ENERGETSKI PORTAL SRBIJE
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ENERGY PORTAL OF SERBIA

E-NEWSLETTER OF THE ENERGY PORTAL SPECIAL EDITION JANUAR 16 2015 | NUMBER 1

Renewable Energy Sources and Energy Efficiency in 2015 and beyond

The turn of the year presents a usual moment to consider what is behind us. On setting goals, global and regional trends and developments in the energy sector, we have talked to Hon. Branko Terzić. Author: Jadranka Mašić-Pavlović

EP: Hon. Branko Terzić has been known for his expertise and a remarkable career not just in USA, but has gained recognition worldwide. What an esteemed member of the energy community you are, speaks also the fact that in 2009 you were admitted to the Hall of Fame in Energy Efficiency. For your fellow engineers who have aspirations to trade in your wake, to try and enumerate all your achievements could be somewhat overwhelming. Why don't we start by you telling us a little bit of how has your career progressed in the energy sector since leaving university?

BT: „My Bachelor of Sciences degree from the University of Wisconsin – Milwaukee (UWM) was in "energy conversion engineering" (a combination of mechanical and chemical engineering) and later the Regents of the University of Wisconsin system and UWM honoured me with a Doctorate of Sciences in Engineering 'honorus causa" in 2009. However, my career was actually based on a single course in the economics of regulated monopolies ("public utilities"). That course gained me a summer position with The American Appraisal Company in my home town of Milwaukee Wisconsin.

"At this point in time, the second decade of the 21st Century with seven billion people on the planet only two billion have adequate energy service including electricity service delivered to the residence. Another 2.6 billion have inadequate service and the remaining 1.4 billion people have no electrical service at all...Those 1.4 billion people without service will need electricity supplied from a combination of conventional fuel (fossil fuel, nuclear, hydroelectric) and renewable solar, wind and biofuels"

- Hon. Branko Terzić

With representatives of the Agency for Energy of the Republic of Serbia

The job was in the valuation department for electric, natural gas, telephone and water systems. Based on that experience the Wisconsin Electric Power Company hired me after graduation to provide valuations of small municipal electric systems which they were to acquire and to be liaison with state and federal regulators. For a short time I was also the first person to hold the title of "Environmental Engineer" at that company.

From that position I progressed through a series of professional positions in the consulting firm of Associated Utility Services Inc., (later AUS Consultants) where I reached the position of Group Vice President. At the same time I was active in politics in the Republican Party of Wisconsin. I was Chairman of the Republican Party in the city of Milwaukee at the same time that George H.W. Bush was National Chairman of the Republican Party. In 1981 Governor Lee Sherman Dreyfus of Wisconsin appointed me as a Commissioner on the State of Wisconsin Public Service Commission (WPSC). That state government agency regulated the electric, natural gas, telephone and water systems in the state. I was the first Serbian-American to reach that high position.

MY PSC experience and political positions led to my appointment in 1990 by President George H.W. Bush to the Federal Energy Regulatory Commission in Washington DC. Again I was the first Serbian-American immigrant to reach that level in the US federal government.

Following my service on the FERC I served as Chairman, President and Chief Executive Officer of the Yankee Energy System Inc. a New York Stock Exchange listed company based in Connecticut. After leaving Yankee I became a Director of Deloitte & Touche in 1999 serving as Global Regulatory Policy Leader, Regional Managing Partner for Energy for Deloitte Central Europe in Prague, Czech Republic and finally as Executive Director of the Deloitte Centre for Energy Solutions in Washington DC and Houston Texas. I retired from Deloitte in May 2014 and started Branko Terzic Associates, Inc.

EP: Until 2012 for a five year mandate, you chaired a UN ECE committee, which must have been a unique experience and a great honour. What is the role of such organizations internationally?

BT: The United Nations Economic Commission for Europe is made up of 56 countries including all of Europe, the former USSR states, Turkey and Israel. The group is headquartered in Geneva Switzerland. For a period I chaired the Ad Hoc Group of Experts on Cleaner Electricity from Coal and Other Fossil Fuels. The members met twice a year and held seminars on the technologies of "clean coal", carbon capture and sequestration or storage (CCS) and related issues. Serbia was represented on the committee as well as the other former Yugoslav republics.

