Energy Improvement District Polytechnic:

Development Strategy

AREA 21
Baltic Smart City Areas
for the 21st Century

Interreg
Baltic Sea Region

EUROPEAN UNION
EUROPEAN REGIONAL DEVELOPMENT FUND

WITH FINANCIAL SUPPORT OF THE RUSSIAN FEDERATION

POLYTECH
Peter the Great St. Petersburg Polytechnic University

Table of Contents

1. Background

The strategy was developed in the frame of the project AREA21, which is a three-year transnational cooperation project jointly carried out by 10 partner organizations from six Baltic Sea countries:

- HafenCity University Hamburg (Germany) - Lead Partner
- Tampere University of Applied Sciences (Finland)
- Peter the Great St. Petersburg Polytechnic University (Russia)
- Kohtla-Järve Town Government (Estonia)
- Tartu Regional Energy Agency (Estonia)
- City of Tampere (Finland)
- Öresundskraft (Sweden)
- Region Skåne (Sweden)
- Free and Hanseatic City of Hamburg, District of Wandsbek (Germany)
- City of Lublin (Poland)

The project partners represent local and regional authorities, energy companies and universities, with extensive experience in the fields of energy planning, citizen participation and strategy development. This guarantees access to relevant information and direct communication during the implementation of local activities. The project partnership is supported by a network of associated organizations, including city administrations; energy companies and housing organizations from the partner cities; national ministries with a focus on energy and environment; international organizations and networks.

The project is part-financed by the European Union (European Regional Development Fund and European Neighborhood Instrument) and Russian national funding in frame of the Interreg Baltic Sea Region Program 2014-2020.

AREA21 seeks to model energy-efficient urban areas of the future, adopting collaborative stakeholder engagement processes in the strategic planning and implementation of energy solutions. Specifically, the project brings together public authorities, energy providers, property owners and citizens to find and to apply the best solutions for saving energy to decrease CO2 emissions. To achieve this, the project enables local authorities from cities around the Baltic Sea Region to run cooperative planning processes within Energy Improvement Districts (EID). The EID concept is based on an innovative system approach for the development of low emission urban districts. It promotes a paradigm change from a strong public sector to a more cooperative model of development that also involves citizens and businesses. The concept promotes the pooling of competencies, activities and ideas for energy efficiency planning and implementation. By promoting network and consensus-building activities, the concept fosters the identification of tailor-made solutions for the area, the piloting of new projects, and the establishment of both informal cooperation and formalized partnerships. The concept offers the opportunity to involve public property owners and citizens as building owners and users in the initiation of energy efficiency measures.

AREA 21 aims to provide local authorities, energy agencies and other institutions responsible for energy planning with the know-how and strategic tools on how to plan and implement new solutions for energy efficiency in urban districts. To achieve this, the project develops and tests new formats of cooperation between public authorities, energy providers, public property owners and citizens. Together across seven locations in the Baltic Sea Region, this project facilitates public organizations and private actors to work together in elaborating holistic strategies and implementing context-specific measures in EIDs. Furthermore,

the project also promotes the use of smart technologies to facilitate the energy planning process, to test new forms of public participation, to raise awareness about the individual energy consumption and to promote behaviour change.

AREA 21 implements the EID concept in the seven pilot areas in the Baltic Sea Region, where Peter the Great Saint-Petersburg Polytechnic University (SPbPU) campus is the Russian focus area. The SPbPU campus is the biggest university campus in Saint-Petersburg with the total area more than 100 hectares, and around 35 000 people use the campus buildings and infrastructure regularly. The behaviour of these people, who are the end-users of energy resources on campus, is one of the key factors determining energy consumption in the EID.

2. Local Context

2.1 Policy Framework

2.1.1 Climate Policy

The Russian climate policy based on the Climate Doctrine of the Russian Federation that was approved by a decree of Prime Minister D.Medvedev on December 17, 2009. The strategic goal of the climate policy is to ensure the safe and sustainable development of the Russian Federation, including institutional, economic, environmental and social, including demographic, aspects of development in a changing climate and the emergence of relevant threats.

Currently, the climate policy and strategy of St. Petersburg are not presented as some separate documents, but are mentioned as part of environmental policy to prevent environmental and other risks associated with climate change (https://www.gov.spb.ru/gov/otrasl/ecology/ecopolicy2/, p. 6.5):

"When preventing environmental and other risks due to climate change, the following tasks should be solved:

- development of the climate strategy of St. Petersburg;
- development and implementation of measures to adapt to climate change, including the consideration of the factor of climate change in the programs of socio-economic development of St. Petersburg;
- development and implementation of a system for preventing environmental and other risks associated with climate change; • ensuring an effective system for protecting the territory of St. Petersburg from weather and climate hazards, including land reclamation systems, hydraulic structures, shore protection, taking measures to prevent the negative impact of water, and more".

