Doctoral School of Management and Business Administration

THESIS SYNOPSIS

Bea Emőke Fodor

Promoting the Use of Renewable Energies

An Evaluation of the Hungarian Feed-in-Tariff System

PhD Dissertation

Supervisor:

Sándor Kerekes, DSc
Full Professor, Doctor of HAS

Budapest, 2012

Department of Environmental Economics and Technology

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I. Background

The role renewable energy sources have in energy production is becoming more and more significant, as the gaining ground of green energy production enhances the security of supply, reduces the burden on the environment and, at the same time, fosters economic growth. For the time being, however, it is a more costly, high-investment alternative to traditional (nuclear and fossil) energy production methods, and thus it is at a competitive disadvantage under current market conditions.

Considering the future exhaustion of fossil fuels, the emission of greenhouse gases and their global warming effect, and mankind's desire for a livable environment, the demand for green energy sources is certain to keep on growing. „[…] renewable energy sources […] are the only types of energy currently available that respond to the compelling challenge of sustainable development." (Dinica, 2006)

In order to facilitate this recognition and to support related efforts, the European Union expects its member states to deliver higher and higher proportions of renewables in energy production. The Directive 2009/28/EC set the target of achieving a 20 percent share of green energy in overall Community energy consumption by 2020. Thus the figure of 2010 needs to be (nearly) doubled, which requires large-scale investments from the green energy sector in the coming years. To this end, member states need to have renewable energy promotion schemes in place that are capable of creating an environment that is sufficiently attractive to investors.

Hungary has been operating a feed-in-tariff promotion system (hereinafter referred to as KÁT, the abbreviation for its Hungarian name) to support renewable electricity production since 2003. The main point of this price-based incentive is a guaranteed purchase agreement for the green energy produced, with a pre-determined price above the market rate. This is how policy makers adjust market preferences, which otherwise tend to ignore external environmental costs because of their focus on traditional economic cost factors. This scheme helped Hungary achieve a renewable energy share of about 6-7% by 2010/2011; the 2020 target figure set by the EU for Hungary is 13%.

Member states summarized the steps to be taken to achieve the year 2020 objectives and the milestones of their development path in national action plans. The Hungarian document, Nemzeti Megújuló Cselekvési Terv („National Renewable Action Plan", hereinafter referred to as NMCST) was ready by the end of 2010, and pledged to achieve a renewable share (14.65%) above the EU's requirement. To meet this goal, the country's green energy production capacity needs to be doubled/tripled, necessitating power generation investments in the several thousand billion HUF range altogether.

The targeted growth rate demands the amendment of the current promotion scheme, as it does not offer a sufficient level of incentive (NFM, 2011). At the end of 2010, accordingly, the government announced that the current KÁT scheme would soon be replaced by a new regulation called Megújuló Energia Támogatási Rendszer („Renewable Energy Promotion System", hereinafter referred to as METÁR). The basic principles would remain unchanged, that is, the new system would also be price-based, there would be no switchover to a quantity-based model of green certificates.

The planned effective date of the new regulation has been postponed several times, and investment in the industry has come to a halt as a result of this regulatory uncertainty. Given these circumstances, devoting my dissertation to renewable energy policies and to the evaluation of the situation in Hungary was an obvious choice.

Based on a thorough review of the qualities of price-based and quantity-based schemes, an evaluation of experiences from EU member states and on the opinion of Hungarian market actors, my thesis aims at formulating recommendations that facilitate the improvement of the Hungarian feed-in-tariff system.

Papers on the evaluation and analysis of regulatory systems (Menanteau et al., 2003), (Fouquet-Johansson, 2008), (Haas et al., 2011a); (International Energy Agency, 2011) usually conclude that feed-in-tariff (that is: price-based) systems are better-suited and more effective than quantity-based regulations, which set mandatory quotas for renewable energy production. This is the type that prevails in EU member states, as well: nearly 3 out of 4 countries opted for a feed-in-tariff scheme. Consequently, the Hungarian scheme being a price-based one clearly appears to be an advantage.