These types of international forums are useful for collecting information from a wide variety of countries and sources, for discussing and understand the results and significance of new research and technologies and for forging personal contacts useful in applying global knowledge locally.

The limitations are that such committees do not solve problems nor do they themselves finance or promote necessary basic research and later commercialization of new technologies.

EP: What is the focus of your new consultancy Branko Terzić & Associates, Inc.?

The firm of Branko Terzić & Associates, Inc. is focused on management consulting to regulated industries, investors in regulated industries and regulatory agencies. At this point I am open to all enquiries as I am a strong believer in letting the "market' decide which services are required. The types of services offered include project valuation and feasibility studies, strategy analysis and economic analysis of regulated markets.

Speaking at Energy Efficiency Forum

EP: Are there any really global trends in RES and EE which should be noted?

Renewable energy supplies and energy efficiency investments continue at a rapid pace but from a very small base. International Energy Agency reports (IEA) and other studies project this growth. I believe that new technologies in energy storage will emerge and provide the basis for even more rapid growth. The key questions are a) which of the various competing technologies (various battery chemistries, compressed air, hydrogen, etc.) will be most successful and 2) when will the new technologies become economically competitive. As the cost of renewable solar and wind power projects decreases, due to technical improvements and manufacturing scale, more and more of these technologies will be implemented. In the case of OECD countries the driving factor will be greenhouse gas emission avoidance. In the case of developing countries many people may get their first home electricity services from low voltage systems powered by solar and wind units providing basic electricity for lighting, communications, video and informational technologies.

Photo NASA earthobservatory.nasa.gov

EP: What do you see globally for growth in energy efficiency and renewable energy investments?

The availability of energy to consumers and the structure of the energy industry is unique to each country in the world. At this point in time, the second decade of the 21st Century with seven billion people on the planet only two billion have adequate energy service including electricity service delivered to the residence. Another 2.6 billion have inadequate service and the remaining 1.4 billion people have no electrical service at all.

I believe that the developed (OECD) countries, which have adequate energy services, will continue to introduce both energy efficiency services and renewable energy supplies as climate change issues become paramount.

The lesser developed countries. Those with inadequate service, will still need to add electric generating capacity to meet reliability needs and support economic improvement all requiring 24 hour a day electric services seven days a week. Some of that need will be met by renewable energy. It is curious that in sub-Saharan Africa 72% of the people have mobile telephones but only 27% have electric service to their homes. This is a failure by those governments to establish a regulatory system which will attract investors to provide electric service just as mobile telephone service investment has been attracted there.

Those 1.4 billion people without service will need electricity supplied from a combination of conventional fuel (fossil fuel, nuclear, hydroelectric) and renewable solar, wind and biofuels.

Thus there is a growing role for renewable energy supplies and energy efficiency globally, but this role will be different according to the state of national governance, economic development conditions and economic resources.

"Today there are some 435 nuclear power reactors operating in 31 countries plus Taiwan, with a combined capacity of over 370 GW. In 2011 these provided 2518 billion kWh, about 13.5% of the world's electricity. Over 60 power reactors are currently being constructed in 13 countries plus Taiwan (see Table below), notably China, South Korea and Russia."

World Nuclear Association (http://www.world-nuclear.org/)

EP: What is your take on re-introduction of nuclear energy?

BT: Except in the USA, all other new nuclear investments are being made by state owned enterprises with the financial backing of their sovereign governments. The countries most active at this time in nuclear construction are China, India and Korea. Nuclear power is safe, reliable and does not produce greenhouse gases during the production of electricity. The management of spent nuclear fuel is well understood and is safely done in France, Canada, USA and other countries with long history of nuclear power.

Large new nuclear power plants, at about 1,000 MW installed capacity, are also very capital intensive (about $5-1O billion per unit), require long construction times and have had a history of cost overruns.

