



# Balkan Energy Solutions Team

Since December 2003

## PLUG IN

-Monthly BEST e-mail bulletin in power systems, renewable energy sources, electricity market and ecology -

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No 1

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office@balkanenergy.com

-based on voluntary work-

No1 bulletin topic – Plug in

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### New in BEST

From January 2004, BEST together with VIBILIA ([www.vibilia.co.yu](http://www.vibilia.co.yu)) placed to the webpage [www.balkanenergy.com](http://www.balkanenergy.com) daily up-to-date information on tenders, news and reports from the Balkans sorted by groups (Hydro, Wind, Solar, Biomass, Gas, and Electricity markets, Ecology, Education, Power Systems Transmission and Distribution).



### Introduction

Dear colleagues this is first issue of BEST bulletin with the mission to be present in the area of power engineering, businesses and research in energy sector, to support ecology in every sense and to help in enlarging practical knowledge on renewable energy technologies on Balkans. This type of e-mail communication via bulletin which BEST offered has found pretty well acceptance among colleagues, experts and interested parties from next countries: Albania, Australia, Bulgaria, Bosnia and Herzegovina, Canada, Denmark, Finland, Greece, Germany, India, Ireland, Lithuania, Macedonia, Hungary, Croatia, Peru, Poland, Romania, Slovenia, Serbia and Montenegro, Switzerland, Sweden, UK, USA, ...

BEST is planning to organize several lectures from the area of free electricity markets, deregulation of power sector, renewable energy sources, which are most suitable for employees in power sector and students of technical science. We would like to make an interests investigation for such lectures as well for other lectures (in Ecology, and similar) and therefore if you have interests in lecturing, listening or opinion about this idea please be free to contact us at [office@balkanenergy.com](mailto:office@balkanenergy.com). Thank You in Advance! /BEST/.

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Future quality of the bulletin, on the first place, will depend on Your interests to participate actively and from Your willingness to send us Your materials related Your activity, ambitious, events, etc. This bulletin is predicted to be recession free but the point is put on the information and contact. Therefore to made this bulletin usable around the globe BEST decide to publish it in English, too. We are aware that might be not perfect use of English and therefore we apologize in advance.

### Hydro energy

Hydro energy represents huge primary source of electrical energy on Balkans. This type of renewable energy resource (resource that regenerates by itself) is unused compared to the real, overall hydro opportunity in Balkans.

The idea of the BEST bulletin has found support among public and therefore we strong support You to send us Your materials, to leave Your contact and in that way BEST can help You, others and itself. THANK YOU IN ADVANCE! /BEST/

BEST is collecting data about hydro potentials for whole Balkan region and when done will be published at the [balkanenergy.com](http://balkanenergy.com) webpage and in the some of next bulletin issues. Therefore please be free to share with us this information if You think that their public announcement will help better utilisation of these resources.



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Special groups of hydro plants are micro (up to 100 kW rated power) HPs and small (up to 3 MW) HPs. Legal status for these objects are not clear and in some Balkan countries not at all regulated by law, while in other countries it is. In every of these cases many people invest on their risk as the investment is low, between 300 – 700 EUR/kW depending on the availability of the terrain and existing electrical infrastructure, while period of return is between 2 – 5 years. For average investments of 650 EUR/kW where infrastructure exists (road, dam, distribution lines,...) period of return is 4 years, accounted by the current valid wholesale electricity prices on Balkans. /BEST/.

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## “MEP – ENGINEERING”, Bajina Bašta

### Design and produce small hydro power plants

Main business for which we are registered for:

1. Electric energy production from Hydro Power and other energy sources
2. Turbine production for small hydro power plants
3. Production of measuring and control equipment

Advantages of “MEP – ENGINEERING”:

- Great experience in design, production and building of power installations
- Familiar with market for small hydro power plants and other power equipment
- Willingness to invest

Dusko Neskovic, director, [inkombb@ptt.yu](mailto:inkombb@ptt.yu)

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## Application of small Hydro Power Plants in Households

Author: Mojic Zoran  
[bmojic@eunet.yu](mailto:bmojic@eunet.yu)

There is significant hydro potential in Serbia that is unused (only about 60% is used) which could be used mainly for Small Hydro Power Plants (SHPP).

Regarding to rising price of electric energy interest for SHPP construction in Serbia became higher in past two years. In this moment it is possible to build SHPPs with power output from few hundreds watts to 15 MW.

Especially SHPPs for households are interesting because electric energy price in Balkan region is going to be significant expense for households. These are mainly SHPPs up to 10 kW of installed power, but there are households that need even more electric power.

