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ENERGY POLICIES OF
GERMANY, FINLAND AND RUSSIA
Building sector

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DESCRIPTION

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Name of the bachelor's thesis Energy policies of Germany, Finland and Russia			
Abstract <p>Significant increase of energy consumption connected with economic development and population growth is expected the next few decades. It can lead to the pressure increase on the energy consumption system. It also leads to increased attention to efficient use of energy. The depletion of energy resources as the global problem appeared in 1970s, after the first energy crisis. After that, a lot of countries started to take arrangements to provide energy savings.</p> <p>The first aim of the bachelor's thesis is to find out the similar aspects and the different aspects of the energy policies of Germany, Finland and Russia. The second aim is to make suggestions how the Russian energy policy could be improved. The aims will be considered in terms of structure of presentation, fullness and depth of suggested organizational and technical measures with introduced indicators.</p> <p>Firstly, prerequisites of the problem are given. The changes in energy consumption of the countries and the events that have a great influence on energy policies are discussed in this part. Secondly, laws, federal acts, directives containing the aims and measures of energy policies are given. The basic information of energy policies is presented in this part. Thirdly, aspects of energy policy of each country are given. The more detailed information of energy savings measures of energy policies of Germany, Finland, and Russia are presented in this part. Fourthly, comparing data are given. The similar and different aspects of the energy policies of the countries are represented in this part.</p> <p>The conclusion is the energy policy of Finland is more developed than the German energy policy, and both of them are more developed than the energy policy of Russia. The structures of presentation of Finland and Germany are more convenient than the Russian structure. The identification of more good - enough solutions for improvement of Russian energy policy is defined with addition of assessment of the impact on energy savings. The second possible improvement is more detailed development of indicators. The fullness and depth of suggested organizational and technical measures of Russia can be provided with information about assessment of the impact on energy savings.</p>			
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1 INTRODUCTION

Significant increase of energy consumption connected with economic development and population growth is expected the next few decades. It can lead to the increasing pressure on the energy consumption system. It can also lead to increased attention to efficient use of energy. The availability of energy resources is a key factor for economic development and it promotes improvement of the life quality.

The issue of energy efficiency is very important in the modern world. People aim at saving energy in different sectors of consumption of energy: transport, industrial, agricultural and, of course, buildings. The term “energy efficiency” is used to describe series of legal, organizational, scientific, production, technical, economic and others measures to decrease the volume of used energy resources on retention of suitable useful effect of their use /1/.

The term “energy policy” is used to describe a system of monitoring energy situation in the country and in the world. One of the aims of energy policy is prediction of possible economic, resource and demand trends. The other aims are formation and ongoing improvement of organizational, economic and legal mechanisms which provide reliable energy supply and rational use of natural fuel and energy resources.

The global energy problem is a problem of providing fuel and energy in our days and in the future. Local energy crises appeared in pre-industrial economic, e.g. in England in 18th century, it was connected with exhaustion of forest resources and replacing them with coal. But the depletion of energy resources as the global problem appeared only in 1970s.

After that, the International Energy Agency was founded. The main aim of the agency is to create a system of collective energy security. A lot of countries started to take arrangements to provide energy savings. Legislative acts, directives, federal acts, guidelines were adopted. Federal Energy Efficiency Centers started to be founded. And now the energy policies of the countries are improved every day.

1.1 Aims

The issue of energy efficiency in Russia is very discussed in nowadays. Several legislative acts are in force now. But the requirements change too fast and it complicates the implementation of the energy saving measures. Most of measures have a qualitative characteristic, there are a lot of obscure wordings, as distinct from energy efficiency measures of Finland. So the Russian energy policy could be improved by means of energy policies of Finland and Germany, their experiences.

The first aim of the bachelor's thesis is to find out the similar aspects and the different aspects of the energy policies of Germany, Finland and Russia. The second aim is to make suggestions how the Russian energy policy could be improved. The aims will be considered in terms of structure of presentation, fullness and depth of suggested organizational and technical measures.

1.2 Methods

In the research the energy policies of Germany, Finland and Russian Federation will be discussed. The energy policies of Germany, Finland and Russian Federation will be compared with introduced indicators. Also the normative-technical literature review in the field of energy efficiency will be done.

Legislative acts, standards and directives will be studied in the research. The EU Directive 2006/32/EC on Energy End – use Efficiency and Energy Services (ESD) is the main document for European countries Finland and Germany. The Second National Energy Efficient Action Plan of Germany and the Second National Energy Efficient Action Plan of Finland will be used as basic documents in the research. They were made according to the EU Directive 2006/32/EC. The Federal Act No 261 “On energy saving and improving energy efficiency and on making amendments to certain legislative acts of the Russian Federation”, the Government Order of Russian Federation No 175-p “On Energy Strategy of Russia up to 2030“, the Government Order of Russian Federation No 1830 - p “The Plan of Energy Savings Measures and Measures of Improvement of Energy Efficiency in Russia Federation, aimed at realization the federal act “On energy saving and improving energy efficiency and on making amendments to

certain legislative acts of the Russian Federation” will be used as basic documents for Russia.

In the second section of the thesis prerequisites of the problem are given. The changes in energy consumption of the countries and the events that have a great influence on energy policies are discussed in this part. In the third section laws, federal acts, directives containing the aims and measures of energy policies are given. The basic information of energy policies is presented in this part. In the fourth section aspects of energy policy of each country are given. The more detailed information of energy savings measures of energy policies of Germany, Finland, and Russia are presented in this part. In the fifth section comparing data are given. The similar and the different aspects of the energy policies of the countries are represented in this part.

2 BACKGROUNDS

The 20th century is a century of great world events: World Wars, rapid process of industrialization with many new manufacturing processors and ensuring the growth of well-being of the people. The natural resources are the foundation for strong industrial breakthrough, especially energy resources. The well-being of the countries, which own such resources, increased rapidly.

The Organization of the Petroleum Exporting Countries (OPEC) was founded on 14th of September 1960. The OPEC includes Iran, Syria, United Arab Emirates and other countries which export oil. The aims of the OPEC are the support of stable oil prices, the supply of stable oil delivery, coordination of the activities and policy formulation with regard to oil production. /2./

The OPEC was very active in the issue of energy. The first energy crisis happened in October 1973. Energy crisis is a phenomenon where demand for energy resources is exceeding the supply. The OPEC increased the oil prices in protest of USA supports of Israel in the War against Egypt and to influence the world prices. The OPEC controlled only 2% of national oil extraction in 1970, but in 1973 – 20%. In our days the OPEC controls about 2/3 parts of world oil reserves. /3./

After the energy crisis, a lot of countries which are the leaders of world industrial production, for example USA, Great Britain, Germany and others understood their energy dependence. People started to think about energy efficiency. The development of guidelines, federal acts, laws have started.

To show the dynamics of energy consumption of Germany, Finland and Russia the graphs of Total Primary Energy Supply (TPES) will be represented below. The increase of TPES shows the need of energy savings measures. One of the reasons of the decrease of TPES can be the efficiency of energy savings measures. TPES includes production and imports from all sources: coal, peat, crude oil, oil products, natural gas, nuclear, hydro, geothermal etc. The exports, international marine and aviation bunkers and stock changes from all the sources are not included in the TPES.