One new development to watch is the small modular nuclear (SMN) power plants proposed in the US which are sized at 50-150 MW, can be built at a factory and can be assembled and disassembled quickly compared to the conventional nuclear plants.

EP: How does the current low price for crude oil affect investment in RES/EE?

BT: The prices of crude oil is not a major issue in most places for RES and EE. The reason is that oil is mostly used for refining into gasoline and thus in most developed countries is not a fuel used for electricity production. There are exceptions such as Japan which has closed its 52 of 54 nuclear power plants. Other fuels affect RES and EE more. Low prices for natural gas in North America have resulted in the increased use of natural gas for electricity production, replacing coal, and in lower electricity prices to consumers. While the prices of solar panels have declined dramatically and wind units declined somewhat, the lower fossil fuel costs have made these renewables less attractive in some cases.

This same lower cost of electricity has also diminished savings from some proposed energy efficiency projects relating to electric usage.

In most situations investment in energy efficiency is the lowest cost way of lowering energy bills. The monthly energy bill is a function of the price of the energy and the amount of energy used. People do not use fuels or energy directly. Electricity or fuels are used by our equipment and devices. Lowering the amount of energy consumed can be done by either changes of operations (such as lowering the thermostat) or investing in energy devices which use less energy for the same output. Thus, in most cases lack of improvement of energy efficiency is a function of lack of investment capital. Yes, a new refrigerator, new water heater or new furnace would use less energy but consumers do not have the capital or credit to borrow to buy the new energy efficient devices.

However, these are still savings to be made as new financing mechanisms in the USA have allowed consumers to add solar panels without making any upfront capital investment. This trend will continue.

EP: Today's laws stipulate that distribution network must take the whole of the RES production regardless of where it is located and when it switches on. That causes major problems for large electro-power systems which suffer from decrease in their own production due to this random switching on and off of RES?

The EE Forum Hall of Fame

BT: Many RES advocates offer Denmark as an example of a country which receives 80% of its energy needs from solar and wind sources. Had Denmark been an isolated island it couldn't have functioned the same way. They receive as much as energy as needed from other countries in the region, it is a regional system.

When capacity production is in question, should a country, say Wisconsin with 35Mw, all 35Mw have to be produced conventionally (from coal, natural gas, nuclear). The point of RES is not the electricity, their purpose is to decrease the CO2 emission and that is the sole benefit of RES. A state cannot rely on RES -to keep the light shining which is something that politicians do not understand, while environmental activists either do not know or do not want to admit that. Yes, I know that the problem can be solved by installation of storage of electricity, but that technology is not available today. I am all in favour of RES, but I do understand that RES are not needed or useful to keep the light shining, but as vitally necessary to cut on the CO2 emissions, and they cannot be insisted upon at all costs.

Another important aspect in RES is changing the awareness of the consumers who have installed solar panels. They believe that because of that, they should not be paying for their grid connection. I would ask them if it have ever occurred to them when they go on vacation to inform the landlord that they would not be paying the rent for that week as they were not occupying the room for the period of time?

EP: What do the studies concerned with RES and EE projects worldwide show?

BT: The International Energy Agency, the U.S. Energy Information Administration and other research bodies have forecasts available of growth in renewable energy into the future by region and even by country. Most of these studies avoid assumptions about changes in government policies with respect to the issues of climate change and green-house gas emissions. However, many advocacy groups, as well as the UNFCC, have their own reports and studies which indicate that a massive reduction in fossil fuel use is necessary to avoid the consequences of carbon dioxide concentration increases. At this point the issue of global RES implementation is a political and economic one, not a scientific question.

EP: Having said that, what factors are necessary for RES/EE growth in countries such as Serbia?

BT: The factors necessary in Serbia are the same factors necessary anywhere. Firstly, these include the existence of an established and viable regulatory system resulting in prices for electricity and natural gas free of subsidies and adequate to fund adequate, reliable and affordable basic services.

