# ASSESSMENT OF THE FOSSIL FUEL SUBSIDY REFORM IMPACT IN UZBEKISTAN

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# CONTENTS

# LIST OF ABBREVIATIONS

| | |
|---|---|
| **ADB** | Asian Development Bank |
| **BAU** | Business As Usual |
| **BGP** | Biogas plant |
| **CCGT** | Combined-cycle gas turbine |
| **CIS** | Commonwealth of Independent States |
| **COP27** | 27th UN Climate Change Conference (Conference of Parties) |
| **CPI** | Consumer price index |
| **CSE** | Consumer Support Estimate |
| **EE** | Electric energy |
| **EECCA** | Eastern Europe, Caucasus and Central Asia |
| **EHS** | Environmentally harmful subsidies |
| **EM** | Energy mix |
| **ES** | Energy sector |
| **EU** | European Union |
| **EU ETS** | EU Emissions Trading System |
| **FC** | Final consumption |
| **FEC** | Fuel and energy complex |
| **FFFC** | Final fossil fuel consumption |
| **FRDU** | Fund for Reconstruction and Development of the Republic of Uzbekistan |
| **G20** | The group of countries with the most developed and developing economies that form 85% of the world's gross national product |
| **GDP** | Gross domestic product |
| **GEM** | General Equilibrium Models |
| **GHG** | Greenhouse gases |
| **GSI** | Global Subsidies Initiative |
| **GSSE** | General Services Support Estimate |
| **GVA** | Gross value added |
| **GTU** | Gas turbine unit |
| **HGT JSC** | Hududgaztaminot Joint Stock Company |
| **HPP** | Hydroelectric power plant |
| **HWS** | Hot water supply |
| **IC** | Intermediate consumption |

| | |
|---|---|
| **ICMA** | International Capital Markets Association |
| **IEA** | International Energy Agency |
| **IEC** | International Energy Charter |
| **IFRS** | International Financial Reporting Standards |
| **IISD** | Global Grants Initiative of the International Institute for Sustainable Development |
| **ISIC** | International Standard Industrial Classification of All Economic Activities |
| **IMF** | International Monetary Fund |
| **I-O** | Input-output method |
| **IP** | Intermediate products |
| **MEF RUz** | Ministry of Economy and Finance of the Republic of Uzbekistan |
| **MPS** | Market price support |
| **MRET** | Mining resources extraction tax |
| **MoE RUz** | Ministry of Energy of the Republic of Uzbekistan |
| **MoF RUz** | Ministry of Finance of the Republic of Uzbekistan |
| **NENU JSC** | National Electric Networks of Uzbekistan Joint Stock Company |
| **NDC** | Nationally Determined Contributions |
| **o.e.** | Oil equivalent |
| **OECD** | Organization for Economic Co-operation and Development |
| **OR** | Oil refinery |
| **OSCE** | Organization for Security and Co-operation in Europe |
| **PEEM** | Public Environmental Expenditure Management |
| **PSE** | Producer Support Estimate |
| **PwC** | PricewaterhouseCoopers. An international network of companies offering consulting and audit services |
| **RES** | Renewable energy sources |
| **R&D** | Research and development |
| **SCC RUz** | State Customs Committee of the Republic of Uzbekistan |
| **SCS RUz** | State Committee of the Republic of Uzbekistan on Statistics |
| **SNA** | System of National Accounts |
| **TCT** | Transfers from the state budget to consumers of energy resources |
| **TPP** | Thermal power plant |
| **TSE** | Total support estimate |
| **UNG JSC** | Uzbekneftegaz Joint Stock Company |
| **UTG JSC** | Uztransgaz Joint Stock Company |
| **UGT JSC** | UzGasTrade Joint Stock Company |

| | |
|---|---|
| **UN** | United Nations Organization |
| **UNDP** | United Nations Development Program |
| **UNECE** | United Nations Economic Commission for Europe |
| **UZEX** | Uzbek Republican Commodity Exchange |
| **Uzhydromet** | Agency for Hydrometeorological Services under the Ministry of Ecology, Environmental Protection and Climate Change of the Republic of Uzbekistan |
| **VA** | Added value |
| **VAT** | Value added tax |
| **WB** | World Bank |
| **WEC** | World Energy Council |
| **WTO** | World Trade Organization |
| **WTO ASCM** | Agreement on Subsidies and Countervailing Measures of the World Trade Organization |

# INTRODUCTION

Central Asian countries, being among the world's most carbon-intensive economies, face the challenge of reducing heavy dependence on fossil fuels.[1] The most effective solution is to eliminate or reduce the significant state support (subsidies) provided to fossil fuel sector.

Studies by the United Nations Development Program (UNDP) show that the world spends USD423 billion annually to subsidize consumers of oil and electricity generated by burning gas and coal. Global fossil fuel subsidies are four (4) times the amount needed to help poor countries fight the climate crisis, or three (3) times the amount needed to end extreme poverty on a global scale.[2]

Assessment of the size and structure of state support in the fossil fuel sector is a new topic for Uzbekistan, although the sector largely determines the socio-economic and environmental situation in the country.[3] At the same time, Uzbekistan has committed to reduce greenhouse gas (GHG) emissions per unit of GDP by 35% by 2030 compared to 2010 levels.[4] Against the background of such an ambitious commitment, the reform of the state support for fossil fuels becomes one of the *key challenges for the country's long-term development*. It is important to implement the reform as painlessly as possible to prevent instability in the energy sector and related industries, decline in economic output, as well as the aggravation of social problems. Global practice shows that such risks inevitably accompany any reform of energy subsidies.

**The purpose of the report** is to provide a toolkit to assess the environmental, economic and social consequences of subsidy reduction in Uzbekistan's fossil fuel sector under various fossil fuel reform scenarios. The goal is to be achieved through the following:

- summarization of existing methodological approaches/tools in world practice for examining the problem;
- analysis of the risks which might come up as part of reform of state support for fossil fuel sector;
- identifying the relationship between the scale of energy subsidies and the level of energy efficiency in industries that are the major consumers of fossil fuels;
- developing scenarios for energy subsidy reform;
- modeling the impact of reduction of energy subsidy scale with a focus on economic, social, and environmental indicators;
- developing recommendations for impact management and preparing a Roadmap for Energy Subsidy Reform in country.

**The report is exploratory and evaluative in nature** and consists of two parts. The first part is the report itself, which contains 10 chapters and 8 annexes. The second part is a Methodological note, which details the approach and mathematical apparatus of the modeling toolkit.

[1] Fossil fuels are coal, oil, oil shale, natural gas and its hydrates, peat and other combustible minerals, and substances used primarily as fuels.

[2] "Don't Choose Extinction" UNDP campaign to actively draw attention to the negative impact of hydrocarbon fuel subsidies on people and the planet. POSTED 28 OCTOBER 2021. https://www.undp.org/ru/kazakhstan/press-releases

[3] The energy sector makes the largest contribution (76.3%) to total GHG emissions in Uzbekistan.

[4] Republic of Uzbekistan. Updated Nationally Determined Contribution (NDC). 2021. https://www4.unfccc.int/sites/NDCStaging/pages/Party.aspx?party=UZB

**Chapter one** of the report presents the current situation in Uzbekistan's fossil fuel sector, the nature and extent of its relationship with the economy as a whole. The analysis was based on the Input-Output model, which is further used for scenario calculations. The choice of the model is based on a number of its advantages in terms of features of the national economy which are not available for other models found in world practice. All arguments for choosing the model, as well as the characteristics of the Input-Output model are presented in Annex 1.

**The next two chapters** examine international approaches to the classification of support measures (**Chapter 2**) and their evaluation methods (**Chapter 3**). Drawing on the findings of these chapters, as well as the specifics of energy pricing (**Chapter 4**), **Chapter 5**, an attempt has been made to calculate the scale of state support for fossil fuels in Uzbekistan for the period 2017-2022. The calculation is based on the structure of the Agreement on Subsidies and Countervailing Measures of the World Trade Organization (WTO ASCM).

**Chapter 6** summarizes the global experience accumulated in fossil fuel subsidy reforms in terms of summarizing the possible economic, social and environmental risks that arise during and after the reform process. This chapter is a "transitional" chapter to subsequent chapters that contain steps to model the impact of energy subsidy reform on Uzbekistan.

**Chapter 7** contains a methodological approach on how to develop the model toolkit for assessing the impact of the energy subsidy reform in Uzbekistan (concept; terms of reference; set of indicators, statistical reporting and input parameters).

**Chapter 8** contains the results of model calculations for which the *final consumption multiplier methodology* was developed. The calculations of reform impact in this chapter are based on the average annual estimate.

**Chapter 9** contains long-term scenario calculations of the impact of energy subsidy reform in Uzbekistan for the period up to 2035.

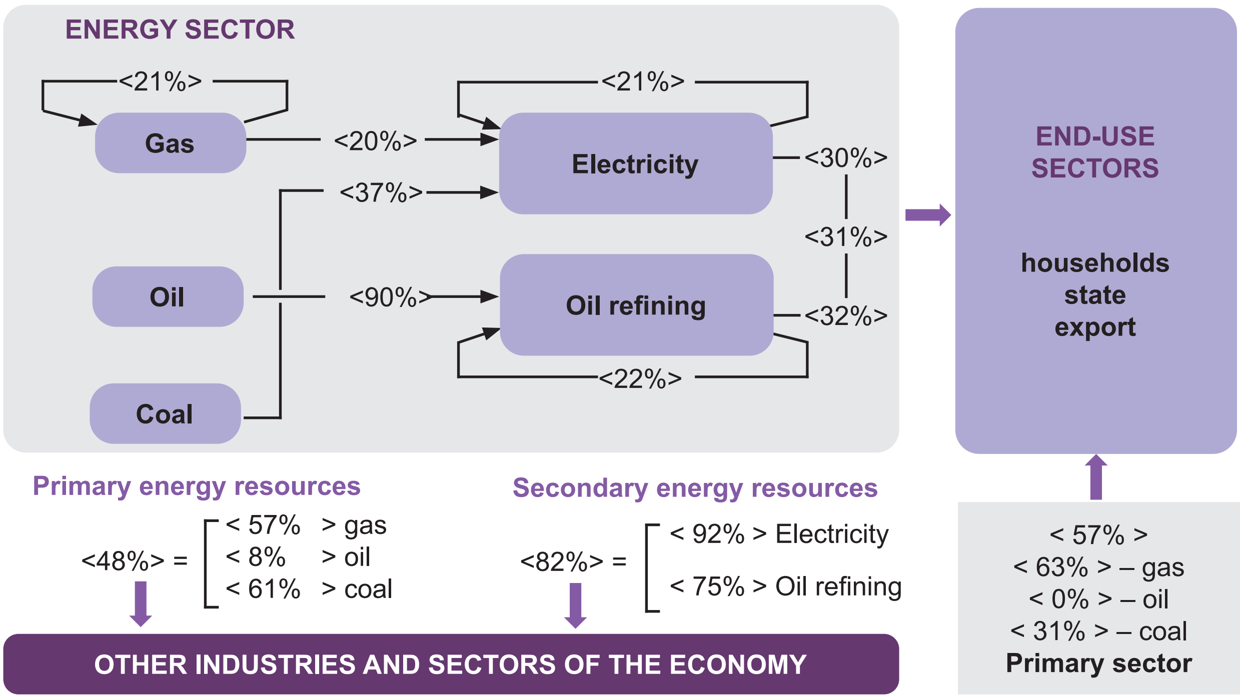
**Chapter 10** provides guidance on how to manage the impact of fossil fuel subsidy reform and develop a Reform Roadmap.

Due to the interdisciplinary and complex nature of the study, the authors' team included specialists from a number of ministries and agencies, as well as independent experts. The authors' team hopes that the report will fill the existing gaps in understanding and the need to revise the state support system for the fossil fuel sector. This, in turn, will provide a roadmap for discussing the energy subsidy reform process in Uzbekistan with policy-makers, line ministries, the expert community and other stakeholders.

The names of ministries and departments are given as of December 2022 (before the release of the Decree of the President of the Republic of Uzbekistan "On measures to implement the administrative reform of the new Uzbekistan" No. 269 dated 12.21.2022). In accordance with this Decree, many ministries and departments have been transformed and changed their names since 2023.

# CHAPTER 1: FOSSIL FUEL SECTOR: SUPPLY, DEMAND, AND STRUCTURAL SHIFTS

Finding a format for energy subsidy reform, suggests, first and foremost, understanding the extent to which the fossil fuel sector is interconnected with the economy. Both primary energy extraction and secondary energy production have direct/reverse links in the **intermediate product** flows not only *within the energy complex* (with each other), but also supply energy resources *to other sectors*, as well as for use by *end users* (population, state, external sector).




*Source: Calculations based on 2019 Input-Output table. The parentheses show the share of the energy carrier supply as a percentage of its supply in general for production needs. This applies to all relationships except for end-use supplies, which are shown as a percentage of the resource volume of the respective energy source.*

**Figure 1. Linkages among energy supply sectors**

**The primary energy sector** includes large state-owned oil, gas, and coal companies. It is the leading sector of the economy. In 2019, it accounted for 1) 85.6% of total output and 90.1% of value added in the mining industry; 2) 5.4% of total taxes received from all sectors of the economy. **The main objective of the sector is to ensure the country's energy security.**

Natural gas resources are formed entirely through domestic production. The main component in the structure of intermediate products of natural gas industry is the natural gas itself, i.e. the industry is self-sufficient (does not depend on the products of other industries). However, the industry is highly dependent on the *imported equipment and materials*. Thus, the share of imports in the position "basic chemical substances" in 2019 stood at 61.4%, "non-metallic mineral products" – 100%, "pumps and compressors" – 72%, etc.

High dependence on imports creates the risk of rising *costs for gas companies in case of increased external instability.* This increases the risk of expanding subsidies to the industry, given its key role in ensuring the country's energy security and the fact that most imported equipment and materials come from Russia, which is under external sanctions and is experiencing a decline in production.

In addition to intermediate consumption costs, cost items also include *tax* payments and wages. The level of the tax burden in the gas industry (11.1%) is higher than in the economy as a whole (4.5%), which indicates a significant *contribution of the gas industry to the sustainability of public finances.* The share of wages in the cost structure of the industry amounted to 16.1%, while the average industry share in the economy was 22.8%. This indicates the *industry's low potential for creating new jobs*.

In the gas distribution structure, 40% goes to the real sector of the economy as fuel for the production of goods, 60% – for final consumption. Among key consumers are the gas industry itself (21%) and the power industry (20%), as gas dominates in the structure of energy resources used for electricity generation. Gas is also used in transport (14.8%), non-ferrous metals production (7%), cement production (3.4%), etc. *These industries can be subject to hidden subsidies on the purchase of gas and the terms of its purchase.*

Coal resources are formed by coal production (64.3%) and imports (35.7%). With the growth of the cost of coal production the state has increasing arguments to *subsidize its imports*, using import duties, taxes and transport tariffs.

The coal industry is more closely linked to the economy *in the consumption of intermediate products.* Whereas the gas industry has 10 items covering 80% or more of its intermediate consumption needs, the coal industry has 16 items. The coal industry also depends on imports of intermediate goods, but to a lesser extent than the gas industry (20% on average). The largest share of imports accounts for "Machinery and equipment" (100%), "Non-metallic mineral products" (42.5%), and "Rubber products" (28%).

A significant contribution to the cost structure of coal production is made by the service sector: equipment repair (9.8%), transport (9.3%), rent and leasing (3.7%), finance (2.4%), accounting (2.2%). In addition, the *share of labor costs is high* (39.5% vs. 22.8% for the economy as a whole), and the share of tax burden is moderate (4.8% and 4.5%, respectively).

Coal distribution structure. More than 80% of the coal used for production needs falls on 4 consumers (electric power – 36.8%, education – 30%, personal services – 9.4%, administration and defense – 5.9%). The removal of subsidies in the coal industry will lead to an increase in electricity prices. Or, if coal prices are frozen, coal-fired power plants' profits will fall. In the education sector, coal is used to heat educational institutions in rural areas with a shortage of gas supply. An increase in coal prices in this case will lead to an increase in the education sector's debt to coal companies.

Oil resources are formed from production (72.2%) and imports (27.8%). During 2000–2019 own oil resources decreased from 7.3 million toe up to 3.9 million t.o.e (by 46.6%).

Oil production is closely linked to the gas industry. In the structure of the intermediate products of the oil industry 2/3 account for gas, as well as services for its transportation and sale. Thus, *oil production is the least linked to imports compared to gas and coal*, although the development of the industry is closely linked to the exploration of new deposits, which is difficult to imagine without foreign companies.

**Secondary energy sector.** Fossil fuels are used not only to meet the needs of the population and organizations for fuel and heat, but also to produce secondary energy inputs, primarily electricity and refined products, including various types of motor fuel.

All primary energy sources, except for oil are used *in the electricity generation.* Gas accounts for more than 40%, coal for almost 8%, and petroleum products (fuel oil) for 3%. Another important item is payment for gas and electricity transportation services (15%), transportation services (8%) and equipment repair (about 5%). The first 7 types of costs account for 81.3% of the total costs of intermediate products.

### TABLE 1. COST STRUCTURE OF INTERMEDIATE PRODUCTS (IP) IN SECONDARY ENERGY PRODUCTION (IN % OF TOTAL IP)

| Electricity | | Oil refining | | Artificial gas | |
|---|---|---|---|---|---|
| **Industry** | **Share in % IP** | **Industries** | **Share in % IP** | **Industries** | **Share in % IP** |
| Natural gas | 40,1 | Crude oil | 47,2 | Electricity | 43,1 |
| Electricity transmission and services | 15,0 | Oil refining products | 35,9 | Compress pumps and other equipment | 7,1 |
| Transportation services | 8,0 | **Total:** | **83,1** | Other electrical equipment | 6,0 |
| Coal | 7,9 | | | Transportation services | 5,0 |
| Trade and repair services | 4,7 | | | Natural gas | 5,0 |
| Oil refining products | 3,0 | | | Basic chemical substances | 4,7 |
| Electricity | 2,7 | | | Other machines and equipment | 4,5 |
| **Total:** | **81,3** | | | Construction services | 4,4 |
| | | | | Trade and repair | 3,4 |
| | | | | **Total:** | **83,1** |

*Source: Prepared based on 2019 input-output table analysis..*

Oil refining is characterized by the smallest number of types of intermediate costs. Two of them, crude oil and refined products, accounted for 83,1% of the total intermediate consumption of the industry, which shows a high degree of technological isolation of the oil refining complex (Table 1).

The secondary energy distribution structure is broader than that of primary ones. If the number of primary energy consumers (more than 80% in the volume of intermediate products) ranges from 1 (oil refining for oil production) to 7 (for natural gas), then for secondary energy it is from 10 to 26 industries.

The power industry is a key sector. Its products are consumed by 26 industries. In addition to energy-intensive industries (metallurgy, construction materials, chemistry, etc.), it includes state administration and defense, light industry, health care, etc. **The public administration and defense** account for the largest share of electricity consumption – **24%**.

In general, 52% of the primary energy goes to the production of secondary energy, and 48% – to meet the production needs of other industries. 82% of secondary energy goes to the consumption of other industries, and the energy complex itself spends 18% (Table 2).

### TABLE 2. STRUCTURE OF DISTRIBUTION OF INTERMEDIATE PRODUCTS (IP) IN THE PRODUCTION OF SECONDARY ENERGY (IN % OF THE TOTAL DISTRIBUTION OF IP)

| Electricity | | Oil refining | | Artificial gas | |
|---|---|---|---|---|---|
| Industries | Share in IP | Industries | Share in IP | Industries | Share in IP |
| Public administration and defense | 24,0 | Transportation services | 33,0 | Construction services | 15,8 |
| Electricity and fuel sale and delivery services | 12,0 | Oil refining products | 21,9 | Electricity and fuel sale and delivery services | 13,7 |
| Non-ferrous metals | 9,6 | Construction services | 5,2 | Non-ferrous metals | 13,1 |
| Transportation services | 4,5 | Fiber crops for spinning | 4,5 | Concrete and cement products | 12,4 |
| Trade and repair services | 2,9 | Public administration and defense | 4,0 | Ceramics | 11,0 |
| Ferrous metals | 2,4 | Trade and repair services | 3,6 | Vegetables and gourds | 4,3 |
| Construction services | 2,1 | Animal husbandry | 3,2 | Public administration and defense | 3,9 |
| Yarn and textile threads | 2,1 | Other crop production | 2,7 | Extraction of other minerals | 2,7 |
| Electricity | 2,0 | Non-ferrous metals | 2,4 | Flour and cereal products | 2,7 |
| Education services | 1,9 | Cereals, legumes and oilseeds | 1,7 | Mineral extraction services | 2,4 |
| Water, natural treatment and water supply | 1,9 | **Total** | **82,1** | **Total** | **81,9** |
| Household appliances | 1,6 | | | | |
| Health services | 1,4 | | | | |
| Fertilizers and nitrogen compounds | 1,4 | | | | |
| Plastics in primary forms | 1,3 | | | | |
| Financial services | 1,2 | | | | |
| Natural gas | 1,1 | | | | |
| Oil refining products | 1,1 | | | | |
| Motor vehicles | 1,0 | | | | |
| Telecommunication services | 1,0 | | | | |
| Basic chemical substances | 1,0 | | | | |
| Finished metal products | 0,9 | | | | |
| Machines for agriculture and forestry | 0,9 | | | | |
| Concrete and cement products | 0,8 | | | | |
| Cement, lime and gypsum | 0,8 | | | | |
| Clothes | 0,8 | | | | |
| **Total** | **81,5** | | | | |

*Source: Prepared based on the 2019 Input-Output table analysis,.*

The situation is different *in final consumption (households, government, export).* While secondary energy supplies account for 31% of all their resources, primary energy supplies almost twice as much (57%). This means that **reduction of subsidies for, for example, gas (ceteris paribus) will have a greater impact on the population than a similar reduction in subsidies for electricity.**

**Dynamics of structural shifts of primary and secondary energy sources.** For 2016–2019, the State Committee on Statistics has Input-Output tables for 78 industries based on the international classification of types of economic activities (ISIC). This enables us to make estimates on structural shifts without the distortions of 2020-2021 caused by the Covid-19 pandemic (Table 3):

- a) *Growth of energy sector (primary and secondary) in the structure of the economy.* The sector's share increased from 5,3% to 7,4% in gross output, and from 11,0% to 15,0% in exports. This indicates an accelerated development of the sector, given that the cumulative growth rate of GDP and exports during this period was also quite dynamic (23,2% and 55,5%, respectively).
- b) *Growth of primary energy sector (fossil fuels) in the structure of the economy.* While in 2016 the share of the primary energy sector was almost 2 times lower than the share of the secondary energy sector (1,7% and 3,6%, respectively), in 2019 the share of the primary sector (3,8%) exceeded the share of the secondary sector (3,6%). *An increase in the share of fossil fuels means an increase in the carbon intensity of the economy.* This is contrary to the goal of transitioning to a green economy contained in the Uzbekistan Development Strategy 2022-2026 and the Strategy for the transition to a Green Economy in the period of 2019-2030.
- c) *Unstable dynamics in the share of energy imports.* Until 2017, the share of energy imports was increasing and accounted for 9,0% of imports of intermediate products, In 2019, this share decreased to 5,6% after the liberalization of the exchange rate. Since oil and its products are the basis of energy imports, the growth of world oil prices can lead to a decrease in the load of oil refineries, prompting the state to sell them raw materials at subsidized prices.

**TABLE 3: KEY INDICATORS OF ENERGY SECTOR DEVELOPMENT IN 2016-2019 (IN % OF THE ECONOMY AS A WHOLE)**

| Indicators | 2016 | 2017 | 2018 | 2019 |
|---|---|---|---|---|
| Output | | | | |
| – economy as a whole | 100 | 100,0 | 100,0 | 100,0 |
| – primary energy sector | 1,7 | 2,5 | 3,5 | 3,8 |
| – secondary energy sector | 3,6 | 3,2 | 3,0 | 3,6 |
| Import of intermediate products | | | | |
| – economy as a whole | 100,0 | 100,0 | 100,0 | 100,0 |
| – primary energy sector | 2,0 | 2,1 | 2,6 | 1,2 |
| – secondary energy sector | 5,4 | 6,9 | 4,2 | 4,4 |
| Export | | | | |
| – economy as a whole | 100,0 | 100,0 | 100,0 | 100,0 |
| – primary energy sector | 9,4 | 10,6 | 16,1 | 13,4 |
| – secondary energy sector | 1,6 | 1,8 | 1,7 | 1,6 |
| Household consumption | | | | |
| – economy as a whole | 100,0 | 100,0 | 100,0 | 100,0 |
| – primary energy sector | 0,4 | 0,7 | 3,4 | 2,2 |
| – secondary energy sector | 2,6 | 2,2 | 7,7 | 3,7 |

*Source: Calculations based on "Input-Output" tables for 2016-2019 for 78 industries.*

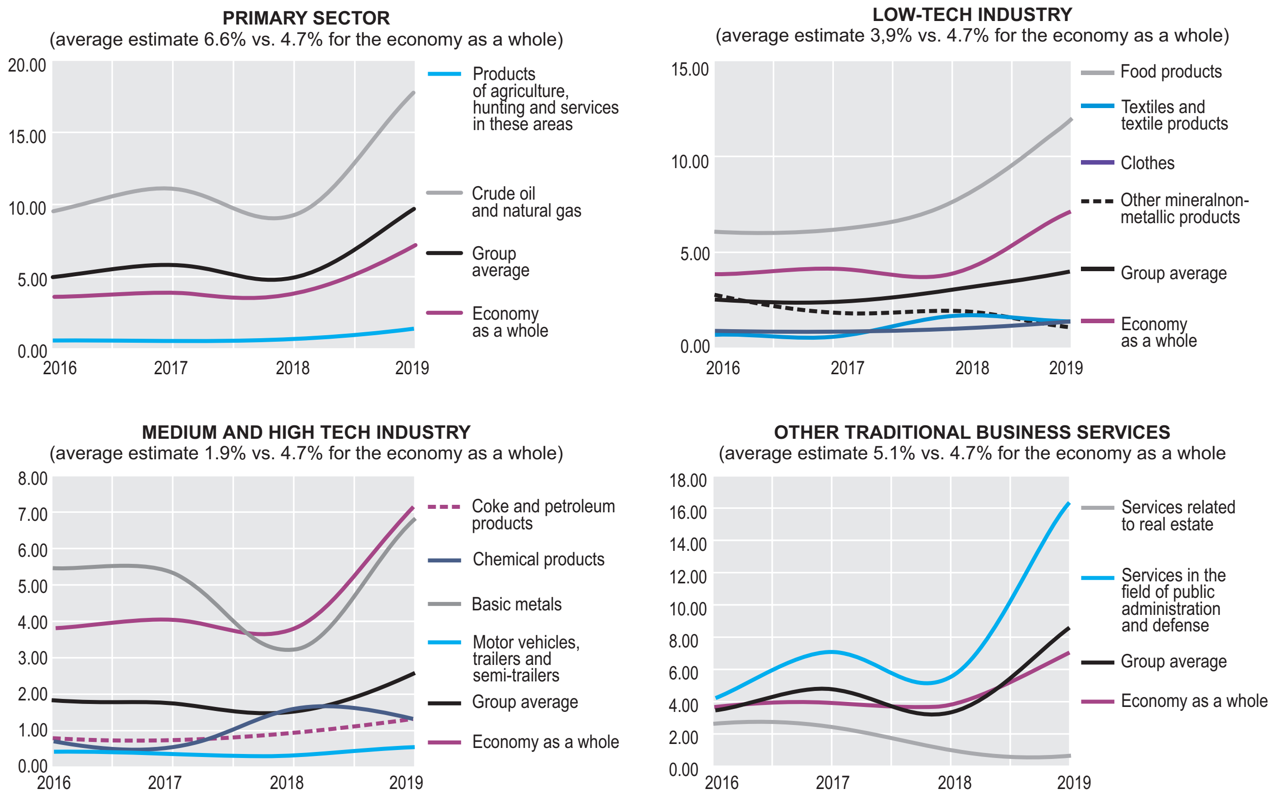
*Note: Different aspects of energy supply and demand in Uzbekistan are given in Annex 2.*

**Energy Intensity,** Figure 2 shows the calculation of energy intensity level of industries, It is made by summing up the energy costs across all energy inputs (primary and secondary) and reckoning with the volume of output of each industry. The calculations are combined into four *enlarged groups* (primary sector of the economy; low-tech industry; medium– and high-tech industry; and service sector). Each group combines a number of industries. The figures reflect both energy intensity for the group as a whole, and for *specific* industries of the group. Thus, for the first aggregated group, the primary sector, the energy intensity calculation for the group as a whole and for two industries (agriculture and extractive industries, oil and gas) is presented. The same is the case for the other aggregated groups.

*The most energy-intensive is the primary sector*. where 6,6% of the output is attributable to primary and secondary energy resources. This is higher than the energy intensity of the economy as a whole (4,7%). The energy intensity of the extractive industry exceeds the average estimate for the group and increased significantly during 2016-2019, while the energy intensity of agriculture is low and almost unchanged.

**Inefficient subsidies.** All subsidies to the fossil fuel sector are harmful by definition, because they exacerbate environmental degradation. But even more "harmful" (less justified) are the subsidies to industries that consume significant amounts of fossil fuels while having and sufficient financial resources to modernize their production facilities and reduce the energy intensity of their products, *but do not use them*. These are the most inefficient subsidies.

*A methodological approach* has been proposed to identify such subsidies, In the cost structure of each industry, energy costs were identified, summed up and divided by the output of each industry. This is how the energy intensity per unit of output of industries was estimated. The level of financial capabilities of industries was also calculated (the value of undistributed profit and mixed income per unit of output of each industry). For comparability, the estimates




*Source: Calculations based on the 2019 Input-Output table,.*

**Figure 2. Specific energy consumption per unit of output by industry, 2016-2019 (primary and secondary energy consumption in % of industry output)**

are normalized to a single scale (divided by the energy intensity/financial capacity estimate, weighted average for all industries). Financial capacity values are analyzed for industries with high energy intensity values. The top 20 industries are those with energy intensity of output that exceeds the industry average by 2 times or more. *This is a significant part of the economy, as these industries account for almost 15% of the total output in the economy* (Table 4).

The energy sector and the logistics structures serving them – oil refining, electric power, energy and gas transmission services are at the top of the list. The energy intensity levels of these industries are 13,0, 6,8 and 6,4 times higher than the industry average (4,4%), Industries outside this sector include cement production, waste processing and disposal, and chemical production (fibers, plastics). *Subsidizing all these industries can be classified as inefficient subsidies.*

At the same time, the justification for subsidizing varies. For example, subsidies are justified for water treatment services, as well as for sewerage systems, as the financial strength of these industries is between 0,26 and 0,3 of the industry averages. On the other hand, subsidies for the gas industry and oil production raise questions, as their financial strength is 1,7 and 1,8 times higher than the industry average. Having increased energy intensity and increased financial strength at the same time, they receive subsidies, although they could use their own funds to invest in reducing their energy intensity. *Subsidies in such a case are the most inefficient.*

**TABLE 4: NORMALIZED VALUES OF ENERGY INTENSITY AND FINANCIAL STRENGTH FOR THE TOP 20 INDUSTRIES WITH THE HIGHEST ENERGY INTENSITY OF OUTPUT**

| Industries | Energy intensity (in times, compared to the industry average) | Financial capacity (in times, compared to the industry average) |
|---|---|---|
| Oil refining products | 12,959 | 0,577 |
| Electricity | 6,778 | 0,690 |
| Services for electricity transmission and sale, sale of gaseous fuels through pipelines: steam and hot water (thermal energy) | 6,437 | 0,707 |
| Artificial gas | 6,284 | 0,691 |
| Natural water; water treatment and supply services | 5,515 | 0,263 |
| Services of sewerage systems; sewerage sludge | 5,214 | 0,301 |
| Electricity distribution services | 5,062 | 0,690 |
| Services for the distribution of gaseous fuels through pipelines | 3,067 | 0,691 |
| Transportation services | 2,953 | 1,098 |
| Cement, lime and gypsum | 2,822 | 0,918 |
| Other porcelain and ceramic products | 2,779 | 0,849 |
| Reclamation and other waste management services | 2,720 | 0,933 |
| Metal casting services | 2,669 | 1,078 |
| Plastics in primary forms | 2,526 | 0,753 |
| Ceramic building materials | 2,521 | 0,851 |
| Refractory products | 2,218 | 0,847 |
| Chemical fibres | 2,210 | 0,663 |
| Natural gas in liquefied or gaseous condition | 2,143 | 1,694 |
| Crude oil | 1,988 | 1,789 |

*Source: Calculations based on the 2019 Input-Output table (136 industries).*

# CHAPTER 2. INTERNATIONAL CLASSIFICATION OF STATE SUPPORT MEASURES IN THE FOSSIL FUEL SECTOR

The complexity of the process of reforming state support for the fossil fuel sector stems primarily from the complexity of evaluating diverse, explicit and implicit (indirect) support measures. Therefore, clarity of terminology, classification and evaluation methods is the starting point for any discussions and decisions aimed at reforming the energy subsidy system.

**International definitions.** There is no single definition and classification of state support measures for fossil fuels binding on all countries worldwide. Two main sources of their classification and inventory are used most frequently:

- classification (matrix) of measures developed by the OECD (Annex 3);
- classification of measures of the Global Subsidies Initiative (GSI).

The term *"energy subsidies"* is most commonly used in the public space to refer to any government measures that keep energy prices for consumers below market levels, or keep energy prices for suppliers above market levels, or reduce costs for both customers and suppliers. Although the specialized literature uses the separate terms *"subsidy"*[5] and "*state support*," they are vague when it comes to the boundaries of subsidization.

A subsidy in the narrow sense is a *direct payment of funds from the state budget* ("direct budget expenditures") to producers or consumers of goods in the form of subsidies (to cover losses of energy enterprises), interest or wage subsidies, loans or loan guarantees, and capital grants (budget transfers) for the purchase of fixed assets for energy enterprises.[6] These expenditures are reflected in state budget expenditures.

Gradually, other categories were added to the category of "subsidy" in the narrow sense, expanding the meaning of the term "state support".

In particular, the category "*Tax Expenditures*" appeared – the difference in income that the state would have received under basic tax conditions and under conditions of special tax measures (a departure from basic tax conditions). This is done by reducing the rate of taxes and duties, providing different tax deductions and privileges for individual consumers/producers, which leads to a decrease in the amount of tax payable.

*Other lost state revenues from the use of its assets.* State revenues may plunge ("fall out") due to a decrease in the rate of payment (royalty) for the exploitation of state-owned resources. For example, it can be in the form of the state's waiver of income from the use of its assets in the fuel and energy sector and transferring them to private companies.

The category *"indirect price measures (secondary transfers)"* is enabled in the form of price regulation in a certain form, If the support is aimed at producers, it is called "*market price support" (MPS),* if consumers – *"market transfer".* The most well-known measure is price regulation for electricity, heat, gas, coal, and petroleum products. It includes cross-subsidies,

[5] The term "subsidy" has been formulated in publications by the OECD, WTO, EU, IEA, World Bank, IMF and IISD, among others.