In properly equipped workshops it is possible to construct all parts for SHPPs in Serbia and other Balkan Countries that will be significantly cheaper than in west Europe.

Basic steps for SHPP construction are:

- **to find location for SHPP**; because installed power is small almost every water stream or small river can be potential location for SHPP; It is very important to know water flux and water drop (Q and H) because they are defining installed power of SHPP; it is important to know the altitude of SHPP too.

- **turbine construction**; It is recommended to use Banki turbine for small installed power because of lots of it's good characteristics. Good characteristics of that turbine are:

1. It has big conversion factor in wide band of water flux.
2. It is resistant on cavitations and its simple construction enables easy cavitations removing.
3. It has small construction price comparing to other turbines.
4. It can be easily constructed in good equipped workshops.



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5. It is resistant to hydraulic pulse during fast opening of turbine valve.
6. It can be easily mounted and demounted because it is very small.
7. It is ecologically completely clean turbine and makes no environmental pollution.

Advices:

Bolsters must be mounted out of turbine cover, what is not difficult to do.

Always use self-adjusting rolling or cylindrical radial bolsters.

If multiplier is necessary, always use one with belt because it suitable for mounting and has high utilization factor (98%).

CV: Zoran Mojic mechanical engineer – small HP designer. Consultant within Institute Nikola Tesla, Belgrade, Serbia

## Wind Energy

### Often used types of Wind Power Generators



Author: Nikola Milivojević  
[mini@beotel.yu](mailto:mini@beotel.yu)

During last decades of twentieth century it was proved that Wind Energy has a big generating potential. Still, there are some difficulties with controlling it's speed and direction, which results output voltage of variable frequency not being suitable for connecting to distributive electrical network system. Wind turbines can either operate at fixed-speed (generator is directly connected to electrical grid) or variable-speed (generator is controlled by power electronics equipment) all depends of environment circumstances and desired output power.

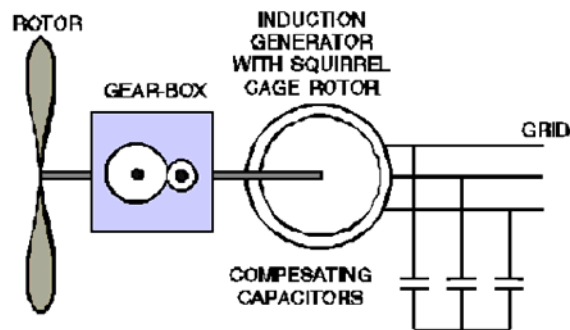
**1. Induction generator with squirrel cage rotor for fixed-speed system** (picture 1), for the fixed rotor speed applications directly connected (or via transformer) to utility grid. Generator mode of operation started when the rotor speed is higher than synchronous speed, and speed variations are only 1-2%. Usually induction generator for fixed-speed applications can be either with possibility of

changing speed (changing number of poles of stator winding), either can be equipped with two different size generators, one for low wind speeds (with lower synchronous speed) and other for high wind speeds – common solution by BONUS Company.

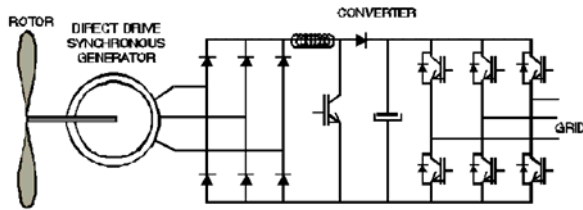
Big disadvantage is, that Induction generator always consumes reactive power, undesirable especially in case of large turbines and weak grids. It is possible to compensate it by capacitors in order to achieve a power factor close to one. Generator speed, in this case, can't be controlled, so we can't use turbulence because it will produce fluctuated output power. Still, advantage of this concept is in simplicity of squirrel cage induction generator and low price.

Option of semi-variable speed system, where squirrel cage induction generator is used, rotor resistance can be changed by means of power electronics. By changing the rotor resistance, the torque/speed characteristic of the generator is shifted and transient rotor speed increases of up to 10% of nominal rotor speed.

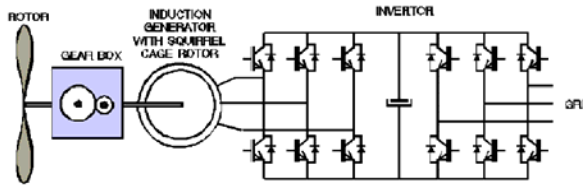
**2. Synchronous generator with multiple-poles** (picture 2), works in full speed range, uses well-developed and robust control. Concept with permanent magnets is successfully manufactured by ENERCON Company. The output voltage of Synchronous generator is lower at lower speed, therefore is one boost chopper built-in, between the rectifier and the DC link capacitors. At the lower speed, boost chopper pump the rectified generator voltage up to the DC link value, necessary for the line side inverter operation. The advantages of variable speed turbines are that they generate more energy for a given wind speed regime, and that the active and reactive power generated can be easily controlled. Also, Synchronous generator with multiple-poles works without gear-box. On the other hand, three converters for full power are in use, where losses are 2-3% of generated power. Large DC link capacitors and line-side inductance which is about 10-15% of generated power, could be one of disadvantages.



