

Market Watch (vol. 1.0)

St. Petersburg region (Russia) cleantech sector

The survey is part of “Central Baltic Cleantech Clusters expanding to East of EU markets (CB2East)” project

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FINNISH WATER FORUM

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1. Background of the survey

This report is part of *Central Baltic Cleantech Clusters expanding to East of EU markets (CB2East)* project. The project is co-financed by European Commission (Central Baltic Programme 2014–2020), Finnish government (The Ministry of Economic Affairs and Employment of Finland (TEM)) and businesses involved in the project. The project has approximately 900 000 EUR budget. The project is implemented from 1 September 2015 to 31 August 2018. The CB2East project consortium involves three cluster organizations as partners – Finnish Water Forum, Green Net Finland and CleanTech Latvia.

The main objective of the CB2East project is to strengthen the Central Baltic Region's economic competitiveness by creating commercially targeted open innovation platforms between Latvia and Finland. The focus areas are in sustainable eco-efficiency and water expertise in North-West Russia and Central Asia.

The project combines the clusters' complementary competences with a potential to develop specialized solutions to the target market needs. These strategic platforms support transnational cluster intermediaries on their operational projects helping companies in their business development and fruitful commercialization of joint ideas internationally.

To provide market knowledge from both market areas two separate market watch reports are compiled as a part of the project – one from North-West Russia and one from Central Asia. This report covers North-West Russia, specifically focusing on St. Petersburg area.

This report contains information gathered from local references and sources from the target market, published mainly in Russian. The information is mostly gathered from the public material of the St. Petersburg city council, their statistics and official websites. Also magazines and other publications have been utilized, such as professional magazines of the building sector. Some information is based on discussions with key personnel in St. Petersburg and Finnish companies that are active in St. Petersburg market.

2. Objectives and framework of the study

The main objective of this survey is to provide up-to-date, accurate and critical state-of-the-art information on St. Petersburg area urban cleantech market, competitive analysis, as well as analyze the possibilities and challenges in the near future for Finnish and Latvian companies.

The thematic focus of this report is introduced in the Figure 1.

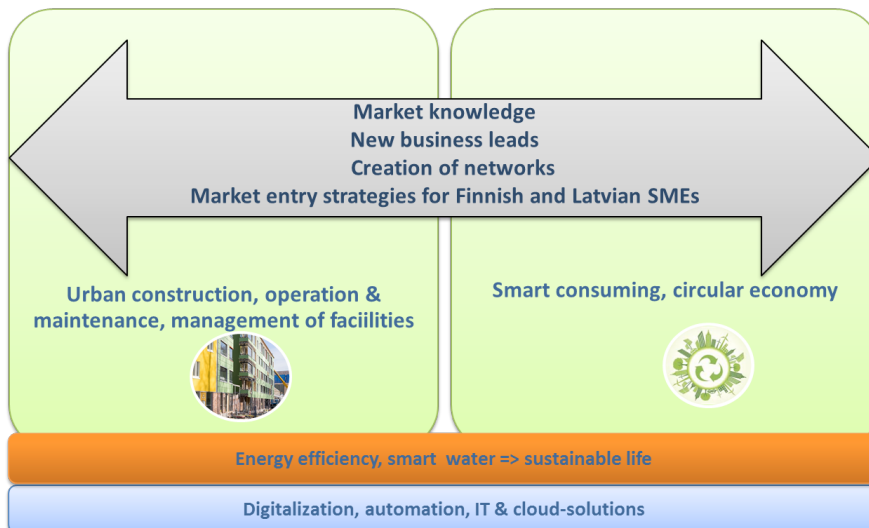


Figure 1 Thematic focus of CB2East project in North/West Russia (St. Petersburg region)

The geographical focus of the report is St. Petersburg and Leningradskaya oblast (Figure 2).

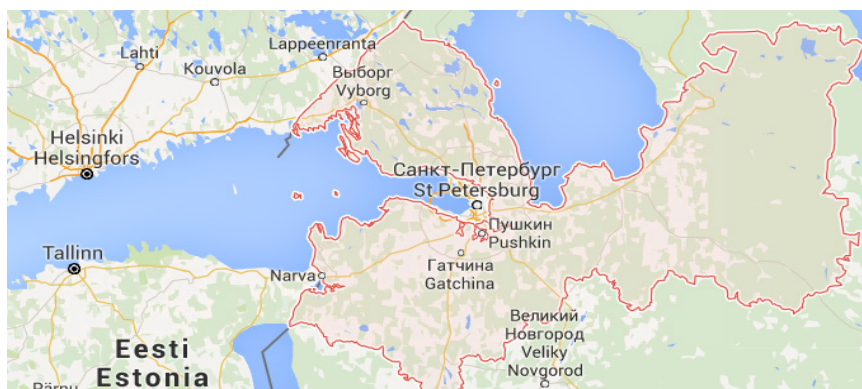


Figure 2 The geographical focus of the report

3. St. Petersburg region market information

There are 7 million inhabitants living in St. Petersburg and Leningradskaya oblast. The region is still growing, according to Petrostat (Statistic agency of the region) there will be growth of approximately 326 000 inhabitants by the year 2020 (Figure 3).

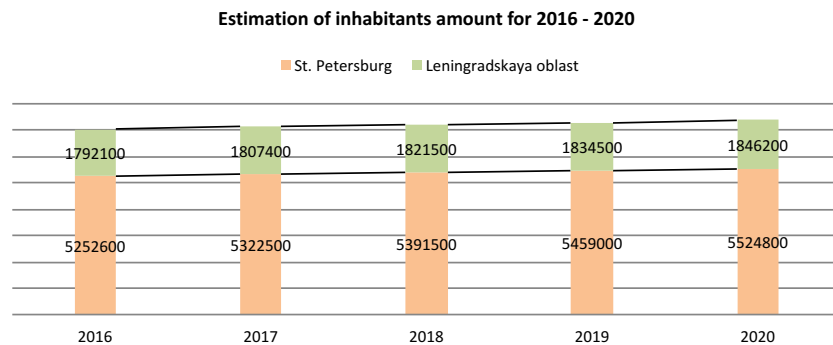


Figure 3 Estimation of the number of the inhabitants in St. Petersburg and Leningradskaya oblast for 2016–2020

Energy consumption shares of different sectors in St. Petersburg (in 2015) are presented in the Figure 4. St. Petersburg consumes more electricity than it produces. The difference is about 7 billion kWh. Again in Leningradskaya oblast in 2015 18 billion kWh more was produced than consumed. Heat generation in St. Petersburg and Leningradskaya oblast in 2015 was about 70 million Gcal (in Russia, the unit of heat is typically Gcal and for that reason it is also used in this report. 1 Gcal = 1.163 kWh) (Figure 4).

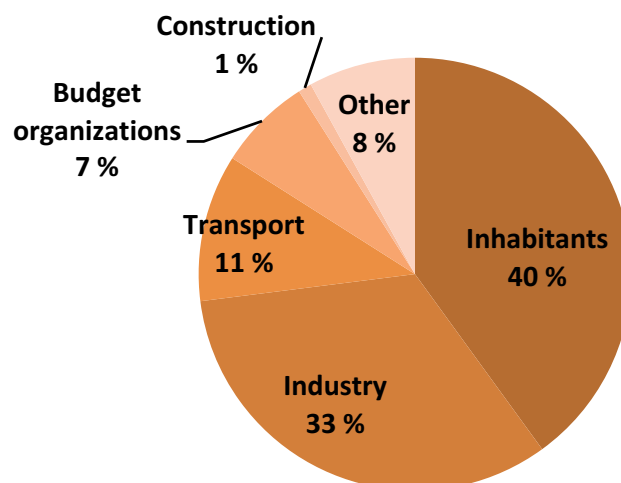


Figure 4 Energy consumption by different sectors in St. Petersburg in 2015 (source, Petrostat)

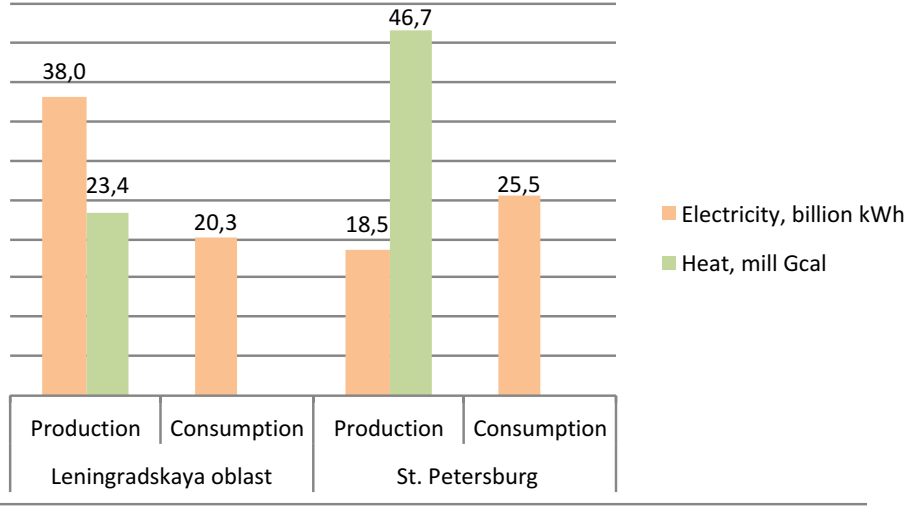


Figure 5 Energy production and consumption in St. Petersburg and Leningradskaya oblast in 2015.

St. Petersburg's main water resource is surface water – Neva river (97% of all demand, 735 000 m³/year). 3% comes from groundwater. The water consumption in SPb is decreasing. The average water supply in 2004 was 2,58 million m³/day, in 2012 – 1,9, in 2014 – 1,7 (Figure 6). Water consumption volumes by different sectors in St. Petersburg in 2012 and 2014 are presented in Figure 7.

