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Methodology to build a power sourcing strategy

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Abstract

Power sourcing for energy intensive industries has changed since many countries began to restructure their electric power sectors. Before, energy sourcing was limited to a set of products offered by electronic companies under regulation. However, deregulation of electricity markets provides costumers significant choices in energy sourcing for the first time; changing the way electricity is purchased increasing the need to develop energy sourcing strategies.

The main objective of this paper is to explain the process to develop a methodology, which should help industries to better decide how to source their power requirements. In order to do so, this paper seeks to first understand new markets factors influencing the sourcing strategy,; as well as an analysis of the current power sourcing options- After market conditions are described, the model on which methodology is based will be explained. As part of this, each step for building up the model will be described. Finally, implementation and monitoring will be presented as complements for methodology appliance.

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INTRODUCTION

Since the 1950s, the energy industry has been characterized as being highly regulated with no competition. However, over the past years, the regulatory environment of the energy industry in many countries has begun to change, modifying it from a monopolistic industry structure to a more competitive one. This movement has affected particularly industries with high energy costs[1] and their energy sourcing methods. Before liberalization, energy sourcing was limited to a set of products offered by electric companies under regulation (e.g., interruption option, real time pricing or flat price, different time rates). Customers had no other choice than to respond reactively to what happened in the market, i.e., to reduce electricity use in peak hours and accept the tariff-based prices. However, deregulation of electricity markets provides customers significant choice in energy sourcing for the first time.

On the other hand, since deregulation of electricity markets started in 1990´s, it provides customers significant choice in energy sourcing for the first time. As a result, a new energy environment emerged, changing the way electricity is purchased and creating a need to develop energy sourcing strategies.

Energy deregulation has created an opportunity for businesses to add electricity procurement to their overall strategic sourcing program. Securing contracts through competitive energy markets can result in significant cost avoidance. In deciding on an energy sourcing strategy, the user has a wide range of options. The most common sourcing strategy approach deals with make or buys decisions. According to this, the company must make a choice whether to concentrate its own resources on a set of core competencies, being supplied by someone else; or produce electricity for own purposes (Snyder and Ebeling 1992, Venkatesan 1992, Barney 1995).

However, current energy sourcing strategies do still not consider new energy market conditions and new power cost savings opportunities. There exist approaches which have not been considered, but represent important savings; such as:

- Load management and energy storage, which must be seen by industry as an important option to save power costs, reducing consumption from the grid during peak hours.
- Distributed generation, describing how it can be an important alternative for industries to self generate their electricity and to promote the development of renewable energy.
- The EU Trading System (ETS), given that new CO_2 costs are being passed through from electricity suppliers to the final customers.
- The new regulatory framework, given that the sourcing of electricity depends upon the specific legislation in each country.

Because of new market conditions presented above, the energy intensive industry has to find new options to manage its power requirements, in a competitive and sustainable way. A methodology to

[1] Including capital-intensive manufacturing industries, as well as the services sector (e.g. healthcare).

develop an electricity sourcing strategy that considers not only the new regulatory framework and CO_2 regulation, but also new power saving alternatives, must be created and will be the objective of this paper.

1. NEW MARKET CONDITIONS

Current electricity market conditions are changing rapidly. The European Union countries, particularly, are in a process of liberalization, facing the implementation of the European Commission's Electricity Directive[2] whose main goal is to establish a single internal market for electricity (IEM) in Europe (Steiner, 2000). As a result of this implementation, electricity markets are being liberalized. The Member States (MS) are forced by these Directives to open their national electricity supply market in order to allow competition. Generally, only retail electricity generation is in the process of being regulated, while the wholesale market electricity has already effectively deregulated.

The additional competition in the electricity market will give customers more and better options for electricity access in a sustainable and cost-effective way. However, the ongoing energy deregulation initiatives at the state levels lead to uncertainty in market structures, and rising energy costs. New risks and costs affect the energy sector, doing more difficult the way electricity is purchased. Challenges and opportunities for energy supply and procurement exist in regulated as well as in deregulated markets. Depending on the electricity market structure, energy intensive industries may be in position to diversify their power sourcing strategies. Therefore, as market becomes more competitive, energy-intensive consumers could benefit having more possibilities for electricity supply. These advantages include the fact that, large customers have the possibility to choose between many suppliers, as well as being supplied under more flexible contracts. As prices are not totally regulated, they can be indexed to the prices of other commodities (fuel, oil, coal, etc.).

