Creation the United Power Grid for countries of Great Silk Road through Xingjian Uigur autonomy region.

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Electricity (e/e) is produced in all countries under uniform quality standards, in view of which it can be an export commodity, if its price is lower than importer. The production of electricity at a lower cost and price in the Republic of Kazakhstan (RoK) increases the possibilities for non-primary exports to the countries of the Silk Road, especially to China where electricity consumption is on 70% higher.

Kazakhstan with a large territory in the center of the Eurasian continent with powerful energy resources can play a pivotal role in the 21st century in the process of creating a unified electricity system (Power Grid) of the countries of the GSR with the connection of the unified electricity systems PG of large Asian countries.
Introduction

• 1Ten years ago Shanghai cooperation organization recommended to Republic of Kazakhstan (RK) to export e/p to China.

• 2. For increasing of export volumes it’s necessary produce the e/p with large scale and low operating cost, without atmosphere pollutions.

• Such demands can to satisfy the free of charge renewable energy sources, especial Wind Energy. His zero cost and clean energy can remarkable decreases the operating cost of e/p producing.

• 3. There is a some Problems about increasing of export volumes and the equipment for cheap e/p output.
The Tasks

- All countries with national Power Grids (PG) try to unite them with neighboring ones, which gives great technical and economic advantages. (Fig.1).

- Such united PG increase reliable of Power supply, decrease Power cost, losses in the distribution electro network, atmosphere pollutions. Avoid new Power Plants (PP) erection, help to use on PP more economy large capacity equipment.

- But on the Eurasian continent, the largest on the planet, this association is not yet complete - there is a gap in a large territory of Kazakhstan, where there are no significant surpluses of electricity and powerful power transmission lines (PTL) to China.

- The Task is, first of all, to find possibilities to Unite National PGs of RoK and China, because first of them has reliable Power connection with Russia PG and second one has some connection with United PG of far East Asia countries.
Using the RoK Renewable Energy Sources.

- To use of RK hydrocarbon fuels has no prospects for e/p production due significant green house gas (GHG) emissions.

- But such opportunities are available due to the transitory nature of the large territory of the RoK and the presence of an excessive volume of Renewable Energy Sources (RES) - wind, hydro, solar.

- RES can reduce the cost of e/p production because the primary energy source is free of charge and environmentally friendly.

- But in the RoK new RES power plants while generate slightly more than 1% of the total generation due to the high cost of the imported equipment and is need to deliver them for thousands of kms.

- The RES using will solve two tasks - set in the Strategy of the RoK 2050 to produce up to 50% of electric power on them, as well as the creation of the UPG of GSR countries.
The China planes transmit large volumes of Power to Central and East part of country from HUAR.

- For this purpose already was erected Power transmission line (PTL) 800 kV by length 1200 km with transmit capability by 18 bln kW-h / year to Central provinces.

- In 2018 yr. will be erected additional two PTL 1100 kV by length 3300 km for departure additional 60 bln kW-h / year on east provinces.

- It is 80% of Kazakhstan yearly Power output.

- In the HUAR e/p will be produced by the Hydro PP and WPP at the open steppes Alashankou province. On this place Djungar Gate (DjG) from RoK has his end. Due different average wind speeds (in DjG to 1,5 time stronger) give possibilities produce e/p with 3 time more than WPP in the Alashankou.

- Shaven create the perspectives to export e/p from DjG installed in the RK on DjG sites.
Mixed Wind and Hydro using
The Problems of export volumes increasing

. On the East of RoK near with China border line there is the windy region with over power potential. It is mountain pass Djungar Gate (DjG) from RoK to Xingjian Uigur autonomy region (XUAR), length of 80 and wide of 12 km, belongs to RK.

Here on 1 sq.km. is possible produce e/p 7 time more than on European sites. Total one trln kW-h, 10 time more than all RK power plants. The estimate operating cost of e/p of Wind Power Plants (WPP) in DJ.G. is 2,7 US cents/ kW-h.

The same cost from WPP in HUAR with normal winds is approx. 8 cents/ kW-h. The distance for export from WPP in Dj.G to China not exceed 30 km. This is unique combination of factors in the world for e/p exportation.