At the city level, the Committee for Nature Management, Environmental Protection and Ensuring Ecological Safety of Saint-Petersburg are responsible for the development and further realization of the climate strategy of St. Petersburg. At the time of analysis (August 2019), there was no official information from the Committee on the current state of the climate strategy development. At the district or municipality levels, actions in the field of climate policies are not presented. On September 23, 2019, Russia accepted the Paris Agreement, and it is expected that in the near future in Russia much more attention will be paid to the problems of mitigating the effects of climate change.

2.1.2 Energy Policy

Key components of energy policy in terms of energy efficiency are:

- efficient production of various types of energy;
- efficient conversion and transmission of energy and energy resources from producer to consumer;
- efficient energy consumption.

The main direction of discussions on the current energy production policy in Russia is the coordinated development of different energy sources, including renewable energy (mainly solar plants in some regions of Russia). At the same time, further development of renewable energy is considered not as an end in itself, but as one of the necessary components of sustainable development of the energy complex of Russia.

Serious attention in Russian energy policy is paid to projects of supply of natural gas as an energy resources carrier. The geography of its production is shifting to the inaccessible areas of Siberia and the Arctic shelf, therefore, the strategic projects are gas pipelines to Western Europe, Turkey and China, as well as the construction of plants for the production of liquefied gas and transporting it using tankers. Serious tasks are being set in providing natural gas to remote areas, including small rural settlements.

Liquid gas and electricity are considered as effective alternatives to traditional energy sources in public transport.

Over the past ten years, serious attention has been paid to improving the efficiency of energy consumption in housing and communal services. Energy efficiency projects in housing are mainly concentrated in the renovation of buildings and development of technical infrastructure to improve indoor climate while reducing payments for consumed energy sources.

The main principles, goals and objectives in the field of energy efficiency and stimulate energy conservation in St. Petersburg were defined in *the concept of improving energy efficiency and stimulating energy conservation*, which was approved by the St. Petersburg Government resolution of November 11, 2009 N 1257. The goals, indicators and activities for energy efficiency further concretized in the State program of St. Petersburg *"Integrated development of public infrastructure systems, energy and energy saving of St. Petersburg for 2015-2020"*.

2.1.3 Spatial Planning Policy

General spatial planning policy in Saint-Petersburg is defined in the law of St. Petersburg of December 21, 2005 N 728-99 "On the General Plan of St. Petersburg". The responsible committee is the City Planning and Architecture Committee. Separate spatial plans for the city districts do not exist. Any changes at spatial plans of the city regions or municipalities must be approved by the Committee.

Based on the general city plan, the Committee on Energy and Engineering Infrastructure develops spatial plans of energy infrastructure presented at the following documents available at https://www.gov.spb.ru/gov/otrasl/ingen/shemy-razvitiya-inzhenerno-energeticheskogo-kompleksa:

- water supply and drainage scheme;
- the current heat supply scheme of St. Petersburg for the period up to 2033;
- power supply circuit;
- gas supply scheme

2.2 Energy Governance

2.2.1 Legal Framework

General rules on energy governance in Russia are formulated at the Federal Law of 23.11.2009 N 261-ФЗ "On Energy Saving and Improving Energy Efficiency" (as amended and added, entered into force on January 16, 2019). Based on this law, the Saint-Petersburg Government issued a resolution of April 28, 2012 N 405 "On Approval of a List of Mandatory Activities on Energy Saving and Enhancing Energy Efficiency with Respect to the Joint Property of Owners of Rooms in Apartment Houses that contains the list of concrete measures that must be done in apartment houses and defines rules for managing companies and homeowners on the installation of metering devices and measures in energy saving in apartment houses. As an instrument for stimulation of these measures, the different tariffs for payment on consumed resources with and without obligatory metering devices are applied. The listed measures for heat saving must be included in energy service and renewal contracts subsidized by the city. The money for the installation of metering devices comes from owners.

2.2.2 Financial Framework

In general, the financial framework for energy efficiency in housing contains two main components:

- tariffs that regulate daily energy consumption;
- subsidies, loans and other financial resources that form the financial basis for the implementation of energy-saving projects.

The framework for tariff regulation of resource consumption in housing and public utilities are defined at the federal level. At the regional level, specific tariffs for the city are determined by the Tariff Committee of Saint-Petersburg (in this case regional level means the city since Saint- Petersburg is one of the Russian Federation subjects and the city municipalities have no own financial resources for energy improvement projects).

Regional Programs

In the frame of existing state system for apartment houses renovation, the list of apartment houses which will be renovated in Saint-Petersburg with the state subsidy is developed by the Housing Committee of Saint-Petersburg and available at official website http://gilkom-complex.ru/2009-10-15-2016-33-37/2009-10-15-15-05-40/sistema-provedeniya-kapitalnogo-remonta-mkd/?item=1848. The state subsidy comes from the so called “renovation tax” (state fund), which is paid by each flat owner in the city and is combined with co-financing provided by owners. A prerequisite for obtaining subsidy for the renovation project is the implementation of energy conservation measures.