For instance, on January 1 2005 the European Union Emission Trading Scheme came into force in order to help achieve the Kyoto reduction targets of greenhouse gases. Under the terms of this scheme, industrial emitters of carbon dioxide (CO_2) are allotted a number of tradable allowances, setting the amount of CO_2 they can emit each year. Power prices are directly affected by these new CO_2 costs, and these costs are passed-through to customers (Ilex Energy Consulting, 2004). If the power generator has a shortage of allowances, the passed-through CO_2 costs are even higher.

In recent years, distributed generation has gained attention given that it can contribute to achieving the goals of the EU energy policy (Skytte and Ropenus, 2005). Until now, the creation of a single market in Europe has considered only central generation, since the liberalized energy markets are developed on such a model (Sustainable Development Commission, 2006). Nevertheless, the increasing demand of energy, the ambitious goal of increasing the share of renewable energy sources (RES) from 14% to 22% of gross electricity consumption by 2010, and the recent blackouts in different parts of the world, suggest the need for a new and different approach to energy supply such as the one originated from distributed generation (Skytte and Ropenus, 2005). Germany is one of the EU countries targeted with

[2] Directive 96/92/EC amended by Directive 2003/54/EC of the European Parliament and of the Council.

the 12.5% of use of RES, as well as UK whose target is about 10%. The same situation concerns to Spain, whose target for RES is 29.4% and Latvia with 49.3%; just to mention some of them.

Another aspect that has gained attention over the past years is load management and energy storage. The high demand of electricity generates congestion on the electric transmission system, especially during peak periods. This drives the energy suppliers to take measures such as the increment of the electricity price during these times. As a result, consumers must find ways to store energy to be used during peak hours.

According to recent changes one can say that as energy markets deregulate and become competitive, the price of energy is expected to remain volatile; then electricity users face uncertainty in the electric power prices and their planning decisions become more difficult. Thus, it is becoming extremely important for energy-intensive companies to have a flexible sourcing strategy that can handle electricity price uncertainty. There are several factors that must be considered, such as supply and demand, CO2 allowances, fuel prices, participation on the market, interconnector availability, weather conditions, etc.; but it must be clear that factors influencing prices in the short run can be different from those in the long run.

1.1 Current supply strategies

A sourcing strategy can help a company to increase its value by obtaining lower prices, more favorable warranties and better terms or conditions (Newhart, 2006). Since energy purchasing depends upon a number of factors and functions in regards to the electricity market and the liberalization process; energy sourcing strategies must take into account specific factors, risks and possible benefits such as cost savings. Traditionally, the energy intensive industry has been satisfying its electricity needs under heavily regulated markets. Flexibility and opportunities to optimize its costs were limited to one single supplier and perhaps few options for load management. However, changes brought about by deregulation have been partly considered in current strategies. Environmental regulation that introduces CO_2 costs isn't taken into account either, nor incentives for renewable generation.

The market opening process started with open access to the grid which has become a regulated third-party access (TPA). The latter obliged to the owners of a network to allow generators, traders, and large customers to have access to their network; with the purpose of trading in accordance with the objectives of transparency and non-discrimination.

As a result, large customers are allowed to have several options to manage their power sourcing requirements. According to this, physical exchanges can be made through different options: one is to buy electricity directly from generators, where agreements between suppliers and power sourcing generators are done. Due to the variety in energy market arrangements, if generators sell the electricity on forward (months, years), the suppliers will offer a fixed price to the large industrial customers when contracts are done. In the case of energy-intensive users, their profitability varies according to prices on the electricity market. Thus, the only way for industrial customers to access the price that is lower than market price, is through sharing the risk traditionally borne by generators alone.

Another option for physical exchanges is buying electricity through market mechanisms, where transactions can be made via power exchanges or OTC (Over-The-Counter). The difference between them depends on the term of contracts arranged. Another option for large customers to purchase electricity on the market is through under-tariff competitive system, with “all-included” price, mainly presented on the framework of regulated prices. Purchasing under this system allows large customers to pay an all-included tariff where distribution, transmission, transportation and all power sourcing services are covered.