2.1 Germany

Planning of energy economy of Germany began in the period of energy crisis in 1970s. The ecological problems can be considered as one of the reasons of development of energy policy of Germany. The problems were connected with the CO₂ emissions which is emerging greenhouse effect. The other precondition of energy efficiency was energy dependence, as discussed earlier.

The International Energy Agency gives the related graph of Total Primary Energy Supply (TPES) of Germany, it is shown on the figure 1 /4/. The peaks of TPES in 1973 and 1979 are connected with energy crises. In 1990s TPES decreased, it is connected with intensive reduction of coal consumption in East Germany. Many power stations and plants which used coal were closed /5, p. 70/.

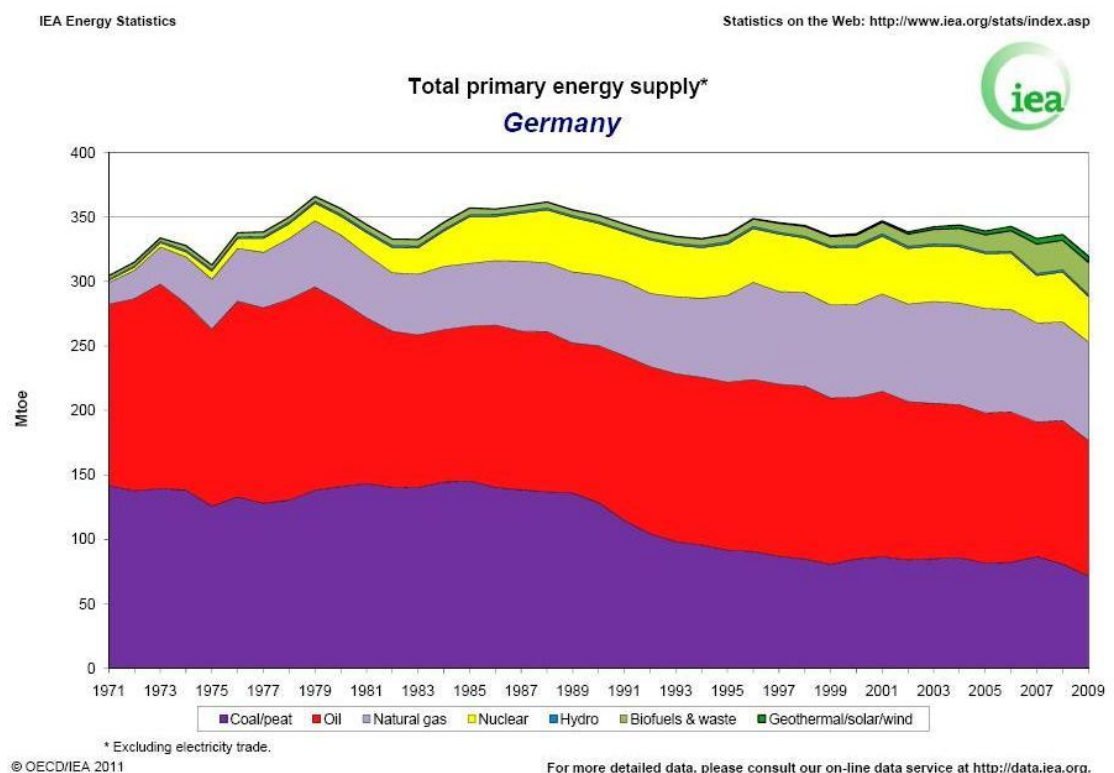


FIGURE 1. Related graph of Total Primary Energy Supply of Germany /4/

2.2 Finland

There are no resources of coal, crude oil, natural gas in Finland. All of them are imported. Finland is highly dependent on the imported energy. So energy supply security is the greatest challenge of Finland. Finland tries to balance the lack of import by using domestic sources: hydro, biomass and nuclear. The International Energy Agency gives the related graph of TPES of Finland, it is shown on the figure 2 /6/.

On account of the cold climate the issue of energy efficiency has been in focus in Finland since the energy crisis of the 1970s. TPES in 1991 decreased, but then it increased until 2004. The value of 2005 is connected with the industrial conflict in forestry industry. The values of 2008 and 2009 reflect the influence of the international financial crisis. The crisis influenced production in energy-intensive sectors. The slump in 2008 also connects with solely mild winter. /7./

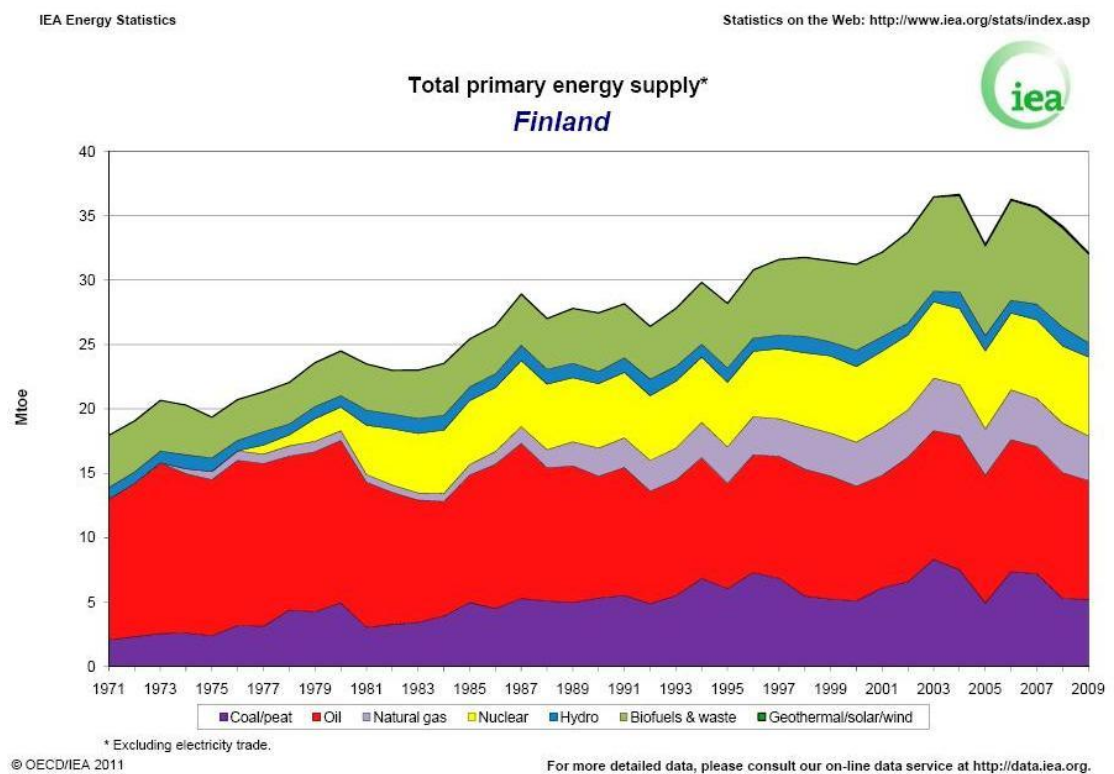


FIGURE 2. Related graph of Total Primary Energy Supply of Finland /6/

2.3 Russian Federation

TPES of Russian Federation decreased by about 330 million tons of oil equivalent (Mtoe) over than last 19 years. But it is not an indicator of energy efficiency policy of Russian Federation. The International Energy Agency gives the related graph of TPES of Russian Federation, it is shown on the figure 3 /8/.

