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Babyna Olha

*PhD in Economics, assistant of the Department of
Agrarian Management and marketing,
Vinnytsia National Agrarian University
(Vinnytsia)*

ORCID: 0000-0002-0115-6600

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INNOVATIVE AND INVESTMENT DIRECTIONS OF DEVELOPMENT OF ALTERNATIVE ENERGY SOURCES: WORLD EXPERIENCE

Бабина О.М.

*кандидат економічних наук, асистент
кафедри аграрного менеджменту та маркетингу,
Вінницький національний аграрний університет
(м. Вінниця)*

ІННОВАЦІЙНО-ІНВЕСТИЦІЙНІ НАПРЯМИ РОЗВИТКУ АЛЬТЕРНАТИВНИХ ДЖЕРЕЛ ЕНЕРГІЇ: СВІТОВИЙ ДОСВІД

Abstract.

The article defines that the economic potential of any country largely depends on the state of its energy resources and the conditions of their use. It is substantiated that reliable, stable and efficient provision of the world economy with energy resources is a guarantee of energy security and an indicator of the quality of life of the population. The analysis of the world experience of innovation and investment directions of development of alternative energy sources is carried out. It is determined that for the sake of sustainable economic development of countries it is necessary to actively develop the use of alternative energy sources and energy efficiency. The necessity of transition to innovative ways of using alternative energy sources, which have huge resources and reduce the negative impact of energy on the environment, in order to ensure the stable development of both domestic and global economies. The adoption of the world experience of stimulating the use of alternative energy sources is proposed and the necessity of its adaptation to the modern conditions of Ukraine 's development is substantiated, applying a wide range of ways of stimulating the use of alternative energy sources.

Анотація.

В статті визначено, що економічний потенціал будь-якої країни багато в чому залежить від стану її енергетичних ресурсів і умов їх використання. Обґрунтовано, що надійне, стабільне та ефективне забезпечення світової економіки енергоресурсами є запорукою енергетичної безпеки та показником якості життя населення. Здійснено аналіз світового досвіду інноваційно-інвестиційних напрямів розвитку альтернативних джерел енергії. Визначено, що задля сталого економічного розвитку країн необхідно активно розвивати використання альтернативних джерел енергії та енергоефективність. Обґрунтовано необхідність переходу на інноваційні шляхи використання альтернативних джерел енергії, які мають величезні ресурси та дозволяють знизити негативний вплив енергетики на довкілля, з метою забезпечення стабільного розвитку як вітчизняної так і світової економіки. Запропоновано перейняття світового досвіду стимулювання використання альтернативних джерел енергії та обґрунтовано необхідність адаптації його до сучасних умов розвитку України, застосовуючи широкий спектр способів стимулювання використання альтернативних джерел енергії.

Keywords: *investments, innovation and investment activity, alternative energy sources, preferential crediting, "green" tariff, "green certificates", compensations, investment grants, preferential taxation, subsidies.*

Ключові слова: *інвестиції, інноваційно-інвестиційна діяльність, альтернативні джерела енергії, пільгове кредитування, «зелений» тариф, «зелені сертифікати», компенсації, інвестиційні гранти, пільгове оподаткування, субсидії.*

As foreign experience shows, the issue of energy security and innovation and investment development of alternative sources in this field has recently been increasingly covered by domestic and foreign scientists. However, despite significant achievements in this area, there are still many unresolved issues regarding the generalization, deepening and use of world experience in the context of energy conservation and the possibility of using alternative energy sources in the light of modern economic conditions [1].

Global trends demonstrate active measures to implement energy-saving technologies that can contribute to higher economic growth, reduce the cost of renewable energy and increase accessibility for all segments of the population. Studies of the successful implementation of energy efficiency policies of the leading energy saving countries, which most actively use both modern energy saving technologies and alternative energy sources, can be used by our state. It is necessary to analyze the effective foreign

experience in this area and, taking into account the national characteristics of our state, to assess the feasibility of its implementation in Ukraine [1].

Given the current trends in the development of this energy sector and environmental thinking, we consider it necessary to consider in more detail and explore the development of alternative energy in the world, in order to learn from foreign experience in energy efficiency in Ukraine [1].

