

Wheeling & Dealing – Scenarios for understanding the European energy future

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Abstract

The deregulation of energy industries in combination with internationalization and a changing Europe requires strategic efforts to be undertaken in a different way than earlier. Policy activities do not control this sector to the same extent as before – corporate strategies and activities have also become important to understand. During 2002 the Royal Swedish Academy of Engineering Sciences engaged more than one hundred experts from industry, government and academia to analyze energy within the project “Energy Foresight – Sweden in Europe”. One part of the project, the structure foresight panel, sketched out four different scenarios that each describes a possible European setting for the energy industries - meaning: corporate action was in the center. In this article the aim is to evaluate the result from that scenario project in hindsight and to compare it with other similar scenario projects in this field.

Key words: Energy foresight, scenarios, company strategy.

I. INTRODUCTION - THE STAGING

This article is based on our participation¹ in the “Energy Foresight - Sweden in Europe” run during 2002 by the Royal Swedish Academy of Engineering Sciences (IVA). The article aims at evaluating the results of the project in hindsight and to compare it with other similar scenario projects in the fields of energy and energy policy in Europe.

IVA is an academy, neither political nor a lobbyist, containing experts from academia as well industry. The purpose of IVA is to promote technological and economical sciences and the development of business. As such IVA has a long tradition working with and influencing, Swedish policy decisions within the field of energy.² The purpose of the energy foresight was to create a foundation for a broad discussion regarding sustainable development of energy in Sweden. An important background to the project was the deregulation of energy markets in Europe, and the new conditions for Swedish energy actors in the larger European context.³

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¹ Fredrik Lagergren was project leader for the “Structural foresight panel”. Henrik Blomgren was a member of the steering committee.

² See for example [11] – [13].

³ For an introduction to the Swedish Energy system and its historical development see [1].

During 2002 more than a hundred individuals from both the private and public industry, and research, participated in four expert panels. This article is based on the result of the “Structural foresight panel”. The objective for this panel, consisting of experts with extensive experience from energy companies, finance, customers, research, government authorities and politics, was to understand how energy structures might change during the next 20 years.⁴

A. Method

The overall method for the project as a whole was similar to what is used in the international foresight-tradition.⁵ In this case combining deep analysis on certain issues - 13 reports were produced on subjects like “energy in buildings”, “economic incentives and taxes”, “technological breakthroughs” etc – using engineering and scientific experts to discuss, evaluate and present a comprehensive amount of material in a popular and up-to-date manner.

When it comes to the method used by the structural foresight panel it was influenced by the “soft”/qualitative scenario methodology developed by [2]. see [2]-[5].

One important aspect of doing scenario work with deep involvement of experts is that they are influenced by the process. [6], [7], and [8]. Scenario studies and similar approaches has also been criticized for use within corporations [9].

In an examination of the method by [10] three primary characteristics of the method is pointed out that makes the multiple scenario approach different in comparison to other strategy and planning methods: 1) the script or narrative approach, 2) uncertainty across rather than within models, 3) the decomposition of a complex future into discrete states.

It is important to notice that the method of multiple scenario foresights is neither about deciding nor about planning the future, it is about preparing for *possible* futures and understanding uncertainties.

Scenarios have been used in energy discussions for a very long time, e.g. [14],[15] and [16].

The qualitative character was also a result of an earlier decision that had methodological implications – the decision to use expert panels. Expert panels can give opinions and

⁴ The complete result of the project is available as download files at www.iva.se/energiframsyn/.

⁵ The Institute for Prospective Technological studies (IPTS), a part of the EU administration, is a centre for this tradition. The IPTS Report is monthly publishing i e methodological issues. It can be reached at www.jrc.es/iptsreport

judgments on aspects that are too complex to be modeled or analysed using quantitative measures, e.g. the complex interaction between regulator and market actors, the impact of new technologies on business behavior etc.

The result of the structural panel was four conceivable future scenarios given names associated with historic episodes (see figure below). In this article we will shortly describe these scenarios and discuss their implications for companies working in the energy sector today.

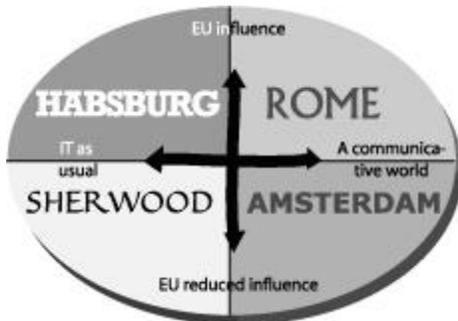


Fig. 1, The four scenarios are based on two dimensions: the influence of IT development and the influence of the European development.

The scenarios are derived from the combination of two fundamental uncertainties: the development of Europe and the EU, and in the ways the evolution of new communications structures may affect society. Will European social orders be super-ordinate? Or will it prove that other already existing social orders have greater strength and longevity? The difference between these possible development paths yields one of the scenario dimensions.

The other dimension is created by the innate difference between a society reshaped by all of the new communication possibilities, and a society, which has used these possibilities to consolidate and confirm its current structure. The recent years have shown a substantive wave of investments in infrastructure for communication and computerisation within all aspects of society, the width and impact of the outcome in business and society that will follow partly remains to be seen.

The panel decided to study three types of structures; the institutional, the industrial and the technological structures. The panel also discussed the way they interact and how this will form the future energy system. The scenario descriptions are mainly presented using these structures.