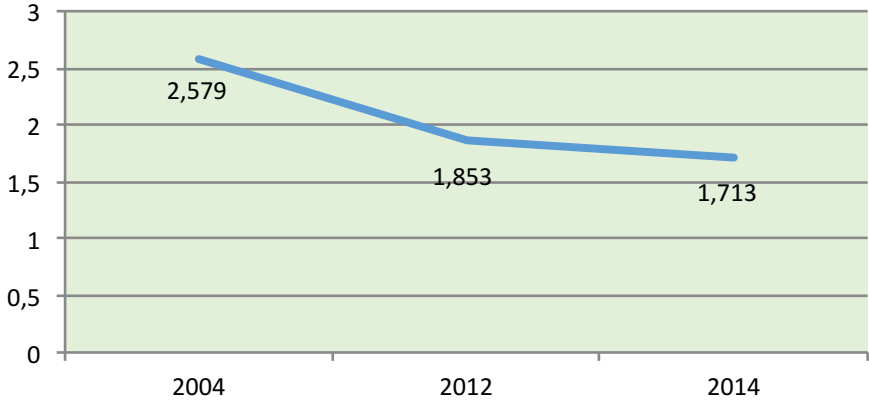


Figure 6 Water consumption in St. Petersburg 2004–2014, million m³ per day

The total water supply balance of St. Petersburg "Vodokanal" (in million m³/year)

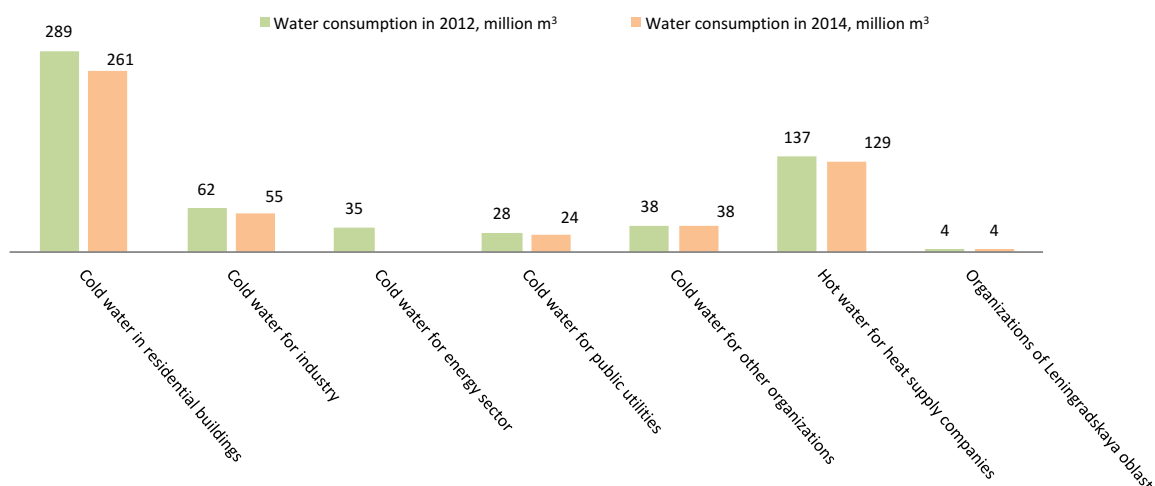


Figure 7 Water supply volumes in St. Petersburg for different sectors in 2012 and 2014, in million m³ per year

The shares of different sectors in the economy of St. Petersburg is presented in the Figure 8.

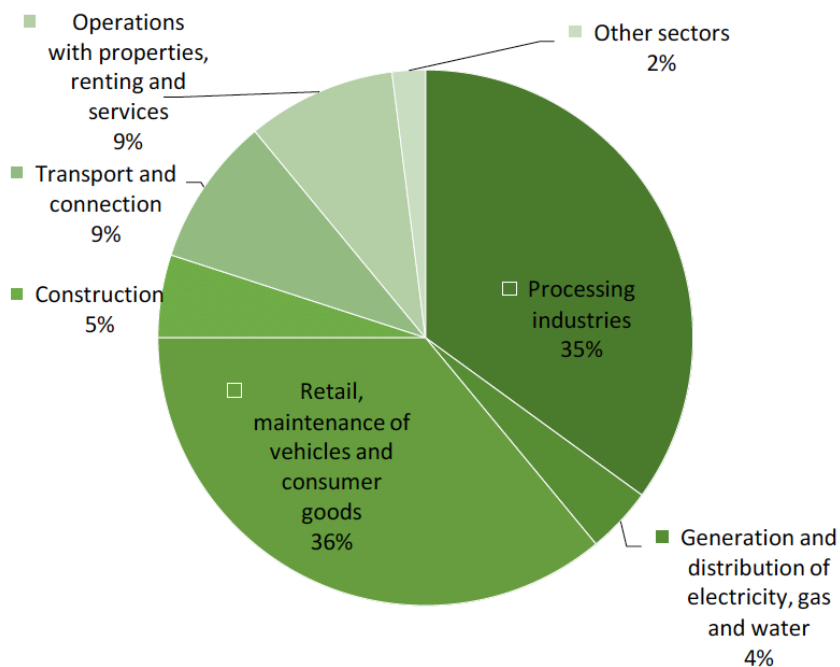


Figure 8 The shares of different sectors in the economy of St. Petersburg in 2014 (source Petrostat)

4. State-of-the-art

As a part of the CB2East project, individual companies' interest and information needs were discussed and identified in order to reach an understanding of what kind of information this market watch should contain. The companies were shown the steps in the urban cleantech project's lifecycle (such as buildings, energy distribution infrastructure, water infrastructure and such) (Figure 9) and the companies expressed their role in the phases and interest of which of the phases should be further investigated. This led to a decision that state-of-the-art analysis was done for phases 3–5 introduced in the Figure 9. The information is introduced in this chapter.

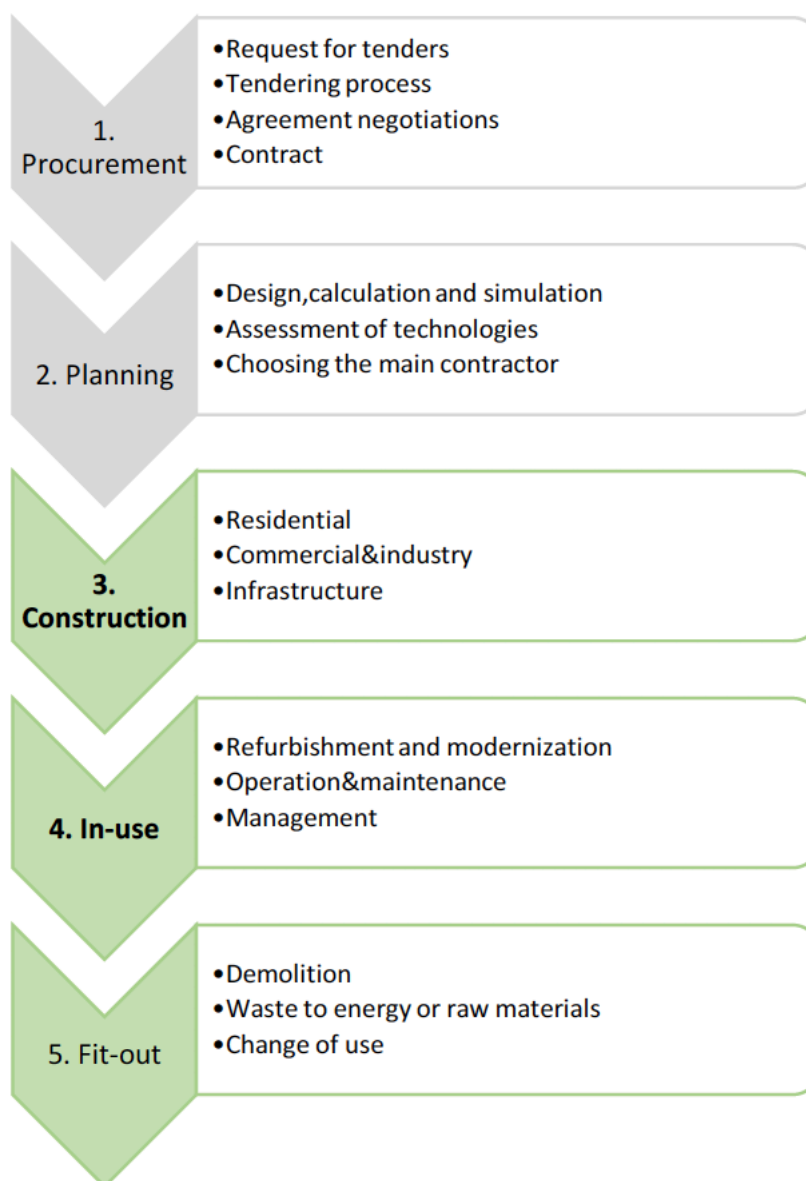


Figure 9 Definition of urban cleantech project lifecycle phases

4.1 Construction

4.1.1 Residential buildings

Residential building construction projects in Russia are divided into three classes: economy, business and elite. In St. Petersburg:

1. **Economy class residential buildings** are mainly concentrated in the peripheral districts of the city, in so-called "dormitory suburbs".
2. **Business and elite class** are mainly located in the city center and are mainly brown field projects.

According to St. Petersburg Construction committee, about 3 million m² of residential spaces were commissioned in the year 2015 (in Russia statistic of construction are compiled in different way than in Finland, where volumes of construction measured in m³ and by the year the building has started). In December 2015 the number was about 650 000 m² (Figure 10). In The Figure 10 and further in the text of report "object" means "residential block" (in St. Petersburg and in the big cities of Russia one construction project includes typically several buildings rather than just one building). In St. Petersburg it is also possible that the main constructor is obligated to take care of building some physical and social infrastructure, i.e. premises for the school in to the building block. The Construction committee of St. Petersburg made that ruling in order to solve the problem of different pace of development of apartment buildings and kindergarten, school, etc., as well as heat and water networks, roads.