The countries that are most intensively developing technologies and markets for alternative renewable energy sources are primarily the countries of the European Union. In the European Union there is a systematic approach to solving this problem. It is recognized that further economic growth depends primarily on the introduction of innovation and competitive energy policy aimed at creating a new, "green" and "smart" economy based on the use of alternative energy sources, which is a priority area of innovative development [2].

As of January 1, 2018 four countries from the European Union are in the top ten, in terms of the use of non-traditional sources of electricity, from the world's twenty countries (G20) (Germany – first place, Italy – 3, Great Britain – 5, France – 6). Despite the fact that in the top five European countries missed only Indonesia, as the second place is occupied by the European Union (27 countries). The United States ranks seventh in this ranking, Mexico – 8, India – 9 [3].

In many European countries, the main part of primary alternative energy production is obtained from biomass and solid biofuels [4], in general, biomass (traditional and modern) provides about 14% of final energy consumption. In some countries, the share of biomass in total energy consumption is much higher than the European average, for comparison, the average value for all EU countries is only + 72%, in the US – 3.2%, in Denmark – 8%, in Austria – 12%, in Sweden – 18%, in Finland – 23% [1].

At the end of 2015, 17376 biogase and 459 biomethane plants were already operating in Europe. In addition, Sweden, Denmark and Germany are actively building boilers and power plants running on biomass products. The leader in the number of biogas plants is Germany – 10846 plants [1].

According to the latest estimates of scientists, today there are about 150 planned and already implemented projects in the world from the full transition to alternative energy [1].

In many US cities – Aspen, Burlington, Vermont – have completely switched to renewable energy, Vancouver – Canada plans to switch completely to energy from alternative energy sources. Iceland has already achieved 100% of electricity production and 85% of thermal energy from alternative energy sources. In some countries, such as Norway, Ireland, and Croatia, alternative energy sources are already successfully replacing traditional energy sources almost completely [5].

France is no less determined, according to the new plan, by 2028 renewable energy capacity should double, Germany has set a goal to increase the share of

green energy to 65% in 2035, and cities such as Frankfurt, Munich – by 2025 100% electricity from alternative energy sources for all consumers [6].

The United Kingdom has held a so-called "green week" without coal for the first time since 1882, and intends to achieve zero carbon consumption by 2050. Long-term development plans for the use of renewable energy sources in Scotland have been developed, the goal of which is by 2020 achieve 100% of electricity production and meet 30% of total energy demand from alternative energy sources, Maldives – by 2020 100% of energy from alternative energy sources. Costa Rica has been providing 100% of its electricity needs from alternative energy sources since the beginning of 2015, and plans to achieve full decarbonisation by 2020 [1].

Latvia has developed long-term plans for the development of renewable energy sources and is expected to increase from 35% in 2000 to 51% in 2020, 60% in 2030, 77% in 2040 and 98% in 2050 [7]. Electricity production in Latvia is now provided by hydropower plants (66%) and thermal power plants running on natural gas (30%), as well as in equal small shares – by wind energy, combustible renewable energy sources and waste, and petroleum products [8].

The Danish government banned the construction of nuclear power plants after the Chernobyl accident, and today 20% of electricity is generated by wind farms. The country's energy policy is implemented within the framework of an energy program that is constantly updated, taking into account the requirements of the time. The "Energy 2000" program provided for efforts to increase the use of environmentally friendly fuels, the "Energy 21" program aimed to achieve by 2005 the share of renewable energy in the country to 12–14% [9]. By 2035 it is planned to achieve 100% of heat and electricity production from alternative sources, and by 2050 it is planned to fully switch to renewable energy sources in all sectors of the country [10].

It is safe to say that more and more countries are currently developing and implementing their plans and strategies to significantly (50–100%) meet their energy needs through the use of alternative energy sources, which is one of the promising areas of innovation. The speed of development of innovative technologies, the introduction of scientific developments in the field of renewable energy allows you to count on the attractiveness of investments in this area in the long run [7].

Although the cost of energy from alternative sources has been declining recently, most technologies for its production are becoming competitive, but still inferior to technologies based on the use of traditional fuels, primarily due to high initial capital costs. Generating facilities based on the use of alternative energy is more capital-intensive, so significant investments are needed to ensure their proper functioning. Large energy companies, banks, international organizations, and funds invest in the development of alternative energy [1].