B. *Conflicting interests*

Early on in the project, it was pointed out that most scenario reports on energy systems tend to centre on three things: security of supply, competitiveness (i.e. energy price), and environment. Their main focus varies but the three variables are the same, which is evident when looking at different, national as well as international, projects on energy. [17] – [19]. It is also easy to agree that these three are important, and difficult, issues to handle. But if this is the case, how can we complement the existing studies and, perhaps, discover the unexpected?

One reason for the earlier focus is that it is a policy perspective on energy. Governments have devoted large efforts to “plan”, to regulate, and to operate the energy system.

New circumstances have evolved since these earlier efforts: governmental planning and politics no longer dominate energy; the energy business has received a new, larger role through the deregulating processes. This new situation requires new ways of discussing energy.

The structural panel took a different approach choosing to discuss energy as a national interest, an industrial enterprise and as a technological system. Early on in the project the panel made the observation/assumption that the potential changes of the technical structures within the twenty year time-frame were limited, but the potential changes within the social structures, - society and industry – were large. Although the technical large structures remain the same there are exemptions. The massive investments in IT-infrastructures, broadband communications, Internet technology and wireless communications networks may have an impact on how the technical structures of the energy system are utilised. But the uncertainty of this impact is large, and therefore it serves as a basis for one of the dimensions of the scenario structure.

II. THE CAST -WHO ARE THE ACTORS?

The Swedish energy system was for a long time, (as in many other countries), a fairly closed system with few actors. The internal bonds were tighter than the bonds to the external environment. One can claim that one of the actors was particularly important, - the government, which planned, regulated, owned and operated large parts of the energy system.

The government is still an important actor but several new institutions have emerged due to deregulation. On one hand there are government organisations; The Energy Authority (Energimyndigheten), The National Grid Authority (Svenska Kraftnät) and The Swedish Competition Authority (Konkurrensverket). On the other hand, new actors, i.e. international players, establishing in Sweden or companies that recently did not consider energy companies as competitors but now do (and vice versa), have emerged. In the case of Sweden, companies like EON (Ger), Fortum (Fi) and Statkraft (No), are now players in the Swedish energy system.

On top of that we might add new authorities, several of them popularly summoned as EU, institutions like Nordpool, the electric power exchange, and financial actors. These new actors will also influence the future energy system.

III. THE PLAY

The scenario play revolves around the key question. – How can “energy swedish energy interests influence the development of the European energy system?”

This question was (and still is) relevant for a wide range of energy related actors in Europe, and not only in Sweden. The answer to this question lies in the four different scenarios. If

one wants to influence the development of the European energy system, different strategies must be taken depending on the development.

To simplify the description of our scenarios we will elaborate with a fictitious corporation, “Noren”.⁶ Noren was established at the same time as electrical power was introduced. After that Noren entered an extensive expansion period, when power supply and production capacity issues dominated. For a long period the company was anonymous and quite often also perceived as a government authority.

At the end of the 20th century Noren had a dominant position in the home market, where there were few significant competitors. But then, the owners, with the government at the helm, came to the conclusion that the nation’s power supply was functioning adequately. The earlier objectives of “society-development” changed and the market was deregulated.

Noren had been organised according to the geographical location of the operations, now an organisation following the “value chain principle” was introduced. The vision of Noren when we enter the scenarios is to be a leading actor in the future European energy market.

A. Habsburg

The upper left corner of our scenario matrix combines the driving forces “The EU develops strongly” and “IT as usual.” Habsburg is characterised by a strongly coherent EU, but the increased use of IT has not lead to any revolutionizing changes in the organisation of society or in industry. The successful energy actors in this scenario will let the driving forces holding the energy chain together influence the business development. The companies that benefit from the new possibilities are those with capital resources at a low cost, competence, and ability. The large companies grow larger and the smaller ones are acquired by the large or allying with larger actors.

This is the beginning of an oligopoly market situation which can be characterised by the actors constantly mapping and monitoring each other, always prepared to a rapid response to sudden changes. All changes on an industry level appear either very slow or fast. When new products or changes in business operations are established, other players immediately react with similar changes, not to lose market shares.

1) How did we get to Habsburg?

New countries entered into the EU and the established European cooperation ultimately lead to consolidation. The result was a Europe where many decisions and protocol issues are discussed interminably. There is an unexpressed will for keeping a steady state situation in competition, power balance, and regulation, a built-in fear of change. However, it is a highly democratic situation. Publicly elected assemblies at all levels engage the many issues through elaborate decision-making processes.

2) An endless Europe with governments and capital in sweet harmony

European citizens have begun to accept the thought of being Europeans, instead of French, German etc. This world does not lack its crises though. The societal problems are formed “from above” by the “elites”, which sometimes brings large problems when the necessary measures are to be firmly established throughout the European population. One example is the threat of global warming.

Politicians can use taxes to influence societal development. The negotiation game within the EU has resulted in a convergence of the regulations (including taxes), which are basically harmonised.

The market for capital is large and stable which results in low cost of capital for investors. This in turn reduces the pressure for rationalization within the companies and increases the size of the investments made.

Integrated value chains are traditionally common throughout corporate Europe. There is no driving force to divide them either. Thanks to the large European home market the companies are able to grow to massive proportions, and powerful “industry houses” control large parts of the European economy. Most of these have a national heritage and a remaining national base.

