EXPERIENCES FROM INTRODUCING A NEW ELECTRICITY DISTRIBUTION REGULATION POLICY

Magnus GAMMELGÅRD
Royal Institute of Technology / KTH - Sweden
magnus@ics.kth.se

SUMMARY

Introducing a new electricity distribution regulation policy is in many aspects a complex issue. This paper presents experiences from a recent case, the Swedish regulation. An overview of the regulation is presented along with a brief discussion on the regulation in an international perspective. Furthermore, experiences from the introduction this far are discussed along with areas where there are remaining issues to further address.

INTRODUCTION

The deregulation of the European electricity market has brought increasing attention to efficient methods for supervising the natural monopolies of electricity distribution. In Sweden, the electricity distribution regulation policy has undergone a fundamental change, moving from a light-handed rate of return regulation to revenue cap regulation [4]. The regulator, the Swedish Energy Administration (Statens Energimyndighet, STEM, in Swedish), has introduced the new regulation and developed the main tool, the Network Performance Assessment Model (NPAM).

The primary purpose of the paper is to discuss the experiences this far from the introduction of the new Swedish regulation and to point to some remaining issues. It is not intended as a comprehensive description of the regulation nor the NPAM. More details on this can be found in e.g. [1], [2], [3], [4], and [5]. Instead, the focus is on providing an overview of the current statues in the regulation and to discuss this. By addressing these areas it can also contribute to create transparency regarding the regulation.

The presented research is a part of an ongoing study at the Competence Centre in Electric Power Engineering at Royal Institute of Technology in Stockholm. It is conducted in cooperation with STEM and a number of Swedish utilities.

THE REGULATION

As a background, it is interesting to address some of the characteristics of electricity distribution in Sweden. The Swedish electricity market with about 5.5 million customers is fully deregulated including domestic customers. There are about 180 distribution system operators (DSO) and they are spread over a large geographical area with varying condition in terms of customer density, types of customers, climate, ownership structures, etc. reflecting a fairly complex situation.

Turning to the regulation policy, a fundamental principle is that evaluation of DSOs tariffs should concentrate on the reasonableness of the accumulated revenues of electricity distribution in relation to the service delivered to the customers [6].

Main steps of the regulation

The execution of the regulation, initiated on yearly basis, can be divided into four major steps. First, since it is an ex-post regulation, data from the previous year are submitted from each DSO to the regulator. It consists of revenues along with other input data to the NPAM, i.e. data on energy consumptions, billings, customers’ geographical positions, outages, local production, and connection to other networks. (See e.g. [1] or [2].) Second, the data from each DSO are reviewed and inputted in the NPAM. The model calculates expected revenues, i.e. the basis for the revenue cap, based on the data, and its parameters and algorithms. The result is then compared to reported revenues. Third, based on the model’s results and other indicators e.g. quality of supply, the regulator determines if further investigations of a DSO are necessary. The decision must be made within one year after the tariffs have been used. Hence, if no investigation is initiated the regulatory process ends for this year. The result of investigations, where DSOs are invited to communicate about their situation, is a decision on tariffs, i.e. reasonable or not. Fourth, such decisions may be appealed to administrative courts, resulting in a legal process where the decision is trialed. The steps are illustrated in figure 1 below.

The main regulatory tool

Since the NPAM is an important part of the regulation it is useful to address some of the model’s basics. See e.g. [1] or [2] for more details. In the model the revenues of each DSO are compared to expected revenues derived from standard costs of a reference utility generated in the model. The reference utility is created by algorithm in the model and based on the input data from the individual DSO. A simplified fictitious network with cables, lines, transformers, etc. is constructed in the model. The network is valued via the standard cost functions. Capital and operational costs are calculated as well as an assessment of the quality of supply. These are aggregated to form the total expected revenues. The actual revenues divided by the expected revenues, i.e. the debiting rate, is the main output from the model and used in the regulation. Other intermediate results from the model can also be utilized.
THE REGULATION IN AN INTERNATIONAL PERSPECTIVE

Since there is an international discussion on distribution regulation, e.g. in the European Union and in relation to the EU directive 2003/54 [7], it is interesting to briefly address the new Swedish regulation in this perspective.