According to a study by the international company Bloomberg New Energy Finance [11], recently there has been an increase in global investment in the development of alternative "clean" energy. The driving force behind this process is changes in the energy policy of countries with structural restructuring of the fuel and

energy complex, related to the environmental situation and the transition to energy-saving and resource-saving technologies in energy and other sectors of the economy.

The International Energy Agency (IEA) estimates that humanity should invest more than \$ 1 trillion annually in innovative energy projects and generating capacity over the next 20 years. It is projected that in 2030 the growth of global demand for the use of alternative energy sources for heating will increase by 7%, and investment in renewable energy sources by 2030 will amount to 5.5 trillion dollars. USA [12]. This need will be driven by shifts in the global economic system due to growing demand for energy resources due to population growth from 6.5 billion to over 9 by 2050, as well as economic growth in developing countries [13 p. 1].

In 2011, countries such as China, the United States, the European Union (Sweden, Austria, Finland, Germany, Portugal, Spain), India and Brazil invested about \$ 160 billion. USA [3].

China has become a leader in terms of investment in the development of alternative energy sources and the production of a number of technologies that are competitive on the world market. The development of alternative energy for China is not only a tool for "own" energy supply and reduction of greenhouse gas emissions, but also a tool for innovative economic development [1].

In 2012, the volume of global investments in alternative energy in the top twenty countries invested more than 268.7 billion dollars. USA. Investors have invested \$ 142 billion in the solar energy segment alone. US, wind – 78.3 billion dollars. USA. According to research company Bloomberg New Energy Finance / BNEF 26 / in 2012, China was ahead of the United States in terms of investment in alternative energy. According to BNEF experts, China's investment increased by 20% compared to 2011 and amounted to 67.7 billion dollars. USA. The bulk of Chinese investment fell on development, as well as the purchase of companies in the solar energy segment [1].

In 2013, \$ 114.7 billion was spent on the development of solar energy in the world. USA, China has invested more than 61.3 billion dollars. The United States has about a third of its solar capacity (60% of all large-scale projects implemented by China, the United States and Japan). In Japan, \$ 35.4 billion has been invested in the development of solar energy. USA, which is 55% more than in 2012. Expenditures on wind energy amounted to 80.3 billion dollars. USA. \$ 8 billion has been invested in the biomass and waste energy sector. US investment, which is 32% less than in 2012. The share of solar energy has been increased by Latin American countries – Brazil, Chile, Mexico and Uruguay, investments in alternative renewable energy sources, each of which amounted to more than 1 billion dollars. USA. In Brazil, investments amounted to \$ 3.4 billion. USA [5].

In 2015, the priority in investment belonged to China (49.74 billion US dollars), then the United States (44.51 billion US dollars) and the European Union

(38.71 billion US dollars), India (10.13 billion US dollars), as well as Brazil (8.23 billion US dollars). That is, there was a steady increase in investment in alternative energy in the top twenty countries [1].

The first place, in terms of investment in 2004–2017, belonged to the European Union (290.68 billion US dollars, of which Spain invested 77.47 billion US dollars, Germany – 49.35 billion US dollars, Great Britain – 45.42 billion US dollars, Italy – 24.28 billion US dollars, France – 20.842 billion US dollars). The next largest investors were the United States (\$ 214.96 billion), China (\$ 197.49 billion), Brazil (\$ 52.31 billion), and India (\$ 39.72 billion). USD (Canada) (USD 23.88 billion), Australia (USD 10.31 billion), Japan (USD 9.41 billion), Mexico (USD 6.03 billion). United States), Turkey (\$ 5.57 billion). In total, in the analyzed period, more than \$ 860 billion was invested in alternative energy in the G20 countries. USA, and in 2018 according to this indicator, the EU countries ranked third, second only to China and the United States [1].

As we can see, the volume of investments in alternative energy is growing every year, which indicates the prospects for significant growth in this area of electricity production in the near future [1].