When more substantial investments are necessary, it is common that alliances emerge, including industry and governmental or European authorities. These players are characterised by a mutual long-term industrial interest. This has enabled the energy industry to make very large investments in new gas pipelines, nuclear power plants, research facilities and other large-scale technologies.

Older power plants are becoming increasingly easy to integrate into the European system. The coordination becomes a sort of internal company operation. However, the manifold parliamentary structure and the elaborate decision-making process can make it cumbersome for a company to get a permission to build a new plant. Intense lobbying is often required to realise such investments. The corporations then prefer to let the EU – or in some cases a national authority – pay for the construction.

3) NOREN in Habsburg

“We are among the leading energy companies in Europe”, the CEO commenced at the press meeting. “Our strategy has succeeded. By retaining the company’s different parts during the acquisition period we have grown to a giant. This is what we look like today:

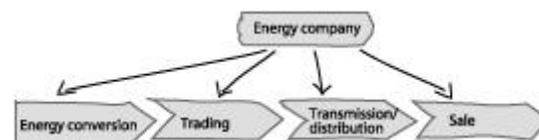


Fig.2, Structure of the (fictive) illustration company Noren, according to Habsburg scenario, a mega company with an integrated value-chain structure consisting of energy conversion, trading, transmission/distribution and sales.

⁶ Noren can be understood as an abbreviation of “NORDic ENergy”.

“The main focus of our operations today is the operation, maintenance, and management of the existing plants. A few decades ago we had a situation where plant investments equalled replacement investments, and primarily in plants with lower capital ratios and higher cost of production. This was the case since the electricity prices fluctuated greatly. Today’s situation is much more stable, which lead us to look at bigger plants with higher capital ratios.”

“Trading plays an important part when compensating for irregularities in electricity and gas use over time, as well as for dealing with the financial risks. Thanks to our size we can deal with these risks much more efficiently than the smaller players.”

“Our transmission and distribution operations are profitable today, but the new EU efforts on trans-European power grids could influence us negatively. Price pressure in the market could be reinforced by the new grids. We question all political interventions.”

“Our sales organisation is small and efficient. For a long time now, electricity has been a standardised bulk product, such as milk or paper pulp. Our difficulty is mainly to make predictions on future demand. Misjudgements and mistakes will quickly lead to lost market shares.”

It should be possible to, sort of, embed our energy products within some type of service for which we can charge a premium...”

B. Amsterdam

The lower right quadrant of the scenariomatrix combines the driving forces “The importance of the EU decreases” and “IT-reshaped society.” If both of these dominate the development, the whole idea of a European Union might become obsolete even before it has been fully shaped. In this scenario the European energy markets do not have a uniform structure. There are different market forms in different regions depending on how far deregulation has come.

1) How did we get to Amsterdam?

After the recession of the early 21st century the IT development gained new momentum. The idea of a “new economy” proved to be more than a fad, and it was realised since different kinds of transactions could take place through new channels. New services and applications were developed which subsequently changed society. The EU administration was “left behind” and “Free trade” was as difficult to tax as it was to regulate or control.

2) Turbo-speed development with multilocal coordination ability

A lot of people consider themselves as world citizens and prefer to be identified as supporters of certain global trends or movements, rather than just citizens of a country.

The urban regions’ international networks are vast. Most countries can be described as twofold, cities and rural landscapes. The citizens have more in common with citizens

in other countries than with the people of the rural areas surrounding the city.

There are no major ambitions to standardise tax regulations. Rather, politicians attempt to create rule criteria that, to the greatest extent, benefit the domestic industry. Large efforts are put into examining other countries’ policy changes in order to make the necessary adjustments at home beforehand.

Due to IT there are great possibilities to coordinate worldwide industrial activities. Functionally divided value chains have thus been established, where the different specialised tasks are handled at the location that has the right competence or the lowest cost. The value chains are organised into networks.

The open capital markets have assured the abundance of “international” capital. Investments are made anywhere in the world depending on where the best yield is to be found. The dominating investment funds have a minimal long-term industrial ownership idea.

The fast moving technological development has resulted in an extensive IT implementation within almost all of the technical areas. This means that different communication networks connect many types of machinery, devices, and everyday gadgets. The “window of opportunity”, or the time and volume required to profitably enable a new technology, is steadily growing smaller.

Different countries use different sources of energy. First and foremost they leverage upon what was already available. There is a genuine interest in new sources of energy, since they can become alternatives to the established technologies – and the established companies.

There are international connections between the energy systems of Europe, but there are also small-scale ventures. The need for a national backup capacity has thus increased, since it is dangerous to take for granted that there is sufficient capacity in nearby regions. The introduction of more elaborate control systems has increased the efficiency in many older plants and also made it possible to run the plants with tighter margins.

3) NOREN in Amsterdam

The “infomanager” magically focused a slide on the wall reading “Noren – a multilocal corporation.”

“ We have come to the conclusion that two Noren units are central, the physical networks and the commercial networks. They act as nodes in networks with a wide scope of business operations. Actually, our company is much bigger than it appears:

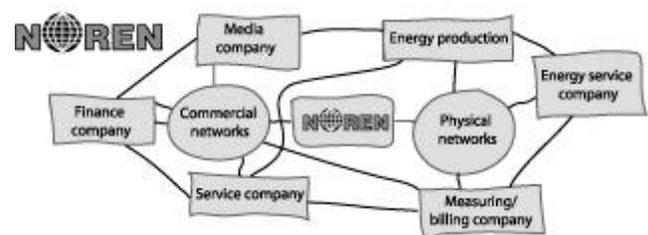


Fig. 3, Noren is in the Amsterdam scenario a network of activities that are connected through several different

channels. Noren controls two nodes in this structure, the commercial network and the physical network.