The year 2020 targets imply a significant growth in Hungarian renewable capacities during the next eight years. In addition, this growth path also presents some new challenges (developing a solar panel promotion scheme, a higher degree of price differentiation between technologies) that we have practically no experience at all with. Therefore it is of utmost importance that the new regulation be efficient, and that the lessons learned from the ten-year operation of KÁT be captured and incorporated into the new scheme. Exploring the strengths and weaknesses of the current scheme might facilitate the amendment and improvement of the system.

As the costs of promoting renewable electricity production (that is: the premium paid above the market energy price) will ultimately be paid for by the end-consumers through their electricity bills, the total cost of achieving a certain share of renewables is a very important aspect, as well. Both the theoretical overview of the functioning of feed-in-tariffs and the review of European experiences have contributed to my recommendations for keeping the burden on end-consumers under control.

The novelty of the approach employed in my thesis is the inclusion of a qualitative analysis along with the hypotheses and conclusions based on the quantitative analyses into the characteristics of the Hungarian promotion scheme. I was convinced that my recommendations must not only draw from the relevant literature, but also reflect upon the actual current situation in Hungary. The fact that I have been employed in the Hungarian renewable industry and hence have experienced the past two years' uncertainty myself has most probably greatly contributed to my determination. In order to illustrate the phenomenon, I conducted structured in-depth interviews with key actors, investors, regulators, experts and banks' decision makers interested in the Hungarian renewable energy industry. This enabled me to employ a complex approach, a synthesis of theory and practice, in developing my recommendations for the new regulatory system, which I very much hope will soon take effect.

II. Research Objectives and Methods

I set out to write my dissertation with the intention of delivering valuable recommendations for the new regulatory system of the Hungarian renewable electricity sector. An overview of the relevant literature, the analysis of the Hungarian regulation and the in-depth interviews were the means to achieve this goal.

In several feed-in-tariff countries, recent years have witnessed solar panels becoming excessively widespread, to an extent that even policy makers were puzzled by (Jäger-Waldau et al., 2011). The phenomenon has acted to contest the view that feed-in-tariff systems tend to be more efficient. The explanation is that the technology of photovoltaic (PV) power stations has been developing too quick for policy makers to keep up the pace in adjusting the tariffs. Therefore they introduce a tariff that exceeds the marginal cost of the technology, which then again leads to an investment boom. In my analysis of the problem, I drew from the environmental economics approaches[1] addressing the price-based regulation vs. quantity-based regulation choice under imperfect information. With regard to the environmental regulation issues examined, these theories concluded that the optimal choice between price vs. quantity-based incentives depends on the slope of the marginal cost and marginal utility curves associated with the problem in question.

If the policy maker happens to make a mistake and endorses a feed-in-tariff that is too high/low, the market might respond with a capacity/volume of production different from what was expected. The actual extent of the difference depends on the slope of the technology-specific marginal cost curve. In a quantity-based system, it is the desirable volume of renewable energy production that is set by the policy maker, in response to which the market generates the price for green certificates, that is: the premium offered for renewable energy production. If the quota they set is too high/low, the price of green certificates will most likely fail to meet their expectations.

Which one of the two types of regulation the potential error is greater for also depends on the slope of the technology's marginal cost curve and the degree of asymmetric information.

[1] For example (Weitzman, 1974); (Cropper – Oates, 1992); (Kerekes, 2007).