Secondly, a national policy with respect to renewable and EE is needed which recognises the value of energy from non-green-house gas emitting sources and provides the correct pricing signal to renewable development. I am reminded that Serbia's electricity rates were the lowest in Europe during the Milosevich era at about 3 dinars per kilo-watt hour when EPS had to purchase wholesale electricity at 30 dinars per kWh. The low rates also meant excessive use of electricity by households especially for area heating. Rates have risen substantially to compensatory levels since then, but I do not know whether commensurate efficiency improvements have followed.

"Serbia has produced excellent power engineers, some now working at the highest levels in the US, so I believe the issues in Serbia are more structural and managerial than technical. Serbia's Agency for Energy Regulation is also first rate with well-educated and international-ly informed staff and could implement effectively well-crafted new laws."

Lastly, investors must be convinced that national policies and regulatory decisions will be made with enough stability to justify capital investment in long-lived renewable electric production assets

EP: Serbia is preparing for a restructuring of EPS this year, and a possible finding of a strategic partner in 2016. We are witnessing the implementation of many energy infrastructural projects, regarding cross-border and national transmission systems and coal production capacity enhancement, in the coming years. What is your take on major energy infrastructure projects in Serbia in general?

BT: I am not as familiar with the various aspects of Serbia's energy infrastructure as I was in 2001 when I was working more in the region. There have been a number of studies of EPS, including one back in 2001, which the various Serbian governments have seen, which indicated that EPS could be a) restructured to operate more efficiently as a government owned series of entities and b) which indicate that EPS could be a candidate for privatization with ensuing efficiency improvement.

Serbia has produced excellent power engineers, some now working at the highest levels in the US, so I believe the issues in Serbia are more structural and managerial than technical. Serbia's Agency for Energy Regulation is also first rate with well-educated and internationally informed staff and could implement effectively well-crafted new laws

At a longer term it is not necessary for the state to invest its capital into the energy system since there is enough capital in the world and possibly in Serbia to invest into it. It might be wiser to invest public funds where private capital does not, that is in schools, roads, hospitals, whereas in areas where the private capital has the necessary experience, which is energy and oil, that is not necessary. On the other hand, in the west there has been a hundred year long tradition of a regulated private monopoly, which with a solid regulation functions very well. Today in the USA there are still many states which kept the regulated vertical monopoly system, and those states and their citizens do not see any interest in introducing competition.

With respect to natural gas, while the cancelation of the South Stream project has been a shock to Serbian politicians, that pipeline was never an economic project. It was a political decision to by-pass Ukraine and build a very expansive pipeline project across the Black Sea. It would not have brought "cheaper" gas to the region. A solution would be for Russia and Ukraine to agree to an international regulatory agency to calculate the fair fee for transit of Russian gas through Ukraine with the result that the new transit fees would support further expansion of the Ukraine transmission system of Russian gas to Europe. Serbia's gas industry suffers from government indifference to non-payment of bills, especially by governmental agencies and state owned enterprises. These things can all be fixed if the government is willing to do so

EP: Energy is a major issue in EU, and as a candidate country we need to find our own way into this complex and complicated field. What would be your advice, also having in mind your working experience in the region?

BT: European Union did some things well, however, there are others which are poorly implemented. Introduction of the competition for one. It was much better in Germany than in France for example since they did not insist on unbundling of companies. Therefore, public utilities have prevented others from buying even though on paper it looked as if there is competition, in practice it was not the case.

Secondly, there cannot exist a European network should there not be a European regulatory body, since without it all its parts are under jurisdiction of different national governments. These parts are governed by different laws, economic principles, tariffs, which is referred

„Coal gasification is somewhat set aside due to the low prices of other fuels, however IEA has shown that in the next 20 – 50 years the decrease of coal share shall only be 2% (from today's 38% to 36%) "

to as the “seams problem”. In the USA we are dealing with the same problem up to a point, however there are four networks and one federal regulatory body

This situation prevents Europe from having integrated long distance transmission networks, and the EU is becoming aware of that and they are making steps towards a European regulatory body. Still, it might end as a purely coordination body, with no real power.