The fastest growing part of the electricity business is power consumption in office companies and other urban European property companies, but where new power suppliers have suddenly emerged. The gas-generated and integrated power-heating-refrigeration modules installed in larger office buildings, account for an increasing market share. Property service companies have in several cases outmanoeuvred us, since they have a legacy of handling the buildings' heating and energy issues.

Today, the competition is fierce between the electricity network industry and the telecommunications industry. As a matter of fact, our access networks compete directly with the traditional telecom companies. Therefore it is of utmost importance that we try to run the services through our own channels, for example by brand building. Complete customer geared service kits could be one solution, but we need to find more fast..."

C. Rome

The upper right quadrant of the scenario matrix combines the driving forces "The EU develops strongly", and "An online world." The historical Rome had standardised measurements and weights, a common legislation, and a common market. The empire was in many ways an early EU but with a smaller central administration and a considerable delegation of power to the provincial governors. There is now a similar arena for all companies throughout Europe. This scenario will extract parts of the companies' operations and put them back again in new ways.

1) How did we get to Rome?

In the aftermath of the early recession of the 21st century, it became clear that competition had diminished severely in many European regions. European standards and a clear standpoint that a national distinction must be subordinate to the common, European, good were implemented by the EU coordination organisation. The transformation to European comprehensive solutions was allowed without any major resistance.

2) The United States of Europe

The European Union can be characterised by "European pragmatism", to reach whatever is best for its citizens. The high level of interaction between individuals, businesses, and countries that have followed in the wake of the IT ventures, has basically made national borders an historic issue and is something which in reality can not influence development.

In the global society of which Europe is a part, it is the cities, and the networks between them, that are most important. Several nodes in such networks exist in Europe: the Paris-London-Frankfurt triangle is a financial network node; the Cambridge/Oxford-Leiden-Budapest connects research nodes into a network of knowledge.

The EU has taken the grass-root perspective seriously and has understood how to make best use of the innate force of such movements. One widespread organisation, Make Your EU Voice Heard (MYEUVH), follows up and examines new issues.

Taxation has also changed. Individuals and companies can be taxed in several countries where after the tax revenues are cleared between countries using a common standard. Compared with today, an individual will pay a larger share of his or her tax for consumption of goods and services, as well as for the use of common social benefits. Companies pay tax according to their production requirements and also for the effects they have on the surroundings and environment.

The large capital volume is global, easily moved, and continuously searching for markets that promise better yields. However, this results in harsher competition for investment objects. The three basic conditions that need to be fulfilled in order to realise investments – yield, risk, and liquidity – are all fulfilled throughout the entire EU territory.

During the major part of the 20th century the price of energy often became a cornerstone in the countries' national strategies for economic growth, and thus the energy infrastructures became subject of public interest. As other issues became increasingly important for the economic development, the interest in energy infrastructure diminished.

Technological solutions which "short-circuit" one or several steps in the value chains are successful. New business concepts more often deal with new ways of using existing technological structures than with the introduction of new technology.

3) NOREN in Rome

"It has really gone well!" The chairman of Noren summarised its development into a major player in the European energy market. An entry into the stock market had made it possible for the prior owners to move capital to other prioritised operations, such as healthcare and education.

"Within the energy company we still have trading, sales, and of course the management functions holding the company together but the different parts of the company showed different yields for a period of years. We therefor sold our capital intensive plant assets, however with some strings attached pertaining to control, and could free capital for other investments. Furthermore, together with a few competitors we established a company that would manage the operations. This company is currently running both power and district heating plants. Following a fusion with a broad-spectrum European recruitment company, we also sold our remaining share in the operations company. Our solution can be summed up in one word: "outsourcing"

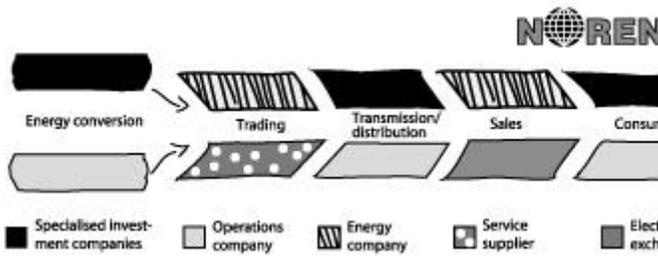


Fig. 4, Noren is in the Rome scenario consisting of two parts, the trading and the sales part. All other activities have been outsourced to specialized actors, e.g. specialized infrastructure investment funds, specialized operations companies etc.

“The trading means that operations are standardised to become possible to trade electronically. There are naturally limitations for this, but we have to be present here in order to retain our experience and competence. Different electronic trading houses offer platforms for various types of products and services. The platforms, invented by one of the founders, are based on different principles of standardisation or packaging. We have to be on the front-line when it comes to new product concepts.”

“The old “smart homes” attempts have been brushed off, touched up, and spread. The most important change for us has been that the application creation itself, i.e. the local energy flow adaptation, has been professionalized. This has subsequently led to a situation where our customers coordinate their energy purchases via brokers. We have had to change our way of selling to put more focus on professional high-volume energy buyers.”

