ELECTRICA'S AMI STRATEGY UPDATES

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ABSTRACT

Electrica's approach from AMI[1] perspective to EU[2] political goal of 20/20/20 is defined after the analysis of factors influencing major investments. Step by step analysis of AMR[3]/AMI applications context is described followed by a presentation of influence factors and risks.

INTRODUCTION

From ancient times, strategy is a military concept that deals with planning of the actions and resources in order to reach previously defined goal [1,2,3]. When it comes to strategy in economy, there are multiple approaches [4]:

- Planning activity as being a guide for a particular course of action; this view, pioneered by George Steiner, is one of the oldest and most common descriptions of strategy [5];
- Strategy as a Pattern can only be understood in retrospect through an analysis of the patterns of past decisions and actions; this view is reflected in much of Mintzberg's other work [6];
- Strategy as Position is seen in the works of Michael Porter and defines the role of the decision maker in analyzing and adjusting to the competitive environment [7];
- Peter Drucker defines strategy as perspective over the system of values and beliefs of the organization [8];
- Strategy as a Ploy give a behavioural perspective; this view can be found in the works of Thomas Schelling [9].

As could be seen in Fig.1, the last decade determined changes in power systems that are more profound than typical innovations in the last half century. Yellow areas are describing developing elements that are expected to impact the power industry, while the red areas are the impacted value chain zones. The distributed resources and storage devices affects system management and effectiveness being one of the key debates nowadays. More or less, most of the concepts involved go under the Smart Grids (SG) cover that is willing to define the way power system is evolving.

AMI is one of the important components of the SG. It refers to systems that measure, collect and analyse energy usage. AMI is based on an infrastructure that includes hardware, software, communications, consumer energy displays and controllers, customer associated systems, Meter Data Management (MDM) software, supplier and network distribution business systems. Despite the efforts to define standards for AMI systems and their components, the subject is still under investigation.

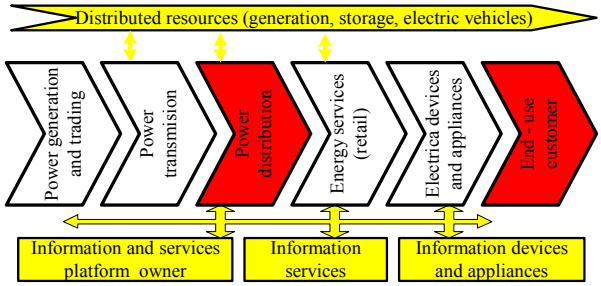

Figure 1 expected value chain changes

In Romania, one of the direct drivers to accelerate AMI implementation was the full market opening in 2007. First consequence was that balancing of the loads that are not hourly metered raises new risks for distributors and suppliers. The balancing risks are not always transparently transferred to the client.

Since there are multiple influence factors besides balancing market consequences this paper is presenting a systematic analysis regarding AMI strategy based on external influence factors and internal capabilities. In the end a number of short term actions are presented.

AMI EXTERNAL INFLUENCE FACTORS

Competition is one of the drivers to improvement economic result in most domains. Power systems went into market development in early nineties. AMR is mandatory in energy markets. The Romanian electricity market that started in 2002 and gave a new perspective in this domain. One of the consequences of AMR deployment process is that the customers are getting more interested in load shaping as a way to reduce costs. Hour by hour price quotations encouraged eligible customers to develop internal energy management systems based on AMR/AMI technologies.

In Fig. 2, an overall image of the AMI drivers is presented. The analysis of the external relevant environment is based on factors in: social, technological, economical, ecological and political domain.

