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**CHANGING ENERGY POLICIES OF THE USA  
AND ROLE OF THE SOLAR POWER**

*The article discusses policies applied by the US government in order to stimulate the development of technologies and growth of productivity in the field of solar power. As a result of those policies, estimated total value of the solar power plants has reached around \$13,7 billion. In 2013, the solar power became the third major source of new electricity generation capacity in the US, accounting for 29%, after natural gas and thermal power station. In addition, due to the solar power, the US managed to decrease demand for natural gas and other sources of energy which pollute the environment.*

**Keywords:** energy security, photoelectric effect, solar power plant, solar panel, photovoltaic module.

*(стаття друкується мовою оригіналу)*

The United States of America is one of the leading energy producers of the world and it takes the 3rd place in the world for the oil production after Russia and Saudi Arabia. The US is already in the 1st place in the production of natural gas for many years, and every year it is more and more ahead of Russia, which is the 2nd place. Meanwhile, The USA is one of the massive energy resources consumer in the world, and for a long time it was considerably depended on oil and gas import. In recent years, situation has significantly started to change due to the «Shale Revolution» and realized energetics strategy, then internal production has considerably risen, meantime, import is also supposed to decrease gradually. In this respect, there appears a question that which part of the change is a purposeful function of the US leadership and in which direction the US energetics policy will develop.

Obama administration was working to strengthen the US technological leadership in the world and global competitiveness as noted that the US has been becoming a leader in solar energetics with help of the investments made during the last six years since they took the office. The last year was prominent in our history in terms of our solar energetics power. It is also a fact that solar industry creates jobs ten times faster than rest of the economy [11]. Today, thousands of renovated energy projects help to increase employment of the tens of thousands of workers from all over the country. For instance, here renewed energy generation has expanded by 180%, since the last time I was in Nevada [12]. In the USA, Ministry of Energetics has a decisive role in investing to the citizen scientific – research and empiric – constructor works spheres and during the 2014 financial year ministry spent 6,2 billion US dollars that the main part of this allocation – 4,7 billion US dollars were budgeted for fundamental research works. It should also be noted that more allocation was budgeted for technological improvement – respectively to strengthen sustainability of competitiveness of national economy and physics science spheres [10, p. 28].

Solar power consumption is one the most perspective resources among the renewable electricity energy resources. Solar power plants bring certain strategic superiorities to the US, as production of electricity energy from solar power will not only decrease natural gas import which increases day by day, but also it will decrease toxic gas emission of electricity energy producing stations. In stations where

coal and natural gas are used to produce electricity energy, there not only energy produced, but also the environment is polluted and toxic gas is produced. Usage of the sun as an energy resource will create energy diversification and it will decrease the effect of rising natural gas prices.

It is notified that, direct transformation process of solar power to electricity with the help of usage of photoelectric effect was invented by Edmund Becquerel in 1839 (It should also be noted that Albert Einstein was awarded with Nobel prize in 1923 for the theoretic explanation of this effect) [1, p. 734]. Even 30 years ago, the USA was proud of itself for having 80% of wind energetics power and 90% solar energetics power. The world's first solar battery was made by Bell Laboratories research center, however it had quite slight power – 4,5%. NASA continued work on solar batteries for its own purposes and transformation of sunlight to electricity was reached to 15%. Although, the first solar electricity plant, and also the first wind turbine which had megawatt power were installed in the US, unquestionably, China is currently leading in the sphere of renewable energy resources [3, p. 26–27]. Yet, during recent years the US has done crucial work in the usage of alternative energy resources in order to restore this lost possibility.

