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## **ELECTRICITY MARKET OPENING AND ELECTRICITY GENERATION SYSTEM'S EXPANSION IN SLOVENIA**

### ***Abstract***

Slovenia is rapidly adopting the European Union (EU) legislation to make itself ready to be admitted among the fifteen EU member countries. In the area of energy or electricity supply industry, Slovenia has consequently enforced the Energy Law, which in its essence follows the idea of the Directive 96/92/EC. Globally, the Directive defines common rules of the internal electricity market within EU. Any EU member country is responsible for assuring a competitive electricity market and implementing corresponding instruments as foreseen by the Directive.

The share of the national market opening is calculated on the basis of eligible customers' consumption versus the overall consumption in a particular member country. Also, the Directive defines the rate of the electricity market opening. It is interesting to note that the EU member countries have been opening their national electricity markets at a greater speed than specified by the Directive.

The overall Slovenian Electricity Supply Industry shall have to adapt itself to new imperatives, whereby the greatest changes will by all means take place in the area of electricity generation. As the reaction of eligible domestic market customers is quite unpredictable, the direct electricity import from foreign countries can only be estimated on a variant basis. EU countries that have deregulated their electricity market have been, step by step, gaining valuable experiences. The majority of them show a considerable pressure on having prices of the EPS generation sector reduced.

A similar development can by all means be expected in Slovenia, too. It is expected that the major burden of the electricity market liberalisation and electric power interconnecting within EU will be carried by the EPS generation sector. The analyses of developed variants show that the burden, imposed by the transition onto the market economy, will be predominantly carried by the coal fired electricity supply industry. Further development of electricity generation of the type will depend on measures to be taken by Owners and Legislators, in particular in the light of an adequate adaptation of generation utilities to the newly arisen environment (stranded investments, (non) implementation of protection legislation, etc.).

# OTVARANJE TRŽIŠTA ELEKTRIČNE ENERGIJE I RAZVOJ PROIZVODNOG SUSTAVA U SLOVENIJI

## **Sažetak**

Slovenija se ubrzano prilagođuje zakonodavstvu Europske unije (EU) kako bi spremna dočekala da bude primljena među petnaest zemalja članica EU. U području energetike ili opskrbe električnom energijom, Slovenija je dosljedno promicala Zakon o energiji, koji u svojim osnovama slijedi Direktivu 96/92/EC. Općenito, Direktiva određuje zajednička pravila unutarnjeg tržišta električne energije u okviru EU. Svaka zemlja članica EU odgovorna je osigurati konkurentno tržište električne energije i uvesti odgovarajuće Direktivom predviđene instrumente.

Udio otvaranja nacionalnog tržišta utvrđuje se na temelju odnosa potrošnje povlaštenih potrošača prema sveukupnoj potrošnji u svakoj pojedinoj zemlji. Također, Direktiva utvrđuje stopu otvaranja tržišta električne energije. Zanimljivo je naglasiti da zemlje članice EU nacionalna tržišta električne energije otvaraju znatno brže nego što je navedeno u Direktivi.

Ukupni elektroenergetski sustav Slovenije prilagodit će se novim imperativima, pri čemu će se najveće promjene svakako desiti u području proizvodnje električne energije. Kako je reakcija povlaštenih potrošača na domaćem tržištu prilično nepredvidljiva, direktni uvoz električne energije iz inozemstva moguće je procijeniti jedino na promjenjivim osnovama. Zemlje EU koje su deregulirale svoja tržišta električne energije stječu dragocjena iskustva korak po korak. Kod većine očit je znatan pritisak za smanjenjem cijena u sektoru proizvodnje električne energije.

Sličan razvoj se u svakom slučaju može očekivati i u Sloveniji. Očekuje se da će glavni teret liberalizacije tržišta električne energije i elektroenergetskog uključivanja u EU podnijeti sektor proizvodnje električne energije. Analize razvijenih varijanti pokazuju da će teret kojeg donosi prijelaz na tržišno gospodarstvo najviše pogoditi postrojenja u kojima se električna energija proizvodi iz ugljena. Daljnji razvitak tog tipa proizvodnje električne energije ovisit će o mjerama koje će poduzeti vlasnici i zakonodavci, posebno u svjetlu odgovarajuće prilagodbe proizvodnih pogona na novonastalo okruženje (investicije bez komercijalnog pokrića, (ne) provedba zaštitnog zakonodavstva, itd.).