1 AMI stands for Advanced Metering Infrastructure
2 EU - European Union
3 AMR - automated meter reading

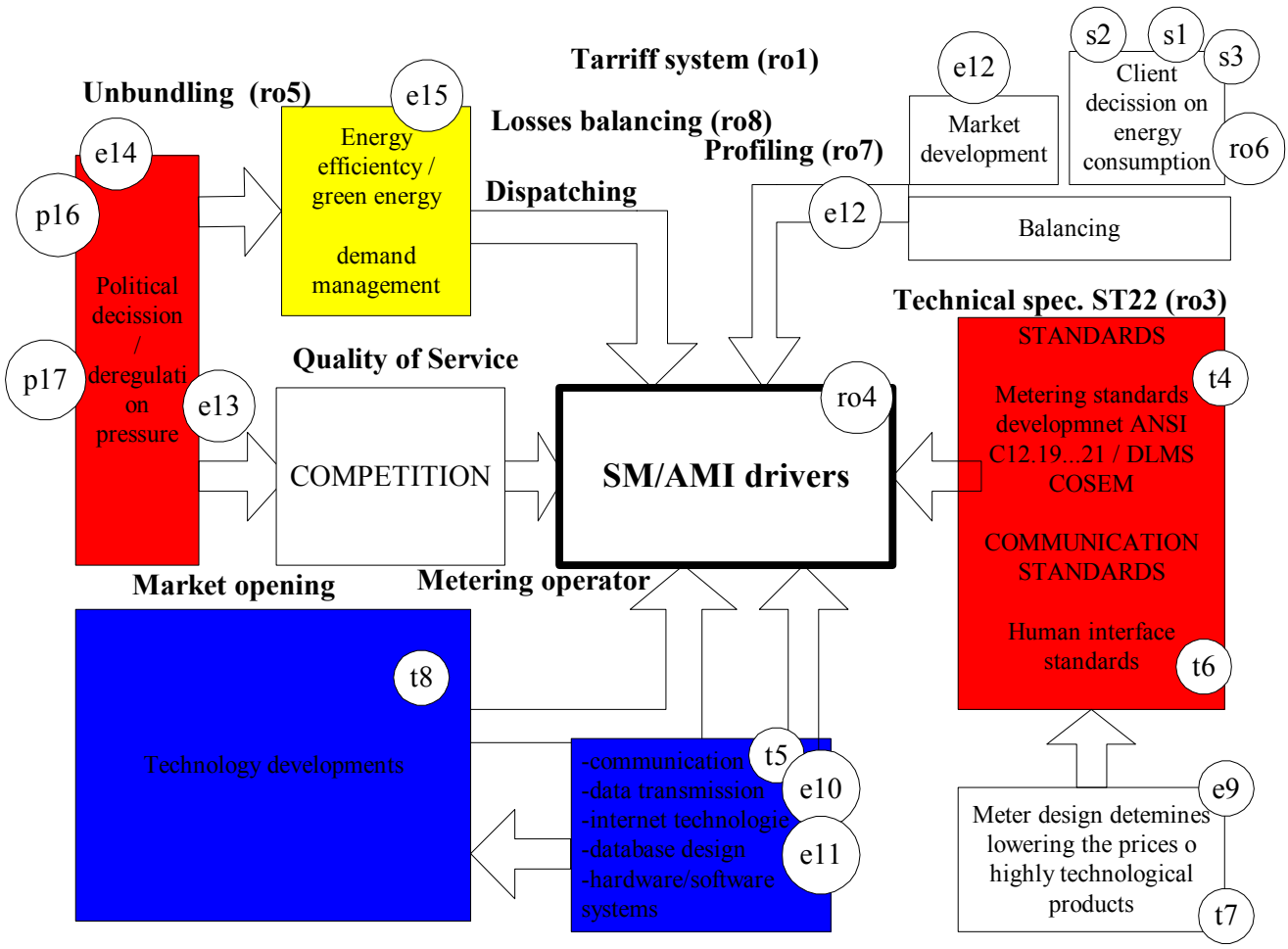

Figure 2 AMI external influence factors

Red areas in the figure are under discussion, yellow areas reflect subjects that already are testing some solutions and blue areas refer to stable development domains.

Social influences on AMI development

Energy consumption had always social impact. Nowadays, global warming makes energy management/energy efficiency one of the major battlefields in preventing climate change. We cannot improve what it is not measured, though SM[4] is an important component of the solution at this problem.

Energy price and tariff level are levers to influence customer behaviour, resulting in load shaping and consumption reduction/efficiency improvement (s1). The aim of such a campaign based on SM should be to develop the energy citizen abilities to most of the customers [10], [11].