There are at least two features of the Swedish regulation distinguishing it from other approaches. First, ex-post regulations are internationally fairly uncommon. Ex-ante regulation seems to be the preferred alternative for the majority of European countries having introduced a regulation. Besides Sweden, Finland is more or less the only other example [8]. Questions have been raised if ex-post regulations are in compliance with the EU directive. However the directive only states that terms and condition of regulation need to be decided on ex ante [7].

Second, in the method for assessing the tariffs, few actual cost data from the individual DSO are used. The NPAM uses none and the regulation as whole aims at avoiding using actual costs from individual DSOs [9]. The intention is to make the assessment based on the service delivered to customer, not the way the service is produced [3]. This is different from other implementation of revenue cap regulations. In e.g. Norway, Denmark, and the UK network book values is used as the asset base, which is complemented with a number of other cost data from the DSO when the revenue caps are set [8].

DIMENSIONS OF THE REGULATION

The remaining discussion in the paper is divided in two main sections. In the first, the experiences so far from introducing the regulation are presented and discussed. In the next, areas with remaining questions and issues are addressed.

When discussing the complex issues of distribution regulation a number of perspectives can be applied. In this paper three dimensions are used. First, the regulation has legal aspects. The legislation states the principles of the regulations and sets the framework for the regulator and other involved parties. Second, the legislation is not specific in how the regulation should be implemented. It is hence the responsibility of the regulator to develop a working regulatory process, including appropriate tools. Finally, when in use, the regulation will have implications on the involved parties. These implications constitute a third dimension. Given the limited space, the intention is to highlight some of the most relevant aspects.

DEVELOPMENTS AND EXPERIENCES THIS FAR

Legal aspects

Following the deregulation of the Swedish market in 1996, the distribution regulation was intended as a rate of return regulation. However, the regulation, legally defined in the energy act, proved difficult to implement in reality. One reason was that the number of customer complaints increased from some dozens per year before the deregulation to several thousands after. Each complaint had to be investigated, resulting in unmanageable amounts of work for the regulator. Furthermore, many of the investigations proved to be demanding. Since the reasonableness of the rate-of-return was to be assessed the costs and revenues had to be determined. Especially what costs to include proved difficult to determine. [10]

A simpler and more manageable regulatory process was one of the intentions of the new regulation. In the new legislation, a key issue is how to assess the service delivered to customer3 in order to compare it to the aggregated revenues. Both the government investigation [10] and proposition [9] mentions the NPAM as a plausible tool for this assessment, although the legislator states that the regulator is free to chose the tool. However, the current implementation heavily rests on the usage of the NPAM. The legislator further states that the objective assessment of the service should be complemented by more subjective parts. This indicates that other factors also should be considered. Compared to the previous regulation, the main difference in policy is the attention to service delivered instead of a reasonable return on capital, given the existing cost structure. [9]

The experiences so far in the legal dimension are limited. Reactions to the change in the electricity act in 2002 [6] are generally positive. It is believed that the previous regulation did not work as intended and that something had to be done. Given the acceptance of the principles of the regulation, most legal aspects will probably be related to the fourth step of the regulation, i.e. if the decisions are appealed to the courts.

The regulatory process

A suitable regulatory process has to be developed to implement the regulation, given the legislation’s broad framework [9]. The NPAM, which the regulator had been working on prior to change in the energy act, is the main

---

1 The service delivered to the customer refers to the accumulated efforts needed for the DSO in order to deliver electricity to its customers [10].
regulatory tool in the process [11]. However, the application of the NPAM and its results in the process, as well as what other factors are to be considered, are two other important parts of the process.

The development of the NPAM has been a central part of the development efforts this far. The regulator is the developer of the model (started in 1998), but representatives from DSOs, customer organizations etc. have provided feedback and contributed. The model has also been tested in a series of pilot tests in 2001, 2002 and 2003. The construction has been officially referred two times to DSOs, customer organizations, academia, and others for input. The NPAM’s development process ended in time for the first usage in 2004. For the future, updates of the model will however have to be made.

The application of the NPAM and considerations to other factors in the regulatory process has not been as extensively developed. The regulator has issued a document [11], stating the general principles on how the NPAM will be applied, how the results are interpreted, and how other factors will be taken into consideration. These parts of the regulatory process have not been tested, e.g. in pilot tests, before the first application.

