smart grid must draw upon a variety of disciplines and stakeholders so that the public and the governmental acceptance is ensured.

## **C. Methodology: Research barriers and critical acknowledgments**

Quantitative data reflecting the success or failure is inaccessible at the moment to public research. Other second hand information was collected through the official project web pages, newspaper articles, publications and documents forwarded by the interviewees. In terms of the retrieval of qualitative first-hand information specific to our case studies, the MeRegio project is extremely transparent and its stakeholders are forthcoming. In contrast, Boulder first hand accounts and interviews with private utility employees was less accessible. This made it difficult to have a unilateral methodological approach to both cases. In a way this strengthens our research, as the cases require the exploration of different ideas, and already provide us with an interesting indication of existing CSR principles: transparency, dissemination of best-practices, and stakeholder engagement. Additionally, although we did speak to an array of differently natured stakeholders, we acknowledge that one individual’s perspective is not valid to represent their entity as a whole.

We would like to stress that any analytical work presented in this paper is to contribute to presenting the smart grid from a multi-layered perspective. This is an immense task to take upon ourselves. Therefore we have selected those conceptual frameworks and approaches that in our opinion best situate the smart grid within current discourses.

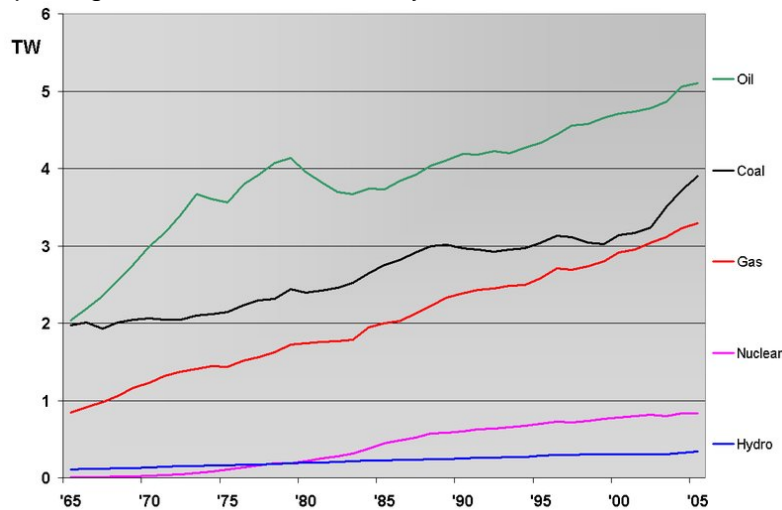
## **2. Introduction to Smart Grid**

In order to establish the relevance of this study, we will begin by describing the current grid and how it gave rise to the conceptualization of the smart grid. The aim of this section is therefore to give the reader general background information about the smart grid, so that in the following discussion of CSR thematic and sustainability, the reader has a better understanding of the scope and implications of a smart grid. First we will discuss the problems of the current grid, and then we will explore ways the smart grid can solve those problems and how it actually works. Concluding this section, we will explore the smart grid’s role in promoting sustainability including user engagement, climate change, and use of renewable energy.

### **A. The Current Grid**

The current grid, or “the electrical power generation, transmission, and distribution system” (Wotruba, 2010), receives power from electricity producers and distributes it to industrial, commercial, and residential customers. Though the current grid has managed fairly well for decades, its age is starting to show and the need for big change is looming (Wotruba, 2010). The current electricity network is inefficient and out-dated. Since Edison first gave power to a carbonized-filament light bulb in 1879, followed by commercial utility provision in the 1880’s our network demands, environmental

concerns have changed dramatically (MIT, 2002), whilst our consumption of electricity and thus required generation of it has steadily risen as well.



Source: Graph created from the data in the BP 2006 statistical review.

The graph demonstrates that regardless of how the energy is sourced, energy generation has steadily been increasing in production intensity since 1965. These trends are driven by a more demanding, growing and production-oriented society, which the current electricity grid is unable to cope with efficiently (European Technology Platform, 2006).

These increases in electric and energy consumption, the threats identified to the security of our infrastructures and thus the pressing need to protect our global livelihoods due to consistent global warming (IPCC, 2007 and the Stern Review; Stern, 2009) call for a systematic reconfiguration of the fundamental principles of the old yet prevailing system.

The grid is also ill equipped to deal with the ever increasing loads of renewable energy being put into the grid (Walsh, 2008) and it converts only a third of fuel energy into electricity, and cannot recover waste heat. Almost 8% of electrical output is lost along the lines during transmission. Twenty percent of its generation capacity exists only to meet peak demand; this is an inefficient system because peak hours only exist 5% of the time. Because electricity has to be consumed the moment it is produced, all this excess electricity is wasted, and consumers have to pay for it (DOE, n.d.). In short, the grid is over engineered to withstand peak demand all the time (Farahnghi, 2010; Hogan, 2010). It is difficult for the current grid to be at peak efficiency, a state where power inflows and outflows are evenly matched. When peak efficiency is not realized, voltage fluctuations occur; excess demand lowers voltage, which leads to big problems. With the current grid keeping at peak efficiency is problematic. (Wortruba, 2010). All these factors mean that when any unforeseen demand surges in the distribution network occur, catastrophic blackouts could be the result (Farhang, 2010).

More nations are industrializing in previously undeveloped regions of the world, whilst already industrialized nations wish to continue a positive economic growth (Soubbotina, 2004). Simultaneously, the people of already developed nations are increasingly finding new uses for electricity in their daily lives out of an assumed necessity, or for commodity, such as ipods, and even for sustainability's sake, such as hybrid plug in vehicles and the manufacturing of solar modules. (Reitenbach, 2010) These three

trends rely upon a consistent electricity supply that enable large and small economic transactions, as well as a greater actual consumption of electrical energy, and this electricity supply relies on the grid. As demand for energy increases the cost of grid disruptions is likely to move higher (Reitenbach, 2010).

### **B. The purpose and essence of the new smart grid**

The smart grid is the solution to the above problems. It is a new way of looking at energy, it “uses information technology to manage flows of power around the network” (Crooks, 2009). It can be defined as, “a grid that accommodates a wide variety of generation options, e.g. central, distributed, intermittent, and mobile. It empowers consumers to interact with the energy management system to adjust their energy use and reduce their energy costs.” (Farhangi, 2010). The smart grid, with its monitoring capacity knows when electricity is needed and can communicate with power stations, consumers, and utilities. Thus it creates a system of supply and demand (by operating at peak efficiency) which can bring prices down and allow for producing only the electricity that is needed (DOE, n.d.)

The current grid has a one-directional data flow of electricity consumption, and therefore has no real time information. But the smart grid is bi-directional and digital. According to Eicke Weber, who is in charge of solar energy systems at the leading German institute on scientific research, “the grid that distributes electricity today is a dumb one, it works in only one way- electricity flows from giant power plants to consumers” (Godoy, 2009). It uses information technology to control power flows through monitoring energy use (Crooks, 2009). The smart grid can send energy from the utility to the consumer and can send information from the consumer about their electricity use back to the utility. The smart grid will use digital technology to monitor all electricity supply flowing into the grid while controlling the consumer’s demand right down to household appliances to save energy, reduce costs, and increase reliability of supply (Godoy, 2009). The smart grid is also capable of delivering unused energy back to the utility. It is self controlling and it can predict problems and then self correct them. (Farhangi, 2010)

Expected benefits to come out of updating the current grid to a smart grid are numerous. There will be fewer incidences of power outages because energy producers and their transmission and distribution partners will be able to anticipate, detect, and response to system failures faster than before. This is an important accomplishment because power outages cost consumers and utilities huge sums of money every year. Just in the United States they cost as much as \$150 million. Because supply and demand can be controlled better with the smart grid, there will be more consistent and reliable power quality, resulting in a more efficient operations, lowered emissions, and cost savings which can be passed on to consumers. (Wortruba, 2010)

The smartgrid is up to now relatively undefined in design and parameters, where many “smart” variants may call themselves to be smart grids. “There is no single type of Smart Grid, not even in an interconnected network grid such as the Union for the Coordination of the Transmission of Electricity.” (DKE, 2010) The standards and practical implementation of the smart grids and smart meters are being processed and identified in this very moment. The terms smart grid, smart meter, or for that matter smart-appliance in that sense refer to a type of electricity utilisation designed to be more intelligent than the present one. The definitions of smart and intelligent for this discussion refer to the capability for independent and resourceful processes, and the ability to comprehend and benefit from experiences. Accordingly, smart grids should have the ability to interpret information resulting in a model of energy management that



is sustainable to our needs and that of the environment, and which engages the consciousness of the end-user's consumption.

### **C. The components of the smart grid**

To avoid getting too technical as we do not wish to focus on the engineering dimension, we have identified the main and most basic components that must be considered when imagining a smart grid. Where energy is used one will need 1) a producer and 2) a consumer. Where energy is managed smartly there is the additional need for 3) a bi-directional communication through a smart meter, and 4) infrastructural requisite.

#### **I. Energy provider**

Since the smart grid is a response to growing communal demands, it truly only proves itself when managing a larger scale of demand and supply dynamics and pressures; in order to gauge real bottlenecks and cope with peak demands. This scale of provision is thus only dealt into the hands of regional utility companies, whether publicly, state, or privately owned, who have the agency to provide to a large customer base. Therefore every smart grid must include an energy provider, who can provide this energy either through non-renewables, or ideally, through the specific and effective integration and sourcing of renewables. (DKE, 2010)

The models of smart grids that we looked at revealed a further trend. The energy provider, i.e. generator, has strategically been partnered with other companies to handle IT requirements, to create digital and data interfaces, and to provide general expertise and know-how to those areas that the energy generating utility itself is novice in. In this sense there are several complimenting bodies that together construct the provision of the smart grid.

#### **II. Energy consumer**

Specific to the smart grid, the energy consumers are those individual households and private or public buildings that are hooked into the smart grid infrastructure. What is interesting to consider is that unlike many other products or services that can be consumed, electricity is not something traditionally selected from a shelf in a shop or a tangible product to behold in that sense. (Godoy, 2009; Summerton, 2002). Literature has explored this intangibility of electricity selection and there is a growing commercialization and branding of electricity provision. (Summerton, 2002)

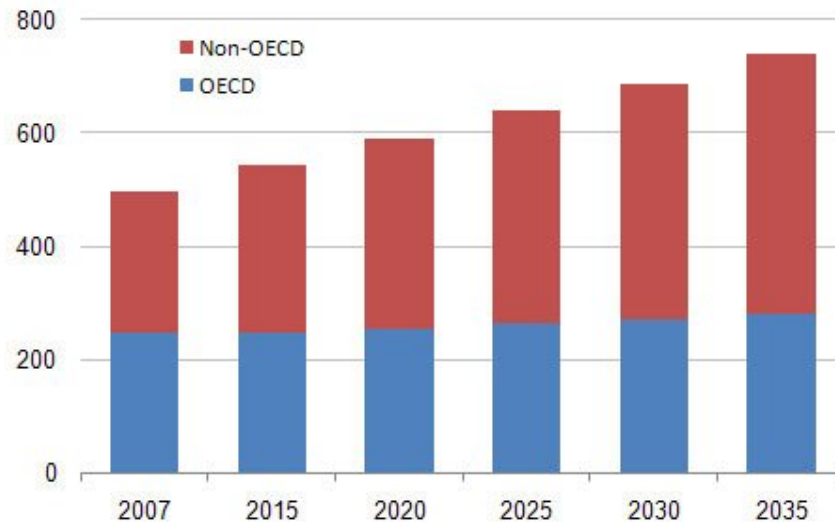
For the purpose of this section what must be acknowledged is that the energy consumer is not only the demand-side cause for and of electricity generation, but also part of the reason why it must be managed properly. Energy consumers of the new and smarter grid now also have an active agency and capacity to help manage this provision (DeBlasio, 2010; Neville, 2008; Reedy, 2009; Smith, 2010).

The graph below illustrates that the energy consuming community is growing, which stresses the importance of a sustainable and efficient electric management even more<sup>2</sup>.

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<sup>2</sup> An additional thought to consider: the smart grid is a replacement of sorts of the older "stupid grid", but many non-OECD countries do not even have functional provisional infrastructures to that purpose up to this point. These countries would benefit greatly from immediately applying smart grid processes when the funding or the ability to provide this type of infrastructure does come along.

Figure 1. World marketed energy consumption



Source: EIA/DOE

### III. Smart meter

The smart meter is the most visible part of the smart grid and is a key part in achieving many smart grid goals. A smart meter is an in home device that can send information and receive instructions (Crooks, 2009). They are more precise than traditional meters because they send readings back to the utility about electricity usage throughout the day (Smith, Feb 22 2020). Thus a home that has a smart meter will know how much electricity they are using and how much it is costing at various times of the day and based on that information can make more informed consumption decisions. More informed consumption choices can lead to a decrease in peak demand which can lead to building new and expensive fossil fuel fired power plants. (Huntley, 2010; Smith, 2010; Spencer, 2010)

With smart meter usage utilities can begin to implement variable pricing programs, which could entail penalties or rebates. For example one plan could charge more for power when the demand is at its highest, while another could provide incentives such as bill discounts for reducing electricity usage during peak demand. (Smith, 2010) The ultimate idea is to let consumers pay for what electricity actually costs, so pay expensive rates when demand is high, and low rates when it is not. But at least at this stage, where smart meters are a very new concept, many utilities have found that though charging more for electricity during peak hours is the best motivator to get people to reduce peak demand, consumers would feel more comfortable with rebates. (Smith, 2010)

Either way, through variable pricing plans, consumers are expected to reduce their energy usage during peak hours. Peak electricity is expensive, up to 15 times more expensive than normal times, and very polluting. As mentioned before, electric grids are over engineered to meet maximum electricity needs, thus, reducing these peak demand needs would allow for less high polluting coal fired plants. An illustrative example from the UK says that if they were able to reduce their peak demand by just 5% the need to build five mid-sized gas-fired power plants would be removed (Crooks, 2009). Through the use of smart meters, electricity could be provided cheaper and cleaner. (Crooks, 2009; Godoy, 2009; Smith, Feb 22, 2010) The smart meter can be

described as an enabler. It will enable customers to shift consumption to lower-priced demand periods, and respond to utility usage-reduction appeals (Wamstead, 2010).

Since the smart grid is still such a new and un-standardized product within R&D activity, the smart metering technology can be very different from one project to another. The accessibility and visibility of data will be different, and its functional abilities will also be differing in quality and quantity. To demonstrate, here are two images and descriptions of the smart meters used in the smart grid cases of MeRegio and Boulder.