As a second area of research, I examined the amount the end users of electricity have to pay as their share of the costs of renewable energy promotion. For the premium (the portion above the market price) included in the feed-in-tariff is, after all, paid for by consumers. Therefore the arguments against renewables often include the need to keep the burden on end users under control. In my dissertation, following a one-by-one overview of the items on the electricity bill, a **quantitative analysis** is employed to derive the cost of green energy promotion per unit of electricity consumed, which I termed „green cent". Annual promotion costs were extracted from the annual reports of the energy authority, and they were divided by the net domestic power consumption figures to arrive at the actual green cent values. Subsequently, I compared these per-unit-of-electricity-consumption figures with amounts spent on subsidizing other, fossil fuel based power generation modes, which were extracted from corporations' annual reports, energy authority data sets and legislative texts. The comparison of the so calculated values of the „cogeneration cent" and the „coal cent" with that of the green cent (that is: the total and the per unit value of subsidies) supported my hypothesis.

My third area of research yielded more complex and more diverse findings. In the course of the **qualitative research**, I conducted 25 structured in-depth interviews. Respondents were selected based on personal acquaintance, the literature I consulted and the advice of professionals with a deeper knowledge of the industry. All 25 people in the sample were industry experts: investors, banking professionals, environmental economists, and current and former policy makers. I strived to find interviewees with a thorough understanding of the industry, people who had been active in the field for several years, almost since the introduction of KÁT. The main topics of discussion were the evaluation of the KÁT system (strengths, weaknesses, most useful/harmful amendments), an overview of the present state of the industry and the regulation, the feasibility of the year 2020 targets and any potential recommendations for METÁR in light of those objectives.

I had several reasons for employing the method of structured in-depth interviews. First, the Hungarian renewable electricity market consisted of 110 power stations (as of the end of 2010), which actually meant a total of some 60-70 potential respondents due to the cross-ownership of companies – a sample far too small for classical mathematical-

statistical analyses. Second, the proportions of wind and biogas power plants are particularly high, and they have certain unique characteristics. Third, I attached importance to asking the most well-informed employee at each company – for which a questionnaire survey could hardly have been the ideal vehicle. The fourth and possibly most important argument in favor of in-depth interviews was my intention to conduct a research study of a primarily exploratory nature, where respondents can freely express their opinions instead of having to choose from a given set of answer options, which might not even include all relevant possibilities.

Out of the 25 respondents, 9 were experts/policy makers, 9 were investors and 7 were banking professionals. I managed to conduct all interviews within one month, beginning in the middle of September 2012. There was no change in the regulation during that period, and no new communication, either, that might have influenced respondents' answers. As many as 80 percent of my respondents have been working in the industry ever since the introduction of the feed-in-tariff scheme, and the average experience of the remaining persons is not less than five years, either; thus the sample appears to indeed comprise individuals with a significant body of relevant experience and a well-founded opinion.

III. Findings

The review of the literature on price/quantity-based regulation systems, and the sources analyzing the root causes for PV bubbles inspired my **first hypothesis**:

> ***H1: For renewable technologies with a steep marginal cost curve, it is the quantity-based, while for renewable technologies with a flat marginal cost curve, it is the price-based regulation system that carries a greater risk of regulatory failure.***

For the purposes of my dissertation, regulatory failure is when the impact of a renewable electricity incentive system on the promotion of green energy significantly differs from the intended outcome. The PV bubbles, observed in several European countries, were caused by excessively high feed-in-tariffs for a technology that was developing rapidly and thus characterized by a rather flat marginal cost curve.

The Hungarian regulation does not really differentiate between technologies in terms of feed-in-tariffs, and thus the relative expensiveness of the PV technology has prevented investors from deploying significant solar power capacities in Hungary. However, should the METÁR prescribe a PV feed-in-tariff above the current level, hypothesis H1 will at once become relevant to the Hungarian regulation. Recognizing, developing an awareness of and avoiding the possibility of regulatory failure will be of key importance during the phase when the PV capacities laid down in the NMCST are being deployed.