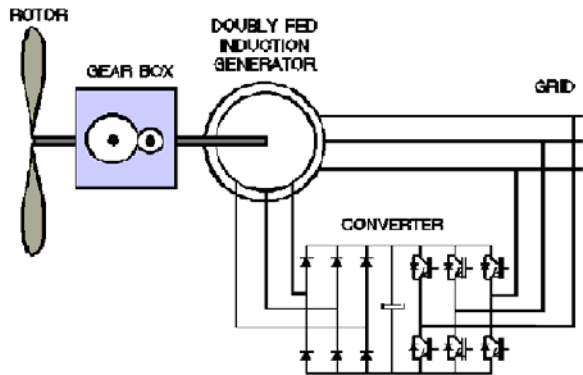
Picture 1



Picture 2



Picture 3



Picture 4

**3. Induction generator with squirrel cage rotor for full variable-speed system** is similar application like previous one, but now two full power converters are in use and gear-box between rotor and generator. The cost of the semiconductor components used in AC-DC-AC converters has, however, fallen spectacularly in the last five to seven years, reducing the latter advantage and also, there is no speed limit for generating power. Control of active and reactive power is possible now using power electronics. But two full power inverters in series are used and power losses are 3% of generated power.

**4. Doubly Fed (Wound rotor) Induction generator for limited variable-speed system** is used for multi-megawatts wind turbines with converter-inverter combination for rotor slip recovery. In a **variable speed turbine** with doubly fed induction generator, the converter feeds the rotor winding,

while the stator winding is connected directly to the grid. The electrical rotor frequency can be varied by this converter, thus decoupling mechanical and electrical frequency and making variable speed operation possible.

Stator windings have to be connected to the grid, only when the rotor speed is near synchronous speed, while rotor circuit is always connected to the grid, over inverter-converter. For the lower rotor speed, generator will be supplied from the grid to the rotor, but for the higher rotor speed power will be supplied to the grid via rotor circuit.

Advantages of such solution are that now two power converters in series for rotor-power exchange only 20-30% of the generated power. Semiconductor power losses are up to 0,6-0,9% of the generated power and Line-side inductance is only 3-4% (12-15% of rotor power).

But Induction generator with wounded rotor is not conventional one, so extra maintenance is required. Generator is not working in full-variable speed system, minimum and maximum speed is shown now, also starting problems.

Solution with similar circuit but without slip rings is with stator with two three-phase windings. One winding is connected to the grid, and the other is connected to the converter and inverter for rotor-power recovery. Energy transfer from the rotor to the additional stator windings is achieved in inductive way, as in a simple transformer. Rotor power can be taken or given using different directions and frequency of the inverter. Additional advantages of that circuit are: no slip rings, and no need for lower inverter frequency. Disadvantage is that we need additional stator winding.

*CV: Nikola Milivojevic was born in Bor on 15 of May 1977, where he finished Primary School and Gymnasium. In the year of 1996 he started graduate studies in Powers engineering at Electrical Faculty, University of Belgrade. He was engaged in projects of designing transformer, high-voltage installation, microprocessor's control of relay protection and testing frequency converters. He graduated in summer of 2003 as co-worker of Laboratory of Digital Control of Electrical Drives, under supervisory of Professor Dr. Slobodan N. Vukosavic. Title of Diploma thesis was: "SPACE-VECTOR control of three-phase voltage inverter implemented on FPGA device". In December 2003 he started with post-graduate studies in field of Wind Energy in the same Laboratory. He took place in few Power Electronics conferences.*



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**KenTec**  
denmark ops



**KenTec Denmark ApS** is a wind energy consultancy company offering support through the whole development phases from finding sites with suitable wind potential and available grid connection over the wind and production assessment and arrangement of contracts with the utility company via Power Purchase Agreement and landowners via Land Lease Agreement. Assistance in financing through Danish and international aid organizations has been performed. Often the outcome is a complete and thorough Feasibility Study with the purpose to reduce risks by highly accurate resource performance and cost analysis

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Rosenstien 12, DK-8800 Viborg, Denmark