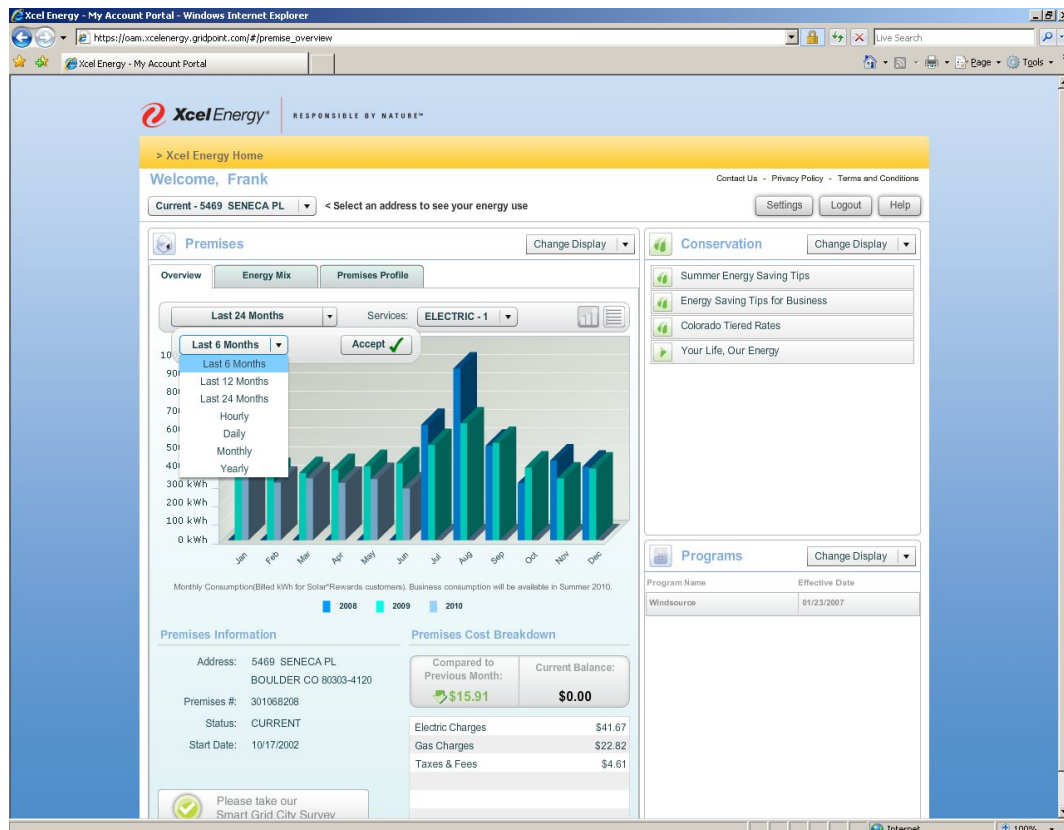


Source: MeRegio web page 2010

This image shows the MeRegio smart meter, the in-house (living room) display, and the consumption visualization for the smart meter owners.



Source: MySmartGridHome (Reid, 2009)  
 This image shows the Boulder smart meter.



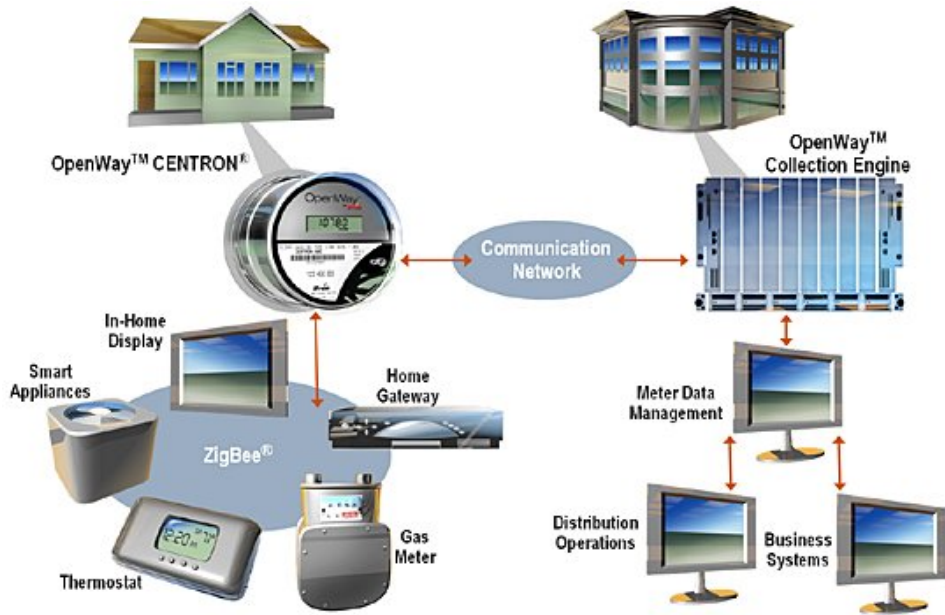
This image shows SmartGridCity's user web portal, where customers with a smart meter can get information on how much energy they use in different time periods and how that use is broken down i.e. cooking, lighting, etc.

#### IV. Infrastructure

The infrastructural requirements can be simplified to the following components: a power plant, electric power cables, internet connection, a software data-based interface, energy storage facilities, and ideally, a range of private and utility owned renewable energy installations. The exterior frameworks for this infrastructure would also entail such things like a policy regulation allowing feed-in tariffs as well as dynamic pricing.

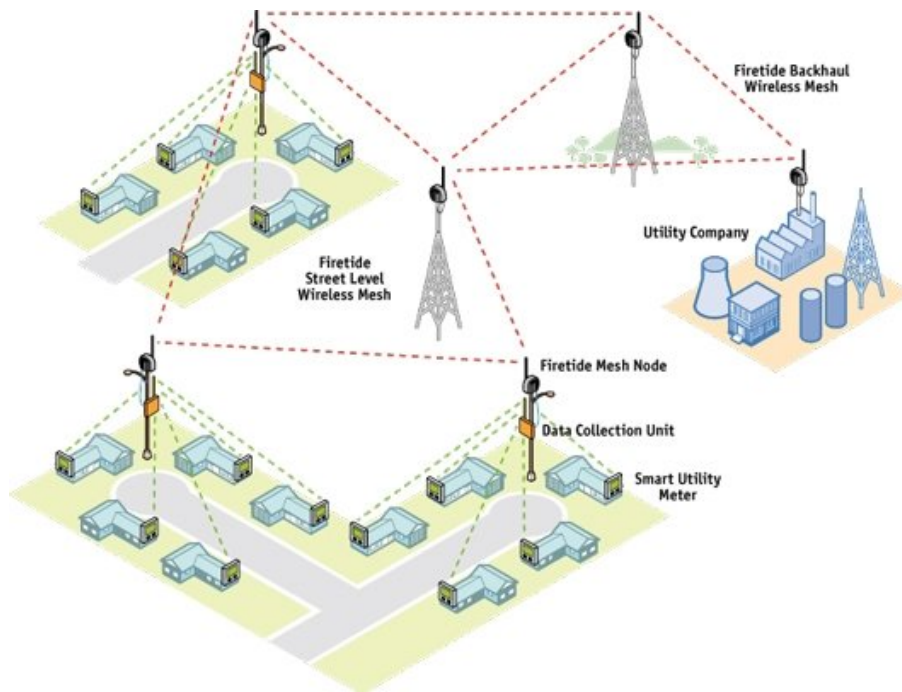
As described previously by the DKE, the plurality of smart grid models at the moment are structured in a multiplicity of ways. The following diagrams from various firms, blogs, business and environmentally oriented think tanks prove this. Nonetheless, the basic building blocks as mentioned in the previous paragraph will be represented and active in one form or another.

**Model 1**



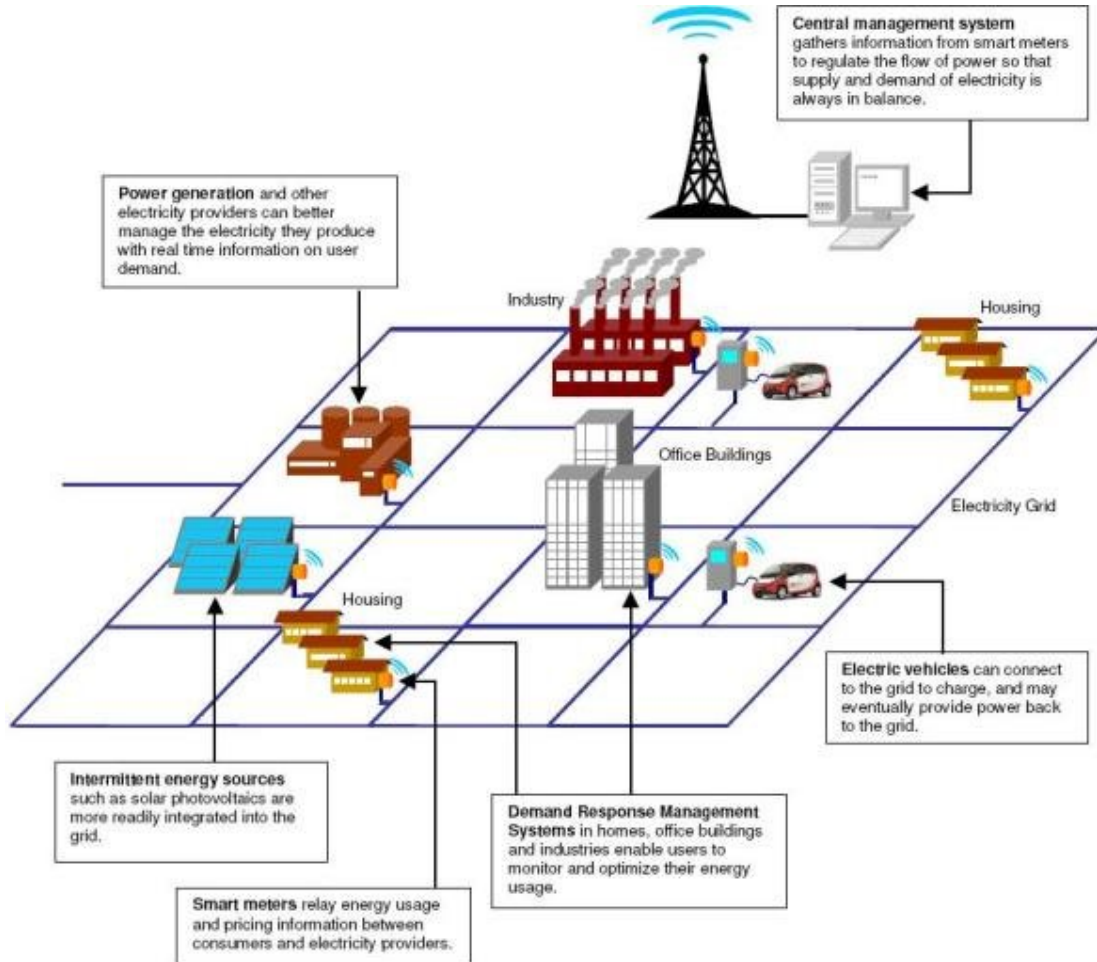
Source: The New New Internet The Cyber Frontier 2009

**Model 2**



Source: Daily Yonder 2009

### Model 3



Source: Green Business Times 2009

The purpose of displaying three different models of the smart grid is to show that there is genuinely not yet one single accepted, conformed, and standardized structure for a functional smart grid and its representation. As you can see, similar components within the smart grid models are named differently. For example, the quintessential element of any smart grid is a data-processing interface or data collection point from where the grid performance can be interpreted and managed accordingly. As you can see model 1 calls this Master Data Management, model 2 Data Collection Unit, and model 3 Demand Response Management Systems.

Without wishing to digress from the presentation of the infrastructural requirements, we would just like to point out that this is an excellent example for the need of communality of terminology within the smart grid discourse to facilitate its dissemination, sharing best-practices and its standardization. This will be explored in depth in the MeRegio case study.

A further contributor, or stakeholder, vesting interest and constituting a key role in the infrastructure of the smart grid, are the suppliers renewable energy installations and of smart appliances. Within this same category of infrastructural component providers that compliment the very mechanism and application of the smart grid, are carbon credit traders, companies that sell or deal with electric vehicles. These latter components not yet of a predominant presence or necessity to the immediate implementation of the

grid, but will grow significantly to be so as the smart grid gains market presence and momentum. There is a symbiotic process between the intrinsic components and the complimentary ones listed above, as one relies upon the other, and one would be ineffective without the support of the other.

### **3. Sustainability and CSR**

“CSR is intrinsically linked to the concept of sustainable development: businesses need to integrate the economic, social, and environmental impact in their operations” (EU, 2002). In terms of private entities, sustainability and CSR are interconnected; sustainability cannot exist without CSR and CSR cannot exist without sustainability. As we will show, the smart grid is contributing to sustainability and therefore, private utilities need to be engaging in CSR.

#### **A. Smart grid’s contribution to sustainability**

In terms of sustainability, or more accurately, in terms of the sustainable development of human dwellings, the smart grid is a crucial component in the idealization of a smarter and more reliable network that can support our growing demands and that allow us to achieve our low and/or minimum emission objectives. (MeRegio, 2010)

The German Roadmap to Smart Grids, which is a very accessible and helpful document addressing the importance of standardization, presents several particularly supportive statements that position the smart grid indisputably within the context of sustainability; “The generic reference architecture for the Smart Grid should form the basis of sustainability, flexibility, efficiency and cost-effectiveness, and also satisfy special requirements such as robustness and resilience of the future energy supply system”, as well as, “The Smart Grid should above all serve sustainable development.”(DKE, 2010)

Sustainability as defined by the UN is “meeting the needs of the present without compromising the ability of future generations to meet their own needs”. (UN, 1987) This is precisely what the smart grid sets out to do. It addresses the roots of sustainability environmentally and socially; environmentally, through the incorporation and attention given to renewables and its contribution to lower climate change effects, and, socially through the effort of creating conscious consumers, by engaging them.

#### **I. Climate Change and the Uptake of Renewable Energy**

Currently electricity generation is responsible for a third of world carbon emissions, thus accounting for two-thirds of greenhouse gas emissions. (Crooks, 2009) Adding to this, we have recently seen an unprecedented rise in demand for electricity, which will only continue to grow. The International Energy Agency’s annual World Energy Outlook released in November 2008 forecasts a global demand increase of 45% between 2006 to 2030. (Walsh, 2008) This increase is for both OECD and non OECD countries (EIA, 2009). As electricity usage comprises such a large portion of carbon emissions, it is a vital that emissions from electricity usage be reduced in order to avoid catastrophic climate consequences.

Smart grids play a key role in enabling the uptake of enabling renewable energy. Renewable energy contributes to resolving climate change (IEA, 2002), and smart grids are an important element in facilitating their usage. Renewable energy is on the rise. Global wind power rose by 29% in 2008 (Crooks, 2009). In order for renewables to be seamlessly integrated into the power mix, smart grids are a necessity (Reitenbach, 2010). Power output of renewable sources is unpredictable, and thus upsets the balance of power output and input. As more renewable sources become connected to the grid, reliability decreases (Wotruba, 2010). A report published by the non profit

group North American Electric Reliability Corporation says that without drastic investments in grid improvements, scaling up intermittent renewables could cause frequent black outs. (Walsh, 2008) Randall Swisher, the executive director of the American Wind Energy Association says that the most important issue facing long term renewable energy sources is the electrical grid. (Walsh, 2008) Because so much of the world's carbon emissions come from electricity usage, it is imperative that more renewable sources be brought into the mix, and the smart grid can help facilitate their uptake.

Promoting home use of renewable energy is another way to reduce climate change impacts, and the smart grid is also help these efforts. The smart grid is a way to incentivize the use of feed in tariffs. Feed in tariffs are a policy measure developed to encourage homeowners to invest in renewable energy systems. When private homes generate their own electricity using solar panels, wind turbines, or domestic boilers, for example (Crooks, 2009), if feed in tariffs are in place, the utility pays the user for that excess power. (Bounds, 2008; Stoutenborough & Beverlin, 2008) The more the use of home renewables grows, the more overwhelmed local transformers will become. But as the smart grid can better maintain peak efficiency, adding more home renewable sources should not be a problem.