There are several factors that might help Hungary avoid a case of regulatory failure. First of all, the monitoring of technological development is essential. Second, it should be clear to policy makers that this technology carries the risk of severe regulatory failure, the extent of which they should therefore try to keep within limits. A possible means might be a bit of quantity-based regulation, as it is the case with the wind energy quotas in Hungary: even though there is a set KÁT tariff, only a certain total amount of quotas is allocated to the actors. Another solution might be the German model, where the promotion of solar power plants is kept under control by decreasing the PV feed-in-tariff as the amount of installed PV capacity increases.

My **second hypothesis** served the purpose of contrasting the subsidies spent on renewable energy production with those poured into fossil energy production, per unit of electricity consumed.

> ***H2:*** ***In Hungary, fossil energy production receives a higher share of the amounts collected for such purposes from end users through their electricity bills than renewable energy production does.***

By allocating the amount of subsidies collected via end users' electricity bills (as derived by my own calculations) to the energy production mode they are intended for, I arrived at figures similar in nature to the widely-known concept of the coal cent. I calculated the values of the cogeneration cent and the green cent (as defined by myself), providing a per-unit-of-electricity measure of the subsidies spent on cogeneration and green electricity production, respectively. The results are shown in the figure below:

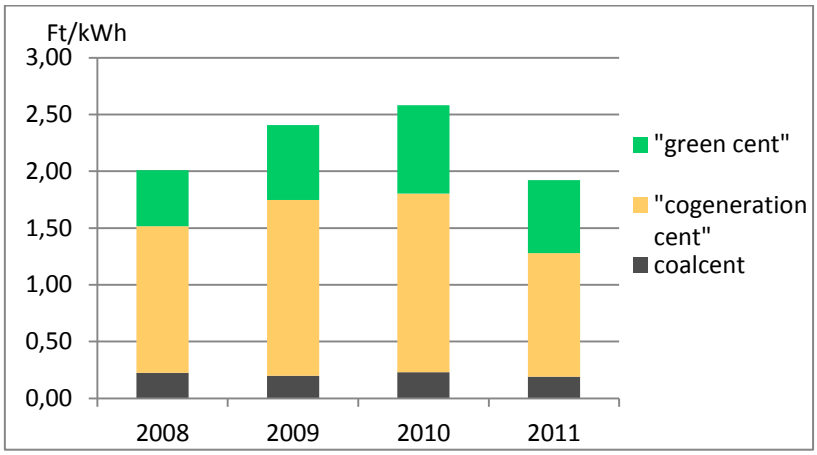

Figure 1: The values of the coal cent, cogeneration cent and green cent

Source: author's calculation

A possible interpretation of these figures is that while the green cent supports renewables, the other two items support fossil energy production, thus the sum of these latter two might be considered some kind of „fossil cent". The value of the fossil cent was 3.1 times that of the green cent in 2008, and the corresponding proportions for 2009, 2010 and 2011 were 2.6, 2.3 and 2, respectively.

This „centification" also points out that if the subsidization of these privileged fossil energy production modes would be abandoned (which will, theoretically, happen to the

coal cent in 2015), and if the two fossil cents would be added to the green cent instead, then the money spent on green energy production could be tripled without adjusting the relevant items (and hence the consumer price of electricity) on the electricity bill.

The green cent value I arrived at was less than 1.5% of the consumer price of low-voltage electricity in 2011. This proportion can hardly be considered high – neither in international comparison, nor considering the two-fold amount spent on subsidizing fossil energy production.

In light of the above, the purpose of keeping end user prices under control should certainly not represent a significant hindrance to the promotion of green energies.

Beyond developing hypotheses based on theories and calculations, it was an important objective of mine to also formulate conclusions and recommendations about the actual situation of the green energy industry in Hungary and to explore the opinions of the stakeholders actually participating in the sector. This was the purpose that the **third part of my research** was meant to serve. By processing and analyzing the 25 in-depth interviews, I validated the following hypotheses:

> ***H3: The primary reason why Hungary needs to increase its use of renewable energies is to enhance security of supply, while environmental protection and economic growth are less important goals.***

From amongst the three pro-renewable arguments most frequently mentioned in the literature, enhancing security of supply clearly emerged as the one my interviewees considered the first priority in the case of Hungary.