Energy citizen is a Smart client that takes advantage of Smart meter in order to make smart decisions based on the consequences of his energy behaviour (s2). This kind of client is aware of its potential in solving problems related to energy and environment.

Reports [12] on customer behavior changes advance 10%-12% for effortless energy consumption reduction at client in the first month of experiment (s3).

Of course SM gets more effective in AMI context and influence factors presented (s1..s3) depends on objective social metrics going from effectiveness of redistributive policies to impact of social constructivism in particular case.

Technological AMI drivers

Based on the number of Conferences and offers on SM/AMI, we could estimate that it's not yet a well defined hardware/software platform (t4). But for sure SM/AMI it is based on stable and well developed technologies (t5).

At this moment, the main effort is taken in order to give a common standard to SM/AMI (t6). First initiative in giving a common standard regarding legal metrology aspects of SM was Metering Directive [13] MID (t7). This seems not enough to get SM to the fungible class of goods. That's why, actual efforts in standardization are focused on communication and AMR/AMI systems integration (t8).

Economics impacting AMI

It is obvious that during the last ten years the costs of

4 SM stands for Smart Metering

SM/AMI solutions dropped based on meter price reduction (e9) and communication costs reduction (e10); Maintenance costs per meter for application that go over the return limit limit are dropping also (e11);

Most important economical consequences are related to the new market mechanisms developed that are more and more difficult to take advantage of by using classical meters (e12).

Now it is not mandatory to use SM/AMI in order to go into the market but it won't take long till such a rule would become common sense. Overall image of economical drivers could be obtained looking at AMR/AMI map on Google. Italy, France and UK applications are among the important projects that could lead the way to a generalized SM/AMI approach at EU level (e13). Maybe one of the important drivers for such development is related to the average bill customer get.

Ecological influences

EU 20/20/20 initiative is a complex program that includes promoting renewable energies (e14). Since domestic applications are supposed to be one important component of this program, it is expected that SM/AMI development would give a good perspective on the impact of the initiative (e15).

Political

In order to speed up the process of standardization and deployment of SM/AMI there are two recent political updates. First would be a requirement [14] to CEN, CENELEC, and ETSI to give a time frame in order to define relevant standards for SM communication and integration to AMI (p16). The second would be to involve private company projects like Iberdrola's Open Meter [15] in a common EU initiative (p17).

Romanian specific impact factors:

- Definition of TOU[16] tariff system for domestic customer ;(ro1);mostly social and technological impact
- Metering code; (ro2) definetelly tecnological impact; good benefits from the standardizations
- ST22;(ro3) technological impact with economical consequences
- SM/AMI trial;(ro4) mainly economic consequences expected; it is aimed to have also environment impact by consumption parameters improvement
- Unbundling;(ro5) political measure determined by EU directive 54
- CuS procedure;(ro6) social impact
- Residual profile;(ro7) Simulated economic impact identifies uncertainties around
- 100000 euros per mont and license area
- Losses balancing;(ro8) economic impact

As could be seen in Fig. 2, all the influence factors identified were positioned relative to major drivers of the AMI.

AMI Internal Impact Analysis

First impact factor is the evolution of SM/AMI in Electrica over time. Table 1 shows the number of SM installed and integrated in AMI systems compared to other type of meters with respect of the total number of clients.

Table 1 SM/AMI evolution

		One phase meters			
Year	Clients	Classical	SMART	Stepper	AMI integrated
2003	8,000,000	386,702	29,676	38,538	470
2004	8,000,000	353,500	46,645	41,000	500
2005	8,000,000	300,718	60,807	67,880	1,000
2006	5,000,000	105,349	75,696	57,255	3,000
2007	5,000,000	247,216	62,430	62,130	6,500
2008	3,000,000	189,440	30,090	54,730	12,000
	total	1,582,925	305,344	321,533	23,470

It would be a fair estimation that at this moment Electrica has around 10% of the customers covered by SM and 1% integrated in AMI systems. Since 2008 most of AMI information is integrated in advanced billing systems.