The level of residential construction has been stable for almost 7 years. Even the bad economic situation has not influenced drastically on the volumes of residential construction. According to the Ministry of Construction and Housing of Russia, the state will be supporting the development of construction business. In 2014 more than 95 % of residential building projects were financed by private investors.

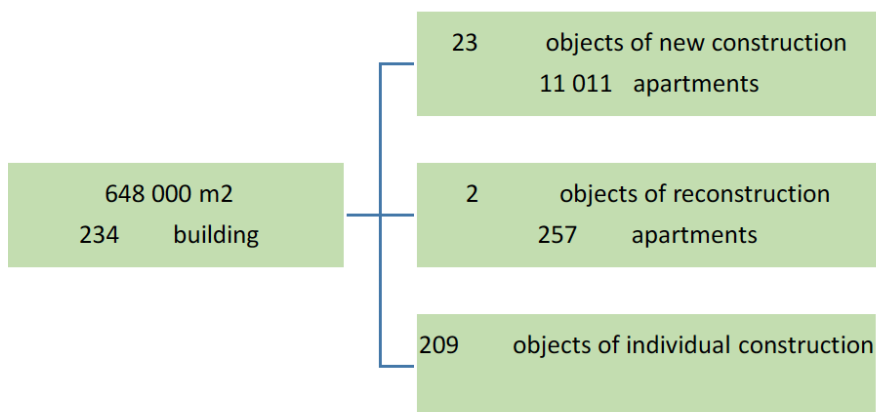


Figure 10 Statistics of residential construction in St. Petersburg in December 2015
(source: <http://gov.spb.ru/gov/otrasl/komstroy/statistic/development/>, read 18.2.2016)

In Leningradskaya oblast construction pace is faster than in St. Petersburg. In the last 8 years housing stock has doubled in size. In 2015 the volume of residential construction was 2 200 000 m² (Figure 11). Though the building size in general is smaller than in St. Petersburg due there are lot of i.e. single family houses or small cottages being built. Quite a recent trend is that land plots with infrastructure are more popular than turn-key properties. Buyers are interested in designing their future home by themselves (<http://doveriekonkurs.ru/> 30.11.2015).

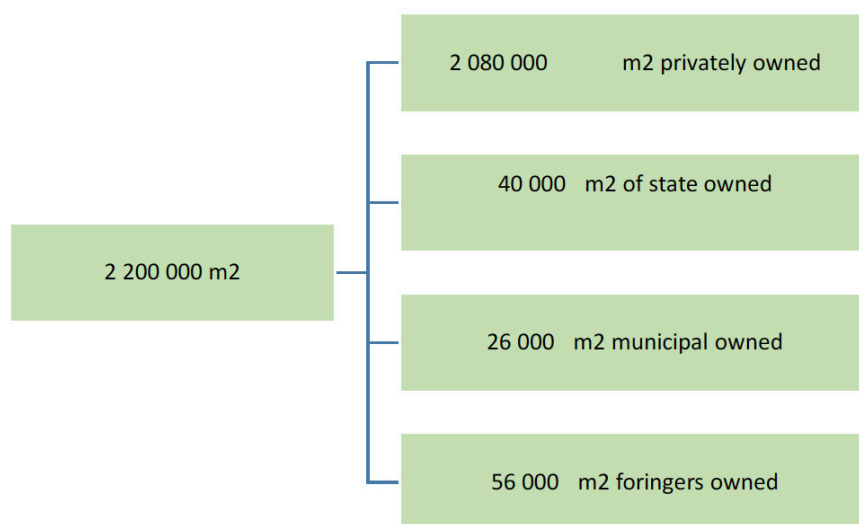


Figure 11 Statistic of of residential construction in Leninradskaya oblast
http://petrostat.gks.ru/wps/wcm/connect/rosstat_ts/petrostat/resources/be-32ca8040681937b3bef7367ccd0f13/03zil_o.pdf , read 7.1.2016)

In the end of 2015 in St. Petersburg the average living space per inhabitant was 24 m². The forecast for 2030 is 35 m². If the planned pace of construction will be realized, the residential building stock will grow 1,45 times in size and the size will reach 185 million m². (http://www.cedipt.spb.ru/press_service/news/news-detail.php?ELEMENT_ID=3738 , read 11.1.2016)

4.1.2 Construction of industrial and commercial facilities

Hotel sector

A remarkable potential for hotel construction in the near future has been identified in St. Petersburg. In example, the City Administration is seeking for investors to build at least 3 star hotels with number of rooms from 80 to 200. A call of tenders was opened in February 2016 for refurbishment of 10 hotel buildings. 6 land plots are on sale for construction of hotels. In order to stimulate the market growth of quality hotels, the city of St. Peterburg has decided to lower the rate for investments that are seen strategical for the City. <http://ktostroit.ru/news/248077/> (read 18.2.2016).

Industrial parks

Currently there are couple industrial parks under development in St. Petersburg region. One of them - the Industrial park Greenstate – is a private industrial park of Finnish construction company YIT. From 112 ha of the total area of the industrial park are 44 ha vacant for production placement (<http://www.yit-greenstate.com/en/main>, read 22.3.2016).

Shopping centres

Shopping centers have been actively constructed in the last few years. According to the vice mayor of construction of St. Petersburg there are no more need for new big retail facilities like shopping centers.

Offices and business parks

Office buildings and business parks have been constructed very actively during the last 10 years. They are mostly LEED or BREEAM certified.

4.1.3 Infrastructure construction

New infrastructure inside a residential block

In St. Petersburg a construction company can be obligated to build physical and social infrastructure (for free) as a part of main contract.

In Leningrad oblast the authorities have launched a separate regional programme few years ago. The programme gives tax reductions for construction companies for building residential block with infrastructure (social and physical) into the block.

Water supply and sewerage networks

In St. Petersburg it is planned that about 40 % of existing water networks will be renewed. The most remarkable new construction is planned in the south part of the St. Petersburg on the border with Leningradskaya oblast for the so called city-sputnik Juzny.

It is planned that before year 2025 about 11 km of deep tunnels for waste water collection and drainage to the treatment plants will be planned.

Water networks in Leningrad oblast have been constructed remarkably during last few last years due to long distances between new buildings from the water treatment facilities.

Roads and other physical infrastructure

St. Petersburg megapolis level – whole St. Petersburg and the urbanized part of Leningrad oblast: Urban development in megapolis level is very challenging. The main challenge is that St. Petersburg and Leningradskaya oblast are different subjects of Russian Federation. There are no ready instruments for developing the megapolis as a whole. This problem has been identified in Russia and the first steps to tackle the challenges have been taken.

In 2014 a concept for cross boarder complex development of Leningradskaya oblast and St. Petersburg, so called KOT-concept was developed (*"Концепция комплексного развития территорий Ленинградской области, прилегающих к границам Санкт-Петербурга"*). The KOT-concept is focused on developing the areas as one holistic concepts including more than 100 000 m² of residential premises.

4.2 In-use phase

4.2.1 Refurbishment and maintenance of multifamily buildings

In St. Petersburg there are totally 22 961 multifamily buildings. More than 53% of those are so called type buildings, which are explained more in detail further in this chapter.

All buildings in St. Petersburg are obligated to create "a building pass", which contains basic information of the building. In the near future the plan is to develop the building pass to include more information about the general condition of the building. Starting from May 2015 all management companies of multifamily buildings are obligated to provide information about the building and its condition on Federal Information System of Housing Sector (ГИС ЖКХ – Государственная информационная система жилищно-коммунального хозяйства): <http://dom.gosuslugi.ru/#/main>. In January 2016 the database included information of 1821 buildings of St. Petersburg, which is only a small share of the building stock. http://gov.spb.ru/gov/terr/reg_kalinin/rajon-noe-hozyajstvo/raskrytie-informacii-tszh-i-zhsk/ 12.1.2016

According to the Building and housing Code of Russian Federation, a decision making on a multifamily building refurbishment (*капитальный ремонт*) and its financing, using funds of capital repair, obtaining loans, etc. can be done only at a general meeting of residents with a majority of at least 2/3 votes (Housing Code of Russian Federation 2013, art. 46).

Residential building type categories

The Russian building stock is divided into 3 main categories based on the following features:

1. construction period
2. apartment sizes
3. façade material.

The construction period is divided into two main groups:

1. Prior to the industrial period (before 1957)
2. industrial period (since 1957)

Division of buildings of “Prior to the industrial period” is further divided into the following sub-categories:

- Prior to the 1917 Revolution (“дореволюционные”)
- construction year 1918-1930 («конструктивизм»)
- “Stalin” buildings 1931-1956 («сталинские»)
- “German” buildings 1945-1948 (“немецкие”)

Typical residential buildings of the industrial period are:

- **1954–1972 “hrushevka”:** Buildings are typically 5 floor element or panel block buildings. The planned life cycle is 25 years. This type of buildings don’t include attic, elevator nor garbage shafts. Some series (1–504/1–507, ГИ, 1–527, ОД, 1–335) will be demolished and new residential multifamily building will be built in the site. For this purpose a renovation programme have been launched. The series 1–507 is the most common “hrushevka” in Saint-Petersburg, with total of about 7500 buildings. All together there are about 9 million m² of “hrushevkas” in Saint-Petersburg.
- **“Breznevka” buildings (so called “second stage of mass production buildings”:**
 - type 504 and its modifications 1ЛГ504Д2; 1–Лг-602; 1–Лг-606; 1–Лг-600 (called “ships” (“корабль”) in the spoken language; 121 (till 1992), 1–528КП, 1–528КП-40, 1–528КП-41, 1–528КП-80.
 - type 121 is the most long lasting building type being built for over 40 years. In the beginning they were 5 floor buildings with no elevator. Most commonly these buildings are located in Leningrad region. In Saint-Petersburg these type of buildings are typically 9 or 10 floors high and they include both elevator and a garbage shaft.
 - Type 1–528КП-40 buildings have been built from 1963 to the 1980s. The type was developed in Saint Petersburg and it spread from there all over the Soviet union. In St.Peterburg there are currently 365 building of this building type.
 - Type 1–ЛГ–606 has a reputation of being nicer and warmer type of “breznevka”. This is partly due the building type was built by a private building company rather than the city (*bt ZSK, жилищно-строительный кооператив*).
 - Type 1–ЛГ–600, “the ship”. The facade is build with concrete panels which are thin and don't have insulation layer. The buildings are 5–15 floors high. Typically these buildings are very poorly insulated.
 - Type 137 is the most popular building type, which also includes some modifications. The buildings have been built in 1973–1992. This building type can be seen in Picture 2 below.