The US President, George W. Bush has established SAI – Solar America Initiative program in 2006 in order to support development of solar power technologies. Newly created SAI program support the goals listed in DOE – Department of Energy 2006 program which determines roadmap of energy security, development and renewals. Apart from that SAI program prepared International Energy Policy and Energy Policy Agreement within the framework of sun and sun related researches, development of solar power technologies and energy management goals. It is noted as an information that within the framework of 2007 financial year the budgeted proposal of the US president worth of 148,4 million US dollar for operation of SAI program was allocated and more than 66 million dollars of this budget was allocated to the solar power researches. Financial resources required from 2007 budget related to photovoltaics was 139,8 million US dollars [2]. The main goals of this program are enlargement of industrial power of the US, creating new industrial areas in order to decrease cost of production more, decreasing price of developed photovoltaic systems and speeding up research and development process in order to increase quality of required equipment.

Solar energetics for its growth rate in the world can be compared not only with other renewable energy resources, but also with scientific production goods such as telecommunication and computer. In this sphere, the main leaders were the European Union countries. However, in recent years leadership was gotten with high temp by Asian countries. During the year of 2013, 40 GW Solar Electricity Plants were opened to operate, and 13 GW of this belongs to China, while 20 GW of this is a portion of Japan. In the case of the US, it is the 5<sup>th</sup> country in the world rating for solar power production. In despite of all applied attempts, Americans could not resolve lagging behind some European countries and China in the area of photovoltaics, and in comparison of installed concentrators' power it even lags behind Spain. Solar power gradually becoming an independent area by courtesy of government given that 5600 companies operates and 143000 people work in this sphere. Overall balance value of Solar Energy

Powers are estimated around 13,7 billion US dollars. In the overall yearly electricity energy increase, proportion of solar energetics section with 29% lagged behind only natural gas and Heating Electricity Stations in 2013. In August 2014, power of Solar Power Plants increased 5 times in comparison with 2008 and reached 15,9 GW [4]. It should be noted that there are 5 leading states for solar energy production in the US, and they have 81% power of all Solar Power Plants: California with 2,6 GW is the first, then Arizona, South Carolina, Massachusetts and New-Jersey. Due to Sunshot Initiative project implementing by the Ministry of Energetics since 2011, by the end of the next decade it is supposed that construction value of Solar Power Plants operating in the country will have been decreased by 75%. Ministry considers that this goal will let Solar Power Plants reach Heating Electricity Stations in production of energy. This will help Solar Energetics to develop in large capacity without federal subsidies [5]. The authors of project predict that by 2030 photovoltaics will have fulfilled 14% of country's demand for electricity energy, by 2050 27% will have met. In order to reach the leader position in Global Energetics Competition, it is important that every year the US should launch Solar Power Plant which has 28 – 34 MW power.

According to the authors of program, revenues from hydrocarbon fuel economics will have been 34 billion dollars by 2030, it will have been 41 billion dollars by 2050, at the same time newly created jobs in this sphere will have been 290.000 people and it will have been 390.000 people by 2050. Although, accepted state programs opened doors to private corporations to recruit their resources, during the last five years average value of photovoltaics by 60%, average value of solar electricity systems by 50% have decreased. This for sure is not sufficient and as it is seen, solar energetics will depend on state support for a long time.

Consistently to the accepted program enormous Solar Power Plants will have been located in the South – East of country covering an area of 75.000 square kilometers empty land by 2050. Those plants will resemble to power plant of Tucson Electric Power Company located in Springville, Arizona, which is 4,6 MW and started to operate in 2000 (picture 1). Thousands of connected photoelectric elements unite in module so that they generate battery. Permanent energy enters transformer from battery, then high voltage energy enters system. Photoelectric element consists of two transistor plastins in which one contains lots of electrons. Light photon passes through this plastin so that mobilize free electron and enters other plastin, so this generates electricity.

Some American experts consider that thanks to the SunShot program Solar Energetics which was called «dark black horse» till recently, makes a step to «blowing» development stage. According to the claim of Solar Energy Industries Association this sphere «is directed to multigigawatts growth rate and creating tens of thousands of new jobs. Then, according to GTM Research Company idea with the making first step towards commercial status, the US is becoming «gravity center» of solar energetics» [6].