## Conferences and meetings about Wind Energy:

- MAR. 2004, 2-4. CHALMERS University of Technology, Gothenburg, Sweden. Nordic Wind Power Conference – NWPC 2004, Grid Integration and Electrical Systems of Wind Turbines and Wind Farms, contact: <http://www.elkraft.chalmers.se/> , [NWPC@eltechnik.chalmers.se](mailto:NWPC@eltechnik.chalmers.se)
- MAR. 2004, 18-19. Lausanne, Switzerland, The Green Power Marketing, contact: [info@greenpowermarketing.org](mailto:info@greenpowermarketing.org), [info@reccs.org](mailto:info@reccs.org), [www.greenpowermarketing.org](http://www.greenpowermarketing.org), [www.reccs.org](http://www.reccs.org)
- 11-14 May 2004, Wind Energy 2004, Hamburg Fair Site, Hamburg, Germany, [www.windenergy-hamburg.de](http://www.windenergy-hamburg.de), [gudrun.blickle@hamburg-messe.de](mailto:gudrun.blickle@hamburg-messe.de)

## Solar energy



**Solaris** Solaris has supplied and installed over 80 thermal solar systems, covering over 550 m<sup>2</sup> all over Ireland since 1997.

We currently represent four German manufacturers of selectively-coated flat-plate collectors with several installation options; the most popular being roof-integrated, roof-mounted (especially for retro-fit installation), wall-mounted (where orientation dictates) or free-standing. CPC evacuated tube collectors offer another option for solar water heating.

The majority of systems were installed for domestic hot water provision with an increasing number (over 30%) of so called combi systems for space heating assistance. These combi systems work particularly well in conjunction with under-floor heating and low temperature radiators.

We specialized in custom designed packages, with all components coming from the same supplier – the flat-plate collectors with a 10 year manufacturer's guarantee.

We have been involved in high profile projects, like the Motor Tax Office in Tralee, County Kerry, the Civic Amenity Site in Macroom, Co. Cork and the first Eco Business Park developed by Cork County Council, but most systems were installed in family homes. Three of these were featured on RTÉ (Irish) Television.

To my knowledge, there is no building project where solar water heating is not an option – with excellent pay-back periods and obvious environmental benefits.

We also provide cost/reduction in emissions analysis and performance simulation for commercial and public projects, i.e. hotels, public buildings, swimming-pools etc..

We have secured the agency for GRAMMER solar air collector systems, which are ideally suited for buildings with planned ventilation systems and holiday homes.

PV stand-alone systems or grid connected, solar street lights, solar road studs ('cat's eyes') or sign lighting – if it's got to do with solar energy, we can deliver!

Consumers are much more aware of our very high level of fuel imports, an increasing volatility in the energy market and the desire to take more responsibility and achieve a greater independence.

Solaris is working with a number of international companies across Europe, Asia and the US & Canada.

Fritz Raake  
Tel: +353-(0)26-46312 , Ireland  
[www.solaris-energy.com](http://www.solaris-energy.com) , [solaris@eircom.net](mailto:solaris@eircom.net),



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**TITANSOL** - Manufacturer of solar thermal systems and components. Solar thermal panels, Solar electronic control panels, solar water heaters, Installation of large scale solar systems.

Oikonomidis Christoforos

[www.titansol.gr](http://www.titansol.gr), [oikon@hol.gr](mailto:oikon@hol.gr)

Tel. +30 210 9969351 Fax/tel. +30 210 93519925,  
Agias Aikaterinis str, 173 42 Agios Dimitrios, Athens,  
Greece

## Ecology

### Conferences and Meetings on Ecology:



May 2004  
FIRST INTERNATIONAL  
SYMPOSIUM ON DESIGNING,  
ENGINEERING, BUILDING &  
MANAGEMENT, [www.emol.co.yu](http://www.emol.co.yu)

**Energy Efficiency Exhibition & Conference  
in the Construction Branch** – 26-27 February,  
Princess Hotel, Sofia, Bulgaria.

The Energy Efficiency Agency and Via Expo  
organize jointly for the first time in Bulgaria a  
Conference & Exhibition on Energy Efficiency in  
Construction.

Conference Objectives are latest energy saving  
technologies in construction and modern materials  
implementing to cut energy consumption.

[office@viaexpo.com](mailto:office@viaexpo.com) [www.viaexpo.com](http://www.viaexpo.com)

### "ELECTRA III"

Third International Conference on Environment  
Management (Energy Efficiency in Power Engineering)

Certified by Ministry of Natural Riches and  
Environment Protection, Ministry Science,  
Technology and Development, Ministry of Mining  
and Energy of Serbia and Montenegro.