The main financial resources for projects on development of energy efficiency of communal infrastructure are concentrated at the State program of St. Petersburg “Integrated development of public infrastructure systems, energy and energy saving of St. Petersburg for 2015-2020“ with the total budget of 431724509900 rubles (approximately 5.7 billion euro) including 120823768100 rubles (1,6 billion euro) from the St. Petersburg budget and 310900741800 rubles (4,1 billion euro) form extra-budgetary sources (any financial sources which come not from the city or the state budget). The program contains a list of objectives, activities and indicators (i.e. determines the policy), as well as a list of sources of funding, the amount of funding and financing mechanisms (i.e. determines the financial framework). The program’s beneficiaries are administrations of the city districts, Committee on Energy and Engineering support and organizations providing operation and development of heat supply systems, water supply and drainage, and gas transportation services through gas

distribution networks. Specific organizations - performers of works within the program are determined on the basis of competitive procedures in accordance with the Federal Law "On the contract system in the field of procurement of goods, works, services for state and municipal needs" dated 05.04.2013 N 44-ФЗ.

Local Programs

SPbPU has a program for modernization of housing infrastructure (updated annually). Because of the state ownership of the university area, funding for this program coming from the state level (from the Ministry of Science and Higher Education of the Russian Federation). The financial framework for maintenance and development of the SPbPU energy infrastructure is approved annually by the SPbPU Rector and available on the SPbPU official website. This document does not contain concrete measures in energy efficiency but contains the total amount of financing for different budget lines (for instance, property maintenance, payments for communal services, investments in real estate etc.). Based on this framework, the SPbPU General Service Department, which is responsible for communal infrastructure, develops the financial plan for the maintenance and development of the infrastructure elements annually.

2.3 Description of EID Polytechnic

2.3.1 EID Location

EID Polytechnic is located at the north part of Saint-Petersburg in Kalininskiy district, Academicheskiy municipality and is based on the communal infrastructure of the SPbPU campus consisting of 5 parts (fig. 1). The land and real estate at the SPbPU campus belong to the state. SPbPU has the right of its unlimited use and is obliged to maintain and use it for educational purposes. SPbPU Department of Chief Energy is responsible for the development and maintenance of the communal infrastructure in the campus and will be one of the project beneficiaries which will provide sustainable development and use of the project results.