The smart grid also plays an important role in facilitating the shift to the electrification of the transport system and the widespread use of electric vehicles. (Crooks, 2009) Electrifying the transport system will be a key element in fighting climate change. In the United States, 20% of greenhouse gas emissions come from the transport sector. Electric vehicles could produce over 50% less greenhouse gas emissions (Wamstead, 2010). With V2G technology, owners of electric vehicles can sell excess energy stored in their batteries back to the grid. As electric cars become more popular, as they are expected to do, it will become more difficult for the grid to keep up with the demand, especially if cars are being charged during peak hours. Having smart grids can help manage the demand. (Andersen, 2010).

Another way in which the smart grid will proffer sustainability, is via the marketing and use of renewables at both a personal and industrial level: Therefore a platform must be created where these variously sourced energies can be interchanged and remunerated for the various suppliers and users. (This information was provided from first hand interviews with smart grid private utilities of the MeRegio project.) Evidently there will be a need for such a platform of interaction once there is a wide spread civil society use of home-installations with excess energy generated; this is why we wished to acknowledge it, yet the intent and scope of this paper will not explore this particular dimension as it does not refer to the immediate implementation of the smart grid.

## **II. Smart grid fosters conscious consumerism through user engagement**

Engaging the user is very important in terms of sustainability. If we look at current patterns of individual consumption we can see them contributing to escalating levels of CO2 emissions and increasing levels of pollution, loss of biodiversity, and depletion of non-renewable resources (Elgar, 2006). Environmental impacts from household activities have worsened over the past three decades and are projected to continue to worsen over the next twenty years, especially in the areas of energy, transport, and waste (OECD, 2002). Household consumption has important effects on the environment and sustainability through their day to day actions, what goods and services they buy, how they get to and from places, how they manage their waste, etc. Household energy use continues to grow (OECD, 2002) and as it does, smart grids can play a key role in reducing this sector, and smart grid success depends heavily on user engagement.



“Environmental research and policy have traditionally been rather one-sided focusing primarily on how to transform production through pollution control and eco-efficiency, rather than on consumption.” (OECD, 2002) In light of this new approach to environmentalism, the responsibility to be sustainable is now no longer seen to be solely in the hands of the producers, but also in the hands of the consumers. Conscious consumerism can thereby be further explained under the gaze of sustainable consumerism. (OECD, 2002) A conscious consumer would be one who is aware of his consumption practices in consideration of sustainability principles.

The smart grid allows consumers to be active participants in their electricity usage and in the overall electric system. The smart grid will allow consumers to be partners in energy consumption, management, and storage. (DeBlasio, 2010) The smart grid is thereby a reconfiguration of the way we should consume and consider electricity. With the above discussed metering and monitoring technology, for the first time, consumers can see how much electricity they use and when, and how much it is costing them. Where the end-user of the smart grid is active and conscious of the price signals available to him/her, he/she can strategically manage the household energy demands according to the most attractive, i.e. cheapest, times of the day. Yet where the consumer does not do this, he/she will not benefit from these opportunities to save money, or potentially earn financial bonuses.

There is an underlying assumption that people could and would act differently if they knew the environmental impacts of their actions. (Elgar) Since the smart grid provides a unique opportunity to attain climate change goals and energy efficiency, this must be stressed over and over again in order to re-configure the behaviour of a historically unconscious and passive consumer-based society.

## **B. CSR and the smart grid**

CSR has been defined as, “a concept whereby companies integrate social and environmental concerns in their business operations and in their interaction with their stakeholders on a voluntary basis” (EU, 2002 p3). It is also widely accepted that CSR goes above mere compliance with laws and that it cannot be just an add-on to core business activity; CSR must be embedded in the strategy of the company (EU, 2001; Franklin, 2008; Porter & Kramer, 2006; UNESCAP, 2009). If CSR is successfully embedded in company strategy, and is not just considered to be a cost, constraint or a charitable deed, it can be a source of opportunity, innovation, and competitive advantage (Porter & Kramer, 2006).

According to Porter and Kramer in their article Strategy and Society the Link between Competitive Advantage and Corporate Social Responsibility, “CSR has emerged as an inescapable priority for business leaders in every country.” (2006 p1) More and more, companies have to be concerned with CSR and private utilities are no different. CSR is important because it can help a company manage their risks and contribute to better transparency, and perhaps most significantly, CSR is important because of the interdependency of business and society.

More than ever private companies are being watched. (CSR Europe, 2009) They have to work harder than ever to protect their reputation, and consequently the environment in which they operate. NGOs, activists, and media have become very good at putting pressure on private companies and holding them accountable for their social and environmental impacts. (Porter, Kramer, 2006; Franklin. CSR can help companies manage their risks and reputation and build transparency. By being in tune with stakeholder expectations, companies know what stakeholders want and care about, before a public relations problem occurs. Stakeholders can be defined as “groups that are affected by or can affect an organization’s activities, products, or services and associated performance” (AccountAbility, 2005 p.16). Practices cannot be considered

credible unless their development has involved the engagement of stakeholders. (EU, 2002) Today, stakeholder relationships can have a significant impact on most companies' bottom line (Svendsen, 1998).

Greater transparency helps businesses improve their practices and behaviour, and provides trust to employees and outside stakeholders, which makes them more likely to support the company and give them the license to operate. License to operate is a CSR principle which holds that every company needs tacit or explicit permission from governments and citizens to stay in business. This license to operate can be obtained through constructive dialogue and partnerships with regulators, citizenry, and activists.

Lastly, it is important to remember that business and society, though often pitted against each other in reality are not. The two are interdependent. Businesses cannot be sustainable without a healthy and productive workforce, a population that can afford its products, good governance that protects consumers and companies, and one where resources are managed well. Likewise, a healthy society needs vibrant businesses in order to provide employment, revenues, and necessary services and goods. (Porter & Kramer, 2006; UNESCAP, 2009). Thus shared value, benefits for society and for the competitiveness of the business, is what can come from CSR (Porter & Kramer, 2006).

The smart grid fits perfectly into this CSR context. Like any new technology, there will be risks when implementing it. Utilities can minimize the impacts of these risks through transparency and communication, and stakeholder engagement. The well managed smart grid is an innovation that will benefit society and the utility implementing it.



#### A Thought

Is smart grid CSR, or does smart grid merely need CSR ?

The smart grid is, amongst other things, an eco-friendly, innovative, energy-crisis-concerned, multi-stakeholder product/service dependent upon an energy provider. The dynamic that intrigues us, is whether this environmentally-sustainable and potentially lucrative product is proffered by governments and a corresponding wish to reduce emissions that is trickled down to the private sector, OR whether it arose from the private utilities' own concerns to engage with a sustainable product, or merely jump onto the bandwagon of sustainability.

Realistically, inevitably, this is answered by the individuals who partake in the implementation, and the particular mission and vision of their company. Eitherway, it is a form of CSR, and also needs CSR tools due to its multi-stakeholder essence.

Additionally, CSR is not something that is either believed in or denied as a real presence, force or consciousness. CSR is a set of tools and a way of addressing the detrimental impacts corporations might have, whilst also guiding their agency towards more positive social impacts

### C. The need for CSR

The following section considers various dimensions of the smart grid and presents them as relying upon CSR principles for an effective address of the problematics identified. The first two parts consider a marked trend of liberalization that leads to a transfer of social provision responsibility from the public to the private sectors and links this to an innate need to apply CSR principles. The second part, referring to engaging with consumers and the consideration of the most vulnerable, can also be ameliorated through CSR activities.

## **I. Transferring responsibilities**

“The liberalization and privatization have diminished the control of the municipalities over prices, investments and corporate policies of utilities.”(Montstadt, 2007, p.327) In liberalisation we witness the transfer of government owned utilities and institutes into private corporate hands. "However, in some countries, many large infrastructure services have always been in private hands, as in the United States (with the exception of water and sanitation services (often run by municipal enterprises), some electric utilities and some railways)." (ILO, 1999) Nonetheless, within the European framework and other nations also, the trend of liberalization happened gradually within the last century.

“As a response to the poor performance of public monopolies- their lack of productive efficiency, their failure to identify consumer demands, and their inertia in socio-technological innovation- and driven by neo-liberal ideas, the European Commission has been initiating the competitive restructuring of the energy markets.”(cf. Heritier, 2002, from Montstadts Urban Govrn.) Additionally, the preceding and causal grounds to this are that after the 1960s there was an urban infrastructure crisis that changed the political economies of urbanisation and governance, effectively resulting in neo-liberalism and the withdrawal of the state<sup>3</sup>. (Coutard, 2008)

Due to the public service and natural monopoly characteristics of the utilities, both ownership and operation have traditionally been considered of strategic importance to governments.”(International Labour Office (ILO), 1999) which is what makes this particular transition so interesting when trying to investigate who carries what responsibilities and agency to cater to society and how this will shape the nation itself from a strategical point of view. In order to address these issues liberalization needed “prior restructuring measures and privatization instruments, constitutional and legislative restrictions, the unbundling of infrastructure sectors and its sequencing, the use of yardstick or benchmark competition as a regulatory tool, regulatory bodies and their powers, new technologies and the emergence of a global industry for infrastructure services.” (ILO, 1999)

Thus the transfer from utility service provision from public to private was mediated through the above mentioned instruments; yet how is the utility to be managed or directed once this ownership is no longer in the hands of the government? Montstadt looks at this situation more specifically in the German regulation, and states that the quality of public services and the promotion of ecological modernization, managed by the private sector, was at least until 2007 still completely free of systematic control. (Montstadt, 2007) This is a huge cause for CSR consciousness, and an equally huge opportunity for the regulatory body to construct and provide the utility market with fresh, prudent, and efficient control mechanisms.

The liberal convention within the regulation of the utility sector is characterized by being profit-driven, giving full-cost pricing, and privatization. (Coutard, 2008) Coutard continues this argument saying that it is nonetheless the obligation of the public authorities to guarantee access and freedom for the individual to be able to choose from as many utilities as there are present. Summerton argues further that “the traditional view of utilities and their regulators as providers of and for the public good...has been increasingly challenged by recent policy reforms that have signalled new roles for utilities.” (2002) She illustrates the UK’s National Consumer Council’s

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<sup>3</sup> Since we are critically engaging with statements such as these, we would like to point out that Coutard does not specify which geographical areas he is referring to when observing this neo-liberalist trend.

notion of consumers' "fuel poverty", where different regulation "mechanisms may serve to reinforce social inequalities. This is quite the opposite of a socially responsive or responsible model, and again highlights the value of a CSR approach to utility management and the need for inclusive and prudent regulatory policy to profer private utility CSR.



#### A Thought

In the case of our two smart grid cases MeRegio and Boulder the smart grid projects are operating in systems where energy utilities are privatized. This raises an important CSR question; how is a commercial entity to introduce and gain support for an environmentally but up-to-now unprofitable innovation for society without excluding members of the respective community?

A notion of a corporation's responsibility to society is the answer, i.e. CSR.

## II. The governance of private utilities

Paul Starr in his work *The Meaning of Privatization* provides a convincing case that privatization is not as clear cut in its daily use and circulation as it might be assumed. An economist as opposed to a sociologist for example will have a very different and pragmatic perception of what public and private would be in relation to his particular field of study and objectives. (Starr, 1988) Furthermore, in the current mixed regulation of corporate structures (internationally accessible shares on stock markets, boasting a diversity of public and private chairmen, etc) as well as corporately managed project ownerships (e.g. MeRegio smart grid project), along with a multiplicity of possible ways that liabilities, funding and the organization of corporations are founded -more often than not it is more a case of "quasi-public or semi-private". (Starr, 1988)

According to Starr, and for the purpose of this essay, private will be considered all that is not public; public being that which is of "common" interest, as opposed to that which is only of interest to a part, whether of a class or an individual. (Starr, 1988) Particularly in the case of smart grids, where one has an interdependent network of actors from energy provider to legislative government and even integration of public research institutions (ex. MeRegio), it is evident that the smart grid is also innately susceptible to the blurring of boundaries between public and private.

Furthermore, it is even more interesting when considering specifically those private corporations that cater social provisions as does the electricity/energy utility business. This condition brings CSR into the foreground of the picture. It is therefore not surprising that CSR was introduced into our vocabulary; it is naturally quite difficult to balance the commercial and "private" pursuits with those of the common and "public".

## III. Engaging with consumers

Traditionally the relationship between the consumer and the utility has been very simple; the utility delivers a service and the consumer, without expecting much more, pays for it. There has been no need to develop the consumer relationship or to know more about this important stakeholder group. (Huntley, 2010; Spencer & Bujnowski, 2010) because until now, it has not been necessary to know more about individual consumers; one residential electricity meter was the same as the next. But the smart grid will change this relationship. Mike Morris, CEO of American Electric Power says the smart grid "is an opportunity to change the relationship on both sides of the meter. It is a fantastic opportunity" (Wamstead, 2010 p28). Soon utilities will be able to communicate better and faster with their customers.

Consumers are a key stakeholder group for private utilities in terms of smart grid projects; the literature clearly shows the importance of their role. As mentioned before,

the smart grid is contributing to sustainability through the development of conscious consumerism by involving consumers in their energy management. A key goal of utilities and policy makers is to get consumers to reduce their peak –hour consumption. (Smith, 2010)

“Engagement is rapidly becoming a necessary skill that all utilities must acquire” (Huntley, 2010). American Electric power, an American utility that is launching smart grid efforts, found that consumer education concerning smart meters are necessary. Through a smart meter pilot program they found a large percentage of their consumer base was not interested in using the smart meter. This utility concluded that they will need to launch several education efforts in order to help this segment of the population understand and use the new technology. (Wamstead, 2010) Simply giving consumers a smart meter will not be enough to stimulate involvement sufficient (Huntley, 2010; Spencer & Bujnowski, 2010). Consumers with smart meters will expect their “utilities to help them make better (or at least more informed) consumption decisions” (Spencer & Bujnowski, 2010).

New relationships will also require collaboration, counselling and responsiveness. (Spencer & Bujnowski, 2010). Yes, through the smart grid and use of smart meters consumers can save electricity and reduce their bills, but these positives come with some trade offs. In order to get the savings, consumers will have to give up certain amounts of control and provide their data to the utilities. Naturally they should get something in return for all of that. Utilities will have to become more adept at customer service and will have to help consumers make informed consumption decisions. (Spencer & Bujnowski, 2010) Utilities will have to provide advice on issues like which variable pricing rates and demand responses are best for their budgets, lifestyles, and behaviours (Huntley, 2010).

#### **IV. Pricing changes and its effects on the most vulnerable**

Though prices can decrease through smart meter usage, so can they increase. As previously mentioned, through use of smart metering technology, consumers will be exposed to less stable pricing (Spencer & Bujnowski, 2010). It is important to remember those in society that cannot afford a raise in prices. This problem is presented very clearly in *The Energy Divide*, relating how lower income groups proportionally spend more on their total expenditure of energy than other consumers and are therefore a lot more susceptible to suffering from the consequences of price increases. (Summerton, 2002) Introducing peak pricing during the hottest and coldest periods of the year could have a negative effect on the most vulnerable of society (Smith, 2010), as they experience a higher cost burden relative to overall income. (Summerton, 2002). Another population to consider is the elderly that use medical equipment on a daily basis. This type of consumer cannot stop running the equipment at peak time (Smith, 2010).

At the beginning of the decade, Norway and the UK opened their markets and allowed consumers to choose their electricity providers. The aim was to make utility provision more competitive and cheaper. However, the results showed that the desired effect was not achieved. A demographic trend amongst the more active players in the consumptive market was found, and regrettably those in the lower income classes and of lesser education from her research were those that simply did not have the time to exercise or learn an adequate understanding of utility provision to be aware of the leverage they had regarding their energy supply and pricing. (Summerton, 2002) This example illustrates that there are certain groups of society that are more likely to take advantage of electricity and money saving opportunities, and that the utilities implementing smart grids cannot forget about the groups that are not.