Nevertheless, as part of these physical exchanges and, with the purpose of accessing to a lower cost that does not affect its competitiveness; self-supply becomes an option for large industrial users to satisfy its own energy requirements. Self generation reduces transmission losses because electricity can be produced close to where it is needed; as well electricity users have the option to connect to the grid or supply from their own sources; inclusive both options.

Apart of physical exchanges, financial exchanges can be made as well. These exchanges are related to the way that supply strategies are managed by large customers; as well as the use of self supply to reduce generation costs. In this way, contracts become the most useful tool for large industrials to manage their power sourcing supplies; where contracts can be arranged to a short or long term, depending on the type of market. Nevertheless, self supply emerges as a new option that allows large customers to satisfy their own energy requirements; with the advantage of reducing the electricity supply costs. Therefore, customers can avoid transmission costs, which amount to around 30% of the total electricity cost (International Energy Agency, 2006). So, managing self supply strategies implies the fact of negotiating contracts, but related to fuels as the raw materials for electricity generation.

For energy intensive industries reliability on power supply is very important. Thus, current power sourcing strategies should be monitored over the time to recognize market condition changes; which changes could represent potential opportunities for new strategy formulation. In the next section of this paper a model for designing a methodology is proposed.

2. BUILDING A METHODOLOGY FOR POWER SOURCING STRATEGY

Due to the new energy sector environment, different electricity/power sourcing strategies should be developed. Current strategies still suggest a short term approach to today’s electricity market, searching for the lowest price and acting if there is a possible raise in costs. Energy intensive industries must leave behind the reactive attitude used in the regulated market and adopt a proactive attitude as a consequence of the new opportunities brought by market deregulation such as renewable resources, wider choice of electricity suppliers, load management, and CO_2 costs.

This paper seeks to design a model as background for developing a methodology, which has the purpose to help energy intensive industries to find new alternatives in the marketplace and to obtain the necessary resources to address them; being aware of any possible risks.

2.1 Model

In order to create a methodology that helps large customers to choose the best option for sourcing electricity; first, a model must be built. Model should be organized similar to a decision tree diagram, because they are excellent tools for helping to choose between several courses of action. At the same time, decision trees provide a highly effective structure within which it can lay out options and investigate the possible outcomes of choosing those options. They also help to form a balanced picture of risks and rewards associated with each possible course of action[3].

The model is structured into two parts. First section is based on external factors analysis; where horizontally, the regulations for energy activities (e.g. supply, generation, etc) would be presented as layers (information clusters); while vertically, branches would present characteristics for market structure. Combination of regulatory framework and market characteristics, would allow the customer to recognize boundaries and opportunities for power sourcing in their market. The second part of decision tree is composed by internal factor analysis, based on qualitative and quantitative assessment. Therefore, the resultant organization proposed previously, would be basis for further methodology development.

In order to build the model up in a sequential way, several steps should be followed. The first step (Figure 1) is proposed to be data gathering with the main objective of identifying the electricity market attributes. Based on the characteristics of each of them, recognition of different market structures could be achieved. As a result, each market organization (structure) would be presented by general characteristics distinguishing them; where evolution from regulated to competitive market would be showed. Hence, energy activities such as power generation, supply, delivery, etc., would be described as well as the market participants who perform them. As a result the parameters describing each type of market are established, helping customers to recognize their belonging market. Once the objectives of data gathering are achieved, the next steps to design model and then methodology can be followed.

Techniques used for data gathering could include in-person interviews, questionnaires sent via regular mail, phone interviews or use of the internet. These methods for searching have the purpose of helping to flesh out the information. Data would be provided by different power sector participants, such as suppliers, generators and energy intensive industries. Besides this, information could be obtained from official documents, such as utility company reports, national industry association reports, national government statistics, international agencies, etc. Therefore, the appliance of the appropriate techniques would provide a complete overview of current conditions in the electricity market.

After data is gathered, as a start to design the model, organizing the information should be the next step (step 2) to follow. The importance of this step is because the information could be sorted in clusters according to common topics; and then, it could be used on the decision tree, covering each layer on it. Hence, knowing that *a market is described by the cross road of demand and supply*; the model presented in this work takes *demand* and *supply* as starting points for the electricity market description.

[3] Mind Tools. Available http://www.mindtools.com/dectree.html.