- **“Modern buildings of the new era”** – All the buildings that have been built after 1992 are this type, The series are called i.e: 121; 137; 600.11; 606; 1.090.1. However, in “Housing stock modernization programme” sees that this building type includes all buildings constructed after 1980.
 - Series 121 is typically 16 floors high and well insulated (i.e. triple windows).
 - Series 137 is very common in Saint-Petersburg and it is the most popular building type among people living in Saint-Petersburg. There are several modifications of this building type, depending on the year it was built in. The “classical version” of the building type was built starting from 1973. The most valued modification is 137.11 and the buildings which were built in 1986 -1989. These buildings include 2 elevators and large kitchens, hardwood floors and rooms are 2.7 m high. Series 137 is so called “better layout buildings” (дома улучшенной планировки). Buildings of this series built after the year 1992 are not that harmonious when it comes to quality. Type 137 currently covers about 17 % of all residential stock of Saint-Petersburg. First ESCO (energy service company) of Saint Petersburg has done implementations on this type of buildings.

Companies interested in the refurbishment business can find more detailed information about Russian and St.Peterburg building types from the Russian document available in <http://yadi.sk/d/lkNt0oxUAKtaW>.

Residential building management models

Formally, apartment owners in multifamily building are responsible for organizing the management of the common property and premises of the building. This regulation came into force about 10 years ago from “The Housing Code of Russian federation (Жилищный Кодекс)”. In reality this process is not fully functioning as it should. Management of buildings is a very delicate and problematic issue in Russia. According to the Russian Minister of Construction and Housing Minin M. (interview on 18.2.2016 for Rossia 24 TV channel), there are few reasons for it. Firstly, the inhabitants or owners of the apartments still have the “socialistic” mentality that someone else will take care of common property. And this “someone” - the managing company – is not always making business in a responsible way. Secondly, the apartment owners haven’t had any real possibility to influence on the management. Formally the management is made through so called “self-regulation”, which means that a self-regulated organization (SRO) non-commercial partnership (NP) of enterprises of housing sector called “MezhRegionRazvitie” has been established. (Саморегулируемая организация Некоммерческое партнерство предприятий жилищного комплекса «МежРегионРазвитие» (СРО НП ПЖК «МежРегионРазвитие»). The main objective of this organization is to develop labor and service market for the management of housing stock. In the cases the owners don’t make a decision on choosing the model of management of the building, the regional SRO “MezhRegionRazvitie” choose management company to take care of the building. But in the cases the management company does not work according to the agreement, SRO can only change the management company, but not to give any sanctions to the company which was not implementing the work as agreed.

Mandatory certification of management companies of multi-family buildings in Russia

Starting from May 2015, a new instrument was launched as an attempt to resolve the problem of non-professional management of multi-family buildings. This instrument means that only certified companies can provide management services for multi-family buildings. The instrument is controlled by an organisation called "Zhilcomservice" ("Жилкомсервис"). If 20 % of managed buildings will not be managed according to certificate, then certificate of the management company can be invalidated.

Minister Minin stated in the interview (on 18.2.2016 for Russia 24 TV channel) that the only effective way to influence the building management quality is to activate the apartment owners in taking part of the decision making process (i.e. by organizing general meetings). Currently in the decision making process there are also some illegal activities taken place – such as minutes of meetings of general meetings are being counterfeited. There are some examples where there has been a decision to start renovating the building and an authority to use house owners' money for it has been given, but in fact no activities are implemented.

Generally the apartment owners have three alternatives to take care of the building of management. The implementation models are:

1. **Direct management:** Starting from 2015 this model has some restrictions – only multifamily building with number of apartments below 12 can choose this model.
2. **Homeowners associations:** In this model a non-profit juridical organization is established for the management and maintenance of common property in a multifamily building. Currently there are 3 types of homeowners' associations: TSZH, ZHSK and ZHK. In Saint-Petersburg about 20 % of multifamily building are managed by this model. (269 ЖСК, 150 ТСЖ http://gov.spb.ru/gov/terr/reg_kalinin/rajonnoe-hozyajstvo/raskrytie-informacii-tszh-i-zhsk/, 12.1.2016)
3. **Management company:** This model has increased its popularity in the past few years. Some of the construction companies have established their own building management companies to take care of the building throughout its whole life cycle. Finnish construction companies who are building in St. Petersburg typically use this model. About 80 % of buildings are maintained by management companies, as seen in the Figure 12.

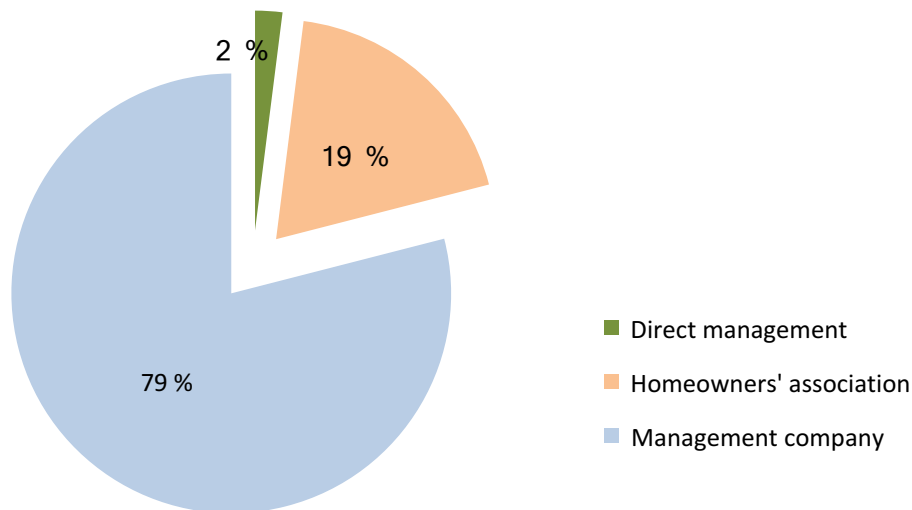


Figure 12 Division between 3 different management models in St. Petersburg

Costs of living in the residential buildings

Person living in a residential building in St. Petersburg pays for the following services:

1. housing services (*жилищные*)
2. municipal services (*коммунальные*)
3. other services (*прочие*)
4. capital refurbishment (*капитальный ремонт*)

The housing services include: building management, maintenance of common property (such as elevators), small renovations, cleaning, metering and waste management. These services are paid based on the apartment size. Starting from July 2016 housing services tariffs in St. Petersburg will be increased 14,2%. Payment will be made based on apartment size m². As an example, for a building with elevator, payment will be 26,09 RUB/m². (in EUR equivalent about 0,30 €). More exact tariffs can be found from the following web-site: <http://www.kvartplata.info/d/46980/index.jhtml> (data in the report from 12.1.2016).

Municipal services include: water, electricity, gas and heat. Maximum level of tariffs level is regulated by the state. Municipalities make decisions of their own rates. In St. Petersburg the rating is under responsibility of Committee of Tariffs. The tariffs are being validated twice a year.

If in the apartment or building without installed consumption measuring equipment, then inhabitants pay according to so called consumption norms (Tables 1 and 2).

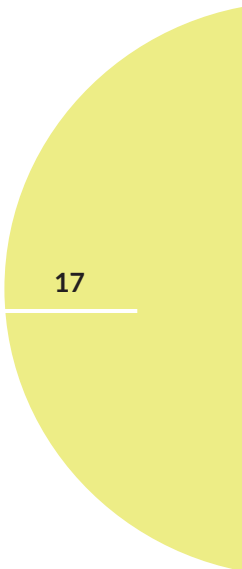


Table 1 Hot and cold water consumption norms in St. Petersburg

		Apartment	Common facilities
		m ³ /person monthly	m ³ /m ² monthly
Cold water	cold and hot water, shower and/or bathtub	5,48	0,03
	cold water, boiler, shower and/or bathtub	9,29	0,03
	cold and hot water, without shower and/or bathtub	4,64	0,03
	cold water, boiler, without shower and/or bathtub	7,01	0,03
	cold water	4,2	0,03
Hot water	cold and hot water, shower and/or bathtub	3,81	0,03
	cold and hot water, without shower and/or bathtub	2,37	0,03
Waste water	shower/bath tab	9,29	-
	no shower/bathtub	7,01	-

Table 2 Energy consumption norms in St. Petersburg

Heating norms				
min	0,0154	Gcal/m ²	0,013	MWh/m ²
max	0,031	Gcal/m ³	0,027	MWh/m ³

Electricity consumption norms					
Rooms in apartment	inhab. per apartment	buildings without gas stove		buildings with gas stoves	
		no boiler	with boiler	no boiler	with boiler
1.	1	90	194	140	244
	4	35	76	55	95
	> 5	31	66	48	83
2.	1	116	251	165	288
	4	45	98	64	112
	> 5	40	85	56	98
3.	1	131	284	181	315
	4	51	111	70	123
	> 5	45	96	61	107
4.	1	142	307	192	335
	4	55	120	75	131
	> 5	48	104	65	114

The tariffs for the past 6 years are presented in the Table 3 and in the Figure 11 are the growth rates per resource.