In the UK it was found that as was the aim, the population as a whole benefited from the changes, but that benefit disproportionately favoured the higher income consumers (Summerton, 2002). This point is mentioned to illustrate how it is possible that changes that are introduced to benefit the consumer end up either only benefiting the already well off or as having negative consequences on the most vulnerable of society. This is something that utilities will need to be mindful of when introducing variable pricing.

Consumption is basically a reflection of life style choices, where it is the economic and social decisions of individual households that characterize their consumption patterns. (Elgar, 2006) These decisions are not deliberately made but are rather a causal result to the socio-economic opportunities and situation of the individual, that will enable or prevent his/her ability to make those decisions in question. (Summerton, 2002) The active consideration of one's corporate role in social impacts can be ameliorated through CSR practices to attend to and safeguard the interests of the most vulnerable.

#### **4. Conceptual Framework**

The reality we live in evolved from our history. In order to understand and assess the present, we must therefore consider this history and the patterns identified within it to understand how these affect, change, contrast to one another and are thus able to create the current phenomena. By drawing upon existing literature and discourses, we can position the smart grid in such a way that guides our understanding of those aspects that should be weighed or viewed most critically, and those aspects that have been established as worthy of concern through previous theorising and analysis when dealing with similar themes and phenomena.

In this section we portray the smart grid in one further conceptual framework in order to craft an instructive interpretation of what the smart grid actually is and how it evolved into being. This will enhance our ability to avoid the repetition of errors, provide recommendable best-practices, and allow us to have a thorough understanding of what the smart grid entails instantaneously and that which it will imply beyond its immediate being.

Previously in section 3 we have already placed the smart grid in the frameworks of CSR, sustainability and conscious consumerism, as these are the most immediate links emerging from our research and were effective to introduce the smart grid dimensions. This section provides one more complimentary way of viewing the smart grid, which can be related to the themes within the previous frameworks, such as privatization and stakeholder engagement. This establishes the smart grid as a truly multi-dimensional, multi-stakeholder and multi-disciplinary phenomenon. This selected framework is socio-technical regimes, specifically, the phenomenon of green niches.

##### **A. Socio-technical regimes: Green Niches**

This section will present the concept of the socio-technical regime and relate how smart grids as a green niche was born from within it. We will briefly discuss what other literature has failed to mention in socio-technical discussions, namely that not every one in society is empowered equally and that this is a cause for CSR, whilst this precise aspect of exclusion simultaneously reaffirms the drivers of socio-technical. The second part draws lessons from green niche theory, in order to argue how we can most fluidly and effectively mainstream the smart grid.

##### **B. Socio-technical regimes need and reflect CSR**

Regimes are governing structures of various agents and stakeholders that provide the direction, directive and exert the laws and pressures that make the nation in question

that what it is. “Regimes are seen as socio-technical in that technologies and technological functions co-evolve with social functions and social interest” shaped by a wide array of participatory stakeholders, such as “technologists, engineers...policymakers, business interest, NGOs, consumers and so on”, who influence it. (Hodson & Marvin, 2008, p3) The argument continues, that the corresponding community must have some degree of sufficing common interests to stabilize the socio-technical regime they live in. This is an interesting and generous claim, postulating that practically anyone can have an impact upon regimes and governance. As the discussion of conscious consumerism and the effects upon the most vulnerable has shown, not everyone has access to information or the individual ability to effect change due to lack of education and agency.

Initially we were uncomfortable with the idea that regimes are genuinely socio-technical, as not all regimes are regulated democratically; therefore not all “social interests” are equally addressed. (We are extremely aware that even in a democracy not every voice is heard as they would be in the idealized democratic regime.) What we wish to point out here is that in reality, there is a relatively small percentage of the population that enacts change on a national level, and a vast majority that follows either willingly or not<sup>4</sup>. Yet it is easy to accept the absolute validity of socio-technical governance structures when it is considered that society is truly all of those within it regardless of social class, sex or race, and that these members do effect a change, directly or indirectly. The social members that are apparently excluded from active socio-technical change, will inevitably effect changes that do engender a continuous social, technical and political adaptation and re-alignment. See the United Nations Declaration of Human Rights, Human Development Index or the Millennium Development Goals; they all address social inequality and empowerment and have trickle down effects from supranational and national levels. Precisely due to the fact that there are “vulnerable” groups or “inactive” groups, there have resulted social measures to engage them more, and regulations have been made to ameliorate this segregation between empowered and powerless social members in various structural, technical and political ways.

More specific to our intent to draw utility provision into the argument of socio-technical regimes, it can be argued that inevitably the development, operation, maintenance and renewal of networked infrastructures occurs within the operational parameters and physicalities of the nation it is in; and will inevitably reflect the very nature and socio-political orientation of society as a whole and its governance structure. Utilities are technical institutions providing social needs, and thereby one of the most powerful agents within socio-technical regimes. As reiterated repeatedly, and once more here, this expresses an intrinsic need to apply CSR principles so that society is seen as a whole and not just from a selective profitable market-oriented lens.

### **C. Green Niche theory facilitates the mainstreaming of smart grids**

It is extremely relevant to situate the smart grid within green niche theory, as it makes us aware of barriers that the mainstreaming of such an entity faces. It highlights the role of the political regime in the support and hosting of the smart grid (as a niche) and the role of partner networks for sharing best practices, communication, and acceptance.

#### **I. The smart grid is a green niche**

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<sup>4</sup> Our initial response to this, and deserving of an entirely separate research paper, is that this vast majority should be empowered.

Adrian Smith in his article *Translating Sustainabilities between Green Niches and Socio-Technical Regimes*, defines green niches as “spaces where networks of actors experiment with, and mutually adapt, greener organizational forms and eco-friendly technologies” (2007); this neatly sets the green niche within socio-technical theory.

To strengthen the links between green niche theory and the smart grid we identify the following three congruences. First of all, smart grids from our research have consistently revealed that there is an organized partnering of IT companies with energy utilities as well as an involvement of other stakeholders within governing bodies whether municipal or national. Secondly, due to the smart grid being a new and in-development phenomenon, it is an experiment of sorts. And finally, hopefully it has been argued convincingly by now that the smart grid in its functional essence is a green initiative that responds in part to growing environmental concerns (in section 2.B and 3). Thus smart grids are a green niche, due to both providing an eco-friendly technology, being in initial experimental stages, and orchestrating this through a collaborative effort.

Green niches are understood to be relatively small scale and alternative product/service to that of the mainstream. Smart grids are currently isolated and closely monitored precisely because it is an alternative and yet to be proven technology in comparison to the conventional unidirectional utility provision. Smith underlines that the more compatible with the regime’s institutions the green niche is, the more likely it will and can be mainstreamed to gain national proportions. In terms of the smart grid this is particularly interesting as this drive to be mainstreamed is actually one of the main goals of the grid in order to secure the long term well-being, i.e. sustainability, of our environment and the security of our energy provision. We will thus explore its barriers as a niche, in order to identify solutions.

## **II. Barriers for mainstreaming**

Green niches often come into being “in opposition to incumbent regimes. They are transformed, initiated and designed in response to sustainability problems” (Smith, 2007, p.428). The crucial point here is that a green niche stereotypically arises due to concerns raised outside of the institutionalized governing system, which is why incumbent rules and regulation are less articulated and clear-cut. (Geels, 2004) Respective of the smart grid’s absence of articulated regulation, this concerns the realm of how to market the smart grid, data protection of the individually metered and reported consumption, and pricing dimensions referring to variable tariffs and feed-in tariffs.

Additionally, “Radically new technologies have a hard time to break through, because regulations, infrastructure, user practise, maintenance networks are aligned to the existing technology” (Smith, 2007). The greater the extent of a certain technology’s institutionalization, the more difficult it is to penetrate this market through a new, smaller (thereby often more expensive as it does not enjoy economies of scale) and less known product<sup>5</sup>.

There is an excellent lesson to be drawn regarding the institutionalized hindrances to smart grid mainstreaming from Sweden, where home-owners and energy consumers had to personally invest into an expensive hour-by-hour smart meters before they were legally able to switch suppliers. (Summerton, 2002) The lesson learned is that the legislation of the incumbent governance paradoxically impedes progress towards a more active consumerism and thus sustainability, and can indeed limit the freedom of

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<sup>5</sup> Smith exemplifies this in the case of housing construction, where standardization and volume building discourage innovation. (2007)



choosing one's preferred energy supplier whilst also discourages the adoption of smart meters as it is more expensive initially. The paradox is that governments set out to address the social, economic and environmental well-being of their nation through regulation, and are instead -at times- stagnating progress through inefficient regulation and policy.

A further barrier to mainstreaming is the current lack of a common linguistic framework that allows for a continuous and shared understanding of all the terms used in the smart grid discourse and activities. A communality of language is crucial for the mainstreaming of this system. Dr Raabe, a leading consultant on legal questions of the MeRegio smart grid, says that one word such as "network" will be understood differently from one team of experts/stakeholders to another; from electrical technicians, infrastructural engineers, to data-information processors. (Raabe, 2010). He explains that this can lead to confusion, miscommunication and time consumed inefficiently for clarifying the not standardized or conformed choices of words and their specific definition when discussing the smart grid.

### **III. Solution for mainstreaming**

The literature has further reiterated that radical new technologies have difficulty breaking through to align with existing regulations and infrastructures. (Hodson & Marvin, 2009) In order to address this "policy interventions may be needed ...and help reconfigurations push developments along a new trajectory." Furthermore, there are "formal rules (that) may be technical standards, or rules for government subsidies which favour existing technologies." (Geels, 2004) Thus if regulation has such agency, it should be directed to foster innovation rather than discourage it. This failing is very excusable when considering that regulation is structured to support existing institutions rather than non-existing ones- such as the novelty of the green niche of the smart grid.

The smart grid does break away from green niche theory one distinct way, as it is not in opposition to the incumbent regime per se, but rather only in opposition to its current energy provision model. To be critical of this point, we should admit that we do not know of all the smart grids and all their incumbent regimes, thereby we are open to consider that perhaps somewhere a smart grid is not in the interest of the ruling government. Generally though, the smart grid is widely endorsed and hailed as a solution to the energy and environmental crisis. (DKE, 2010; DOE, 2009; ETP, 2006) The way that the incumbent national-level regime governments themselves truly endorse and embrace the smart grid is through creating "protected spaces"; "in terms of subsidies, by public authorities, or as strategic investments within companies." (Geels, 2004) For example, Obama provided \$3.4 billion from the stimulus bill to fund a demonstration of US smart grids. (U.S. DOE, 2009) In a way this appears to be a slight contradiction within niche conceptualization, as it claims that the green niche is both in opposition to the incumbent regime, whilst simultaneously being protected by it. Yet as the above paragraphs have explained, this succession of events is due to the regime recognizing the need to foster the niche which its current regulation and policies is not facilitating on a national or systematic level.

#### **aa. Regulation and policy are a tool**

There is a need to understand the landscape at a macro-level, where the government depends on adaptive capacity; which should not be reactive, but must co-ordinate its capacity and mobilize capability. (Hodson & Marvin, 2008 ) We argue that it is the greater encompassing regulatory framework that has the ability to guide or hinder the implementation of smart grids and innovative technology, and that it is the instruments of regulation that give directive through immediate or trickle down communications to the various national industrial sectors. Regimes, and thereby its regulatory policies,

fulfill socially valuable functions and help constitute them, proliferating the socio-technical regime argument. (Smith et al., 2005)

Ko and Fenner, referring in their case to sustainable housing construction, provide the strategy to be applied to ameliorate the difficulty of mainstreaming a new technology. "Through regulation, the government can create a market gap in which new technologies can be trialled, refined and diffused...reduce the perceived riskiness of an innovation, and force later adopters to react or be penalised through legal actions or fines" (Ko & Fenner, 2007, p.159) The critical observation they make here acknowledges the full agency and potential of regulation to mediate mainstreaming of new technologies, i.e. the smart grid. The way to facilitate the adoption and mainstreaming of a niche is through government grants, subsidies, promotion to raise awareness, and penalties for deliberated eco-inefficient activities. (Ko & Fenner, 2007)

Smart grids in these experimental niche stages require certain infrastructural and technical investments, and thereby are a certain venture risk to those companies that decide to invest or contribute via other resources to its implementation or creation. Therefore it is relevant to consider the positive impact upon the attitude and drive for a company with a shift in funding from private to public, and how immensely encouraging it is to an organization when there is a shift of financial accountability from the developer to society. (Ko and Fenner, 2008) There will always be debates over where tax money should go to, and as urbanization theory supports the introduction of networked spaces is never uncontested.<sup>6</sup> (Graham, 2000) Nonetheless, public funding is another regulatory tool, which has proven to foster green innovation, (MeRegio, 2010) which is a more sustainable economically, and therefore something to recommendable.

Regulation also refers to consumer and corporate laws, which particular to the smart grid, is extremely focused on data security and privacy protection. (Raabe, 2010) The smart grid is a revolutionized two-directional communication network, that is providing the utility with very intimate details on the user's energy consumption. Supposedly, even the use of a hair dryer would be able to be recognized on the graphical display, revealing itself as such through the specific kWh of energy it consumes. (Kestenbaum, 2010) Never before considered privacy and security issues come to light, where the regulatory policies must ameliorate these concerns, and protect the community, whilst not hindering the informational needs that the smart grid requires in order to act smartly. In terms of the organizational structure therefore of smart grid projects, legal teams should be on board from step one, to bridge this gap between existing legislation and regulatory laws that address the new concerns of data protection.

In conclusion, regulation must facilitate eco-innovation and deter eco-unfriendly institutions. This is difficult evidently as explained above, and therefore legal stakeholders with inside information as well as an understanding of the incumbent policies must be an innate component of smart grid partnering and implementation.

#### **bb. Importance of standardization and communication**

Regulation as explained is therefore a current hindrance, an opportunity for improvement/facilitation of smart grid implementation, as well as a continuous focal point in the actual developments of the smart grid itself from a technical point of view. This technical angle refers to the new smart grid collecting personal data and demanding a personal consumption change, which raises unprecedented legal questions. As so many actors are involved with different leverages, concerns and expertise, it is extremely important that there is an open dialogue between all the

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<sup>6</sup> See appendix 1 for further exploration on urbanization.

stakeholders, and an ongoing process of communicating the latest developments and requirements needed in terms of regulation and policy frameworks from various stakeholders.