June 2004. in Herceg Novi, International Conference  
"ELECTRA III", Organized by Power Utilities of  
Serbia, Republic of Srpska and Montenegro.  
Important dates:

27. February, abstracts submission

15. April, acceptance verification

1. May, papers submission

Information: FORUM KVALITETA, 11030 Beograd,  
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e-mail: [forumq@eunet.yu](mailto:forumq@eunet.yu)

F. Cocha, president

## Electricity Markets

### Electricity Market in Balkans

At present most of Balkan countries do not have  
electricity market. Balkan countries supported by the  
rest of international community are working towards  
creating necessary conditions for the regional  
electricity market formation.

In aspect of HV electrical network Balkan is divided  
in two synchronous zones UCTE 1 (Slovenia,  
Croatia, western part of Bosnia and Herzegovina,  
Hungary) and UCTE 2 (Eastern part of Bosnia and  
Herzegovina, Serbia and Montenegro, Macedonia,  
Bulgaria, Albania Greece, Romania). Exchange of  
electrical energy between the divided zones is done  
by island operation at the borders of UCTE 1 and  
UCTE 2 and exchanged amount is very low.  
Exception is Greece (UCTE 2) which is connected to  
Italy (UCTE 1) by the HVDC cable link buried under  
the Adriatic Sea.

At present among Balkan countries only Slovenia,  
Romania and Hungary have possibilities of market  
based trading of electrical energy, which includes  
existence of power exchanges at the wholesale  
market level. In the rest of the Balkan countries  
selling and buying of electrical energy is done by  
State owned power utilities and via public open  
tenders which has to be announced in advance, and  
at the end closed by bilateral agreements.

Merging of UCTE 1 and UCTE 2 into UCTE 1 is  
planned for 2004. For detailed info about this  
international project and as well similar international  
projects for Balkan region in terms of reinforcing  
power systems, BEST recommends next web  
address [www.seetec-balkans.com](http://www.seetec-balkans.com), /BEST/.

### Existence of UCTE 1 and UCTE 2

UCTE 1 – 50Hz synchronous zone up to 1991  
included Western and Central European countries  
plus all countries of former Yugoslavia. From 1991 -  
2000 several backbone transmission lines and  
substation were cut and destroyed in the war



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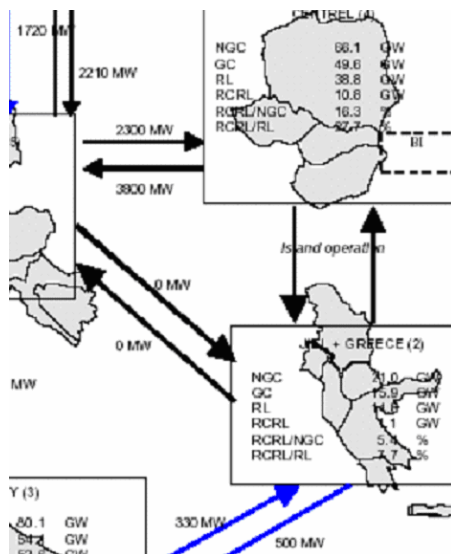
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conflict, which are today (2004) in final stage of rehabilitation. Since 1991 Central, Southern and Eastern Balkan operates in UCTE 2 - 50Hz synchronous zone. UCTE 1 and UCTE 2 shall merge in 2004.

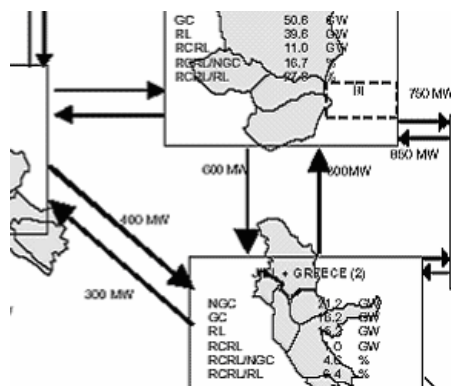
## Power flows after reconnection

UCTE ([www.ucte.org](http://www.ucte.org)) publish study report »UCTE SYSTEM ADEQUACY FORECAST 2004 – 2010« which can be download from the address: [http://www.ucte.org/pdf/Publications/2003/SAF\\_Report\\_2004-2010\\_web.pdf](http://www.ucte.org/pdf/Publications/2003/SAF_Report_2004-2010_web.pdf) . Report shows expected power flows between UCTE 1 and UCTE 2 for January 2005 and present values for January 2004. Figures that show transmission capacities from this report are given below. /BEST/

### Data for January 2004 (before reconnection)



### Data for January 2005 (After reconnection)



BEST will try, with Your help, to present international experiences with deregulation of power sector in sense of electricity market liberalization and in sense of changes from the aspect of the ownership. BEST invites You to present short materials by the topic of deregulation related next countries: American continent, EU countries, Australian continent, Japan and others. BEST hope to get Your feedback, therefore thank in advance for Your work and remind that cooperation is based on voluntary work (BEST do not provide financial refund for Your work). First in the row is Finland and material which was sent by Mr. Katancevic.