Table 3 Tariffs in Saint-Petersburg for individuals in multifamily buildings and private houses
(source: Tariffs Committee of St. Petersburg)

	2009	2010	2011	2012	2013	2014	2015	1.1.2016 *	growing per year	growing in % 2009-2015
Heating energy, RUB/Gcal	795,9	931	1050	1175	1351	1408	1542	23,068	9,52 %	94 %
Hot water, RUB/m3	47,74	55,88	63	70,5	81,08	84,48	92,51	1,384	9,51 %	94 %
<i>Electricity in houses with gas stoves, RUB/kWth</i>										
Whole day tarif			2,8	2,97	3,39	3,53	3,84	0,057	8,78 %	
"Night" electricity tarif/day	2,31	2,55	2,81	2,98	3,41	3,55	3,91	0,058	10,14 %	69 %
"Night" electricity tarif/night	1,39	1,55	1,71	1,81	2,06	2,14	2,3	0,034	7,48 %	65 %
<i>Electricity in houses with electric stoves, RUB/kWth</i>										
Whole day tarif			1,96	2,08	2,37	2,47	2,69	0,040	8,91 %	37 %
"Night" electricity tarif/day	1,62	1,79	1,97	2,09	2,39	2,49	2,74	0,041	10,04 %	69 %
"Night" electricity tarif/night	1,39	1,55	1,2	1,27	1,44	1,5	1,6	0,024	6,67 %	15 %
Cold water and waste water	11,14	13,15	15,78	17,72	20,38	21,03	23,13	0,346	9,99 %	108 %
Natural gas RUB/1000m3	2700	3313	3 806	4 375	5032	5242	5582	83,507	6,49 %	107 %
* amount in Euros, average rate in 2015	66,85	http://cbr.ru/statistics/print.aspx?file=credit_statistics/ex_rate_ind_15.htm&pid=svs&sid=analit 7.1.2016								
** in Russia using Gcal, here is 1 Gcal = 1,163 MWh	1,163									

<http://gov.spb.ru/helper/tarif/tarify-2015-goda/tarify-dlya-rascheta-razmera-platy-za-kommunalnye-uslugi-dlya-naseleni/>
7.1.2016

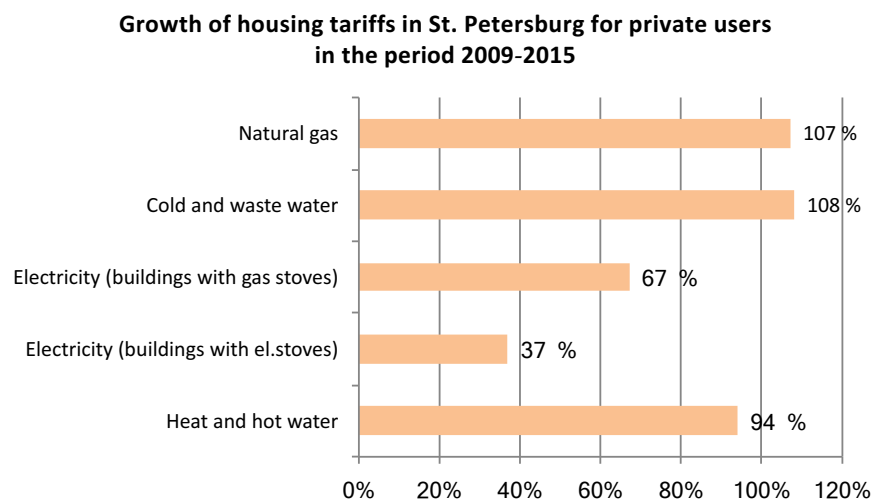


Figure 13 Growth of housing tariffs in St. Petersburg for private users in 2009-2015

Tariffs on heating and hot water are growing about 9,5 % per year.

In order to motivate users to reduce their water consumption level and install water metering equipment a new payment model has been introduced. From 1 January to 30 June 2016 norm of payment for water use will be increased 3 times higher for those individuals / apartment owners, who have not installed water metering equipment. Starting from 1 July the the price will be 5 times higher.

Other services include: TV, internet, security, parking, janitor.

The process for agreements for payments of services in management company -model of is presented in Figure 14.

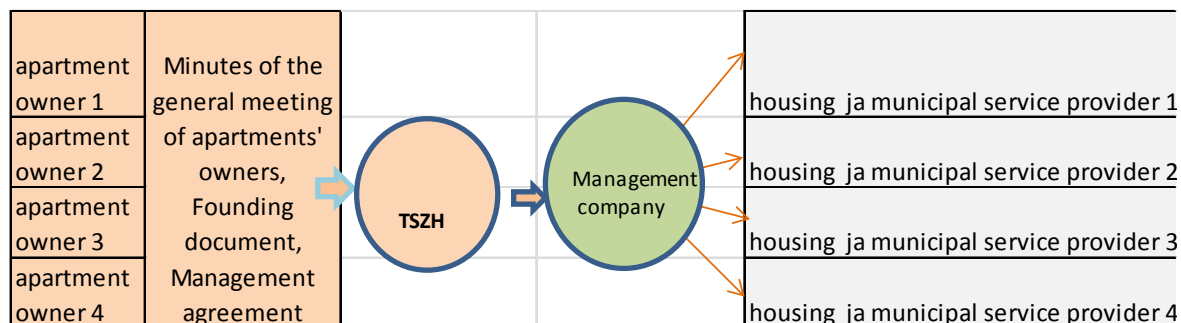


Figure 14 Agreement process for payments of services in multifamily buildings in Russia

The payment for capital refurbishment

This payment is collected for the future refurbishment activities, which will be implemented in the frame of "Capital refurbishment of multifamily buildings programme" (more detailed explanation about the background of the programme, money using mechanisms and implementation of the refurbishment projects is in the Chapter 7. The minimum level of payments in St. Petersburg in 2015 was 2–3 rubles per m² (this level is the lowest in Russia). 8 rates were developed in 2015, depending on the following factors: the period of construction, the façade material (division as explained in chapter 3.2.1) and the fact if the building was refurbished before the privatization of the apartments.

If the apartment owners would like to implement more activities than included into the Programme, the Housing Code allows owners to collect more than the minimum payment. In St. Petersburg in 2015 about 90 buildings were collecting 5–15 RUB/m² per month. Higher level payment should be decided in the General meeting of the building.

4.2.2 Heat supply system

The development process of the heat supply system in St. Petersburg is defined in the decision made by the government of St. Petersburg on "Complex development of systems of communal infrastructure, energy sector and energy saving in St. Petersburg 2015–2020". (*постановление Правительства Санкт-Петербурга от 17.06.2014 N 486 «О государственной программе Санкт-Петербурга «Комплексное развитие систем коммунальной инфраструктуры, энергетики и энергосбережения в Санкт-Петербурге» на 2015-2020 годы»*).

The main technical components of the development programme 2015–2030

Generally, the condition of heating networks is bad in St. Petersburg. About 40% needs to be renewed. As an attempt to improve the situation, the utilization of the following advanced technologies are implemented by the biggest heat supply company in St. Petersburg – “GUPTEK SPb”:

- thermal aerial photography from the helicopters for monitoring the condition of underground network (contractor is a local company «ДИСКО»). Based on the data the aim is to form GIS database which is used for the implementation plan of heat network modernization programme (more detailed description of the programme in chapter 7.3 of the report)
- magnetic sludge separator (*магнитные шламоотделители*)
- ODACON technology for conservation of boiler surface during long maintenance periods
- colloidal carbon inhibiting in open water heating systems (*технологии коллоидно-углеродного ингибирования подпиточной воды открытых систем теплоснабжения*)
- operational remote control (*системы оперативно-дистанционного контроля*)

For peak consumption periods a heat plant “Parnas” (*«Пиковая» котельная «Парнас»*) is utilized. Parnas serves about 2 000 buildings and has a total heat capacity of 1250 GCal/h.

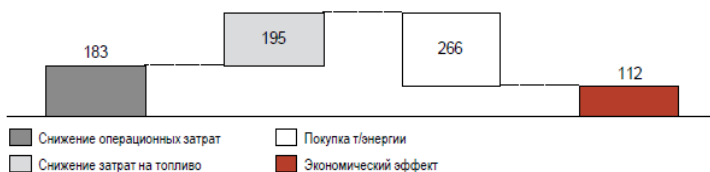
Non-efficient coal plants are currently planned to be shut down. In the remaining small and large scale heat plants automated process control systems will be installed.

An example of a planned investment is a project, where 3 old non-efficient heat plants of “GUPTEK SPb” will be shut down and there will be a combined heat and power plant of “TGK-1”. More detailed information about the project is presented in Figure 15.

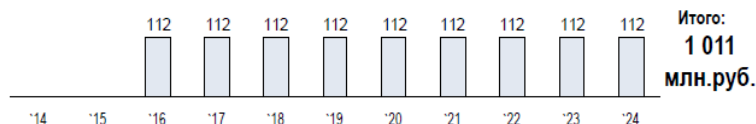
Инвестиции в вывод котельных из эксплуатации позволят сократить расходы ГУП ТЭК на обеспечение тепловой нагрузки потребителей

№	Котельная	Инвестиции в разбивке по годам, млн. руб.											Итого
		'14	'15	'16	'17	'18	'19	'20	'21	'22	'23	'24	
1	«1-я Кировская»			44	44								87
2	«1-я Московская»			10	10								20
3	«2-я Фрунзенская»			97	97	97	97	97	97				582
				151	151	97	97	97	97				689

Годовой экономический эффект, млн. руб.:



Экономический эффект в разбивке по годам, млн. руб.:



↑ Снижение затрат на обеспечение тепловой нагрузки потребителей за счет более дешевой тепловой энергии от ТЭЦ

↓ Повышение объема закупаемой тепловой энергии

• Экономия за счет низкого УРУТ на ТЭЦ в теплофикационном режиме

• **1 011 млн.руб.** – накопленная экономия к 2024 году

Figure 15 Example of planned investment project of the heat supply system in St. Petersburg

The main structural components of the programme

1. New structure of responsibility

Currently the zones that are under responsibility of different heat supply companies are relatively small. The plan is to combine heat distribution systems into a larger zones in the near future (*целевые укрупненные зоны ЕТО*) (Figure 16).