[6] The main reference on public funding of fossil fuels in the form of loans and loan guarantees is Oil change international's Shift the Subsidies Database. It contains data for 2008-2015 on more than 7,000 energy-related financial transactions worldwide.

**BOX 1: TAX EXPENDITURES IN THE ENERGY SECTOR: CATEGORIES**

- Tax expenditures related to the final consumption of certain fuels (mostly by households) in the form of reduced VAT or excise tax rates.
- Tax expenditures related to energy used as a resource for production. These include exemptions from excise taxes on consumed fuel for certain categories of households and activities (e.g., agriculture, fishing, mining) or reduced energy tax rates associated with high energy-intensive production.
- Tax expenditures related to energy production (extraction, production, transportation), where reduced corporate income tax rates are applied, as well as targeted support measures in the form of accelerated depreciation, lower resource taxes, royalties and other fiscal measures.

There are several methods for estimating tax expenditures:

- *Lost income method.* Tax expenditures are measured as the tax credit rate multiplied by the base or scale of use, This is the simplest and most common method of measurement.
- *Revenue growth method.* The expected growth of government revenues in the event of the abolition of the tax benefit is estimated. The removal of the tax credit is expected to lead to a reduction in the consumption of the (now more expensive) good, which will cause an increase in tax revenues that will be less than the lost revenues.
- *Equivalent costs method.* The amount of funds is estimated that would be required to achieve the same result with a direct budget transfer.

direct price controls, import tariffs/quotas, export subsidies, mandatory domestic resource purchase/supply, regulated wages and land prices, and other measures aimed at setting the price of the energy resource below the market price.

Price measures strongly distort the market but enable guaranteeing a minimum volume of consumption of a certain commodity (fuel), especially for vulnerable groups. Price measures are not directly reflected in the state budget, but lead to an increase in public expenditures, since the difference between the base and consumer prices for an energy resource (which arises on the market due to price measures) creates the need for *direct cash transfers* from the state budget to producers or the population.

The category of *“environmentally harmful subsidy (EHS)*, EHS arises as a result of consumer/producer support that leads to increased adverse environmental impact, deterioration in public health, and aggravation of climate risks. If producers do not compensate for these adverse effects of their activities, public expenditure for this purpose can be considered as subsidies.[7]

There is also the category of *“risk transferred to the government”*. The government assumes part of the risk of energy producers by providing them with loan guarantees, restructuring and writing off debts, participating in the equity of energy companies, acting as the last insurer in case of critical accidents, ensuring the protection of key energy facilities, pipelines, etc. It is difficult to assess this category, as there is no methodology for evaluation. The System of National Accounts (SNA) contains data only on some capital transfers (debt write-off).

In general, against the background of the similarity of the term “subsidy”, different international organizations have different and even missing definitions of other categories (Table 5).

[7] OECD definition of 2005 is used, according to which EHS is “the result of a government measure that provides consumers or producers with an advantage to supplement their income or reduce their costs, but which creates an unfavorable environment for sound environmental policy. However, this definition: a) is of a general nature and b) it is difficult to estimate the amount of the cost of indemnification.

### TABLE 5: COMPARISON OF CATEGORIES OF DIFFERENT INTERNATIONAL ORGANIZATIONS

| Critical subsidy transfer mechanisms | WTO | OECD | IEA | IISD |
|---|---|---|---|---|
| Direct transfer of cash and liabilities | ✓ | ✓ | | ✓ |
| Tax revenue shortfalls (tax expenditures) | ✓ | ✓ | | ✓ |
| Other budgetary shortfalls (provision of goods and services at below market value) | partially (does not cover subsidies for general business infrastructure) | ✓ | covered in part or in full only if reflected in the price in the domestic market | ✓ |
| Secondary transfers (income or price support) | partially (does not cover support provided through tariff and non-tariff barriers) | ✓ | | ✓ |
| Transfer of risk to the government | ✓ | ✓ | | ✓ |
| Non-internalization of external effects | - | - | - | ✓* |

*Source: Methods for analyzing energy subsidies in countries of Eastern Europe, the Caucasus and Central Asia (EECCA region), OECD Publication, 2013.*

*Definition of subsidies in the CIS countries and Uzbekistan.* The difference between the concepts of "subsidy" and "support" in the legislation of CIS countries is significant. Thus, while all CIS countries consider direct budget transfers as subsidies, secondary transfers are not considered a form of support (Table 6). However, underreporting secondary transfers can greatly distort the real size of energy subsidies. For example, in Kazakhstan in 2019, secondary transfers were estimated at 3,3 trillion tenge, while about 175 billion tenge[8] or 18,9 times less, was spent on direct subsidies from the budgets of all levels.

### TABLE 6: TERMINOLOGIES "SUBSIDY" AND "STATE SUPPORT" USED IN THE LEGISLATION OF CIS COUNTRIES

| CIS country | Direct budget transfers | Shortfall in budget revenues | Secondary transfers | Transfer of risks to the state |
|---|---|---|---|---|
| Armenia | | | | |
| Azerbaijan | | | | |
| Belarus | | | | |
| Georgia | | | | |
| Moldova | | | | |
| Ukraine | | | | |
| Uzbekistan* | | | | |

*Note: Blue – Included in national definitions of subsidies and state support; Light blue – included only in national definitions. No color – not included in national definitions of subsidies and state support.*

*Source: OECD, 2018, Estimated for Uzbekistan – authors of the report.*

In addition, in CIS countries, subsidies often take the form of indirect support or the form of changes in the distribution of risks and benefits in the fossil fuel sector, which are difficult

[8] Report "Fiscal stimulus for low-carbon development of the Republic of Kazakhstan", 2021. Prepared by experts from the International Institute for Sustainable Development within the framework of the Partnership for Action on Green Economy (PAGE), with the support of the United Nations Environment Program (UNEP) and in collaboration with the United Nations Development Program (UNDP).

to assess. Many of them are hidden in legislation, either disguised in socially acceptable language or “hidden” in extra-budgetary funds. Extra-budgetary funds are widespread in the CIS countries and include various state extra-budgetary and trust funds, accounts of budgetary organizations (hospitals, educational institutions, etc.) and state enterprises, In particular, the presence of a large number of extra-budgetary funds is a feature of the budgetary process in Uzbekistan. It is difficult to estimate the size of subsidies that are “hidden” in these funds, since their expenditures are not accountable to most budgetary rules (they are subject to less stringent reporting and public control requirements).

In accordance with the Budget Code of the Republic of Uzbekistan, a “subsidy” is identified only with funds provided to legal entities and individuals on a gratuitous basis at the expense of the budget system (state budget) for specific purposes: 1) financing or co-financing the production of goods, performing work, providing services and their implementation; and 2) partial reimbursement of targeted expenses.

In general, in Uzbekistan, as in most CIS countries, state support measures in the fossil fuel sector are not harmonized with international terminology. Lack of a clear concept and classification of energy subsidies in the legislation makes it difficult: a) to account for direct and indirect subsidies; b) to obtain estimates of the full amount of support; c) to assess the effectiveness of state support, This limit effective decision-making in area of reforming energy subsidies.

# CHAPTER 3. METHODS FOR ESTIMATING STATE SUPPORT MEASURES IN THE FOSSIL FUEL SECTOR: GLOBAL PRACTICES

In world practice, there are six (6) methodologies for estimating the size of energy subsidies: (see Annex 4 for the specifics and formulas for calculating each method):

- price gap methodology;
- bottom-up inventory method;
- Producer Support Estimate (PSE) methodology;
- Consumer Support Estimate (CSE) methodology;
- General Services Support Estimate (GSSE) methodology;
- Total support estimate (TSE) methodology,

**Price gap method** is based on a comparison of actual fossil fuel prices with prices that would have been set under ideal (competitive) market. Presence of a price difference between the actual price and the competitive (benchmark) price indicates to the existence of fuel subsidies. This methodology underlies the estimates of energy subsidies for EECCA countries[9] contained in the publications of the OECD, the IEA and the World Bank. The size of the subsidy is calculated by multiplying the resulting price difference by the sales volume of the type of energy resource.

The following **two methodologies** can be used to calculate the price difference:

- the difference between the *export* price of the fuel (established in the regional/world market) and the actual selling price of the fuel;
- the difference between the *import* price of fuel (established in the regional/world market) and the actual selling price of the fuel.

According to the IEA estimate based on the price gap methodology, Uzbekistan is characterized by the high scale of energy subsidies (Figure 3, 4, Tables 7, 8). The total amount of subsidies over the period 2010-2020 was USD70 billion. *At the same time, the number of subsidies decreased by 2,5 times, and the level of subsidies fell from 17,2% to 6,6% of GDP.* The dynamics of subsidies have been volatile.

In general, the advantages of the price difference method are: a) the ability to *quickly calculate aggregate* estimates of the amount of price subsidies to consumers; b) *relative simplicity* (useful in countries where the activities of the fuel and energy sector are closed, but energy prices for all user groups are open and relatively complete) and c) the ability to use the *price difference indicator in modeling and obtaining predictive prospective estimates*.

At the same time, the price difference methodology has a number of limitations (Annex 4). The main limitation is that it does not allow: a) to evaluate other categories of state support; and b) to identify the policies that affect the formation of the price difference. However, answers to these questions are important for the development of perspectives on energy subsidy reform.

[9] Countries of Eastern Europe, Caucasus and Central Asia (EECCA region) – Azerbaijan, Kazakhstan, Russia, Turkmenistan, Ukraine and Uzbekistan.

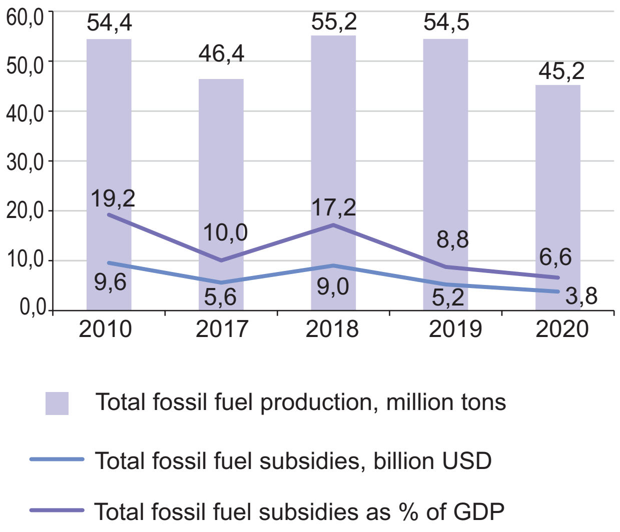



**Figure 3. Amount of energy subsidies in Uzbekistan, 2010-2020**

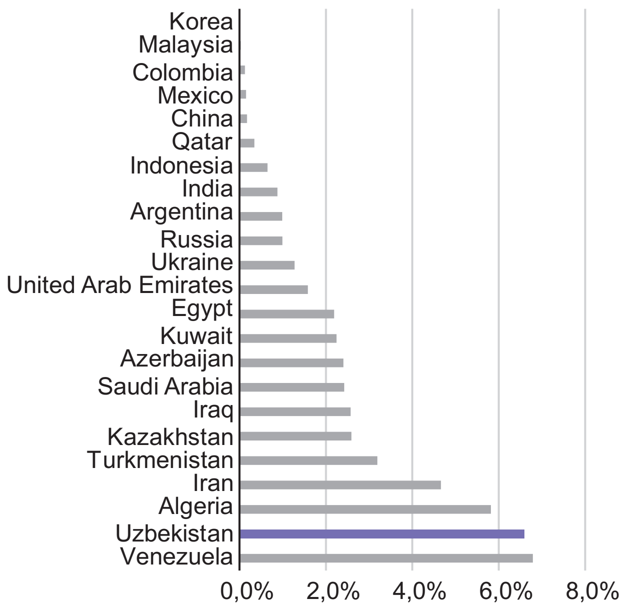



**Figure 4. Scale of energy subsidies in Uzbekistan (% of GDP, 2020)**

*Source: Calculated based on IEA database, 2021, (IEA fossil fuel subsidies database: Uzbekistan (2021))*

In the structure of Uzbekistan's energy subsidies during 2010-2020, the share of natural gas dropped from 81,5% to 57%, while the share of electricity increased from 18,4% to 31,2%. The scale of support to the oil sector has also increased.

### TABLE 7. FOSSIL FUEL SUBSIDIES IN UZBEKISTAN (MILLION USD)

| Product | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Oil | 9,2 | 440,4 | 474,0 | 502,1 | 399,2 | 134,5 | 155,5 | 441,8 | 980,4 | 748,4 | 455,0 |
| Electricity | 1 756,8 | 1 764,0 | 1 580,9 | 1 266,4 | 884,7 | 608,4 | 343,9 | 1 362,5 | 2 487,8 | 1 471,3 | 1 188,0 |
| Natural gas | 7 797,0 | 6 503,5 | 5 231,6 | 4 850,6 | 3 913,2 | 2 513,6 | 1 976,9 | 3 809,9 | 5 561,8 | 3 024,2 | 2 161,5 |
| **Total** | **9 563,0** | **8 707,9** | **7 286,6** | **6 619,0** | **5 197,1** | **3 256,5** | **2 476,2** | **5 614,2** | **9 030,0** | **5 243,8** | **3 804,5** |

*Source: International Energy Agency, Energy Policy Review, 2022.*

### TABLE 8. STRUCTURE OF FOSSIL FUEL SUBSIDIES IN UZBEKISTAN (%)

| Product | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Oil | | 5,1 | 6,5 | 7,6 | 7,7 | 4,1 | 6,3 | 7,9 | 10,9 | 14,3 | 12,0 |
| Electricity | 18,4 | 20,3 | 21,7 | 19,1 | 17,0 | 18,7 | 13,9 | 24,3 | 27,6 | 28,1 | 31,2 |
| Natural gas | 81,5 | 74,7 | 71,8 | 73,3 | 75,3 | 77,2 | 79,8 | 67,9 | 61,6 | 57,7 | 56,8 |
| **Total** | **100** | **100** | **100** | **100** | **100** | **100** | **100** | **100** | **100** | **100** | **100** |

*Source: prepared by the authors based on IEA data.*

*The bottom-up inventory methodology* involves: 1) taking an inventory of fossil fuel production and consumption support measures; 2) quantifying each measure; and 3) summing up the resulting values to estimate the total amount of subsidies.

The inventory involves filling out forms containing the main characteristics of each subsidy, It uses official data from laws on the state budget, state budget execution reports, tax expenditure documents, explanatory notes from the Ministry of Finance, etc. The result of the inventory is a combination of 1) a monetary evaluation of some types of subsidies and 2) a list of identified subsidies which could not be quantified. Due to the availability of detailed data, the inventory methodology has been applied to estimate subsidies in a number of CIS countries (Armenia, Georgia, Moldova, Ukraine).

**Both methodologies are recommended for estimating and analyzing subsidies.** The price difference methodology is used to calculate the amount of subsidies to consumers, and the inventory methodology is used to evaluate individual support measures that cannot be identified when calculating by the price difference methodologies, It is important to avoid double counting of individual measures. This requires disaggregated information on individual subsidy measures.

The remaining 4 methodologies "correct" the shortcomings of the two foregoing methodologies, In particular, the PSE methodology and the CSE methodology give a more accurate indication of the amount of subsidies to either producers or consumers. However, these methodologies require a larger data set. Therefore, in countries where publicly available data are not available to estimate the value of certain transfers, the use of this methodology will be limited.

*General Services Support Estimate (GSSE)* methodologies estimates the amount of support for collective purposes. For example, expenditures on R&D, staff training, inspections, marketing, advertising, etc. An example of estimating subsidies using the GSSE methodology is given in Annex 4.

*Total Support Estimate (TSE) methodology* takes into account all transfers from producers and consumers minus the associated budgetary revenues, regardless of their purpose and impact on production and income or energy consumption.

In general, despite the differences in terms and methodologies, all international organizations adhere to the *World Trade Organization's Agreement on Subsidies and Countervailing Measures (WTO ASCM)* typology of subsidies. The ASCM typology contains four types of subsidies and can be considered "standard" ("basic"):

- direct transfers of public funds;
- tax expenses, other lost revenues of the state budget, as well as understated prices for goods and services provided by the state;
- indirect transfers (price support);
- risk transfer to the state.

*Most countries estimate the first three categories.* However, national definitions of these subsidies are narrower than international ones. This is due to the complexity of calculations and the low availability of data for estimates.

# CHAPTER 4. ENERGY PRICING POLICY

In Uzbekistan, *the government determines the methodology and sets prices (tariffs) for energy resources.* The regulatory body is the Interdepartmental Tariff Commission (ITC) under the Cabinet of Ministers, which includes 12 ministries and agencies. The ITC reviews tariffs for electricity, natural and liquefied gas, and heat and submits them to the government for approval. The Ministry of Economy and Finance together with the Ministry of Energy is in charge of justification of calculations and approval of tariffs, Approved tariffs are published in the form of resolutions of the Cabinet of Ministers.

Electricity tariffs are approved based on a *cost-plus methodologies*[10]. The cost of fuel consumed (e.g. gas) is determined on the basis of regulated prices and tariffs, based on specific consumption rates for the production of 1 kWh of electricity.

In addition, the tariff calculation includes equity dividends, interest on loans and other elements. *At the same time, there is no restriction on the rate of return.* At the same time, the tariff methodology does not provide incentives for cost optimization, reduction of losses and electricity consumption for own needs. The tariff is formed by *summing up* the weighted average costs for the production, transmission, distribution and supply of electricity.

There are 4 tariff groups of consumers: 1) commercial consumers (750 kVA and above); 2) other commercial consumers; 3) residential consumers; 4) heating, hot water supply and cooking consumers (Table 9).

### TABLE 9. ELECTRICITY TARIFFS IN UZBEKISTAN, PER 1 KWH

| Group | Category | Tariff list (options) | Tariffs (VAT included) |
|---|---|---|---|
| I | Commercial consumers (with 750 kVA connected capacity and above) | Single-rate tariff for budgetary organizations and certain categories funded from the state budget | 450 UZS/kWh (0,04 USD/kWh) |
| | | Differentiated tariff for all other consumers | Semi-peak 9:00-17:00<br>UZS 450/kWh (USD 0,04/kWh)<br>Peak 6:00-9:00 and 17:00-22:00<br>UZS 675/kWh (USD 0,06/kWh)<br>Night 22:00-6:00<br>UZS 300/kWh (USD 0,03/kWh) |
| II | Other commercial users | Single-rate tariff | UZS 450/kWh (USD 0,04/kWh) |
| III | Household consumers | 50% of the single-rate tariff for consumers with electric stoves | UZS 147,5/kWh (USD 0,015/kWh) |
| | | Single-rate tariff for other consumers | UZS 295/kWh (USD 0,03/kWh) |
| IV | Tariff for consumers of groups I and II for heating, hot water supply and cooking | Single-rate tariff | UZS 450/kWh (USD 0,04/kWh) |

*Source: Resolution of the Cabinet of Ministers of the Republic of Uzbekistan "On changes in prices and tariffs for fuel and energy resources" No, 633 dated July 30, 2019.*

[10] Resolution of the Cabinet of Ministers of the Republic of Uzbekistan "On measures to further improve the tariff policy in the electric power industry" with using the cost-plus approach, No. 310 dated 13.04.2019

Natural gas tariffs are differentiated by consumer categories (Table 10). Legal entities make 100% prepayment for the supplied gas based on concluded supply contracts. If gas consumption exceeds the volume specified in the contract, the consumer is charged an increased fee with 1,4 coefficient applied to the cost of gas received in excess of the contractual volume, In case of late payment of the debt, the consumer pays a penalty to the gas supply organization.

**TABLE 10. NATURAL GAS TARIFFS IN UZBEKISTAN (PER 1 CUBIC METER)**

| Consumer category | Unit | Price for 1 unit (VAT included) |
|---|---|---|
| Household consumers with metering devices, | cubic meters | UZS 380 (USD 0,04) |
| Household consumers without metering devices*: | | |
| ▪ food preparation and hot water supply | cubic meters | UZS 660 (USD 0,07) |
| ▪ heating | cubic meters | UZS 380 (USD 0,04) |
| Legal entities | cubic meters | UZS 660 (USD 0,07) |
| Automotive gas filling compressor stations | cubic meters | UZS 1,000 (USD 0,11) |
| Commercial users | | |
| Liquefied gas sold to the population and social facilities for household consumption | kg | UZS 1,120 (USD 0,12), sold through exchange auctions |

*Note: *calculated on the basis of norms based on the following indicators: number of gas-consuming appliances, number of people living, total living area, presence of pets, etc.*

*Source: Decree of the Cabinet of Ministers of the Republic of Uzbekistan "On changes in prices and tariffs for fuel and energy resources" No, 633 dated July 30, 2019*

Tariffs for district heating. Calculation and approval of tariffs are performed by local authorities. Tariffs are set on the basis of 1 square meter of heated area per day of the heating season. The current tariffs do not cover the cost of heat and hot water production.[11]

Tariffs for oil and oil products. During 2018-2020, Uzbekistan deregulated retail prices for motor gasoline and diesel fuel of all grades and therefore subsidies for oil products are not considered.

In the context of a vertical management model and the absence of a *free energy market, energy prices are formed in a directive manner and at an understated level.* Therefore, the tariff policy justifies cross-subsidization between groups of consumers and energy producers, as well as subsidies from the state budget.

Subsidizing energy prices is contingent to *maintaining the competitiveness of the national economy and social guarantees:*

- The poverty rate in Uzbekistan was estimated in 2021 at 17%;
- Ensuring the availability of energy resources for economic growth and addressing social problems (creation of new jobs against the background of growing labor supply);
- Maintaining the competitiveness of domestic producers through keeping energy prices below world prices. схемы распределения активов, управления финансовыми потоками и прав на владение месторождениями.

**Social norms of energy consumption**. The social norm is understood as a certain amount of energy consumption paid for at a preferential price. The volume consumed above this

[11] Resolution of the President of the Republic of Uzbekistan "On additional measures to improve the heat supply system and financial rehabilitation of heat supply enterprises", No. 4542 dated 02.12.2019

### BOX 2. WHY HAS UZBEKISTAN NOT INTRODUCED DIFFERENTIATED TARIFFS?

The size of the social norm and the price of "sanctions" for exceeding the norm have been criticized. The Ministry of Energy was also criticized for its main argument stating that natural gas consumption by the population has increased by 30% over the last 5 years. Alternative estimates show that gas consumption by the population, on the contrary, has been decreasing from year to year. The root of unreliability is "hidden" in the quality of the current metering system, which has no protection against manipulation by energy suppliers and other market players.

In addition, before introducing differentiated tariffs, it is necessary to ensure stable energy supply and upgrade the equipment of TPPs. Thus, the volume of gas production is decreasing, but instead of taking measures aimed at increasing gas production, they are trying to convince the population of the need to increase tariffs. At the same time, those who do not pay for gas consumption continue to do so.

There are 7 main operators in gas production industry, of which 6 are foreign controlled, It is clear that foreign investors are not interested in the problems of the country's population. They can easily cover their losses from production cuts by increasing gas prices for export and sold to commercial consumers. This is what investment agreements and production sharing agreements are aimed at, according to which the investor shall return their investments in the first place. Thus, gas supply for the country's needs is not their key objective.

In addition, even at current tariffs, there is enough money in the gas production industry to cover the cost of production for most producers. But the opportunities for market players to earn money are different (since different conditions of production and sales), respectively, the cash flows between them are distributed incorrectly, It is no secret that owners of CNG filling stations pay less for gas, resorting to various tricks and connecting to medium pressure gas pipes, bypassing the installed meters.

In general, **the problem lies not in the level of tariffs, but in the fact that the financial deficit of individual extractive enterprises is caused not by the overall low profitability of the industry (as a type of activity), but by the fact that some in the industry earn a lot, investing little**. At the same time, other players bear the main burden of the costs of production, transportation, storage and delivery, for example, Uzbekneftegaz JSC. This JSC lobbies to raise tariffs, as it bears the main responsibility for gas supply to the population, being in the least favorable conditions. Other players are also not against this idea, although they can perfectly do without it, increasing the supply at free (increased) tariffs.

The main challenge is that without addressing these issues, the main problem – the reduction in production and the growing shortage of energy resources for domestic consumption will not be addressed. A simple increase in tariffs will only lead to increased poverty and significantly reduce the development of productive forces in the country.

*Source: comments on the publication "Is it about tariffs?". Anhor e-publication. June 14, 2022 https://anhor.uz/economy/tariffs/*

norm must be paid at the market price, Such a differentiated pricing mechanism[12] was supposed to be introduced from July 1, 2022, for the population along with the introduction of social consumption norms for electricity and natural gas.[13] The draft Resolution of the Cabinet of Ministers "On changes in prices for fuel and energy resources", providing for the introduction of differentiated tariffs and a social norm, was posted for public discussion in June 2022. It caused a flurry of criticism. The population believed that it was not about benefits for certain segments of the population, but about a new way of withdrawing funds to finance the industry, which for many years has had non-transparent schemes of asset allocation, financial flow management and ownership of deposits.

[12] The risks of applying block tariffs in Uzbekistan are outlined in the report "Methodologies of stimulating energy saving through tariff policy and investments in energy saving technologies". The report was prepared under the auspices of UNDP, 2018.

[13] This measure is envisaged by the CONCEPT NOTE for ensuring electricity supply in Uzbekistan in 2020-2030.

# CHAPTER 5. ESTIMATING THE SIZE OF ENERGY SUBSIDIES IN UZBEKISTAN

The estimated energy subsidies in Uzbekistan for the period 2017-2021 are calculated below and are based on the 4 components of the WTO ASCM subsidy structure.[14]

*1. The amount of direct subsidies (transfers) from the state budget* to enterprises in the oil and gas, electric power and heat and power industries during 2017-2021 amounted to USD333 million (Table 11). For other categories of direct subsidies (capital transfers, public procurement, state-owned enterprises, state financial injections into the equity capital of companies), an estimate was not conducted due to the lack of relevant data.

It is important to note that direct subsidies in the oil and gas industry reflect the activities of UzGasTrade JSC, which was established to purchase and sell natural gas on a centralized basis, Subsidies from the state budget are provided to compensate for losses arising from the difference in prices of natural gas purchase and sale, as well as to finance the operating activities of UzGasTrade JSC.[15] In 2021 alone, the negative difference between the average sale and purchase price of natural gas by Uztransgaz JSC totaled more than UZS 1 trillion.

### TABLE 11. ESTIMATED DIRECT SUBSIDIES IN THE FOSSIL FUEL SECTOR, 2017-2021

| | 2017 | 2018 | 2019 | 2020 | 2021 | Total |
|---|---|---|---|---|---|---|
| **Direct subsidies, million soums** | **0,00** | **19,515,44** | **392,635,32** | **1,229,045,52** | **1,523,992,47** | |
| oil and gas industry | 0,00 | 0,00 | 0,00 | 399,689,60 | 1,001,785,26 | |
| electric power industry | 0,00 | 19,515,44 | 160,623,54 | 499,612,00 | 0,00 | |
| coal industry* | … | … | … | … | … | |
| thermal energy | 0,00 | 0,00 | 232,011,78 | 329,743,92 | 522,207,21 | |
| *USD to UZS average annual rate* | *5,675,78* | *8,229,81* | *8,923,53* | *9,992,24* | *10,657,29* | |
| **Direct subsidies, mln USD** | **0,00** | **24,00** | **44,00** | **123,0** | **143,0** | **333,0** |
| oil and gas industry | 0,00 | 0,00 | 0,00 | 40,00 | 94,0 | 134,0 |
| electric power industry | 0,00 | 24,00 | 18,00 | 50,00 | 0,00 | 92,0 |
| coal industry* | … | … | … | … | … | …, |
| heat power industry | 0,00 | 0,00 | 26,00 | 33,00 | 49,0 | 107,0 |

*Source: Compiled according to the Ministry of Finance of the Republic of Uzbekistan, Source for calculation of the average annual US dollar exchange rate – https://bank.uz/currency/archive/5-9-2017*

*2. The amount of the state's tax expenditures and underpricing of goods/services* during 2019-2022, amounted to almost UZS8 trillion or USD811 million (Table 12). The state has already significantly reduced the scale of benefits. Thus, the amount of tax expenditures decreased from USD310 million in 2019 to USD81,13 million in 2022, or 3,8 times. This was largely due to the elimination of exemptions in the refined products, gas, and hydroelectric power generation sectors (Table 12). At the same time, the calculation is not complete, as not all tax exemptions are publicly available, In addition, it is required to develop a calculation methodology to estimate the *"tax exemptions"* item.

[14] The OECD distinguishes 5 components: 1) direct transfer of funds; 2) tax expenditures); 3) other lost revenues of the state budget; 4) risk transfer to the government; and 5) secondary transfers.

[15] Resolution of the President of the Republic of Uzbekistan "On additional measures to reform the natural gas market" No. 280 dated June 15, 2022

## TABLE 12: ESTIMATED TAX EXPENDITURES (TAX EXEMPTIONS AND UNDERPRICING OF GOODS AND SERVICES) FOR THE FOSSIL FUEL SECTOR, 2019-2022

| № | Tax Expenditure | 2019 | 2020 | 2021 | 2022 | Total |
|---|---|---|---|---|---|---|
| 1 | Tax incentives (million UZS) | 2,766,324,32 | 2,581,996,62 | 1,707,168,39 | 892,719,00 | 7,948,208,33 |
| | Lignite mining | 6,034,30 | 33,856,80 | 29,139,70 | 26,560,00 | 95,590,80 |
| | Natural gas production | 29,90 | 16,919,90 | 64,182,20 | 59,464,00 | 140,596,00 |
| | Workwear production | 5,35 | 0,00 | 0,00 | 0,00 | 5,35 |
| | Manufacture of refined products | 77,899,60 | 3,508,40 | 2,960,80 | 21,735,60 | 106,104,40 |
| | Production of plastic in primary forms | 7,677,60 | 25,882,90 | 35,896,90 | 685,40 | 70,142,80 |
| | Manufacture of building products from concrete | 56,20 | 189,10 | 638,50 | 4,132,20 | 5,016,00 |
| | Manufacture of building metal structures and products | 550,30 | 0,00 | 35,60 | 839,10 | 1,425,00 |
| | Electricity generation by thermal power plants | 6,960,77 | 1,860,92 | 59,925,09 | 31,373,00 | 100,119,78 |
| | Electricity generation by hydroelectric power plants | 499,095,30 | 433,650,60 | 35,505,00 | 68,646,00 | 1,036,896,90 |
| | Sale of electricity | 43,347,10 | 18,085,00 | 11,615,80 | 132,097,70 | 205,145,60 |
| | Gas production | 1,960,099,90 | 2,043,391,70 | 1,077,807,60 | 12,292,30 | 5,093,591,50 |
| | Steam and air conditioning systems | 1,008,00 | 693,00 | 3,748,00 | 2,660,00 | 8,109,00 |
| | Water collection, treatment, and distribution | 47,90 | 171,90 | 280,30 | 47,30 | 547,40 |
| | Construction of residential buildings | 322,10 | 0,00 | 0,00 | 0,00 | 322,10 |
| | Construction of distribution facilities and pipelines | 7,230,30 | 516,10 | 11,533,80 | 5,098,90 | 24,379,10 |
| | Construction of other engineering structures | 260,00 | 521,30 | 33,30 | 0,00 | 814,60 |
| | Exploration drilling | 0,00 | 12,40 | 115,70 | 49,40 | 177,50 |
| | Pipeline transportation | 151,183,30 | 513,10 | 136,342,00 | 452,333,10 | 740,371,50 |
| | Activities of parent companies | 262,10 | 15,60 | 233,656,20 | 71,458,30 | 305,392,20 |
| | Activities in the field of engineering surveys | 3,215,30 | 287,30 | 673,50 | 357,90 | 4,534,00 |
| | Other activities | 1,039,00 | 1920,60 | 3,078,40 | 2,888,80 | 8,926,80 |
| 2 | Reduced prices for goods and services (million UZS) | 0,00 | 0,00 | 14,072,60 | 2,228,10 | 16,300,70 |

| № | Tax Expenditure | 2019 | 2020 | 2021 | 2022 | Total |
|---|---|---|---|---|---|---|
| | Fuel wholesale | 0,00 | 0,00 | 13078,00 | 2197,10 | 15275,10 |
| | Retail sale of motor fuel | 0,00 | 0,00 | 994,60 | 31,00 | 1025,60 |
| | **TOTAL subsidies, million UZS:** | **2,766,324,32** | **2,581,996,62** | **1,721,240,99** | **894,947,10** | **7,964,509,03** |
| | USD/UZS average annual exchange rate | 8,923,53 | 9,992,24 | 10,657,29 | 11,031,56 | |
| | **TOTAL subsidies, million USD** | **310,00** | **258,40** | **161,51** | **81,13** | **811,04** |

*Source: Compiled according to the State Tax Committee and the legal portal www,lex,uz,*
*Source for calculating the average annual USD exchange rate: https://bank,uz/currency/archive/5-9-2017*

3. *Amount of the secondary transfers (price subsidies).* The following input data were used for calculation:

- Volumes of annual gas and electricity consumption by consumer groups.
- Approved selling prices for energy resources on the domestic market.
- Dynamics of volumes and average export prices for energy resources.
- Dynamics of volumes and average import prices for energy resources.
- Dynamics of average stock exchange quotations for energy resources.

When calculating price subsidies, it is very important to choose an option of the basic price of energy resources. As mentioned above, the following can be taken as a base price:

- *The price that would be set under competitive market conditions,* i.e. the price covering the cost of production and supply of fossil fuels;
- *The price of the fossil fuel type on the world (regional) market.* This price must be adjusted for a number of factors (exchange rates, transportation and distribution costs, tax rates, etc.)[16].

Calculation using a base price covering the *cost of production and supply* is not yet possible due to the difficulty of determining the cost of production of products at certain production cycles, as well as the lack of data on current (or effective at a particular time/period of time) benefits.

Calculation using the base *price on the world (regional) market* also has a number of peculiarities. For example, given the higher price of natural gas from foreign companies operating in Uzbekistan, we can say that the price of gas sales by Uzbekneftegaz JSC is apparently understated, i,e, does not reflect the real cost of gas production and supply.

If the price at which JSC “Hududgaztaminot” (which sells gas to the population) buys gas from suppliers is used as the base price, the price difference is insignificant. In particular, Hududgaztaminot JSC buys gas from Uztransgaz JSC for UZS340 (per 1 cubic meter), from

[16] The IEA and IMF take the import/export price at the nearest international hub, adjusted for quality differences, plus freight and insurance costs for net importer (or recalculated for net exporter), plus domestic distribution and marketing costs and VAT. For goods delivered to world markets (mainly coal, crude oil and oil products), the reference prices are based on the spot price at the nearest international hub. Since the calculation of the price differential compares adjusted benchmark and domestic prices at a particular point in time, the results of the calculations are affected by fluctuations in world prices as well as exchange rates.

the Epsilon foreign company – for UZS501 and from Uzbekneftegaz JSC – for UZS250.[17] Meanwhile, Uztransgaz JSC itself buys gas from Uzbekneftegaz at UZS250.[18] Thus, the average base price is UZS375,5[19].