The slump of TPES in the 1990s is connected with the political climate in the country, break-up of USSR. The basic decrease of energy consumption took place in industrial, transport and agricultural sectors, a lot of factories were closed. In 1998 – 1999 the increase of energy consumption began, it was connected with industrial recovery, mainly with the increase of oil extraction. However the national economy was not ready for such changes. So the 1990s can be considered as crucial point for understanding the necessity of energy efficiency.

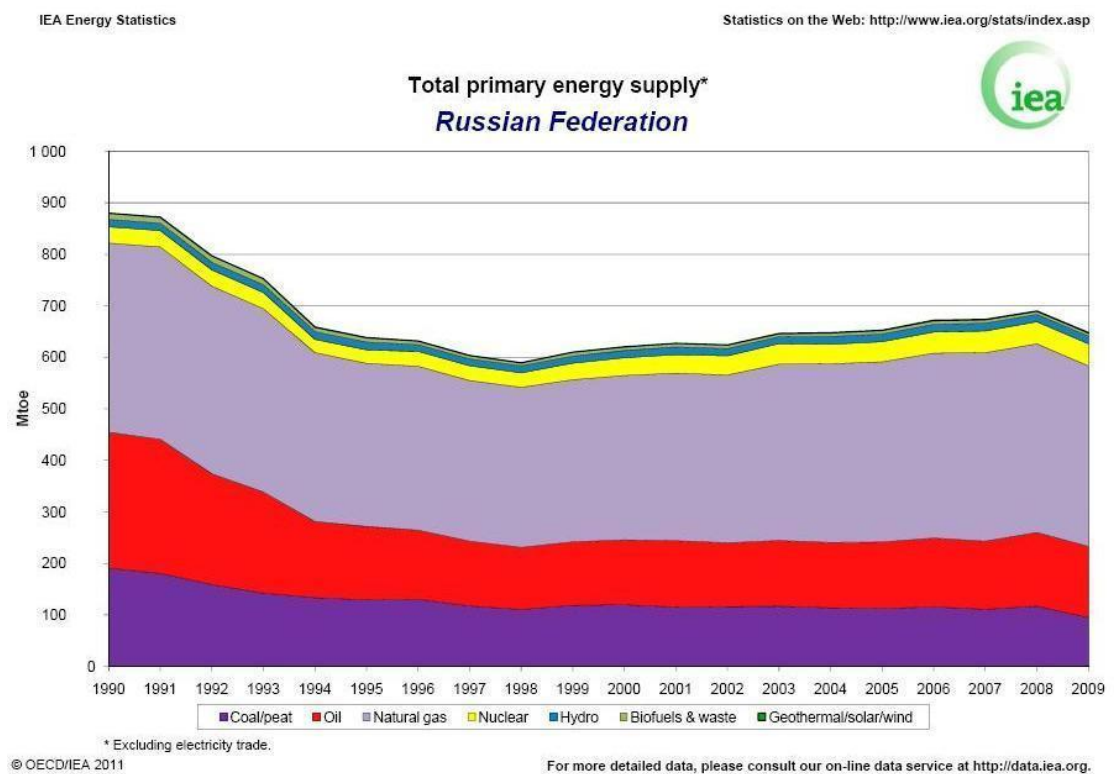


FIGURE 3. Related graph of Total Primary Energy Supply of Russian Federation /8/

3 ENERGY POLICY: LAWS

3.1 Germany

The EU Directive 2006/32/EC on Energy End – use Efficiency and Energy Services (ESD) is the legislative act of the European Union for energy savings. The main energy savings targets for the Member States are represented in the ESD. The ESD includes measures to improve energy services and energy efficiency. The ESD also contains responsibility of national public authority in respect of energy savings and energy efficient procurement. The ESD obliges the Member States to assume the measures by the time fixed: the overall national indicative energy savings targets of 9% for the period between the beginning of 2008 and the end of 2016 (the 9th year of the application of the ESD). /9./

The Concept for environmentally – friendly, reliable and affordable energy supply adopted by the federal government of Germany on 28th September 2010 has the next specific national goals:

1. Decrease of primary energy consumption by 20 % up to 2020 as compared with 2008, and 50% up to 2050 /10, p.5/.
2. Increase of energy productivity by 2,1% for each year up to 2050 (in term of primary energy consumption) /10, p.5/.
3. Decrease of the final energy consumption in the transport sector by about 10 % up to 2020 and by about 40 % up to 2050 as compared with 2005 /10, p.5/.
4. Decrease of electricity consumption by around 10 % up to 2020 and 25 % up to 2050 /10, p.5/.
5. Decrease of the heating requirement of the building stock by 20 % up to 2020 and decrease of primary energy by 80 % up to 2050, presence of almost climate–neutral building stock up to 2050 /10, p.22/.
6. Decrease of the heat requirement orders duplication of the reconstruction rate from approximately 1 % of the total building stock for each year to 2% /10, p.22/.

The Federal Energy Efficiency Center (BfEE) was prescribed at the Federal Office of Economics and Export Control (BAFA) in 2009. The BfEE checks achievement of the indicative energy savings goals, monitors and develops the market for energy audits,

energy services and etc., and prepares the NEEAPs. Second National Energy Efficiency Action Plan (NEEAP) of Federal Republic of Germany was developed in accordance with the ESD. The Second NEEAP of Germany has 89 individual measures, 43 of them are quantified with references to their energy-saving effects. The measures are mainly at national level. A lot of measures fulfill independently at municipal level or at the level of federal acts, these measures are not mentioned in the Second NEEAP of Germany. /11./

The second part of the Second NEEAP of Germany is about the implementation of energy savings on the end-user and the current common political framework. The third part of the Second NEEAP of Germany is about the strategy for achievement of the indicative energy saving targets and methodological requirements of the ESD. It also includes the specifications and recommendations of the European Commission. The fourth part of the Second NEEAP of Germany is about energy savings and energy efficiency in Germany in different sectors. It also contains trend and quantified measures, and further projects and measures. The fifth part of the Second NEEAP of Germany is about market for energy related services in the country, energy audits, contracting, energy and climate protection agencies. The sixth part of the Second NEEAP of Germany is about outlook – planned measures for various areas for action. /11./

3.2 Finland

The issue of energy efficiency has been in focus in Finland since energy crisis of the 1970s. The measures of voluntary character acquire special importance in the energy policy. Only in 1990s mid-term scenario planning was begun. The two mid-term energy strategies were used in the capacity of the foundation for the first National Energy and Climate Strategy adopted by the government in 2001. Since that time the issue of energy efficiency reached a new level.

The Long-term Climate and Energy Strategy of Finland was reported to the European Parliament on 6th of November 2008. The European Parliament adopted the strategy in June 2009. The goal of the strategy is to provide a foundation for the Government's

statements not only in European Union negotiations and other international contexts, but also in the preparation of the domestic policy /12, p.3/.

The main focus of the strategy is the measures and the guidelines up to 2020 and 2050 /12, p.3/. One of the targets is increase the use of renewable energy to 38 % /12, p.3/. The end – use and energy saving targets are the next:

1. Decrease of the energy end – use by about 11 % up to 2020, and by about 58% up to 2050 as a vision /7/.
2. Decrease of the energy end – use for electricity by about 5 % up to 2020, and up to about 68 % by 2050 as a vision /7/.
3. Decrease of the total primary energy consumption by about 10 % up to 2020, and by about 15% up to 2050 as a vision /7/.