“Our transmission operations have developed in a similar way as the energy production. Today, there is hardly any energy company which owns its network, and the network companies have subsequently begun to operate in other businesses with similar business logic's, such as telecommunication.”

D. Sherwood

The lower right corner of our scenario matrix combines the driving forces “The importance of the EU decreases” and “IT as usual.” In Nottingham there was law and order, but only as far as the sheriff’s power reached. Outside of this judicial district other power reside. The Sherwood scenario is characterised by a close to symbolical European Union, at the same time as the IT-development has not led to any significant structural changes in industry or society.

In Sherwood, the fundamental principle of the network-based energy companies is an entirely integrated value chain. This means that it is the profitability of the whole that is important, not of the parts. Since subsidies are frequently available it becomes a viable business to produce even without advantages of scale, c.f. Danish wind power today.

Infrastructure investment incentives decrease for large power networks, international power interconnectors, and Nordic power supply network coordination. The network structure is developed according to the German model – a

player wishing to sell electricity from Hamburg to a customer in Munich is forced to negotiate with 28 different network owners in order to deliver.

1) How did we get to Sherwood?

In connection with the EU expansion it became evident that there existed more or less hidden subsidies to the home country’s industry and that several of the “old” members did not want changes in the same way as they forced changes onto the new countries of the EU. An increasing number of countries pulled out of the joint ventures and focused on their domestic issues. However, it did not mean that the EU-idea was about to be abandoned. Brussels remained a European hub but with a quickly diminishing influence on the individual countries’ rules and regulations.

2) Structures in Sherwood

A period of “Europisation” has been replaced by growing regionalism and maybe even nationalism. Earlier experiments with an extensive European community deterred. The EU is good, but with limitations. The competition between the countries leads to attempts to use the taxes for competition purposes. By first implementing a tax system and then allowing exceptions, the advantages are partly hidden. The countries simply try to avoid a convergence of rules and regulations.

The energy markets are characterised by the international situation, which has led to a return to more nationally demarcated systems. There is however, some international trade, but it is mostly a pool trade open only to directly involved parties. In certain parts of the world the lion share of the energy markets are monopolised.

The industrial value chains are often nationally maintained since it is easier to administer business in an environment with local and national regulations. The difficulty to coordinate and control peripheral value chains has resulted in a return to a more close-knit and local business environment. Regional cooperation between industry and society is important.

New business concepts often stem from the use of national and local characteristics in the existing industry and regulatory system. Sometimes a business concept that was originally developed for a country or for a certain region proves to be applicable in most regions where there are similar rules. From here a successful export can emerge, but it is unusual.

Different countries use various types of energy carriers. Initially, the most common way is to leverage on what was already available. Some countries use both electricity and gas, others electricity only. The expected European integration came to a halt in this area as well. The scale of the new power plants differs with country. Some nations build smaller, complementing plants while others erect large plants in order to benefit the domestic industry.

Instead of investing in international coordination, money is put into the rebuilding of domestic capacities. This will create a situation where all countries make worst-case scenario calculations, which in turn leads to general overcapacity. This overcapacity is subsequently put out for sale to other

countries, which leads to an auction where the sellers underbid each other.

3) NOREN in Sherwood

“Our strategy from the turn of the century, where the value chain was the foundation, was only successful for ten years”, the regional manager of Noren’s middle district told the newly recruited assistant.

“During the early 10’s there were many signals indicating that something was wrong. A common issue was that the rules varied greatly in the different countries we operated in. To alleviate this we divided the company based on its geographical presence. We thought that this would solve the problems. Instead, we created international “matches” around investments and ventures, and the board then decided to focus on the Nordic home markets. Today we look like this:”



Fig.5, Noren in the Sherwood scenario maintain all operations within a single company structure. The most important difference is that there might be several local Noren companies with strong local ties.

“Today we try to work close to customers and society. An example is a new technical solution that coordinates surplus heat from a paper and pulp factory in Piteå (in northern Sweden) with the heating needs of the municipality of Piteå. An exchange of information between the customers and Noren makes it possible for each to optimise the production.”

“Our biggest problem child is the trading department. Sure, it has possibilities to benefit from the international differences in taxes and subsidies that have emerged, but yet doesn’t do much.”

The assistant asked:

“But what about the customers? What are their characteristics?”

“Our major customers are located in small energy-intensive cities, where we also have local offices. We also try to coordinate electricity and gasoline/oil sales with a gasoline chain. The Piteå model becomes a corporate model.”

“But don’t you use e-business and the Internet when selling to rural customers?”, the assistant asked.

“Yes but who needs a new billion-crown IT system to keep track of a hundred thousand customers plus a large pulp & paper factory? Today marketing is primarily done through local newspapers and joint advertising together with local traders. Advanced sales is done by offering the first customer in a new neighbourhood an entire installation for free, if the family agrees to be the hosts of an “energy Tupperware party.” We cooperate with other companies when it comes to allowing points on each other’s products. In this way we can optimise local trade.”

IV. LESSONS LEARNED

A. Actors and their activities

The capital market is important in all scenarios, but appear differently depending on the conditions of the scenarios. In the Habsburg and Rome scenarios it is large and quite stable, which results in lower cost of capital which favour larger investments and thus larger project sizes regarding transmission lines and generating capacity etc. The capital market in the Amsterdam scenario is even larger, but less dependent on European circumstances, the global development matters more. In the Sherwood case the capital market is mainly regional and national. This results in higher capital costs, but there are also “unconventional” measures available to handle these higher costs.