If we consider the prices at which Uztransgaz purchases gas from foreign companies, the base price will be higher. In particular, Uztransgaz purchases gas from Lukoil and Uz-Kor Gas Chemical at UZS1,100, from Natural Gas-Stream at UZS550, and through imports at UZS1,320, In this case, the average base price will be UZS744,2.

Considering these features, the calculation was conducted on the basis of the price difference methodologies between the average selling price of energy resources in the domestic market and the average export/import price of energy resources. The amount of the subsidy was calculated by multiplying the resulting price difference by the volume of energy resource sales.

The source of data on the physical volumes of gas and electricity consumption by consumer groups was the data of the State Committee on Statistics. In addition, data from the relevant ministries and departments were used.

*Domestic natural gas consumption* increased from 35,6 to 42,4 bln $m^3$ (by 6,8 bln $m^3$ or 19%) during 2017-2021. Given the liberalization of the UZS exchange rate in 2017, *average natural gas prices* increased by 5,6% in 2021 (from USD56,5/ths $m^3$ to USD59,6/ths $m^3$). At the same time, average export gas prices were 2,1-3,6 times higher than domestic prices.

*Electricity consumption* from 2017-2021 increased from 46,8 billion kWh to 54,5 billion kWh (up 7,7 billion kWh or 17%), and average prices increased by 2,3% (from USD 38,4/MWh to USD 39,3/MWh). Domestic and export prices were almost equal in 2021.

Since August 1, 2018, *prices for liquefied gas* have been set uniform[20] throughout the country, while previously prices differed depending on the region. Part of liquefied gas is sold through exchange auctions, where the average price is 3-4 times higher than the preferential one.

Data analysis enabled to estimate the amount of price subsidies for the period 2017-2021 using two methodologies for calculating the price difference (based on the export and import base price). The total amount of price subsidies amounted to more than USD22,0 billion (Table 12), of which:

- price subsidies (negative difference between the domestic sales price and export sales price) for gas amounted to USD17 billion;
- price subsidies (negative difference between domestic and export sales prices) for electricity amounted to USD4,9 billion;
- price subsidies (negative difference between selling price for households and the average exchange price) for liquefied gas amounted to about USD0,7 billion,

[17] The article “From whom and at what price does Uzbekistan buy gas and why is the deputy not satisfied.” https://www.gazeta.uz/uz/2022/06/22/gas/

[18] Uztransgaz JSC sells gas to Hududgaztaaminot JSC at UZS 340, to consumers connected to the main gas transportation system and TPPs at UZS1,000, to other consumers – at UZS1,150-1,300.
«World bank›s technical assistance in Energy Tariff Reforms», 2022

[19] It would be more correct to calculate a weighted price taking into account the weighted values of purchased gas volumes from each supplier. At the same time, it is enough to understand the situation.

[20] Resolution of the Cabinet of Ministers of the Republic of Uzbekistan dated December 29, 2017 No. 1033 “On the phased introduction of a single national retail price for liquefied gas sold to the population for domestic consumption.”

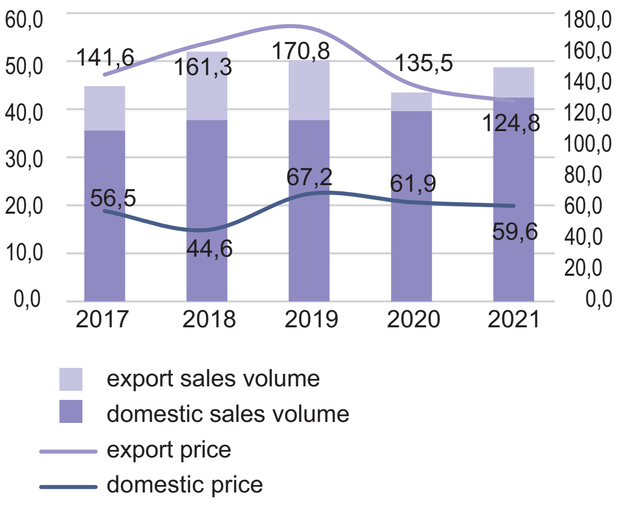



**Figure 5. Sales volume (bcm) and natural gas price (USD per 1,000 cubic meters, right scale) in the domestic and export markets**

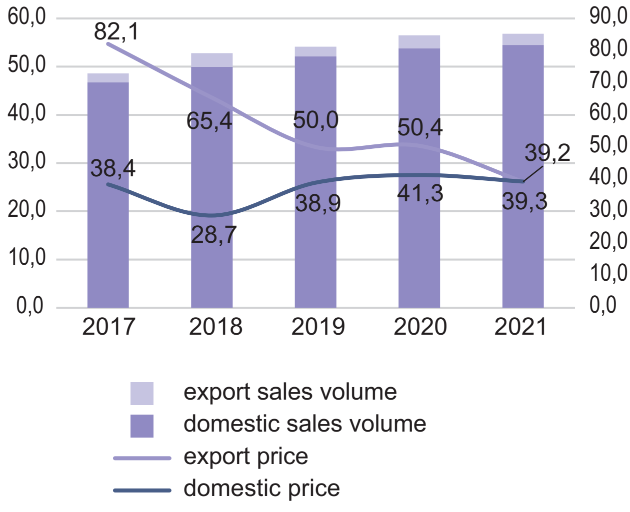



**Figure 6. Sales volume (billion kWh) and electricity price (USD per MWh, right scale) in the domestic market and exports**

*Source: Author according to the Ministry of Finance and the State Committee on Statistics*

## TABLE 12. ESTIMATED PRICE SUBSIDIES IN THE FOSSIL FUEL SECTOR, 2017-2021

| № | Product type | Unit | 2017 | 2018 | 2019 | 2020 | 2021 | всего |
|---|---|---|---|---|---|---|---|---|
| | **Natural gas** | | | | | | | |
| 1.1 | **Average selling price in the domestic market** | USD/ths m³ | 56,5 | 44,6 | 67,2 | 61,9 | 59,6 | 58,1 |
| 1.1.1 | Sales volume | bln m³ | 35,6 | 37,8 | 37,8 | 39,6 | 42,4 | 193,2 |
| 1.1.2 | Gross revenue | million USD | 2010 | 1684 | 2538 | 2455 | 2530 | 11217 |
| 1.2 | **Average selling price for export** | USD/ths m³ | 141,6 | 161,3 | 170,8 | 135,5 | 124,8 | 152,8 |
| 1.2.1 | Volume of sales | bln m³ | 9,2 | 14,2 | 12,4 | 3,8 | 6,3 | 46,0 |
| 1.2.2 | Gross revenue | million USD | 1303 | 2297 | 2125 | 521 | 787 | 7032 |
| 1.3 | **Average import price** | USD/ ths m³ | …. | 100,0 | …. | 100,0 | 71,0 | 75,0 |
| 1.3.1 | Import volume | bln m³ | 0,00 | 0,04 | 0,00 | 0,5 | 3,7 | 4,2 |
| 1.3.2 | Total cost | million USD | …. | 4,0 | …. | 48,0 | 260,0 | 312,0 |
| 1.4 | *Subsidies* (on exports) (1,2 – 1,1) x 1,1,1 | million USD | 3031,0 | 4406,0 | 3911,0 | 2918,0 | 2763,0 | 17029 |
| 1.5 | *Subsidies* (on imports) (1,3 – 1,1) x 1,1,1 | million USD | …. | 2092,0 | …. | 1509,0 | 481,0 | 4082,0 |
| | **Electric Energy** | | | | | | | |
| 2.1 | **Average selling price in the domestic market** | USD/ths kWh | 38,4 | 28,7 | 38,9 | 41,3 | 39,3 | 37,4 |
| 2.1.1 | Sales volume | ths kWh | 46,8 | 49,9 | 52,1 | 53,8 | 54,5 | 257,2 |
| 2.1.2 | Gross revenue | million USD | 1794,0 | 1432,0 | 2028,0 | 2223,0 | 2139,0 | 9616,0 |
| 2.2 | **Average selling price for export** | USD/ths kWh | 82,1 | 65,4 | 50,0 | 50,4 | 39,2 | 56,7 |
| 2.2.1 | Volume of sales | billion kWh | 1,8 | 2,9 | 2,0 | 2,7 | 2,3 | 11,7 |
| 2.2.2 | Gross revenue | million USD | 150,0 | 188,0 | 101,0 | 135,0 | 91,0 | 665,0 |
| 2.3 | **Average import price** | USD/ths, kWh | 20,0 | 20,6 | 21,3 | 25,9 | 24,5 | 24,0 |
| 2.3.1 | Import volume | billion kWh | 1,1 | 2,3 | 3,3 | 5,3 | 6,2 | 18,0 |
| 2.3.2 | Total cost | million USD | 23,0 | 47,0 | 70,0 | 138,0 | 152,0 | 430,0 |
| 2.4 | *Subsidies* (on exports) (2,2 – 2,1) x 2,1,1 | million USD | 2045,0 | 1833,0 | 578,0 | 489,0 | -3,0 | 4942,0 |

| № | Product type | Unit | 2017 | 2018 | 2019 | 2020 | 2021 | всего |
|---|---|---|---|---|---|---|---|---|
| 2.5 | *Subsidies* (on imports) (2,3 – 2,1) x 2,1,1 | million USD | -859,0 | -402,0 | -919,0 | -826,0 | -806,0 | -3812,0 |
| | **Liquefied gas** | | | | | | | |
| 3.1 | Volume of sales to the population and social facilities | thousand tons | 366,0 | 409,0 | 470,0 | 528,0 | 591,0 | 2364,0 |
| 3.2 | Average selling price | USD/t | 93,0 | 84,0 | 115,0 | 111,0 | 106,0 | 508,0 |
| 3.3 | Average stock quotes* | USD/t | 400,0 | 381,0 | 348,0 | 384,0 | 423,0 | 1936,0 |
| 3.4 | Subsidies to the population | USD million | 112,0 | 122,0 | 110,0 | 144,0 | 188,0 | 675,0 |
| 4.0 | **Total subsidies:** | | | | | | | |
| 4.1 | exports (1,4 + 2,4 + 3,4) | USD million | 5188,0 | 6361,0 | 4599,0 | 3551,0 | 2948,0 | 22646,0 |
| 4.2 | imports (1,5 +2,5 + 3,4) | USD million | -747,0 | 1812,0 | -809,0 | 827,0 | -137,0 | 945,0 |

**Note: data of the Uzbek Republican Commodity Exchange (www.uzex.uz).*

*Source: calculations based on the data of the Ministry of Finance of the Republic of Uzbekistan.*

Considering that prices for natural gas and electricity in Uzbekistan remained unchanged for a long time, and the cost of their production is growing, *the need for price subsidies will increase in the future.* Therefore, the urgency of changing the tariff policy is increasing. In 2022, in cooperation with the World Bank, work was underway to develop a new tariff methodology for calculating prices for natural gas and electricity. According to preliminary calculations under the new methodology, the natural gas price (considering the income required to finance investment projects and repay loans) should be **UZS1,393 per cubic meter** (2,2 times higher than current prices), and electricity – **UZS742 per kWh** (1,8 times higher than current prices).[21]

Table 13 provides a summary estimate of state support for the fossil fuel sector, taking into account the estimates by category. It is incomplete due to the lack of access to data to estimate a number of items. However, even an incomplete estimate enables to say that: a) support is provided mainly in the form of price subsidies; b) the choice of the base price option significantly affects the total amount of subsidies; c) underreported subsidy categories (the category “direct transfers” and the category “risk transfer to the state” can significantly increase the estimate of the total subsidies due to the high presence of the state in the economy and in basic sectors.

## TABLE 13: INDICATIVE ESTIMATE OF STATE SUPPORT TO THE FOSSIL FUEL SECTOR IN UZBEKISTAN, 2017-2022 (MILLION USD)

| № | Subsidy | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|---|
| | **Direct transfers** | | | | | | |
| 1 | Direct subsidies from the state budget: | 0,00 | 24,00 | 44,00 | 123,00 | 143,00 | …. |
| | heat power industry | 0,00 | 0,00 | 26,00 | 33,00 | 4900 | …. |
| | oil and gas industry | 0,00 | 0,00 | 0,00 | 40,00 | 94,00 | …. |
| | electric power industry | 0,00 | 24,00 | 18,00 | 50,00 | 0,00 | …. |
| | coal industry | …. | …. | …. | …. | …. | …. |
| 2 | State funding of exploration works | N/A* | N/A | N/A | N/A | N/A | N/A |
| 3 | Capital transfers | N/A | N/A | N/A | N/A | N/A | N/A |
| | investment grants | | | | | | |
| 4 | State procurements | N/A | N/A | N/A | N/A | N/A | N/A |
| 5 | State-owned enterprises | N/A | N/A | N/A | N/A | N/A | N/A |

[21] «World bank’s technical assistance in Energy Tariff Reforms», 2022

| № | Subsidy | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|---|
| 6 | Direct state injections into the equity capital of companies | N/A | N/A | N/A | N/A | N/A | N/A |
| 7 | Dividends left to producers | N/A | N/A | N/A | N/A | N/A | N/A |
| | **Tax expenditures, other government lost revenue and underpricing** | | | | | | |
| 1 | Tax exemptions | …. | …. | 310,00 | 258,40 | 160,19 | 80,92 |
| 2 | Under-pricing goods and resources | …. | …. | 0,00 | 0,00 | 1,32 | 0,20 |
| 3 | Preferential loans to infrastructure enterprises and thermal power plants | it is required to develop a methodology for data collection and assessment | | | | | |
| 4 | Preferential export credits related to the supply of energy resources | it is required to develop a methodology for data collection and assessment | | | | | |
| 5 | Other state lost revenues | Inventory-taking of all benefits needed | | | | | |
| | **Secondary (indirect) transfers: price subsidies to consumers** | | | | | | |
| | Natural gas | | | | | | |
| | Export subsidies | 3,031,0 | 4406,0 | 3,911,0 | 2,918,0 | 2,763,0 | … |
| | Import subsidies | …. | 2,092,0 | … | 1,509,0 | 481,0 | …. |
| | Electricity | | | | | | |
| | Export subsidies | 2,045,0 | 1,833,0 | 578,0 | 489,0 | -3,0 | …. |
| | Import subsidies | -859,0 | -402,0 | -919,0 | -826,0 | -806,0 | ,,, |
| | Liquefied gas | | | | | | |
| | Subsidies to the population | 112,0 | 122,0 | 110,0 | 144,0 | 188,0 | … |
| | **Risk transfer to the state** | | | | | | |
| 1 | Preferential government loans and loan guarantees for oil, gas and energy-intensive companies | access to relevant data is required | | | | | |
| 2 | Restructuring and writing off debts | N/A | N/A | N/A | N/A | N/A | N/A |
| 3 | Insurance in case of accidents, protection of key power facilities | access to relevant data is required | | | | | |
| 4 | State spending on the environmental damage restitution | N/A | N/A | N/A | N/A | N/A | N/A |
| | Reference: | | | | | | |
| | GDP, mln USD | 62,081,3 | 52,633,1 | 57,711,9 | 57,698,5 | 69,238,9 | 80,384,0 |
| | Scale of subsidies (in % of GDP) including price subsidies for exports | …. | 12,1 (no tax exemp-tions) | 8,6 | 6,8 | 4,7 | …. |
| | Scale of subsidies (in % of GDP), including price subsidies for imports | …. | …. | -0,8 | 2,1 | 0,00 | |

*Note: * no data available or classified.*

*Source: Compiled by the authors using data from the State Committee on Statistics, the Ministry of Finance, the Ministry of Energy, the Ministry of Economic Development and Poverty Reduction, the State Tax Committee, the State Customs Committee, Uzneftegaz JSC, Regional Electric Networks JSC, Uztransgaz JSC, Hududgaztaminot JSC, etc.*

# CHAPTER 6. GLOBAL EXPERIENCE IN ENERGY SUBSIDY REFORM

Global energy subsidies are slowly declining. In 2021, they amounted to USD697,2 billion, recovering rapidly in the post-COVID period as a result of rising fuel consumption and higher global energy prices.

**Developed countries** (G20) made a commitment back in 2009 to phase out fossil fuel subsidies that “encourage wasteful consumption”.[22] However, in 2019, the Global Subsidies Initiative noted that despite this commitment, G-20 countries continue to provide about USD150 billion per year for this purpose across the value chain.[23]

**Developing oil and gas producing countries do not want to divest from fossil fuels.** Subsidy reform involves reducing fossil fuel production. Developing countries question why they should restrict themselves from using their own fossil fuels and pay the risks of their development when more than 80% of global emissions are created by developed countries. During the 27th Conference of the Parties to the UN Framework Convention on Climate Change (COP27, November 2022, Egypt), it was precisely because of developing countries that the call to phase out fossil energy use *was not included in the text of the COP27 final declaration*.

Overall, by 2021, 40 countries have implemented some reforms to fossil fuel subsidies[24], and 50 countries have implemented carbon pricing measures.[25]

The complexity of advancing the reform process is explained by the fact that despite a number of negative effects of energy subsidies,[26] their removal is associated with the emergence of no less difficult economic, political and social challenges, In particular:

- **Subsidy removal leads to higher inflation** (through rising prices for energy and essential goods), which is a controversial social effect, given that access to cheap energy is crucial for the welfare of the population (especially poor households), Subsidies are an easier way to protect the public from high energy prices. *The population feels the effect of subsidies immediately,* while other forms of support require efforts from the state (technical, administrative, temporary, etc.). The civil unrest that has erupted in many countries following announcements of price hikes (for electricity, gasoline, transport) has encouraged governments to continue to favor subsidizing energy prices.
- **Risk of increased unemployment.** The energy subsidy reform leads to structural changes in the economy, making certain industries uncompetitive and thus leading to job losses.
- **More difficult reform in energy exporting countries.** In energy producing countries, the population and businesses believe that they have the “right” to cheap energy

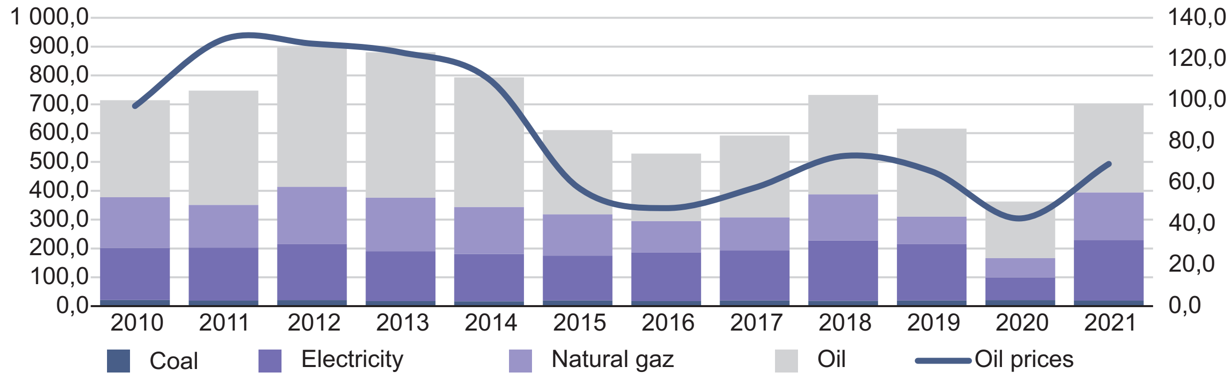
[22] G-20 Summit Closing Statement (Pittsburgh, Pennsylvania, 2009): "Inefficient fossil fuel subsidies encourage wasteful consumption, distort markets, discourage investment in clean energy sources, and undermine climate change efforts."

[23] Fossil fuel subsidy reform: lessons and opportunities. UNDP, 2021.

[24] Fossil fuel subsidy reform: lessons and opportunities. UNDP, 2021.

[25] WBG, 2019a; Zinecker et al., 2018

[26] Most studies demonstrate the high cost of energy subsidies to society. They distort the GDP structure, worsen inter-fuel and inter-factor competition, balance of payments, energy consumption balance and, ultimately, losses for the economy. In many countries, energy subsidies have led to trade deficits, excessive burden on government budgets, wasteful energy consumption, price distortions and a range of negative social and environmental effects caused by this distortion.




*Source: Adapted from OECD Inventory of support measures for fossil fuels, IAE analysis (2022)*

**Figure 7. Global energy subsidies and world oil prices, 2010-2021**

simply because their country has fossil fuel reserves. Therefore, compared to energy importing countries, energy subsidy reform in energy exporting countries is more fiercely resisted by the public and takes longer.

- **Risk of destabilization due to the wrong moment to start the reform.** The factor of "political window of opportunity" is important, i,e, the right choice of the moment to start the reform depending on the peculiarities of the political situation in the country. Thus, many studies show that subsidy reform is less feasible in cases where: a) political leadership is weak (no consensus among parties, no trust in the government, etc.); b) before the elections. Countries planning reform are better off doing it: a) *during* political windows of opportunity; b) accompany the reform with economic concessions in case of negative social reaction, It is important for energy-importing countries to initiate reform *during cycles of declining commodity prices*, while it is important for exporting countries to avoid starting reform at a time of *high/increasing world energy prices*.

Global practices have developed three main areas for reallocating funds that are released to the state as a result of energy subsidy reform:

- reallocation of funds to change the energy consumption pattern: increased investment in improving the energy efficiency of the economy.
- reallocation of funds to the development and scaling up of alternative low-carbon technologies: increased investment in RES development.
- reallocation of funds for the expansion of social protection to minimize the social consequences of the shock to the poor groups of the population resulting from the reform: development of targeted support measures.

The main mechanisms for reallocating funds to these three areas based on the analysis of global experience with a focus on developing countries are discussed below.

**The essence of extending social protection** is to make it *inclusive* in terms of energy access. It comes in the form of:

- **First,** the use of *traditional social protection programs* (social assistance, social security, social services and labor market programs).[27] This approach is driven by the desire to avoid additional costs, as the development and implementation of new social protection programs requires significant investment.

[27] Each component has a number of programs. For example, the 2030 Strategy for Social Protection of the Population of the Republic of Uzbekistan includes 64 programs.

- **Second,** *targeted support* is provided in the form of targeted payments. A number of developing countries used not only traditional cash payments as targeted payments, but also alternative measures in the form of:
  - *supporting employment in other sectors.* For example, the 2008 oil price increases in Malaysia and Viet Nam were accompanied by successful incentives for employment of the poor in the fisheries sector;
  - *introduction of progressive (block) pricing* with determination of the basic (minimum, social) rate of energy consumption. Thus, a certain low tariff is taken as the base rate of energy consumption to meet the needs of low-income households. Energy consumed above the base level is charged at the market rate.[28]
- **Third,** support should be *phased,* In the beginning, it is better to raise prices that have the least impact on vulnerable groups. Only then can one move on to the next phases of phasing out sensitive energy subsidies. So, it is very important to: a) establish a clear schedule for the gradual domestic price increases and b) choose the right timing for targeted smoothing measures.
- **Fourth,** *transparency of the reform*. Studies show that the effect of the reform is regressive, i,e, the cost of energy consumption in vulnerable groups will increase more than in the financially stable group.[29] Therefore, decisions on reallocation of budgetary funds should be transparent in terms of: a) understanding the cost of subsidies and their recipients, as well as completeness of data on household energy consumption and poverty level; b) availability of a system of accounting /monitoring of the distribution of funds saved from the subsidy removal.
- **Expanding the use of low-carbon technologies.** There is no point in wasting society's energy on fossil fuel reform if alternative technologies are *not viable*. Alternatives include RES and energy efficient technologies. They have both advantages and disadvantages for developing countries.

The accelerated decarbonization and RES deployment is important for the following reasons:

- *the concept of "protection" of hydrocarbon exports is futile,* It makes no sense to invest in energy or metallurgy facilities that are designed for at least 30 years. The world will decarbonize during this time, and these facilities will be unnecessary;
- *shrinking export markets for energy-exporting countries* under conditions of accelerated decarbonization of energy-importing countries;
- *US return to the Paris Agreement on climate change,* which dramatically accelerated the global decarbonization trend. Hoping to reverse the global course of climate protection becomes very risky;
- *the introduction by the EU of a Carbon Border Adjustment Mechanism (CBAM),* the so-called EU carbon tax. Its purpose is to charge suppliers of imports to the EU market if their products are produced with high $CO_2$ emissions, and thereby encourage manufacturers around the world to adopt low-carbon/carbon-free technologies. Energy exporting countries will therefore incur additional huge costs;
- *the intention of China,* Asia's largest energy buyer, to achieve climate neutrality by 2060.

[28] Opportunities and risks of applying block tariffs in Uzbekistan are discussed in the report "Methodologies of stimulating energy savings through tariff policy and investments in energy-saving technologies", UNDP, 2018.

[29] Vagliasindi, 2012.

At the same time, the analysis of studies enabled to summarize the main reasons why developing countries have little interest in accelerated RES development:

- *alternative types of energy are not able to provide the necessary generation volumes and uninterrupted supplies.* Depending on the energy source, the capacity of alternative forms of energy is 2-3 times more expensive than traditional fossil fuel power generation. So, if you need 1 GW of energy capacity, you can build a 1 GW solar plant, but you will also have to build conventional generating capacity of 1 GW, as the solar plant does not produce energy at night. That is, the solar plant will cost 2 times more,
- *difficulty of determining the optimal level of RES subsidies.* Constant subsidies for RES utilization are expensive and risky. Thus, an upward deviation from optimal subsidy levels (by 2%) reduces public welfare (-3%), while a downward deviation increases emissions (+18%).[30]
- *RES subsidies are questionable in terms of compensating for externalities from the use of fossil fuels.* Thus, the cost of a solar or wind power plant is almost 5 times higher than the externalities arising from the combustion of fossil fuels (USD368/MWh vs. USD78/MWh)[31];
- *ambiguous environmental efficiency of RES.* Subsidizing RES is beneficial from an environmental point of view, but it is important to take into account all the effects. For example, it is very difficult to dispose of wind turbines, besides, they generate ultrasound, cause the death of birds, etc. Another example, the production of solar panels pollutes the environment with harmful chemicals, etc.;
- *uncertainty of the social effects of RES.* The social effects of new technologies are sensitive topic for developing countries suffering from high unemployment and inequality. Selected evaluation of RES' effects show that their impact on the social sphere is often unpredictable.

Given the ambiguity of RES effects, the need for the availability of *criteria for selecting RES in relation to local conditions* increases. As part of the UNDP report, an attempt was made to develop criteria for selecting RES for typical (standard) "green" projects on the example of the energy, agriculture and water sectors in Uzbekistan. These three sectors account for over 93% of the country's total emissions.[32]

**Increased investment in energy efficiency.** Energy efficiency reserves are of such magnitude that they can become the "first fuel" for the economies of many countries.[33] The question is to choose the most optimal mechanisms/sectors for a particular country. Tariff policy and smart meters are mentioned as the main energy saving policy *measures* in Uzbekistan, and the sectors selected are: 1) electricity generation, 2) heating sector; and 3) energy efficiency in buildings. All three sectors are very capital intensive. However, international experience has other approaches to improving energy efficiency *that are less costly.* According to the UNECE approach, there are 5 sectors, each with its own "set" of effective solutions to increase energy efficiency (Annex 5).

[30] Kalkuhl et al., 2011

[31] Zycher, 2012

[32] Report "Assessment of socio-economic consequences from increasing Uzbekistan's commitments to reduce greenhouse gas emissions for the energy, agriculture and water sectors". Prepared under the auspices of UNDP jointly with the Center for Hydrometeorological Service of Uzbekistan (Uzhydromet), 2021.

[33] Energy Efficiency Policy: Best Practices. UNECE Publication Series on Energy for Climate Change Mitigation and Sustainable Development. New York and Geneva, 2015.

The basic scheme of state budget redistribution is shown in Figure 8 on the example of the Republic of Kazakhstan. Energy subsidy reform (liberalization of energy prices) is one of the options for expanding fiscal space (i.e. increasing the financial capacity of the state budget) for green development.

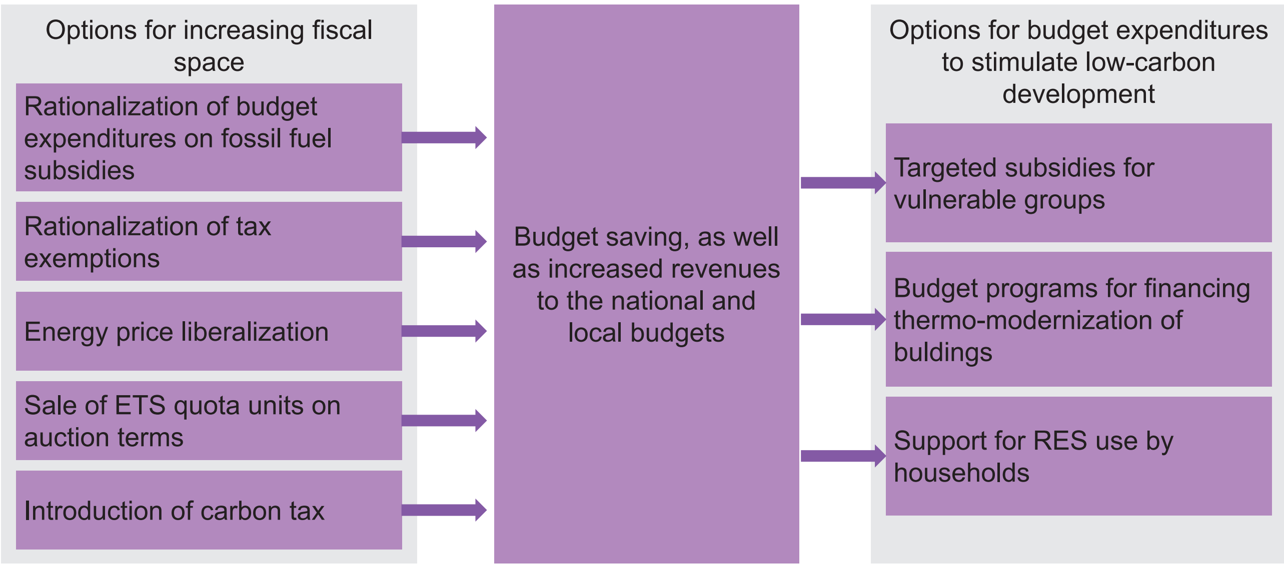



**Figure 8. Redistribution of budgetary funds released as a result of energy subsidy reform in the Republic of Kazakhstan**

*Note: The sale of Emissions Trading System (ETS)[34] quota units is a feature of the Republic of Kazakhstan.*

*Source: Fiscal Stimulation for Low-Carbon Development in the Republic of Kazakhstan, 2021. Report prepared under the auspices of the Global Subsidies Initiative of the International Institute for Sustainable Development (GISI SDI).*

[34] The ETS only covers $CO_2$ emissions for major pollutants. It is expressed in the trading of free emission quotas distributed by Zhasyl Damu JSC, an organization subordinate to the Ministry of Ecology, Geology and Natural Resources. When quotas are exceeded, companies can purchase them from other enterprises on the exchanges or directly from each other. As a rule, the main buyer of quotas is the energy sector, and the seller is the oil sector.

# CHAPTER 7. MODEL TOOLKIT FOR ASSESSING THE IMPACT OF SUBSIDY REFORM IN THE FOSSIL FUEL SECTOR

Reduction of subsidies can be expected if: a) demand for fossil fuels decreases due to rising fossil fuel prices; b) energy (resource) saving technologies are introduced; and c) the share of energy-intensive industries in the economic structure decreases. Accordingly, the toolkit should include *three channels:* 1) the energy efficiency (investment) channel; 2) the structural channel; and 3) the direct subsidy reduction channel. Measures to activate the channels have different costs, different impact on emissions, macroeconomic and structural indicators, employment, incomes of the employed and the state, exports, etc. **The purpose of the modeling toolkit** is to generate scenarios for reducing energy subsidies that are optimal in terms of the combination of all these indicators. The methodological note to the report contains a detailed methodology of the toolkit.

**Energy Efficiency Channel: Estimating subsidy cuts depending on energy saving policy priorities.** Channel logic: Investments in modernization of energy-intensive industries improve energy efficiency, which leads to a reduction in energy costs (primarily in energy-intensive industries) and, through established technological interrelations in intermediate consumption industries, to a decrease in output in related industries. As a result, the same volume of final demand in the economy can be provided by a smaller volume of sectoral output. This reduces emissions and the demand for subsidies (positive effects). On the other hand, the demand for employment and income of the employed decreases, and the country's external debt grows (negative effects).

Calculations made earlier as part of the UNDP[35] project showed the *promising potential* of this channel. Thus, the use of modern combined-cycle and gas turbine technologies (CCGT and GTU) at 7 operating TPPs enabled estimating gas savings in the amount of 5,16 billion cubic meters or by 36% to the base estimate. Accordingly, subsidies to electricity producers will decrease in the same proportion. Unit emissions in the power sector will be reduced by 21%. The calculations also showed that the estimate of the size of total emissions (direct and indirect, considering inter-sectoral interaction) exceeds the estimate of the size of direct emissions by 1,36 times, strengthening the positive effect of the channel's impact on the environment.

Decrease in demand for gas may have some negative impact on the social sphere, In particular, the decrease in production output may amount to 0,15%, reduction in the number of employed – by 0,06%, income of employed – by 0,16%, state budget revenues – by 0,04%. Unemployment will affect Uzbekneftegaz JSC (1,3 thousand new unemployed), the power sector (0,16 thousand), and the services sector (0,5 thousand). These effects can be compensated by the growth of labor-intensive industries (e.g., textiles). In addition, negative social effects can be reduced if instead of the current investment model (purchasing equipment abroad), investments are directed to the creation of own technological base and training of personnel to operate modern energy-saving technologies.

*The main limitation* for the activation of this channel is the high capital intensity of energy saving projects in the basic sectors of the economy. For example, the project on replacement of equipment at 7 operating TPPs, discussed above, is estimated at USD7 billion. Most of this amount is foreign loans, which increases the country's external debt.

[35] UNDP "Assessment of social and economic impacts of increased ambition NDC on energy, agriculture and water management sectors in Uzbekistan" report. Tashkent, 2021.

**Structural channel: assessment of subsidy cuts depending on structural policy priorities.** A slowdown in the growth of the most energy-intensive industries (Top-20, Table 4) compared to the growth of the economy as a whole, or a reduction in the production of their goods on obsolete equipment, will reduce the share of these industries in the structure of the economy, and, consequently, the demand for primary fuel and subsidies for their production.

This raises the question of the *weight of energy-intensive industries in the economic structure*. The experience of successful developing countries can provide clarity. For example, in the structure of electricity distribution for end-use needs in 2019, the public administration and defense sector was the leader – 24%. However, for China the value of this indicator is 1,3%, Vietnam – 0,6%, Malaysia – 7,2%, Kazakhstan – 5,3%.[36] *A reasonable reduction in the scale of the public administration sector* (in terms of electricity consumption) is a significant reserve for Uzbekistan to save energy, reduce demand for fossil fuels, and, consequently, limit subsidies. Calculations have shown that if the gap in the average estimate of electricity consumption by the public administration sector between Uzbekistan and the above countries (3,6%) is halved, i.e. from 13,7% (2018) to 8,7% or by 5 p.p., the effects arising from this will be multidirectional.

