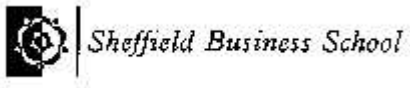

MANAGEMENT DEVELOPMENT PROGRAM

(LEADING TO THE AWARD OF MBA)

In association with the

CZECH TECHNICAL UNIVERSITY IN PRAHA

DIPLOMA IN MANAGEMENT STUDIES - 1995/1996

Decision modelling process

Identify a possible model which could improve the decision-making capability of an organisation of your choice. Discuss its formulation, data source and use.

In doing so, your answer should:

· outline briefly the decision context you have chosen

· clearly describe the model and its importance to the organisation

· identify the boundary of the model

· show how the model could improve decision making

Zdeník Pistora

Praha, November 18, 1995

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1. Introduction

This assignment deals with the decision-making process of an electricity-sector regulator.

Since late 1994, the power sector in the Czech republic has been going through substantial changes. The reason for this is the new "Energy Law" passed by the Parliament in 1994. This law requires all subjects on the market establish an association for the purpose of real-time control and also establishes a new role of a Regulator. The regulation duties will be performed by a Ministry of Industry and Trade.

At present, the way of regulation is unclear. Nothing has been published and the "involved experts" are reluctant to publish anything. Therefore the topic is open for discussions and there are no limits for creating possible models.

My task in this work is to establish possible approach to settling the price of electric power between a transmission system and a regional distributor.

2. Decision-making theory

The theory for decision making is quite comprehensive in these days. Many aspects of any future decision must be taken into account and proper ways of decision making must be chosen.

2.1 Stages in decision making

2.1.1. Identify the problem

First of all, the problem must be properly identified. Usually it has much more aspects than can be obvious on the first sight. Every future decision has "side-effects" which must be investigated carefully. Furthermore, the "core of the problem" doesn't have to be distinguished in the beginning - after some studying we may have to solve completely different problem than we had begun with. This is usually the case (not only) in power industry.

Example: As decribed in Chapter 3 of this assignment, Czech power sector is opening itself to a competition. The problem stands "How to secure a fair handling for newcomers ?" After some investigations everybody must arrive to other questions, like "Is the existing pricing system well-balanced ?" or "What should be the regulatory princioles ?".

2.1.2. Expected performance

The decision-maker must very precisely think out, how his system will work after its implementation. It should provide fair handling for everyone and must not be biased. The decision-making model must not rely on unavailable inputs and the processing time must not be inadequate. The system sources must be freely available.

According to Murphy, the correctness of any decision is measured by following events. This is 100% true. Every decision will surely have an impact not only on those for whom it is made, but the range will very likely be much broader. The decision-maker therefore has to make a detailed analysis of all stakeholders in the decision process and decide:

· whether the model is biased in favour for some
· whether the model is biased against some
· whether some have a power to reverse the decision
· whether some may have a power to remove the decision-maker.

If the answer to last two items is "YES" and the model is biased against these stakeholders, however the model maybe correct from theoretical viewpoint, it is not applicable. Such stakeholders may be of various types - beginning from a supervisor in individual case and ending with coalition party deputies in the Parliament.

2.1.3. Search

This stage comprises looking for those stakeholders, who mav:

· provide knowledge for constructing a model
· provide input data
· be affected by a model output.

This stage, together with a next one, are the most important stages in a decision making. They are quite decisive, whether the future model will be "implementable" or not.

2.1.4. Construct a model

The model construction process has two phases, which may overlap:

· building a theoretical model

This phase is the one usually taught in all types of schools. The problem is identified, very likely translated into mathematical language and the problem is to find a method for solving. Problem may be linear or non-linear, deterministic or stochastic, static or dynamic; for all of these the proper method is available. The methodology is described in the literature and I will not repeat it here.

But to give my personal preferences - if there is a necessity for me to build a model (and this has happened many times), if the nature of the problem allows, I prefer either regression approach - both linear and non-linear, for optimizing I use frequently linear programming - software package MERCURY. For all problems which may be formulated using mathematical or logical language I use my favourite spreadsheet SuperCalc5.

In most cases in every-day practice the highest point of applied theory reached by decision-makers is the least-square linear regression. Only specialised institutions may be able to apply more advanced methods. But to be honest - in most of these cases this approach is correct.

· fixing it to its environment

This is the more difficult part of work to be done. No theoretical knowledge is applicable here, one has to look and see, that's all. Any model, however good it might be from theoretical viewpoint, is not appicalble, if there are some of the required input data not available or required techniques are not mastered by people. If this occurs, one has usually to go back to previous stage and choose a simpler model, not maybe so accurate, but applicable. As mentioned above - this is often a reason for not using advanced techniques. But still - every managerial decision must provide for a "reserve" and count with inaccuracies.

2.1.5. Test model

Before any model is started to be relied on, it must undergo a comprehensive testing. During this period the model is tested from the viewpoint of:

· homogenity

· accuracy (bıas and varıance)
· input data availability
· implementability
· acceptance of results

2.1.6. Choice

This is the last period in a decision-making process. The decision-maker has an approved model available including all input data. But still - the decision is up to himself. The model and its results can only serve as a tool, but the decision may depend on many other factors, which may have not been known during the model creation or which importance has changed.since that time. At this stage all possible impacts of a decision must be re-thought.