The following statements evaluated the ten-year era of the KÁT system:

> ***H4: It was only wind power stations and large-scale, mainly multi-fuel biomass power plants where the insufficiently differentiated system of feed-in-tariffs currently in place managed to achieve the installation of substantial capacities. For the time being, tariffs are too low for establishing smaller, new biomass power plants and solar power stations.***

H5: ***The greatest strength of the Hungarian KÁT system is that it created a predictable environment for green power stations.***

H6: ***The greatest weakness of KÁT is its insufficiently differentiated tariff system, while the second greatest weakness is the regulatory uncertainty caused by the government announcing but never actually providing any useful detail about the METÁR system.***

H7: ***At the moment, the most significant obstacle to the promotion of renewable electricity production in Hungary is regulatory uncertainty.***

The hypotheses clearly indicate that the regulatory uncertainty, which practically rendered KÁT dysfunctional about two years ago, causes significant difficulties for the industry. Power plant investments have come to a halt, as no one actually knows whether (and how) the regulation will change during the multi-year process of preparation and installation. Even though it was said to remain a price-based scheme, the priorities and the actual feed-in-tariffs of METÁR will certainly differ from those of KÁT – just no one yet knows how and to which extent. What this situation undermines is exactly the greatest advantage of feed-in-tariff systems: predictability.

Restoring stakeholders' trust in the reliability and the longevity of regulation will be one of the greatest challenges that the METÁR system will have to meet. Respondents' expectations from the new regulatory system can be summarized as follows:

The greatest challenge the METÁR system will have to face is whether it will be able to restore the credibility and predictability of regulation.

The appropriateness of the METÁR system's tariffs will be another key factor to the success of the regulation and the future of the industry.

Two additional challenges for METÁR will be to keep the burden on end users under control and to simplify the licensing procedure for green projects.

In the absence of appropriate regulation, investors and financial institutions will refrain from actively participating in the extension of green capacities.

IV. Summary of Conclusions, Recommendations for the Hungarian Regulation

Part of my research project explored the challenges the Hungarian renewable energy sector will have to face in the next ten years, and formulated recommendations for the regulatory system with respect to those challenges.

My first hypothesis illustrated that for technologies with a flat marginal cost curve, an erroneous tariff may lead to a significant divergence from the desired level of capacity extension. The resulting risk can, according to my proposal, be neutralized by introducing a quota system, and through an active dialogue with the industry, market monitoring and international benchmarking. The cases of so-called PV bubbles also offer important lessons to be learned about which tariffs might be considered too high and how the resulting issues should be overcome. As our goals for the year 2020 include a solar PV capacity (63 MW) that is quite significant in contrast to today's value of 0, it might be worth formulating the following recommendation:

Solar PV technology is characterized by fast development and short installation times. If Hungarian policy makers plan on increasing the tariffs – currently too low to effectively promote the technology – then their market knowledge should by all means be updated beforehand; and in order to prevent a potential PV bubble, an annual quota on new capacity should be in place, as well.

The same might also be achieved through a tendering system, by introducing annual maximum capacity levels, by reducing the tariffs as the installed capacity grows or in a way similar to how wind quotas are allocated.

An increasing share of renewables also brings about an increasing demand for, an increasing volume of green power subsidies, which is paid for by the end users. As of now, the Hungarian government seems committed to freeze household utility prices, a reason for which may be the economic crisis having weakened the population's financial position. This commitment might, however, hinder the further promotion of renewable energies. Which is why I considered it important to prove, by confirming my second hypothesis, that in the present scheme, certain fossil energy production modes receive amounts far higher than what we spend on subsidizing green energies.