## **1. INTRODUCTION**

In the area of energy or electricity supply industry, Slovenia has consequently enforced Energy Law (EL) [1], which in its essence follows the idea of the Directive 96/92/EC [2]. Globally, the Directive defines common rules of the internal electricity market within EU. It was approved by the European Parliament and the European Council (EC) at the end of 1996. Prior to this, on October 29, 1990, EC had agreed on two non binding acts regulating electricity transit (Directive on Transit of Electricity through Transmission Grids)

and price transparency for electricity supplied to end users (Directive concerning a Community Procedure to Improve the Transparency of Gas and Electricity Prices Charged to Industrial End Users (90/377/EEC) dated June 29, 1990). The two acts represent the first phase of the development of the internal electricity market within EU. Provisions of the Directive took effect in February 1999.

Any EU member country is responsible for assuring a competitive electricity market and implementing corresponding instruments as foreseen by the Directive. The share of the national market opening is calculated on the basis of eligible customers' consumption versus the overall consumption in a particular member country. Also, the Directive defines the rate of the electricity market opening. It is interesting to note that the EU member countries have been opening their national electricity markets at a greater speed than specified by the Directive. The major problem of the common EU market presents mostly limited interconnection capacities and cross border transmission pricing [3].

The Slovenian legislation governing the area of energy is very liberal as it sets the threshold to be attained for being granted the status of the eligible customers rather low. The threshold is 41 kW of the connecting power, this represents almost 65% of the overall consumption in the country. Taking into account that the status of eligible customers is being held also by distribution utilities, this means as much as the 100% share. In 2003, eligible customers will be given the right to buy electricity outside the system that will be covered by the System Operator (SO). It should herewith be well noted, that the share of thus purchased electricity will by all means be subject to negotiations and in particular a reflection of the generation sector of the electric power system (EPS) to market conditions and restrictions as may arise at ensuring imported electricity.

EU countries that have deregulated their electricity market have been, step by step, gaining valuable experiences. The majority of them show a considerable pressure on having prices of the EPS generation sector reduced. A similar development can by all means be expected in Slovenia, too. It is expected that the major burden of the electricity market liberalisation and electric power interconnecting within EU will be carried by the EPS generation sector.

The EU member countries have entered the power market deregulation and formation of the internal electricity market with adequately technically and financially "equipped" systems, thus disabling the newly introduced competition and the system breakdown to cause significant problems. The situation in Slovenia is quite opposite; the system experiences temporal difficulties accompanying quality and reliable electricity supply. Slovenia is already now much depending on the electricity exchange, and losses of the EPS sector have been permanently present for the last couple of years.

The majority of EU countries that have enforced new acts (laws and other regulations) to adapt themselves to the newly arisen situation have taken due regard to respond to their own specific situation and to optimally respect their own national interests.

## **2. ELECTRICAL GENERATING SECTOR EXPANSION PLANNING WITHIN THE ELECTRICITY MARKET**

Operation, and in particular expansion planned for the EPS generation sector are approached in compliance with several legislative documents, either directives, requirements, rules or recommendations [4]. They altogether define the following:

- requirements for a quality and reliable electricity supply,
- assurance of system services in the area of electric power,
- criteria for qualified power production,
- production system design criteria,
- environmental criteria - Kyoto Protocol and
- planned electricity demand.

Along with the establishment of the electricity market, the meaning, and in particular the content, of the above requirements will of course be constantly changing to meet current needs. There will nevertheless be some autonomous categories that will be paying no regard to market principles; they will be set up strictly in compliance with the adopted legislation. In Slovenia, the liberalisation of the electricity market pursues the following targets:

- purchase of electricity outside the system [6] as Third Party Access (TPA),
- equalisation of investment costs and fuel prices on the EU level to allow for establishing independent power production in Slovenia, presumably on current locations,
- combination of above options.