Целевые укрупненные зоны ЕТО

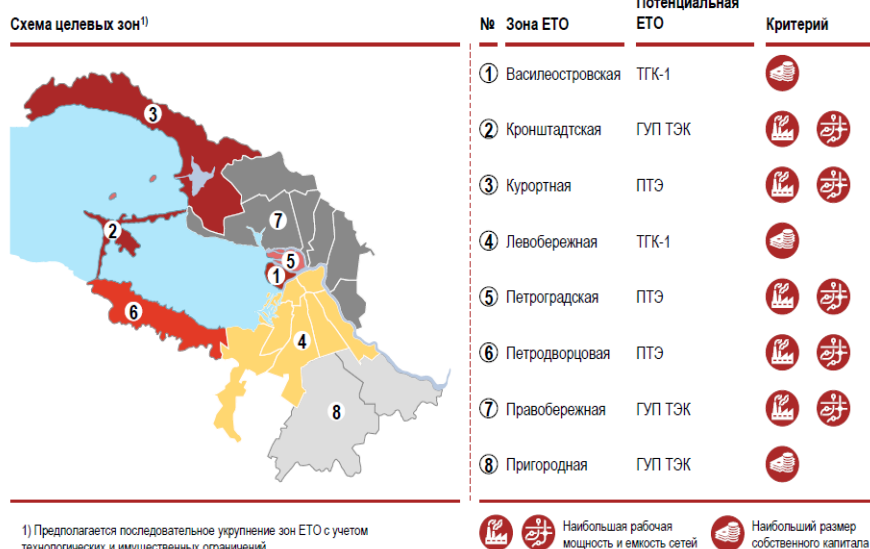


Figure 16 Scheme of targeted widened zones of heat supply in St. Petersburg

2. Development of optimized tariff regulation

At this moment the tariffs for heat supply companies are regulated by the Tariff committee and are based on real, approved and justified costs of the heat supply company. As an example, in the Figure 17 there are the tariffs of the biggest heat supplier in St. Petersburg – “GUPTEK SPb”. The difference between what’s been invoiced from the inhabitants and justified and approved tariff for the heat supply company are compensated to the heat supplier from the municipality’s budget. In 2015 in St. Petersburg this was about 16 % of the total costs (Figure 18). In the development programme, the target for 2027 is to decrease this rate to 7%.

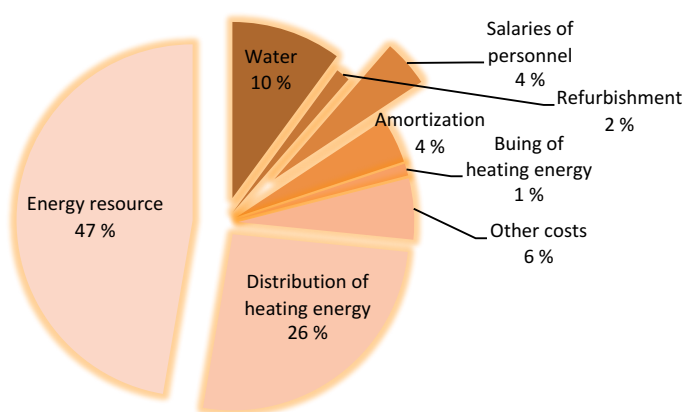


Figure 17 Tariffs of one of the heat suppliers in St. Petersburg – “GUPTEK SPb” in 2015.

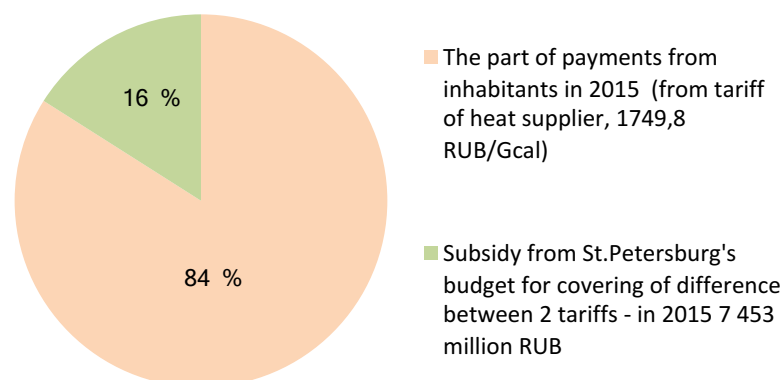


Figure 18 Division of costs of heat between consumers and St. Petersburg City's budget in 2015.

3. Billing and payments models for heat consumption

The level of collected payments from heat consumers are relatively low and this is a challenge for the development of the heat supply network. The main reason for the low level of payments is that the heat supply companies are not invoicing directly the consumers rather than indirectly via two organizations – the accounting center of the municipal services (БЦКП) and the management company of the building (ИКУ) (Figure 19). In the left in the Figure 19 there is the scheme how it is currently and in the right there is the planned scheme, where the consumers can choose whether they pay through the management company or directly to the heat supplier.

In order to enable the direct invoicing, some technical activities in the building stock needs to be implemented - such as installation of measurement equipment of heat consumption (узлы учета теплового потребления – УУТП). Measuring the heat consumption on the consumer side would have an impact on resolving the problem with the mismatch between the data in heat supply company and the customer invoicing level (Figure 20). The mismatch is currently a remarkable problem. For example, the invoicing level of the heat supply in February 2016 should be the same as for January 2016 even though in January there was a long period of cold weather (difference in the monthly mean temperature is more than 10 °C). The City Administration obligated the billing organization to “correct” the bills to avoid the problems with the inhabitants.

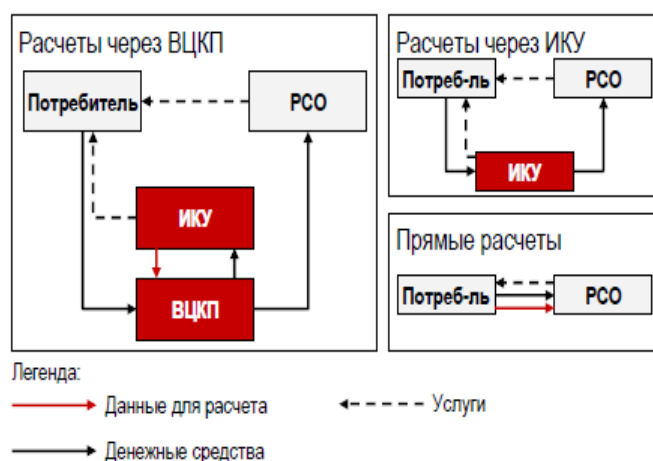


Figure 19 Billing scheme for heat supply in St. Petersburg (on the left – existing and on the right – planned)

Текущая ситуация

- ВЦКП использует для расчетов данные, которые предоставляются ИКУ
- Данные ИКУ могут отличаться от данных, которые используются для расчетов РСО

Расчеты ВЦКП		Расчеты РСО
Исходные данные Площадь, кол-во жильцов и т.д.	≠	Исходные данные Площадь, кол-во жильцов и т.д.
×		×
Нормативы	=	Нормативы
×		×
Тариф	=	Тариф
Начисления ВЦКП	≠	Начисления РСО

1. Расхождения в исходных данных приводят к расхождению в расчетах
2. Расчеты основаны на нормативном, а не фактическом потреблении тепловой энергии

1) узел учета тепловой энергии

Целевая ситуация

- Расчеты производятся на основании показаний узлов учета тепловой энергии

Расчеты биллингового центра		Расчеты РСО
Показания УУТЭ ¹	=	Показания УУТЭ
×		×
Тариф	=	Тариф
Начисления биллингового центра	=	Начисления РСО

1. Реализация может привести к снижению полезного теплоотпуска после перехода на учет по фактическому потреблению

Figure 20 Explanation of the current scheme of billing for heat consumption (on the left) and the planned scheme (on the right)

Heat generation

In St. Petersburg 4 heat generation companies connected to the centralized heat networks. The structure of one of them "GUPTEK SPb":

1. Branch office for energy generation: including 56 big plants, 317 small scale plants with heating networks (supplying heat to one or a few buildings). Most of them are working on natural gas. Serving about 12 000 buildings with 2,5 million inhabitants. Wide range of customer groups.
2. Branch office of heat networks: including networks of big plants including all equipment. Controls also the quality of heating energy. 4367 km heat supply networks (D 5 – 140 cm).
3. Other supporting departments:
 - transport and technic for operation and maintenance of networks (563 units)
 - sales and development (connecting of new consumers to networks)
 - customer service

Heat distribution

St. Petersburg has fairly large centralized heat supply network. The total length of the network is around 5000 km. Typically the network is 2 pipes system.

Heat consumption

St. Petersburg has developed a plan for switching from existing system of hot water supply where the hot water supply is an open system to a closed one (Figure 21).