The amount of KÁT subsidy spent on green power plants only grew by 27% between 2008 and 2011 (from HUF 18.4 billion to 23.3 billion), while during the same period, the amount of green energy produced increased from 1.771 GWh to 2.236 GWh, that is by 26%. Thus the price of renewable energy production has practically remained unchanged (as the tariff has been rising in line with inflation). As also evinced by the green cent figures I calculated, the subsidization of green energies does not, for the time being, put a significant burden on end users, whereas we spend (both on an individual and on a state level) nearly the double of that on supporting cogeneration and coal-based electricity production through our electricity bills. This is what my second recommendation is concerned with:

By abandoning or gradually phasing out the coal cent and the fee for the structural reorganization of the cogeneration sector, and by rearranging these sources to support renewables, the subsidy spent on green energies could be nearly tripled without any additional burden on end users. For similar reasons, it might be worth to do away with preferential electricity prices and redirect the sources in a similar way instead.

The third part of my research project comprised of conducting in-depth interviews with key actors of the industry, and drawing relevant conclusions. I confirmed that the announcement of the METÁR system two years ago along with the failure to actually implement it ever since has acted to fundamentally undermine stakeholders' trust in the regulation. As a consequence of the removal of the cogeneration sector from the KÁT system in the meantime and the retrospective amendments that affected the regulation of some other areas, the view that the introduction of the METÁR system might actually also affect the projects that have still been realized under the KÁT system has become surprisingly (to me, at least) widespread. Therefore the banks would not finance any new KÁT projects, or would only do so under very special circumstances. Investors, on the other hand, have refrained from starting new projects because of the repeated postponements of the deadlines. In order to preserve stakeholders' vision and their faith in the industry, it would be essential to subject the following recommendations to careful consideration:

The METÁR system must not have retrospective effect, that is, it must not influence the power plants operating within the framework of KÁT; it should have prospective effect, only affecting the projects the licensing of which takes place after its effective date.

Moreover, it would be crucial to eliminate the currently prevailing regulatory uncertainty.

The government should issue, as soon as possible, a reliable communication on the actual expected effective date (possibly one that they can indeed keep to) of the METÁR system. This would largely contribute to the predictability of the regulatory environment.

It would not be a problem even if that date was not one in the near future. If this is known in advance, then at least the investments that suit the old KÁT system could go on. As I already pointed out earlier: the absence of credible communication will keep investors at bay, right until the reliability of the policy maker has been restored.

Certain recommendations may even be formulated for the hopefully soon-to-appear METÁR system, as well, in order to increase our chances of meeting the year 2020 goals.

In order to achieve the year 2020 targets, the METÁR system needs to employ a tariff system that is more differentiated than the current one, and an increase in the tariffs for PV and biomass power plants seems inevitable, as well.

Given that METÁR consciously prefers smaller, decentralized units, this path will require a larger number of projects in order to achieve the desired growth rate than the current practice, which primarily focused on large-capacity biomass power plants and wind turbines. This increased number of projects may well be expected to put a larger load on licensing authorities, which will also have to cope with the challenge of speeding up their currently lengthy procedures and that of licensing new types of power stations (e.g. solar panels).

It would be advisable to introduce a simplified, uniform licensing process, to improve transparency and to develop the practices of licensing the new types of power plants along with the implementation of the new regulatory system.

Respondents were divided about the feasibility of the year 2020 objectives. They all agreed that the targets had actually appeared realistic at the time when the NMCST was issued (the end of 2010), yet as a consequence of the period that has passed since then without any significant advancements, without any noteworthy investments, but with a decreasing share of renewables, more than one third of them have become extremely skeptical about achieving the targeted rate of 14.65%.

I do sincerely hope that this proportion will not continue to deteriorate and that the policy makers will very soon put the industry back on a path of stable growth, the first (and in fact a crucial) step of which would be to give a clear indication of what the regulatory reform should be expected to be like.

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VI. The Author's Own Publications on the Topic

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