Worldwide production capacity of photovoltaic module reached 40 GW in 2013, and although, China had 64% in this common production capacity, proportion of the US was slightly more than 2% [7]. 7 out of the 8 worldwide photovoltaic module producers are Chinese companies,

while only one belongs to the USA. However, the US is still a step ahead in production of innovative thin layer modules. As, worldwide innovative thin layer module production was 4,2 GW in 2013, and 63% of this production belong to two companies – American company called First Solar and Japanese company called Solar Frontier.

In recent years, different than photovoltaics solar concentrators have been started to be used widely in industry upon the successful experiments. Theoretically, energy network possibilities of the seven states in South – West can be increased a few time with installation of 7500 GW concentrators in territories of the US. It is considered that installation of solar concentrators even on the 0,6% of all land fields in country is sufficient to meet all electricity demand of the US. According to the project of International Renewable Energy Laboratory if photovoltaic system worth of 3 kW was installed on the roof of every house in the USA, it would generate 420 billion Kw/hour electricity, which is equal to more than 35% of the US electricity demand [8, p. 1].

All massive projects related to solar energetics in the last years were realized on the support of federal government and state leadership which had interests. As, in order to realize Ivanpah project worth 2 billion dollars, the US has spent 1,6 billion dollars which had the most massive credit guarantee in the history of renewable energetics. However, experience showed that this electricity station can only generate half of its nominal power. In order to realize Solono project which worth of 2,2 billion US dollars, 1,45 billion dollars federal allocation was spent.

Meanwhile, construction of enormous photoelectric and thermoelectric plants are planned in South – West of the US. One of them is Kramer Junction station based on Israeli technology located in Mojave Desert, California and has been operating since 1989. Metal mirrors in the shape of parabola collects sunlight in heating receiver, internal heating carrier warms up ethylene glycol. This mirrors turn to follow sun. Warmed heating carrier enters heating exchanger so that vapor mobilizing turbine is created. In future perspective, certain proportion of energy of heating carrier is planned to be addressed to melted salt reservoirs. Heating collected in this way can be used to generate vapor in the nighttime.

However, calculations show that in despite of applied tries, in medium range perspective US will hardly be able to remove distance with European countries. In comparison with Germany who has 26% of total world solar energetics power, the slice of the USA is 14%, and this indicator is just predicted to raise only a little [9, p. 38]. In conclusion, on the contrary to what was supposed in SunShot Initiative Program, without revolutionary changes in technology appointment to be the leader of world solar energetics will not be possible.

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#### Мінлива енергетична політика США і роль сонячної енергії

Обговорюється політика, що проводиться США в цілях розвитку технологій і збільшення продуктивності в області сонячної енергетики. Сьогодні сонячна енергетика поступово перетворюється в незалежну сферу.

Загальна вартість всіх сонячних електростанцій оцінюється в 13,7 мільярдів доларів. У 2013 році 29% всієї нової виробленої електроенергії було отримано за допомогою сонячних електростанцій, що поступає за часткою лише природному газу і тепловим електростанціям. Також, за останні роки завдяки сонячній енергетиці, Сполученим Штатам вдалося зменшити попит на природний газ та інші забруднюючі навколишнє середовище види енергії.

**Ключові слова:** енергетична безпека, фотоелектричний ефект, сонячна електростанція, сонячна панель, фотовольтаїчний модуль.