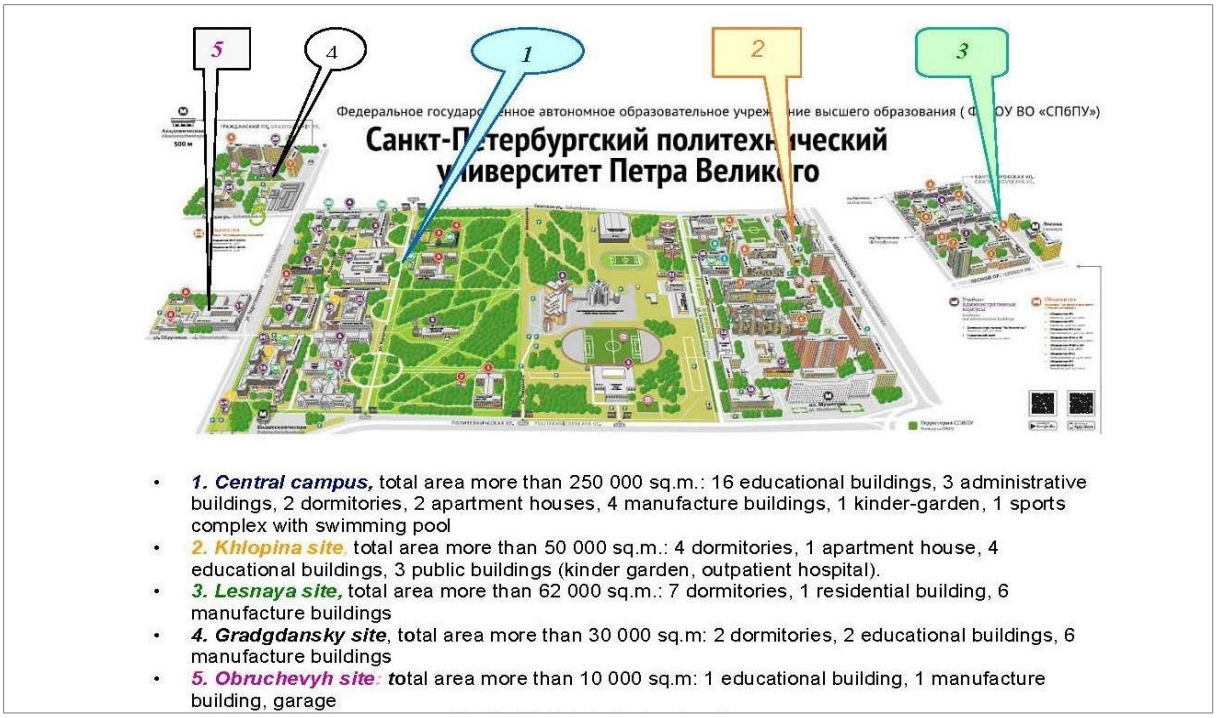

Figure 1. SPbPU campus plan

2.3.2 Site Analysis

Urban Structure

In general, the campus, which is managed by SPbPU, is 102 hectares. There are 112 buildings on the campus which are located in 5 main sites (see fig. 1). Half of them are public buildings, including 42% of educational buildings and 8 % of social buildings (kindergartens, clinic and sports complex). 35% of the buildings belong to the residential area. 27% of them are dormitories and 8% - residential buildings. 15% of buildings contain manufacturing and office area. Most of the buildings are owned by the state, except for residential buildings with private flats.

Eight buildings were built 120 years ago when SPbPU was established. Among them: Main Building and Chemical Building which are protected by the state as historic buildings, two residential buildings; two educational buildings and two manufacture buildings (see pictures below).

Figure 2. SpbPU Main Building at the beginning of the last century

Figure 3. SpbPU Main Building at present time

Figure 4. SPbPU Chemical Building at the beginning of the last century

Figure 5. SPbPU Chemical Building at present time

Figure 6 and 7. Manufacturing buildings at SPbPU campus


Figure 8 and 9. SPbPU dormitories (one dormitory was built in the end of last century, one in 2012, while most of dormitories were built in the middle of the last century)


Figure 10 and 11. Educational buildings of SpbPU (most educational buildings were built in the middle of the last century and only two were built in 21st century)

Figure 12. The most modern building is the Scientific-Research Building, which was put into operation in 2017

Polytechnic is an area, which contains residential sector which is used for education, research and living as well as sport (fig. 13 and 14) and rest area including a park, which is the same age as SPbPU i.e. founded in 1898 (fig. 15 and 16).

Figure 13 and 14. SPbPU sport complex


Figure 15 and 16. SPbPU park

Demographic Structure

- Total number of Polytechnic users: 35 500 persons, including 32 000 students and 3 500 SPbPU staff
- Number of students living in dormitories: 9 000
- Number of residents: 450

Urban Infrastructure

SPbPU is responsible for the maintenance and development of the communal infrastructure of its campus. The scale of this task can be demonstrated by the following figures:

- the length of external serviced heating networks is 20 km;
- the length of outdoor networks of drinking and fire water supply and sewerage systems is 30 km;
- the length of internal heat supply, water supply and sewerage systems more than 150 km. The number of heat nodes and water-measuring units more than 140;
- the number of sewers and water wells more than 800.

Electricity and Supply Sub System

There are no generators on the SPbPU campus. Electricity is supplied to the SPbPU centrally from the city. Small solar and wind generators are used only for testing and research. The following technical objects of the electricity supply are located at SPbPU campus:

- 24 electricity transformer substations,
- 42 transformers,
- cable lines 6kV with a length of around 25 km,
- cable lines 0,3kV with a length of around 50 km.

Heat and Water Supply Sub System

There is a combination of centralized and decentralized heat supply systems at SPbPU campus. Two gas boiler stations are located at the Central Campus and Lesnaya site while buildings at Khlopina, Gradgdansky and Obruchevyh sites are connected to the city grid.

Status of the Supply Network

31 of 45 of the electricity transformers at SPbPU are more than 45 years old while the lifetime is 20-25 years. 90% of cable lines have an average exploitation age of more than 45 years. 80% of all external and internal water and heat supply and sewerage systems have physical wear or exceeded service life that can cause utility accidents. The responsibility on maintenance and use these energy supply subsystems lies on a single juridical person - SPbPU that makes it natural to consider different technical elements of the infrastructure of supply energy resources in Polytechnic as subsystems of one energy resources supply system. The technical condition of these systems elements creates the most dangerous threats for the achievement of the EID goals.

Existing Plans

Recently there are no large infrastructure projects in SPbPU campus, while a pre-project study for an outdoor lighting system has been done and routine repairs and upgrades are carried out regularly.

There are no approved strategic planning documents on the development of energy efficiency in Polytechnic. Several proposals for energy efficiency improvement were developed by corresponding stakeholders during last years, but these documents were not approved by decision-makers. Since the technical objects of energy infrastructure in the Polytechnic area belong to the city, these documents create provisions for the future development of energy supply infrastructure in Polytechnic. To realize these provisions, responsible SPbPU department develops plans and corresponding applications, which are the subject for discussion with subordinate to the Committee organizations, that are responsible for energy infrastructure of the city.

In the frame of the existing state system for apartment houses renovation, the list of apartment houses which will be renovated in Saint-Petersburg with the state subsidy is developed by the Housing Committee of Saint-Petersburg (available at the official website http://gilkom-complex.ru/2009-10-15-16-33-37/2009-10-15-15-05-40/sistema-provedeniya-kapitalnogo-remonta-mkd?item=1848). No state subsidies for the renovation of dormitories or private houses in Polytechnic are planned for 2018/2019 in the above list.