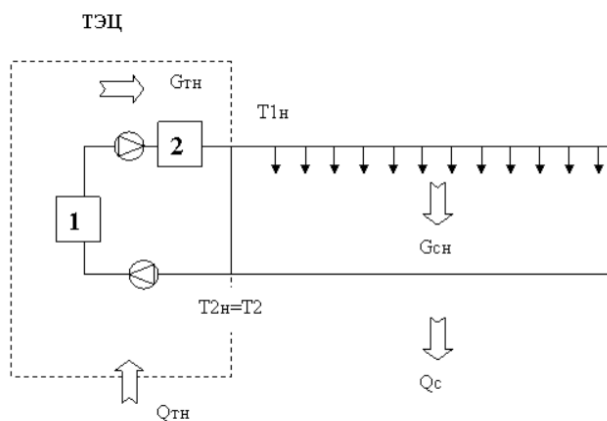


Figure 21 Hot water supply scheme in St. Petersburg

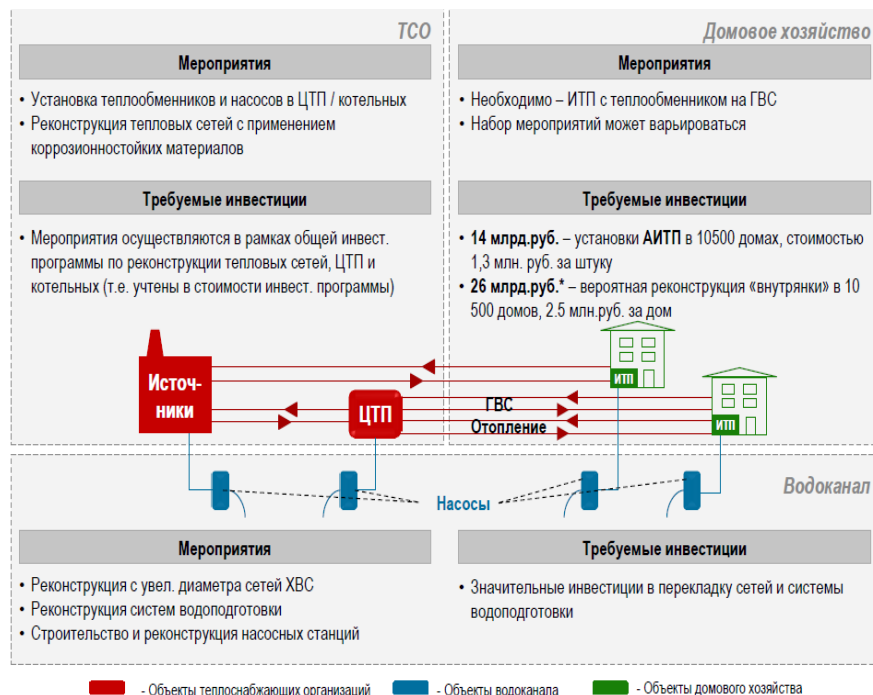


Figure 22 Planned scheme for closing of hot water supply system in St. Petersburg

4.2.2 Sewerage system

St. Petersburg has a combined scheme of sewerage: 70% of the whole territory has a combined sewerage system, which receives domestic, industrial as well as surface (rainfall, snowmelt) runoffs, the remaining area – mainly, new developments and suburbs are handled according to the separate scheme (rainfall and snowmelt waters are collected separately from other sewage).

The wastewater disposal system is divided into wastewater disposal basins. Discharges of each basin are channeled to corresponding wastewater treatment plants. The wastewater disposal basins are further divided into wastewater disposal districts; their territories are limited by the catchment of big tunnel collectors.

The St. Petersburg wastewater disposal system comprises:

- sewage networks – 8603 km
- tunnel collectors – 270.7 km
- sewage pumping stations (SPS) – 176
- wastewater treatment plants of different capacity – 15
- sludge incineration plants – 3
- permanent snow-melting stations – 10
- permanent technically equipped snow collection points – 6
- Pipe diameters of municipal sewerage network in St. Petersburg vary from 150 mm (courtyard networks) to 4.7 m (tunnel collectors).

Tunnel collectors are the basic mains for transporting sewage to wastewater treatment plants. In Leningrad the construction of tunnel collectors began in 1947. Inner diameter of tunnel collectors is 2 to 4.7 m, the depth is 15 to 80 m. The design capacity of sewage pumping stations varies from 300 m³/d to 1,000,000 m³/d. SUE “Vodokanal of St. Petersburg” performs modernization and reconstruction of SPS by implementing modern submersible pump units and integrated sewage pumping stations. In addition to the replacement of pumps and electrical equipment other auxiliary mechanisms are also modernized.

The biggest wastewater treatment plants in St. Petersburg are:

- Central wastewater treatment plant
- Northern wastewater treatment plant
- South-West wastewater treatment plant.

Sludge incineration

Three sludge incineration plants operate in St. Petersburg – at the Central wastewater treatment plant, Northern wastewater treatment plant and South-West wastewater treatment plant. Sludge is incinerated in the fluidized-bed furnaces at the temperature of 870°C. The heat produced by sludge incineration is used for process needs, space heating and power generation for Vodokanal to save energy resources. Flue gases are treated in three stages.

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5. Market potential for cleantech solutions

For this report, the market potential of cleantech solutions is analyzed based on energy and water production steps and a value chain (Figure 23) and an energy efficiency industry value chain (Figure 23).

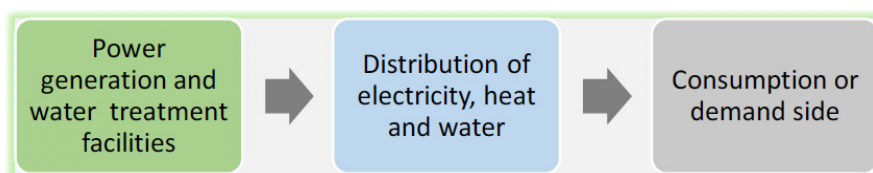


Figure 23 Energy and water production steps

The water supply is examined in three angles:

1. Improvement of efficiency of using energy in water supply and sewerage system
2. Quality of processes, “clean water”
3. Energy generation linked to water handling

5.1 Business possibilities in energy efficiency of energy and water supply

In this chapter business possibilities related to energy efficiency in heat and water supply are reviewed.

The different steps in the value chain are introduced in the Figure 24.