*Positive effects:*

- reduction of emissions by 4,1% or 8,980 thousand tons of CO2-eq, including 8,320 thousand tons for the electric power industry, 257 thousand tons for agriculture, 193 thousand tons for the chemical industry, 95 thousand tons for transport sector;
- reduction in the production of fossil fuels (coal, oil, gas) by 0,7%;
- reduction of subsidies, Using the International Energy Charter's estimate of USD8,1 billion in subsidies in 2018[37] and a 0,7% rate of decline in fuel demand, the subsidy savings could be USD56,7 million;
- improvement in the foreign trade balance by 2,3% due to lower demand for intermediate imports.

Negative effects:

- decrease in economic activity in terms of GDP and gross output by 2,5%, incl, for public administration and defense sector services – by 41,2%, publishing services – by 11,8%, electric power industry – by 5,3%, repair of machinery and equipment – by 3,8%;
- reduction of state revenues by at least UZS630 million as a result of a decrease in the level of economic activity. This is higher than the savings from reducing subsidies (UZS466,6 million), which means an increase in the state budget deficit;
- decrease in employment by almost 180,000 people, of which 111,000 (61,7%) are in the public administration sector (the defense sector is outside of market regulation);
- decrease in income of the employed by 11,4% (by UZS6,434 million), including in the public administration and defense sector – by UZS5,338 million,

A similar approach applies to other energy-intensive sectors of the economy.

Calculations show that the scale of using the structural channel is limited not so much by the set of energy-intensive industries as by negative social consequences.

[36] ADB (2022). Economic insights from Input–Output tables for Asia and the Pacific. July 2022.

[37] In-depth review of the energy efficiency policy of the Republic of Uzbekistan. Protocol to the Energy Charter on Energy Efficiency and Related Environmental Aspects PEEREA. Brussels 2022.

**Price channel: Emissions subsidy reduction assessment, social and structural indicators.** An increase in energy prices leads to an increase in prices in all sectors (cost inflation), as well as consumer prices (consumer inflation). In Uzbekistan, the supply of energy resources does not change depending on price changes (inelastic) due to their administrative regulation, Reducing subsidies at stable energy prices will lead to a deterioration in the financial condition of mining companies and consumers of their products. The result will also be a reduction in the production of energy companies (due to increased wear and tear of equipment) and related industries, with a subsequent negative impact on the environment and social indicators.

The choice of subsidy reform channel may lead to different consequences for the environment, employment, household income and state budget, macroeconomic and social stability. These differences are summarized in Table 14.

**TABLE 14: DIFFERENCES IN ALTERNATIVE CHANNELS FOR SUBSIDY REFORM**

| Distinctive characteristics | Investment and energy efficiency | Structural | Price |
|---|---|---|---|
| Need for investment | High | No | No |
| Demand for foreign loans | High | No | No |
| Emission control potential | High, but deferred for the period of implementation of modernization projects | Moderate but short term | Moderate but achievable in the short term |
| Impact on social indicators (employment, income) | Weak negative under the traditional investment model (purchase of imported equipment) and positive in the medium term when changing this model and focusing on the creation of a domestic technological base and its own personnel. | Significant growth of unemployment in energy-intensive industries at the initial stage of the reform and a noticeable drop in the incomes of the employed throughout the economy. | Significant increase in unemployment in the mining and related industries at the initial stage of the reform and a noticeable drop in the incomes of the employed. Neutral in the medium term when using the released funds for employment/ income support |
| Impact on macroeconomic stability | Neutral for inflation, but negative in terms of external debt growth | Neutral for both inflation and external debt | Accelerates inflation with free-of-control gas/electricity prices, but neutral for external debt |
| Impact on employee income and state budget deficit | Weakly negative in the short term with a shift to positive when the investment model changes | Ambiguous – negative for revenues, but reduces demand for subsidies and state budget expenditures | Reduces spending and the state budget deficit |
| Impact on the financial condition of fossil fuel producers and consumers | Positive for fossil fuel consumers (energy saving effect) | Neutral | Negative for producers at a fixed oil/gas price and for primary energy consumers at a free oil/gas price |
| Impact on social stability | Neutral in the short term and slightly positive in the medium and long term | Negative depending on the level of employment reduction | Negative depending on the level of growth in prices for energy, transport, basic necessities |

*Source: authors.*

The differences between the *energy efficiency channel and the price channel*. Under the energy efficiency channel, through mainly external borrowing (i.e. growth of external debt), the energy efficiency of the economy is increased and, consequently, the demand for subsidies is reduced, while final consumption and price level remain unchanged.

Under the *price channel*, by reducing subsidies and increasing energy prices, there is a decrease in sectoral production and final consumption in general, but the level of external debt does not change, In addition, the price increase caused by the removal of subsidies (unlike in the energy efficiency channel) increases the risk of macroeconomic instability and social risks. The other effects – the decline in sectoral outputs, emissions, employment and income of the employed – are approximately the same for both channels.

The effects of the *structural channel* and the *price channel* are similar. The main difference is that the structural channel does not increase the risks of macroeconomic instability and does not worsen the financial situation of fossil fuel producers and consumers, However, its scope is much narrower than that of the price channel.

Channel features create opportunities to search for subsidy reform scenarios with the lowest costs for the environment, macro-stability and social sustainability. Summarizing the publications enables to identify a *number of key scenario alternatives*.

Thus, three scenarios are considered for **Russia:**[38] "basic" ("Business as Usual" (BAU), "reasonable" and "aggressive". The baseline scenario is aimed at achieving high (above the global average) economic growth rates. It assumes the realization of Russia's resource potential, limited technological modernization (due to technological imports) and inertial dynamics of energy efficiency growth in the economy. The baseline scenario does not allow achieving compliance with the Paris Agreement conditions regarding Russia's contribution to emission reduction. *The reasonable scenario* is focused on compliance with the Paris Agreement by maximizing the use of the internal potential of the economy, technological modernization, and improving the quality and standard of living. The main goal of the *aggressive scenario* is a sharp reduction in emissions without regard to the consequences for the economic sustainability. Measures to reduce emissions include reducing the export of hydrocarbons by 90%, introducing an emission tax, transition to RES, reducing the share of hydrocarbons in the fuel mix to 15%, reducing the number of cattle by 2 times, etc.

Scenarios for **Kazakhstan** have been developed based on similar principles.[39] The starting point is the BAU scenario plus active scenarios, which are divided into two groups: removal of subsidies until 2035 (group 1) and until 2050 (group 2). Within each group, the scenarios are divided according to the priorities of the structural and investment policy, which is funded by private investors and budget funds released as a result of the reform – energy efficiency, RES development, conversion of transport to electric power and a balanced approach to all these priorities with redistribution of 75% of tax revenues to low-income households.

In the IISD study[40], calculations were made for 20 countries that have: a) per capita income levels in the "low" and "below group average" categories and b) a high level of energy subsidies (in % of GDP). The dynamics of emissions changes after subsidy removal, options for redirecting savings to RES investments and energy efficiency ("subsidy swap") and options for reallocating tax revenues to the same alternatives (Earmarked tax revenues) were assessed. The results of the scenario calculations were compared with the results of the

[38] B.N. Porfiriev, A.A. Shirov, A.Y. Kolpakov, E.A. Yedinak (2022). Opportunities and risks of climate regulation policy in Russia // Voprosy ekonomiki. 2022. No. 1. pp. 72-89.

[39] Georg Pallaske. Researcher, IISD.Project Manager, KnowlEdge Srl. Modeling results of fossil fuel subsidy reform in Kazakhstan. Presentation at UNDP. Tashkent. November 8, 2022.

[40] "Reducing greenhouse gas emissions through fossil fuel subsidy reform and taxation," 2021.

BAU baseline scenario. Four scenarios were assumed: 1) subsidy removal; 2) reallocation of subsidy savings to investments in energy efficient solutions and RES; 3) introduction of a carbon tax; 4) reinvestment of subsidy savings in green development.

Calculations have shown that *if only subsidies are removed, the emissions will fall sharply.* But after that, energy prices will stabilize, emissions will also stabilize and will remain unchanged in subsequent years (will not decrease).

If the subsidy removal is complemented by reallocation of the released funds to investments in energy efficient solutions and RES, the *annual emission reductions will increase until 2025*, but then also stabilize. That is, the potential of the first two scenarios is limited to achieve further emission reductions.

Reallocation of funds to investments in energy efficiency solutions and RES, as well as the introduction of a carbon tax and the reallocation of tax revenues lead to a sharp acceleration in emissions reduction after 2025. In addition, in the long term, Scenario 4 will reduce emissions more than simply subsidy removal due to the *cumulative effect* of such investments.

The study was able to obtain the *optimal values of each scenario, which gives the maximum cumulative effect for emission reduction*. This combination is as follows:

- complete removal of energy subsidies;
- reallocating 20% of the savings to investments in energy efficient solutions and 10% of savings to RES development during 2021-2030;
- introduction of a carbon tax of 10% of the level of energy prices;
- reinvesting 20% of tax revenues generated into investments in energy efficient solutions and 10% into the use of RES during 2025-2030.

These approaches are the basis for selecting energy subsidy reform scenarios in Uzbekistan. However, it is important to reasonably limit the number of scenarios. It is suggested to limit the number of scenarios to *two main working scenarios*:

- **The baseline scenario** is a phased subsidy reduction using the freed-up budget funds for energy efficiency, social protection of vulnerable groups and employment.
- **The pragmatic scenario** is a combination of measures to increase energy efficiency and curb the development of energy-intensive industries with a smoother schedule of subsidy reductions that would avoid aggravation of social risks and deterioration of financial sustainability of the basic economic sectors.

# CHAPTER 8. MODELING THE IMPACT OF FOSSIL FUEL SUBSIDY REFORM

A multiplier technique for final demand (consumption) was developed for model calculations. Calculated as per unit values (based on UZS1 billion change in final demand in the economy), the multipliers enable to compare the response of the economy across all indicators and across different industries (for more details on the methodology and technique of calculation, see Methodological note to the report).

**The final demand fossil fuel consumption multiplier** shows how fuel production will increase (in billion UZS) if final consumption increases by UZS1 billion. The value of the multiplier for all industries (136) is *greater than zero*, since all industries use electricity, for the production of which gas, coal, oil products are used. The greater the weight of electricity or other energy inputs in the cost structure of each industry and the shorter the supply chain of energy inputs to this industry, the higher the multiplier value for this industry, and vice versa.

For the energy sector industries, the multiplier values are greater than one, as an increase in final consumption, for example, of coal by UZS1 billion will require an increase in its production by the same amount plus additional demand for electricity, oil products and gas, which are used for coal mining. The multiplier for coal amounted to UZS1,034 billion (see Methodological Note to the Report). This means that the indirect effect from the increase in final coal consumption by UZS 1 billion amounted to UZS34 million.

Among non-energy sector industries, the largest multipliers are cement, lime and gypsum (2,02), porcelain and ceramic products (1,80), plastics in primary forms (1,40), etc. It is *these industries that should have the priority* in the implementation of measures to decarbonize the economy.

**The final demand GHG emission multiplier** shows how emissions will increase if the final fossil fuel consumption increases by UZS1 billion. The calculations showed that the economy-weighted emission multiplier amounted to 305 tons of CO2 per UZS1 billion increase in final consumption (2019 prices). The highest multiplier values are in such industries as electricity generation (10,9 times higher than the average for the economy), its delivery to consumers (10,5 times), plastics production (5,2 times), drinking water delivery (5,0 times), sewerage services and fertilizer production (3,1 times). *Emphasis on energy saving in these industries will enable to reduce emissions in the economy* to the greatest extent compared to other industries (with the same investment costs).

The advantage of the GHG emission multiplier is related to the importance of accounting for not only direct but also *indirect* emissions. Thus, while 73 industries have direct emissions, indirect emissions (i.e., non-zero values of the emission multiplier) have all 136 industries, including services industries that do not have direct emissions. For example, for the "Public Administration and Defense" industry, the emission multiplier amounted to 470 tons per UZS1 billion of output, and these are indirect emissions (through inter-sectoral links), since the sector does not produce direct emissions. This is due to the high share of public administration in the structure of electricity for production needs (24%).

If the per unit subsidy indicator is used instead of the per unit GHG emission indicator, then the result will be the **final demand subsidy multiplier**. Thus, the *specific volume of subsidies* amounted to: UZS2,93 per one UZS of *oil* production; UZS1,04 per one UZS of generated *electricity*; UZS0,77 per one UZS of *gas* production. The high value of specific subsidies for oil reflects the process of deterioration of oil production conditions and high difference in oil prices in the domestic and world markets. The range of values of subsidy multipliers for other industries is wide: in the energy sector from 0,73 (oil products) to 3,02 (oil), and outside the energy sector from 0,01 (in a number of services industries) to 0,35 (water supply). Therefore, *subsidy reform should be aimed primarily at reducing subsidies to the energy sector industries.*

Using a similar scheme, the **multipliers of employment, household incomes and state revenues (tax revenues)** were calculated with an increase in final demand in the economy by UZS1 billion (see Methodological note to the report).

Being generated based on single approach, multipliers allow joint calculation. For example, dividing the emissions multiplier by the employment multiplier shows *how much emissions will decrease in terms of reduction of one job with a decrease in final consumption by UZS 1 billion.* Such an assessment can be used to justify policy priorities when the goal is to reduce emissions at minimal social costs. Thus, the growth of final consumption in the economy by UZS1 billion is accompanied by an increase in emissions by 3,32 thousand tons of CO2-eq. (of which direct emissions – 2,63 thousand tons) in the electric power industry. But it also leads to employment growth. Thus, for 1 new job, emissions from the electric power industry will amount to 1,068 thousand tons of CO2-eq., while from agriculture – 0,22 thousand tons of CO2-eq. (Figure 9).

| | Direct per unit GHG emissions (thousand tons of CO2-eq,) with an increase in final consumption in the economy by UZS1 billion | | Total per unit GHG emissions (direct and indirect, thousand tons of CO2-eq,) with an increase in final consumption in the economy by UZS1 billion | | GHG emissions (thousand tons of CO2-eq,) per 1 unit of employment growth in the economy (1 job) |
|---|---|---|---|---|---|
| | $em_i / x_i$ | | mult(em) | | mult(em) / mult(lab |
| 1 | EL (2.63) | 1 | EL (3.32) | 1 | EL (1.068) |
| 2 | ELD (2.33) | 2 | ELD (3.19) | 2 | GAS (0.99) |
| 3 | PLAST (1.29) | 3 | GASD (2.14) | 3 | PLAST (0.55) |
| 4 | GAS (1.29) | 4 | WATER (1.73) | 4 | ELD (0.40) |
| 5 | GASD (1.29) | 5 | PLAST (1.58) | 5 | ZEM (0.24) |
| 6 | ZEM (0.81) | 6 | GAS (1.56) | 6 | VEGET (0.22) |
| 7 | WATER (0.78) | 7 | ZEM (1.13) | 7 | GASD (0.20) |
| 8 | AZOT (0.68) | 8 | SEWAGE (0.96) | 8 | PETROL (0.19) |
| 9 | WASTE (0.57) | 9 | AZOT (0.86) | 9 | SEWAGE (0.18) |
| 10 | SEWAGE (0,52) | 10 | WASTE (0.81) | 10 | OIL (0.17) |
| | . . . . | | . . . . . | | . . . . |
| | | 11 | VEGET (0.39) | | |
| | | 12 | PETROL (0.38) | | |
| | | 13 | OIL (0.39) | | |

*Designations: EL – electric power industry; ELD – electricity delivery and sales services; PLAST – plastics in primary forms; GAS – natural gas; GASD – gas distribution and delivery services; ZEM – cement and lime, gypsum; WATER – drinking water supply; AZOT – fertilizers and nitrogen compounds; WASTE – waste management; VEGET – vegetables and gourds; PETROL – petroleum refining; SEWAGE – sewage services; OIL – oil.*
*Source: authors' calculations.*

**Figure 9. Estimates of specific emissions per workplace**

The resulting multipliers are the basis for modeling measures to mitigate the effects of the energy subsidy reform. Energy demand, and thus the volume of emissions, subsidies, income of the employed and other social and economic indicators will depend on the expected growth rates of final consumption and changes in its sectoral structure in the forecast period.

**Modeling implications under the baseline scenario: without subsidy reform, while maintaining the rate and structure of final consumption, and moderate progress in energy efficiency growth** (reduction of per unit gas and electricity costs in the cost structure of energy-intensive industries). The baseline scenario is divided into two: scenario **[BS-]** (2010-2019 before the Covid-19 pandemic, with more favorable foreign trade conditions) and scenario **[BS]** (2020 – pandemic crisis with less favorable foreign trade conditions). The growth rate of final consumption elements for these two periods is shown in Table 15.

At the same time, an accelerated development scenario **[OS]** was added, which reflects the conditions for achieving the goal of the New Uzbekistan strategy (the country's entry into the category of upper middle-income countries by 2030). Further **[OS]** scenario is not considered; it is provided for comparison purposes only.

**TABLE 15. BASELINE SCENARIO OPTIONS CONDITIONS (AVERAGE ANNUAL RATES, %)**

| End-Use Items | BAU baseline scenario | | Accelerated development scenario OS* |
|---|---|---|---|
| | Before the pandemic 2010-2019 [BS-] | Pandemic crisis period 2020 [BS] | |
| Household final consumption | 8,8 | 0 | 12 |
| Government consumption | 6,3 | 1,4 | 8 |
| Gross capital formation | 13,9 | -4,6 | 15 |
| Export | 6,4 | -20 | 8 |

*Source: [BAU] baseline scenario – data of the State Committee on Statistics for 2010-2020, accelerated development scenario in accordance with the "New Uzbekistan" strategy [OS] – expert estimates.*

Scenario comparison allows us to conclude the following (Table 16):

- **As the economy grows, the demand for subsidies increases dramatically.** This can only be avoided by reducing the scale of gas exports, If the average annual rate of gas exports falls to minus 4-5%, gas production, and hence gas subsidies, will decline. This is due to: a) the high share of gas in the export structure and b) the ratio between gas exports and gas consumption by population, which is 4:1 in favor of exports (2019).
- **The key condition for reducing specific emissions is a moderate rate of devaluation of the Uzbek soum.** Although in the **[BS]** scenario the GDP growth rate (5,91%) outpaces the emissions growth rate (5,07%), the value of advance is not so large (1,0591/1,0507=1,16), Since the calculation of specific emissions uses the size of GDP in dollar equivalent, the rate of devaluation of the Uzbek soum should not exceed 1% (devaluation rate in 2019-2022 reached 4,5%-9%) to achieve the goal of the Concept of transition to a green economy (to reduce specific emissions by at least 30% in 20 years).
- **The increase in subsidies** (UZS 1,696,4 billion for **[BS]** and UZS 2,505,8 billion for **[OS]**) **cannot be fully funded from the state budget**, since the amount of revenue that the state can receive with economic growth is less in response to the growth of final consumption: UZS 1,519,2 billion for the **[BS]** scenario and UZS 1,955,1 billion for the **[OS]** scenario. This is a strong argument for subsidy reform.
- **The objectives of the "New Uzbekistan" strategy may contradict the objectives of the green growth strategy if the economic growth rate is increased without subsidy**

**reform.** Increasing subsidies in this case will increase the state budget deficit, external debt and macro-economic instability (a key condition) of the green growth strategy.

**TABLE 16. ESTIMATES OF AVERAGE ANNUAL GROWTH RATES (IN %) OF DEMAND FOR ENERGY SUBSIDIES AND OTHER INDICATORS UNDER THE BASELINE AND ACCELERATED SCENARIOS**

| Indicators | Baseline Scenario [BS] | | Optimistic scenario [OS] |
|---|---|---|---|
| | Baseline Scenario [BS-] | Baseline Scenario [BS] | |
| **INPUT: growth rate of final consumption, %** | | | |
| Household final consumption | 5,28 | 7,04 | 9,6 |
| Government consumption | 4,34 | 5,32 | 6,68 |
| Gross capital formation | 6,5 | 10,2 | 11,08 |
| Export | -4,16 | 1,12 | 2,4 |
| **OUTPUT: growth rates of financial, macroeconomic and other indicators** | | | |
| Energy subsidies, % | 0,07 | 3,63 | 5,37 |
| growth in billion UZS | 31,2 | 1 696,4 | 2 505,8 |
| GHG emissions, % | 1,86 | 5,07 | 6,80 |
| increase in thousand tons of CO2-eq, | 3 557,8 | 9 680,3 | 12 984,1 |
| GDP, % | 3.12 | 5,91 | 7,61 |
| including vegetables | 4,55 | 7,02 | 9,11 |
| meat and meat products | 5,21 | 7,00 | 9,51 |
| gas | -1,11 | 3,00 | 4,61 |
| oil | 0 | 3,07 | 5,21 |
| electricity | 2,53 | 5,24 | 7,02 |
| chemical fibres | -8,39 | -3,11 | -1,35 |
| accumulators and batteries | -8,03 | -3,61 | -1,21 |
| non-ferrous metals | -5,33 | 0,12 | 1,45 |
| cement | 5,17 | 8,69 | 9,81 |
| plastics in primary form | -0,52 | 4,11 | 5,33 |
| transport | 0,83 | 4,37 | 6,16 |
| Employment, % | 3,54 | 5,86 | 7,50 |
| increase in thousand people | 166. 4 | 275,6 | 352,3 |
| Budget receipts, % | 2,61 | 5,78 | 7,44 |
| billion UZS | 684,7 | 1 519,2 | 1 955,1 |
| Income of employed, % | 3,58 | 5,77 | 7,37 |
| Import, % | 1,56 | 3,16 | 4,13 |
| Change in the export-import balance billion UZS | -9 595,6 | -5 094,4 | -5 250,2 |

*Source: Calculations based on the input-output model.*

**Modeling impacts under the baseline scenario: maintaining current trends but with subsidy reform.** The calculations in Table 16 are made without subsidy reform. Further, the assessment is made under the **[BS-]** and **[BS]** baseline scenario conditions, supplemented with the subsidy reform condition – *the rate of subsidy reduction*. Two options were laid down: 1) subsidy removal until 2030 **[Sub]** and 2) subsidy removal until 2035 **[Sub+].** Four scenarios were combined in the modeling: **[BS-], [BS], [Sub] and [Sub+].**

The modeling steps for the **[BS]** baseline scenario supplemented with the subsidy reduction condition **[Sub]** are described below. The resulting scenario is referred to as **[BS]&[Sub].**

The introduction of an additional condition on subsidies leads to: 1) reduction of subsidies; 2) increase in energy prices (primarily for gas and electricity); 3) slowdown in the dynamics of energy-intensive industries (non-ferrous metallurgy, cement production, etc.).

*Additional starting conditions* are a) elasticity of changes in output of energy-intensive industries in terms of energy prices;[41] b) growth rates of energy prices that ensure compensation of subsidies being withdrawn; and c) specified level of profitability of energy-intensive industries sufficient to ensure the country's energy security, It is also assumed that with an increase in energy prices, the share of energy consumption for production increases proportionally, thereby increasing the magnitude of reduction in industry outputs.

In addition, it is important to determine *the relationship between subsidy reductions and energy price increases.* In the absence of relevant studies, the following preconditions were accepted as *working hypotheses*:

- increase in fuel prices should *fully compensate for the reduction in subsidies*, as well as provide *additional funds* for modernization projects, especially for production industries with high wear and tear of equipment;
- amount of subsidies reduces in *equal parts* over a given period. At the same time, the longer if the period of *subsidy reforming*, the lower, caeteris paribus, is the price rise, and vice versa;
- the higher is the *base amount of subsidies per unit of output*, the faster is the price rise;
- the higher is the vulnerability of *demand for a particular energy resource to tariff growth*, the more demand (the volume of energy supply) falls, which makes an additional contribution to the growth of energy prices, and vice versa,

Calculations showed that the average annual increase in electricity and gas prices caused by the reduction of subsidies until their removal in 2030 (including the receipt of additional funds for equipment renewal in the two industries) would be 15%.

Estimated annual subsidy reductions would be UZS26,931 billion/8 years = UZS3,366 billion for gas and UZS13,045 billion/8 years = UZS1631 billion for electricity, followed by an estimated annual average subsidy reduction of UZS11,784 billion per year for gas and UZS5,706 billion per year for electricity.

[41] In the absence of reliable estimates of elasticities, the hypothesis of equality of price elasticity of the share of energy costs in the value structure of output was used, i.e. the higher the share of these costs, the more vulnerable the industry's output dynamics is to the growth of energy prices, and vice versa. This premise can be clarified in the framework of a separate study on the impact of the factor of energy costs growth in energy-intensive industries on their dynamics.

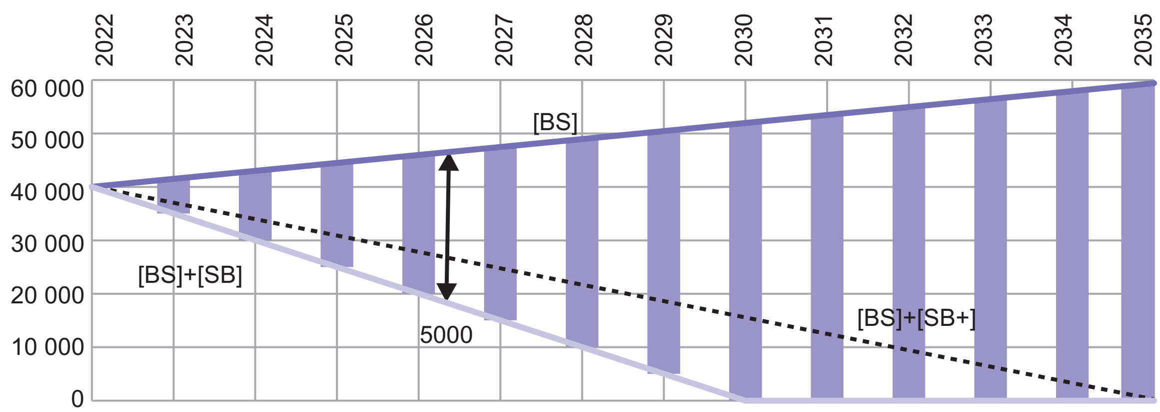
## TABLE 17. AVERAGE ANNUAL ESTIMATES OF THE SUBSIDY REFORM IMPACT

| Indicators | Baseline Scenario [BS] | Baseline scenario with subsidies [BS]&[Sub] | Scenario deviations: [BS]&[Sub] from [BS] |
|---|---|---|---|
| **INPUT: lower subsidies and slower growth of energy-intensive industries due to rising energy prices** | | | |
| 1. Annual (until 2030) reduction of **subsidies**, UZS billion, total: | 0 | -4 997 | -4 997 |
| including gas | 0 | -3 366 | -3 366 |
| for electricity | 0 | -1 631 | -1 631 |
| 2. Growth in **energy tariffs** due to subsidy reduction (%) | | | |
| gas | 0 | 15 | +15 |
| for electricity | 0 | 15 | +15 |
| 3. Index of deceleration of **growth in energy-intensive industries** due to tariff increases | | | |
| non-ferrous metals | 1 | 0,991 | -0,009 |
| cement | 1 | 0,978 | -0,022 |
| plastics in primary forms | 1 | 0,981 | -0,019 |
| transport | 1 | 0,977 | -0,023 |
| **OUTPUT: annual averages** | | | |
| 4. **Energy subsidies** total (in UZS billion on average annual basis) | 48 379,7 | 24 271,4 | -24 108,3 |
| including gas | 27 780,2 | 11 784,0 | -15 996,2 |
| for electricity | 13 728,2 | 5 706,00 | -8 022,2 |
| 5. **GHG emissions** in thousand tons of CO2-eq, (average annual volume) | 200 532,5 | 199 547,4 | -985,1 |
| including transport | 17 177,0 | 16 735,9 | -440,7 |
| plastics in primary forms | 7 336,6 | 7 177,0 | -142,0 |
| natural gas | 46 798,4 | 46 654,0 | -139,1 |
| Cement, lime, gypsum | 4 207,0 | 4 105,7 | -91,3 |
| electricity | 34 620,3 | 34 536,1 | -84,1 |
| 6. **GDP energy intensity** (%) | 8,14 | 8,10 | -0,04 |
| 7. **GDP** (% average annual growth) | 5,91 | 5,62 | -0,3 |
| including vegetables | 7,02 | 7,02 | 0 |
| meat and meat products | 7,00 | 7,00 | 0 |
| gas | 3,00 | 2,69 | -0,32 |
| oil | 3,07 | 1,75 | -1,32 |
| electricity | 5,24 | 4,98 | -0,26 |
| chemical fibres | -3,11 | -3,18 | -0,07 |
| accumulators and batteries | -3,61 | -5,62 | -2,0 |
| non-ferrous metals | 0,12 | -0,80 | -0,92 |
| cement | 8,69 | 6,33 | -2,36 |
| plastics in primary form | 4,11 | 2,1 | -2,0 |
| transport | 4,37 | 1,69 | -2,68 |
| 8. **Employment** (%) | 5,86 | 5,67 | -0,2 |
| increase in thousand employed | 275,6 | 266, 7 | -8,9 |
| including transport | 8,13 | 3,15 | -5,0 |
| trade | 21,8 | 21,3 | -0,56 |
| non-ferrous metals | 0,06 | -0,39 | -0,45 |

| Indicators | Baseline Scenario [BS] | Baseline scenario with subsidies [BS]&[Sub] | Scenario deviations: [BS]&[Sub] from [BS] |
|---|---|---|---|
| **9. Budget receipts** (%) | 5,78 | 5,29 | -0,5 |
| growth in UZS billion | 1 519,2 | 1 394,3 | -124,9 |
| including transport | 101,35 | 39,3 | -62,1 |
| non-ferrous metals | 2,03 | -13,07 | -15,1 |
| **10. Income of employed** (%) | 5,77 | 5,57 | -0,2 |
| growth in UZS billion | 6 118,2 | 5 902,5 | -215,7 |
| including transport | 154,51 | 59,91 | -94,6 |
| non-ferrous metals | 4,03 | -25,96 | -30,0 |
| **11. Import** (%) | 3,17 | 2,98 | -0,2 |
| 12. Export-import **balance** (UZS billion on average annual basis) | -69 560,0 | -69 824,6 | -264,6 |
| including non-ferrous metals | 50 380,8 | 49 948,6 | -432,2 |
| plastics in primary form | -1 572,6 | -1 673,9 | -101,3 |

*Source: Calculations based on the Input-Output model.*

The calculations also showed that *budget savings* (from subsidy release) would amount to UZS24,108,3 billion in average annual (indicator 9 in Table 17). The savings may increase over time (Figure 10), since in the baseline scenario **[BS]** subsidies increase with economic growth (by about UZS1,500 billion per year), and in the subsidy reform scenario **[BS]&[Sub]** decrease by given schedule.




*Note: The calculations estimate the possibility of reducing subsidies only for gas and electricity, as the dominant energy input in the structure of the fuel balance.*

*Source: Calculations based on the input-output model.*

**Figure 10: Gap between subsidy amount in scenarios without subsidy reform [BS] and with subsidy reform [BS]+[Sub] (UZS billion)**

Other *positive impacts* of the **[BS]&[Sub]** *scenario* are decrease in the average annual level of emissions (by almost 1 million tons) due to a decrease in the growth rate of energy-intensive industries (primarily transport and plastics production (indicator 5, Table 17), as well as slight (by 0,04 p.p.) reduction in the energy intensity of GDP.

*The costs of the* **[BS]&[Sub]** *scenario* are a slowdown in the GDP growth rate (by 0,3 p.p.), an increase in unemployment (by 9 thousand people), a decrease in the income of the employed (by 0,2 p.p.), a decrease in revenues to the state budget (by 0,5 percentage points, since the reform will affect, first of all, large enterprises that provide the largest share of budget revenues), an increase in the foreign trade deficit (annually by UZS260-270 billion, or by USD30 million).

At the same time, it should be considered that the obtained estimates *underestimate the negative effect,* since the calculations used a narrow range of energy-intensive products (4 types – non-ferrous metals, cement, etc.), although their number is much wider.

**One of the most negative impacts of subsidy reform is price rise.** This is relevant for Uzbekistan, as there has already been an increase in prices, as well as increase in external debt, the state budget deficit and the foreign trade balance in recent years.[42] *Rising prices increase the risk of poverty growth.* For the category of countries with per capita income below the world average (Lower Middle Income), which includes Uzbekistan, price growth by 1 p.p. increases the number of this category of population by 0,31 – 0,65 p.p.[43]

The calculations show that a *15% increase in gas tariff* will lead to an overall price increase of 0,64% according to the GDP deflator (cost inflation) and 0,8% increase in consumer

| | INPUT: increase in tariffs for: | → OUTPUT: Industries and products with the highest increase in prices due to rising energy tariffs | → OUTPUT: price rise in the economy as a whole |
|---|---|---|---|
| 1. | Gas (GAS) by 15% | – EL 3,67%;<br>– ELD 2,77%;<br>– HPw 2,68%;<br>– GASD 2,23%;<br>– ZEM 1,73%;<br>– CER 1,53%;<br>– OIL 1,35% | GDPDef 0,64%<br>CPI 0,80% |
| 2. | Electricity (EL) by 15% | – WATER 4,0%;<br>– SEWAGE 3,5%;<br>– ELD 1,6;<br>– IOr 1,3%;<br>– ChemF 1,1% | GDPDef 0,70%<br>CPI 0,31% |
| 3. | For both energy inputs 15% each (GAS + EL) | – WATER 4,04%;<br>– ELD 3,96%;<br>– SEWAGE 3,84%;<br>– HPw 3,66%;<br>– GASD 2,61%;<br>– ZEM 1,96%;<br>– CER 1,96%;<br>– WASTE 1,57%<br>– OIL 1,42% | GDPDef 1,16%<br>CPI 1,02% |

*Designations: EL – electric power industry; ELD – electricity delivery and sales services; GAS – natural gas; GASD – gas distribution and delivery services; ZEM – cement and lime, gypsum; WATER – drinking water supply; WASTE – waste management; SEWAGE – sewerage services; OIL – oil; IOr – iron ores; ChemF – chemical fibers; HPw – heat energy; CER – ceramics production, GDPDef – GDP deflator, CPI – consumer price index.*

*Source: calculations based on the input-output model.*

**Figure 11: Estimates of the impact of gas and electricity tariff growth on individual commodity items and on price rise in the economy as a whole**

[42] Inflation according to the GDP deflator rose from 9-10% in 2015-2016, to 13.5% in 2021-2022, external debt from 15-16% in 2012-2014 to over 60% in 2022. While the foreign trade balance was zero/surplus in 2013-2016, the deficit exceeds 10% of GDP in 2019. Source: press release of the IMF mission on the results of diagnostics of Uzbekistan's economy dated 16.11.2022 https://www.imf.org/ru/News/Articles/2022/11/15/pr22385-imf-staff-concludes-visit-to-uzbekistan

[43] Sh. Talukdar (2012). The Effect of Inflation on Poverty in Developing Countries: a Panel Data Analysis. Texas Tech University. https://ttu-ir.tdl.org/bitstream/handle/2346/46939/TALUKDAR-THESIS.pdf?sequence=1

prices (CPI). Electricity (by 3,67%, since a significant part of it falls on gas production), the cost of services for its delivery and distribution (by 2,77%), heat energy for households (by 2,68%), and others will rise in price most of all. With the same *15% increase in the electricity tariff*, the inflation rate according to the GDP deflator is higher (0,7%), since the share of intermediate consumption in the structure of electricity distribution is higher.