There are a number of interesting experiences this far. First, the NPAM puts requirements on the DSO in order to be used. Input data to the model need to be available with sufficient quality. (See e.g. [3] for further discussions on this.) Since it is required for all customers, including domestic, lack of data was in the beginning perceived as a major risk but it proved possible to acquire the right data. For the DSOs, there have however been substantial efforts related to gathering and integrating data. In the future, there will also be efforts needed to maintain and update the data. There have also been discussions related to the quality and amount of input data, e.g. the necessity of having detailed data for each customer.

Second, it is naturally important that the NPAM correctly assesses the service delivered to customers. As stated, much attention has been focused on NPAM and its construction, parameters, algorithms, etc. have been analysed and discussed in various forums. An experience is that DSOs are, to some extent, concerned if the model makes correct assessments of their situations, e.g. allowing the long-term survival of efficient utilities. Customer organizations, on the other hand, have concerns regarding the amount of pressure put on DSOs by the regulation. There has been, and still is, a lively discussion on these matters.

Furthermore, experiences from application of the NPAM and how other factors outside the model are to be handled are limited. The regulator has selected a number of DSOs for further investigations based the results of 2003 year’s data. The regulator states that generally, i) the results of the NPAM is not the only reason for further investigations and decisions on tariffs and ii) there can be other factors speaking in favour of the DSO that the NPAM does not consider [11]. There is a discussion related to what specific factors will be considered in the two cases.

Implications

The new regulation will, in various degrees, have implications on the involved parties. Some of the expected business related effects for DSOs can be found in [3]. This includes e.g. a new focus on cost management, since the regulation puts a cap on the revenues. For customers, economic implications can be refunds of tariffs if they are found to be unreasonable [11].

Although the direct economic impacts are yet to be shown, the effects have been discussed. The general opinions are that most parties accept the fundamental idea of the regulation, i.e. that the DSO should be compensated for the value of the service delivered. However, the opinions differ on the level of compensations.

Besides economic implications the new regulation has had other effects. For example, the development has lead to an increased focus and discussion on general issues and problems in regulation, e.g. what reasonable compensation for delivering electricity is customers’ valuation of the service as well as failure to deliver, etc.

REMAINING ISSUES TO ADDRESS FURTHER

Before addressing these issues, it should be noted that the whole regulation has not yet been fully applied in practice. 2004 (using data from 2003) is the first year with this regulation and so far only the first two steps of the regulation (figure 1) have been completed. It is at the moment in the third step, i.e. further investigations of selected DSOs.

Legal aspects

The legislator states that the development of a legal practice is an important part of the regulation [9]. It is then vital that the regulatory process is accepted as a valid implementation of the electricity act. Hence, the NPAM, its application in the regulatory process, and handling of other factors have to be legally verified. One way would be that the involved parties accepted the decisions of the regulator per se. However, it is more likely that the regulator’s decisions will be challenged. It is the Swedish legal tradition that the decisions of government administrations can be appealed to the administrative courts. A likely scenario is that some of the first regulator’s decisions on tariffs will be challenged there.

Hence, a major unresolved issue related to the new regulation is if the regulatory process will be accepted by the administrative courts. A key part is if the NPAM is accepted as the tool for assessing the service delivered to the customers. This is important since the current implementation is largely based on the model and its application. The regulator will have to convince the courts that the NPAM makes a reasonable assessment and that the results are used correctly. Given the complexity of the regulatory process this is a considerable task. However, if the process can be verified and relevant precedents established, this would be a vital step in establishing a regulation being able to function long-term.
The regulatory process

Even though much effort has been invested in developing the regulatory process some issues could be further discussed. First, the NPAM can of course be made more sophisticated incorporating more detailed conditions. However, there is a balance between the how complex it can get without losing in transparency. The level of detail has increased in the model during its development. The reason is primarily that the model then more correctly can represent a wider range of conditions, but at the cost of increased complexity. An alternative to the increased complexity would be to deal with issues that the NPAM is not able to represent correctly elsewhere in the regulation, e.g. in the further investigations. It has also been indicated [11] that other factors will be consider in the regulatory process. Exactly how this is will be done is not fully established. However, to be able to do this it is necessary to have a clear picture of under which circumstances the model is providing correct assessments.