## Finland Deregulation



Author: Aleksandar R. Katančević

[aleksandar.katancevic@hut.fi](mailto:aleksandar.katancevic@hut.fi)  
<http://www.hut.fi/~katala>

Today Finland, Sweden, Norway and Denmark have unique wholesale power market. Tradition from past characterized by often exchange of power and joint coordination of power production leads to market based exchange within the Nord Pool institution.

Due to transforming the mutual bilateral wholesale power market into the well organized international power market operated by the independent institution, Finland and other Scandinavian countries had need to change old and introduce new laws: law on power sector and power market law. Finland did it in two steps:

1. By the initiative of Ministry of Industry and Economy the independent, self run, domestic power experts group was formed. This body had the task to make analyses in opportunities for improving the organisation and efficiency of Finnish power utilities, and to evaluate circumstances that might arise if changes in ownership happened. This group had several tasks with the most important one to prepare the proposal of the layout for the new power sector and power markets laws, all based on the results of the analyses they had conducted before. The proposal of the layout for the laws had to be submitted to the Finland Government.
2. Further on, Ministry of Industry and Economy in Finland has formed 2<sup>nd</sup> work group which was consisted of more



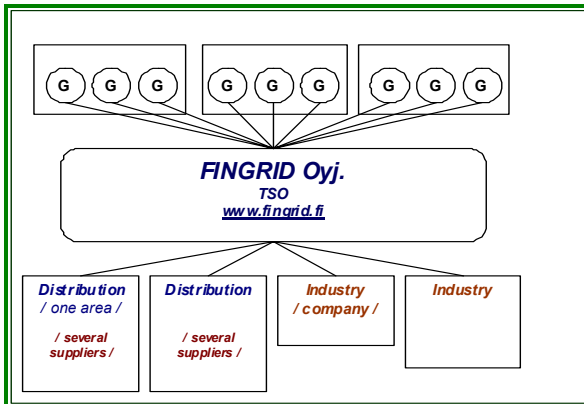
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Government people then experts in energy and power systems. That group had target to check and evaluate proposal of the first experts group. After checking and bringing opinion together with the experts group, the 2<sup>nd</sup> group has adopted the proposal for the energy law layout, which was sent to the Government on voting, afterwards.

Main excellence which was brought by new law is independent accounting for the companies in energy business with a ban over merging and mixing capital in order to avoid monopoly situations on the wholesale and retail electricity market.

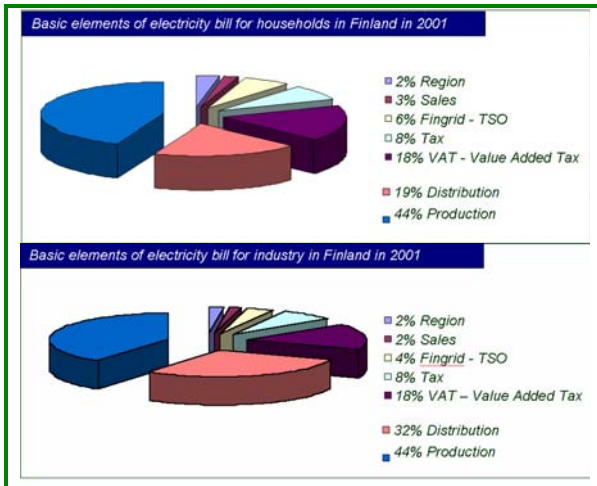
Transmission system business was transformed in the sense of ownership (from fully State into mixed), but it is still fully monopoly business monitored by the Regulatory Agency. The company that was formed for the purpose of transmission system operation (TSO) is Fingrid Oyj and it is share holding company. In 2001 Fingrid Oyj was the ownership in: 25% of the Fortum Group, 25% of the industrial capital, 12% of Finland Government, 38% institutional investors.



Elimination of monopoly was achieved and applied at the retail market (small consumers, house holds) as well, and this gives special value to the Finland Society and Industry. The method of giving chance to anyone to choose has not only economical benefits to the person who can make choice, but has social impact on the people who are part of the society which offer you choice. Therefore, business in distribution of electrical energy is separated from the business of retail suppliers who offer agreements for electrical energy to people. These retail energy dealers (household's electricity suppliers) are experiencing market fight in non monopoly environment, and of course the benefit shall be on the customer side. Behaviour of the retailers is monitored by the Regulatory Agency.