The price shock will be intensified if tariff increases occur simultaneously for both gas and electricity. The inflation rate will exceed 1% according to both the GDP deflator and the CPI. Price growth will be higher in some commodity groups, especially in such groups as electricity supply and distribution (3,96%), hot water supply (3,66%), production of ceramic products (1,96%).

However, it should be emphasized that we are talking about only one source of price growth – *cost inflation*. During the subsidy reform, price growth may be higher due to the influence of other factors, such as growth of world prices and devaluation of the UZS (imported inflation), outpacing growth of household incomes in relation to the supply of consumer goods and services (demand inflation) and others.

These results indicate that there are *high social risks in moving towards subsidy reform*. **To mitigate the risks, energy efficiency policies need to be stepped up and a softer option to reduce subsidies to the fossil fuel sector to be provided.**

**Modeling energy efficiency policies to mitigate the negative impact of subsidy reform.** One of the factors that mitigate the negative impact of the reform is investments in energy efficiency, In assessing energy efficiency potential, it is important to *answer the following questions*:

**Question #1:** *How will the implementation of energy efficiency programs change the demand for energy subsidies?* Calculations have shown that despite a slight improvement of GDP energy intensity and other indicators in the transition from the **[BS]** scenario to the **[BS]&[Eff]** and **[BS]&[Eff+]** energy efficiency scenarios (energy intensity decreases by 0,07 p.p. in the **[BS]&[Eff]** scenario and by 0,16 p.p. in the [BS]&[Eff+] scenario at the initial level of 8,14%, see the Methodological Note for detailed calculation of these values), energy saving is not a major factor in the demand for energy subsidies.

In the first energy efficiency scenario [**BS]&[Eff],** the demand for subsidies will decrease by UZS 300 billion (by 17,7% compared to the baseline scenario **[BS]).** For the second energy efficiency scenario **[BS]&[Eff+]** (resource saving applies not only to the energy sector, but also to other energy-intensive industries) – by UZS753 billion (44,4%) compared to the baseline scenario **[BS].** The results are similar for emission reduction (Table 18).

**TABLE 18. COMPARISON OF SUBSIDIES, EMISSIONS AND MACRO INDICATORS FOR THE BASELINE SCENARIO WITHOUT AND WITH ENERGY EFFICIENCY PROJECTS**

| Indicators | Scenario [BS] | Scenario [BS]&[Eeff] | 2 – 1 | Scenario [BS]&[Eeff+] | 4 – 1 |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 |
| Energy subsidies (increase, UZS billion) | 1 696,4 | 1 396,4 | -300,0 | 943,3 | -753,1 |
| GHG emissions (increase, thousand tons) | 9 680,3 | 9095,0 | -585,3 | 8 056,3 | -1 624,0 |
| GDP (growth %) | 5,91 | 5,85 | -0,06 | 5,78 | -0,13 |
| GDP energy intensity (%) | 8,14 | 8,07 | -0,07 | 7,98 | -0,16 |
| Export-import balance (change, UZS billion) | -5 094,4 | -5 067,13 | 27,27 | -5 019,9 | 74,5 |

*Source: Calculations based on the Input-Output model/ .*

**Question 2:** *How effective are the energy efficiency measures envisioned until 2030 in reducing the negative impact of subsidy reform?* Rising energy prices caused by subsidy reduction could accelerate increase in prices with subsequent negative impact on household income and poverty. Combining subsidy reform with energy efficiency measures could mitigate these effects to some extent. As the calculations (Table 19) show, adding energy efficiency growth conditions **[Eff]** and **[Eff+]** slows down price growth. But the magnitude of the slowdown according to the GDP deflator and the consumer price index is insignificant. The additional price growth remains above 1%, which *does not reduce the social risk of reform under the baseline scenario* **[BS]&[Sub]** and the scenario with the condition of implementation of *energy efficiency programs* **[Eff+].**

**TABLE 19. ESTIMATES OF PRICE GROWTH IN THE BASELINE SCENARIO WITH SUBSIDY REFORM, AS WELL AS IN SCENARIOS WITHOUT AND WITH ENERGY EFFICIENCY PROGRAMS IMPLEMENTED**

| Inflation indicators | Scenario [BS]&[Sub] | Scenario [BS]&[Sub]&[Eeff] | 2 – 1 | Scenario [BS]&[Sub]&[Eeff+] | 4 – 1 |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 |
| GDP deflator | 1,156 | 1,150 | -0,006 | 1,139 | -0,017 |
| CPI | 1,023 | 1,020 | -0,003 | 1,011 | -0,012 |

*Source: Calculations based on the Input-Output model.*

As mentioned above, the negative impact of the subsidy reform will also affect other indicators (**[BS]&[Sub]** scenario). The GDP growth slowdown under this scenario is estimated at 0,3 p.p., employment will decrease by almost 9 thousand people, income of the employed will decreases by 0,2 p.p. compared to the baseline scenario **[BS].**

To assess the social impacts of the reform, a number of scenarios were generated (Figure 12). The *baseline scenario* **[BS-]** is the starting point. It is characterized by low indicators of final consumption and GDP, and, consequently, low level of emissions, subsidies and social indicators. Switching to the **[BS]** scenario increases all indicators, including subsidies growth to almost UZS1,7 trillion, and the GDP growth rate (from 3,12% to 5,91%).

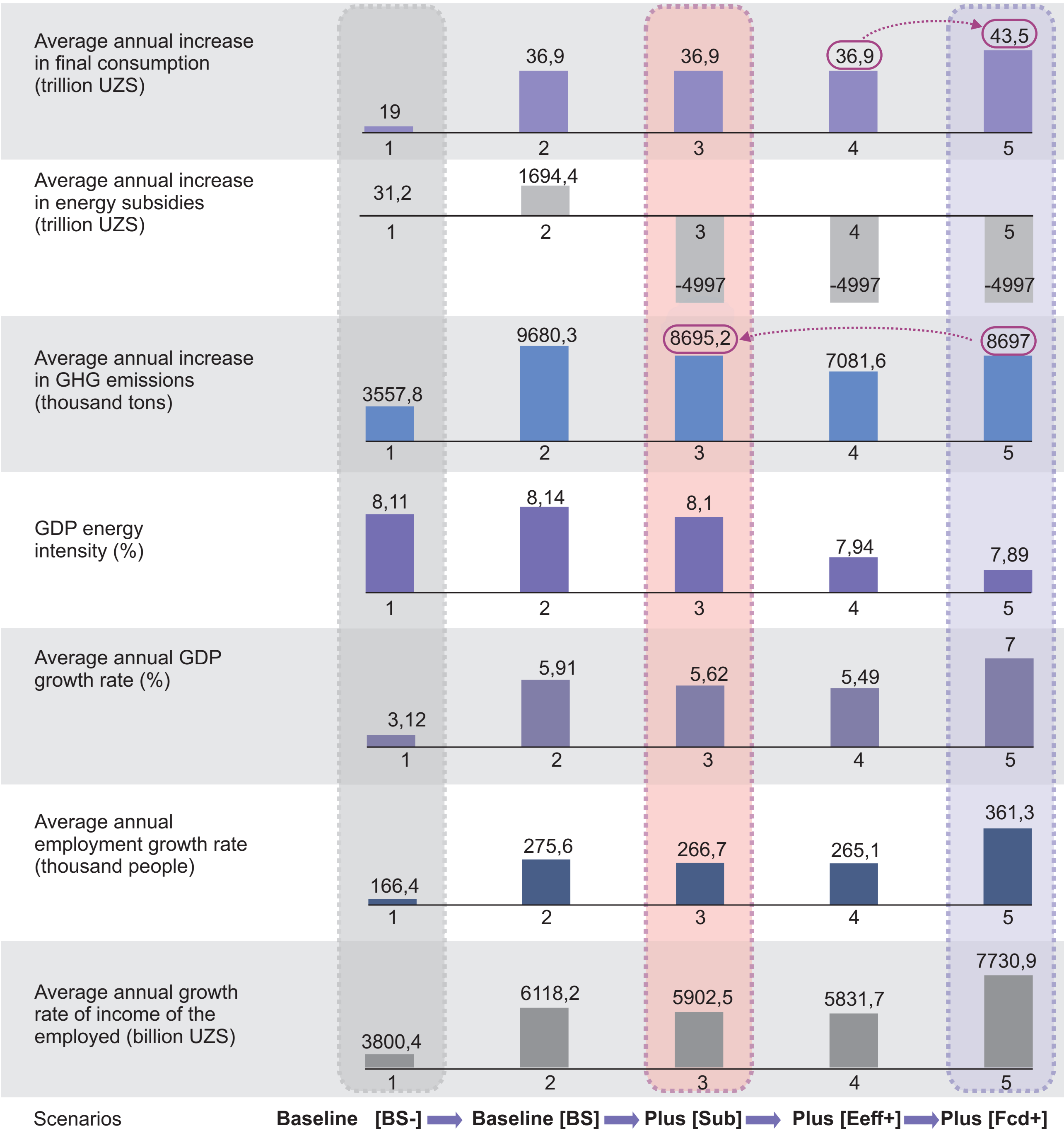
Switching to the scenario with subsidy reform **[BS]&[Sub]** brings the values of all indicators into the area of negative values. The difference between the values of the indicators reflects the *social costs of the reform* (decrease in the growth of income of the employed from UZS6,118,2 billion to UZS5,902,5 billion, the number of employed – from 275,6 to 266,7 thousand people).

The subsequent scenario (**[BS]&[Sub]&[Eff+]**) enabled us to assess the impact of the energy efficiency growth factor on reducing the negative social costs of the reform. Energy saving by itself cannot affect the solution of this problem. By reducing the GDP energy intensity (from 8,10% to 7,9%, Figure 12), energy saving measures reduce the demand for gas and electricity required to produce the same volume of final products (UZS36,9 trillion, **[FCD]**). As a result, economy-wide intermediate demand, GDP growth rate (5,49% vs. 5,62%), employment growth (265,100 employed vs. 266,700 employed), and income of the employed (UZS5,831,7 billion vs. UZS5,902,5 billion) shall reduce.

On the other hand, a decrease in energy intensity leads to an additional increase in final demand in the economy. To this end, it is enough to increase the growth rate of exports of agricultural products from 1,12% to 5%, textile products from 1,12% to 5%, chemical products from 1,12% to 5%, consumption of services from 7,04% to 15%, as well as public consumption of education, health care and public administration services from 5,32% to

7,2%. At the macro level, this means an increase in final consumption growth from UZS36,9 trillion to UZS43,5 trillion (Figure 12) and GDP growth rate from 5,49% to 7%. Emissions remain at the level of the baseline scenario with subsidies **[BS]+[Sub]**, i.e., in the amount of 8695 thousand tons of CO2-eq.

Such an increase in economic activity will not only compensate for the negative impact of the reform but will also enable achieving higher (1,3 times compared to the **[BS]&[Sub]** scenario) results in terms of employment growth and income of the employed. Thus, *the implementation of energy efficiency programs as a tool to reduce the costs of the reform requires their combination with efforts to stimulate final demand and economic growth within the established environmental limits.*




*Source: modeling results, Growth indicators in absolute terms (for subsidies, employment, etc.) are estimated in relation to the values of the corresponding indicators in the baseline (2019) period.*

**Figure 12. Estimated impact of subsidy reform on macroeconomic and social indicators under different conditions in terms of energy efficiency and final consumption growth**

**Question 3:** *What is the risk of rapid growth of external debt in the implementation of energy efficiency programs until 2030?* Financing large-scale low-carbon projects is only possible through external borrowing, Their share (foreign investment and loans net of foreign direct investment) in the structure of investment sources has already increased from 7,8% to 30% during 2017-2021. The result was a rapid growth of *external debt*, which exceeded 60% of GDP in 2022.[44]

The risk of external debt growth under the energy efficiency scenario **[Eeff+]** is due to the fact that only for 2022-2026 it was expected to allocate USD7,6 billion for RES development,[45] the vast majority of which are external borrowings. An accurate assessment of these risks is possible with the availability of data on the cost of green energy projects (in the energy sector itself and in energy-intensive industries).

Overall, the calculations show the economy's initial short-term response to the subsidy reform. *The subsequent medium and long-term effects will depend on how efficiently the released budgetary funds are used for the technological renovation of energy-intensive industries, the use of renewable energy sources, maintaining employment and social support for the poor.*

[44] External debt of Uzbekistan approached USD40 billion. https://www.gazeta.uz/ru/2022/03/29/debt/

[45] Presentation "Renewable Energy in the Republic of Uzbekistan", Ministry of Energy, 2022.

# CHAPTER 9. MODELING THE IMPACT OF ALTERNATIVE FOSSIL FUEL SUBSIDY REFORM SCENARIOS UP TO 2035

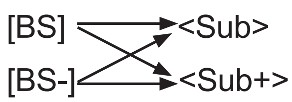
The Section 8 presents estimates of the energy subsidies reform impacts: a) based on the structural trends that have developed in the economy over the period 2010-2021 and b) in average annual growth rates of indicators. However, to understand the long-term policy priorities, it is important to estimate the reform impacts for at least 10-15 years under different scenario elements: expected GDP growth, final product, economic structure, frequency of external shocks, energy efficiency of the economy, pace of subsidies reduction, dynamics of household and state income, employment, emissions, etc.

*Alternatives* are possible for each of the scenario elements (Table 22). Thus, the consumption rates of the final product until 2035 can either correspond to the average annual rates typical for 2020-2021 (scenario component FCcr), or the average annual rates of the pre-crisis stage of development (FCst), or their combination, or the rate of accelerated growth in demand for final products (2-3 p.p. higher than in the pre-crisis period, component FCac) when the effectiveness of social reforms and the degree of inclusiveness of economic growth increase.

Alternatives can be introduced for other conditions of economic development for the period up to 2035. The combination of these alternatives gives a large number of possible scenarios, whose impact in terms of social, environmental, financial and other indicators may differ significantly from each other.

For example, the *baseline scenario* can take into account **[BS]** or not subsidy reform **[BS-].** For both **[BS]** and **[BS-],** it can be assumed that the current sectoral structure of the economy **<SP->** remains unchanged and that weakly positive energy efficiency growth trends **<Eeff->** persist.

*The baseline scenario with subsidies* is generated from **[BS]** (or **[BS-]**) by adding a subsidy component **<Sub>** (or **<Sub+>)** to the terms of these scenarios, i.e. the following combinations are possible in this case:




If the *baseline scenario is supplement by the subsidy reform condition* **<Sub>,** then a prerequisite for a phased but dynamic reduction of subsidies (until their complete removal in 2030) is introduced using the released budgetary funds for the development of RES use (in most of them) and for the support of vulnerable groups (to a lesser extent). The main source of the scenario implementation is the budgetary funds released by the rapid reduction of fossil fuel subsidies, whose amount, according to various estimates, may reach from 7% of GDP to 17% of GDP.

Under the *baseline scenario without the subsidy reform condition*, it is possible to estimate the demand for subsidies at a given growth rate of final consumption, comparing them with the estimated subsidy demand in the *baseline scenario with the subsidy reform condition* in the **[BS-]&[Sub]** scenario.

## TABLE 20. ALTERNATIVE FOSSIL FUEL SUBSIDY REFORM SCENARIOS

| Factors and constraints to economic growth | Alternatives | Legend |
|---|---|---|
| **Final demand (growth rate)** | ▪ growth at crisis development stage level (2020)<br>▪ growth at pre-pandemic levels (2010-2019)<br>▪ accelerated development (2-3 p,p, higher than in St, Petersburg) | <FCcr><br><FCst><br><FCac> |
| **Frequency of crisis periods** | ▪ once every five years<br>▪ more than once every five years | <Cr1><br><Cr2> |
| **Energy efficiency** | ▪ growth at the level of the reporting period<br>▪ as part of the energy efficiency growth program within the energy sector;<br>▪ same throughout the economy | <Eeff-><br><Eeff><br><Eeff+> |
| **Industry structure of final consumption** | ▪ low and corresponds to the sectoral structure of the base year<br>▪ curbing the growth rate of energy-intensive industries | <SP-><br><SP+> |
| **Rate of cut in energy subsidies** | ▪ high, with the subsidy removal until 2030<br>▪ moderate, with most subsidies removed by 2035 | <Sub><br><Sub+> |

*Source: developed based on structural analysis.*

In contrast to the baseline, the *pragmatic scenario* is based on the need for a combination of advanced measures to increase energy efficiency, restrain the development of energy-intensive industries, and a smoother schedule of subsidy reductions that would prevent the increase of social risks and deterioration of financial sustainability of basic industries. The main conditions of this scenario are described by the following components:

In contrast to the baseline, the *pragmatic scenario* is based on the need for a combination of advanced measures to increase energy efficiency, restrain the development of energy-intensive industries, and a smoother schedule of subsidy reductions that would prevent the increase of social risks and deterioration of financial sustainability of basic industries. The main conditions of this scenario are described by the following components:

**[PrS]**∈{[BS]&<Sub+>&<Eeff>} – with implementation of energy efficiency programs in the energy sector,

**[PrS+]**∈{[BS]&<Sub+>&<Eeff+>} – with implementation of energy efficiency programs in all energy-intensive sectors of the economy,

**[PrS++]**∈{[BS]&<Sub+>&<Eeff+>&<Fcd+>} – offsetting the negative effects of the fossil fuel subsidy reform,

The source of funding for the scenario is external borrowings for the implementation of energy saving programs at the first stage, followed by a shift of focus to budgetary funds released by subsidies reduction, as well as additional resources from economic growth resulting from dynamic growth of energy efficiency.

The extreme is the *optimistic scenario* **[OS],** which assumes an accelerated rate of final consumption, ensuring economic growth at a rate of at least 7,6% per year.

Below are the results of forecast calculations for some of these scenarios.

Assessment of the impact of subsidy reform up to 2035: the baseline scenario. The estimates of the average annual growth rates of indicators for different scenarios obtained in Chapter 8 enables to assess the long-term impact of alternative scenarios.

For example, if recent trends in final demand, crisis frequency, energy efficiency, GHG per unit emission and subsidies (**baseline scenario without subsidy reform [BS-])** continue, GDP could increase to USD92 billion in 2025 (or by 18,8% compared to 2022), to USD125 billion in 2030 (58,3%) and to USD166 billion in 2035 (110%).

As a result, the *demand for energy subsidies* will increase by 33% in 2030 and by 59% in 2035 (compared to their level in the baseline period), which means their increase to UZS53 trillion in 2030 and to UZS64 trillion in 2035 (in 2022 prices). It should be taken into account that these estimates are minimal, as the calculations took into account subsidies only for gas and electricity, although the range of subsidy recipients is much wider.

The forecasts also showed that with an increase in *budget revenues* from UZS35,9 trillion in 2022 to UZS56,3 trillion in 2030, or by UZS20,4 trillion (2022 prices), the state will have to spend over 65% of this increase (13,2/20,4, where UZS 13,2 trillion is an increase in subsidies in the next 8 years) on providing subsidies to energy producers, which in the context of rapid population growth will lead to a budget deficit for the implementation of social programs and to support the accelerated development of priority sectors of the economy. This result once again emphasizes the urgency of reforming energy subsidies, which has increased in recent years.

*GHG emissions*, although they will grow rapidly (by 48,5% in 2030 and 90,2% in 2035), their growth rates will lag behind the GDP growth rate (58,3% and 110,9%, respectively). As a result, GHG emissions per unit of GDP will be reduced from 2,7 kg/USD in 2022 to 2,6 kg\USD in 2030 and up to 2,5 kg/USD in 2035 (slightly).

In switching to the baseline scenario with the reform of subsidies [**BS]+[Sub]** (subsidy removal by 2030), there will be an increase in energy prices (gas, electricity) and a slowdown in the growth of energy-intensive industries. As a result, *economic growth will slow down and employment will decrease* (by 63,000 jobs by 2030 and by 135,000 jobs by 2035).

Another negative effect is a 1,5% *reduction in the accumulated increase in the income of the employed* in 2023-2030 (1-286,537/290,808) and by 2,5% until 2035 (1-375,673/385,144). However, this negative effect can be fully compensated if part of the resources generated after the subsidy removal is directed to increasing the income of the employed after 2030, If this is the case, the amount of accumulated income of the employed (UZS415,6 trillion) for the period up to 2035 will exceed the income in the previous scenario (UZS385,1 trillion, Table 23).

It is important to note that the outcome of all these scenarios is an *increase in the negative foreign trade balance.* This could result in devaluation of the national currency and increased macroeconomic instability, which could *devalue the outcome of the fossil fuel subsidy reform.* Therefore, this reform should be implemented as part of a package of reforms aimed, inter alia, at expanding the export potential of the economy.

Long-term effects of increased energy efficiency in the economy combined with energy subsidy reform. Implementation of energy efficiency programs will lead to a significant reduction in the energy intensity of the economy, Under the pragmatic scenario [PrS+] (adding the <Eeff+> condition to the conditions of the baseline scenario with subsidy reform [BS]+[Sub]), the GDP energy intensity is reduced by 0,16 pp, in the short term (from 8,14% to 7,98%). Using this result to forecast the energy intensity dynamics for the long-term period showed that the share of energy costs in the structure of the economy can reduce from

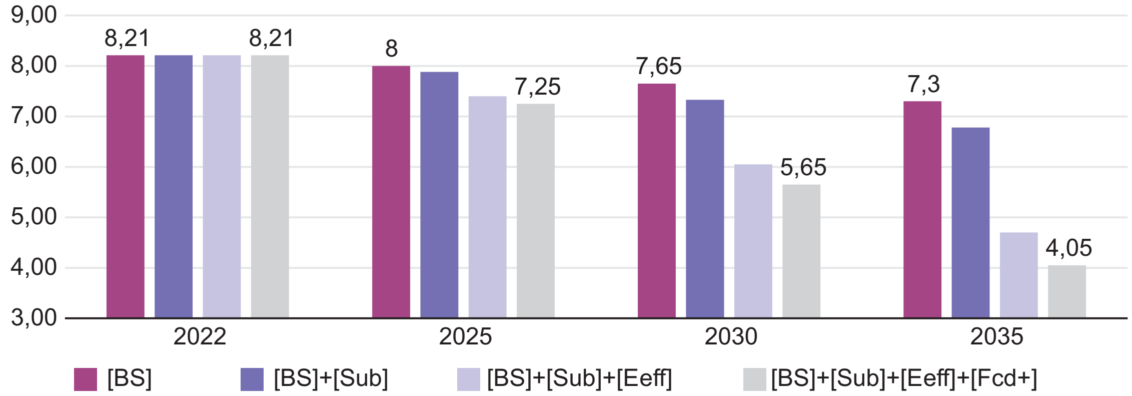
## TABLE 21. IMPACT MODELING UP TO 2035: BASELINE SCENARIO

| Indicators | 2020 | 2022 (estimate) | Scenario | Forecast | | |
|---|---|---|---|---|---|---|
| | | | | 2025 | 2030 | 2035 |
| **Growth indicators (for the forecast period – growth rates accumulated in % to 2022), %** | | | | | | |
| 1. Energy subsidies | -27,5 | 3,6* | [BS] | 11,3 | 33,0 | 59,0 |
| | | | [BS]+[Sub] | -16,6 | -100 | -100 |
| 2. GHG emissions | -1,6 | 4,7 | [BS] | 16,0 | 48,5 | 90,2 |
| | | | [BS]+[Sub] | 14,3 | 42,8 | 78,5 |
| 3. GDP | 1,9 | 5,3 | [BS] | 18,8 | 58,3 | 110,9 |
| | | | [BS]+[Sub] | 17,8 | 54,9 | 103,5 |
| 4. Employment | -2,25 | 2,12 | [BS] | 18,4 | 56,8 | 107,6 |
| | | | [BS]+[Sub] | 18,0 | 55,5 | 104,8 |
| 5. Budget receipts | -17,5 | 5,4 | [BS] | 18,4 | 56,8 | 107,6 |
| | | | [BS]+[Sub] | 16,7 | 51,0 | 95,4 |
| 6. Income of employed | 2,8 | 10,9 | [BS] | 18,3 | 56,6 | 107,4 |
| | | | [BS]+[Sub] | 17,7 | 54,3 | 102,3/121,4 |
| 7. Import | -6,8 | 20,4 | [BS] | 9,8 | 28,3 | 49,8 |
| | | | | 9,2 | 26,5 | 46,5 |
| **Subsidies and emissions (in absolute units)** | | | | | | |
| 8. Energy subsidies (billion UZS) | 33460 | 39976 | [BS] | 44493 | 53168 | 63562 |
| | | | [BS]+[Sub] | 33340 | 0 | 0 |
| 9. GHG emissions (thousand tons of CO2-eq,) | 197503 | 215873 | [BS] | 250413 | 320571 | 410590 |
| | | | [BS]+[Sub] | 246743 | 308267 | 385333 |
| 10. GDP (billion USD) | 60,0 | 80,4 | [BS] | 91,8 | 124,8 | 166,2 |
| | | | [BS]+[Sub] | 91,1 | 122,1 | 160,4 |
| 11. Emissions (in tons per USD1 million of GDP | 3291,7 | 2685,0 | [BS] | 2727,8 | 2568,7 | 2470,5 |
| | | | [BS]+[Sub] | 2708,5 | 2524,7 | 2402,3 |
| 12. Export-import balance (% of GDP) | -14,7 | -14,2 | [BS] | -15,9 | -18,8 | -21,7 |
| | | | | -16,1 | -19,5 | -23,2 |
| **Social indicators (in absolute units)** | | | | | | |
| 13. Employment (thousand people) | 4613,1 | 4818,6 | [BS] | 5705 | 7556 | 10003 |
| | | | [BS]+[Sub] | 5686 | 7493 | 9868 |
| 14. Budget revenues (billion UZS in 2022 prices) | 31460 | 35910 | [BS] | 42517 | 56307 | 74549 |
| | | | [BS]+[Sub] | 41907 | 54224 | 70168 |
| 15. Income of employed (billion UZS in 2022 prices) | 158199 | 185701 | [BS] | 219684 | 290808 | 385144 |
| | | | | 218570 | 286537 | 375673/415613 |

**) Preliminary estimate.*

*Source: calculated using the developed modeling tools.*

8,21% to 5,65% (or by 31%, Figure 13), provided that sectoral energy efficiency programs are fully implemented by 2030. This will enable achieving one of the main targets of the transition to a green economy program – reducing the GDP energy intensity by 30% by 2030 compared to the level of 2021.[46]




*Source: Calculated on the basis of modeling results.*

**Figure 13. Energy intensity of the economy under different assumptions regarding growth rates of final demand, energy subsidy reform and energy efficiency programs until 2035 (energy cost share as % of output)**

This result can be *improved if, in addition to subsidy reform and energy efficiency programs, measures are implemented to stimulate the growth of final demand and accelerate economic growth* (premise **<Fcd+>).** In this case, by 2035, the energy intensity of the economy can be reduced by almost half to the baseline level, which will ensure reaching the world average in terms of resource efficiency.

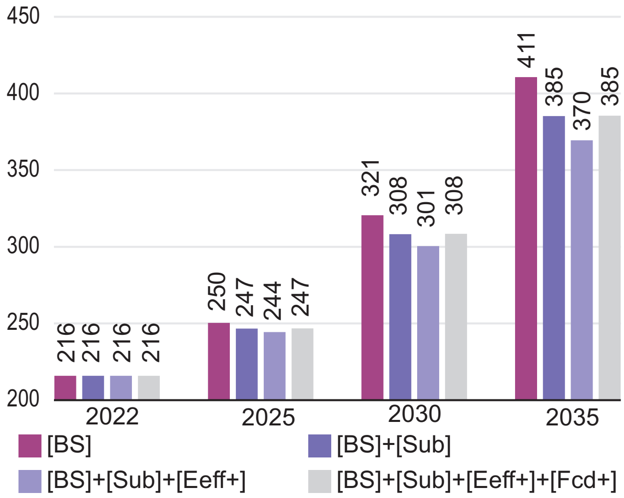
Reduced per unit fuel consumption as a result of energy efficiency programs will also slow down the growth of GHG emissions (Figure 14). Combined with subsidy reform, compared to the baseline scenario, the gap could be 6,2% in 2030 (301 MtCO2-eq/321 MtCO2-eq) and 10% in 2035, which would meet the target reduction of specific emissions by 35% compared to 2010 set out in the system of measures for the transition to a green economy.[47]

However, *energy saving measures alone cannot limit the negative social impact of subsidy reform.* Energy saving measures reduce the demand for gas and electricity to produce the same volume of end products. As a result, intermediate demand across the economy declines slightly, which is reflected in a decrease, compared with the estimate in the previous scenario, of GDP growth rates, sectoral outputs, and, consequently, *labor demand*. The number of employed may decrease in 2030 from 7,556,000 to 7,493,000 in the transition from the baseline scenario to the subsidy reform scenario (or by 63,000 employed), and to 7,435,000 (or by 81,000 employed) if energy efficiency programs are implemented. By 2035, this gap will increase to 135,000 and 169,000 people, respectively, which indicates the need to complement subsidy reform and resource efficiency programs with measures to address employment and income problems.

A noticeable decrease in the energy intensity of GDP creates prerequisites for additional (relative to the previous scenarios) growth of final demand. The modeling showed that if the conditions of the **[BS]+[Sub]+[Eeff+]** scenario are supplemented with the **[Fcd+]** scenario assumption, it will be possible to increase the volume of final consumption, industry outputs

[46] Resolution of the President of the Republic of Uzbekistan “On measures to improve the effectiveness of reforms aimed at the transition of Uzbekistan to a “green” economy for the period up to 2030” No. 436 dated 2.12.2022

[47] Ibid




*Source: Model calculations.*

**Figure 14. Emission growth forecast up to 2035 under different scenarios (million tons)**

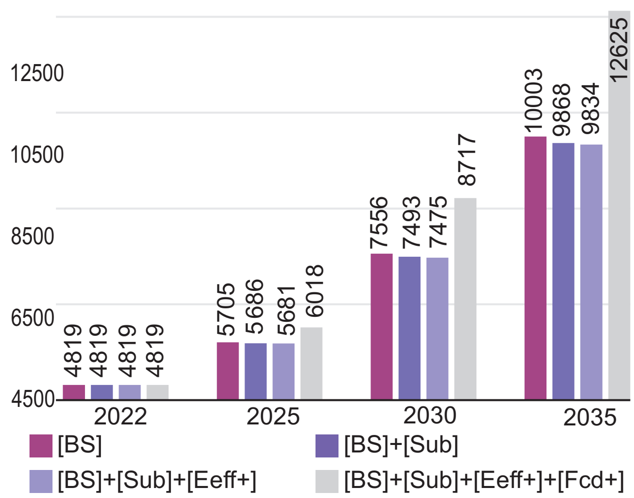



**Figure 15. Forecast of employment in the economy by 2035 under different scenarios (thousand people)**

and GDP to the level at which the increased volume of GHG emissions will not exceed the value of this indicator in the baseline scenario with subsidy reform **[BS]+[Sub]** (308 MtCO2-eq in 2030 and 385 MtCO2-eq in 2035).

Such an increase in economic activity will not only compensate for the negative impact of the energy reform (a decrease in employment by 81 thousand people in 2030 under the **[BS]+[Sub]+[Eeff+]** scenario), but also achieve higher employment results, the value of which increases by 1,161,000 people in relation to the baseline scenario, and employment itself may increase to 8,7 million people.

Such a significant increase in employment will largely contribute to addressing the problem of job deficit, limiting the size of the shadow economy, reducing labor migration, and increasing household incomes. *Thus, the implementation of energy efficiency measures and programs as a tool to limit the costs of subsidy reform requires their combination with efforts to stimulate final demand and economic growth within the established environmental limits.*

When analyzing the forecast estimates of employment growth, it should be taken into account that the calculation assumes invariability of the ratio of employed people per mln. UZS of industry output (a constant level of industry labor productivity). In recent years, this indicator has been growing at a rate of about 4% per year. If this condition is introduced into the calculation, the forecast employment estimates will decrease, Under the baseline scenario **[BS],** they will be 5,553,000 employed in 2030 and 6,068,000 employed in 2035. For the *pragmatic* scenario with subsidy reform and final demand stimulation **[BS]+[Sub]+[Eeff+]+[Fcd+],** they would be 6,369,000 employed and 7,582,000 employed, respectively.

# CHAPTER 10. MANAGING THE EFFECTS OF ENERGY SUBSIDY REFORM: RECOMMENDATIONS

Due to the complex nature of the problems associated with energy subsidy reform, the recommendations for Uzbekistan are divided into three blocks: 1) a general approach to minimize the negative effects of the reform; 2) building an effective communication strategy with society; and 3) further steps to prepare the Reform Roadmap.

### 1. General approach to minimize the negative effects of the reform

World practice shows that **any scenario** of energy subsidy reform requires measures to avoid the most difficult negative impacts, such as: 1) the emergence of price unaffordability of energy resources; 2) a decrease in energy production. There is a widespread policy consensus on the need for measures in these two directions (ensuring adequate energy prices and improving energy efficiency). They are part of the concept of a *just energy transition (ET)*,[48] Figure 16 presents a general scheme for managing the effects of energy subsidy reform.

| Industry/Business | Social sphere | Energy |
|---|---|---|
| ▪ Support for industries undergoing restructuration, e.g., retraining programs<br>▪ Increasing energy efficiency<br>▪ Investments in infrastructure | ▪ Cash aid: (un)conditional<br>▪ Social protection, pensions, health insurance<br>▪ Raising (minimum) wages | ▪ Investments in RES, rural electrification, etc.<br>▪ Energy saving policies, energy efficiency and energy security |
| **Macroeconomics** | **Banking sector** | **Transport** |
| ▪ Inflation control measures<br>▪ Strengthening market mechanisms and promoting competition | ▪ Assistance in financing cash assistance<br>▪ Credit lines, e.g., for SMEs, micro-credits | ▪ Expanding public transport systems<br>▪ Alternative forms of cargo transportation (railway and river transport)<br>▪ Support for taxi drivers during the transition period |

*Source: OECD (2018), Inventory of Energy Subsidies in the EU's Eastern Partnership Countries, OECD, Paris.*

**Figure 16. Approach to managing the effects of energy subsidy reform**

**Tax and tariff policy** instruments (the key channels affecting the formation of household incomes) are used **to minimize the effect of reduced affordability of energy resources.** In addition, additional social protection mechanisms are introduced through redistribution of funds available to the state through reduced energy subsidies.