It has been assumed that (without an adequate financial disburdening and corresponding organisation of the generation sector) in the first phase (the years to come), the market deregulation will be manifesting itself mostly through direct electricity import. In the second phase, having established the equilibrium between consumption and production within EU, the free electricity market will be developing at an increased share of independent power production. In EU, the construction of power plants has followed agreed plans unlike consumption, i.e. the planned demand was greater than the actual one, the result being the current surplus of generation capacities. In Slovenia, this will take place on existing locations.

When contracting electricity outside the system, a hypothetical assumption is taken into account regarding mode, regime, quantity and cost of such contracting. The main considerations are herewith paid to quantities and regimes as well as simultaneous assurance of quality and reliability of electricity supply.

Any estimation based on the import share is quite questionable as EL defines that the threshold for obtaining the status of an eligible customer is 41 kW. Such customer will be allowed to purchase electricity anywhere (inside or outside the system). The actual decision about the purchase location (inside or outside the system) will be with individual customers. It is therefore necessary to define the limit between the rate of the market deregulation, as foreseen by the Law, and the actual electricity contracting abroad.

The analysis tree which duly follows directions set forth for the generation sector deals, in the variant form, with the expected quantities of the imported electricity. The tree implementation is based on the following assumptions:

- directly imported electricity is kept on the present level - some 10% - designation U10, protection legislation in compliance with article 24 of EL is observed, an adequate disburdening of the national generation by means of stranded investments is facilitated, grounds for long term independent generation are established,
- the import in the horizon year (i.e. 2020) represents a >20% share in the electricity consumption - designation U20, measures aimed at preservation of the current share of electricity generated from domestic coal are not implemented as planned,
- import in the horizon year (2020) represents a  $\approx$  30% share in the electricity consumption - designation U30, there are no measures adopted to motivate market efficiency of the domestic production.

The analysis of the market deregulation is based on the optimistic program (the Directive stimulates renewable sources) for the construction of run-of-river hydro power plants (HPP).

According to the program for the modernisation and construction of thermal power plants (TPP), environmental sanitation of large electric power facilities has been completed and a considerable effort is being laid in construction of combined heat and power plants (CHPP). Further exploitation of domestic coal and the need of the consequently required new capacities will be decided upon after the reaction of the Slovenian market is known (various import options). At the same time, the answer will be given to the question whether or not older units, further in service or already out of service, will still be maintained.

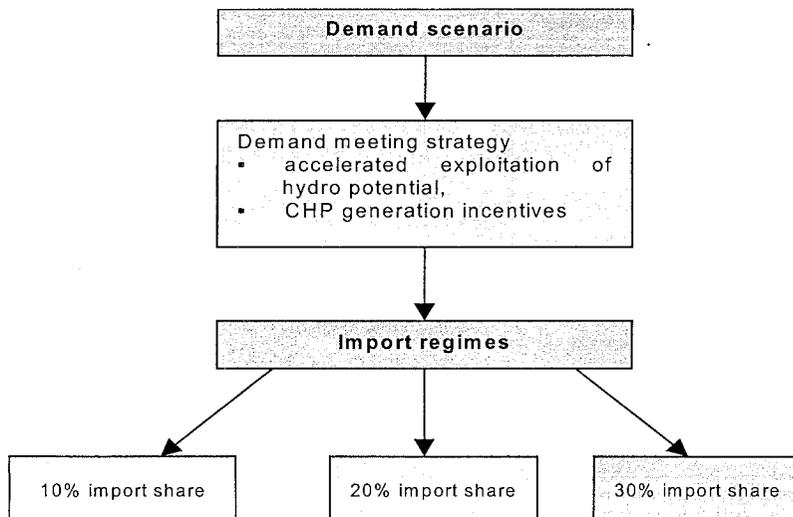


Figure 1. Analysis Tree Following Development Directions and Assumed Import Shares

### 3. ANALYSIS RESULTS

Speaking in terms of the EU Directive and globalisation processes, the Slovenian EPS, not excluding of course the overall Slovenian Electricity Supply Industry, will not be able to pursue the set targets at the foreseen speed as there are several important conditions for fast development and construction of particular generations units missing. The option in the field of the future power plant construction that might be realistically attained is more in their independent production rather than as a result of funds invested in them by the state, i.e. the current system Owner.

By the time when normal conditions for independent power production are established, the electricity market deregulation will most likely be exhibiting itself in direct electricity contracting abroad and in pressures aimed at having prices of the home generated electricity adapted to the new market environment.