The European Technology Platform's document on smart grids states that the platform under design as its foremost aim allows "a group of high-level stakeholders with one primary objective: to define a coherent and unified industry-driven approach." (2006) Particular to the smart grid in terms of a green niche which is small, new, and relatively unknown and "semi-private", there is a need to create and communicate a guiding vision that congregates intent and activities. (Smith et al., 2005) This is achieved through a defined and publicized conformity of key terminology via electronic platforms that share data and observations, regular stakeholder meetings, and generally, a close collaborative and supportive group effort<sup>7</sup>. (DKE, 2010)

Beyond the standardization of terminology, there is also a huge emphasis on the standardization of the meters and infrastructural technologies themselves (DKE, 2010; addresses this in elaborate depth) in order to avoid technological divides such as occurred for example with the previous incompatibility of Microsoft and Apple when they became mainstreamed products. Standardization, compatible technologies and a common language disseminated publicly and amongst the key partners, will avoid that smart grids remain in their niche state, and facilitate their transition into the mainstream and mass implementation. (DKE, 2010; DOE, 2009)

There is another group which requires communication beyond our previous discussion of user participation and the partner networks. Particular to niche theory, where a green niche is so dependent upon wide spread acceptance in order to be mainstreamed, we suggest that it is not only about the dialogue with your smart meter user, but also about actually earning wider public support through media communication tools so that others feel animated to be hooked onto the smarter grid as well, and a conscious consumerism is promoted. This is exactly in line with the type of social interests that can engender socio-technocracies and promote and stimulate the growth of the smart grid to the mainstream. For this purpose, "more tailored information about the advantages and disadvantages of innovations is needed at the persuasion stage." (Ko & Fenner, 2008) Advertisements, promotional events, t-shirts, press releases, mass-media; any of these would help mainstream the smart grid and make it more popular. Face-to face communication and local presence and the use of intermediaries between various bodies is a further way to enable communication, a dialogue, and will facilitate the acceptance, dissemination of smart grid benefits, and thus facilitate its implementation. (These are typical CSR principles; Hodson and Marvin, 2010)

### **cc. Partnerships and best practices**

Green niches in socio-technical regimes as cited previously are experimental in nature. As any experiment, there will be hypothesis, trials and outcomes, and this precise accumulation of knowledge, observations and experience must be shared if we wish to avoid making the same mistakes. (Smith et al, 2005) Mistakes here would cost money, time, and a continued waste of our energy resources. Therefore the accumulation of knowledge in niche service or product implementation needs to be shared. Evidently,

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<sup>7</sup> An interviewee from a smart grid consortium made a very interesting point, and described how one of the private companies involved with the project had exchanged and re-allocated employees after the first phase of the project implementation. This resulted in having to re-educate and induct the new-comers to the vocabulary and developments of the grid. Furthermore, this same interviewee mentioned that this close team work (inevitably) also fosters personal relationships between the individuals of various teams, and that this replacement not only causes development set backs, but also inter-personal losses.

due to the nature of the capitalist market and commercial interests, successful trade secrets are conventionally not shared. There is no way to avoid this, this current human condition; apart from perhaps regulatory interventions which is too great and intrusive a task into the market competition and would probably stilt its innovative growth. (Please see appendix 2 for more information about liberalization and how this has led to positive market outcomes as opposed to a centralized and public owned industry where all best practices would/should be common property.) Therefore we must shift the focus to that which we can build upon, which is the already existing network of partners, who amongst themselves must crystallize communication methodology, provide publications and internal (or external) electronic platforms to inform one another of best practices and lessons learned.

Due to the immense technical, organizational and financial demands of the smart grid which is currently primarily provided for and fostered outside of the mainstream competitive and commercial markets it is orchestrated through a network of stakeholders who can share costs and risks. "The greatest capacity for adaptation and change may rest in incipient networks of capable actors beyond the membership of the incumbent regime." (Smith et al, 2005) This point of shared responsibilities and partnership networks is very crucial. The smart grid as it does not yet enjoy of a wide selection of suppliers and thus competitive pricing, typical of green niche innovations, is an expensive experiment. (Ko & Fenner, 2008) Therefore it is recommendable, not only from technical and expertise-related dimension to rely upon partners, but there is also a compelling economic case to foster partnerships.

Partnerships enable this communication, "facilitate consent", and will ensure that there is a coherence of intent and consideration within the redesign of regulation, and that as many possible dimensions are considered from various fields of expertise (Smith et al, 2005). For this reason, as presented in the case study of MeRegio, a legal team should be involved since the beginning who will build their smart grid experience and smart grid particular expertise from the very beginning of project implementation. As we have mentioned before, quantitative data is still unavailable, so it is not scientific to postulate a legal team would be able to help the barriers of market entrance if it were included in smart grid organizational structures. Here we can merely draw upon the literature which repeatedly makes compelling arguments for the necessity to "enlist a broad network of actors in support of its socio-technical practice and the future of the regime it prefigures. Supportive actors must include producers, users, third parties (e.g. regulators, standards, institutes, investors) and policy makers". (Smith, 2007).

These partners would also in essence not be impeded by competition and secrecy within its organization, as this would defeat partnerships. Furthermore, in the case of model eco-homes in Northstowe, UK, this program is frequented by four groups of local governments professionals, researchers and industry associates. (Ko and Fenner, 2008) This helps others see the project in action, and enables the data gathered to be shared, i.e. the best practices to be shared that prove themselves effective, and facilitates others build eco-towns with less government co-ordination and financial support. The smart grid would benefit of similar exposition, to promote the project, engage exterior curiosity, and show those who are tentative the real potential of the smart grid in action.

Since niches enlist government support, Summerton suggests there should be energy efficiency programs, more accessible information, and a direct reporting to the government. (Summerton, 2002) Obama's smart grid grant, as well as MeRegio's program structure as will be explained in the case study, in design require that there is a dialogue with the government that shares its findings, and thereby also its best

practices acquired, which will enable the government a more adequate understanding and thus facilitation of similar projects.

#### **D. Conclusion to socio-technocratic green niches**

The presentation or implementation of green niche innovation as described often enlists a broad network of partners, and exists via the direct or indirect role of the incumbent regime's regulatory support. These partner groups will or should share best practices and co-ordinate to the greatest extent possible for both technical as well as economic benefits. Since green niches are often fostered in protected areas within the government, these are a way of the government of enabling experimentation, where the claim has been made that this "practical implementation arouses curiosity and leads to solutions". (Smith, 2007) Research and development is driven by curiosity which will be stimulated even more if there are existing phenomena to be analyzed and considered, where companies or groups with similar capacity and agency of expertise will be encouraged to set-up similar green niches (smart grid research), due to having observed successes and failures within existing programs that enticed them. Our very research here in this paper, was equally enabled and incited through the visibility of existing implementations of the smart grid, where the extent of transparency and the ability to identify their best practices was the key point enabling us to proffer solutions. Thereby sharing best practices, civil and professional engagement through communication, and the overall application of regulatory policies as a way of fostering all of this, are crucial to the mainstreaming of the smart grid.

#### **5. Case studies**

We choose two smart grid projects from two comparably developed countries, Germany and the USA (HDR, 2009); Meregio and SmartGridCity. We conducted our research using empirical, second hand, and tertiary data. The first hand data was gathered through in-depth interviews with representative stakeholders from the private, public and government sector. For the Boulder case study we used 5 interviewee responses, and for MeRegio we used 12. Second and tertiary information was collected through the official project web pages, newspaper articles, publications and documents forwarded by the interviewees.

Transparency in this case was an interesting quality to observe within the exposition of the smart grids and the individual companies' reaction to our attempts to contact them and then actually speak with them. To what extent information was provided or visible to us already gave us a quantifiable and qualitative indication of the companies' and partners' existing CSR practices and consciousness.

We will present the preliminary and existing regulatory frameworks of the respective cases, their actual mechanisms and models of implementation, followed by an analysis of how these tie into our conceptual frameworks of CSR and sustainability and green niche theory.

#### **A. Introduction to SmartGridCity Boulder**

Evidence was gathered through interviews with the Colorado government agencies of Colorado Public Utilities Commission, Office of Consumer Council, and the City of Boulder, as well as private citizens and smart meter owners, and through articles in newspapers and the utility website. The number of interviews, five, is lower than we would have liked; however this was due to low response rates. The private sector was, for reasons unknown, unable to provide information. Citizen groups contacted responded but felt the project was not developed enough or that their organizations were not involved enough to give good information. However despite these limitations we feel we were able to get a good picture of what is happening.

## **I. US energy system background**

Before explaining the case study in Boulder, Colorado, we feel it is necessary to provide some background information about the electricity system of the United States. The U.S. electric power industry is the last major regulated energy industry in the country, and it is changing, namely becoming more competitive. Traditionally this industry has been thought of as monopolistic. In the early 1900s, as the use of in home electric appliances began to increase so did the demand for in home electricity use. By the 1920s private electric utility holding companies provided 94% of USA's generation, with the other six percent coming from publicly owned utilities. (EIA, n.d. b) Because these companies were unregulated they engaged in questionable business practices with many of the different directors having conflicts of interests and no accountability or liability. These problems often lead to inflated rates for consumers and created unstable financial structures (EIA, n.d. a). In 1935 the Public Utility Holding Company Act was passed which gave government agencies the ability to regulate these organizations. The act led to a more fair system that privately owned companies had to operate under. The act also led to the virtual elimination of non-utilities in wholesale electric power sales. Around this time publicly owned utilities began to increase in importance because citizens put more trust in them than the private sector. By 1941, public power represented 12% of total utility generation. (EIA, n.d. b)

In the next decades utilities were able to meet increasing energy demand with lower and lower costs. This was done through economies of scale and technological advances, and as the utilities were monopolies they had no worries of competition. Things changed in the late 1960s when unit costs began to increase and growth slowed. These changes in addition to the increase in oil prices due to the Oil Embargo and the increase in concern about the environment led to the passage of Public Utility Regulatory Policies Act (PURPA) of 1978. (EIA, n.d. b) PURPA was passed in order to promote more efficient use of fossil fuels in electric power production and the use of renewable resources (EIA, 2000). PURPA allowed for competition because it allowed non utility facilities to enter the electricity wholesale market. (EIA, n.d. b) These certain non utility facilities were co-generators and independent power producers and they were exempt from utility regulations but had guaranteed markets for their electricity; the established utility had to buy the non-utility's electricity. (EIA, n.d. a, b).

Competition continued to grow with 1992's Energy Policy Act (EPACT). EPACT allowed the non-utility market to expand with a new category for exempt wholesale generators (EWG). Like the other non-utilities, EWGs do not sell electricity in the retail market (they only sell to utilities) and do not own their own transmission facilities. EPACT also required utilities to provide access to their transmission systems. Before PURPA's passage, the electric power industry had been fairly stable, but things have changed and continue to do so. (EIA, n.d. b). Today electricity customers have the opportunity to purchase cheaper power from alternative suppliers like power marketers or independent power producers. (EIA, n.d. b).

We are currently seeing a transformation in the electric power industry. It is changing from a regulated monopoly system to a deregulated industry where various generators of electricity compete for customers. (EIA, n.d. b) In some states, customers can choose their electricity company. These once non-existent wholesale markets are now operating in many regions of the country. Over the past few years the number of independent power producers has increased substantially. This also means that there are many sources of electricity entering the grid; which places greater strain (EIA, n.d. b)

The most recent advancement in the American electric system has been the introduction of the smart grid. In 2007 the United States government created the Energy Independence and Security Act. The purpose of the act was to move the USA to greater energy security and independence and Title XIII is dedicated to the smart grid. This act gave power to various organizations, such as the National Institute of Standards and Technology, to identify standards for smart grid technology and in 2009 they published Framework and Roadmap for Smart Grid Interoperability Standards. But they are not alone in their efforts; the communications, IT, and power industries are also coming together and working on standards and deciding which technologies are necessary and how they will be interconnected. (DeBlasio, 2010).

Recently president Obama and the United States congress declared it a priority to modernize the American electrical system, focusing on smart grids. (Simon, 2009) In 2009 the Department of Energy awarded \$3.4 billion in stimulus funds to over 400 smart grid stimulus applicants. This grant was the biggest single grant that the DOE has ever granted in one day (Reedy, 2009). With all this money available, utilities are taking note. The smart grid movement has significant momentum with utilities developing and deploying technologies like smart meters, digital transformers, and automated power monitoring and management systems (Violino2009). Nearly all the private utilities are beginning pilot programs to test smart grid technologies.

#### **aa. Current energy picture**

According to the United States Department of Energy (DOE), "The more than 3,273 traditional electric utilities in the United States are responsible for ensuring an adequate and reliable source of electricity to all consumers in their service territories at a reasonable cost."<sup>8</sup> These traditional electric utilities can be investor-owned, publicly-owned, or Federal and are regulated by local, State, and Federal authorities.

There are 210 investor owned utilities, which tend to be large and vertically integrated, meaning, they provide generation, transmission and delivery service at a bundled price to retail customers. They own more than 38% of the nation's generating capacity and serve 71% of nation's consumers. State public service commissions have jurisdiction over these utilities. There are 2,009 publicly-owned utilities, and 883 consumer-owned rural electric cooperatives, and 9 Federal electric utilities. Thus there are fewer private electricity companies than government owned, but they serve more of the population. Though providing basic services, these companies are private and therefore their main objective is making profit for their shareholders. Though they are granted service monopolies in their geographic areas, they are required to charge reasonable rates and to give all consumers similar access to services. (EIA, n.d. c)

Publicly-owned utilities are non profits and are run by local or state governments. They account for 9% of the generating capacity. They are funded through the sale o bonds and from revenue from electricity sales. These entities are able to provide service at cost and often time result in cheaper prices than those that privately owned can offer because they are not subject to income tax. Cooperatives are owned by their members and usually operate in rural areas where historically the public owned utilities had overlooked because of the low population density. Their generation capacity is 4%. Lastly, the 9 Federal utilities are part of various government agencies. (EIA, n.d. c)

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<sup>8</sup> <http://www.eia.doe.gov/cneaf/electricity/page/prim2/toc2.html>

Currently the United States spends over 500 billion dollars annually on energy<sup>9</sup>(the mix is as follows: oil 37.1%, natural gas 23.8%, coal 22.5%, renewable energy 7.3%, and nuclear power 8.5%. 40% of all energy used in the US is electric power.<sup>10</sup> (DOE). Though renewables represents a small percentage, this number will be increasing. There is now a separate office to deal with renewables, the Office of Energy Efficiency and Renewable Energy (EERE<sup>11</sup>) and it has created the National Renewable Energy Laboratory, the only federal laboratory dedicated to furthering the usage of renewables<sup>12</sup>. In 2008 the US was the fastest growing wind power market in the world and the amount of money the Obama administration is giving to clean energy research is the largest in American history. Despite this, the USA is falling behind many nations in renewable energy development like China, and Japan (Walsh, 2009).

## II. Xcel's SmartGridCity

Xcel Energy Company is leading a smart grid initiative in Boulder Colorado called SmartGridCity. Xcel is an investor owned utility which operates in 8 Western and Mid-Western states and deals in electricity and gas (Fialka, 2009). It is Colorado's largest utility and serves over 1.3 million people (Fialka, 2009). According to Xcel, the smart grid is, "an intelligent, auto-balancing, self-monitoring power grid that takes a variety of fuel sources, coal, sun, and wind for example, and transforms them into electricity for consumers' end use with minimal human intervention." (Neville, 2008). According to their website they initiated SmartGridCity because customers' needs are growing faster than the grid can handle, and demand is expected to grow another 40 percent over the next 25 years. If utilities do not keep up with the demand grids will continue to grow less and less reliable.[1] Over the past decade most utilities have run pilot programs involving one or more smart grid technology, but Xcel's is the most all inclusive yet. (Neville, 2008). In fact SmartGridCity will be the first American city with a fully integrated smart grid and will serve as an example of how all the technologies work together (Neville, 2008; Violino, 2009)

Xcel is not working alone; they established what they call the Smart Grid Consortium; a group of seven private partners. These partners are Accenture, Current, GridPoint, OS/soft, Schweitzer Engineering Laboratories, SmartSynch Inc., and Ventyx. The partners are involved to help with technical aspects of the project concerning things like, project management and communication, metering technologies, and demand response technologies, etc.