The ESD Implementation Group was prescribed by the Climate and Energy Policy Ministerial Working Group Network in 2006. The ESD Implementation Group was responsible for the preparation of the Finland's Second National Energy Efficiency Action Plan. The experts of the Ministry of Employment and the Economy, the Ministry of Transport and Communications, the Ministry of Agriculture and Forestry, the Ministry of Finance, the Ministry of Environment, the National Land Survey of Finland, Motiva Oy took a part in the preparation of the Second NEEAP of Finland. The Second NEEAP of Finland compiles as complete as possible all continuing and completed energy – efficiency measures which promote energy savings in the country. /7./

The second part of the Second NEEAP of Finland is about starting points, energy use, the place of energy savings and energy efficiency in Finland's energy policy. It also includes the national energy efficiency and energy savings targets. The third part of the Second NEEAP of Finland is about energy saving measures and their impact in terms of energy savings in different sectors, e.g. buildings, service, transport etc. The forth part of the Second NEEAP of Finland is about other responsibility of the ESD: responsibility of energy companies, measures of improvement energy efficiency in public sector, etc. The fifth part of the Second NEEAP of Finland is about reporting under the energy performance of the buildings Directive (EPBD): nearly zero – energy

buildings, alternative measures of inspecting air-conditioning and heating systems, etc. /7./

The Second NEEEEAP of Finland has about 50 individual measures to promote energy efficiency. The Second NEEEEAP of the country calculated the influence on energy savings of 36 measures, 34 of them are intended at the ESD field. /7./

3.3 Russian Federation

November 13, 2009 the Government Order of Russian Federation No 175-p “On Energy Strategy of Russia up to 2030” went into effect. The Strategy of Russia forms new guidelines of energy sector within transition of Russian economy on innovation way of development. It is done according to the Concept of Long – term Socio – economic Development of Russian Federation up to 2030. The Strategy of Russia defines the aims and tasks of the development of the energy sector of the country. It also defines the priorities, mechanisms of the state energy policy at the different stages of its realization. The Strategy of Russia has two main aims. The first main aim of the Strategy of Russia is as efficient as possible use of natural energy resources and potential of energy sector for sustainable growth of economy. The second main aim is the increase of life quality of population and support for strengthening the external economic positions of the country. The targets in fuel and energy sector are the next:

1. Decrease of gas share in the consumption of primary fuel and energy resources by 6 % up to 2030.
2. Increase of not fuel energy sources in the consumption of primary fuel and energy resources by at least 6 % up to 2030.
3. Decrease of specific power intensity of energetic in 2,1 – 2,3 times.
4. Increase of processing depth of oil by 11 % up to 2021 and by about 18 % up to 2030.
5. Decrease the share of boiler houses in heat production of district heating systems by 9 % up to 2030.
6. Decrease of specific heat losses by 9 % up to 2030, so the fuel saving will be about 40 Mtoe /13./

The main organizational and energy potential of energy savings is about 40 % of internal energy consumption of Russia. 18 – 19 % are for residential houses. 13 – 15 % are for industry, power industry and transport. 9 – 10 % are for service industry and engineering. 5 – 6 % are for fuel production, energy supply of public offices and burning of casing – head gas. 3 – 4 % are for agriculture. /13./

The realization of the State Energy Policy of Russia is planned to be realized in 3 stages to coordinate the work. The first stage is the stage of way out of the crisis and the forming of the foundation of the new economy of Russia. The timescale of the end of the first stage is about 2013 – 2015, it will be defined with the scale of crisis consequence and the rate of their overcoming. The second stage is the stage of transition to the innovation development and formation of the infrastructure of the new economy of Russia. The timescale of the end of the second stage is about 2020 – 2022. The third stage is the stage of development of innovation economy of Russia. The timescale of the end of the third stage is 2030. /13./

The second part of the Strategy of Russia is about ongoing results and the targets and tasks up to 2030. The second part of the Strategy of Russia is about basic trends and predictive estimates of the socio – economic development of Russia up to 2030. The fourth part of the Strategy of Russia is about outlook for Russian energy resources. The fifth part of the Strategy of Russia is about the state energy policy. The sixth part of the Strategy of Russia is about outlook and strategic initiatives of development of the fuel and energy sector. The seventh part of the Strategy of Russia is about regional and intersectional aspects of the development of the fuel and energy sector. The last, eighth part of the Strategy of Russia is about predicted results and realization of the system of the Strategy. /13./

November 23, 2009 the Federal Act of Russian Federation No 261-FZ “On energy saving and improving energy efficiency and on making amendments to certain legislative acts of the Russian Federation” went into effect. The Federal Act regulates relations in the field of energy saving and improvement of energy efficiency. /14./

December 1, 2009 the Government Order of Russian Federation No 1830 - p “The Plan of Energy Savings Measures and Measures of Improvement of Energy Efficiency

in Russia Federation, aimed at realization the federal act “On energy saving and improving energy efficiency and on making amendments to certain legislative acts of the Russian Federation” went into effect. The Plan includes the energy saving measures, players responsible for and participating in implementation and the dates the measures should be done before. The players are from different Ministries, e.g. the Ministry of Energy of Russia, the Ministry of Economy Development of Russia, the Ministry of Region Development of Russia and etc. /15./

4 ENERGY POLICY: ENERGY SAVINGS MEASURES

4.1 Germany

Building sector stock of Germany can be named quiet efficient, primarily because it is relatively new. A lot of building in the East of the country were destroyed or left. The building codes of Germany are quiet strong. The energy savings in building sector is a major target of the government. /16, p.56/.

Verifications and measurements of energy saving use a top – down and bottom – up calculation methods /11/. All ongoing measures of the Second NEEAP of Germany are performed below.

4.1.1 Energy saving ordinance

The regulatory law Energy Saving Ordinance (EnEV) went into effect in 2002. It was amended in 2009. The end date is not determined. The EnEV includes requirements of envelope of buildings and heating and air conditioning systems for residential and non – residential buildings. /11./

The residential and non – residential buildings to be constructed should not transcend the annual primary energy demand for ventilation, heating and etc. of similar buildings of the same geometry. The envelope and engineering systems of the buildings should meet the minimum requirements. The total energy saving for residential buildings from 1995 to 2016 is 236,1 PJ/a (65 583,3 GWh/a). The total energy saving for non – residential buildings from 1995 to 2016 is 98,3 PJ/a (27 305,6 GWh/a). /11./

4.1.2 KfW energy – efficient redevelopment

The funding Energy – Efficient Redevelopment program of Reconstruction Credit Institute (KfW) banking group went into effect in 2009. The end date is not determined. The aim of the program is to promote complete redevelopment into “KfW efficiency houses” or special measures to improve energy efficiency. /11./

The program includes the federal budget funds, loans and grants of the building stocks. The predominant building standard is transcended: KfW efficiency houses 115, 100, 85, 70, 50; and they meet minimum requirements of specific measures up to maximum EUR 50 k per housing unit (HU). The program also includes: energy efficiency redevelopment, complete redevelopment up to maximum EUR 75 k per HU, reward bonuses (maximum 12,5 %) and grants (maximum 17,5 %). The total energy saving from 1995 to 2016 is 52 PJ/a (14 444,4 GWh/a). /11./