2.3.3 Stakeholder analysis

The analysis is based on results of discussions which were held in the frame of the first stakeholders' workshop that took place in SPbPU in November 2018. The following factors that have a significant impact on the stakeholders' behaviour were identified.

- state ownership of the land and most of the buildings in EID,
- a relatively small amount of private apartment owners,
- EID territory is under SPbPU management; SPbPU has a direct motivation to reduce payments for housing resources,
- special departments at SPbPU are responsible for the maintenance of energy infrastructure, the staff of these departments has no direct motivation in energy saving (salary received does not depend on results of energy-saving, energy-saving indicators are not targeted for employees of these departments),
- most end-users of energy resources in the EID are not economically motivated to contribute to energy saving

The methodical framework for the stakeholder analysis was developed by the HafenCity University Hamburg. Results of this analysis are presented in figures 17 and 18, which show the list of stakeholders and their involvement in different stages of the EID development process.

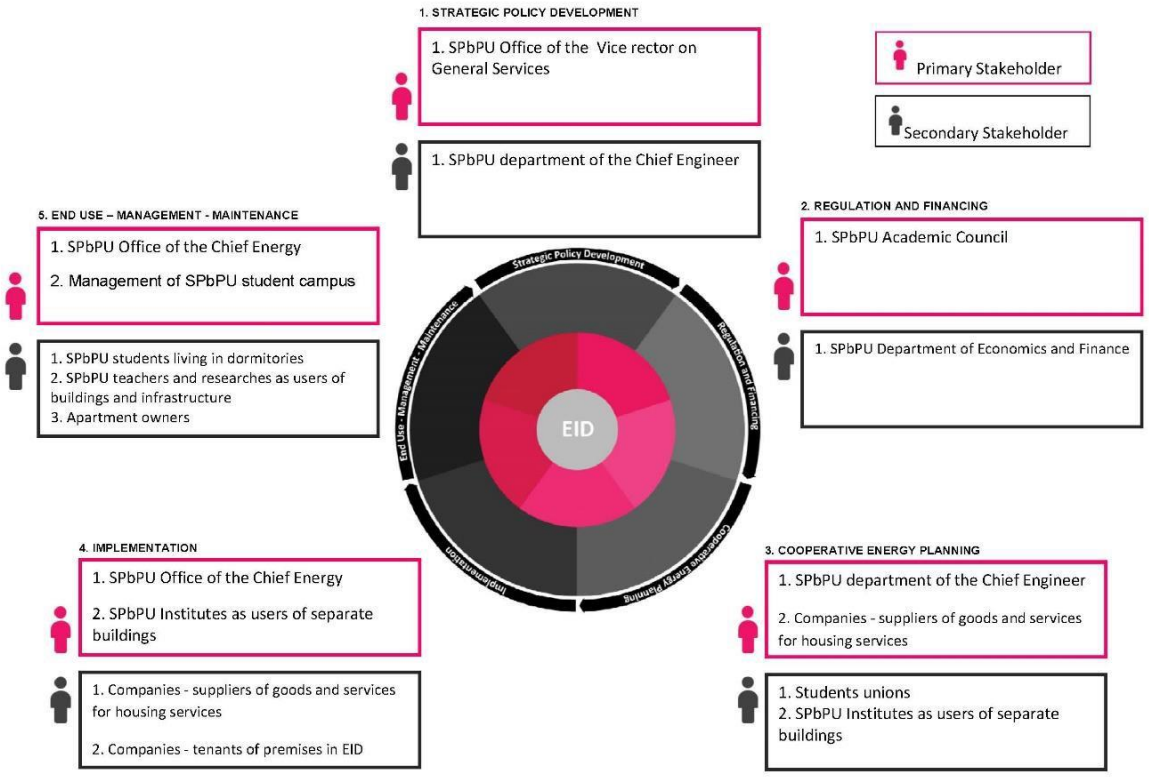

Figure 17. Stakeholder Map

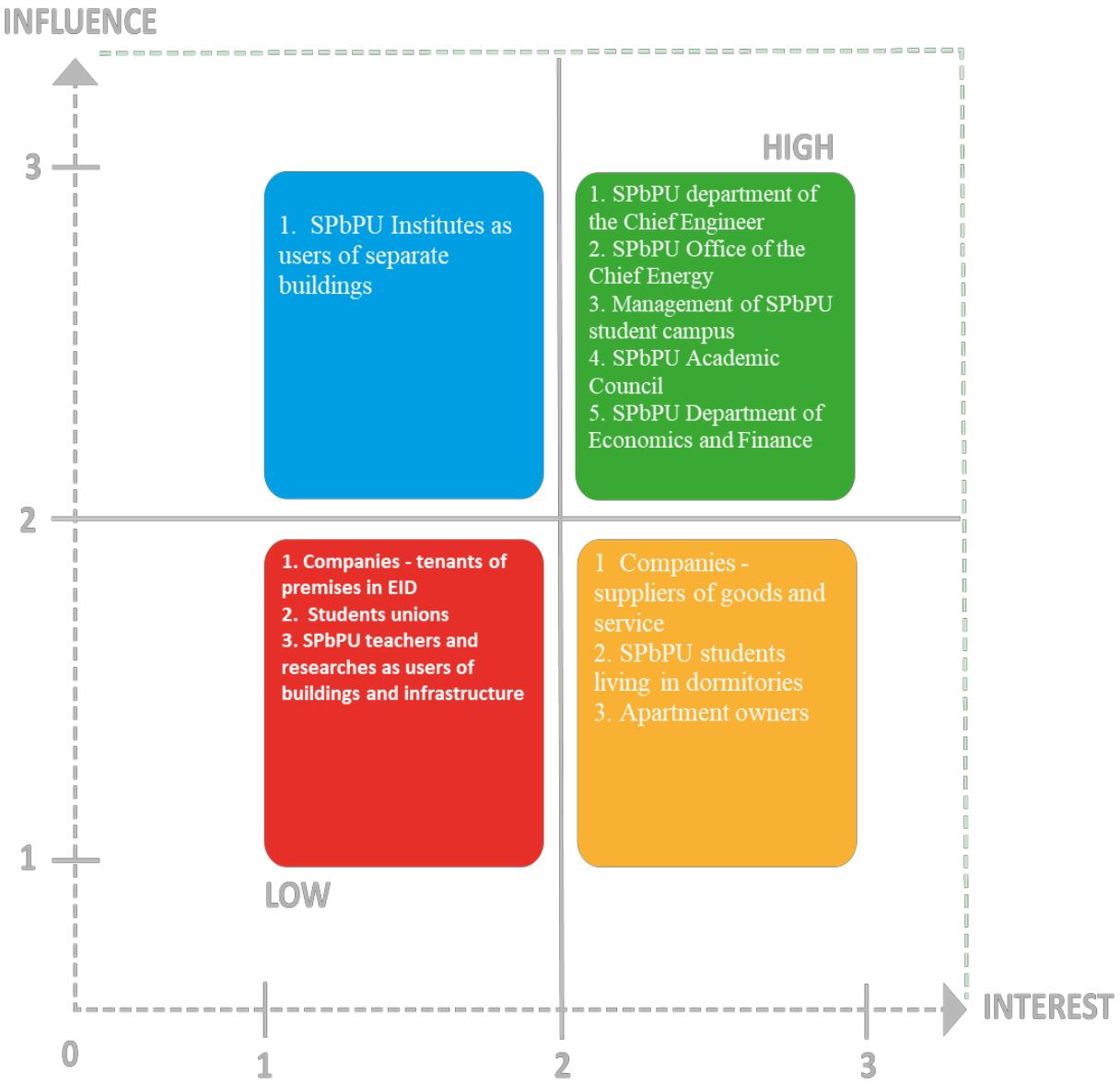

Figure 18. SPbPU Stakeholder impact assessment

3. EID Vision and Goals

As it was mentioned above, the stakeholders' workshops took place in SPbPU as a part of the process for implementing the EID concept. As a first step to engage stakeholders in the discussion of the EID concept, a vision for the EID Polytechnic was developed and discussed. Energy efficiency is considered not as an end in itself, but as a tool to improve the quality of communal infrastructure and ensure a high level of quality of life for users of this infrastructure. With this in mind, the EID vision is based on the following key points.