Similarly to transmission network, distribution companies are monopolies in the certain area. They do not have any competition from the aspect of operation. Their ownership is shareholding, where those who own some shares in the distribution companies business can not have in total more than 30% of all shares of all distribution companies in Finland. And this is one more anti monopoly fuse for protecting the business.

Price of electrical energy for 2001 in average was 8 CentsEUR/kWh, while for industry it was 5 CentsEUR/kWh. In the price of electrical energy are accounted generation, transmission, distribution, administration and taxes. Participation of each part is clearly shown on the figures below.



CV: Aleksandar R. Katancevic, graduated Master of Science in Technology (Power Systems curriculum) from the Helsinki University of Technology in Finland, attended first degree studies at Belgrade Faculty of Electrical Engineering, electro-technician of automatics from Technical school in Pirot. Was employed with ABB Power Systems AB in Sweden, ABB Corporate Research Ltd in Switzerland, Fingrid Oyj in Finland, and at present is employed with Holding Slovenske elektrarne doo Representative Office in Belgrade working on power engineering business development energy businesses in Southeast Europe. Contact: [aleksandar.katancevic@hut.fi](mailto:aleksandar.katancevic@hut.fi), <http://www.hut.fi/~katale>.

### Conferences and meetings on Electricity Market:

- 10th -12th February 2004, The Biggest Fair in Europe u Power, Electricity and Gas Trading, Essen, Germany, <http://www.e-world-of-energy.com>, [mail@e-world-of-energy.com](mailto:mail@e-world-of-energy.com)



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- 20-21 April 2004, Modernising Central & European Electricity Markets, Prague, Czech Republic, [s.ducker@highburybiz.com](mailto:s.ducker@highburybiz.com)



- JUN. 2004, Balkan Power Conference, Sarajevo, BiH, Electricity Market, Deregulation of Power Sector, Power Systems, [www.balkanpower.org](http://www.balkanpower.org)

## Elektroenergetski sistemi

### HVDC (High Voltage DC) project Tasmania – Australia

HVDC transmission technology enables very economic electric energy transmission on long distances with very low losses. New planned HVDC link between Tasmania and Victoria (Australia) i.e. between towns Georgetown and Loz Zang will be about 360 km long of what 289 km will be under water and it should be in operation in year 2005. This HVDC link will be able to transmit 500 MW on DC voltage of 400 kV and current of 1250 A. Investment value is over 300 million Euros. Siemens is going to build both substations on cable ends. There is need for this link on both sides of the sea. Tasmania will be able to export power to Victoria in peak hours because of it's riches in hydro power, while Victoria will be able to supply Tasmania with base load during the drought periods. Siemens will completely build substations (converter, converter's transformer, reactors for voltage control, high voltage equipment, communications, control and protection).



**POWERSWID  
International**

**Equipment**

### The Automatic Voltage Stabiliser (AVS)

It is installed in homes, offices and industry. A three phase version is also available for large companies that have a heavy load conditions such as a production line. The installation is simplicity itself for

the homes and offices, but for a more permanent installation, we will offer Powerswid installation department's services. Large size voltage stabilizers up to 1,500Kva are part of Powerswid's range of products and are installed in large complex's. There is two types of AVS; the EM range and Servo range offered currently.

### The Inverter

The inverter is a device that provides electrical power when there is no available electrical power. It does this by turning (inverting) the DC voltage of a battery into an AC power source. The battery in this case is a 12 volt car battery rated at 100 ampere/hour. The inverter comes in a variety of power ranges, to be installed in the home, office and industry. An extension to this inverter is the Compinverter, which is a UPS and inverter built into a single equipment. It offers long backup times and services both computer networks and office and home environments. Solar re-chargers are also available as well as in-line solar supply units that will replace the batteries completely and offer 24 hour supply of electrical power. The capital cost of these solar devices are high at this time, but this cost is offset by the low running costs. We also offer wind power as an alternative to solar, for re-charge purposes.

### The Uninterruptable Power Supply (UPS)

UPS's can be supplied that provides for networked systems and the autonomy (back-up time) can be as required for sizing each system. The complex systems offer safe management through software solutions and remote monitoring and control. The large UPS range incorporates DSP technology and is direct on-line pure sinusoidal output. Power ranges from 1 Kva to 800 Kva, in single phase and three phases.

### Motor Generators.

A wide range of motor Generators from 1Kva to 550Kva is offered from our range of Broadcrown PLC equipment. Manufactured in the UK, they include John Deere and Perkins engines, with New age alternators, and are industry standard equipment's world wide. We also offer genuine Honda and "powered by Honda" motor generators along side a wide range of complimentary equipment.