**Tax policy: change in the tax burden depending on the volume of energy consumption.** In the world practice, the most commonly used methodology is to increase the value added tax (VAT) rate for *energy consumers*. The effects of the VAT increase were assessed for

[48] Energy transition is a structural change in the energy system, during which old energy sources are replaced by new sources in the total energy consumption. There are four energy transitions in the history of mankind. The first transition is from biofuels (firewood, charcoal, etc.) to coal. The second transition is an increase in the share of oil in primary energy. The third transition is the growth in the use of natural gas. The fourth transition (present) is transition to RES.

Moldova as part of three subsidy schemes that were in effect in the country in 2018 (before the reform): 1) reduced VAT rate (8%) for gas consumption; 2) VAT exemption for electricity consumption; 3) VAT exemption for heat consumption.

According to calculations, the VAT rate increase to 20% with a subsequent increase in energy tariffs will lead to a significant increase in state budget revenues and a slight reduction in GHG emissions. However, the increase in **heat** prices will be especially painful for *low-income households (up to 1,000 lei per month per capita).* Such households will spend more than 20% of their disposable income on heating. Without introducing compensatory measures for social protection of vulnerable groups, such a reform will be difficult to implement in terms of **social acceptability.** As a result, it was decided that the VAT rate should not be increased until a *social protection system* is in place.

For Uzbekistan, estimates of the effects of a VAT rate increase may differ due to different energy consumption pattern. Preliminary estimates show that even in the case of a VAT increase above 12% (the current VAT rate), the costs for low-income households may exceed their disposable income.

The introduction of a carbon tax is often used to increase the tax burden *on manufacturers*.

*For Uzbekistan, it is important to understand under what conditions the increase in the tax burden will be most effective.* **First,** the introduction of additional taxes may cause tensions in society (as it was the case in countries that had introduced carbon tax). **Second,** at the current stage, the task is to reduce the tax burden in the economy, and raising VAT would be unpopular. **Third,** there are many arguments in favor of the fact that the country can provide cheaper energy to domestic consumers not through rising energy prices, but through structural and institutional reforms in the energy generation sector.

**Tariff policy: progressive energy pricing.** The attempt to launch block tariffs in Uzbekistan showed that the government is aware of the need to depoliticize the process of energy pricing (the block tariff mechanism makes this process, in fact, *automatic*). Initially, it was believed that only technical conditions were needed to introduce block tariffs. In particular, it was pointed out that technically the transition to block tariffs is possible, since the system of "smart meters" – AMRS (automatic meter reading system) has long been introduced in the country. However, the attempt to introduce block tariffs immediately revealed the need for *other large-scale reforms*, such as structural reforms in the energy sector, institutional

**BOX 3: SOCIAL PROTECTION SCHEMES CONSIDERED IN CALCULATING THE EFFECTS OF ENERGY SUBSIDY REFORM IN MOLDOVA**

- **Scenario 0.** No cash compensation to vulnerable households when subsidies are removed.
- **Scenario 1.** VAT compensation to vulnerable households based on needs assessment (based on family income).
- **Scenario 2.** Providing a VAT voucher to vulnerable households based on needs assessment (based on family income).
- **Scenario 3.** Direct transfers assuming energy overconsumption relative to household disposable income: 6% for electricity; 3% for gas used for cooking; 10% for gas used for cooking and heating; 15% for gas used for heating.
- **Scenario 4**. Lump sum payment to vulnerable households (with a monthly income below 4,000 lei).
- **Scenario 5.** VAT voucher to vulnerable households (with a monthly income below 4000 lei).

*Source: Energy Subsidy Reform in the Republic of Moldova – Energy Affordability, Fiscal and Environmental Impacts, OECD, 2018, Paris* reforms, changes in the legal framework, assessment of household energy poverty, social protection mechanisms, and others.

**Redistributive effects: social protection mechanisms for disadvantaged groups.** Social effect is the first issue in redistributing subsidies. World practice shows that it is *necessary to target the level of energy poverty instead of targeting the level/dynamics of energy prices (tariffs),* which is currently used. In case of transition to such a regime, it is necessary to formulate the term of *energy poverty* for Uzbekistan and introduce it into the legal field.

Energy poverty is a situation where households cannot heat their homes or receive other energy services at an affordable price, In a number of EU countries, this term is established at the legislative level as a key indicator of the effectiveness of social policy in the field of affordability of energy supply. Energy poverty is measured by the *bi-fuel* basket check, which usually includes an energy package: gas and electricity, or heat and hot water. An affordability assessment is usually not made separately for electricity, as it has no practical significance from household budget perspective, In the case of energy poverty targeting, the state gets the opportunity to use the *targeted mechanism of social support and a declarative/formalized procedure for obtaining social benefits* to minimize the risk of energy poverty (since not all low-income households will face energy poverty).

World practice can offer the following social programs mitigating the negative effects of energy subsidy reform:

*a) Social tariffs*. Regulators target energy poverty rather than household income (as in CIS countries). To this end, over the last 10-15 years, EU countries, for example, *have phased out common uniform social tariffs* (as in Uzbekistan), Instead, mechanisms such as:

- *matching the prices* (tariffs) for households for energy consumption with the prices of small and medium-sized businesses (SMEs);
- *transition to targeted subsidies for specific vulnerable categories.* For example, the Winter Fuel Payment mechanism in the UK is provided to 11,8 million pensioners;
- *"regulatory energy services" programs to improve housing energy efficiency* – obligation of supply companies to conduct energy audits and introduce energy saving measures for vulnerable groups;

*b) inter-territorial subsidies* – subsidizing regions with high energy prices in the form of lowering prices to the national average. This direction is considered as a program of social solidarity.

*c) concession fees,* Developed countries use the practice of financing municipal budgets from consumers' payments ("concession fee"). In Germany, for example, it amounts to more than USD6 billion per year, In France, it is called a municipal levy and amounts to USD3 billion per year. The explicit allocation of this amount ensures transparency of accounting and use of collected funds for the needs of the city, including for social protection of certain groups.

**To minimize the impact of the decrease in energy generation**, tools are used to increase the energy efficiency of the economy. Here it is proposed to consider four (4) mechanisms that will enable activating *the dynamics and volume of investments not only in new "green" technologies (use of RES), but also in conventional measures to improve the energy efficiency.* The state, financial institutions and the private sector are considered as investors.

Barriers to increased investment in green technologies include a) high upfront costs of these technologies; b) high cost of capital; and c) difficulties in accessing international finance. As a result, green technologies cannot yet compete with the subsidized fossil fuel sector. World practice has developed a number of mechanisms to address this challenge.

**Mobilizing the potential of "green" financing of financial institutions by introducing the principles of environmental, social and corporate governance (ESG) into the methodology of credit risk assessment.** Along with traditional financial risks, financial institutions try to assess non-financial risks of borrowers (business management standards, environmental risks, fulfillment of social obligations to employees, etc.). There are financial *ESG tools* for financing "green" projects – green, social, sustainable and sustainable-linked, Funds are raised through various financial instruments (loans, insurance, asset management, direct investments, bonds).

The Resolution of the President of the Republic of Uzbekistan "On measures to improve the effectiveness of reforms aimed at transition of the Republic of Uzbekistan to a "green" economy until 2030" № 436 dated December 2, 2022, is the most important step in this direction. However, it should be expanded as much as possible drawing on global practice, especially the countries of the Middle East and Asia. ESG financing in these regions is growing every year. This is not surprising, since the largest increase in emissions is observed, for example, in Indonesia, where GHG emissions increased 9,5 times between 1990 and 2020. In terms of GHG emissions in the transportation sector – China ranks first, where the scale of GHG emissions increased 9 times in 30 years. The largest increase in GHG emissions in industrial production is in Qatar, where GHG emissions increased 7 times.[49]

The United Arab Emirates (UAE) is considered the leader in ESG financing in the Middle East. The first green bonds in the Middle East were also issued in the UAE, In 2017, they were placed by First Abu Dhabi Bank.[50]

In the Asia-Pacific (APAC) region, China is leading the way in ESG financing, having become the first country to set criteria for green projects back in 2015. In 2021, China became the largest climate investment market, overtaking the US.

In the Central Asian region, Kazakhstan stands out, having already started testing a CO2 emissions trading system in 2013. Uzbekistan was the first in the CIS to place public bonds for the financing of the national priority Sustainable Development Goals (SDGs) – Sovereign SDG Bonds.

**Developing criteria for green economy regulation.** Lack of clarity on what assets can be considered sustainable is holding back the implementation of green finance mechanisms. Therefore, countries are developing *sustainable finance taxonomies* – sets of criteria that help determine whether projects, companies or financial instruments meet the ESG agenda.

The most common are green taxonomies. The detail of the criteria and goals of green taxonomies may vary. The most common is the EU Green Taxonomy. It includes 13 sectors and over 100 activities and serves as a basis for other regulations such as the Corporate Sustainability Reporting Directive (CSRD),[51] the Sustainable Finance Disclosure Regulation (SFDR)[52] for investment products.

[49] European Commission EDGAR (Emissions Database for Global Atmospheric Research) database. GHG emissions of all world countries - 2021 Report . https://edgar.jrc.ec.europa.eu/report_2021

[50] "Eastern Express: How Asian and Middle Eastern countries are developing an ESG agenda". Sberbank of Russia Survey, 2022. https://esg-sber-world.rbc.ru/?utm_source=rbc&utm_medium=main&utm_campaign= sbesg22f-r-trln-m&from=column_12

[51] https://finance.ec.europa.eu/capital-markets-union-and-financial-markets/company-reporting-and-auditing/company-reporting/corporate-sustainability-reporting_en

[52] https://finance.ec.europa.eu/sustainable-finance/disclosures/sustainability-related-disclosure-financial-services-sector_en

There are currently no internationally recognized social taxonomies, In 2022, the EU Sustainable Finance Platform published a draft social taxonomy.[53] It outlines social goals that are linked to the principles of the EU Green Taxonomy (related to human rights, health, issues of eliminating discrimination, etc.). In 2020, UNDP and the China International Center for Economic and Technical Exchange (CICETE) released the SDG taxonomy.[54]

In 2021, Uzbekistan published its first-ever report on ESG aspects to measure and evaluate the country's progress in implementing the SDGs, but the possibility of developing a taxonomy and full ESG criteria for the economy and business has not yet been considered.

- **Greening public finance and investment** is especially relevant for countries where the state plays a decisive role in the formation of financial/investment flows in the economy, such as Uzbekistan. Here we can note:

*Greening the mechanism of public finance management and public investment programs.* There is a rapidly growing interest in the green budget methodology around the world, which is used to align government revenues and expenditures with climate and environmental development goals of countries.

Uzbekistan has begun the transition to results-based budgeting (RBB),[55] and uses elements of program budgeting. However, state budget expenditures, as well as state investment programs, lack clearly defined and measurable environmental/climate targets, and program performance evaluation indicators are usually not consistent across project years.

Uzbekistan can take advantage of available solutions in this area. Thus, in 2007, the OECD developed Guidelines for the evaluation of environmental projects financed from public funds.[56] In addition, at the One Planet Summit in 2017, the OECD launched the Paris Cooperation Mechanism on Green Budgeting.[57]

- **Reforming state environmental funds.** "Traditional" environmental funds were established in the late 1980s in many republics of the USSR. They have three main features: a) manage the allocated state resources; b) are replenished mainly from revenues from pollution charges and fines; c) finance a wide range of environmental protection measures (water resources, waste, air, biodiversity). Some EECCA countries (Azerbaijan, Kyrgyzstan, Moldova and Uzbekistan) continue to maintain their traditional environmental funds. Now, the resources of these funds have been transferred from extra-budgetary to national budgets.

Modern practice shows that a number of countries have created new types of state environmental funds – *clean energy funds*, which have the following features:

a) the main source of revenue is also the state budget, but not pollution charges or fines, Instead, the funds receive budget allocations based on their *spending plans*;

b) *the targeted mandate and strategy of the funds*. While the "traditional" funds finance projects on all environmental issues, the "new" funds invest only in RES and energy efficiency;

c) the new funds are much *better capitalized and better administered*. International Financial Institutions (IFIs) have been providing them with funding and technical support for many

[53] https://commission.europa.eu/document/d07e1f1e-3a1f-4d55-add4-a130f26b33e3_en

[54] https://www.undp.org/china/news/debut-sdg-finance-taxonomy-2020-edition

[55] Resolution of the Cabinet of Ministers "On approval of the Strategy for improving the public finance management system of the Republic of Uzbekistan for 2020-2024" No. 506 dated 08/24/2020.

[56] OECD (2007), The Handbook for Appraisal of Environmental Projects Financed from Public Funds, OECD, https://www.oecd.org/env/outreach/38786197.pdf.

[57] OECD (2017), "Paris Collaborative on Green Budgeting", https://www.oecd.org/environment/green-budgeting/ (2022).

years. As a result, the funds use more sophisticated financial products and can support larger investments/projects;

d) the institutional model of the new funds is better adapted to market needs. In addition to sector specificity with a targeted mandate, they use a *project cycle management model* (rather than just disbursement of funds).

The Table 22 shows countries with traditional environmental funds and new clean energy funds. *Uzbekistan should reform its fund, focusing it on RES development and energy efficiency.*

**TABLE 22. TYPOLOGY AND EVOLUTION OF "TRADITIONAL" AND "NEW DEDICATED" PUBLIC ENVIRONMENTAL FUNDS**

| Traditional environmental funds fully financed from the state budget and the year of their closure | Traditional operating budgetary environmental funds | Dedicated Clean Energy Funds |
|---|---|---|
| **Belarus:** National and regional funds for environmental protection (closed in 2011) | **Azerbaijan:** National fund for environmental protection | **Armenia:** Renewable Resources and Energy Efficiency Fund (established in 2005) |
| **Kazakhstan:** National and regional funds for environmental protection (closed in 2000) | **Kyrgyzstan:** Republican and 4 local funds for environmental protection and forestry development | **Georgia:** Georgian Energy Development Fund (established in 2010) |
| **Turkmenistan:** National fund for environmental protection (closed in 2008) | **Moldova:** National fund for environmental protection | **Ukraine:** Energy Efficiency Fund (established in 2018) |
| **Ukraine:** National (separate budget) environmental fund (closed in 2014) (but local environmental funds continue to exist) | **Uzbekistan:** National Fund for Ecology, Environmental Protection and Waste Management and 14 local level funds | |

*Source: OECD, Role of National Environmental Funds in Promoting Green Investments, GREEN Action Task Force, Paris, 2019.*

**Stimulating “green” investments of the private sector.** For Uzbekistan, this direction is very relevant given the high and growing scale of the private sector against the background of increasing problems with access to energy resources (i.e. high potential for RES development). However, only a small part of business (10%) considers the goals of decarbonization and carbon neutrality as development goals.[58]

World practice has developed at least two efficient mechanisms for enhancing the “green” initiative of business.

*“Green” securities.* By investing in “green” securities, such as bonds, an investor relieves himself of concerns about the environment, as they are issued to finance environmental projects. According to the Ministry of Finance, Uzbekistan issued USD870 million worth of bonds in 2021 to finance land rehabilitation, green transport development, the launch of the Green Sukuk mechanism, and energy efficiency projects. However, these measures are insufficient for the transition to green economic development.

*“Green” public procurement for the business sector.* Green public procurement is the procurement of goods/services subject to environmental requirements. Compliance with these requirements is taken into account along with price when selecting a supplier. Thus,

[58] PricewaterhouseCoopers (PwC) "On the Threshold of Change. Uzbekistan edition of the annual survey of CEOs of the world's largest companies, 2022 https://www.pwc.com/uz/en/publications/uz-ceo-survey-2022.html

the state supports responsible manufacturers who are engaged in environmental protection, and also expands the opportunities for innovation. “Green” public procurement has long existed in many countries. According to OSCE, 69% of all OSCE members have implemented and monitor such procurement.[59]

Green products may cost more than conventional products, but in the long run they reduce the operating costs.[60] In Uzbekistan, there are only a few examples of environmental requirements for purchased products. Such requirements do not have an official status, buyers are not guided by eco-labeling of goods, there are cases of using unjustified environmental statements for marketing their products (greenwashing). The majority of suppliers participate in public procurement procedures without experience in using environmental characteristics (performance) of their products, not to mention numerous violations of the public procurement mechanism.[61]

### 2. Developing an effective public communication strategy

The flurry of criticism that arose from the attempt to introduce block tariffs in Uzbekistan demonstrates the need for a thorough preparation of a public communication strategy on energy subsidy reform.

Communication is an investment that should be planned and implemented before and throughout the reform process. By early assessing public sentiment and communicating reform mitigation measures, a public consensus can be built on the need for reform. Among the 22 countries implementing energy subsidy reforms, a well-planned and organized communication campaign has been an important factor in the success of the reforms.[62]

Communication campaigns can take many forms, but there are some common elements that transcend national boundaries and political contexts. Based on a review of the literature and international practice, the following *common aspects of successful communication campaigns* can be identified:

- define goals, deadlines, budget and management of communication campaigns;
- compile a list of parties and account for the level of their interest and influence;
- conduct research on the opinions and perceptions of stakeholders;
- produce and test compelling materials that reflect the views of all parties, raise awareness of the scope and impact of subsidies;
- Identify the best channels for communicating information to different parties and encourage two-way dialogue;
- set measurable goals to track the effectiveness of the communication campaign.

The content and key messages of the dialogue is as follows:

- Communicate the concept of an integrated vision of energy sector development and climate change action and the role of government’s energy policy.

[59] https://www.oecd.org/gov/public-procurement/green/

[60] For example, energy-efficient equipment reduces electricity bills, even at a higher initial price of such equipment. For example, in London, the procurement of LED lighting for the subway system resulted in a 25% reduction in the life cycle cost of the equipment, including a 75% reduction in maintenance costs.

[61] https://www.podrobno.uz/cat/razbor/svoi-kompanii-zolotaya-khlorka-i-plata-za-vozdukh-kak-chinovniki-pri-pomoshchi-tenderov-perekladyvayu/

[62] Clements, Benedict, David Coady, Stefania Fabrizio, Sanjeev Gupta, Trevor Alleyne, and Carlo Sdralevich. 2013. Energy Subsidy Reform: Lessons and Implications. IMF.

- Clarify that energy subsidies are a regressive measure that benefits mainly the wealthy segments of society. In addition, subsidies encourage increased consumption of fossil fuels, which causes increased GHG emissions and environmental problems.
- Discuss how to improve energy efficiency as a key driver of income growth and the action to improve the environment.
- Discuss phasing out of fossil fuel subsidies while putting in place effective support mechanisms for vulnerable groups. Key aspects of these mechanisms should include:
  - Analysis of household survey data to identify the number of low-income families, the amount of energy consumption per each low-income family (energy poverty). This will enable to identify a social norm of energy consumption as a benchmark for reimbursement of poor families' expenditures on energy resources;
  - Identification of the number of poor families based on energy poverty assessment. The register of poor families ("Iron Notebook") formed at the level of local self-government bodies (Mahalla) can be used for this purpose;
  - Provision of compensations to cover the price difference to vulnerable families (from the Unified Register) who consumed gas and electricity not exceeding the established (approved) social consumption norms.

### 3. Steps to Prepare the Fossil Fuel Subsidy Reform Roadmap

The assessments enable formulating the steps that will make it possible to prepare a for Energy subsidy reform roadmap:

- Finalizing the energy subsidies inventory methodology and its testing across wide range of industries and sectors of the economy (gas, electricity, coal, major energy-intensive sectors of the economy, household sector).
- Recalculation of vulnerability assessments of economic sectors according to different sectoral and macroeconomic criteria using the developed model toolkit in subsidy reform and related benefits.
- Formation of alternative reform scenarios that differ in terms of: the rate of subsidy reduction; average incomes of 60% of the most disadvantaged groups; degree of depreciation of fixed equipment in energy generating/energy producing companies and their profitability; growth of energy tariffs; priorities for use of budgetary funds saved through subsidy reduction (social support of vulnerable groups; RES development; implementation of energy saving measures); structural and investment policy priorities.
- Refinement of the modeling toolkit to improve its ability to address the challenges identified in paragraph (c).
- Modeling the impact of alternative scenarios (paragraph (c)) with cost-benefits analysis for all participants and segments of the economy (energy sector, government, household sector, major energy consuming industries, small business, environment, economy as a whole).
- Based on the results of modeling, development of a road map of reforms with a focus on mitigating its negative impact on certain sectors of the economy using the funds released as a result of the reform and economic policy measures (social, structural, tax, etc.).
- In parallel with paragraphs (a-e), establishing the monitoring of the real income dynamics of the most disadvantaged 60% of the population, the financial situation of the main energy generating and energy producing companies and other focus groups to monitor the level

of energy security and the level of social sustainability in a volatile global economy and to assess the effectiveness of subsidy reform.

- In parallel with paragraphs (a-e), establishing the monitoring of the energy efficiency level of the main energy consuming sectors as part of implementation of measures taken earlier in sectoral/national energy saving programs and investment projects in the field of green economy.

**Creating macroeconomic conditions to mitigate the negative impact of the reform: ensuring stability of the exchange rate of the Uzbek soum; creating a domestic technological base for the introduction of new low-carbon technologies; measures to curb inflation against the background of rising energy tariffs.**

# ANNEX

## ANNEX 1: CHARACTERISTICS OF INPUT-OUTPUT TABLES AND THEIR ANALYTICAL POTENTIAL

The input-output (IO) method is one of the main methods of economic analysis and forecasting, since it enables analysis of material and financial flows that have generated in the economy at the maximum achievable system level. As the core of the SNA system, Table 3-B discloses GDP and other major macroeconomic indicators by sector, linking production and value-added indicators with their intermediate and final uses (including household consumption, government spending, investment, exports).

### TABLE 1. SIMPLIFIED SCHEME OF A TYPICAL INPUT-OUTPUT TABLE

| | | Intermediate Uses | | | | Final Uses | | | | | | Gross Output |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Industry 1 | Industry 2 | … | Industry n | Households | NPISHs | Government | GFCF | CIIs | Export | |
| Domestic | 1 | $Z_{11}$ | $Z_{12}$ | … | $Z_{1n}$ | $f_{11}$ | $f_{11}$ | $f_{11}$ | $f_{11}$ | $f_{11}$ | $e_1$ | $x_1$ |
| | 2 | $Z_{21}$ | $Z_{22}$ | … | $Z_{2n}$ | $f_{21}$ | $f_{21}$ | $f_{21}$ | $f_{21}$ | $f_{21}$ | $e_2$ | $x_2$ |
| | … | … | … | … | … | … | … | … | … | … | … | … |
| | n | $Z_{n1}$ | $Z_{n2}$ | … | $Z_{nn}$ | $f_{n1}$ | $f_{n2}$ | $f_{n3}$ | $f_{n4}$ | $f_{n5}$ | $e_n$ | $x_n$ |
| Imports | | $Z_{m1}$ | $Z_{m2}$ | … | | $f_{m1}$ | $f_{m2}$ | $f_{m3}$ | $f_{m4}$ | $f_{m5}$ | | |
| Value-Added | | $v_1$ | $v_2$ | … | $v_n$ | | | | | | | |
| Total Inputs | | $x_1$ | $x_2$ | … | $x_n$ | | | | | | | |

*Note: here Zij – inter-sectoral flows of intermediate products (intermediate product of industry i used in the production of industry j, first quadrant), fi – elements of final product (consumption of households, population, etc., second quadrant), Zmi – intermediate and final imports, ei – exports, vi – value added, xi – output (total costs).*

*Source: R. Miller P. Blair, (2009). Input-Output Analysis Foundations and Extensions, Second Edition, p.14.*

Each element of the flow of goods and services reflected in the table (quadrants I, II) can be analyzed in a 3-dimensional coordinate system: by levels of aggregation (first dimension: “macroeconomic ←→ sectoral”), by purpose (second dimension: “goods/services for final consumption, ←→ goods/services for production purposes (intermediate consumption)”), by source of origin (third dimension: “domestic production ←→ imports”).

Other SNA principles realized in IO tables are basic balance identities (resources = consumption plus change in inventories), equality of GDP by any method of measurement – by production method (sum of added values for all sectors of the economy), calculation by final consumption and by factor cost.

The main advantage of the method is the possibility to include the *technological factor* in the analysis in the form of indicators of the intensity of interrelations between all sectors of the economy in terms of production and consumption of intermediate products (supply/consumption chains of intermediate products), reflected in the technological rates of direct costs $a_{ij}$ (for example, the amount of natural gas in Uzbek soums spent to produce 100 Uzbek soums worth of electricity, the amount of electricity in Uzbek soums spent to produce 100 Uzbek soums worth of mineral fertilizers, etc., $a_{ij} = Z_{ij}^o / x_j^o$, where $Z_{ij}^o$ – reported estimates of inter-sectoral flows of intermediate products (the first quadrant), and $x_j^o$ – reported values of industry outputs, third quadrant of the table).

This enables the analysis of the cost structure of any industry, including intermediate costs, labor costs, transportation costs, capital expenditures, etc., as well as the distribution of industry output to the production needs of other industries, as well as to the needs of end use. Supplementing the basic IO tables with statistics on employment, GHG emissions, subsidies, etc. expands the range of tasks to be addressed, including the tasks of finalizing the strategy of green transformation of the national economy.

The construction of model tools for the analysis of fossil fuel subsidies in Uzbekistan based on the Input-Output (IO) approach is focused on the existing statistical reporting, which enables assessment of the *impact of various green investment projects and changes in the energy sector subsidy policy* on macroeconomic indicators, carbon footprint reduction, employment growth, income of the population, accounting for all industry-specific technological relationships that have developed in real sector.[63]

It is also important that the IO method, given the values of GHG emissions per unit of industry output for the main industries – GHG emitters, provides an estimate of carbon footprint both for individual industries and for the economy as a whole. Model calculations enable answering the question of *how much emissions will increase for the economy as a whole when the final demand of the industry for any industry j increases by one unit.* Its value will depend not only on specific emissions of this industry j, but also on specific emissions of all other industries i = 1– n (in addition to industry j), which have technological interrelations with this industry j, and, ultimately, on the cost structure of all industries and the intensity of technological interrelations between them (matrix of technological coefficients).

Similarly, the *change in fossil fuel subsidies for fossil fuel producing industries and for the sectors of the economy that consume fossil fuels* can be estimated. Subsequent model calculations using direct, full-cost, and unit input-output matrices will enable estimating the reduction in output for any of these industries due to the reduction in subsidies to technologically related industries, and for the economy as a whole, according to indicators of subsidy reductions overall, emissions reductions, employment and government income, and the demand for imported intermediate goods, raw materials, and semi-finished products.

As part of the IO approach, it is possible to most fully reflect the *specifics of the national economy and the problems of its development*, focus model calculations on the objects of state subsidies for production and use of fossil fuels – gas, oil, coal, electricity, production of non-ferrous metals, cement and other items.

Model calculations can reflect such specific features and problems of the national economy development as *its high carbon and energy intensity* (indicators are GHG emissions and consumption of primary energy resources per unit of GDP), raw material orientation of the economy (the share of raw materials and extractive industries in the output of the economy as a whole, GDP, exports) and a number of others, which enables using the relevant indicators as criteria for selecting the most promising scenarios for the implementation of the fossil fuel subsidy reform.

The data of IO tables prepared in accordance with modern statistical standards have *rather high degree of reliability and validity,* as all rows and columns of the table are balanced in accordance with the principles of SNA, and the final indicators are also indicators of official statistical reporting (on GDP, output of economic sectors, imports, exports, etc.).

Another advantage of this approach is the *allocation of the import component* in all quadrants of the reporting table, which enables forecasting the demand for intermediate imports, whose share for some types of goods of the economy of Uzbekistan exceeds the share of domestically produced goods, as well as obtaining unbiased (more accurate) estimates of sectoral outputs and macro indicators on the economy as a whole.

[63] Report "Assessment of social and economic impacts of increased ambition NDC on energy, agriculture and water management sectors in Uzbekistan". UNDP, Tashkent 2021. https://www.uz.undp.org/content/uzbekistan/ru/home/library/environment_energy/assessment-of-social-and-economic-impacts-of-increased-ambition-.html

Based on the principles and provisions of the System of National Statistics (SNA), the IO approach is characterized by flexibility and the ability to generate different model configurations by combining sets of input and output variables based on the specifics of the problem and the alternative conditions and assumptions implicit in it.

Like other methods and models, the IO approach has a number of limitations:

- belonging to the class of static models, the solutions obtained on its basis cannot be categorized by time periods;
- changes in industry outputs depend only on final consumption and, unlike CGE models, they are not related to industry prices;
- the absence of restrictions on the growth of industry output with the growth of final demand also looks not quite realistic in the IO model, since any enterprise producing goods and services has limited capacity to produce them, the expansion of which requires, as a rule, large-scale investments and a long period of their development.

At the same time, some of these limitations can be addressed by moving from a *balance* to an *optimization formulation*, as well as by supplementing the balance equations with *econometric equations*, formed on the basis of an analysis of time series dynamics or development statistics of pre-selected countries of the world, which are close to Uzbekistan in their key characteristics. All these possibilities are used in the report.

In preparing specific recommendations arising from the results of model calculations, it is necessary to proceed from the fact that the economies of developing countries, including Uzbekistan, are largely dependent on traditional industries with high level of carbon intensity, many of which are burdened with significant external debt obligations. Under these circumstances, higher fossil fuel prices due to limited subsidies or increased use of capital-intensive renewable energy technologies could slow or halt economic growth and exacerbate poverty.[64] Consequently, the transition to a low-carbon economy, including reform of fossil fuel subsidies, must take into account a variety of specific vulnerabilities and risks that determine the set of possible pathways for such a transition.[65]

[64] Peszko G., van der Mensbrugghe D., Golub A., Ward J., Zenghelis D., Marijs C., Schopp A., Rogers J.A., and Midgley A. (2020). Diversification and Cooperation in a Decarbonizing World: Climate Strategies for Fossil Fuel-Dependent Countries. Washington, D.C.: The World Bank, 2020.

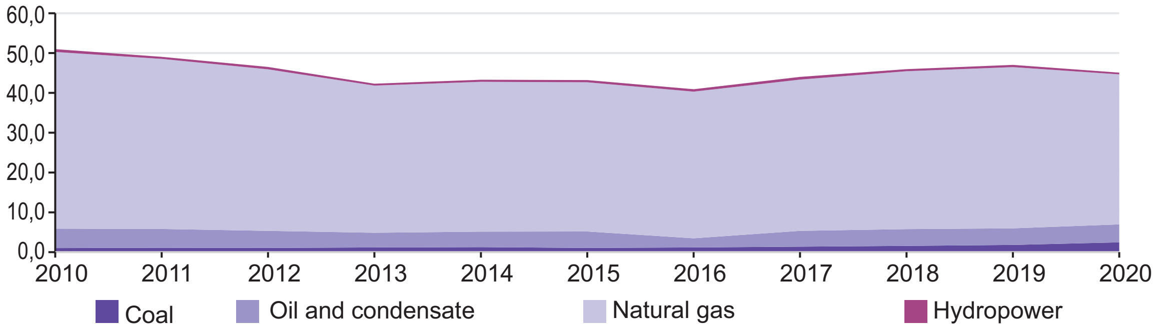
[65] Etienne Espagne, Antoine Godin, Guilherme Magacho, Achilleas Mantes, Devrim Yilmaz (2021). Developing Countries' Macroeconomic Exposure to the Low-carbon Transition. Research Papers. October, 2021. №. 220

# ANNEX 2. ENERGY SUPPLY AND DEMAND IN UZBEKISTAN

## Fossil fuel supply

*Total Energy Supply (TES).* The main types of energy resources are natural gas, oil and oil products, coal and electricity. Dynamics of the TES indicator for 2010-2020 are given in Chart 1.

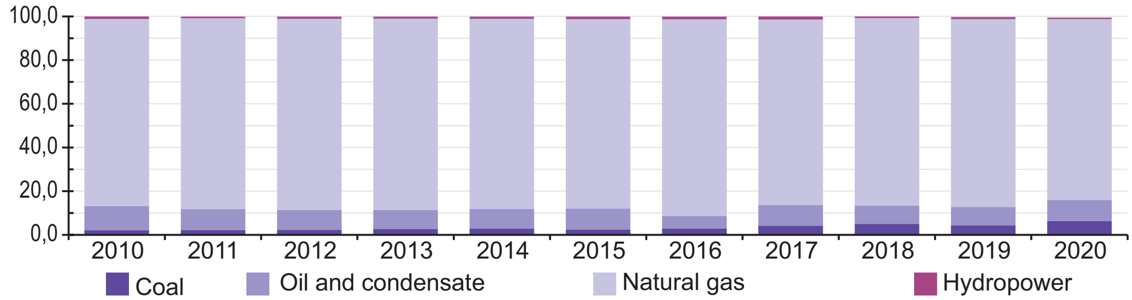
**Chart 1. Total Primary Energy Supply (TES), Mtoe**




*Source: prepared on the basis of data from the State Committee on Statistics of the Republic of Uzbekistan, the IEA and expert estimates*

Gas dominates the TES structure, with its share decreasing from 85,5% to 82,7% during 2010-2020. The situation is similar in the supply of oil and gas condensate, whose share also decreased from 11,1% to 9,5%. At the same time, as a result of high demand for coal, its share increased from 2,1% to 6,4%. The contribution of RES to TES (represented as hydro resources) is still modest at 1,6%-0,9% (Chart 2).

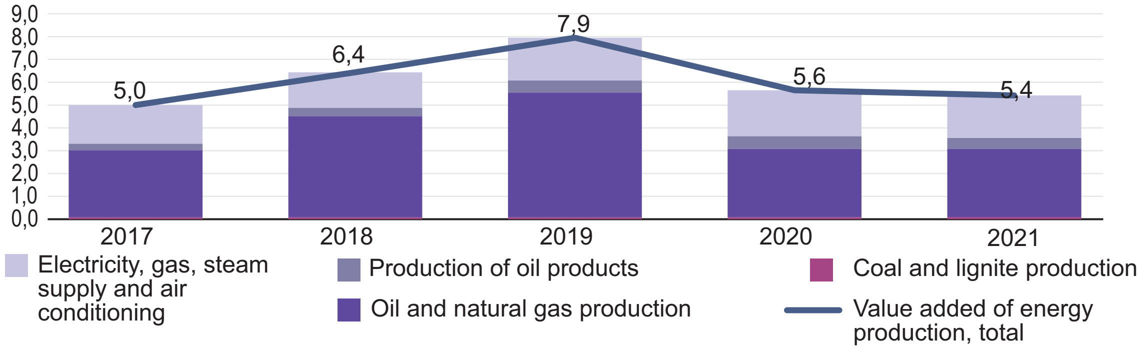
**Chart 2. TES structure, %**




*Source: prepared on the basis of data from the State Committee on Statistics of the Republic of Uzbekistan, the IEA and expert estimates*

*Production.* In the GDP structure, the share of energy production tended to increase from 5% to 7,9% during 2017-2019, but it started to decline to 5,4% starting from 2020 (Chart 3). The largest contribution to GDP was made by oil and natural gas production.