- Respect for nature and green spaces
- Respect for historical heritage
- Sustainable development based on innovative technologies

The vision is stated as follows: "Polytechnic is a high-quality green habitat"

3.1 EID Polytechnic as a Complex System

Resources consumption in the residential sector is implemented in the framework of complex systems that belong to the class of socio-technical systems, and have technical, economic and social subsystems.

The technical components of the system are equipment and technologies that ensure the supply and metering of energy consumption by end-users. For energy saving, the objective function of this subsystem is to minimize energy losses during its transfer from the power generator to the consumer. The necessary conditions are the requirement to ensure the transfer of energy in the mode of peak consumption and average loads.

The economic components of the system are financial and organizational mechanisms that stimulate (or vice versa, impede) the consumption of various types of energy resources in the context of consumption volumes, time and spatial frameworks of energy consumption by end-users. For energy saving, the objective function of this subsystem is to stimulate the minimization of energy consumption. A necessary condition for the effective functioning of this subsystem is the compliance of the general level of financial burden on the energy consumer with the general level of economic development and financial condition of energy end-users. Too high tariffs or financial restrictions on the use of resources can serve as a barrier to the development of the economy or worsen the quality of life of the consumer (the greatest energy savings will be achieved if you refuse to use any electrical appliances due to the high cost of electricity). On the contrary, the financial burden of 0,5-1% is unlikely to serve as an effective economic incentive to save energy consumption.