Some development options can be found in the area of the run-of-river HPP construction, i.e. exploitation of the Slovenian hydro potential. One of the development elements of the Slovenian electricity supply industry concerns qualification of electricity generators.

Slovenia lacks primary energy sources in particular fossil fuels. This makes it rely on imported energy carriers (natural gas) and consequently dependent on import. It is the thermal part of the Slovenian EPS that will be predominantly affected by this fact. Diversification of primary energy carriers must nevertheless remain one of the principal targets of the demand meeting development strategy for Slovenia.

The perspective of the thermal part of the EPS production sector is principally in the possibility of having combined heat and power plants constructed to meet the heat demand, and at the same of producing high efficiency electricity from primary fuels, in particular from natural gas. For such high efficiency units, adequate heat consumption should be ensured so as to match their installed power.

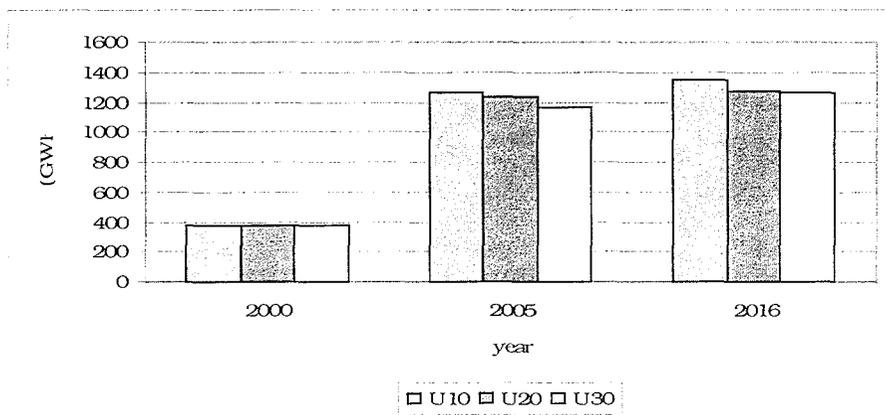


Figure 2. Shares of Large Combined Generation Units in the EPS Electricity Demand Meeting

Each variant of the foreseen market opening, i.e. U10, U20 and U30, affects the EPS operation and development differently. Their effect on operation, production of individual TPP and HPP is shown in Figures. 3 and 4.

Unless adequate measures are taken, or if they are inappropriate (absence of disburdening and protection of domestic generation units), it is expected that after 2003 (the year when eligible customers will be allowed to buy electricity outside the system), there will be a considerable electricity purchase increase outside the system. Variant U30 is the one that is believed to have the greatest probability of short-term commitments. Compared with the reference electricity balance for 2000, it is believed that, in the generation sector, this balance will cause the market opening to presumably mostly affect the current generation and future construction of the classic (domestic) coal fired technology.

Generally speaking, the comparison with the reference year 2000 reveals that it may be expected, as regards generation, the balance to be most favourable for hydro and combined generation plants. At the same time, contracting of imported electricity, too, will increase, in particular as a result of diminishing the share of domestic coal fired generation (assumption of absence of protection and disburdening and thus retaining current price levels for electricity generation from domestic TPP).

In comparison with the reference year 2000, the variant U30 assumes that by 2005, the coal fired generation will decrease by 38%. The electricity import and adoption of advanced technologies will replace almost 25% TPP generation. At such dynamics, the old TPP units will be closed down already in 2004.