4.1.3 KfW energy – efficient construction

The funding Energy – Efficient Construction program of KfW banking group went into effect in 2009. The end date is not determined. The program includes the federal budget funds, loans and grants of new buildings. The predominant building standard is transcended: KfW efficiency houses 70, 55 and 40. The program also includes: energy efficiency construction, maximum EUR 50 k per HU, reward bonuses (maximum 10 %) . The total energy saving from 1995 to 2016 is 6,9 PJ/a (1916,7 GWh/a). /11./

4.1.4 Market incentive program for promotion of the use of renewable energies

The funding Market Incentive Programme for Promotion of the Use of Renewable Energies went into effect in 1999. The end date is not determined. The aim of the program is to support renewable energy, not only sale technologies, but also use of the sources in existing residential and non – residential buildings. The program consists of two schemes: Federal Office of Economics and Export Control (BAFA) – component and KfW – component. /11./

The BAFA – component is the funding of investment grants or subsidies by Federal Government. The investments by BAFA promote construction of efficient heat pumps, biogas combustion systems, solar energy systems. The total energy saving from 1995 to 2016 is 39,9 PJ/a (11 083,3 GWh/a). /11./

The KfW – component is the funding of reward bonuses by the KfW banking group. Grants of the KfW – component are low – interest long – financing. The KfW funds large solar energy installations. The total energy saving from 1995 to 2016 is 0,1 PJ/a (27,8 GWh/a). /11./

4.1.5 Federal states' activities in the buildings sector

This measure includes several programs of different German Federal states. The type of the measure is funding. The program went into effect in 1995. The end date is not determined. The total energy saving from 1995 to 2016 is 6,2 PJ/a (1 722,2 GWh/a). /11./

“The Federal states' activities are:

- Bavarian modernization programme (Bavaria);
- Major modernization programme – Programme B (Hamburg);
- Climate protection programme plus component funding – Programme A (Hamburg);
- Thermal insulation in the building stock (Hamburg);
- State programme for housing funding, modernization/ restoration (Mecklenburg – Western Pomerania);
- Funding of subsidies housing (Lower Saxony, North – Rhine Westphalia, Rhineland – Palatinate);
- Schleswig – Holstein fund: energy optimized building redevelopment (Schleswig - Holstein);
- Progress.nrw, market launch (North – Rhine Westphalia);
- Climate Protection Plus Programme, General CO₂ Reduction Programme (Baden - Württemberg)”. /11./

4.1.6 BAFA On – site construction

The types of the measure are motivation, information and communication. The measure has been applied from 1998. The end date is not determined. Funding is made available for on – site consultations by energy consultants. The consultations totally deal with heat generation and distribution, structural thermal insulation, use of renewable resources. The consultations which are added with recommendations for saving electricity or air tightness inspection according to DIN 13829 have additional funding. The total energy saving from 1995 to 2016 is 2,3 PJ/a (638,9 GWh/a). /11./

4.1.7 Energy certificate

Energy certificates should be made for new buildings by every owner since 1995. The type of the measure is a regulatory law. Further to this, since 2009, the sellers and lessors have to make energy performance certificates of new buildings or old buildings which are to be rent, let or sold. The certificates have to be given the interested parties in the case of leasing, selling at the latest on demand. The energy performance certificate have to contain the most important information about the building: current level of energy efficiency, type of the building, years of construction of building and construction of installation engineering (or construction of heat generating unit and air-conditioning system for non – residential building), usable surface area, and type and percentage of renewable energies. Also the energy performance certificate includes recommendations for renovation. /11./

There are two types of energy certificates: the needs – oriented performance certificate and the consumption – oriented performance certificate. The needs – oriented performance certificate is based on the calculated energy requirements. The consumption – oriented performance certificate is founded on the recorded energy consumption. The both types of certificates are in use. /11./

4.1.8 Law on the promotion of renewable energies in the heating sector

The Renewable Energies Heating Act went into effect in 2009. It was amended in 2011. The end date is not determined. The type of the measure is a regulatory law. It

requires use of renewable energies, e.g. heat pumps or solar energy, compensative measures, e.g. use of waste heat. /11./

According to this law the owners of new residential or non – residential buildings are obligated to use renewable energies as a part of heating or cooling. The requirements also are applied to existing public buildings. The German Government supports the program. It helps the owner of existing buildings with capital grants for small installation or redemption grants and low – interest loans for large installations. /17./

4.1.9 Heating costs ordinance

The Heating Costs Ordinance went into effect in 1981. The Ordinance was amended in 2009. The end date is not determined. The type of the measure is a regulatory law. The law imposes requirements on allocation of energy consumption, e.g. water heating and heating costs, consumption metering and also technical equipment for the metering to provide economical use of energy. /11./

4.1.10 Ordinance on small and medium – sized firing installations

The Federal Immission Protection Act went into effect in 1988. The end date is not determined. The type of the measure is a regulatory law. The Ordinance was amended in 2009. The aim of the law is to protect the environment, people, and animals against injurious effects from noise, vibration, air pollutants, etc. The energy – saving effect is provided because of approbation requirements as regards installations. /11./

4.1.11 Low – energy buildings in the building stock

The German Energy Agency (DENA) began the pilot project ” Low – energy buildings in the stock” in 2003. The end date is not determined. The type of the measure is a promotion. The aims of the project are the dissemination of knowledge of technologies for energy renovation, development of these ideas and their adoption into the market. The other aims are acceleration of transfer of expertise, support of imitation with the use transferable, economically – viable renovation recommendations. /11./

According to this project, more than 330 buildings were renovated, in some cases the components of innovative passive house were used. After the renovation the buildings comply with energy requirements 60 % lower than the level of new buildings. Since 2007 Energy Standard of DENA have required the energy consumption of renovative buildings in 30 % lower than consumption of comparable new building. /18./

4.1.12 Energy hotline and internet platform

The types of the measure are motivation, information and communication. The measure has been applied from 2001. The end date is not determined. The energy hotline and internet platform give the information and explanations about documents, directives, standards of energy efficiency and NEEAPs and referrals to further sources. These tools support the energy efficient market and help consumers or specialists in the field of energy efficiency. /11./

4.1.13 Energy saving guidelines

The types of the measure are motivation, information and communication. The measure has been applied from 2000. The end date is not determined. The guidelines were written for private and public sectors, enterprises by the federal government and the federal states. The aims of the guidelines are motivation and provision with information about increase of energy efficiency. The guidelines are applied in energy efficiency, buildings, procurements, funding. So the guidelines promote increase of awareness and understanding of users. /11./

4.1.14 Energy efficiency initiative

The types of the measure are motivation, information and communication. The measure has been applied from 2002. The end date is not determined. The first aim of the energy efficiency initiative is to pay consumers attention to efficiency use of electricity in different sectors. The second aim is to increase popularity and awareness of energy efficiency technologies for energy use. The fields of actions of the initiative are about 40 millions of households, industry, trade and service sector. According to results of

the Forsa research institution 2003, 61 % of the householders assumed the measures to save energy in 2009. /11./

4.1.15 “Future of housing” campaign

The types of the measure are motivation, information and communication. The measure has been applied from 2002. The end date is not determined. The means of the goals achievement are public relations, internet, press, congress – at house engineers, architects, owners, leaseholders and also municipalities and building sector. The goals of the measure are to create products and services which provide more available and simple energy efficient construction and renovation. /11./

4.1.16 Heat from renewable energies

The types of the measure are motivation, information and communication. The measure has been applied from 2006. The end date is not determined. The project of heat from renewable energies is a continuation of the other project of the German Energy Agency “Solar heat plus initiative”. The goal of the project is to carry information about use of renewable energy sources in constructive sector to owners, leaseholders. The means of the goals achievement are public relations, press, and internet. /11./

4.2 Finland

The efficiency of building sector is one of the areas for particular focus. In spite of the toughness and increase in building standards, the building codes of Finland are not as strong as the codes of its neighbors /19, p.50/. The top – down and bottom – up calculation methods are used to assess the impact on energy savings. All ongoing measures of the Second NEEAP of Finland are represented below.