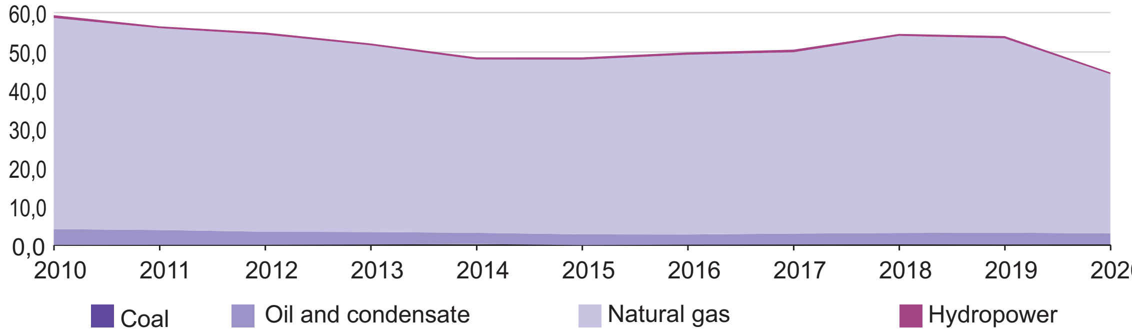
**Chart 3. Share of energy production in GDP, %**




*Source: prepared on the basis of data from the State Committee on Statistics of the Republic of Uzbekistan, the IEA and expert estimates*

The production of primary fuel in oil equivalent in 2020 compared to 2019 reduced due to a decrease in natural gas production by 18% (Chart 4).

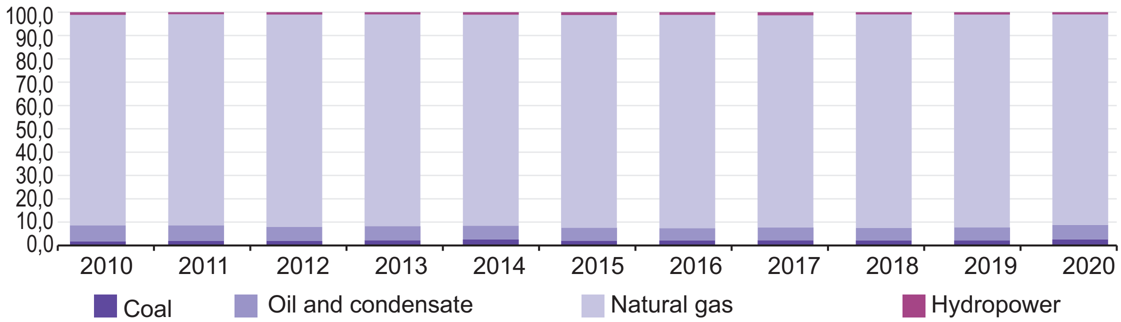
**Chart 4. Primary energy production, Mtoe**




*Source: prepared on the basis of data from the State Committee on Statistics of the Republic of Uzbekistan, the IEA and expert estimates*

Gas production accounts for more than 90% in the structure of energy production (Chart 5).

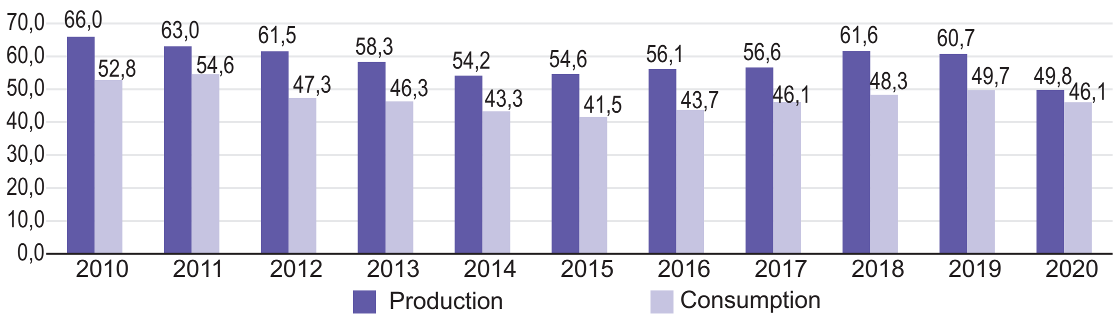
**Chart 5. Structure of primary energy production, %**




*Source: prepared on the basis of data from the State Committee on Statistics of the Republic of Uzbekistan, the IEA and expert estimates*

*Natural gas production.* During 2010-2019, gas production was between 61-66 bln m$^3$ (Chart 6). Gas supply from domestic producers was sufficient to meet domestic demand, which facilitated gas exports. The trend of gradual decline in natural gas production started from 2011 to 2019, when it declined by 8% due to source depletion. The downward trend in natural gas production worsened in 2020, with a decline of almost 10 bln m$^3$ (by more than 20%) to 49,8 bln m$^3$ compared to 2019. The main reasons for the decline were the Covid-19 pandemic and the decrease for natural gas demand in importing countries, particularly in China.

**Chart 6. Natural gas production and consumption, bcm**



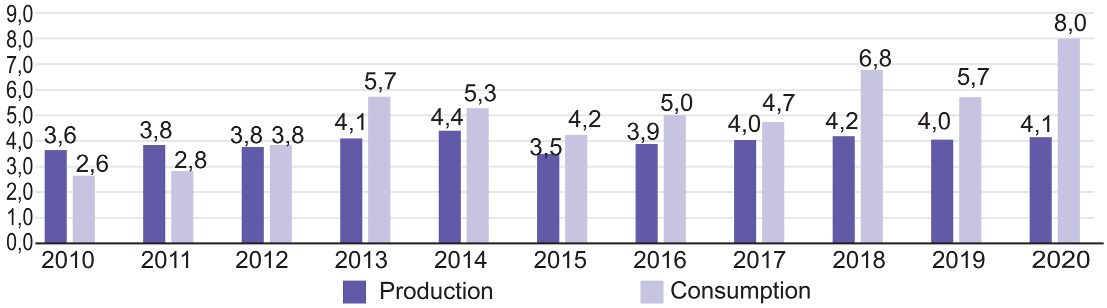

*Source: prepared on the basis of data from the State Committee on Statistics.*

Decrease in gas production during 2010-2020 was caused by financial cuts of Uzbekneftegaz JSC on exploration, development and commissioning of new gas deposits. Another factor was the decrease in the specific gas consumption for generating 1 kWh of electricity from 381,3 grams in 2010 to 333,8 grams in 2020 (by 12,5%), since gas is the main fuel for electricity generation.

Of the total natural gas consumption in 2021, 59% was used by industries of the economy, including 31% for electricity generation and 24% by households.

*Coal production* in 2020 amounted to 4,1 million tons (Chart 7), while coal consumption amounted to 8 million tons. In 2015, Uzbekistan started importing coal for the first time, and in 2020 imports reached almost half of the total coal consumption. At the same time, there are challenges to increasing coal production due to high wear and tear of mining and transportation equipment and limited financial resources of Uzbekugol JSC for additional extraction works.

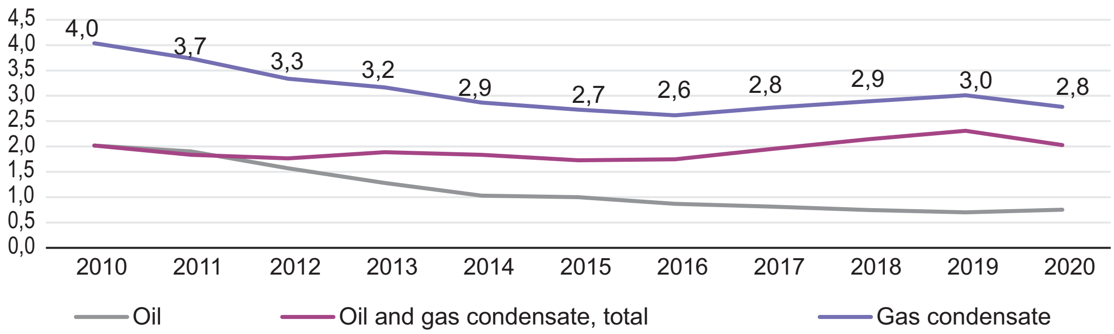
**Chart 7. Coal production and consumption, mln tons**




*Source: prepared on the basis of data from the State Committee on Statistics*

*Production of oil and gas condensate.* In 2010, the production of this resource amounted to about 4 million tons, but by 2020 it decreased to 2,8 million tons (by 31%) (Chart 8).

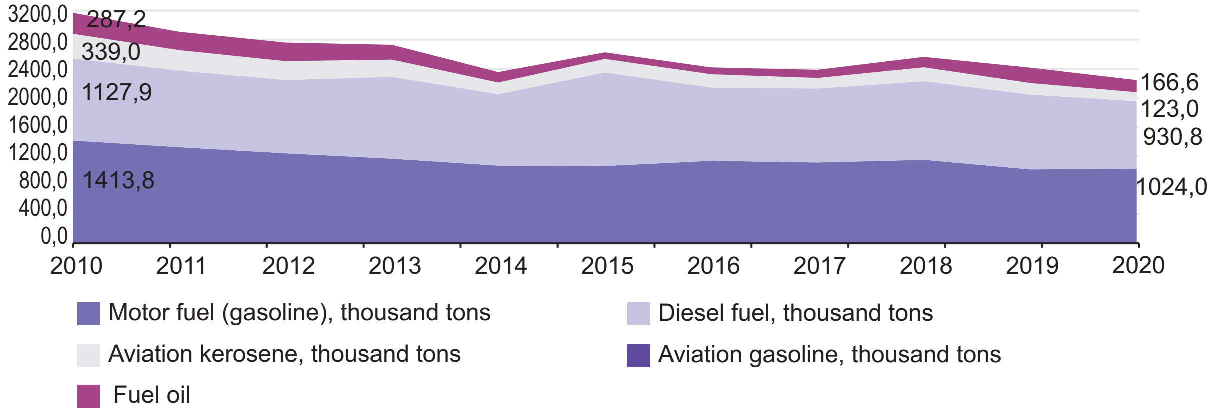
**Chart 8. Production of oil and gas condensate, milliom tons**




*Source: prepared on the basis of data from the State Committee on Statistics.*

The main reasons for the decline in oil production is the limitation of financial resources and their inefficient use by Uzbekneftegaz JSC to increase oil production capacity. The decline in oil production affected the production of oil products, which decreased by 29% compared to 2010 and amounted to 2,2 million tons (Chart 9).

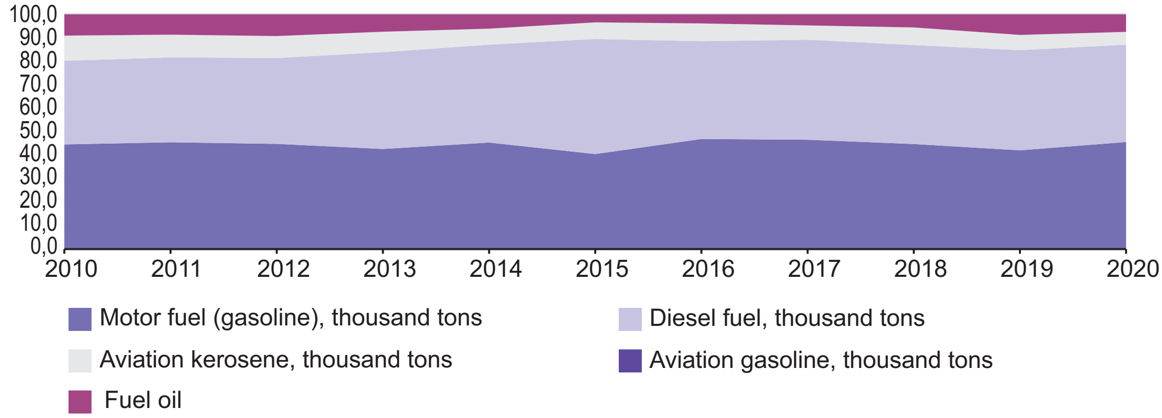
### Chart 9. Production of oil products




*Source: prepared on the basis of data from the State Committee on Statistics.*

In the structure of oil products production, the largest share falls on motor fuel (gasoline) – 45,6% and diesel fuel – 41,5%, aviation kerosene and fuel oil account for 5,5% and 7,4%, respectively (Chart 10).

### Chart 10. Structured of oil produced, %

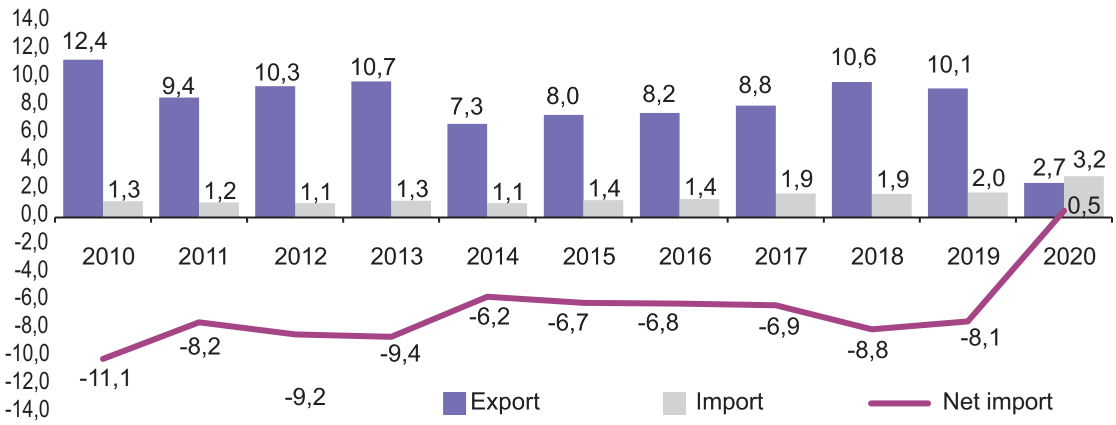



*Source: prepared on the basis of data from the State Committee on Statistics*

## Exports and imports of fossil fuels

To meet the growing domestic demand, Uzbekistan imports oil, gas condensate, coal, oil products and electricity. Energy exports are mainly provided by natural gas. However, there was a sharp decline in exports in 2020, while there was an increase in oil and coal imports (Chart 11).

### Chart 11. Export and imports, toe




*Source: prepared on the basis of data from the State Committee on Statistics of the Republic of Uzbekistan, the IEA and expert estimates*

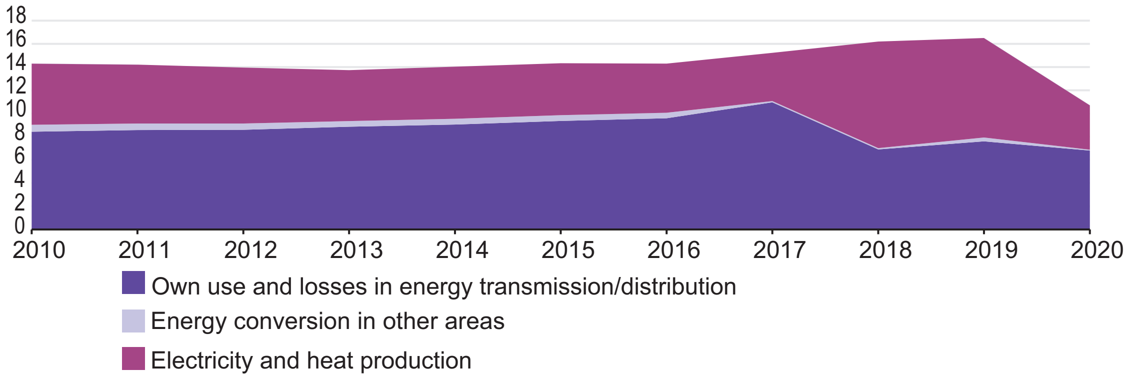
In 2020, the share of natural gas in the structure of energy exports totaled 91,5%, while the volume of exported natural gas amounted to 6,1% of total natural gas production and was significantly lower compared to 2019. Over 2010-2019, natural gas was exported at an average annual rate of 12 billion cubic meters.

To cover the needs of the domestic market, Uzbekistan imports 76,9% of its coal production and 51,4% of its oil and gas condensate production. Imported oil is used to produce oil products, diesel fuel and gasoline. Oil imports in 2020 amounted to 1,5 Mtoe and more than doubled compared to 2010. High growth dynamics was also characteristic of coal imports, which increased from its zero value to 1,1 Mtoe. At the same time, net imports amounted to only 0,5 Mtoe.

**Demand for fossil fuels**

*Energy conversion and losses.* Primary energy consumption during energy conversion tended to increase from 14,3 Mtoe to 16,5 Mtoe between 2010 and 2019 or increased by 15,4% over time (Chart 12).

**Chart 12. Primary energy conversion and losses, mtoe**

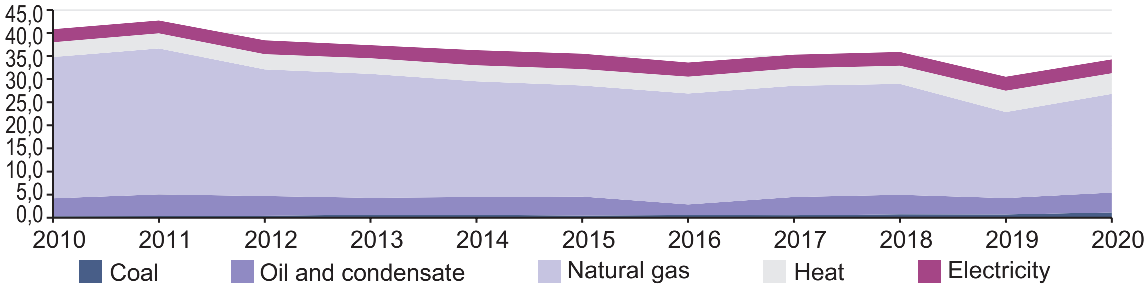



*Source: prepared on the basis of data from the State Committee on Statistics of the Republic of Uzbekistan, the IEA and expert estimates.*

The main growth factor for this indicator was the growth in primary energy consumption by energy companies for their own needs and due to losses in the transmission/distribution of energy – from 5,3 Mtoe up to 9,2 Mtoe or by 74,4%. This change was caused by the increase in electricity generation by thermal power plants. At the same time, a decrease in the use of primary energy for electricity generation from 16,2 Mtoe to 12,8 Mtoe (by 21%) was observed in 2020 as compared to 2017.

*Total Final Consumption (TFC).* During 2010-2020, there was a steady downward trend in TFC from 40,9 Mtoe to 34,5 Mtoe or by 16%. The largest decrease in oil equivalent was observed in natural gas consumption – by 30%. At the same time, electricity consumption increased significantly – by 39%. However, in 2020, TFC increased by 12,3% compared to 2019 (Chart 13).

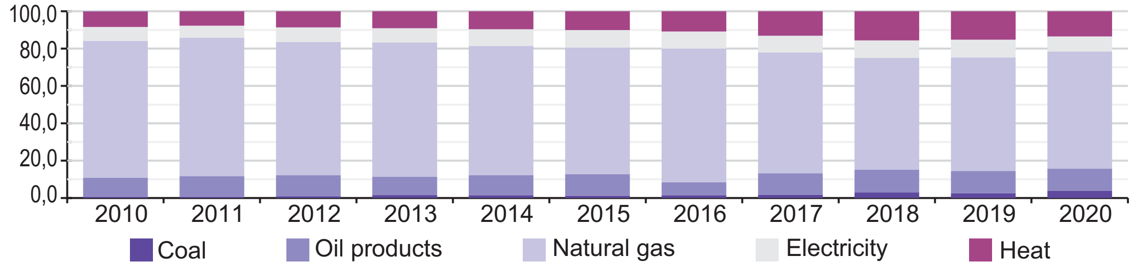
**Chart 13. Total Final Consumption (TFC), Mtoe**




*Source: prepared on the basis of data from the State Committee on Statistics of the Republic of Uzbekistan, the IEA and expert estimates*

As a result, in the TEC structure by fuel type, the share of natural gas decreased from 73,3% to 62,2%, while the share of oil increased from 10,2% to 11,9%, coal from 0,7% to 3,9%, electricity from 8,4% to 13,5%, and thermal energy from 7,4% to 8,1%[66] (Graph 14). Consequently, the main leap in final energy consumption in Uzbekistan was due to an increase in the consumption of electricity and oil products.

**Chart 14. Structure of total energy consumption, %**




*Source: prepared on the basis of data from the State Committee on Statistics of the Republic of Uzbekistan*

In the structure of final consumption, the largest consumers of energy resources are manufacturing, whose share decreased from 23,6% to 19,3%, transport – from 21,3% to 18,2%, while the share of other consumers increased from 55,1% to 60,8%[67] (Table 1).

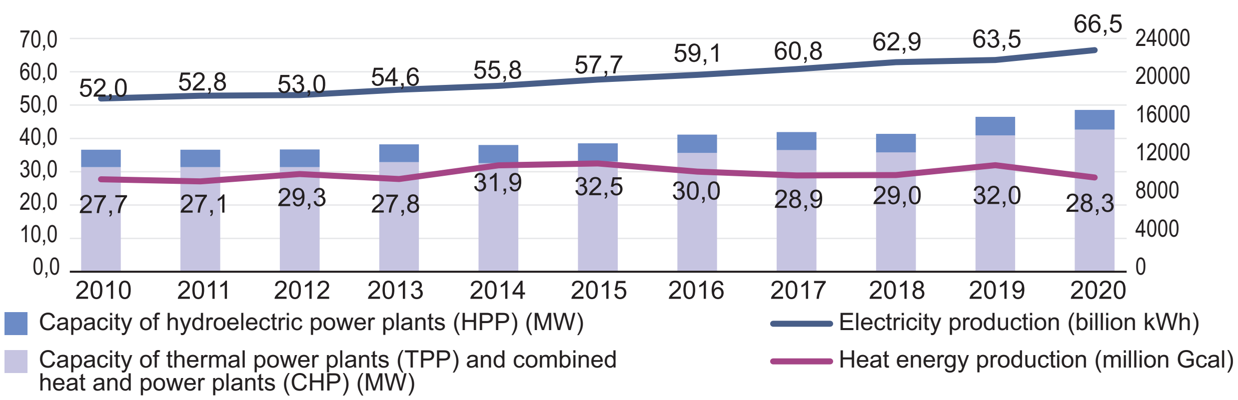
**TABLE 1. FINAL ENERGY CONSUMPTION BY INDUSTRY**

| | 2010 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|
| **Mtoe** | | | | | |
| industry | 9,6 | 8,0 | 6,8 | 7,1 | 6,6 |
| transport | 8,7 | 7,8 | 6,0 | 6,1 | 6,2 |
| others | 22,5 | 19,5 | 16,9 | 17,3 | 21,5 |
| including households | - | - | - | 10,7 | 12,9 |
| **Structure, %** | | | | | |
| industry | 23,6 | 22,6 | 22,9 | 23,3 | 19,3 |
| transport | 21,3 | 22,0 | 20,2 | 19,9 | 18,0 |
| others | 55,1 | 55,3 | 56,9 | 56,6 | 62,7 |
| including households | - | - | - | 35,2 | 37,6 |

*Source: prepared based on data from the State Committee on Statistics of the Republic of Uzbekistan, the IEA and expert estimates*

*Electricity and heat generation.* From 2010 to 2020, the installed capacity of electricity generation increased by 30%, and electricity generation increased by 28%, which is comparable to population growth (Chart 15).

**График 15 Установленные мощности и производство электро– и теплоэнергии**




*Source: prepared on the basis of data from the State Committee on Statistics of the Republic of Uzbekistan*

[66] Electricity and heat are included in the TFC in accordance with IEA methodology

[67] IEA data was used for the analysis

# ANNEX 3. OECD CLASSIFICATION OF SUPPORT MEASURES

| | | Statutory or official scope of distribution (who gets and which transfer in the first place) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Extraction | | | | | | | Direct consumption | |
| | | | | | Cost of inputs | | | | | |
| | | Product revenue | Enterprise income | Cost of intermediate costs | Work force | Land and minerals | Capital | Knowledge | Unit cost of consumption | Income of households or enterprises |
| Transfer mechanism (how a transfer is generated) | Direct money transfer | Output bonuses or deficit coverage | Operating subsidies | Subsidizing the price of inputs | Employment incentive subsidy | Capital grant in connection with land acquisition | Capital appropriation in relation to capital | State R&D | Per-unit subsidies transferred to support unit cost of consumption | State-subsidized social tariff for electricity (or natural gas) |
| | Lost tax income | Production tax credit | Reduced income tax rate | Reduced excise tax on inputs | Reduced social payments (payroll taxes) | Reduced property tax (or exemption from it) | Investment tax credit | Tax credit for private R&D | Preferential VAT or excise tax on fuel | Tax deduction for energy purchases in excess of a certain share of income |
| | Other shortfalls in budget revenues | | | Underpricing a good or service provided by the government | | Underpricing access to public lands or natural resources, reduced royalty or subsoil use tax | | Public transfer of intellectual property rights | Underpricing of a natural resource received by the end user | |
| | Transfer of risks to the government | Government buffer stocks | Limitation of manufacturers' liability to third parties | Ensuring the safety of energy facilities | Assuming by the government of responsibility for compensation for damage resulting from accidents and incidents at work | Land Acquisition Loan Guarantee | Capital loan guarantee | | Price related subsidy | Means-tested allocation during the cold season |
| | Secondary transfers | Import tariff or export subsidy | Monopoly concession | Monopsony concession | Control of wage rates | Land use control | Credit control (accounting for industry specifics) | Derogation from the norms of legislation in the field of intellectual property | Price regulation; cross subsidization | Mandatory social tariff for electricity (or natural gas) |

*Source: OECD, 2013*

## EXPLANATION OF THE FOSSIL FUEL SUBSIDY SUPPORT MATRIX

| Sphere of production | | Sphere of direct consumption | |
|---|---|---|---|
| **Type of energy subsidy** | **Explanation** | **Type of energy subsidy** | **Explanation** |
| Direct transfer of funds from the state budget | | | |
| Output bonuses or deficit coverage to support product revenues | They are part of the energy subsidy and reflect the annual value of the portion of transfers to fossil fuel producers from consumers and taxpayers.<br>The amount of the subsidy is calculated as the difference between the target price, which ensures coverage of the producer's costs with a set or fixed rate of profit, and the actual price prevailing on the market. | Per-unit transferred to support unit cost of consumption | Per-unit subsidies transferred to support the unit cost of consumption are considered as subsidies aimed at improving the energy efficiency of energy consumption for the production of goods and services using a technologically and economically justified consumption rate for inclusion in the cost.<br>The amount of the subsidy is determined as the difference between the cost calculated according to the actual and special consumption rate of fuel and energy resources (FER). |
| Operating subsidies to support the income of the enterprise | Directed to support energy enterprise income in two forms of transactions between the public and private sector.<br><br>The first is government subsidies, defined in IAS 20 as government assistance in the form of a transfer of resources to an entity in exchange for the fulfillment of certain conditions relating to that entity's operating activities.<br><br>The second is concession contracts aimed at involving the private sector in the effective management of public property. | State-subsidized social tariff for electricity (or natural gas) | Considered as a subsidy to support the income of vulnerable households and ensure their access to natural gas and electricity consumption.<br><br>The amount of subsidy is determined as the difference between the cost calculated according to the actual and social norm of electricity (natural gas) consumption. |
| Subsidized input price included in the cost of intermediate inputs | Considered as subsidies aimed at covering the costs and supporting the income of the energy producer.<br><br>The amount of subsidy is calculated as the difference between the actual market price of purchased intermediate inputs (raw materials) and the subsidized price. | | |

| Sphere of production | | Sphere of direct consumption | |
|---|---|---|---|
| **Type of energy subsidy** | **Explanation** | **Type of energy subsidy** | **Explanation** |
| Employment-stimulating spending (labor) | They are considered as subsidies and are used to increase the personnel potential of energy enterprises.<br>The amount of the subsidy actually represents the state budget expenditures for training and retraining of personnel, employment of personnel. | | |
| Capital subsidies for land acquisition and capital (machinery, equipment) | Considered as subsidies directed to energy companies in financial distress to compensate for high-priority capital expenditures, as well as to curb energy resource price increases.<br>The amount of the subsidy actually represents the amount of budget expenditures provided by the state for subsidies. | | |
| Government spending on R&D (knowledge), | Considered as subsidies aimed at supporting the scientific and technical base of energy enterprises related to the introduction of new technologies in the processes of extraction and processing of fossil fuels.<br>The amount of the subsidy actually represents the amount of funds provided by the state to finance research and development. | | |
| Lost tax revenues | | | |
| Production tax credit | It represents the postponement to a later date of the deadline established for payment of taxes, fees (duties) falling within the period of validity of the tax credit.<br>Provided against the entire amount by type of taxes, fee (duties) or their part for a certain period, without accruing penalties on the amount of the granted tax credit (usually from one to three years) in case of a threat of economic insolvency (bankruptcy) in the case of a lump-sum tax payment, fee (duty).<br>Not available for taxes, fees (duties), the payment deadline for which has already come.<br>The amount of the subsidy is calculated as the difference between the nominal and actual tax payment of a producer in arrears. | Preferential VAT or excise tax on fuel | Considered as a subsidy to support demand for fuel consumption by businesses and households.<br>The amount of the subsidy is determined as the difference between the amount of VAT or excise tax calculated at the standard and established preferential VAT rate, or excise tax on fuel. |

| Sphere of production | | Sphere of direct consumption | |
|---|---|---|---|
| **Type of energy subsidy** | **Explanation** | **Type of energy subsidy** | **Explanation** |
| Reduced income tax rate | Considered as a subsidy to support the income of an energy producer.<br><br>The amount of subsidy is calculated as the difference between taxes paid on the income of energy enterprises, determined at the standard rate and the reduced (preferential) rate established for the producer. | Tax deduction for energy purchases in excess of a certain share of income | A tax deduction is an amount by which the tax base on an individual's income is reduced in cases prescribed by law.<br>The tax deduction is an energy subsidy and is applied especially in regions of the country where energy costs may account for a large share of household budgets for energy purchases in excess of a certain share of income. In this case, certain share of income is calculated based on the minimum subsistence budget for the household, and the amount of money spent on energy in excess of the established share of income is not subject to taxation.<br>The amount of the subsidy is calculated based on privileged consumption volumes and the established income tax rate. |
| Reduced excise tax on inputs subject to excise tax | Considered as subsidies aimed at covering the costs and supporting the income of an energy producer.<br><br>The amount of the subsidy is calculated as the difference between the amount of excise tax paid, determined at the standard rate, and the reduced (preferential) rate established for the producer. | | |
| Reduced social payments (payroll taxes) | Considered as subsidies aimed at covering labor costs and supporting the income of an energy producer.<br><br>The amount of the subsidy is calculated as the difference between the amount of the social payment paid, determined at the standard rate, and the reduced (preferential) rate established for the producer. | | |

| Sphere of production | | Sphere of direct consumption | |
|---|---|---|---|
| Type of energy subsidy | Explanation | Type of energy subsidy | Explanation |
| Reduced property tax (or exemption) | Considered as a subsidy aimed at covering the cost of production and supporting the income of energy producers.<br><br>The amount of the subsidy is calculated as the difference between the amount of property tax paid, determined at the standard rate, and the reduced (preferential) rate established for the producer. | | |
| Investment tax credit | Represents a form of change in the term of fulfillment of tax obligation, which is characterized by postponement (deferral) of tax payments, accumulation and repayment of tax debts during the term of the investment tax credit agreement.<br>An investment tax credit can be provided to enterprises for each type of tax (profit tax, property tax, land tax, etc.) separately (usually for a period of one to five years, in some cases up to 10 years) to stimulate investment activities.<br>The basis for granting an investment tax credit is its compliance with the goals and priorities of the state's socio-economic and investment policy (development of science and new technologies, innovations, creation of new jobs, including for the disabled persons, environmental protection, energy efficiency improvement, fulfillment of a special state order, etc.).<br>A reduction is made for each payment of the relevant tax for which an investment tax credit is granted for each reporting period until the amount not paid by the organization as a result of all such reductions (the accumulated credit amount) becomes equal to the credit amount provided for in the relevant agreement.<br>The amount of the subsidy is calculated as the difference between the nominal amount of taxes payable by the standard deadlines and the actual tax payment of the producer. | | |

| Sphere of production | | Sphere of direct consumption | |
|---|---|---|---|
| Type of energy subsidy | Explanation | Type of energy subsidy | Explanation |
| Tax credit for private R&D | A tax credit for private R&D is a form of modification of the term of fulfillment of a tax obligation, which is characterized by the postponement (deferral) of tax payments, accumulation and repayment of tax debts during the fixed term of the private R&D contract.<br><br>A tax credit for private R&D can be granted separately for each type of tax (profit tax, property tax, land tax, etc.) for private enterprises to stimulate the implementation of R&D in the energy sector.<br>The basis for granting a tax credit for private R&D is their compliance with the goals and priorities of the state's scientific, technical and innovation policy (conducting breakthrough scientific research and creating new innovative technologies in the energy sector, improving energy efficiency, fulfillment of a special state order and environmental protection, etc.);<br>A reduction is made for each payment of the relevant tax for which a private R&D tax credit is granted for each reporting period until the amount not paid by the organization as a result of all such reductions (the accumulated credit amount) becomes equal to the credit amount provided for in the relevant contract.<br>The amount of the subsidy is calculated as the difference between the nominal amount of taxes payable within the standard established periods and the actual payment of taxes by the producer. | | |

| Sphere of production | | Sphere of direct consumption | |
|---|---|---|---|
| Type of energy subsidy | Explanation | Type of energy subsidy | Explanation |
| Other budgetary shortfalls | | | |
| Underpricing public good or service (dumping) | It is conducted by the state in the expectation that a desired market position will be achieved through dumping.<br><br>The amount of the subsidy is calculated as the difference between the underpriced public good or service and its base price. | Underpricing access to a natural resource (such as fossil fuels) received by the end user | It is conducted by the state in the expectation that the desired market position will be achieved.<br><br>The amount of the subsidy is calculated as the difference between the underpriced public good or service and its base price. |
| Underpricing access to public land or natural resources, reduced resource exploitation royalties, or mineral extraction tax | Considered as subsidies to support producer income and increase the energy production.<br><br>The amount of the subsidy is calculated as the difference between the value of land or natural resources calculated at the base price and at an undervalued price; or royalties on resource exploitation, or mineral extraction tax calculated at the base and at an undervalued rate. | | |
| State transfer of intellectual property rights (IPR) | Considered as subsidies directed by private companies to intensify the extraction of minerals (oil and gas) in order to increase their production.<br><br>The amount of the subsidy is calculated as the difference between the value of the transferred intellectual property (the value of the patent) and the value of its revaluation as a result of an increase in income from investments. | | |