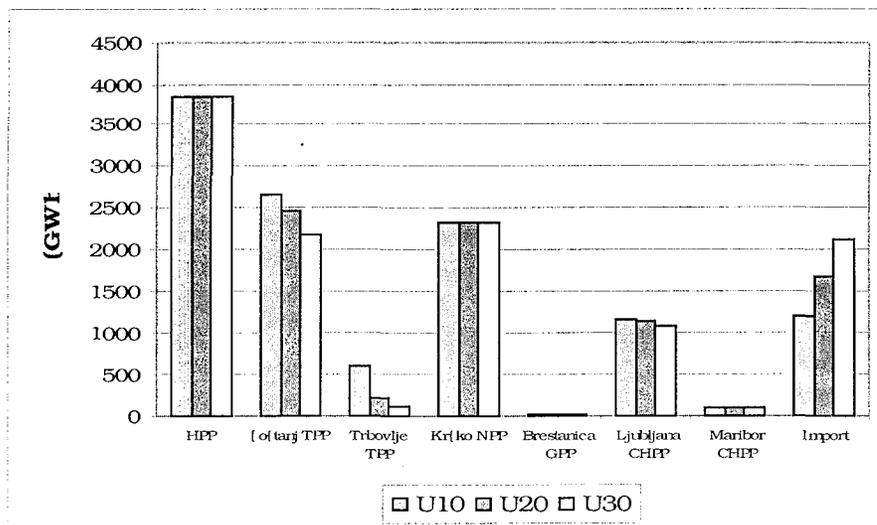


Figure 3. Slovenian Power Plant Generation in 2005 at the Foreseen Electricity Import

Figures obtained with variant U20, with which in 2005 the domestic coal generation loses 27.1% of its production in 2000, are to some extent lower. The state of the coal

generation upon disburdening and protection, as foreseen with variant U10, is better. It is nevertheless estimated that advanced technologies and hydro generation will replace their production by over 10%.

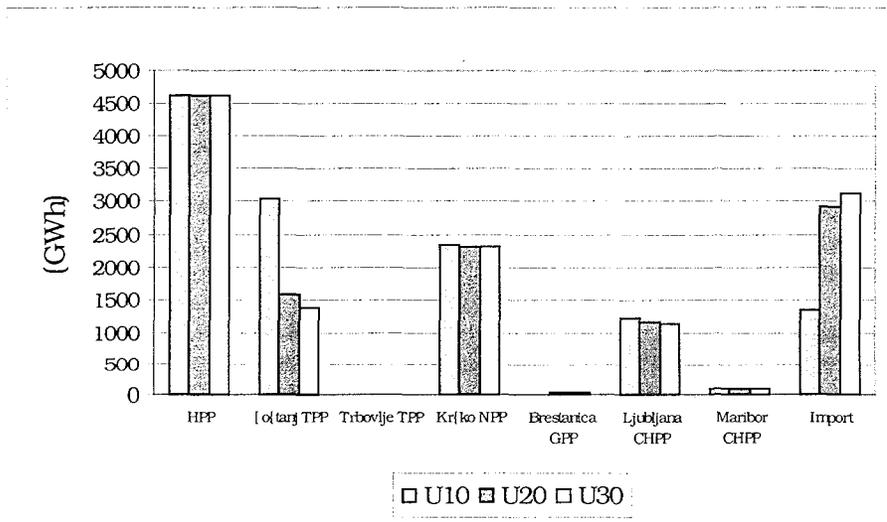


Figure 4. Slovenian Power Generation in 2016 at the Foreseen Electricity Import

Along with years, the foreseen circumstances (a view at 2016) worsen. The worst may be expected in case that the import logic is given priority over the construction of substitution of coal fired TPP. The consequence of such decision will most likely be the shutting down of the coal mine due to the fact that results for 2016, assumed with the U30 import regime do not show the need of having the coal fired TPP substitution units constructed. This means that only one large coal fired TPP (no extension of the TPP beyond 40 years of its operation being expected) will remain in operation. For the mine, this means that no more than 1600 kt of coal annually will be dug out.

The U10 option foresees that, despite the given assumptions for 2016, the domestic coal generation will go on losing 17.3% of its referencing generation. This means that the decrease will mainly be the result of the difference of the Trbovlje TPP generation, which will in this year, despite the protection of its generation in the preceding years, already be out of service due to the closing down of the Trbovlje mine and expiration of its foreseen life.

Other quantities are over individual strategies of the foreseen electricity demand meeting satisfied through import, depending on individual variants. It should be noted that questions related to interconnections limit capacity for thus foreseen imported quantities are not analysed here. Figure 5 shows the foreseen direct electricity imports for individual import variants.