For the development of renewable energy in 98 countries provide benefits to producers of "green" energy, realizing that its development meets the strategic goals of the country. Ways to stimulate the use of alternative energy sources in the European Union are a complex and extensive system [14]. The legislation of each of the EU member states defines the ways in which such incentives are provided, there are relevant regulations on state support for electricity producers. The need for such support is related to the specifics of investing in "green" technology, as a rule, it is:

- projects with a long payback period, for the implementation of which funds of international financial organizations in foreign currency are involved;
- compensation (in the form of a fixed ("green") tariff or a surcharge on the price of electricity produced on the basis of the use of renewable energy sources);
- use of the concept of "green energy" for alternative energy, which implies a higher price for its conscious consumer;
- tax benefits;
- soft loans;
- preferential tariffs for the sale of electricity produced from renewable sources in the grid;
- quotas for production (consumption) of electricity from renewable energy sources energy sources and penalties for non-compliance with established obligations;
- a legislative requirement to ensure an appropriate share of alternative energy in the overall energy balance within a specified period;
- various tender policies, special tariffs, "green" certificates, types, and ways to combine them [7].

The most common and promising stimulus for the development of alternative energy is the "green" tariff – a mechanism to encourage and compensate for costs in the form of establishing a long-term fixed tariff for electricity generated through the use of renewable energy sources. In essence, a "green" tariff is a regulated

cost of electricity produced from alternative energy sources, which is set by law for a certain period of time and is usually higher than the affordable market price of electricity. The application of the "green" tariff implies state guarantees to producers that the energy produced by them will be purchased at higher prices than from traditional energy producers, and the quantitative result of this type of incentive directly depends on the tariff set by the government. This approach allows the state to attract private investors to the industry, who are guaranteed a return on investment in the generation of renewable energy sources with adequate rates of return in countries where the entire electricity market is in private hands, the state sets quotas for the purchase of a certain amount of energy. alternative sources and imposes fines on those electricity traders who do not buy a certain amount of "green" electricity [7].

According to the plans for the development of the alternative energy industry, Germany should provide 18% of renewable sources in the country's energy consumption by 2020. The Law "On Renewable Energy Sources", which was adopted in 2000, introduced a differentiated "green" tariff for a long period – 20 years. Under this support system, the law sets a priority for electricity producers in the electricity market and provides them with access to the grid; electricity prices are fixed, which provides guarantees to private investors and allows the relevant power plants to operate at a break-even point [15].

This incentive model is used by Austria, Denmark, France, Italy, the Netherlands, Greece, Spain, India, Brazil, the Czech Republic, Canada and other countries [9].

Mandatory quotas for the production or consumption of alternative energy sources operate in the Netherlands, the United Kingdom, Belgium, Sweden, and Japan. The fact of consumption (production) of a certain amount of energy for alternative energy sources is confirmed by "green" certificates (certificate and / or entry in the electronic register), valid since 2000 "Green" certificate is a document confirming the production of each MW/h of electricity from alternative sources. The country sets a mandatory quota for the amount of "green" electricity in total production. Green energy has priority in network access [1].

Producers of electricity from alternative energy sources, wholesalers, distribution companies or retailers (depending on who is involved in the electricity supply chain) are obliged to accept and pay for it, consumers are obliged to buy it in accordance with the established quotas [9]. Trade in "green" certificates was introduced for companies that did not meet or exceeded quotas. The price of "green" certificates is determined on the market for these certificates (for example, NordPool). Producers can sell electricity at the market price, as well as "green certificates" that prove that the electricity is produced from alternative energy sources. Vendors prove that they are fulfilling their obligations by buying "green" certificates or paying a fine. Under favorable market conditions, this method of incentives should lead to the lowest costs of electricity production from alternative sources [1].

The system of "green" certificates (quota system) also operates in Italy, Poland and Romania [16].

For the development of renewable energy in many countries, governments have enacted legislation to reduce taxes on producers of electricity generated by renewable energy sources, as well as developed programs and strategies for the development of renewable energy, which include financial and organizational support, both interstate, and at the national level, companies engaged in alternative energy [1].

The instrument of investment tax benefits (investment tax credit), which are set depending on the type of equipment, has become widespread in the United States. For example, for solar-powered equipment, tax benefits of 30% of costs (capital costs) are provided, with no limit on the maximum amount of benefits [12]. Owners of wind turbines receive a government loan of 0.5 to 1.5 cents per 1 kWh of electricity sold. This loan is included in tax, insurance or land fees [17 p. 96].