The project began in May 2008 at its core is the installation of broadband over power line systems, enabling meters and sensors to instantaneously send data back to Xcel's operation centers (Jaffe, 2009). Currently, the new infrastructure consists of automation of four of five distribution substations, four computer-monitored power feeders, and another 23 feeders that are watched for voltage irregularities. Xcel has installed 200 miles of new fiber optic cables which allows power to be distributed to houses, and it allows retrieval of power use information from the houses back to the utility. They have distributed upwards of 24,000 smart meters. (Fialka, 2009; Violino, 2009) As of February 2010 the grid could remotely read electric meters and detect outages and move power around congested transmission lines. (Fialka, 2009). Xcel launched a webportal for home owners with smart meters. They can log in and manage their energy usage and see when electricity costs less and therefore adjust their appliance usage accordingly (Violino, 2009).

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<sup>9</sup> <http://www.energy.gov/energysources/index.htm>

<sup>10</sup> [http://www.eia.doe.gov/aer/pecss\\_diagram.html](http://www.eia.doe.gov/aer/pecss_diagram.html)

<sup>11</sup> <http://www.eere.energy.gov/>

<sup>12</sup> <http://www.nrel.gov/>



Xcel's smart grid can predict equipment failures and proactively make needed repairs before outages occur, and indeed, in 2009 they successfully averted four potentially long term outages when the system detected transformers that were about to fail. (Violino, 2009). Traditionally, problems with transformers are not detected until they have failed. Other positives include fewer complaints about voltage. In 2007 there were 70 complaints, either regarding surges or drops, and in 2008 there were none. (Fialka, 2009; Jaffe, 2009) The smart grid is responsible for better regulation of voltage. In recent years the city's demand has grown 39%, mostly because many new air conditioners were being installed and most of those customers were not notifying the utility. This would cause voltage problems, but there were no signs of trouble until the transformer blew. Now with the installed smart grid systems, as soon as a new air conditioner is turned on the systems knows and the transformer is beefed up. (Fialka, 2009)

Looking to the future, Xcel is planning pilot pricing programs. Phase 1 of the Pilot Pricing program is set to begin in October 2010 and continue until September 2013. This pilot program would include 2,000 customers with smart meters and participation would be on a voluntary basis. Participants will select from three pricing schemes: Time-Of-Usage (TOU), Critical Peak Pricing (CPP), and Peak Time Rebate (PTR). TOU would charge customers different rates depending on when electricity is consumed throughout the day, specifically during the hours of 2 pm to 8 pm, peak hours and non peak hours. CPP expands on the TOU rate, adding critical peak periods, which would occur 15 times per year and last six hours each time. PTR would be very similar to standard rates but Xcel would pay customers if their electricity consumption falls below a determined level during the abovementioned critical peak periods.

### **III. Analysis of SmartGridCity**

Here we will look at SmartGridCity in terms of the Sustainability and CSR framework.

As the smart grid infrastructure has been successfully laid, it can be assumed, that in terms of promoting the uptake of renewable energies, it is doing its job. Things are running smoother and more efficiently and in the future as more homes start generating their own renewables, and as big wind and solar power play a more important role, there should be no problems integrating them. The increase of these two renewable sources seems likely to happen in Boulder because the people there are very pro-renewable energy and are active in lobbying their government and utility for larger percentages of renewables in their energy mix.

Though it remains to be seen what kind of role Xcel will take in providing incentives to their consumers to use home renewables and what efforts they will make to integrate more big renewables into their portfolio. At the moment Xcel says their hands are tied because the PUC sets the generation mix and legally they cannot add anymore.

In terms of creating conscious consumerism, their impact has not been as great. There are 24,000 smart meters in place and this represents a large opportunity to save electricity and reduce peak demand. However, it seems that a significant amount of people do not even know they have smart meters and if they do, probably do not know about their benefits and how to utilize them. One interviewee said, "change happened with little fanfare," one day he looked at the meter and it was different. Another said, "I *think* I have a smart meter. It looks different than the one I had a few months ago anyway." It seems that Xcel's smart grid project has not yet starting contributing to creating conscious consumerism. But it will be interesting to see what develops from the variable pricing pilots that begin in October and with the in home device pilots that are supposed to happen at some point in the future.

Looking through the CSR lens, Xcel's stakeholders are certainly watching them and holding them accountable, namely Boulder and Colorado regulators. There has been a lack of transparency in terms of financing, and Xcel had to pay for this through greater control and regulation. The project is estimated to cost about \$100 million, and in March 2008, when beginning the project Xcel originally anticipated their costs to be around \$15.3 million, (which is what the Office of Consumer Council originally approved) and later in May 2009, revised that to \$27.9 million. Now it is looking closer to \$42.1 million (Smart Grid News, 2010; Snider, 2010). According to Xcel, they had to lay more underground fiber than expected, which is very expensive. Also according to Xcel, its consortium partners were to pay the remaining money, but it is still unclear where all the money for the project is coming from. All interviewees from government made comments about the lack of transparency in funding. In 2010 Xcel applied to the Public Utility Commission (PUC) in Colorado for rate recovery. The PUC granted the 6.5% rate hike, allowing \$11 million of it to go towards rate recovery. However this move has been unpopular with some of the commissioners because it is giving the bill to all Colorado tax payers, even the ones not benefiting from the smart grid project. (Jaffe, 2010; Snider, 2010) PUC granted Xcel rate recovery but they also required them to apply for Certificate of Public Convenience and Necessity which gives regulation authority to PUC and OCC. Xcel appealed this decision but their appeal was denied.

Due to lack of transparency, the PUC and OCC has had to become more involved and this is slowing the process down considerably, as Xcel has to file with the PUC on most major decisions concerning rates and pricing. Perhaps the working relationship could be improved and things could be speedier if Xcel would reach out more to the PUC, the OCC, City of Boulder etc. As it stands, contact is extremely limited; PUC and OCC only see Xcel when they file motions. A representative from the City of Boulder has a weekly telephone call with Xcel; however, this weekly telephone call is the only time to speak to them. Making contact with Xcel is very difficult. If she wants to contact her usual contact person she has to go through the media contact, and this can take days or longer. PUC, OCC, and the City of Boulder do in fact support the project and think it has promise. Interviewees said that their agencies all support the project and think it is a good thing for Boulder, but it must be done carefully and not at any cost. The regulatory agencies are optimistic but also wary. Boulder's sustainability coordinator, who works for the City of Boulder, has said, "How much will it cost? What are the benefits? We need a transparent forum to discuss these questions" (cited in Jaffe, 2010).

In terms of consumers the things people are noticing is lack of communication. The funding problems, the slowness with PUC, and other things like unexpected construction problems have caused delays. For example, in home device pilots were supposed to start in summer 2009, but pilot pricing, which is the first step, will only begin in October 2010. Problems are to be expected when testing new technologies. But instead of talking about them, Xcel has kept quiet. Because of this silence, many got angry with the utility, and others just lost interest.

Xcel does not seem to be in the position where it can lose favor with their stakeholders. Boulder has a franchise system for electric utility operation. When the current utility's contract runs out, the city can renew it, find another utility, or let the city take over and municipalize the electricity system. Xcel's contract is up at the end of 2010, and in 2006 the City of Boulder began seriously looking into plans for taking over electricity provision. There is a feeling among some Boulderites that Xcel only introduced the smart grid initiative as a way to get their contract renewed. According to one interviewee, some people feel that Xcel "snookered" the City of Boulder into dropping its municipalization plans. This hostility can be explained because Boulder

residents are very green and they want to source as much renewable energy as possible. They do not see Xcel as doing enough to increase renewable usage.

This negative view seems to go against what Xcel has officially said about why it implemented the smart grid (in order to provide regular service as demand continues to increase while using renewable energy). While it is impossible to know Xcel's real motivation, it does seem that people see them in an overly negative light. The interviewee from the City of Boulder said that Xcel gets a bad rap and that people do not seem to know that Xcel is the country's utility with the highest percentage of wind power in its portfolio. It seems that Xcel is not managing their risks very well and their reputation is suffering.

#### **IV. Conclusions**

Transparency, communication, and stakeholder engagement are missing from Xcel's management of SmartGridCity, and missed opportunities are the result.

With 24,000 smart meters installed and a large number of those households not even knowing they have one, opportunities for improved energy management and reductions in electricity usage and pollution are missed.

Xcel has a supportive body of regulators in Boulder which could provide resources for getting consumer support. So far, they have not taken advantage of PUC, OCC, and City of Boulder. Xcel currently sees the regulatory bodies as groups that must be complied with, but they could be more.

In an atmosphere where their contract is not secure and many stakeholders are not happy, opportunities are missed to communicate with their consumers to bring them on board to their project and thus encourage the City to renew their contract. Reaching out and engaging with stakeholders, Xcel can learn what their expectations are and clarify any misconceptions consumers might have.

Xcel has a great opportunity to interact with their consumers and regulators in ways that they never have before, the result could be beneficial for all.

#### **B. Introduction to MeRegio in Baden-Wurtemberg**

MeRegio: Minimum Emission Region is a four year project that was incited by the German Federal Ministry of Economics and Technology. It is currently in its first phase, and involves over a 1000 private and public participants in the communities of Freiamt and Goepingen. It is located in two towns in the Baden-Wuertenburg region, and orchestrated by five partnering private companies and one educational institute. We choose the MeRegio project for our European case study because it offered, even at first glance, very accessible and bountiful information. To understand how this particular smart grid came into being, we have looked at the historical policy background of the German nation and have traced significant policy changes and their complimentary frameworks. Furthermore, in order to gain insight into the manifestation and/or absence of CSR activity, we have perused the official web pages of each partaking corporation and interviewed as many participants as possible, to gather a range of insights and first hand accounts of the smart grid in place.

The description of the case study is divided into two main sections. We shall first describe the governing profile and their legislative regulations, and introduce the historical elements that preceded the current environmental policies of Germany. This will help understand how the MeRegio smartgrid project came into being and how and why it is modelled as such; to provide an idea as to what conditions are or must be present in order to achieve a project as such. The second section will place the first

and second hand data gathered of the MeRegio project within the theoretical frameworks relevant to the smartgrid.

### **I. Political history and national frameworks**

What makes Germany so interesting, without wishing to dwell on its unique historical profile, is the distance it has come to have attained the economic and social stability it currently enjoys. Not only are they now one of the strongest economies within Europe from being the weakest in the 1920s (Mortimer, 1995), but they also efficiently address energy provision issues and GHG emission reductions. Consequently, “the growth of renewable energy in Germany has often been cited as a model success story.” (Bechberger et al., 2004) By looking at the steps Germany has taken to have earned this praise, we can better understand what a recommendable model is that encourages renewable energies, energy provision, and the implementation of green initiatives, such as MeRegio’s smart grid.

Germany has probably one of the most turbulent histories of European countries, finding itself in complete financial, social and infrastructural ruin following the first World War and the Treaty of Versailles in 1919 (Solsten, 1995). As common within most nations, the initial provision of electricity, foremost light initially, was not provided in rural areas in the 1920s as it was simply of no lucrative interest to the private companies that were active in this market, especially when one considers the market failures of the Great Depression in the 1920s which in no way encouraged the undertaking the construction of a national provision infrastructure.(Paeger, 2006) Gradually though, to also address the unemployment problem, the economic-political tendencies became more socio-political, and expressed themselves in the shape of collaborations of state-owned conglomerations based on a privatized model. Under the re-building programs when Hitler came to power in the 30s, provision fell under the governance of the totalitarian regime and was entirely dictated through the state.

It is also very interesting to fully consider the geopolitical attention following the end of WWII, resulting in the East-West division within the German nation. In this state of split and differing governing profiles, the West was able to enjoy a gradual rise from poverty and post WWII decline through privatization and capitalism, whilst the East patterned on the Soviet model became a centrally planned and state-controlled production and distribution system by 1948. (Solsten,1995)

As in all nation’s histories, the political developments enable or disable the economic ones. Thereby, for the sake of this discussion, and since Germany practically faced a completely restructuring twice within only a single century the events of WWI and WWII (DeLong, 1997), it is more valid to focus on the later decades where the current regulations were successive to rather than go into depth into the totalitarian regulation of provision or the cold war period.

First energy security concerns were addressed in policy regulations in the 1970s in the promotion of renewables, through a promotional program for wind energy technologies in 1974. (Runci, 2005) It resulted in the governments large scale wind plant project (GROWIAN) which was considered a relative failure due to manufacturing limitations and the inability to integrate it into the operating energy system and was thus dismantled in 1987. It has been argued by Smith that setbacks are crucial to the learning process, (2007) which GROWIAN would most certainly suit to compliment as it resulted in technological improvements and the recognition to create a greater supply industry which was consequently stimulated through further government subsidies and incentives.

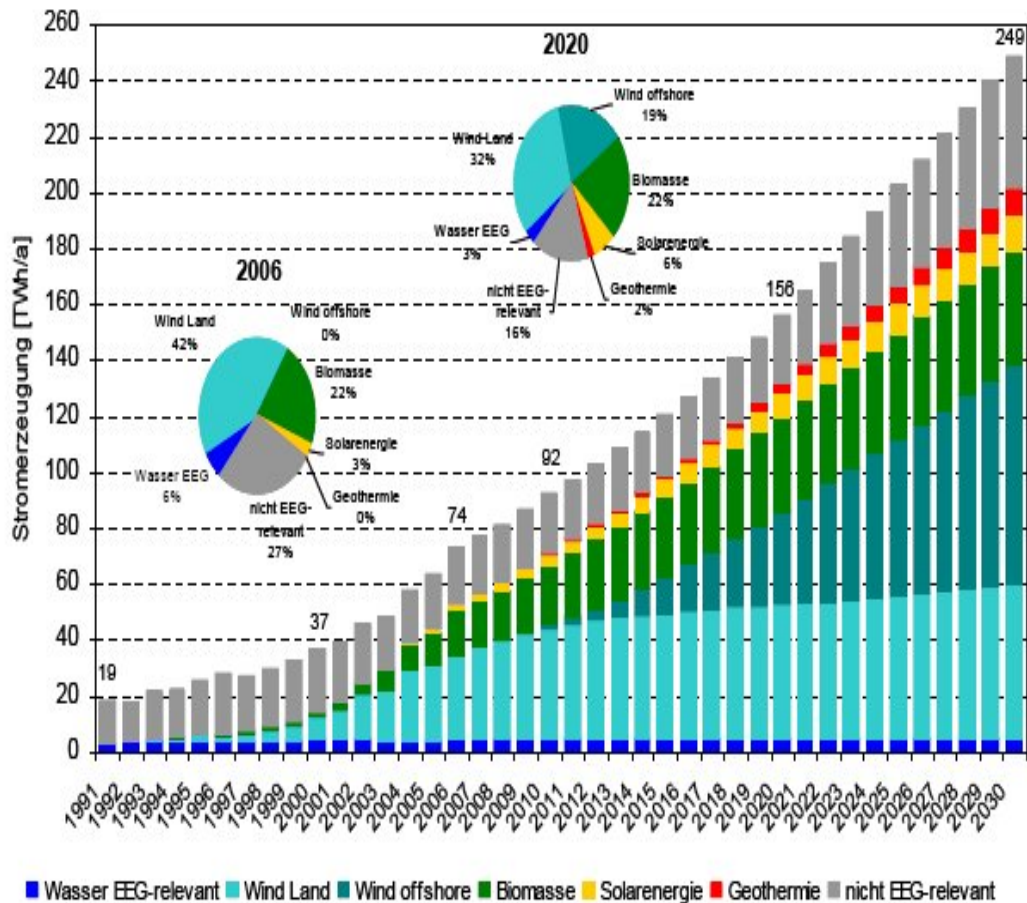
In the 1991, a federal Electricity Feed Law (StrEG) was adopted, which enforced public utilities to purchase wind, solar, bio-mass, hydro and landfill-gas sources on an annual fixed rate. These feed-in tariffs were calculated according to the utilities' average revenue per kWh, having the effect of subsidizing, encouraging and integrating renewable energies into the conventional energy sourcing which regulation had previously not accounted for. Additionally, the state-owned bank Deutsche Ausgleichsbank provided government backed loans of low-interest to encourage the development of wind power technologies. (Runci, 2005)

In accordance with Germany's goal to reduce their greenhouse gas emissions by 12% under the European Union's commitment to the Kyoto Protocol of 1997, "renewable energy sources and accelerated deployment of renewable energy technologies are seen by the German government as playing a central role in meeting its voluntary goal". (Runci, 2005) With the red-green coalition government forming in 1998, taxes were increased on fossil fuels and upon electricity use across all sectors, under the 1999 Ecological Tax Reform (ETR).