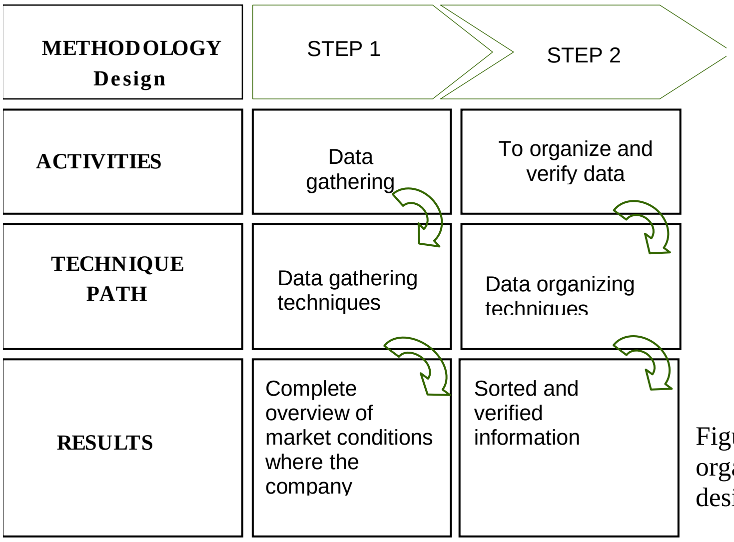

Figure1: Data gathering (step 1) and organization (step 2) as part of model design.

__Supply__ should be analyzed from different points of view: Being supplied by someone else, Self supply, and finally going directly to the market. For each of them (sub layers), there are main characteristics to consider.

- ***Being supplied*** *by someone else*, it implies to consider the type of supplier (Government or private company); as well as contract arrangements (time framework, interruptability option), reliability of supply, electricity price (fixed vs variable, regulated vs indexed, etc.);
- As a second layer, ***self supply*** should be analysed considering environmental framework (RES target, government incentives, CO2 price and allowances), technology used (electricity generation costs, investment); as well as the possibility to sell electricity (capacity vs guaranteed price, reliability of delivery), and network condition (network connection, connection fees, etc.).
- The third cluster is that customer can be supplied ***going directly to the market***. This subtopic should analyze the type of market for physical delivery, main players in the electricity market, the role of network operators and access to grid, contract arrangement (price, time framework), electricity trading (export/import), balancing system, etc.

__Demand__ is proposed to be next layer, which should describe:

- Size of the market and who are the main players (market share /market power);
- Total consumption (kWh);
- Load management and energy efficiency as tools for managing electricity requirements (from operational point of view);
- Contracts management using market mechanisms.

The importance of clustering and organizing information in the way presented above is that, appropriate questions of each topic could be formulated. Therefore, customer could be allowed to confirm current position and to recognize new opportunities for power sourcing. For example, if cluster main topic is about supply, then specific questions should be asked to know who is in charge for supply, types of contracts arranged, electricity prices, etc.

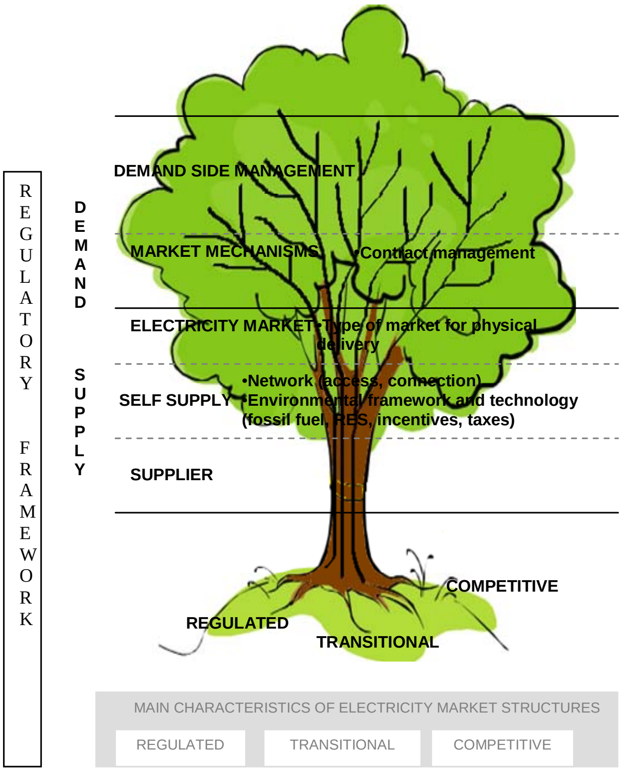

Figure 2: Model layer design (demand/supply clustering topics).