In European countries, tax incentives often complement key incentives and remain an important and flexible tool. For example, in the Netherlands, the production of electricity from alternative sources is stimulated by directing income tax on investment in alternative energy projects, in Denmark 75% of wind turbines are privately or cooperatively owned, and the owners of the installations are exempt from tax [1].

The Chinese government has introduced the following mechanisms of state regulation development of renewable energy as a reduction of 50% by 2015 the tax on the sale of energy produced by solar power plants, the introduction of restrictions on expanding the production of solar modules, the government creates favorable conditions for innovation and implementation of new projects [1].

A special means of stimulating energy production from alternative sources is also the provision of investment grants, loans, tendering systems, a common means is the provision of subsidies [1].

Some European Union countries, such as Germany and the Netherlands, use low-interest loans with longer repayment periods for producers of electricity from alternative energy sources. In Poland, the National Fund for Environmental Protection and Water Resources provides soft loans for the implementation of "green" electricity projects in the case of the use of wind, biogas and hydropower. The loan amount is 1... 12.5 million euros, but may not exceed 75% of the project cost. The borrower is exempt from paying up to 50% of the loan. Preferential lending for "green" technologies in various forms is also available in Denmark, Slovenia and the Czech Republic [18].

Grants are often awarded to stimulate electricity of alternative origin generated by new innovative technologies. In particular, in Finland, investment grants and subsidies are the only types of incentives for the use of alternative energy sources.

In Denmark, the amount of subsidy for "green" electricity is 20 euros / MWh. To encourage the introduction of modern biomass boilers that have been certified, the Danish Energy Agency has provided a subsidy of 20% of the cost of the boiler. The system of surcharges (bonuses, subsidies) for electricity from RES

also operates in Finland, the Czech Republic, the Netherlands, Spain and other countries [1].

Producers of "green" electricity receive significant compensation for the supplied electricity (compensation is paid for twenty years, but its size will decrease every two years). Thus, for electricity from biomass the base tariff is approximately 7.79... 11.67 eurocents / kWh depending on the plant capacity, and for electricity from biogas obtained by anaerobic fermentation of biomass – 8.79... 12.67 euro-cents/kW·year. There are surcharges to the basic tariff: for the simultaneous production of heat and electricity, for the use of energy crops as biomass and for the use of innovative technologies in the production of electricity from biomass, etc [1].

France and Latvia also have a tendering system. The essence of this system is that the country announces a tender for the construction of "green" electricity facilities and the winner of the tender receives full or partial state funding for construction [15].

In many developed countries there are state programs for the development of renewable energy sources. Thanks to such programs, scientific and technical, energy, environmental, social and educational tasks are weighed. The set goals are achieved by solving problems in the field of state regulation, preferential tax legislation, state financial support through scientific and technical programs of preferential lending, creation of information network, education system, internships, promotion of high technologies, job creation and public opinion training [17]. World experience of stimulating the use of alternative energy sources (Fig. 1.).