4.2.1 Energy efficiency regulations for new construction, 2003, 2008, 2010 and 2012

The measure has been applied from 2003. The end date is not determined. The measure is aimed at energy saving in heating (from 2003), water (from 2003) and electricity

(from 2012). The building companies, designers, independent builders and developers comply with the requirements. The requirements of 1976 for new buildings were amended in 2003 with decrease of energy consumption of the buildings in 25-30 %. The national building codes D3 and D5 define requirements of energy efficiency of the buildings and the ways of calculations of energy consumption. The national building codes C3 and C4 define requirements of heat insulation of the building. The national building code D2 defines requirements of indoor climate and ventilation systems of the buildings. /7./

The air tightness of the building envelope was included in the calculations as new parameter. The efficiency of heat recovery in ventilation systems was increased by 30%, the U – values were decreased by 30 % in comparison with requirement 2003. The E – ratio of the buildings should be lower than the maximum value for the same type of the building conformity with the norms. The total energy saving from 2010 to 2020 is 12 820 GWh/a (46,2 PJ/a). /7./

4.2.2 Energy subsidies for residential buildings

The measure has been applied from 2003. The end date is not determined. The measure is aimed at energy saving in heating. The owners of residential buildings comply with the requirements. /7./

The subsidies are granted for the renovation of the residential buildings every year. The subsidies are appropriated to adaptation the heating methods which use renewable energy sources, correction of radiators in multi – storey buildings, reduction of harmful emissions. The subsidies are also granted for low – income one – family houses, energy surveys of residential buildings, construction of heat recovery of ventilation systems, connection to district heating. The total energy saving from 2010 to 2020 is 2 292 GWh/a (8,3 PJ/a). /7./

4.2.3 Heat pump for one – family houses

The measure has been applied from 2000. The end date is not determined. The measure is aimed at energy saving in heating, electricity and fuel. The owners of one – fam-

ily houses comply with the requirements. Since 2001, the owners of the buildings can get tax deduction for installation of the heat pump. The tax deduction can be no more 60 % of the cost of the installation and no more EUR 3 000/pa (in 2011) per person. The installation of the heat pumps is one of the key measures to achieve the national target of 38 % of use of renewable energy resources. The one – family houses were outfitted with about 335 000 heat pumps at the end of 2010. The total energy saving from 2010 to 2020 is 14 596 GWh/a (52,5 PJ/a). /7./

4.2.4 Heat pumps for town houses and multi – storey buildings

The measure has been applied from 2000. The end date is not determined. The measure is aimed at energy saving in heating and electricity. The town houses and multi – storey buildings are under the requirements. The householder can make the tax deduction, similarly to measure “Heat pumps for one – family houses”, if the individual householders did the procurement, not the housing association. The town houses and multi – storey buildings were outfitted with more than 50 000 at the end of 2010. There are used geothermal heat pumps, air to air heat pumps, air to water heat pumps and exhaust air heat pumps. The total energy saving from 2010 to 2020 is 1 145 GWh/a (4,1 PJ/a). /7./

4.2.5 Mandatory water meters for houses

The measure has been applied from 2011. The end date is not determined. The measure is aimed at energy saving in heating, fuel, water and electricity. The owners of residential buildings comply with the requirements. The water meters should be installed in the each building to measure cold and hot water arrived in the building. The water meters help to monitor water consumption, to use the data for paying bills. The total energy saving from 2010 to 2020 is 202 GWh/a (0,73 PJ/a). /7./

4.2.6 Energy labeling of windows

The measure has been applied from 2006. The end date is not determined. The measure is aimed at energy saving in heating, fuel and electricity. The builders and decorators are under the requirements in new constructions and renovation. The energy label-

ing of windows is a consequence of development of funding project by businessmen and Ministries of Employment and Economy. The aim of the measure is to reach the harmony of builders' and decorators' choices between different windows solutions. The labeling scale is from A (A+, A++) to G like the energy scale of household appliances. The windows are responsible for 15 – 20 % of heat losses, they are the weakest place in the building envelope in terms of heat insulation. The total energy saving from 2010 to 2020 is 268 GWh/a (0,97 PJ/a). /7./

4.2.7 Höylä III energy efficiency agreement – oil heated one family houses

The measure has been applied from 2008. The end date is in 2016. The measure is aimed at energy saving in heating and fuel (oil). The oil – heated one – family houses are under the requirements. Since 2001, the owners of the buildings can get tax deduction for renovation the oil – heating systems. The tax deduction can be no more than 60 % of the cost of the installation and no more than EUR 3 000/pa per couple. The Höylä III is a consequence of the Höylä I (1997 – 2001) and II (2002 – 2007). Increase of energy efficiency of houses and oil – heating systems, provision with information and recommendations the consumers about the requirements and motivation of use of renewable energy resources, like solar energy, are the tasks of the program. The total energy saving from 2010 to 2020 is 7 906 GWh/a (28,5 PJ/a). /7./

4.2.8 Energy efficiency agreement for the property sector – residential lettings associations

The measure has been applied from 2010. The end date is in 2016. The measure is aimed at energy saving in heating, electricity, water and fuel. The residential letting stocks owned by residential lettings associations are under the requirements. The energy efficiency agreement consists of two programs: for residential lettings associations and for business premises associations. As of the 1st June 2011, about 80 % of building stock are under the measure. The companies taking part in the program can define the measures of energy improvement for their real estates and equipment production, the implementation of the measures, the support of renter's energy use. The total energy saving from 2010 to 2020 is 298 GWh/a (1,1 PJ/a). /7./

4.2.9 Energy certificates for buildings

Every new building and most of extant buildings in Finland have to have energy certificates. Since 2008, every new building has to have energy certificate. Since 2009 the requirement are applied to extant buildings or their parts, the buildings are sold or rented. The department of building supervisor of the local council has to save the energy certificates in archive. As of 2010, only 10 % of sold buildings hadn't got energy certificates. The energy certificates have to include information about energy efficiency of the buildings, possible measures of energy efficiency improvement. /7./

4.2.10 Environmental and energy classification of buildings

There are three environmental and energy classification systems, which are used in Finland. The classification systems are environmental assessment and classification system Promise, Leadership in energy and environmental design (LEED) and Building research establishment environmental assessment method (BREEAM). The Promise is a national classification of Finland, it is used for residential and office buildings and retail buildings. The LEED and BREEAM are the international classifications used mostly by companies involved in international real estate business. The main goal of the classifications is to approximate the conditions of the buildings to zero – buildings. /7./

4.2.11 Inspection of cooling equipment for air – conditioning system

The measure went into effect in 2008. The cooling equipments have to be inspected at least once in five years. The equipment conditions, efficiency of the equipment and the recommendations of the efficiency improvement are performed in the inspection certificates. According to the “Inspection of cooling equipment for air – conditioning system” the inspectors have to have conforming qualifications, the requirements are presented in the measure text. /7./

4.2.12 Alternative procedure for inspecting boilers

The Energy performance of Building directive (2002/91/EC) and Temporary maintenance work on oil – heating equipment, measures of heating technology, and energy efficiency inspections” specify the requirements for boilers. As of 2011 130 qualified inspectors work in Finland. According to Höylä III about 50 000 of inspections of boilers should be done every year. /7./

4.3 Russian federation

Energy consumption of the buildings in Russia is 43 – 45 % of the whole volume of consumed heating energy, including: 90 % - operation of the buildings, 8 % - production of building materials, 2 % - construction process /20/.