The social components of the system reflect the behavioural characteristics of the energy resources end-users. They are significantly affected by financial and economic mechanisms that regulate energy consumption. However, issues of end-user behaviour cannot be reduced only to the issues of tariff optimization for consumed energy. Obviously, to optimize the activities of this subsystem, it is necessary to maximally activate non-economic energy stimulation mechanisms that could be considered as the objective function of this subsystem.

Themes addressed by the EID Strategy

- Theme 1: performance of the energy system in the EID (technical aspects)
- Theme 2: efficiency of the heating and electricity consumption in EID (economic aspects)
- Theme 3: end-users' motivation and behaviour (social aspects)

3.2 Energy Efficiency Potential and Key Challenges

3.2.1 Technical Sub System

According to expert estimates obtained in 2016-2018 during the development of proposals for implementation of energy-saving measures in SPbPU, the following measures have the highest energy saving potential in the technical subsystem (table 1).

Energy Efficiency Measure	***Application***	***Energy saving potential for the EID***
Implementation of energy-saving measures in heating systems	Installation of automated block heat points in buildings (flow heaters for fresh water heating) and ICT-Tools for online control. Replacement of obsolete heating equipment	Up to 50% reduction of costs across the EID
Implementation of resource-saving measures in gas supply systems	Installation of commercial gas metering stations	Up to 20% reduction of costs across the EID
Implementation of measures for saving electricity	Installation of modern lighting systems, increasing end-user motivation to save energy	Up to 20% reduction of costs across the EID
Implementation of measures for saving water	Replacing the deaerator on the Central boiler room	1% reduction of costs across the EID

Table 1. Energy-saving potential in SPbPU

Key challenges for implementing these measures have financial and organizational nature. Federal ownership of the real estate in the EID creates formal barriers for the use of regional financing in Polytechnic.

Energy-saving projects are implemented with the involvement of external suppliers of goods and services, which, according to Russian legislation, should be selected based on tender procedures. Existing tender procedures are aimed at choosing cheap technical solutions with the limited possibilities of taking into account the best quality characteristics (for instance green solutions). The system for organizing tender procedures requires improvement at the federal level.

3.2.2 Economic Sub System

To ensure that the SPbPU management system is more focused on energy saving, the following should be done:

- make changes in the internal regulation of external goods and services suppliers selection, to provide more balance between the formal requirements to tender procedures and the needs for specific contracts and goals should be developed;
- make changes to internal regulations that determine procedures for the formation of a wage fund of departments responsible for maintaining the energy infrastructure based on results of energy-saving,
- make changes to internal documents that determine the order of formation of personal accounts of institutions, depending on the energy savings in the building used by these institutions.

The main challenges for economic subsystem development are connected to the fact that at the moment the budgets of SPbPU subdivisions do not depend on energy consumption (the University pays for the infrastructure in the whole area). In order to raise awareness about the own energy consumption, it is necessary to calculate which School or Institute is consuming how much. Currently, there is a problem with the calculation since schools and institutes are not strictly separated by buildings, and there are not enough meters. Possible action could be to install it in each building or building section. Technically, it is possible to install meters, and it is not even very expensive. The main problem is to change the procedure for the formation of budgets of individual SPbPU units, which will depend on the resources consumed. It is possible to start these changing with a pilot building(s) and later on expend the idea to the rest of the University's buildings.

3.2.3 Social Sub System

Existing instruments for involving different stakeholders in the realization of various aspects of sustainable development of SPbPU should be further developed to create new social groups and networks involved in the EID goals achievement:

- student society on energy saving,
- social networks of SPbPU premises users,
- targeted round tables on energy saving in SPbPU Scientific Week and other scientific events.
- involvement of students in energy saving through educational tasks and projects,
- promotion of green sustainable development ideas through existing channels (internal television, corporate SMS mailing, visualized information).

The main challenges in the development of the social subsystem are related to the difficulties in changing the behaviour of students as unmotivated users. First of all, they are interested in comfortable conditions in the room, and energy-saving measures are considered something of secondary importance. How to make the results of reducing energy consumption by end-users visible to convince students who are temporary tenants of dormitories to save energy? How to involve students in activities that have never been discussed before? The University has to promote own activity in the development of housing infrastructure and energy saving in order to serve as a good example and to counteract students' arguments such as "Why should we do something if they don't do anything?"

4. SWOT Analysis

The EID development process includes a SWOT analysis to identify strengths, weaknesses, opportunities and threats for integrated energy planning in the EID area. The results of the analysis are presented below:

Strengths

- Cooperation formats already exist within the district: regular working meetings and round tables in the frame of local events;
- Availability of own scientific and service departments that conduct benchmarking of technical and organizational solutions on the realization of unused potential of energy saving
- Centralized management system with a high level of main stakeholders' responsibility concentration. The EID territory is under SPbPU management, and SPbPU has direct motivation to reduce payments for consumed energy resources.