Data analysis, as a third step, requests to have sorted information. The purpose is to identify the cause-effect relationship between components being part of power sourcing strategies (e.g. traditional long-term contracts affecting fixed cost-based electricity prices). Questions that reflect influencing interaction between components would be prepared; not only within clustered information, but also between them. Then, changing from one issue to another (supply to demand questions) is possible; avoiding gaps.

In order to achieve this, problem solving techniques could be used. There are many approaches to problem solving, depending on the nature of the problem. By answering these questions in the methodology, the decision making process starts. Customers would be allowed to confirm their current supply strategy; as well as to identify limits and opportunities for it. Customer’s answers for each cluster of information would depend on regulatory framework and market structure, recognized since the beginning.

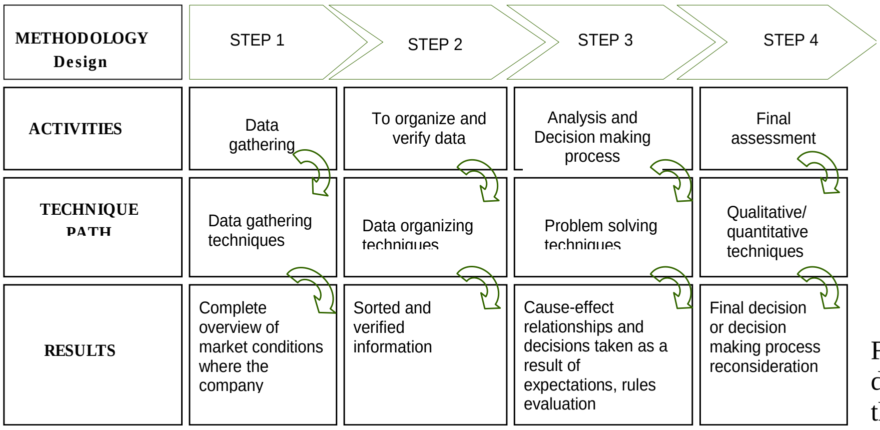

Figure 3: Model development for designing the basis of methodology.

Therefore, decision making process would allow customers to identify their current position in the market; as well as to discover alternatives for power sourcing. Finally, a qualitative and quantitative assessment based on internal factors, is requested to choose the best alternative to be implemented.

2.1.1 Qualitative and quantitative analysis options

After the large customer followed the decision making process, it should be in position to recognize at least one alternative or new solution for power supply. These alternatives are result of legal framework and market conditions interaction, under which the company is supplied. These alternatives are created according to environmental factors, not taking in consideration the strength or weakness of the customer to realize them.

The decision making process is constrained by time, costs, previous experiences, and perception of the company's participants. The final decision for power supply should be based on quantitative and qualitative analysis. The quantitative analysis should not be a substitute for qualitative analysis, and vice-versa. Both are useful and complementary techniques for structuring a problem to reach a rational conclusion. Both may be used to reduce uncertainty in decision making.

During quantitative analysis large customers should classify features of alternatives, analyze them, and even construct more complex statistical models in attempt to explain what is observed. Findings can be generalized and direct comparisons can be made between several supply options. For example, it might be used the technical, economical and environmental considerations; which would lead to success in a given alternatives.

Technical feasibility is usually based on an assessment of need for new equipment, impact on product quality, staff time required, etc. This analysis takes more serious steps in the case of self-supply than in the case when the company only plans to change its supplier.

Economic feasibility is made through an analysis of one-off investment costs; annual operating /ongoing costs, annual cost savings, payback period, NPV, etc. For example, sometimes the simple payback period is not enough to know if an option is financially feasible (e.g. a large amount of money consideration must be made as to worth of it in the future, because it may be better to invest it in something else with better return on investment). Sometimes the company is ready to pay more for supplied power in order to secure its core operations (e.g. high reliable supply or fewer blackouts).

Environmental feasibility analysis is necessary if the company considers self supply option. Local and regional pollution levels are getting more and stricter, and for this reason, the environmental feasibility analysis should include impact on greenhouse gas emission, also look at water use, solid waste, waste water, other air emission, noise, and odors.