| Sphere of production | | Sphere of direct consumption | |
|---|---|---|---|
| **Type of energy subsidy** | **Explanation** | **Type of energy subsidy** | **Explanation** |
| Transfer of risks to the state | | | |
| Government buffer stocks | These are state budget expenditures for the creation and maintenance of fuel reserves intended for use in order to ensure measures to stabilize the economy in case of imbalances between the demand and supply of fuel and energy resources in the domestic market, and to mitigate emergencies.<br><br>The amount of the subsidy actually represents the public budget expenditures for the establishment and maintenance of reserves. | Price-related subsidy | This is the fixing by the state of a guaranteed price for an energy resource, which enables leveling market price fluctuations in the short or medium term and, thus, to transfer price risks from consumers to the budget.<br><br>The amount of subsidy is determined as the difference between the market price and the fixed price in a certain period, It can have both negative and positive values. |
| Limitation of producers' liability to third parties | It is a form of indirect energy subsidies for energy producers by transferring risks from under-supply or supply constraints of energy resources to the state.<br><br>The amount of the subsidy is estimated as the amount of damage caused by the producer to a third party, resulting from man-made accidents at hazardous production facilities and energy supply failures covered by the budget. | Means-tested grant during the cold season | Allocation of direct state subsidies to vulnerable segments during the heating period to compensate for the costs of heating of residential premises.<br>It is determined by the authorized state bodies (usually local authorities), based on the marginal share of household expenditures on energy products from the total household income, based on the declarative or revealing principle.<br>The amount of the subsidy is calculated as the amount of all subsidies for the period. It may have an implicit form if the cost of thermal energy is directly compensated from the budget to the energy supply organization. |
| Ensuring the security of energy facilities | It is a form of energy subsidy aimed at ensuring the security of energy facilities (for example, military protection of energy supply facilities and transmission lines).<br><br>The amount of the subsidy actually represents the state expenditures on the provision of security services for energy sector infrastructure. | | |

| Sphere of production | | Sphere of direct consumption | |
|---|---|---|---|
| **Type of energy subsidy** | **Explanation** | **Type of energy subsidy** | **Explanation** |
| Acceptance of responsibility by the state to compensate for damage resulting from accidents and incidents in energy production | It is a form of energy subsidies.<br><br>The amount of the subsidy is estimated as the amount of damage compensated by the state as a result of accidents and incidents in energy production. | | |
| Land acquisition or capital loan guarantee | Payments on land acquisition and capital loan guarantees represent the state expenditures on interest payments and a portion of the principal on energy enterprise loans established by government resolution. | | |
| Secondary transfers | | | |
| Import tariff or export subsidy | A subsidy to a producer or seller of an exported energy resource that reimburses a part of production or circulation costs to increase the competitiveness of the energy resource in the foreign market.<br>It is used by the state to encourage the export of certain types of products and provision of services to foreign partners in order to expand exports and capture foreign markets. An export subsidy creates more favorable price conditions for the sale of goods in foreign markets.<br>In world practice, export subsidies are usually applied in the form of full or partial exemption of exporting firms from payment of certain taxes, import duties, excise duty refunds, or in the form of direct export subsidies. In the European Union, export subsidies are applied in the form of tax refund on exports.<br>It is determined as the amount of lost tax revenues from energy exporting producers. | Regulated price, cross subsidy | Centralized setting of regulated energy prices, usually through cross-subsidies between the population and organizations in the real sector of the economy or between types of energy inputs (for example, lowering the price of heat energy by increasing the price of electricity).<br><br>It is usually used to maintain the state's social guarantees to the population or for political purposes.<br><br>The subsidy is calculated using the price difference method with the determination of tariffs that ensure full reimbursement of economically justified costs for each type of energy input. |

| Sphere of production | | Sphere of direct consumption | |
|---|---|---|---|
| **Type of energy subsidy** | **Explanation** | **Type of energy subsidy** | **Explanation** |
| Monopoly concession | It is a type of indirect energy subsidy aimed at involving the monopoly-type private sector in the efficient management of public property based on a concession agreement.<br><br>The amount of the subsidy is calculated using the price difference method between the price of a dominant private enterprise on the market with benefits (preferences) established by the concession agreement and the actual price for the operation of state assets under comparable conditions. | Mandatory social tariff for electricity | The established minimum level of electricity consumption by a household, paid at a subsidized (social) tariff. Above the established level of electricity consumption, tariffs are applied that provide full reimbursement of economically justified costs,<br>It is determined by the price difference method between the social tariff and the real tariff. |
| Monopsony concession | It is the opposite of a monopoly concession, where there are many sellers (producers of raw materials, inputs, investment goods and factors of production) and only one buyer (e.g., a single energy producer) in a small area.<br><br>A monopsony concession is a type of indirect energy subsidy aimed at supporting one monopsonist enterprise in maintaining demand for certain types of goods, services or factors of production (raw materials or labor force) produced by many enterprises based on a concession agreement with the government.<br><br>The amount of the subsidy is calculated using the price difference method between the purchase prices of the dominant monopsonist enterprise on the market and the actual prevailing price for goods and services produced in a competitive market under comparable conditions. | | |

| Sphere of production | | Sphere of direct consumption | |
|---|---|---|---|
| Type of energy subsidy | Explanation | Type of energy subsidy | Explanation |
| Payroll control | It is conducted by one enterprise – the consumer of labor, which has a monopoly on hiring labor (monopsony) and has the ability to dictate working conditions.<br><br>Ceteris paribus, a monopsonist maximizes its profit by hiring fewer workers and at the same time sets a wage rate lower than under competitive conditions. As a result, the market receives less output, and workers receive a wage rate less than their marginal product in monetary terms.<br><br>Just as a monopolist-seller finds it profitable to reduce production to raise the price of its goods above the competitive price, so a monopsonist-employer of resources finds it profitable to reduce employment and lower wage rates, i.e., to set wage rates below the competitive price.<br><br>The amount of the subsidy is calculated using the price difference method between the prevailing labor rate below the market competitive rate set by the dominant monopsonist enterprise and the actual prevailing labor rate in a competitive market under comparable conditions. | | |
| Land use control | Providing preferences to energy producers in terms of land use through priority or preferential granting of rights to land or natural resources, ensuring mandatory land allocation for the creation of energy infrastructure (construction of power grids, pipelines, etc.), use of water bodies as technological water supply systems for energy facilities without environmental compensation.<br>The subsidy is calculated as the amount of shortfall in budget revenues from lost funds and fees. | | |

| Sphere of production | | Sphere of direct consumption | |
|---|---|---|---|
| Type of energy subsidy | Explanation | Type of energy subsidy | Explanation |
| Credit control (industry specific) | Credit is controlled by the bank, which has a monopoly on lending and a monopsony in raising funds in deposits and has the ability to dictate terms in this regard.<br>At the national level, fixed low lending rates are set for certain enterprises in the energy sector or for large investment projects, for which banks are obliged to lend.<br>The amount of the subsidy is calculated using the price difference method between the prevailing interest rate on loans below the competitive market price set by the dominant monopsonist bank and the actual prevailing interest rate for loans established in the competitive market under comparable conditions. | | |
| Deviations from standard rules on import share in the economy | The amount of energy subsidies required to deviate from a certain or established level of diversification is calculated as the amount of funds allocated for the purchase of additional volumes of fuel and energy resources required to deviate from this share.<br>Given that usually such purchases are made to balance energy flows at the national level, the funding sources are targeted state funds that are generated from the national budget, i,e,, it is the targeted transfers from the budget for energy purchase that will be the value of the volume of energy subsidies. | | |

*Источник: ОЭСР, 2013*

# ANNEX 4. METHODS FOR ESTIMATING ENERGY SUBSIDIES

**Price gap (difference) method (IEA and IMF approach).**

*The price difference* is the difference between the domestic price of a given fossil fuel and *its reference (world, regional) price* (Formula 1 and 2). In principle, the price difference method can be used to calculate the support of both the consumer and the producer. The price difference method is based on the comparison of actual (average) fossil fuel prices for final consumers with the prices that would have been set under ideal (competitive) market conditions (so-called *reference prices* that fully cover the cost of production and supply of fossil fuels). At the same time, the assessment of the amount of subsidies covers only those actions of the state authorities that resulted in final consumer prices below those that would have been established under competitive market conditions.

**FORMULA 1. CALCULATION OF THE PRICE DIFFERENCE**

**Price difference = reference price of fossil fuel - actual price of fossil fuel to final consumers**

The reference price can be:

- I. The price that would be set under competitive market conditions, i.e., the price that covers the cost of production and supply of the fossil fuel;
- II. The price of a type of fossil fuel on the world (regional) market. Moreover, this price should be adjusted accounting for a number of factors (market exchange rates, transportation costs, distribution costs, tax rates, etc.).

Actual price (final consumer price of fossil fuels) - the price paid by the consumer for the purchase of fossil fuels.

Price difference is a positive difference between the reference price and the actual price for final consumer. The presence of a difference indicates the presence of fuel subsidies.

**Subsidy = Price difference × Volume of fuel type consumption**

*Source: OECD (2018)*

It is the price difference method that underlies the estimates of the size and level of energy subsidies in EECCA countries[68] (including Uzbekistan), which are often contained in OECD, IEA and World Bank publications.

The advantages of the price difference method are:

- Relative simplicity. A simplified approach is useful in countries where government activities in the fuel sectors are classified, and the price data used for all fossil fuels and for all categories of users are open and relatively complete.
- The price difference enables understanding the factors that influence decision making. The output of the method can be used in macroeconomic models. This enables estimating how subsidy reforms may affect energy markets, consumer welfare and trade flows.

However, along with its advantages, the price difference method has a number of limitations. The literature review enabled summarizing five main limitations of the method:

**1. Complexity of calculating reference (world) prices.** These prices must be adjusted for a number of factors that are difficult to estimate in practice. The adjustment is carried out in different ways depending on whether the commodity is foreign traded or not. If the fuel type is *foreign traded*, the calculation of reference prices looks like this:

[68] Azerbaijan, Kazakhstan, Russian Federation, Turkmenistan, Ukraine and Uzbekistan, which are part of the Eastern Europe, Caucasus and Central Asia region (EECCA region).

**FORMULA 2. CALCULATION OF REFERENCE PRICES FOR OIL, GAS AND COAL**

For the importing country, the reference price includes:

- fuel price adjusted for differences in quality characteristics at the nearest international center/hub (plus);
- costs of the importing country for freight and insurance (plus);
- domestic distribution and marketing costs (plus);
- value added tax (VAT).

For the exporting country, the reference price includes:

- fuel price adjusted for differences in quality characteristics at the nearest international center/hub (plus);
- costs of the importing country for freight and insurance (plus);
- domestic distribution and marketing costs (plus);
- value added tax (VAT).

*Source: IEA, OECD and World Bank (2010)*

In addition, the reference price should be adjusted to factor in differences related to the way foreign traded energy resources are sold. For example, oil products are sold either on exchanges or on spot markets. If there are no government price intervention, end-user prices will change in close connection with changes in spot market prices. In the case of coal, the bulk of transactions are conducted under long-term contracts with periodic adjustments to reflect changing market prices. Therefore, officially announced domestic coal prices should be adjusted to reflect actual coal purchase prices.

In general, for exported fuels, the reference price is the export parity price. Thus, the estimate of the price difference (hence the amount of subsidies) is dependent on the reference price, which in turn is highly dependent on fluctuations in world fossil fuel prices. This is the main disadvantage of the price difference method.

In the case of non-foreign traded fuels (electricity, sometimes coal), the reference price is calculated based on the costs of its production, transmission and distribution in a particular country (i.e. on the domestic market). In contrast to foreign traded goods, in this case there is no need to adjust the reference price to account for differences in the quality characteristics of the fuel. In this case, there are different practices for selecting the reference price.

The IEA determines the reference price based on the long-run marginal cost of supplying electricity to end-users. The World Bank and IMF determine the reference price based on the average cost of production (which includes, among others, the current repair and maintenance of fixed assets and replacement of depreciated capital), which tends to be a lower benchmark for pricing policy than the long-run marginal cost.

**APPROACH TO CALCULATING BASIC ELECTRICITY PRICES**

- based on a price calculated on the basis of the average annual cost of electricity in the country (weighted to factor in the production volumes of each electricity generation method);
- determined taking into account the cost of electricity production, transmission and distribution;
- determined using reference prices for fossil fuels and the average annual fuel efficiency of power plants;
- limited to the normalized cost of electricity produced at the power plant, such as combined cycle gas turbines (CCGT) to avoid overpricing.

The levelized cost (LC) is a summary indicator for assessing the competitiveness of different power generation technologies. It refers to the cost per kilowatt-hour (in real terms) of building and operating a power plant over its financial life cycle. The data for calculating the LC are one-day capital costs, fuel costs, fixed and variable costs for operation and maintenance of fixed assets, financing costs and the utilization rate of each type of plant.

*Source: IEA, OECD and World Bank (2010)*

The price difference method enables assessing the overall effect of government actions on the level of final prices of fossil fuels, but does not answer the question of which policies led to price distortions. At the same time, the answer to this question is important for developing directions for energy subsidy reform.

**2. Difficulty in assessing all secondary transfers**. In many countries, the bulk of subsidies are not provided through direct payments from the state budget, but indirectly in the form of price support through “secondary transfers”. Not all secondary transfers can be easily identified and valued. They include import tariffs or import quotas, export subsidies, regulated prices and cross-subsidies that regulate wages and land prices, among others, In addition, secondary transfers are the result of regulated tariffs and prices, which often do not reflect the full cost of energy production and transportation. Therefore, the scale of secondary transfers can be much higher than the size of direct subsidies. For example, in Kazakhstan in 2019, the amount of secondary transfers was estimated at 3,3 trillion tenge[69], while about 175 billion tenge, or almost 18,9 times lower, was spent from budgets of all levels on direct subsidies, At the same time, not all secondary transfers (e.g., in the coal rail transportation sector) were taken into account due to lack of data.

**3. The price difference method is not used to estimate the amount of subsidies in the heat energy sector**, although such estimates are important for a comprehensive view of the situation and development of directions for energy subsidy reform.

**4. The price difference method does not cover subsidies that do not affect final prices.** The method assesses the extent to which available measures support domestic fossil fuel prices below the international reference price. However, the method does not take into account support for fuel production (for extractive companies) and various tax incentives for extractive companies and consumers, as these measures do not reduce final prices. Meanwhile, such measures can be significant, incentivizing increased production and/or consumption of fossil fuels. Without an assessment of such measures, the total amount of subsidies may be significantly underestimated. The significance of the assessment is especially increased when comparing a particular country with countries where such measures are not applied.

*Bottom-up inventory method (IISD approach)*

The method involves:

- an inventory of specific mechanisms to subsidize the production and consumption of fossil fuels;
- quantification of support under each mechanism, and
- summarizing the values obtained to estimate the total amount of subsidies,

The inventory is performed by completing standardized tables containing the main characteristics of each subsidy.

The easiest way to quantify each subsidy is to use official data. Such data can be obtained from state budget laws, state budget execution reports, tax expenditure documents, explanatory notes of the Ministry of Finance and other official documents.

The result of the inventory is a combination of 1) a monetary value of certain types of subsidies and 2) a list of identified subsidies that could not be quantified. Due to the availability of

[69] Report "Fiscal Stimulus for Low-Carbon Development in the Republic of Kazakhstan", 2021. The study was conducted by experts of the International Institute for Sustainable Development within the Partnership for Action on Green Economy (PAGE), with the support of the United Nations Environment Program (UNEP) and in cooperation with the United Nations Development Program (UNDP).

sufficiently detailed data, the bottom-up inventory method was applied to estimate subsidies in Armenia, Georgia, Moldova and Ukraine.

However, the literature often distinguishes between two main approaches to estimating elements of fossil fuel subsidies, However, the approaches do not exclude, but complement each other, considering the same phenomenon from two different angles:

- price difference approach for calculating the amount of subsidies to consumers;
- "registry" or "inventory" approach, which consists of identifying and quantifying (where possible) selected consumer and producer support measures that cannot be identified by examining price difference.

Since both approaches are important for analyzing different aspects of fossil fuel subsidies, it is recommended to use both approaches while avoiding double counting of individual measures. Double counting means factoring in the same subsidy in direct (budgetary) and indirect transfers in estimating the total subsidy for a country. To avoid double counting, it is necessary to determine which calculation (price difference method or inventory method) best reflects the value of the subsidy and include it in the total subsidy amount, It is because of the risk of double counting that it is very important to have disaggregated information on individual subsidy measures.

The OECD follows a registry approach, evaluating individual support measures for energy consumers and producers. The OECD is the only organization to make a statistically clear distinction between subsidies to consumers and subsidies to producers, classifying support measures according to who benefits. The OECD defines *consumption* as "the stage at which fuel is burned, whether in motor vehicles, stationary engines, heating equipment or power plants." The concept of "production" includes a) exploration and extraction; b) transportation and storage; and 3) refining and processing.

The IEA uses the price difference approach to estimate the amount of consumer subsidies. The advantage is the ability to estimate total subsidies and their breakdown by 4 sectors. This enables the use of sectoral estimates in the model calculations, albeit on a limited scale, given that there are no producer subsidies in the IEA estimate.

The disadvantage of the price difference approach is that it provides an overall estimate of subsidies, which does not enable determining measures that affect the formation of the price difference, as well as identifying specific subsidies that do not directly affect prices. This is what is needed now for Uzbekistan, which is at the beginning of work in analyzing the effects of fossil fuel subsidies.

The IMF uses an estimate of consumer subsidies based on a price difference approach, adding the OECD's estimate of producer subsidies. The IMF's approach is somewhat complicated as it is tied to the estimation of pre– and post-tax subsidies.

*Producer/consumer support assessment method (OECD approach).* To remedy the short-comings of the price difference method, a method was developed that combines the calcu-lation of price difference and the estimation of producer subsidies – the *Producer Support Estimate (PSE)* method (Formula 3).

This method was originally developed for use in agriculture. The details of the calculation are contained in the OECD document "PSE Handbook"[70], which includes: 1) indicators of the price difference method (market price support provided to producers, i.e. MPS market price support); 2) other transfers (budget transfers; lost revenues of the state and other economic agents).

[70] Producer support estimates and related indicators of agricultural support: concepts, calculations, interpretation and use (PSE Handbook), 2010.

**FORMULA 3. CALCULATION OF THE PRODUCER SUPPORT ESTIMATE (PSE)**

**PSE=MPS+BOT**

where:

**PSE** - producer support estimate;

**MPS** - [producer] market price support;

**BOT** - budget and other transfers

**MPS** is a measure of price difference, measured as: **MPS=(DP–BP) *PV,** where:

**DP** – internal price (as a rule, the selling price of the producer, that is, the price at the mouth of the mine shaft, at the wellhead, oil refinery);

**BP** – border price (reference price);

**PV** – production volume.

*Source: OECD*

To remedy the shortcomings of the price difference method, a method was also developed that combines the calculation of the price difference and the estimation of the amount of consumer subsidies, the *Consumer Support Estimate (CSE)* method. The CSE measures all types of support that affect consumption (transfers to consumers resulting from consumer support policies). However, the OPPR and OPPO methods also have their limitations. In determining budget transfers and revenue shortfalls, a number of issues need to be carefully considered.

First, regarding to *budget transfers*, special care should be taken in determining the PSE to ensure that there is no double counting of support.

Second, the PSE and CSE do not factor in administrative costs of ministries (e.g. salaries, materials and buildings) related to the development, implementation and evaluation of energy subsidy policies. The general rule is that these costs are not included (as they are common to all government entities and, as such, are not strategic transfers), but the situation may vary considerably from country to country.

The calculation of tax expenditures related to excise taxes on fossil fuel consumption also requires attention. In many countries excise taxes are high, but tax expenditures related to excise taxes (e.g., in EECCA countries) are not published. This may be due to the lack of accurate estimation of natural resource rents.

For example, some deposits serve as a source of excess profits that are taxed at higher rates than the standard corporate income tax rate. However, for other, less large/profitable fields, exploration and production decisions may be distorted by high tax rates, therefore, the government may provide tax incentives relative to the standard tax regime.

In general, the PSE and CSE method provides a more accurate picture of subsidies, but it requires a larger data set than the price difference method. Therefore, in countries where there are no publicly available data to estimate the value of certain transfers, the use of this method will be limited.

*General Services Support Estimate (GSSE) method*

The GSSE estimate reflects the amount of transfers made as part of the policy to support energy producers or consumers on a collective rather than individual basis. Such general services support measures are those to support R&D, staff training, inspection activities, marketing and advertising, etc.

### *Total Support Estimate (TSE) method*

The Total Support Estimate (TSE) method accounts for all gross transfers from taxpayers (producers) and consumers less associated budgetary revenues, regardless of their purpose and impact on production and income or energy consumption. There are two methods TSE calculation, both of which can be used to calculate the amount of support:

- **First method:** summing transfers by recipient (transfers to producers, PSE), transfers to general services (GSSE), and transfers to consumers from taxpayers (consumer subsidies);
- **Second method:** summing transfers by source, i,e, transfers from consumers and transfers from taxpayers.

It should be noted that both calculation methods assume that the entire amount of transfers from consumers to someone (producers or the government) is received as budget revenue (e.g., in the form of import duties).

## EXAMPLE OF GAS CONSUMPTION SUBSIDIES ESTIMATION IN 2015 USING THE PRICE DIFFERENCE METHOD FOR COUNTRIES IN THE EECCA REGION

Given the importance of natural gas subsidies for the region, natural gas consumption subsidies in the countries of the region in 2015 were estimated using the price difference method. The estimate revealed significant gas consumption subsidies in Azerbaijan ($1,7 billion) and Ukraine ($3,1 billion). The price difference method found no subsidies in Armenia, Belarus, Georgia and Moldova, However, in Belarus and Georgia, prices for the population are kept below market prices at the expense of commercial consumers.

| Countries | Overall estimate using the price difference method | Base price, USD per 1000 $m^3$ (incl, VAT, but excluding transportation and distribution costs) | VAT exemption | Weighted average price (incl, VAT, adjusted in case of VAT exemption) | Notes |
|---|---|---|---|---|---|
| Armenia | -204 (no subsidies) | 198 (import price USD165 +20% VAT) | No | 295 | All natural gas is imported from Russia, Differentiated tariff depending on the category of consumers. |
| Azerbaijan* | 1,700 (subsidies) | 267 (alternative use price for export USD226 + 18% VAT) | No | 120 | All natural gas is produced domestically. The alternative use price is the price of export to the EU market. |
| Belarus | -593 (no subsidies) | 209 (import price USD174,4 + 20% VAT) | For the public, abolished from January 1, 2016 | 238 | All natural gas is imported from Russia. Cross-subsidization of the population through increased tariffs for commercial consumers. |

| Countries | Overall estimate using the price difference method | Base price, USD per 1000 m³ (incl, VAT, but excluding transportation and distribution costs) | VAT exemption | Weighted average price (incl, VAT, adjusted in case of VAT exemption) | Notes |
|---|---|---|---|---|---|
| Georgia | -64 (no subsidies) | 191 (import price USD162 +18% VAT) | For TPP | 236 | Gas is imported from Azerbaijan and Russia. Cross-subsidization of thermal power plants and the population through increased tariffs for commercial consumers. |
| Moldova | -22 (no subsidies) | 307 (import price USD256 + 20% VAT) | Reduced VAT rate for the population (8% instead of 20%) | 386 | All natural gas is imported from Russia. Differentiated tariff depending on the category of consumers. |
| Ukraine | 3,137 (subsidies) | 332 (import price USD277 + 20% VAT) | No | 195-201 | Some volume of gas is produced in the country, the rest is imported, Import price according to Naftogaz of Ukraine. Domestic price range due to discrepancies in industrial tariff data. |

*Notes: All estimates are for 2015, except for Azerbaijan (for 2014). Data on insurance, transportation and distribution costs were not available, so they are excluded from reference prices. Therefore, estimates derived from the price difference method should be considered as a lower bound for natural gas consumption subsidies. For some countries simplified calculations have been made excluding VAT, which is also factored in the table.*

*Source: OECD (2018)*

## EXAMPLE OF SUBSIDY INVENTORY DATA STRUCTURE TEMPLATE FOR THE NATURAL GAS SECTOR THROUGH THE BOTTOM-UP INVENTORY METHOD USED IN UKRAINE

| | |
|---|---|
| Category | Income or price support → Market price support and market regulation → Establishing regulated prices for the population below the market level |
| Incentivized activities | Natural gas consumption |
| Name of the subsidy | Requirement for state-owned national gas producers to sell gas at regulated prices to meet the needs of the population |
| Administrative level | National |
| Legislative act/body | Art, 10 of Law No, 2467-VI from 2010; (Verkhovna Rada, 2010b) |
| Purpose of public policy | Ensuring reliable gas supply to the population and keeping tariffs at a low level |
| End beneficiaries of the grant | Population |
| Period of application | At least from 2001 to 2016 |
| Brief information | According to Law No, 2467-VI (2010) "On the Fundamentals of Natural Gas Market Functioning", state-owned enterprises (with a state share in the authorized capital of 50% or more) were obliged to sell all gas produced in Ukraine to the population at regulated tariffs set by the National Commission for State Regulation in the Sphere of Energy and Utilities (Verkhovna Rada, 2010b).<br>As of October 2015, this law became invalid due to the adoption of the new Law No, 329-VIII (2015) "On the Natural Gas Market", and the government decided to increase the wholesale gas price for domestic producers to the market level (based on import parity) from May 2016 (Verkhovna Rada, 2015b). However, the provisions obliging Ukrgasvydobuvannya to sell produced gas to meet the needs of the population are still in force, which was confirmed by the Cabinet of Ministers Resolution No, 758 dated October 1, 2015 (Cabinet of Ministers, 2015a).<br><br>The volume of this type of implicit subsidy to the population is estimated as a lost profit of national producers (i,e,, additional revenue that could have been received as a result of gas sales in a fully liberalized market). The calculations utilized data on the average annual gas price in the EU market, purchase prices for gas produced by Ukrvydobuvannya and Chornomornaftogaz set by the National Commission for State Regulation in the Sphere of Energy and Utilities (NCSREU), as well as gas production volumes in Ukraine. |
| Amount of the granted subsidy | 2012: UAH 43,2 billion (USD5,4 billion)<br>2013: UAH 44,5 billion (USD5,6 billion)<br>2014: UAH 36,7 billion (USD3 billion)<br>2015 (preliminary): UAH 53,9 billion (USD$2,5 billion) |
| Information sources | World Bank (2015), Naftogaz (2015c) and NCSREU resolutions on setting purchase prices for gas produced by Ukrgazvydobuvannya and Chornomornaftogaz in Ukraine. |

*Source: OECD, 2018.*

## EXAMPLE OF ESTIMATING THE SIZE OF SUBSIDIES USING THE GENERAL SUPPORT METHOD FOR THE HARD COAL SECTOR IN SPAIN (IN MILLION EUROS, IN NOMINAL TERMS)

| Support element | Adm, level | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011* |
|---|---|---|---|---|---|---|---|---|
| Producer support estimate | | | | | | | | |
| Support for specific revenues | | | | | | | | |
| Operational assistance to coal mining enterprises | Central | 296 | 284 | 284 | 267 | 253 | 250 | 231 |
| Subsidies for inter-basin coal transportation | Central | 4 | 7 | 7 | 11 | 14 | 13 | 0 |
| Operational assistance to the «HUNOSA» company ** | Central | 89 | 85 | 85 | 85 | 80 | 76 | 72 |
| Income Support | | | | | | | | |
| Adaptation assistance to coal mining enterprises | Central | 42 | 20 | 35 | 40 | 40 | 10 | 6 |
| Consumer support | | | | | | | | |
| Funding for coal dumps | Central | 8 | 3 | 3 | 3 | 6 | 13 | 0 |
| General Services Support | | | | | | | | |
| Accumulated liabilities related to coal mining | Central | 258 | 275 | 290 | 303 | 328 | 336 | 327 |

*Notes:*
** y – "conditional";*
*** HUNOSA is a large state-owned enterprise engaged in the extraction of hard coal in the Asturian coal basin.*

*Source: OECD (OECD, 2012).*

## EXAMPLE OF AN INVENTORY OF DIRECT FINANCING (DIRECT OR INDIRECT TRANSFER OF PUBLIC FUNDS, OR OBLIGATIONS FOR SUCH A TRANSFER)

### Evaluation form for Gazprom JSC's subsidy to cover the price difference in connection with the gasification of the Russian Far East

| | | | |
|---|---|---|---|
| Category | Direct or indirect transfer of funds, or obligations for such a transfer. Direct financing of the government-earmarked financing of activities related to the extraction of fossil fuels | | |
| Incentivized activities | Infrastructure development | | |
| Name of the subsidy | Subsidies to Gazprom JSC to cover the difference between the gas purchase price from the Sakhalin-2 project operator and the gas price set at the entrance to the «Sakhalin – Khabarovsk – Vladivostok» gas transmission system for the purpose of supplying gas to energy sales organizations in the Far East region. | | |
| Administrative level | Federal | | |
| Legislative act/body | Law on the federal budget adopted by the Federal Assembly of the Russian Federation | | |
| Purpose of public policy | Stimulating gasification of the Russian Far East by compensating Gazprom JSC's expenses for the construction of the «Sakhalin – Khabarovsk – Vladivostok» gas pipeline | | |
| End beneficiaries of the grant | Gasprom JSC | | |
| Application period | 2011–2013 | | |
| Brief information | Subsidies to Gazprom JSC are provided for in the federal budget, which is the responsibility of the Russian Ministry of Finance. Currently, the fuel and energy balance in the Russian Far East is dominated by coal, which is produced in the region itself, as well as imported fuel oil from Siberia. The decision to switch the energy sector of the Russian Far East to gas, despite the high capital costs for the companies, is largely a political choice, which has led to the provision of these subsidies to Gazprom JSC. Royalty payments under production sharing agreements for the Sakhalin-1 and Sakhalin-2 projects have been identified as the source of funds for these subsidies for the gas company. The subsidy was actually provided to Gazprom JSC to compensate for the construction costs of the «Sakhalin – Khabarovsk – Vladivostok» gas pipeline. Nevertheless, this measure can be seen as a subsidy for production, as Gazprom JSC is a monopoly in both gas production and transportation, and all of its revenues are recycled. | | |
| The amount of the granted subsidy | 2011: RUB 1,885,7 million ≈ USD65,9 million | 1 885,7 млн руб. | ≈ 65,9 млн долл. |
| | 2012: RUB 11,162,4 million ≈ USD388,9 million | 11 162,4 млн руб. | ≈ 388,9 млн долл. |
| | 2013: RUB 11,493,5 million ≈ USD390,9 million | 11 493,5 млн руб. | ≈ 390,9 млн долл. |

*Source: Gerasimchuk I. V. State Support for Oil and Gas Production in Russia: At What Cost? A study by the World Wildlife Fund (WWF) and the Global Subsidies Initiative of the International Institute for Sustainable Development (IISD), Moscow – Geneva: WWF Russia and IISD, 2012.*

# ANNEX 5. UNECE FRAMEWORK APPROACH FOR SELECTING EVALUATION CRITERIA OF WORLD EXPERIENCE IN ENERGY EFFICIENCY

| Policy | Policies (best practices) | Strategy criteria | | | |
|---|---|---|---|---|---|
| | | Results | Synergy | Consistency | Marketability |
| Inter-sectoral policy: Control | Favorable regulatory framework | ✓ | ✓ | ✓ | ✓ |
| | National strategies, plans and targets | ✓ | ✓ | ✓ | ✓ |
| | Institutional mechanisms: dedicated energy efficiency agencies | ✓ | ✓ | ✓ | ✓ |
| | Coordination mechanisms | ✓ | ✓ | ✓ | ✓ |
| | Cities and regions | ✓ | ✓ | ✓ | ✓ |
| | Statistical records and evaluation | ✓ | ✓ | ✓ | ✓ |
| Inter-sectoral Policy: Financing | Loan co-financing under the auspices of the state or the Ministry of Finance | ✓ | ✓ | ✓ | ✓ |
| | Public-private financing, including ESCOs | ✓ | ✓ | ✓ | ✓ |
| | Financial guarantees, risk sharing | ✓ | ✓ | ✓ | ✓ |
| | Tax exemptions, discounts | ! | ✓ | ✓ | ✓ |
| | State subsidies | ! | ✓ | ✓ | ✓ |
| | Funding from international climate funds | ✓ | ✓ | ✓ | ✓ |
| Policy on utilities | Cost-reflective tariffing of utility services | ✓ | ✓ | ✓ | ✓ |
| | Regulatory targets for improving energy efficiency | ✓ | ✓ | ✓ | ✓ |
| | Utility ESCOs | ✓ | ✓ | ✓ | ✓ |
| | White Certificates of Utilities | ! | ✓ | ✓ | ! |
| | Funds allocated through the MoF to improve the energy efficiency of utilities | ✓ | ✓ | ✓ | ✓ |
| | Voluntary energy efficiency programs | ✓ | ✓ | ✓ | ✓ |
| Household policy, Residential buildings and electrical appliances | Thermal insulation of residential buildings and their adaptation to local climatic conditions | ✓ | ✓ | ✓ | ✓ |
| | MEPS, energy codes for residential buildings under construction and existing buildings | ✓ | ✓ | ✓ | ✓ |
| | Energy efficiency certification | ✓ | ✓ | ✓ | ✓ |
| | MEPS and appliance labeling | ✓ | ✓ | ✓ | ✓ |
| | Testing of high-efficiency appliances | ✓ | ✓ | ✓ | ✓ |
| | Energy efficient lighting | ✓ | ✓ | ✓ | ✓ |

| Policy | Policies (best practices) | Strategy criteria | | | |
|---|---|---|---|---|---|
| | | Results | Synergy | Consistency | Marketability |
| Transportation: passenger and freight | Transport Taxes and User Fees | ✓ | ✓ | ✓ | ✓ |
| | Fuel Efficiency Standards and Labeling (FESL) for Light Duty Passenger Vehicles (LDPTs) | ✓ | ✓ | ✓ | ✓ |
| | Fuel Economy Standards and Labeling (FESL) for Heavy Duty Vehicles (HDVs) | ✓ | ✓ | ✓ | ✓ |
| | Eco-driving | ✓ | ✓ | ✓ | ✓ |
| | Public transport and energy-saving modes of transportation | ✓ | ✓ | ✓ | ✓ |
| Business sector: Industry and trade | Energy management, including ISO 50001 | ✓ | ✓ | ✓ | ✓ |
| | Commercial buildings | ✓ | ✓ | ✓ | ✓ |
| | Capacity building in energy management | ✓ | ✓ | ✓ | ✓ |
| | Small and medium-sized enterprises (SMEs) | ✓ | ✓ | ✓ | ✓ |
| | MEPS of production equipment | ✓ | ✓ | ✓ | ✓ |
| | Voluntary agreements | ✓ | ✓ | ✓ | ✓ |
| | Innovation in production and export | ✓ | ✓ | ✓ | ✓ |

*Notes:*
*A check mark (✓) indicates that the policy meets this criterion.*
*Exclamation point (!): This criterion requires special attention when implementing the appropriate policy.*

*Source: Energy Efficiency Policies: Best Practices, UNECE Energy for Climate Change Mitigation and Sustainable Development Series, New York and Geneva, 2015.*