A successive law in 2000, the EEG (Erneuerbare-Energien Gesetz or the Renewable Energy Law) is considered by the Bundesministerium fuer Umwelt, Naturschutz und Reaktorsicherheit itself (Federal Ministry of Environment, Nature Protection and Reactor Security) to be one of the most important laws to address sustainability concerns and environmental targets. (BMU, 2007) It is a replacement of the StrEG law, and was further improved and adapted in 2004. This law resulted in a doubling of renewable energy use from 6.3% in 2000 to 12% in 2006.(BMU, 2007) The success of this regulatory application is further established in light of a total CO2 reduction of over 100 mill tons by 2006. The elaborated EEG policy was in fact so successful, that the targets set for 2010 were already exceeded by 2007.

In policy, the EEG law includes the following provisions:

- A minimum period of 20 years guarantee for the purchasing of one's renewable energy installation
- The nation-wide compensation for the purchased electricity flow, as well as the corresponding compensation payment and the shared-differential cost for sourcing renewables compared to acquiring conventional energy. (In effect the energy consumers contribute to the necessary conversion of energy provision. Furthermore, the external costs of fossil fuel energy generation are partly internalized.)
- The integration of renewables into the electric grid and a preferential treatment of renewable energies



Source: BMU, 2009

The graph shows the incremental increase of renewable energy sourcing, which the EEG since 1999 has facilitated.

The EEG was improved upon again and active since 2009. The new legislation wishes to achieve an increase of 30% of renewable energy use by 2020 and will do this via an additional focus upon those emission reduction of heating and cooling within buildings specifically, and the implementation of a complimentary law; EEWärmeG (Erneuerbare-Energien-WärmeGesetz, or, Renewable Energies Heating Law). The essential policies of the 2004 EEG regulation were maintained, but the overall bullet points of address have now been tripled from 22 to 66. Evidently, Germany has a continuous reassessment of new developments and sustainability needs and is effectively building upon past policies that proved effective, whilst addressing new dimensions such as the sector of heating and cooling facilities.

## II. The model of MeRegio

“E-Energy: ICT-based Energy System of the Future” is a new support and funding priority undertaken by the Federal Ministry of Economics and Technology (BMWi) as part of the technology policy of the Federal Government.” (BMWi, 2008) The primary goal of the program is to prove and take advantage of the immense potential that information and communication technologies can bring towards energy security, energy efficiency, and environmental sustainability and how this in turn can enable new markets to be developed where such suppliers and actors may deal and interact. All of these specifically intend to suit the incumbent energy and climate policies. (BMWi, 2008)

To stimulate innovations that would address the above mentioned goals, the BMWi created E-Energy; a competition based program where 28 projects partook and six were selected to be governmentally subsidized. Together with the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) a total of 60 million Euros was contributed to the various projects, in effect renumerating 40% of the budgets that each project's field experiment and R&D implementations required. MeRegio is one of these selected projects

The model is thus a government incentivized research project, through a collaboration of private utilities, a university and a "Begleitforschung" (Accompanying Research Team). This accompanying research team has four groups who address four specific concerns; standardization, market development, system architecture, and legalities. This Begleitforschung serves all of the six selected projects and gains immense benefits from having the collective insights into all of the ongoing projects and the dialogue with each of them.

MeRegio is realized through 6 main partners; the consortium leader and energy provider EnBW, ABB, IBM, SAP, Systemplan and the Karlsruhe Institute of Technology (KIT). The transparency and accessibility to personal actor details of E-Energy and MeRegio is remarkable. The very engagement with the positive dissemination of information and best practices is further complimented by the E-Energy intent to create a "knowledge pool", which is stressed throughout the various sites and expressed in the personal interviews we had with the collaborators of the various partnering entities.

The technicalities of how the MeRegio smart grid is actually in place is the following: in two regions, one slightly more industrial and the other rather rural were selected, where in each household a smart meter with bi-directional broadband communication interfaces was installed free of charge, delivering a high level of consumption transparency. Within the pilot project these meters will be installed with a forecasted 800 consumers, 150 generation units and 50 storages for electrical energy. As it will not be possible to change existing grid codes within the pilot project, bottlenecks in low and medium voltage level will not occur in reality. Therefore MeRegio will also simulate load flows in a virtual network model. This online-simulation will be used to analyse how the use of CO<sub>2</sub> free energy resources could be maximised in a market-oriented way if grid codes would change.

### **III. Analysis of MeRegio**

In order to obtain the aforementioned information on the case study, we were able to consult second and third hand documentation from web pages and from documents forwarded to us from individuals involved with the MeRegio implementation. Yet what truly made the analysis of MeRegio so rewarding were the inter-personal and extremely positive interviews with leading figures and project leaders from the consortium partners and the Begleitforschung. This alludes to the CSR notion of transparency, which in the case of MeRegio is incredibly well achieved and managed. Due to individual names, their responsibilities within the projects and teams, and even personal office numbers and emails being proliferated over various web pages that are either directly or indirectly related to MeRegio- it was a very straightforward process to contact them. Yet having personal details does not guarantee a personal response per se, yet to compliment this irrefutable transparency and accessibility via the internet, the actual individuals contacted, each and every one (of which there were at least 15) made an effort to reply to our research efforts. This is a recommendable example of a

true engagement with CSR, and a genuine reflection of an interest to be a community concerned, research supportive, and best practise sharing program.<sup>13</sup>

In terms of the conceptual frameworks of our paper, MeRegio's active concern to share and communicate best practices and achieve partnership networks, are key CSR activities that can foster sustainable practices and facilitate the implementation of multi-stakeholder services/products such as the smart grid. The consortium partners meet regularly; the Begleitforschung teams have an ongoing dialogue with all the consortium teams; and occasionally the six E-Energy project consortiums also meet one another to share experiences and lessons learned. There is a general emphasis upon communication and a strategic design to benefit from all informational and technical resources available.

Curiously enough, when asked whether the interviewees were familiar with CSR concepts in general, most of them were not actively concerned or aware of this process. Nonetheless, their very behaviour did reflect a CSR attitude. This is not a qualitative judgement what so ever, since CSR is merely a word and a term, which is potentially understood or expressed in different ways and therefore no indication what so ever of actual CSR behaviour. It is merely interesting to point this out, as CSR is evidently able to exist, without a systemized implementation or defining of CSR. Nonetheless, three stakeholders did specifically stress CSR needs (using the same vocabulary) and were consciously applying CSR approaches for networking, communication, smart grid promotion, and also mainstreaming via regulatory engagements.

The Begleitforschung as well as the private utilities attend conferences and meetings to further their knowledge and also contribute their own experiences in order to attain a communal goal. This suits socio-technocratic regimes, where a communality of intent is able to foster niche implementation. Furthermore, the legal team is highly capable of addressing the particular legal or regulatory constraints/opportunities that the smart grid (and the other projects) face, which will enable a more fluid transition into the mainstream. The legal body collaborates closely with the technicians, IT and other elementary smart grid contributors, and due to a prescribed policy within E-Energy is provided with all the information they might desire from the E-energy consortiums. This provides them with a broad and in-depth understanding of all the potential legal requirements.

As part of the E-Energy program, the individual consortium partners have to offer a report to the Ministry after four years of field research that provides constructive suggestions and recommendations to achieve the specific goals set out by the Ministry. This refers to the conceptual framework of regulation and policy and exemplifies an efficient way of how one can connect the private utility knowledge and their intellectual capital resources to support those national objectives of the incumbent regime -and in effect thereby also the needs of the public. This is also an example of CSR, yet evidently one that was proffered by the government itself, which would be a reason for recommending that governments take an active regulatory and financial stake in green innovation as this appears to engender transparency and CSR.

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<sup>13</sup> The author does not wish to digress from an objective analysis, but it is a fact that the individuals contacted were forthcoming, and that this deserves to be complimented. Furthermore, it is a factual and unemotional observation that their interest in supporting our research was present proven through their very time dedicated to our research, and it is a fact that some actually called *us* after we contacted them by e-mail rather than us having to make the effort to call them.



One of our interview questions asked whether there were any constraints or set backs so far.<sup>14</sup> Both these questions were often answered with “no”, due to MeRegio being a government lead experiment and thereby benefitting from certain exemptions and freedoms that other non-government backed initiatives would not have. This suits the green niche conceptualization that governments create protected spaces for green initiatives to exist and grow in. The idea that it is an experiment, as was explained to us, is also a reason for interviewees not having identified any significant set backs as it is still within its initial phases and an on-going learning process. Partners did mention repeatedly, when this question was posed, that it was an unexpected outcome that there was such a lack of participation from the smart meter users, and that this caused certain constraints for the full deployment of the smart grid potential. Repeatedly, private and government interviewees would concede that they had very little contact with the actual end-users and civil society. This is very interesting, since it is admittedly the end-users who must be activated and engaged, yet only the main utility provider (EnBW) has regular contact with them.

In terms of conscious consumerism, the interviews created the impression of not having reconfigured consumption patterns significantly. It was pointed out, that it is not in our daily behaviour patterns to look at a smart meter display (since previously it simply was not in our daily lives), and that it will require a significant and conscious effort to reconfigure this. There were no quantified public documents available to us reporting or quantifying a change in consumption patterns within MeRegio so this statement is purely derived from the first hand stakeholder accounts. Interestingly enough, one interviewee from the private sector remarked, that the smart grid will not in fact decrease the aggregate consumption and demand for electricity, but merely impact *when* this energy is consumed. This stresses the need for renewable energy integration and evidently the promotion of smart meter engagement itself. This suits the frameworks of stakeholder/end-user engagement and regulation. Regulation is mentioned because government policy as described in section 5.B.I can heavily induce the up-take of renewables and deter the continued reliance upon fossil fuels.

Furthermore, we were informed of experiments being made with ipods and ipads that have a smart meter-data-feed where one would have one’s consumption displayed conveniently in a specific smart-grid related application on their i-appliance. With the growing trend of mobile phone technology and the ever growing functions they are able to offer, this seems like a practical and “trendy” way of creating greater accessibility for the consumers to their own consumption data. This would ideally contribute more effectively to their engagement with price signals, and promote, familiarize and influence the smart grid. Thus fostering the reconfiguration of consumer practices which is so important to the smart management of our electric provision.

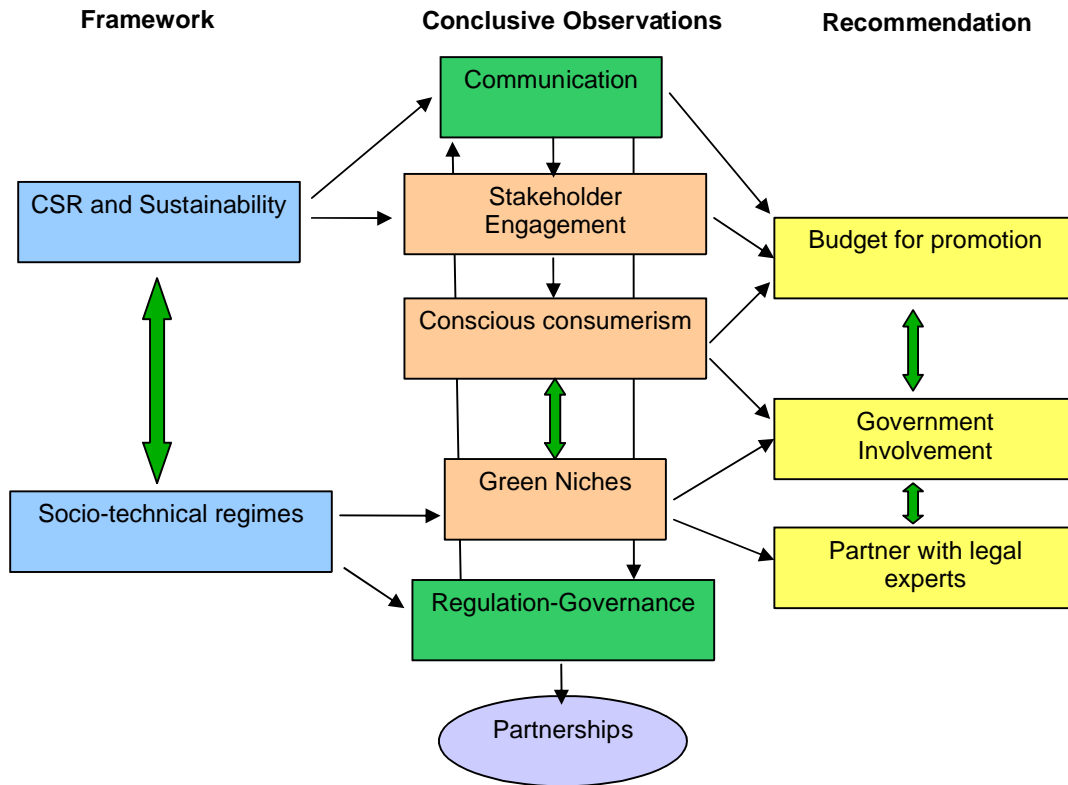
#### **IV. MeRegio conclusion**

MeRegio gives a very positive impression, yet this is admittedly a very subjective deduction and until further data is released no indicators of success can be referenced. In actuality, what it does offer is a broad frame of reference to CSR practices and sustainability, and draws upon a wide stakeholder engagement from private, public (university) and government. The only underrepresented stakeholder in MeRegio is the end-user, who has been identified in this paper and in smart grid discourse as a quintessential participant.

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<sup>14</sup> Please see appendix 4 for the list of questions that were addressed, or attempted to be addressed, in the personal stakeholder interviews.

## 6. Conclusion to the paper



To reconcile our multi-perspective approach we have created this diagram. The first column shows our conceptual lenses. The first lens of CSR and sustainability links to our observation that the smart grid requires stakeholder engagement in order to foster a more conscious consumerism. These two ideas are strongly influenced by good or bad communication practices. Successive to the observations labelling the three upper boxes we point to our first recommendation, which is the need to allocate resources of the smart grid budget towards promotion of the smart grid.

The second conceptual framework of socio-technical regimes is first of all interlinked with sustainability above it, and results in green niches, whilst making us aware of the regulatory and political governance of our society that can hinder or profer the implementation of the smart grid. Attention to governance practices runs throughout the various observations, as all are inevitably governed in one way or another. This thereby highlights the importance of this governance having to be efficient, similar to the need for the communication tools to be effective and engaging. Following this observation, the conclusive recommendation in column three is that through government involvement and the inclusion of a legal team, green niches and smart grids as such can be facilitated and their mainstreaming be made more fluid.

Partnerships are situated as the baseline requisite for smart grid implementation.