Qualitative analysis is the examination of potential targets to determine importance, significance, and priority of decision made. Since qualitative analysis occurs in an environment where power relationships, personal desires, and the necessity for coordination exist; power supply problem can almost never be approached on a completely systematic (quantified) basis. The final decision is somewhat arbitrary. Much of alternatives are concerned with value choices that can be explicitly described in words.

Therefore, observation is the key for a qualitative analysis assessment. Standards should be set by the project evaluator, according to its particular perception. Large customer could prioritize different characteristics for supply; as an example, a customer can prioritize reliability of supply while another customer does with electricity price.

The company should also think of possible barriers to follow the option. These barriers could be internal, such as financials, knowledge, market position, etc For example, an option may have a large savings and a short payback period, but investment capital is not available in the company. However, large customers are sometimes exposed to external limitations, which cannot be overcome. As an example, long administrative procedures can delay a project; even if it is ready to be executed.

After the large customer applied its respective assessments, an alternative could be chosen to become a power sourcing strategy. If alternatives do not satisfy the large customer’s requirements; methodology could also be used to improve existing solution.

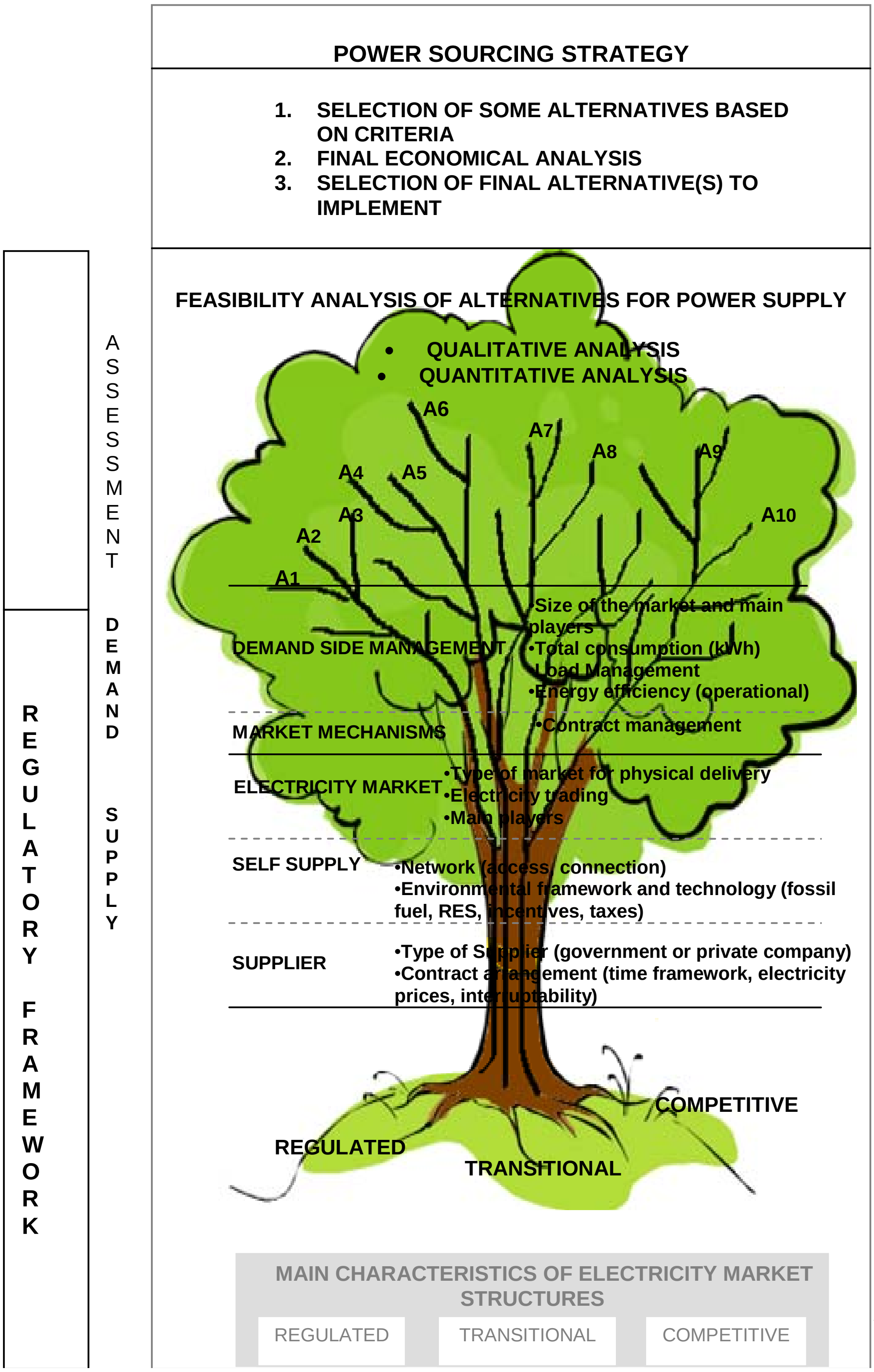

Figure 4: Methodology design for building up an electricity.

A1, A2,…,An, are the alternatives resulting from the decision making process.

2.1.2 Implementation, monitoring and continuos improvement

After the final decision is made, which of proposed options are feasible, the implementation process should be done. The purpose of this step is to implement feasible choice(s) in order to prioritize and monitor results; then, to discuss findings with top management. The output of this step should improve reliability of electricity supply and reduce costs.

Without monitoring it would be very difficult to convince management that energy supply strategy is beneficial to the company. First of all, the manager needs to proof especially the financial benefits of implemented strategy to get their support for future improvements.

The company must upgrade chosen strategy for electricity supply in a systematic way, integrated in company processes. In this way, the company could achieve integration of energy management into company processes and systems. For example, energy management should be involved into the same management system for environment, health, and safety, quality, and risks.

3. SUMMARY