It is not only the size of the capital market that matters, political stability and regulations are at least as important. This is evident in the Sherwood case where the tight interaction between local municipalities authorities and industry can delimit the market risk from a potential investment thereby overcoming the higher cost of capital.

B. Illuminating Noren

It is not unrealistic to assume that structure follows strategy. Or maybe, if using the vocabulary of [20] it should be that company strategy defines company structure. The scenarios we have created illustrate developments in the society that influence company strategy. Needless to say, a general study like this can only bring up general aspects to the discussion.

Nevertheless, the different scenarios can be used to discuss future possible strategies for companies in the energy sector. Noren clearly illuminates questions like: Is it important to be a big or a small energy company? Is it important to keep the current parts of the energy company together, or can it be divided? And with what do energy companies actually compete?

Comparing the Habsburg versus the Sherwood scenarios, they have some characteristics in common with situations described i.e. by [21] who claim that the generic strategies for companies are cost leadership, differentiation and focus. Cost leadership means constantly working with productivity enhancing activities and offering similar products and services to all markets. Economics of scale are important. Could this be the Habsburg situation? Differentiation and focus however means serving specific parts of the market with products/services that in some way differ from the competitors. Here the battle is about economies of scope. Could this be the Sherwood situation? And if so; could Noren working according the Habsburg scenario give room for another Noren working according the Sherwood scenario? Are these two scenarios in that respect in symbiosis?

If we look at the Rome versus the Amsterdam scenarios, the actions of Noren have some characteristics in common with [22] who claims, specifically in contrast with [21], that the value-chain is not a powerful metaphor to help companies working in the knowledge and service based economy. Instead

he suggests strategic models based on resources and competence, well in line with i.e. [23] and [24]. A similar conclusion is reached by [25] who suggests that the electric utilities in the US should transform into “Value networks” instead of operating according to the “value chain”.

Would Noren working according to Rome or Amsterdam mean that the winning strategies are about how well different kinds of networks are maneuvered, not about focusing on scale or scope? Or could it be that Noren working according to the Amsterdam scenario needs, or creates, other Noren working according to Rome and vice versa?

To take it one step further, one may ask if Noren working according to the Amsterdam scenario utilise (and perhaps depends on) other Noren working according to the Sherwood scenario.

C. 5. What does the present tell us? - Reality versus Noren

When looking at the present energy industry one may ask whether there are companies, or other actors, working according to the scenarios presented. There are three archetypical industry strategies visible today, that might indicate strategic thoughts along similar lines as within our four scenarios: the multiutility-, the multiservice- and the specialisation strategy.

The multiutility strategy is chosen by companies such as Suez which provide many different infrastructure dependent utilities such as water, district cooling and also electricity (through its subsidiary Electrabel). Also other companies seem to go along this path by integrating electricity and gas, e.g. EON, or Vattenfall offering electricity, district heating and cooling.

A different strategic path was the multiservice path with the extreme position of Centrica (former part of British Gas), which offered a broad range of services beside electricity and gas. Electricité de France (EdF) has also chosen to move in this direction through the part-owned subsidiary Dalkia, which offer facility management services. Although EdF is still active in almost all other aspects of energy as well, so there is no clear strategic choice visible yet.

The third strategic development pattern is specialisation, which is most evident in the US where several Independent Power Producers, IPPs, are specialising in electricity production through certain types of technologies, e.g. specialised on nuclear power or gas turbine technologies. This development has not yet been present to any extent in Europe.

The question is in which of our four scenarios does each of the three strategies fit best? The specialisation strategy is visible both in the Rome and the Amsterdam scenario, because of the transparency of the companies. There is no need to hold different activities together within the same company if the same service can be bought on a market.

But does the multiutility strategy fit with the Habsburg scenario? Does the multiservice strategy fit with Sherwood?

a) The questions can lead to the conclusion that some actors, already, are working as if some of the scenarios will come true, but the questions can also lead to the conclusion that some actors believe in other scenarios. No matter which

we believe that this kind of exercise can be fruitful and vitalize the discussion of the European energy future.

D. Understanding policy?

During the 1990's several areas in society were deregulated in Sweden. In many instances it has been impossible to even guess what the consequences would be. In the previous reality, when the Swedish government exerted a more direct influence, mainly through “Statens Vattenfallsverk” (which today is Vattenfall Ltd.), it was probably easier to estimate consequences of different measures since they emerged internally, within the own organisation. Today, the direct governmental influence has decreased through incorporation and deregulation. As a result new government agencies and authorities have been formed. Their purpose is to follow the development in order to regulate and adjust the institutional framework.

The government and the municipalities have other means to influence the development, i.e. by adjusting the requirements on yield on publicly owned energy companies. If the requirements on dividends decrease, a greater part of the internally generated means can be invested. This is sometimes voiced as a reason for the acquisitions of other energy companies during the last years, with fingers pointing at the publicly owned companies such as Vattenfall and EdF. [26]

The government has also been forced to alter its role from directly pushing through decisions, to indirectly influence through incentives, taxes, and research and development. It is reasonable to believe that increased European coordination will force the energy field to harmonise similarly to what has happened on other trade. This will further limit the national government's toolbox when it comes to influencing the development. Instead new tools such as trying to reach changes within the EU will create conducive conditions for operations in line with the governments' original intentions. However, in reality it could be difficult to practice such indirect influence.