4.3.1 Technical regulation

The development of technical regulations and national standards in the field of energy savings and improvement of energy efficiency on a regional level is started in 2010. The Ministry of Energy of Russia and the Ministry of Industry and Trade are responsible for it. The list of measures in the field of energy savings and improvement of energy efficiency are defined by the same Ministries and by federal authorities interested in it. The part about energy efficiency of the building has to be included into design documentation. /15./

The buildings have to correspond to the energy efficiency requirements, such as specific quantity of energy consumption, architectural, constructive and engineering solutions. The requirements have to be amended at least 1 time in 5 years. The requirements are not applied to monument of architecture, temporary structures. /14./

4.3.2 Requirements for multi – storey buildings, town houses

The federal authorities approve the list of measures of energy savings and improvement of energy efficiency. The executive body can approve additional list of recommended measures. The owners of premises or a person, who is responsible for maintenance

nance of the multi – storey building, have to conduct activities to improve energy efficiency in relation to goods of common use. The organization which provides with energy resources can conduct the activities at the expense of means of owners or part of rates. /14./

4.3.3 Systematization of data collection of the volume of energy consumption

The measure is applied to organizations. The development of form of federal statistic monitoring about the volume of energy consumption (by energy resources) during 1 year, about payment costs and energy efficiency indicators had to be done up to 1st May 2010. The players responsible for and participating in implementation are the Ministry of Energy of Russia, the Ministry of Economic Development and the Russian State Statistics. /15./

4.3.4 Measures to provide with energy meters

The buildings connected to electricity network of district heating, district water supply or district gas supply have to be provide with energy meters. The requirements are not applied to buildings which are to be pulled down or capital repaired before 1st January 2013 and building with power consumption less than 5 kW. The energy meters have to be set in operation within 1 month after the month of installation. Local authorities are able to pay for the installation of energy meters for preferential category of citizen. /14./

The owners of buildings had to install energy meters up to 1st January 2011. The multi – storey buildings had to be provided with individual, collective and general energy meters up to 1st January 2012. The development of rules of norms definition of energy consumption for buildings without energy meters had to be done up to 1st May 2010. /14./

4.3.5 Realization of measures of calculation and reduction of energy losses

The organization of process of collection information about energy losses by transfer of energy resources started in 1st January 2010. The foundation of the collection in-

formation is the data from energy meters. The measure also includes the development of long term programs of decrease of energy losses for organization which effect energy transfer. The players responsible for and participating in implementation are the Ministry of Energy of Russia, the Ministry of Economic Development. /15./

4.3.6 Motivation of consumers in energy resources saving

The introduction of tariffs of electricity according to day times, workdays and days off. The tariffs have to be amended every year from 2011. The development of set of measures which aims at improvement of payment system had to be done up to 1st May 2010. The players responsible for and participating in implementation are the Ministry of Energy of Russia, the Ministry of Economic Development, Federal Tariff Service of Russian Federation. /15./

4.3.7 Informational support of energy saving measures

The information support of energy saving measures had to have been realized by means of state information system in December 2009. The measure includes publications of local and regional programmes of energy savings, organization of TV programmes about the methods of energy savings. It also includes the achievements, organization of exhibitions of modern energy efficient technologies. The development and promotion of public service advertisement started in 1st January 2011. The educational programmes, training in energy savings and improvement of energy efficiency had to have been created up to 1st June 2012. The players responsible for and participating in implementation are the Ministry of Energy of Russia, the Ministry of Economic Development, the Ministry of Industry and Trade, the Ministry of Education and Science. /15./

4.3.8 Energy survey and energy certificate

The energy survey should be conducted in voluntary order, besides energy surveys of organization of state or local education. The organizations which effect energy production and transfer have to conduct the energy survey, if they are funded by the State. The required survey have to have been conducted up to 31st December 2011,

following surveys have to be conducted at least 1 time in 5 years. The energy certificates have to be prepared as the result of the energy surveys. The energy certificate includes information about availability of energy meters, volume of energy consumption. The indicators of energy efficiency, set of typical measures of improvement of energy efficient have to be included into the certificates too. The each self – regulatory organization which conducts the surveys have to sent the energy certificates to federal authorities 1 time in 3 monthes. /14./

4.3.9 Energy efficient classification

The development of the rules of definition of energy efficiency class of multi – storey had to have been conducted up to 1st May 2010. The class of energy efficiency of new multi – storey buildings or reconstructed buildings is defined according to requirements of federal authorities. The class of energy efficiency is shown in the opinion letter of building inspection and at the facade of the building. The players responsible for and participating in implementation are the Ministry of Energy of Russia, the Ministry of Regional Development, the Federal Service for Environmental, Technological and Nuclear Supervision. /15./

4.3.10 State supervision

State supervision aimed at activities of self – regulatory organizations in the field of energy survey. The federal authorities conduct planned and unplanned inspections. The planned inspections are conducted 1 time in 3 years according to plan of the inspections. If there are any violations, the federal authority can stand the self - regulatory organization off the work of 1 year. /14./

4.3.11 Energy savings and improvement of energy efficiency in public offices

From 1st January 2010 to 1st January 2015, the public offices had to ensure decrease of energy consumption at least at 15 % according to 2009 level. The decrease of energy consumption in 1 year has to be at least 3 %. If the charge of energy resources purchase is more than 10 mil. rubles, the person responsible for the measures have to be appointed. /14./

4.3.12 State support

The federal and local authorities promote innovation activities, development of use object and technologies with high energy efficiency. They also promote the construction of multi – storey buildings with high class of energy efficiency, organization of educational programs and support of regional and local programs. The co – finance of the subjects of Russia is shown with subsidies. /14./

The Bank for Development and Foreign Economic Affairs started to fund the projects of energy saving and improvement of energy efficiency in December 2009. The refund of costs part of interest credit payment, lending got in Russian credit organizations is available for investment projects in the field of energy savings. /15./

5 COMPARISON OF ENERGY POLICIES

The energy policy of Germany, Finland and Russia can be compared with next sets of indicators: measure content and strategy content. The measure content includes assignment of measure implementation period, assignment of measure subjects, assignment of energy saving type, assignment of measure funding and budget, assignment of players responsible for and participating in implementation, measure description, and assessment of the impact on energy savings. The strategy content includes convenience of description of the energy policy structure for users, depth of study material, availability of organizational measures and availability of technical measures.

To compare the energy policies the scale of comparison will be introduced. The 4 points scale will be used: 0 point, 1 point, 2 points, 3 points. The scale for measure content and strategy content will be designated next:

- 0 point – no information;
- 1 point – little information, user should try to find needed information;
- 2 point – enough information, user should find needed information while reading all the measure content;
- 3 point – full information, user can find needed information at the moment.