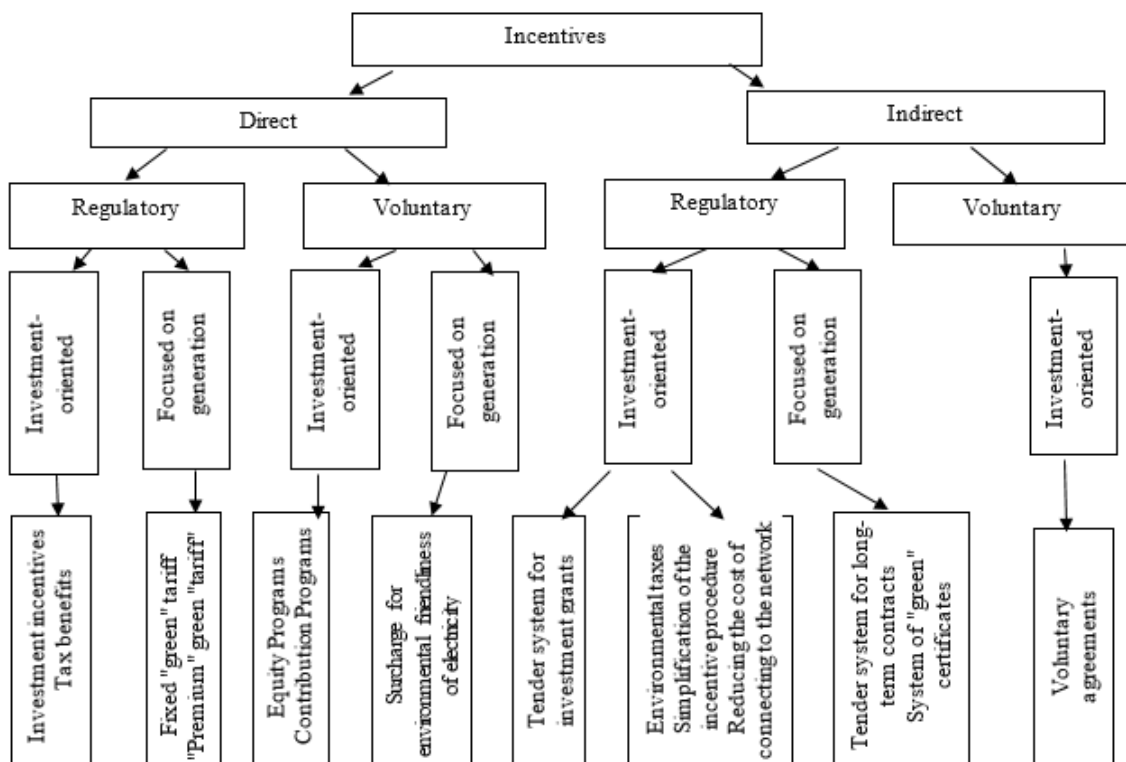


Fig. 1. World experience in stimulating the use of alternative energy sources [1]

Source: developed by the author

Austria has a law to stimulate the production of energy from renewable sources. The solution of energy issues is transferred to the regional governments. The Government of Upper Austria provides information support to private users (hotline, publications, CDs, the Internet, holding annual Energiesparmesse exhibitions with awarding winners, free consultations and energy audits for private users) [1].

At the legislative level, the priority is also set for the use of biomass in the heating of public buildings, simplification of administrative procedures. A Stock Exchange for trade in biomass fuels has been established. Significant support is provided to research projects in the field of renewable energy sources. Funds are provided by federal departments, regional governments (in the provinces), the Research Support Fund (FWF), the Industrial Research Support Fund (FFF), the Austrian National

Bank Fund, and the Innovation Technology Fund (ITF) [1].

Summing up the results of the study on the development of alternative energy in the world, we can conclude that the best option is a gradual transition of humanity to alternative sources, which are still quite expensive, but more importantly – are renewable. It is proposed to adopt the world experience of stimulating the use of alternative energy sources and member states of the European Union and adapt it to modern conditions of our country, using a wide range of ways to stimulate the use of alternative energy sources [1].

Extensive experience in using various mechanisms of state support for the use of alternative energy sources must be taken into account in the development of Ukrainian state policy in this area, among which the dominant ones are "green" tariff, "green certificates",

compensations, investment grants, preferential taxation, subsidies and low-interest loans [1].

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Лагун Антоніна Іванівна
аспірант кафедри Міжнародного обліку та аудиту
Київський національний економічний університет ім. В. Гетьмана

МОДЕРНІЗАЦІЯ ВНУТРІШНІХ ВЕНЧУРІВ БАГАТОНАЦІОНАЛЬНИХ ПІДПРИЄМСТВ В ФОРМАТІ ТЕХНОГЛОБАЛІЗАЦІЇ

Lagun Antonina Ivanivna
Postgraduate student of the Department of International Obligation and Audit
Kiev National Economic University im. V. Getman

MODERNIZATION OF INTERNAL VENTCHURIS IN BAGATONATSIONALNIKH PIDPRIUMSTVS IN TECHNOGLOBALIZATION FORMATS

Стаття присвячена діючим на сьогодні механізмам корпоративного венчурингу БНП, мова насамперед йде про: внутрішні венчури та корпоративні венчурні фонди, а також мотиваційні цілі, що спонукають корпоративний сектор до заснування у своїй організаційній структурі внутрішніх венчурів спінофф-компанії, стратегії супутнього венчурного бізнесу, публічного розміщення акцій на IPO. Саме цим визначена і актуальність теми, поза як внутрішній венчуринг демонструє вагомі «вузькі місця», пов'язані з

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