An important factor affecting the development of the energy industry is whether or not the current trend of increasing deregulation and more widespread market solutions will be allowed to continue. A possible obstacle might appear if supply reliability becomes so important that it will require governmental or maybe even supranational intervention. The case of California leads us in that direction. This can be achieved through some sort of regulation, even though the same issues could be solved by agreements or by political intervention in other arenas. Such a regulation could, in turn, influence the energy industry's structures by, for example, the prevention or the obstruction of new and emerging players.

As shown here it is important for the companies to understand how politics might act if oneself wants to act. The question is only how that knowledge can be developed without studying the whole field of political science. [37] suggests that a starting point is to analyze interests, i.e. interests coming from external factors like public interest groups, result of elections etc and internal factors like task oriented interests, personal ambitions/opinions etc. After that he suggests a

power analysis since he considers power as the medium through which conflicts of interests are ultimately solved.

The suggestion of [21] might seem to be a fairly simple suggestion, but still probably valuable. In the context on the dramatic changes of the structure of the energy sector during the last years, in many ways we can even see it as dramatic as the "creative destruction" described by [27], we have a total new map of both actors and interests. Today's discussion on the future of the energy sector however often implicitly assume that analysts know the actors and their interests - and that the map looks the same as before. In contrast to that we claim that this is nothing to take for granted anymore.

One panellist once claimed that politics very seldom have one will. Political decisions, and actions, are nearly always compromises since they are part of democratic systems. Therefore one should not expect precision in political decisions. This might complement the learning points put forward by [21].

E. How about capital?

It is difficult to claim that capital, as such, has a will. However actors behind the capital, even though they often are described as actors reacting, rather than pro-acting, act in certain directions. And since several of our scenarios show the importance of capital, not at least in the scenarios of Habsburg and Rome, it is important to understand how capital works.

In theory, three essential components decide the cost of capital: risk-free interest rate, risk compensation, and liquidity reimbursements. [28] A driving force in the restructuring of the European energy market today, is the availability of inexpensive capital. "The one with the most (inexpensive) capital wins." Since the risk-free interest rate varies between countries, and as dividend requirements, risk and added liquidity differ between owners, corporations experience different growth possibilities.

In theory, the capital cost ought to be the same for all companies on the same market. However, in practice there are differences. Companies perceive capital expenditure differently, and it may also appear more or less visible to managers, e.g. it can be more or less explicit in the owners' directives. In some cases it is not perceived at all, which has resulted in different results to the calculations that evaluate purchases.

The electricity market is limited since elements of technological monopolies exist (for example, there are no parallel electricity supply networks). They are also limited because of no major increase in customer demand - so far. Therefore, the growth for a company must primarily come from purchasing market shares from other companies. This can also be done through own organic growth but also through acquisitions, acquiring another company with an existing customer base. Thus in a limited market, a company with greater availability of inexpensive capital will be more likely to grow, and since it is expensive to "lure over" customers through marketing, companies have focused mostly on customer base increase through purchases.

When compared with privately owned energy companies, the capital expenditure may often be perceived as substantially

lower for the municipally or publicly owned counterparts. The country last to deregulate could be a "winner" since it gives possibilities to purchase other companies with inexpensive capital. On the other hand, the company will probably have to go through a painful rationalisation phase, especially if the availability of inexpensive capital simultaneously decreases. In that respect companies in Europe that have undergone early deregulation can both have an advantage and a disadvantage.

But demands on yield and dividends are not the only factors affecting growth possibilities. Tax, depreciation, and retirement regulations can create "hidden" assets that may be used. German corporations usually have substantial fixed liquidity. This fact creates a situation where it has been less costly to purchase the businesses than originally calculated. Subsequently, this has enabled more corporate purchases.

If risks throughout the different energy businesses are viewed through a financial perspective they will stand out as capital expenditure variations. This could in turn lead to business differentiation, meaning that certain capital requirements are drawn to certain business types. Hence, the demands of the capital markets do influence the business structures. This is already a fact for companies with capital-intensive operations; such as the aviation business that transfers the airline fleets to other owners and instead leases the airplanes. For a similar discussion see [29].

F. The art of wheeling and dealing

When government regulated energy markets it was important for leaders in the energy system to understand politics. It was as basic as today claiming that it is important to be customer oriented.

One may therefore assume that the consequences of a deregulated energy sector means that the major actions needed for companies is to create a market focus. In many respects that might be correct and we will not argue against that.

However, we show that there are more than customers that decide what is the adequate strategies and actions. In particular politics and capital, two arenas that during regulation more or less was one and the same but now have begun to divide, are important to handle if one wants to influence the future energy system. The future is not only about markets. It is also a matter of politics and capital. It leads to the conclusion that the art of "wheeling and dealing" is important.

The scenarios might help us to *understand* what might happen in the future energy system. But if one wants to *influence* the development of the future energy system the art of wheeling and dealing is important. And since Europe still is only partly deregulated it might be *more* important today than before deregulation.

V. EVALUATION AND COMPARISONS - WHAT HAPPENED?

Models, or maps, influence the actions we undertake. One major point by drawing new maps therefore is that they include later experiences and show other phenomena than the old maps.