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#### ОБ ИСТОРИИ ГЕНЕАЛОГИЧЕСКОЙ ТРАДИЦИИ АЗЕРБАЙДЖАНЦЕВ

Опираясь на местные средневековые источники по истории, рассматривается богатая родословная традиция азербайджанцев. В качестве раннего первоисточника приводится «Огузнаме» Фазлаллаха Рашидаддина (XIII век), где со ссылкой на «анонимных тюркских историков» прошлого излагается родословия древних огузов, а в «Истории Албании» (VII век) Моисея Каланкатукского говорится о родословии албанских царей из династии Аранишахиков. Далее в примере трудах средневековых историков-азербайджанцев Гасан бека Румду, Абди бека Ширази, Искендер бека Туркман эта традиция прослеживается в отношении правителей Азербайджана из разных царствующих династий (Селджукиды, Ширваншахи, Каракойунлу, Аккоюнлу, Сефевиды и др.). Отмечается, что во все времена азербайджанские историки придавали большое значение этой специфической работе, благодаря которой сегодня историки и этнографы располагают богатой базой родословных таблиц исторического прошлого народа.

**Ключевые слова:** Азербайджан, беки и асары, бекские комиссии, родословная, генеалогия, Гасан бек Румду, Искендер бек Туркман.

(стаття друкується мовою оригіналу)

Наличие богатого материала по родословиям является доказательством тому, что на протяжении многих веков генеалогия как общечеловеческая традиция получила должное развитие и у азербайджанцев. В качестве научной дисциплины в азербайджанской

историографии, генеалогия, изучающая происхождение семей, родов, правящих династий, начало своего развития берет в раннее средневековье.

В последующем, во дворцах мусульманских султанских династий, в период государственных образований с центром Азербайджана, родословия стали фигурировать в качестве официальных документов, обосновывающие легитимность правителей, племенных предводителей и высшего духовенства. Составленные родословия содержали под тщательным контролем, их сохранности придавалось особое значение, как с точки зрения политики, так и с позиции управленческой практики, причем, по всей видимости, дворцовые историки, обладающие навыками ведения генеалогии, подходили к этому вопросу с особой скрупулезностью.

В силу того, что мировая генеалогия базировалась, прежде всего, на письменных данных, а также то обстоятельство, что исторически была тесно связана с правящими династиями и дворянскими родами, вопрос формирования местной аристократической иерархии следует изучать в купе с культурой ведения письменной генеалогии. В контексте изучения азербайджанских традиций в данном вопросе обращает на себя внимание тот факт, что, согласно различным вариантам «Огузнаме» и другим историческим текстам, в раннем периоде в племенной среде древних огузов-тюркмен был широко распространен как устной передачи генеалогических сведений [1; 2], так и «письменных родословных экземпляров» [3, с. 46].

В «Истории Албании» Моисея Каланкатукского (VII век) мы встречаем также примеры письменного изложения родословия правящей династии. Здесь, начиная от генеалогии рода Яфета и далее, представлены краткие изложения родословия царей, некогда правивших Албанией. Автор свой труд завершает следующими словами: «Мы различные родословий объяснили до этого». Это говорит о существовавшей в стране навыков работы с родословиями [4, с. 14–17]. Представленные в «Албанской летописи» (XII в.) Мхитаром Гошей родословия патриархов албанской церкви начиная с апостола Елисея, прибывших сюда из Йерусалима [4, с. 242–245], также были изложены на основе сложившихся культурных традиций в области местной генеалогии.

Широко употребляемое в азербайджанской исторической литературе слово «шаджара» заимствовано с арабского языка, в переводе означает «дерево». В исторической литературе мусульманского Востока больше всего употреблялось именно это слово, а на тюркском языке сходным по смыслу этому слову было «soy kütüğü», «soyağacı», что в буквальном переводе означает «родословное дерево».

Существование местной родословной культуры у азербайджанцев и применение ими системы составления родословий в управленческой практике находит подтверждение сведениями ранних арабских источников (Ибн ал-Факих, ад-Димашкийя, Якут) [5, с. 61]. Вслед за арабскими завоеваниями новые хозяева первым делом обращают внимание к родословным таблицам о происхождении населения Азербайджана. Следовательно, с целью изучения генезиса азербайджанского народа были составлены таблицы известного содержания, согласно им и по трактовке арабских авторов выходило, что