Another internal impact factor is the losses balancing mechanism determined by unbundling. Impact of (ro5), (ro7) and (ro8) drivers could be estimated based on losses profile estimation. In order to do this, we considered three scenarios: losses are constant over time (a); losses are proportional to energy consumption (b); losses have two components – one depending on the energy consumption one depending on the voltage of the network (c).

Based on math done in [17] the differences on balancing market for June 2005 for one of our subsidiaries are:

- Scenario (a) compared to scenario (b) leads to the need to buy energy for 61013 Euro and sell for 7206 Euro;
- Scenario (a) compared to scenario (c) leads to the need to buy energy for 316000 Euro and sell for 44810 Euro;

Despite the high degree of uncertainty of the analysis it is obvious that for all eight license areas during twelve months the amount of money could be quite impressive.

AMI Dynamics - Apocalypse of the Two Elephants

Data gathered during the investigation is presented in Fig. 3 in the context of the apocalypse of the two elephant. That theory of David Clark estimates optimal bulk investment time frame.

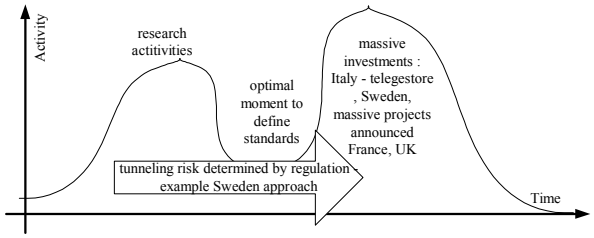

Figure 3 AMI dynamics

When AMI concept was launched, there was a burst of research activity in the form of discussions, papers, and meetings. After a while, corporations discover the subject,

and the billion-dollar wave of investment hits.
It is essential that the standards be written in the trough between the two ‘‘elephants.’’ If they are written too early, before the research is finished, the subject may still be poorly understood, which leads to bad standards.
If they are written too late, so many companies may have already made major investments in different ways of doing things that the standards are effectively ignored. If the interval between the two elephants is very short (because everyone is in a hurry to get started), the people developing the standards may get crushed. Detailed analysis of AMI development dynamics [18] reveals the importance of EU initiative [17] to mandate CEN, CENELEC and ETSI developing standards for SM/AMI integration.

ELECTRICA AMI STRATEGY ADJUSTMENTS

Linear extrapolation of the evolution of SM/AMI investments within Electrica presented in table 1 leads to hilarious results. Fifty years time frame for SM generalisation and five hundred years for AMI integration. Despite the fact we practically doubled the pace there is still a lot to work.
Based on the data gathered by now, we present in table 2 the short term actions to complete AMI strategy.

Table 2 action plan development

influence factor	Strong point	Weak point	Opportunity	Threat	action to be taken in order to adjust strategy
s1		x	X		(act1) define vision of smart client
s3	x		X		(act2)manage tariffs as influence factor
t6				X	(act3)stay informed
e13	x		X		(act4) to be developed into opportunity
p16				X	(act5) it's safer to be treated as a threat for the moment; Getting in touch with the client could reduce risks
ro5		x			(act6) could get into a strong point if activity based on service level agreement gets to a better process and quality

For the six actions resulted from analysis (act1…act6) the next step is to define clear objectives establish budget and name responsible within a defined time framework.

CONCLUSION

After AMI strategy influence factors analysis, eighteen general drivers were identified. One of the general conclusions is that we are in the need to change metering place from the position of being part of the support services chain, to part of value chain. Technological challenges coming from this are showed and preliminary impact of digital services is named. Based on the investigation, we could tell that:

- Promoting investments based only on financials is tricky in a fast changing environment;
- Despite the fact overall pressure on SM /AMI development increases, lack of standardization leads to uncertainties that are difficult to handle;

Coming from the analysis there are two proposals to smooth AMI path: (1)look at the meter as a hardware platform with intensive upstream and downstream communication capabilities; (2) use balancing market as reference to estimate effectiveness of AMI/SM investments in load shaping.
Based on flexible architecture the platform supports investment sharing between DSO, supplier and customer.

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