In 2001 the original text of the Act on Agency for energy of the Republic of Serbia has been passed with a change in a single sentence which made the whole difference. The passed law stipulated the right of AE to govern the methodology and permitted the right to confirm rather than set the price of electricity. One reason behind it is that the public utilities do not need state regulatory bodies. The biggest government owned electric utility in the USA – the Tennessee Valley Authority (TVA) operates 11 fossil, 29 hydro-power plants, and several nuclear plants. They set the prices themselves and there is no need to fear that they might create private profit as they are publicly owned. However, in future, should EPS be privatized, the law needs to be changed so that prices are set by the independent regulatory agency.

EP: What is the rule of the thumb for regulating a market?

BT: In 1999-2000 California created an independent electricity market. In 2001 it completely collapsed, with prices plummeting, power outages, and overall chaos. It served as an argument for some that electricity market cannot be created. At the same time, an even larger market, namely Pennsylvania – Jersey - Maryland – PJM grid has been doing great for years! This leads to a conclusion that the example of California is a showcase of how poor legislation creates poor results. If you design a marker badly, it will work badly. The California law had been politically crafted. This illustrates the fact that laws cannot be written by people who do not know the market. This has been the first lesson learned and the principle of a good electricity market – it takes good legislation and proper rules.

The second factor is that a competitive market cannot be introduced where there is an existing electric supply shortage. It would result in sky-rocketing the prices and create a set of small monopolies over separate production capacities. Should, for example.. the state of Wisconsin have only 30MW at disposal out of a demand of 35Mw which it needs, each owner of a power plant is a monopoly in itself as it does not have a real competition. In order to introduce a market, there has to exist enough capacity and large enough energy surplus.

Thirdly, there has to be potential participation by multiple buyers and multiple sellers. There must not be a monopoly of a sole buyer nor a seller. And neither can have market power.

Fourthly, the competing power plants need to have sufficient transmission capacity to be able to reach the buyers. The transmission network has to be designed so as to encourage competition. Should it not be available to competition, we face the phenomenon of stranded energy or stranded assets and the market will not function. Those are our lessons learned, and many countries are still not mature for competition due to lack of power production capacities.

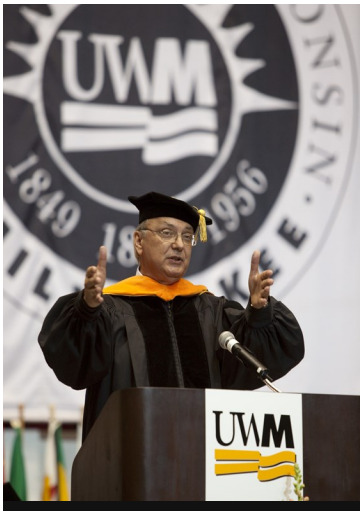
For a small country such as Serbia or Macedonia, their markets are the markets of their regions, and those regional markets should be regulated and conditions should be provided as in any other market.

Branko Terzić is the author and co-author of the following works:

⇒ **10 Myths in Utility Ratemaking**

⇒ **Energy Independence and Security: A Reality Check**

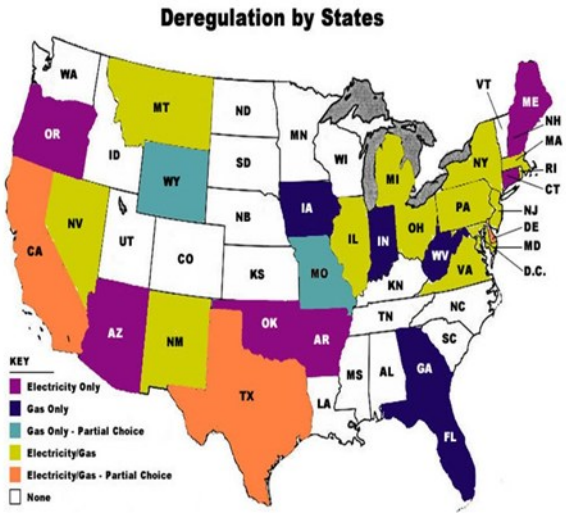
⇒ **World Crisis: The Way Forward After Iraq** a collection of 20 essays of senior British and American officials, including J. Carter and H. Kissinger. Mr. Terzić is the author of the “The New Middle Ages” essay.