The comparison data are shown in the table 1.

The measure implementation period is defined with started and end points. The measures of energy policy of Finland have concrete assignment of the dates: the year or information that the measure is ongoing. The measures of energy policy of Russia has the concrete dates, but not for all measures, e.g. measure motivation of consumers in energy resources saving have to be done up to 1st May 2010, and there is no information about implementation period for measure state supervision. The measures of energy policy of Germany have the concrete assignment of the beginning date of the measure implementation, but not all measures have the information about and date, e.g. the Heating Costs Ordinance.

The measure subjects define the persons or organizations which have to meet the measure requirements. All the measures of energy policy of Finland has a special line for measure subjects, so the user can find the information at the moment. The user have to read the measure content to find the information about measure subjects in energy policies of Germany and Russia.

The energy saving type defines what kind of energy the measure is aimed at. All the measures of energy policy of Finland has a special line for energy saving type, so the user can find the information at the moment. The user have to read the measure content carefully to find the information about measure subject in energy policies of Germany and Russia.

The measure funding and budget defines the information about funding subsidies for implementation of the measures. All the measures of energy policy of Finland has a special line for measure funding and budget, so the user can find the information at the moment. But not all of the measures has the line completed, e.g. the measure energy efficiency regulations for new construction 2003, 2008, 2010 and 2012. The user has to read the measure content carefully to find the information about measure subject in energy policies of Germany and Russia.

The measures of energy policies of Finland and Russia have a special line for players responsible for and participating in implementation. All the measures of Finland have the line completed. Not all of measures of Russia have the line completed, e.g. measure energy survey and energy certificates. There no special line for players

responsible for and participating in implementation in Germany energy policy, so the user have to read the measure content to find the information.

The energy policies of Germany, Finland and Russia have a full information about represented measures. The policies have a special line for the measure description.

The assessment impact on energy saving defines in GWh/a or PJ/a. The measures of energy policy of Russia have no information about estimates. Most of measures of Germany and Finland have a special line for assessment of the impact on energy savings, the exeption is the further measures and projects.

Verifications and measurements of energy saving of Finland and Germany use a top – down and bottom – up calculation methods. In general a top – down calculations take into account energy consumption at massive levels, e.g. energy consumption of federal or national level, macro – economic sector. Energy consumption is usually based on mention variable such as activity factor, e.g. economic output, or amount of house-holders. The motion of a top – down indicator can be determine and the drop of the specific energy consumption can be shown. But there is no information about the reasons of these changes. In general a bottom – up calculations take into account individual measures, e.g. realization of funding programs or insertion of standards. Energy savings of individual case are evaluated. But this kind of calculations is expensive and very time – taking, and sometimes required data are not available. Conversion factor for electricity is 1. /11./

The description of energy policy structure of Finland is the most convenient for users. It has all the measures content as a special line, it makes the search of needed information and perception of the information easier, and gives more full picture of energy policy of Finland in building sector. The energy policy of Germany has special lines for 3 indicators: assignment of measure implementation period, measure description, assesssment of the impact on energy saving. Most of needed information can be found in the measure description while reading. The energy policy of Russia has special lines for 3 indicators: measure description, assignment of players responsible for and participating in implementation, assignment of measure implementation period. The needed information can be found in the measure description, but the user

should read it carefully and there is no information about assessment of the impact on energy savings.

The availability of organization measures are represented in all energy policies of Germany, Finland and Russia, but at different level. There are information about approval of guidelines, standards, federal or regional programs in field of energy efficiency, e.g. the Energy Saving Ordinance of Germany, the Höylä III of Finland and the Government Order of Russian Federation No 175-p of Russia. There is also information about players responsible for and participating in implementation, it was discussed earlier.

The availability of technical measures are represented in all energy policies of Germany, Finland and Russia, but at different level.

The depth of study material can be evaluated by means of the measures content and availability of organization and technical measures. According to this, the energy policies of Finland and Germany are more depth studied than the energy policy of Russia.

The results of comparison of energy policies of Germany, Finland and Russia are presented in table 1. Table 1 is shown on page number 32.

TABLE 1. Comparison of energy policies of Germany, Finland and Russia

Country		Germany	Finland	Russia
Indicators				
Measure content	Assignment of measure implementation period	2	3	2
	Assignment of measure subject	2	3	2
	Assignment of energy saving type	1	3	1
	Assignment of measure funding and budget	1	2	1
	Assignment of players responsible for and participating in implementation	2	3	2
	Measure description	3	3	2
	Assessment of the impact on energy savings	2	2	0
Strategy content	Convenience of description of the energy policy structure for users	2	3	1
	Availability of organization measures	3	3	2
	Availability of technical measures	3	3	2
	Depth of study material	3	3	2
TOTAL POINTS		22	28	15

6 CONCLUSION

According to table 1, the energy policy of Finland is more developed than the German energy policy, and both of them are more developed than the energy policy of Russia. The main reason of crudity of Russian energy policy is that the consumers are not used to save energy. The European countries Germany and Finland faced to the problem of energy saving in 1970s. The energy crisis gave the experience in the issue of energy savings and improvement of energy efficiency. Russia hasn't got the same experience because of the availability of energy resources and not so long life story of the country.

The structures of presentation of Finland and Germany are more convenient than the Russian structure. The energy policies of Germany and Finland include as national targets of energy savings, as the targets of building sector and the measures to improve the energy efficiency. The Russian energy policy includes only national targets. The targets of building sector and the measures are performed in other documents:

the Federal Act No 261, the Government Order of Russian Federation No 1830 – p. The lack of directly developed ways of the realization of energy savings measures in the energy policy of Russia is the reason of appearance of great number of regional and local documents, guidelines. The great number of such documents complicates the search of needed measure. As opposite to Russian energy policy, the energy policies of Finland and Germany include the information about the documents. The structure of presentation of Russian energy policy can be improved with the use of structure of presentation of Finland energy policy as foundation. It is very convenient for user to get the information by the way of table form with all the indicators were discussed before.

In the thesis the issue of identification of similar aspects and the different aspects of the energy policies of Germany, Finland and Russia were made by means of comparison the policies with the measure content and the strategy content indicators. The measure content is representative of information about the measures. The strategy content is representative of more complete information about the measures as the energy policy. According to table 1, the energy policies of Germany, Finland and Russia have similar points with one indicator and different points with the others. For example, Germany and Russia have 2 point for assignment of measure implementation period, but Finland has 3 points for it. Or, Germany has 2 points for convenience of description of the energy policy structure for users, Finland has 3 points and Russia has 1 point.

The identification of more good – enough solutions for improvement of Russian energy policy is defined with addition of assessment of the impact on energy savings. The second possible improvement is more detailed development of indicators. The indicators are assignment of measure implementation period, assignment of measure subject, assignment of energy saving type, assignment of measure funding and budget, assignment of players responsible for and participating in implementation, measure description, availability of organizational and technical measures. The indicators can be improved with of addition the needed information.

The fullness and depth of suggested organizational and technical measures of Russia can be provided with information about assessment of the impact on energy savings.

The lack of the information in Russian energy policy is a great disadvantage. As opposite to Russian energy policy, energy policies of Germany and Finland have the estimates according to years.

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