E Machen.

[eddie@powerswid.com](mailto:eddie@powerswid.com), [www.powerswid.com](http://www.powerswid.com)

Powerswid International Sh.p.k

Rr Myslym Shyri, Nr 117,1, Tirana, Albania



# Balkan Energy Solutions Team

Since December 2003

## Conferences and Meetings on Power Systems:

- 26th February 2004, Energy Efficiency Exhibition & Conference, Sofia, Bulgaria, [www.viaexpo.com](http://www.viaexpo.com), [office@viaexpo.com](mailto:office@viaexpo.com)
- 10-12 February 2004, E - world Energy and Water, Essen, Germany, [www.e-world-2004.com](http://www.e-world-2004.com)
- 26-27 February 2004, Cogen Europe Annual Conference, Brussels, Belgium, [www.cogen.org](http://www.cogen.org)
- 3-4 March, Power - Gen Renewable Energy, Flamingo Hotel, Las Vegas, USA, [www.power-green.com](http://www.power-green.com), [pgre@pennwell.com](mailto:pgre@pennwell.com)
- 10-11 March 2004, World Trade Centre, Moscow, Russia, [www.russia-power.com](http://www.russia-power.com), [russiapower@pennwell.com](mailto:russiapower@pennwell.com)
- 30 March – 1 April 2004, Conference for protective relay engineers, Texas A&M University College Station, TX 77843-3128, (979) 845-7912, [s-loe@tamu.edu](mailto:s-loe@tamu.edu)
- 20-21 April 2004, Modernising Central & European Electricity Markets, Prague, Czech Republic, [s.ducker@highburybiz.com](mailto:s.ducker@highburybiz.com)
- 5-7 May, International Stirling Forum, Osnabruck, Germany, [www.ecos-consult.com/et](http://www.ecos-consult.com/et)
- MAY 2004, 9-12. MELECON, Dubrovnik, Croatia, oblasti: Power Resources and Systems, <http://www.melecon2004.org>, [melecon@melecon2004.org](mailto:melecon@melecon2004.org)
- 25-27 May 2004, All Energy Opportunities 2004, Aberdeen Exhibition and Conference Centre, Aberdeen, UK, [www.all-energy.co.uk](http://www.all-energy.co.uk)
- 25-27 May 2004, Power - Gen Europe, Barcelona Spain, [www.pennwell.com](http://www.pennwell.com)
- 25-27 May 2004, Annual Meeting on Nuclear Technology 2004, Congress Centrum Dusseldorf Stadthalle, Dusseldorf, Germany, [www.dbcm.de](http://www.dbcm.de), [info@dbcm.de](mailto:info@dbcm.de)
- JUN. 2004, BPC, Sarajevo, BiH, Electricity Market, Deregulation of Power Sector, Power Systems, [www.balkanpower.org](http://www.balkanpower.org)
- JUN. 2004, 6-12. PES-General Meeting, Denver, Colorado, USA, Power Systems, Power Engineering, [110033.556@compuserve.com](mailto:110033.556@compuserve.com)
- 21-23 June 2004, Electricity Storage Systems for Stationary Applications 2004, Oestende, Belgium, [www.epri.com](http://www.epri.com), [hannedy@epriww.com](mailto:hannedy@epriww.com)
- 28-30 July 2004, Coal - Gen, Overland Park Convention Center, Overland Park, USA, [www.coal-gen.com](http://www.coal-gen.com), [coalgen@pennwell.com](mailto:coalgen@pennwell.com)
- SEP. 2004, 15-17. AFRICON, Gaborone, Botswana, Energy and Power Systems, Power Electronics and Drives, <http://eerc.up.ac.za/~ieeef/>
- 13-15 September 2004, Power - Gen Middle East, Bahrain International Exhibition Center, Kingdom of Bahrain, [www.power-gen-middleeast.com](http://www.power-gen-middleeast.com), [yaserm@pennwell.com](mailto:yaserm@pennwell.com)
- 28-30 September 2004, Toronto Congress Centre, Toronto, Canada, [www.coal-gen.com](http://www.coal-gen.com), [coalgen@pennwell.com](mailto:coalgen@pennwell.com)
- OCT. 2004, 10-13. PES T&D Conference and Exposition, New Orleans, Louisiana, USA, Power Distribution, [t.mayne@ieeef.org](mailto:t.mayne@ieeef.org)
- 5-7 October 2004, Power - Gen Asia 2004, IMPACT Exhibition and Convention Center, Bangkok, Thailand, [www.powergenasia.com](http://www.powergenasia.com), [powergenasia@pennwell.com](mailto:powergenasia@pennwell.com)

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