Related to this are the principles for using the NPAM’s results in the regulation. There are at least two different types of approaches. One would be to use the results basically as the whole regulatory process, i.e. stating that DSOs should lower and refund tariffs based solely on the results of the model. This puts strong requirements on the NPAM since it has to correctly represent the various conditions of the DSOs. The NPAM must also in all aspects fulfil the legislation. On the other hand, the regulatory process would be relatively simple from the regulators point of view. Only to collect the input data from the DSOs, run the NPAM, and present the results. The second approach would be to use the NPAM’s result only indicatively, i.e. the results would not fundamentally influence the decision of the regulator and only serve as initial guidance. The requirements on the NPAM in this case are much weaker. Any shortcomings of the model can be dealt with in the rest of the regulatory process. However, this process would be much more demanding since larger efforts are needed for investigating the DSO in other ways. In practice, the application of the NPAM will most likely be some kind of compromise between these approaches. Although, it has been indicated that the regulator’s intentions are more towards the first [11].

Furthermore, the details of the regulatory process are not fully known. For example, there is limited information about the conditions for the communication process that is a part of the deepened investigation e.g. structure, time frames, types of explanations the regulator is looking for, etc. This will probably become clearer over time, but for the first application of the regulation there are remaining questions.

Implications

One important issue is related to different time horizons. The regulation is done on yearly basis, based on data from a single year. Hence variations between years e.g. due to weather can have effects on the assessments. Furthermore, the NPAM essentially takes a snap-shot picture by the end of each year since input data should be as of December 31 each year. However, in operation and planning of electricity distribution much longer time horizons are used. The effects of this difference are at least two-folded. First, DSO that have, over time, reasonable tariffs may in a single year appear unreasonable due to specific events that influence the input data. It has been indicated that consideration will be taken to this in the regulation [11]. However, it is currently unclear exactly what factors are considered and how they are valued.

Second, the regulation will create incentives for the behaviour of the involved parties, particularly for the DSOs. It is then important that these incentives lead to efficient electricity distribution in the long run. Hence, the regulation also has to deal with the long term implications of the regulatory process and the NPAM in particular. Exactly how this is to be done is at the moment unclear. For example, there have been discussions if the regulatory process, more precisely the NPAM, creates incentives for an efficient level of the quality of supply. (See e.g. [5] and [12].) Furthermore, it is also reasonable to assume the current implementation of the regulation does not cover all the relevant implications on electricity distribution and that these issues need handled in other ways. Hence the coordination between the regulation and other methods and ways is an issue to address further.

Another aspect of the long-term effects is the fulfilment of the overall goals for the regulation. This includes e.g. efficient utilities, self-regulation of utilities, and reasonable distribution of wealth between the DSOs and the customers [3]. Given the limited space, it will not elaborate on here. Please refer to e.g. [5] for a more thorough discussion on these issues. However, it can be noted in relation to the discussions above that further investigations are perhaps needed to determine if these goals will be fulfilled in the long run.

CONCLUSIONS

A number of conclusions can be drawn related to introducing of the new regulatory policy. First of all, the whole regulation has not been wholly applied yet. Several steps remain. This is also visible in the experiences and the areas where there are issues to be further addressed. Much focus has so far been on the first steps of the regulation and especially the development of the NPAM as the regulatory tool. The experiences in this area are more comprehensive and the remaining issues are on a more detailed level compared to the legal dimension and the implications. Even though much effort has been put into the development of the regulatory process there are still issues to address, foremost related to the application of the model and what other factors that will be considered in the process. For the legal dimension, the issue for the future is to verify that the implementation of the regulation is in accordance with the legislation. This would be an important step towards establishing the regulation as functioning regulation in the long run. The long-term perspective is also an important issues related to the implications of the model. Although there are more direct economic implications to expect, the long-term effects are important to address. How the differences in time horizons
between the regulatory process per se and the effects of the regulation should be managed is a central area to discuss. A final conclusion would be that the development of a new distribution regulation policy and its implementation is a complex issue. Although much effort has been invested in the Swedish regulation, there are still a number of areas that need to be further addressed.

REFERENCES