Although energy deregulation has added layers of complexity to energy supply management, it has also created the opportunity for businesses to integrate electricity procurement into their overall strategic sourcing program. Purchasing energy supply in competitive markets can significantly reduce costs, increase operational efficiency and to achieve competitive advantage. The key to manage the energy deregulation process is having a strategic sourcing plan in place.

The methodology presented in this paper should help customers to understand changes in electricity market deregulation process, taking advantage of them to benefit themselves. As a result, a sourcing strategic plan would be achieved by customers.

The companies that invest the time and resources to develop such a plan can be assured that their energy sourcing strategy will align with overall corporate goals. Integrating energy procurement into the broader strategic sourcing program allows the company to take and manage one of the top largest operating expenses proactively; rather than allowing volatile energy costs to damage the budgeting process and financial projections.

Competitive markets continually change and energy sourcing strategy should be monitor all the time. Methodology proposed in this paper also looks forward to help supply managers to continually re-evaluate their power sourcing strategies over time. Likewise to propose new strategies which stay consistent and focused with the company’s goal and objectives for its energy purchase. This is necessary because of regulatory climate and market conditions changes; which could influence indirectly to the business performance of the company.

REFERENCES

[1] BENSAOU M., 1999. "Portfolios of Buyer – Supplier Relationships".

[2] ROBERT B.H., 2004. "The Impact of Energy Deregulation on Sourcing Strategy". The journal of Supply Chain Management.

[3] JAMES H. and F. CHRIS, 2001. Energy procurement in a deregulating United States. "*Key considerations and criteria in long term energy commitments*".

[4] RICHARD L., 2007. "Ten steps to a Strategic Energy Plan".

[5] TOMI V., 2006. "Elements of Sourcing Strategies in FM Services". *International journal of Strategic Property Management*.

[6] PAULO F., BRIAN K., MARIESA L., AYSEN A. and YILU L, 2001. "Energy Storage Systems", *Proceedings of the IEEE.*

[7] HAILI S., CHEN CHING L. and JAQUES L, 2001. "Decision Making of an Electricity Suppliers` bid in a Spot market", *Department of Electrical Engineering*, *University of Washington*.

[8] FAYE S., 2000. "Regulation, Industry structure and performance in the Electricity Supply industry", *Economics Department Working Papers, OECD.*

[9] PÖYRY. "Electricity Sourcing Strategy: Analysis of Electricity Markets and Competitors` approaches".

[10] DAVID A.K. and FUSHUAN W., 2001. "Market Power in Electricity Supply". *IEEE*.

[11] SUZANNE T., 2002. "Tools for success- a manager's guide"; *Mc graw – Hill Professional*.

[12] HORNGREN, SUDEM and STRATTON. "Introduction in management of accounting", *Pearson education international.*