The Dj.G. attracts attention of World Firms produce the WT. But they not act, braked on strong winds till hurricane velocity.

The RK EcoWatt firm elaborated special WT adopted for DjG strong winds. WT became the Winner of international innovative competitions (Shanghay, Los Angeles, Moscow), demonstrated on international exhibition EXPO 2017.
Djungar Gate 100 km between RoK and China

Mountain pass between two lakes. Picture from space.

The blue lake 110 km in RoK, the yellow one 70 km in China. Mountain 3500 m.
The Winds in RoK

WTs Comparison

Comparison e/p output by sprcial WT for D.G. (green curve) with in increased blades lift force by capacity 1000 kW with universal conventional WT (red curve).
Special Wind Turbine for Djungar Gate
Operating costs of RoK and China Wind Energy

• This intermountain passage is 100% owned by the RoK, and the overage wind there is 1.5 times higher than outside, which provides the power of WT approximately 3.4 times higher.

• The cost of production of electric power of Chinese Wind farms in the XUAR is about 6-8 US cents/kWh. They are placed close to the border line with Kazakhstan in DG, but not inside.

• Therefore, the cost of electricity in the wind farm in DjG will be about 2.5 US cents/kWh, less 3 times in comparison to Chinese. Nearest Powerful substation 500 kV in RoK places on 230 km, but to XUAR ones 30 km. This provides great advantages of electricity supply from the RoK.

• Like first stage of UPG implementation we suggest to install powerful WPP on RoK territory in DjG near border line with XUAR and transmit e/p by PTL 500 kV on short distance about 30 km on HUAR.
Six circumstances RES forcing for GSR United Power Grid implementation

- **1.** In 2017, the Law of the RoK "On the Export of Electricity" was published, expanding the country's capacity to produce e/p, provided it is cheap enough.

- **2.** A number of regions of the RoK have excessively rich and even surplus energy resources of winds - allowing generating from 1 km² electricity at times more than in China.

- **3.** The RoK provides for measures to attract investment in this industry. This can revive the use of WPP.

- **4.** At the same time, the large losses of electric power in distribution networks are drastically reduced.

- **5.** The RoK will have the opportunity to fulfill its international obligations to reduce GHG emissions and **avoid penalties**.

- **6.** RoK can participate in the international profitable market of GHG quotas trade.

These six significant circumstances make the task of forcing the use of the RES of the RoK to be feasible.
The conclusion stage of the GSR United Power Grid creation

- The e/p from another countries the participants of GSR (Russia, Centraj Asia) can delivery e/p to HUAR by PTL 500 kV belongs UPG of RK. But for this purpose it's necessary to erect two PTL 500 kV with lengh 250 km like the branch from s/st Aktogay to DJG on the Power transit 500 kV Ekidastuz – Almaty.

- On this case near China border line can be stipulated Direct Current insert like on the border line Russia- Finlang for sinhronization of Kazakhstan and China electr. current friquancy

- This is conclusion stage of the GSR UPG creation. In the fact it will be like UPG of most large in world Europe - Asia continent ("from Paris till Beijing"). The break of future UPG presence only on RoK large territory

- Given Techknic Suggestion demands providing preliminary scientific engineer investigations and fulfilment of fesiability report.

- We are seeking the funds for such works providing .

- The terms of execution is 1,5 yrs. The cost is 9 mln USD include fulfilment pilot WT of 2,5 MW.
Taking part on innovation competitions

• **1.** The First innovation Convent Almaty City Sciences (2009г.). WT for Jetysu Gate was included in 6 best innovations.

• **2.** WP Project in Jetysu Gate takes 3 place in National innov-n Compet-n (Astana City) (2010г).

• **3.** “To China electricity export

• Project with Kazakhstan renewable

• Energy sources using » becomes the winner of Asia

• winner in Asia countries innovational

• Business - plans competition

• (Shanghai, 2010г)

• **4.** The Project « WP with special WT using

• for electricity export to China, Russia and

• Centr.Asia countries” becomes the winner

• of global innovational Business- plans

• Competition (Los-Angeles, 2011).
**Literature**


Thanks for attention

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