Challenges (possible limitations or weaknesses)

- SPbPU departments responsible for maintenance of energy infrastructure have no direct motivation in energy saving (salary received does not depend on results in energy saving)
- Most of end-users of premises have no motivation (and partly - technical possibility) for energy saving.

Opportunities

- Local energy policy focused on energy saving. SPbPU plans for modernization of the communal infrastructure (updated annually)
- Big potential for implementation of energy- and resource-saving measures including the rise of end-users' motivation in energy saving
- Use of EID for implementation of quality education in SPbPU and for development of new types of scientific and technical services provided by SPbPU

Threats (possible conflicts etc.)

- Energy suppliers have no interest in energy-saving measures (economically harmful for them)
- Lack of effective financing instruments. Formal barriers for the use of regional financing in EID which is federal property
- Existing tender procedures are aimed at choosing the cheapest technical solutions with the limited possibilities of choosing the best quality solutions.

Benefits of implementation

Having created the EID, SPbPU can play the role of a pilot zone of high energy efficiency, where the best organizational and technical solutions will be demonstrated. This will allow the SPbPU to improve its competitiveness as a world-class university, to offer new types of consulting services for a wide range of customers in energy efficiency and to use the results of the EID development in the educational process.

The creation of the EID Polytechnic in the frame of the INTERREG project AREA 21 will help SPbPU to attract additional funding from the state budget for further development of the campus and improvement of indoor condition in SPbPU premises.

5. Definition of EID Specific Objectives

5.1 Background Information

Decision-makers at SPbPU (top management of the University) are interested in saving money. They get statistical data which show that technical and building renovations can help them save money which is spent on communal infrastructure. They need visible/tangible results, e.g. statistics illustrating that the payments for heat, water, etc. go down. Middle-level managers (Directors of Institutes, Heads of Schools) are not directly motivated to save energy as they do not pay for consumed resources from their own budgets. For most of the end-users (students and university staff) there is no financial motivation to save energy either, and they often do not even recognize themselves as end-users of energy resources.

All the above issues were discussed in the second stakeholder workshop that took place in SPbPU in April 2019. The list of EID Polytechnic goals and measures to achieve these goals were discussed.

5.2 EID Goals

The following goals were formulated by stakeholders:

Goal 1: To increase the reliability and efficiency of the energy system in the EID. Target indicator: 50% reducing the number of accidents at the heating and electricity networks.

- Description: regular maintenance and replacement of obsolete equipment of internal heating, water supply and sewage networks in buildings and external networks
- Timeframe: regularly

Goal 2: To reduce heating and electricity costs. Target indicator: 13% reduction of fuel and energy costs while improving the quality of the urban and internal environment.

- Description: installing double-glazed windows, retrofit indoor and outdoor lighting. Installation of automated block heat points in buildings, commercial metering of gas and electricity; development of online monitoring and control of heat consumption.
- Timeframe: by 2022

Goal 3: To raise end users' awareness for conscious energy consumption and saving.

- Target indicator: involvement of 25% of students and university staff in the implementation of energy-saving measures.
- Description: promotion of energy saving among users who do not have direct economic motivation. Development of the section focused on end-user behaviour in the energy-saving program at Polytechnic.
- Timeframe: by 2022

5.3 Stakeholder's Responsibilities towards Goals

Stakeholder(Institution Name, Department)	Goal to be achieved by the stakeholder	Group of measures to achieve the Goals
• SPbPU department of the Chief Engineer • SPbPU office of the Chief Energy • SPbPU department of Economic and Finance SPbPU Academic Council Companies - suppliers of goods and services	Goal 1: To increase the reliability and performance of the energy system in the EID. 50% reducing the number of accidents at the heating and electricity networks	• Replacement of obsolete power grid equipment. • Routine maintenance and repair of energy networks. • Improvement of indoor climate by means of replacement of internal heating, water supply and sewage networks in dormitories and office buildings, installing double-glazed windows, retrofit indoor and outdoor lighting • Providing financing necessary for the maintenance and development of energy infrastructure • Retrofit indoor lighting • Retrofit outdoor lighting in the campus
• SPbPU department of the Chief Engineer • SPbPU office of the Chief Energy • SPbPU department of Economic and Finance SPbPU Institutes as users of separate buildings SPbPU Academic Council	**Goal 2:** To reduce heating and electricity costs. 13% reduction of fuel and energy costs while improving the quality of the urban and internal environment	• Development of the resource consumption accounting system Development the automated system for online monitoring and control of heat consumption • Development of the internal regulations aimed at resources saving. • Piloting the metering system for separate Institute/building
• Students unions • SPbPU teachers • SPbPU students • SPbPU Institutes	**Goal 3:** To raise end users' awareness for conscious energy consumption and saving. Involvement of 25% of students and university staff in the implementation of energy-saving measures	• Use of EID concept for education in SPbPU • Use of communication tools for energy-saving promotion • Targeted round tables on energy saving in SPbPU scientific events; creation of social groups: • Social networks of SPbPU premises users • Student society on energy saving