Smart grids are an inevitability; we must learn to manage our energy needs more efficiently, more sustainably and thereby more intelligently. CSR practices are an extension of sustainability itself and as this paper has explored, would provide a set of tools to facilitate smart grid implementation. Necessary tools in terms of CSR in order to implement a smart grid project are transparency, stakeholder engagement, communication and partnerships.

## **7. Recommendations**

Following are three specific recommendations that can improve the implementation of the smart grid, drawing upon CSR understanding, and resulting from our analysis of the smart grid theory, data, and actuality.

**1)** We recommend that utilities include in their budget money for smart grid promotion. This could be through stakeholder engagement activities, advertising, etc. There must be a continuous reminder that the smart grid requires active participation, and of its benefits. Concrete examples include: dropping a sticker in the mailbox of every house that has a smart meter installed, informing them of their new meter, collaborating with citizen organizations, placing a smart-grid advertisement on a billboard in a centralized part of the smart-grid community, and handing out promotional items such as t-shirts.<sup>15</sup>

**2)** We recommend that governments take an active role in the implementation of the smart grid, as this facilitates mainstreaming and allows for the most immediate policy adaptations that the smart grid may require from the regulatory bodies as they are part of the partnership and implementation. Additionally, government involvement will facilitate funding, transparency, and have greater agency to promote and solicit public support.

**3)** We recommend that from step one a legal team compliments and accompanies the technological and private/public teams that work on the smart grid project concerned. A specifically assigned legal team would be the most qualified to bridge the gap between existing legal frameworks and those that must be created a fresh.

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<sup>15</sup> Please look at appendix 4 for an example of such a promotional item we specifically designed for this paper and for the smart grid.

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## Appendix 1: Some ideas on urbanisation theory related to the Smart grid

In 1900 only 13% of the global population was living in cities. This is predicted to increase to 70% of the population by 2050 as a result of ever increasing movements to the city. There are two main reasons for urbanization, 1) population growth and lack of resources in rural areas is pushing people towards the city, and 2) standard of living is presumed to be better in the city, including health services, job opportunities and education. This causes a need to restructure or re-imagine our inhabited urban landscapes in such a way so that this growing community is supplied for adequately and sustainably. (IBM, 2009) In an attempt to understand the social movements that cause migration to urban areas and how this impacts the structure of the city itself, a school of literature to engage with urbanisation was born. Urbanisation theory therefore mediates an understanding of urban trends, and tries to resolve those demands that accompany urbanization. The smart city is one of these solutions, of which the smart grid is a crucial component to safe guard the energy needs of a growing community whilst being environmentally sustainable.

Analyses of urban developments have identified some very interesting and potentially troublesome patterns. Graham in *Introduction: Cities and Infrastructure Networks* argues that the infrastructure development within cities are inevitably never uncontested or isolated in impact; they will always reflect geographies of either constraint or enablement, and will give more power to one over another. (Graham, 2000) Similar to the socially undermining energy provision in Sweden where utilities selectively choose those consumers with the highest potential for profit (Summerton, 2002), urban network provisions “are carefully configured for selected powerful spaces and users whilst bypassing less profitable locations and users.” (Graham, 2000, p.118)

Urbanisation theory considers the unbundling of provisional utilities and the preference of certain spaces and demographic groups over others. (Graham, 2000) The research so far does not expose the smart grid to be guilty of this in a significant way. In the way that it does benefit one group over another, is in a rather positive sense; namely that those that respond to price signals are rewarded accordingly. Yet this is not what Graham is referring to. What is more accurately to the point he raises, is the fact that the opportunity to partake in the smart grid tends to offer itself only to existing customers of the energy provider. This would exclude those supplied by others and create a divide of sorts. At the moment this is no call yet for great concern, since the financial advantages and quality of service provision have not yet proven themselves to be quantitatively better than the common grid. Nonetheless, qualitatively speaking, the fact that smart meter owners have a greater oversight of their energy use, does allow them greater control which is always a benefit, and might be lamented by those that were not invited to join the smart grid project in question.

Since urbanization theory also draws upon socio-technical observations, we would like to re-iterate that not all societal member’s demands or interests can be attended to equally. (see Summerton *The New Energy Divide*, 2002 This point is stated in order to stress the importance of good urban (alluding to corporate and national for that matter) governance in those specific instances where not all stakeholders and societal members are or can be heard. It underlines the importance of prudent regulatory systems that should consider the pillars of sustainability and the importance of acting efficiently towards consensus objectives.

## Appendix 2: Exploring privatization and regulation a little further

Initially we had envisioned to discuss the smart grid in relation to privatization trends and look at it through all the implications and conceptualizations related to privatization frameworks. This would have been interesting since private companies are those most actively and frequently, on a day-to-day basis, implementing the actual infrastructure and engaging the various partners and stakeholders needed for the smart grid. Yet after gaining a better understanding of the smart grid itself through an analysis of the respective historical backgrounds of MeRegio and Boulder, it became apparent that although privatization is a pertinent angle to approach smart grids from, it is in no way the decisive factor for the smart grid implementation's success or failure. Almost obviously, it appears, it would be the greater encompassing regulatory frameworks that have the ability to guide the implementation of smart grids, and which give directive through immediate or trickle down communications/regulation to the various national industrial sectors. Privatization in that context is only one of many regulatory outcomes. Nonetheless, as privatized companies are those introducing and experimenting with smart grids (in all the smart grids that we have read and heard about), this particular regulatory outcome should be highlighted.

Regardless of whether regulation is reactionary or not, the regulatory frameworks that now host our smart grids experienced vast liberalization to stimulate competition and innovation within the last 20 years. Basically, government regulation must be tightened whilst at the same time those same markets under vigilance are being opened up and partially relinquished. This seems to be quite a contradiction in intent, whilst in practise it is a very urgent necessity and should and does effectively co-exist.

In case that the grounds for privatization remain unclear, or for those in favour of publicly or state owned utilities and provision, the following two paragraphs will attempt to legitimize or at least explain the benefits of privatization. In many ways it was almost inevitable that governments would encourage privatization, simply because the existing model of state-owned utility was neither meeting the competitive standards desirable, nor the demands of the consumer market in both price and service quality. (Montstadt, 2007) Montstadt exemplifies the case of Germany, where due to the severe fiscal crisis of all the Bundeslaender (states), energy policy was increasingly more dependent upon private capital, leading to the eventual recognition, that the entire ordeal of utility provision would be financially more sustainable and qualitatively enhanced through the competitive forces of a non-state-owned and freer model.

Another potential or additional cause for privatization is "that people began to conclude that government had simply gotten too big, bureaucratic, and inefficient." (Poole, 1988) The regulatory system was failing, so decentralization of responsibilities ensued. It would be interesting to ask how Poole views the root causes of privatization now more than 20 years later. And generally, it is valid to be conscious of the sourced data's time frame, location, and historical setting as these are all significant influences upon how one sees and explains the world surrounding you.

The importance of exploring these causes and dimensions of regulation, and particularly the rise of privatized markets, is that smart grids wish to be mainstreamed. Sharing best practices and lessons learned, as related in the green niche section previously, is one of the best ways to achieve coherency and improvements of the technology of the smart grid. Yet by definition "private" companies pursue private objectives. On the one hand, this competitive and profit driven element has stabilized and enhanced national utility provisions (Montstadt, 2007) and can therefore not be criticized too harshly, yet on the other hand it often creates problems of transparency and lack of social consideration. This is exactly where CSR principles come in handy,

and where hopefully one can identify the causal chain reaction which we have tried to reconstruct in this conceptual framework of regulation: i.e. national regulation enabled liberalization, leading to privatization, resulting in commercialization and capitalization, which in turn formulated the concept of CSR. Within all of this, the smart grid is embedded, needy of CSR consideration and a regulatory framework that considers its prerequisites as well as successive requirements for mainstreaming and management.

Summerton makes a compelling case for the detrimental effects upon inactive consumers in her analysis of energy pricing and provision in Norway of 1998. It is not the inactive consumer that is criticized here, but rather the utilities that facilitate and take advantage of the inactive consumer. This is something that is not all too surprising in a liberalized market. Summerton identified a demographic trend amongst the more active players in the consumptive market. Regretfully those in the lower income classes and of lesser education from her research were those that simply did not have the time to exercise or adequate understanding of utility provision to be aware of the leverage they had regarding their energy supply and pricing. (Summerton, 2002)

### Appendix 3: The interview questions

*(Personal Stake/interest of the interviewee in their smartgrid)*

- Why is the smart grid important?
- What is your companies/institutes contribution to the project?.
  - What is your stake in the project?
- What **part** of your company is involved with the project ?.
  - How much of your companies resources are dedicated to this p/s?
  - What other activities do you have?
- **How** did your company get involved with the project?
  - Were you asked to take part, or did you apply?
- With an **unlimited budget** what would you do differently?
- What does the smart grid mean for your company?
- What **changes** strike you the most for Freiamt and Göppingen?
  - For the country?

*(Governmental or policy/organisational frameworks related to the smartgrid)*

- External: Are feed-in tariffs being considered?
- Does your company, or this part of the project, benefit from any **government support**?
  - Either regionally, or on a national level?
  - Which ones are constraining? Which are enabling you in your smart grid efforts ?
- What **WOULD** you like to see being introduced; what policy reforms would aid you?
  
- Do you know whether consumers are able to sell back to the grid ?
- How is the **data** that you collect handled; the impact/success and effectiveness/efficiency results?
  - with whom is it shared ?

*(Marketpresence)*

- Is there any discussion about **de-centralizing** and/or opportunities for small energy providers to get into the game?
- What are the major constraints the SG project is facing now?
- What technologies does your product improve or replace ?

*(suppliers ONLY RELEVANT FOR THE COORDINATING PARTNER, EnBw for MeRegio)*

- How did you select the partners for your current smartgrid project?
- Did you have previous partnerships with any of the other partner-companies or other stakeholder-groups?

*(The engagement with the smart grid users and stakeholders)*

- Who are your **stakeholders** in this project?
- What are/were the **selection** criteria for the pilot homes ?
- Are there financial **benefits** to the families/individuals selected for the smartgrid project ? (short/long term)
- What has your interaction been with the various stakeholders so far?  
-easy, hard.
- What reaction have you been seeing from the Freiamt and Göppingen/Boulder residents?
- Have you had any reactions from non- Freiamt and Göppingen/Boulder residents?
- Have you come up against any groups that are providing resistance?

*(Learning process)*

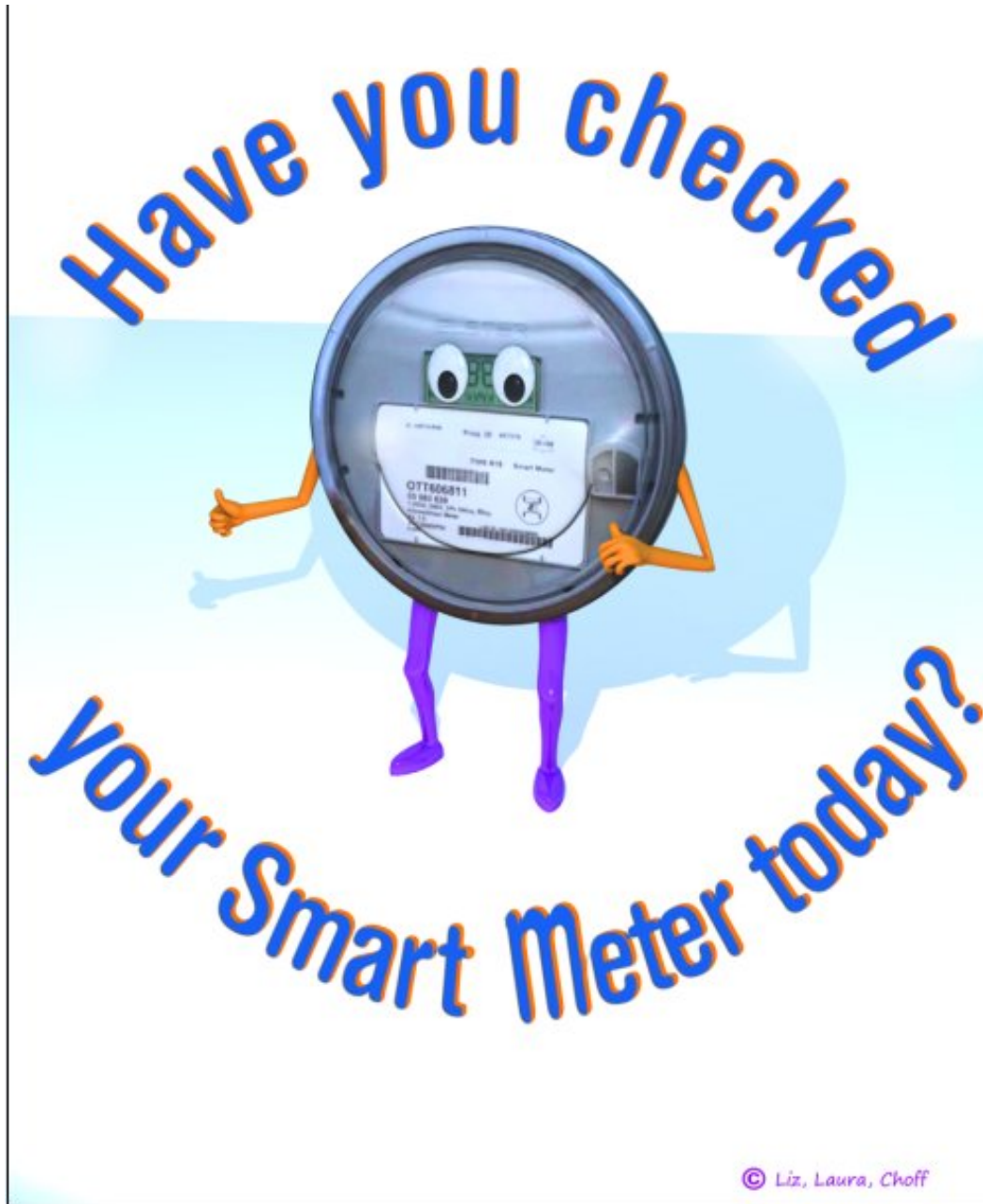
- What **setbacks** have you experienced?
- To what extent is information and **BEST PRACTICES**, and project results shared?
  - with whom ?

*(CSR and SD)*

- Internal-How does your company view the subject of **CSR (Soziale Verantwortung der Unternehmen)** ? Are there any policies?
- How do you view the smart grid Project?
- Has the SG project lead to any other sustainability initiatives in Freiamt and Göppingen?
  - **Or in your company ?**
  - Are there any positive changes besides improved electricity service?
- What are your companies **aspirations**?
  - Have you considered the long term integration of the smartgrid/ or **your specific service- into the mainstream?**
- In your view, is this project a good thing?
  - What do you wish to learn or gain through this project ?
- MeRegio: What happens **after the 4 year project** ?
  - What is the longer term objective of your product/service contribution to the MeRegio project?
- How does your company view their relationship with its community?
  - Its employees?
  - The environment?

**\*\*\*\*Interviews were of a formal or informal structure. They often resulted in a dialogue, where questions mentioned above were not directly addressed but questions and issues were raised beyond these pre-structured ones.**

#### Appendix 4: Promotion example



This is a cartoon of a smart meter that invites you to engage with him/her. We believe this anthropomorphism ameliorates the unfamiliarity of the new technology the smart grid's smart meter presents. Something like this can be used for posters or printed on T-shirts and circulated in society/ the smart grid community. A more aesthetically engaging promotion could appeal to the consumer and bring greater conscientiousness for the smart meter/grid in general.