Speaking at UWM Commencement

EP: What is the status of RES and EE projects and programs in the USA?

BT: The electricity situation in the USA is unique and complex with some states allowing competition for retail electricity and natural gas sales and other states maintaining a vertically integrated electric and gas utilities. The complexity also extends to the areas of energy efficiency and renewable energy supply. Some 29 states plus the District of Columbia and Puerto Rico have introduced state laws mandating that a certain percentage of the state's electricity supply be produced from "renewable" supplies in order to reduce greenhouse gas emissions (mostly the gas carbon dioxide). This is called a 'renewable portfolio standard" (RPS) law. However, the definition of "renewable" varies from state to state and the commitment varies too, as some states have firm targets, while others have only aspirations or goals.

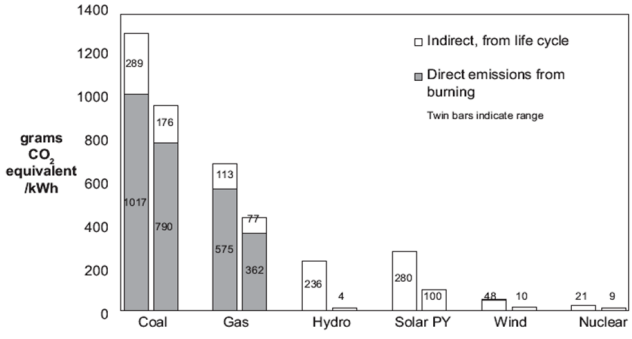


A few states have included "energy efficiency" in their RPS law as a method of reducing greenhouse gases, but most have not . The federal government has provided various tax incentives to solar and wind projects and these incentives have been critical to the attraction of capital to these investments. The tax benefits have not been extended for a long term, but extended from year to year, making it difficult for investors to have confidence that the tax benefits will exist during the 15-25 year life of the projects.

There is no new federal government law in the US requiring a certain fuel supply mix. There are, however, new rules issued by the federal government's Environmental Protection Agency (EPA) which reinterprets the 1970 Clean Air Act to allow the EPA to regulate emissions of carbon dioxide (as a greenhouse gas) from electric power plants. A new rule affecting coal fuelled power plants was issued last week and will be the subject of intense legal battles all the way up to the US Supreme Court.

EP: We talked earlier about EPS, but how do the state owned system function in the US?

BT: They can function very well. However, 85% of people in USA receive their electricity from private (investor owned) companies, while 15% receive it from municipal companies or agricultural power cooperatives in rural areas. The most famous municipal system is the Sacramento Municipality Utility District, followed by Los Angeles Power and Water District. The federally owned Tennessee Valley Authority provides electricity supply and transmission services to 155 local electric sytems where the city owns the distribution. In Wisconsin, where I was a member of the Energy Committee, with a population of 5.7 milion people, slightly less than Serbia, there are 500 towns with 21 of them having a municipal electric distribution systems which all functioned very well.



EP: What do you see as developments there in the near future in USA?

BT: New renewable energy supplies will be added based on a combination of competitive economics and direct and indirect subsidies from state governments and the federal government. Some technologies and projects have been and will be competitive without subsidies. This category will grow as energy conversion and storage technologies develop and improve.

News from the world of clean energy daily on our Portal

⇒ Possible Production of Electric Vehicles in Kragujevac

⇒ An Energy Efficient Yacht

From EP's calendar:

⇒ Jan 23 **|** Seminar: Changes to the Law on Planning and Construction and application in the practice by the Institute for Business Research MBA in Belgrade

⇒ Jan 26 **|** First Preparatory Meeting of the 23rd OSCE Economic and Environmental Forum, Hofburg, Vienna, Austria

Energy portal Presents:

⇒ ABB Solar Inverter

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Energetski portal Srbije

Koste Jovanovića 66
11000 Beograd
Srbija

+381 11 24 64 580

info@energetskiportal.rs

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