3. Present situation in the Czech power sector

The marketplace with electric power in the Czech republic undergoes substantial changes in these days. The former vertically integrated monopoly has been dismantled in 1990 and thing have been much more complicated since then. Moreover - new independent power generators and brokers emerge and this requires adapting the system to this new circumstances.

3.1 Subjects on the market

As the marketplace develops, the number of subjects playing on it is steadily increasing. In the old times there was only a big ÈEZ, which was a vertically integrated monopoly beginning from a generation up to retail distribution. In 1990 the monopoly was dismantled and 9 new companies were launched: new ÈEZ, as a generator and an owner of a transmission grid, and 8 regional distributing companies, which exercise monopoly on their own territory. New entrants also exist - namely independent power producers (IPPs) and new small private companies who act as power brokers - they usually import power from outside and try to sell it to regional distributing companies.

3.2 Role of a regulator

Since the interests of some players on the market are often contradictory, the regulator is needed. His role is in establishing clear rules for the game and settling disputes. He should be as independent as possible, but on the other side he must have some background in order not to harm the game.

A typical problem he must solve is the one of prices between transmission and distribution systems.

4. Price setting mechanism

How should the price be settled, if the partners cannot reach

an agreement ? I will study this problem here in accordance with above mentioned rules:

4.1 Problem identification

The first sight says that the price must be settled between two partners. With no knowledge at all it might be suggested to split the margins 50% : 50% and problem is solved. But it is unfortunately much more complex.

4.2 Expected performance

The solution which should last long enough must satisfy following criteria:

- all involved partners must have a space to not only survive, but also to generate reasonable revenue for future development and for their shareholders
- the system adopted must not have a negative impact on security and reliability of supply
- the solution must be politically acceptable
- it must give reasonable incentives for all partners to improve their efficiency and being rewarded for doing it
- it should provide for possible changes in economical and business environment in future so as not to be changed too often

4.3 Search

The task is a typical optimization problem with "known" constraints, therefore solved e.g. by linear programming methods. . There is a profit to be maximized and also all constraints are known as well. The "only minor problem" is to choose properly the criterion to be maximized and choose whether some constraint is allowed or not. Most of these decisions are political rather than economical and therefore not so easy.

For example - the profit to be maximized can be the profit of one shareholders' group, profit of both shareholders' groups, profit of customers (price decrease), maximizing tax income of the government etc.. The constraints can but need not be like maintaining some specified level of ROI (return on investment) with all partners, not exceeding some working ratio, etc. The outcome of the model must give a chance for a long-term development of all partners and the whole system. If these criteria would be followed depends on the Regulator's decision, but on the other side he is responsible for them, at least politically. The Regulator has to make a very precise SWOT analysis having on mind all existing and potential stakeholders.

In the Czech republic the situation looks like ÈEZ has enormous profits, while all others suffer from it. But it must be taken into account, that only ÈEZ cares for sustainable development of the system, namely generating capacity. It is also affected by a "Clean air Act" which requires all generating units be desulphurised by

1998. This costs a lot and all the profits are spent for this.

On the other side, the legacy of the past are underdeveloped distribution grids (namely the lowest voltage levels), which are not able to supply all customers with required amount of power. To improve income for all partners, improving of these distribution grids is inevitable (to sell more).

The price must also provide for covering costs for those generators, who do not directly sell their power, but rather provide dynamic services required by physical laws or maintain the emergency power reserve.

All this and much more must be considered by the Regulator.

4.4 Model construction

As mentioned above, the problem is a classical optimisation task ready to be solved by linear programming tools.

If I was a Regulator, my "regulatory function" would very likely be

SUM OF DISCOUNTED RETAIL PRICES NEXT 5 YEARS = MIN

with constraints:

ANNUAL PRICE INCREASE < 50% INFLATION
PROFIT FOR ALL INVOLVED > INFLATION RATE
PROFIT FOR ALL INVOLVED < PREDEFINED VALUE
(e.g.15%)
etc.

4.5 Model testing

The model testing must begin with the first step - not to make any sharp and sudden change in the existing pricing system. The industry is not prepared for any "earthquake". The adverse example of sudden changes and their adverse impact comes from England, where the Regulator Prof.Littlechild introduced a new price cap in the middle of the period. I wonder, how he could have survived in his position after such a movement.

5. Limits of the model

The model can serve as a tool for decision-maker, but the decision itself is affected by many other factors. These are very often of non-economical nature and are very difficult to be translated into numbers. One of them may be the political orientation of the Government (willingness to support the Regulator) or power of all involved stakeholders and their interests. Last but not least also the personality of the Regulator, namely his ability to defend himself

and his decisions.

The model I proposed does not reflect all possible influences. For example, the companies will not hurry with sharing some information with the Regulator, which means that some data may be unavailable.

6. New model contribution

The proposed model (and any other as well) would solve the today's situation, in which the partners are not able to reach any agreement. The result of this unability is simple: there are no contracts even for the year 1995 (!!) and the price for electric power between transmission and distribution systems has not been set so far. In this situation it is very uneasy to plan any future development of the system - beginning from distribution grid improvement and ending with building new generation capacity.

Furthermore, the industry needs a clear price signal to be sent to a public, while the demand grows too fast while the capacity does not. And last, but not least, the Minister could be saved from making one decision regarding the price and immediately changing it within two weeks after argumentation of harmed partners.

To conclude: the industry now needs a strong regulator to settle all existing disputes. Whatever way he will choose will contribute to calming down the atmosphere and providing clear signal as regards future development of our industry.

7. Reference

[1] MBA handouts
[2] Internal ÈEZ documents