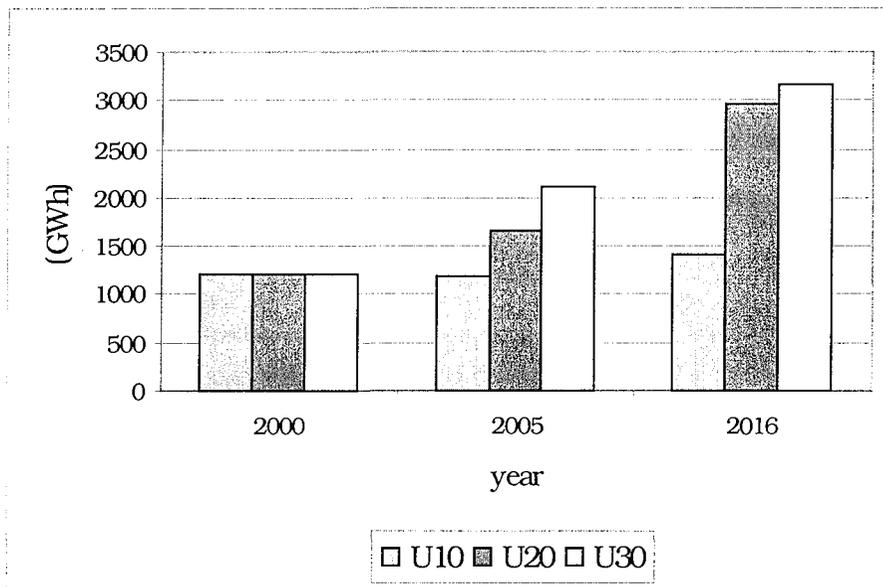


Figure 5. Foreseen Electricity Import

EL allows the domestic generation to be protected within 15% of the primary energy as needed for the generation of electricity consumed in the observed year. Such protection is needed to assure reliable electricity supply though it has been noted that by means of this instrument the EU member countries protect electricity generation from coal of a lesser quantity types, i.e. they protect generation not tolerated by the market.

The obtained results show that at the U30 foreseen import and the protected Trbovlje TPP generation the overall share of the protected Trbovlje TPP generation share is 8.4%. If a decision is taken to use the overall protection allowance, a part of the remaining coal generation may thus be preserved. Apart from the Trbovlje TPP production protection, this would also mean that electricity generation from other domestic coal units (not all of them) will be retained on the level between 300 and 400 GWh annually.

#### 4. CONCLUSIONS

Slovenia is rapidly adopting the EU legislation. Within EU, the basic guidelines governing operation and development of the energy sector are determined by its Directive, whereas in Slovenia this is regulated with the recently enforced Energy Law, which globally follows the idea of the Directive and is market oriented.

While the Law defines general traits of the new approach to the electricity market, the responsibility for the very important details will be laid with legal sub-acts. As they are still not known, they present a very serious obstruction for the energy sector in its endeavour to adapt itself to the newly arising environment.

The liberalised open electricity market will undoubtedly (variants) have a very strong impact on the current shares in the electricity generation in Slovenia. It is believed that, as a consequence of the level of the Slovenian electricity market liberalisation and inadequate adoption of measures in the generation sector, the domestic coal industry will be the one that will be the greatest loser.

There are several possibilities for this type of generation to get adapted to new circumstances. The decision that has already been taken is that there will be no transition period. This will allow the industry to get well prepared for a successful market bid in future.

The greatest expectations are focused on the so-called stranded investments. With this regard, it will be necessary to disburden all the generation utilities, in particular the coal generation, to such an extent that, at the formation of the Slovenian free electricity market, they will be able to cope with the foreign competition. It should well be born in mind that this mode has been widely accepted all over EU in order to disburden the domestic generation, despite the fact that the overall EU generation has been financially well provided for (unlike in the Slovenian case, there have been no losses in the EU electricity sector) and, compared to the Slovenian industry, finds itself in a much better situation.

In the area of new production capacity planning, too, the market-oriented way of thinking will bring forth new ideas. The main changes are expected as to who and how new generation units will be financed. On the short-term basis, the state will retain its major share in EPS, whereas in future, independent power production, mostly financed through foreign capital, will strengthen.

As a result of the TPA principle, the market opening will reveal bottle necks in the transmission and distribution network. This will give rise to an increased wish to have new transmission and distribution paths constructed, which has, speaking in terms of assurance of new corridors, a rather negative connotation.

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