Companies, organisations (and nations) that navigate the new waters with new maps do also, at least theoretically, have a competitive advantage in terms of time. They have a chance to prepare before the competitors do.

In the following we will evaluate the result of the project in relation to recent developments within the energy field in Europa, and discuss the methodology and learning obtained from the scenario methodology.

1) Which scenario describes the development in Europe best?

The answer is that no single scenario appears in reality, but two scenarios seem to better describe the events that unfolds: the Habsburg and the Rome scenarios. In both scenarios the development of Europe has been successful and European Union and institutions are gaining in importance over national. European regulation, markets and industry structures.

In both the Habsburg and the Rome scenarios, very large integrated multinational energy companies dominate over local and national players. This is evident also in reality when looking at industry cross-border mergers and acquisitions. [30], [26]. In 2009 the European deals in the energy industry were fewer than the preceding years, although eight of the worlds ten largest deals were made in Europe. In total 60% (both counted as number of deals and as deal value) of the global mergers in the energy industry took place in Europe. Although this was still an almost 50% reduction compared to 2008 and less than a third of the deal value from 2007. In total it is reasonable to claim that the merger pace in European energy has been rapid and the creation of trans-european mega energy utility companies is a fact. This is also in line with the two scenarios Habsburg & Rome.

But, on the other hand, Eurostat reports that the actual number of enterprises active in the field of energy in Europe is growing. [31]. But the new growth of energy related companies are primarily small-scale companies operating in renewable energy technology.

Another observation that underpin the developments in the Rome and Habsburg scenarios is how new investments in the energy sector are made. Several very large infrastructure investments involving many European and foreign companies joining forces in consortia have started large projects: “North Stream” bring gas from Russia to Europe is built by a consortia consisting of Russian Gazprom and German energy companies. “South Stream” is built from the Caspian sea and almost in parallel is the third gas pipeline, “Nabucco”, developed.

In the UK and Denmark large-scale off-shore windpower sites are offered to international consortia of power companies.

The fundamental difference between the Habsburg and the Rome scenario is the role that IT plays. The whole ICT-based technology shift that transverse the society like a tidal wave is transforming industries at a rapid pace. The question is to what extent it will transform the energy markets? This was an open question at the time of the project in 2002. Now, bits and pieces of this development appear in the market e.g:

1) The development of “smart grids” and the networks of the future. [32],

2) The transformation of the telecom industry and the development machine – to – machine communication.

The transformation effect of the ICT-technology shift is not evident at the moment, although interesting developments take place. On the other hand, new technology will be put into use and eventually effect the strategies and development of the energy companies over time. If so, the Rome scenario describes possible outcomes best.

2) Scenario methodology in hindsight

The scenario methodology was useful in providing a framework for understanding the processes that surround the energy development in Europe. It also highlighted the driving forces for the future energy industry development. It provides a framwork for further discussions on future investment and hence potential technology development needs.

By that we can articulate at least three reasons to do scenarios: to visualise, discover and prepare. For a deeper discussion on this subject see for example [2], [24], [38] or [39].

The use of multiple “soft” scenarios has been widespread in organizations and companies since its first appearance in Royal Dutch/Shell in the 1970ies, [10], [14], [15].

In a recent study on wind power development in Finland the soft scenario methodology is used [33]. The results from this study illustrates the complexity of the energy development in general and in particular to judge the development of a single technology as wind power in isolation. The complex relations between policy making, technology development and investment decisions are illustrated using the scenario methodology which thus increase learning and also may influence future policy making and investments decisions.

Former cases where similar questions like here however have been addressed have also, in contrast to this study, mainly been focusing only one side of the issue, in assuming that corporations have unlimited ways of acting (meaning that the complexity within the technological structures per se is not included within the analysis) [34]. Also; the [34] study only focuses the gas market which give us limited value for our purpose here.

Further, [35] have shown previously that there are huge obstacles embedded in assuming corporations free choices of acting in the energy sector.

VI. FINAL REMARKS

Since the ambition has been to analyse energy with a different approach than the conventional, we believe that the scenario work gives room for plenty of speculation. In fact it is the purpose. But at the same time they might be seen as controversial. Having that said it can be useful to comment some of the limitations of the scenarios.

The scenarios focus external factors that, in some respect, are equal to all actors on a market. The internal factors within companies and organisations are naturally also important, but not possible to study within such a broad study as this. To be used in a company context these limits have to be considered. The scenarios do not give detailed information on how to

handle company (not even governmental) strategy. However they give a somewhat new "roadmap" for an actor that wants to discuss and form a new strategy.

Many other foresight studies in areas outside the field of energy focus on markets and customer behavior in the future. In terms of customer behavior and the development of markets this study do not give detailed predictions. In fact one might even claim that the scenarios implicitly give the picture that the markets, even though they are deregulated, still mainly are driven "from within". Even though these limits are well in line with many other future studies on energy we recommend future studies in energy to consider these limits. There would be interesting with pure market oriented studies on energy future.

However: for recently deregulated industries the forms for regulations are subject to change and adaptation for a long time after the deregulation process. It is even argued that the "intensity of regulation" become larger after competition is introduced [36]. For that reason (and of course also for the reasons earlier presented, i.e. the slow change of the technological system and the dominance of existing actors), a focus on structures and the forces that shapes the structures seem to be at least as important to study as customer behaviour for the newly deregulated industries.

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