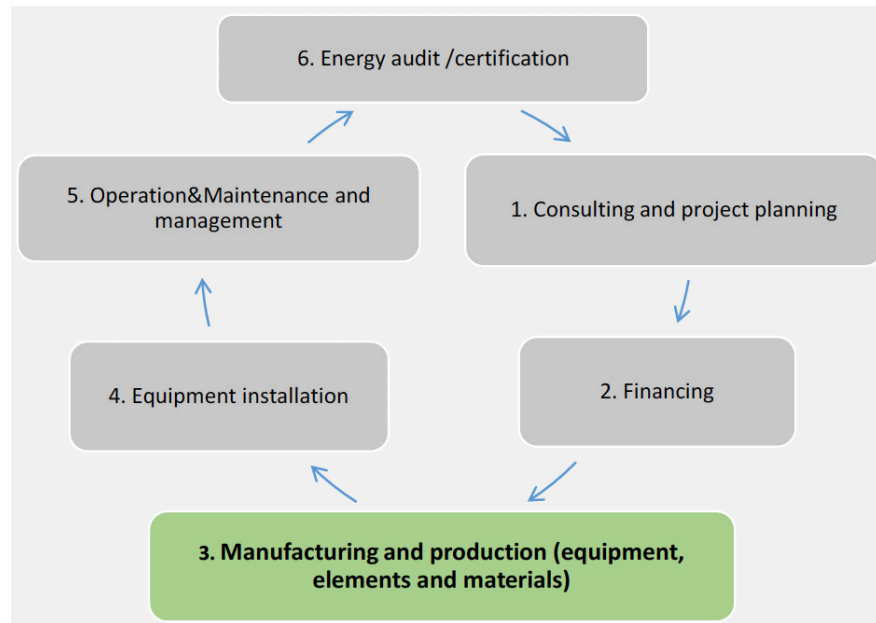


Figure 24 Energy efficiency value chain steps – EE business

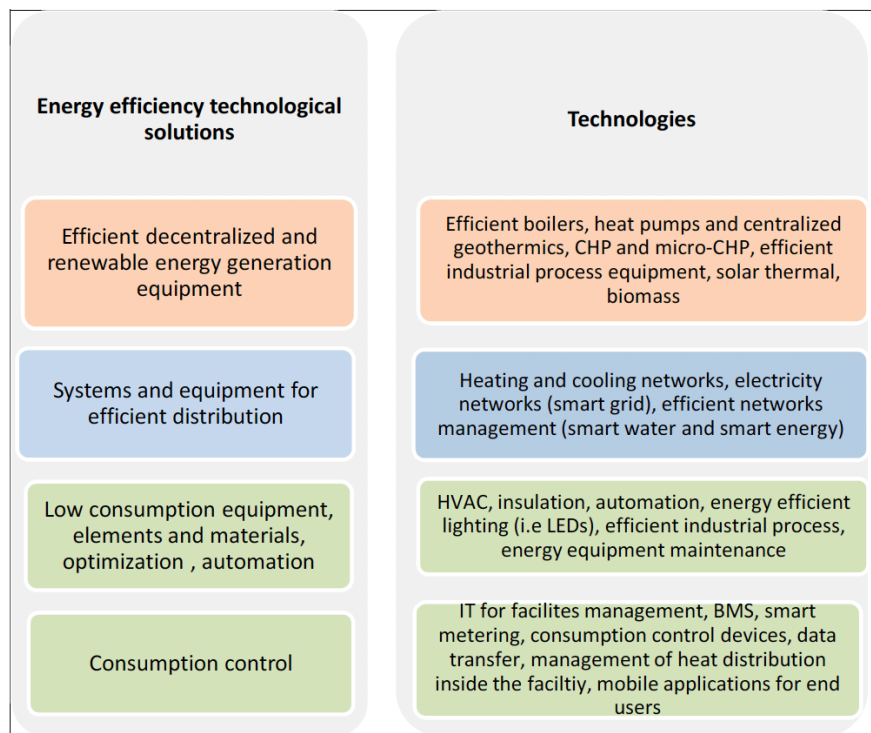


Figure 25 Energy efficiency and technologies related to it

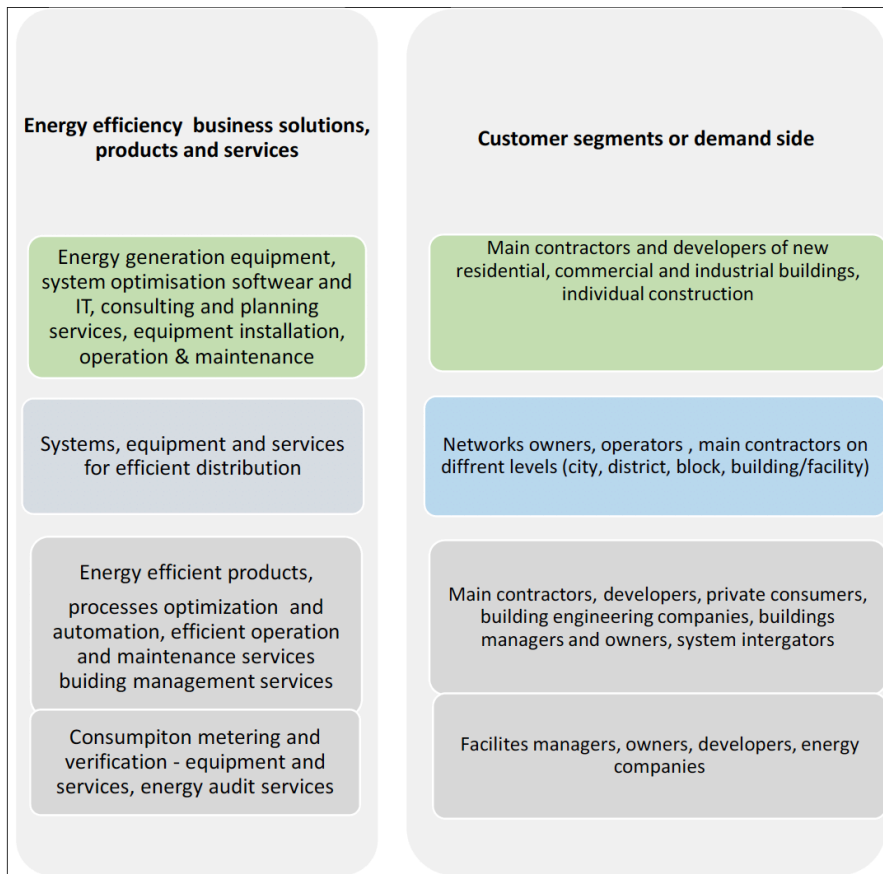


Figure 26 Customer segment for each product and service

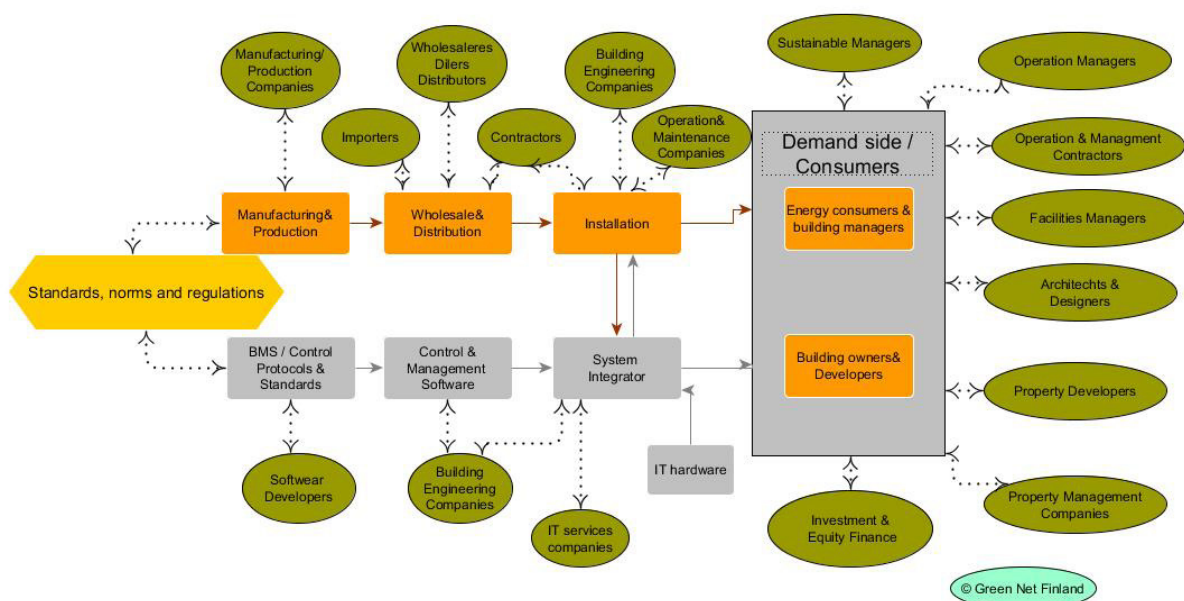


Figure 27 Energy efficiency infrastructure

5.1.1 State-of-the art of energy efficiency in Russia

In Russia, industrial energy efficiency is understood mainly in two ways:

1. Energy efficiency in production (i.e. technologies that make the production process more efficient)
2. Energy efficiency in energy use (i.e. lighting of the facilities, heat supply to production facilities, etc. (Interview of Nikolai Grachev, Leader of Energy efficiency cluster of Skolkovo <http://aktualno.ru/news/view/nikolay-grachev-1479>, read 9.2.2016)

Housing sector is seen as the most challenging sector when it comes to improving energy efficiency. The main problem is the regulation of tariffs. On the other hand, potential for energy savings is remarkable. The potential of energy savings in housing stock is evaluated to be at least 30%. The main players in the housing sector are regional authorities and construction, energy service and management companies.

In the following chapters an analysis of the six main parts of energy efficiency improvement framework (as shown in the Figure 28).

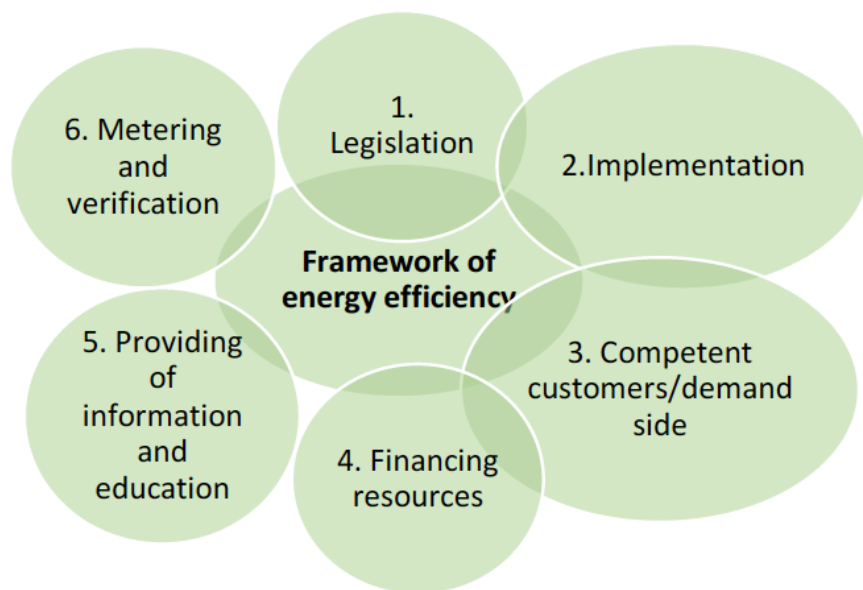


Figure 28 Energy efficiency improvement framework

5.1.2 Russian legislation and norms on energy efficiency

Development of energy saving and efficiency legislation started in Russia about 6 years ago. The first law that was introduced was "Energy saving and efficiency Federal law No 261" (Full name in Russian: *Федеральный закон от 23.11.2009 N 261-ФЗ (ред. от 13.07.2015) "Об энергосбережении и о повышении энергетической эффективности и о внесении изменений в отдельные законодательные акты Российской Федерации"*). In the past 6 years energy saving norms have been developed and first successful projects are realized.

Recent or expected changes in the near future in the legislation:

1. Energy saving and efficiency Federal law no 261 (261–ФЗ).
 - 1.1 Switching from mandatory energy audits to mandatory declaration of energy consumption volume.
 - 1.2 Establishment of yearly targets for the public purchasers and public utilities of decreasing the energy consumption and improving energy efficiency.
2. Changes in the Housing Code (Full name in Russian: *“Жилищный кодекс Российской Федерации” от 29.12.2004 N 188–ФЗ (ред. от 31.01.2016)*.
 - 2.1 Initiative from the State Government, which will allow ESCO (energy service company) agreements also for i.e. residents who get income support from the city (льготников) and for people who rent their apartments (нанимателей). This is expected remarkably improve the economic effect of energy service contract in the housing sector and lower the risks of energy service companies.
 - 2.2 Owners of new apartments will not start paying for refurbishment at once but gradually.
 - 2.3 Apartment owners are allowed to collect higher amount of monthly payment for capital refurbishment. This is to be decided on the General meeting of apartments’ owners.
3. Ministry of Economical Development is finalizing the development of Methodologic recommendations for public purchasers and public utilities for making ESCO–agreements.

In the end of 2015 **the Federal law No 307** came into force. The law is supposed to work as an instrument to raise payment discipline for energy resources. (Full name of the law in Russian: *№ 307–ФЗ от 03.11.2015 «О внесении изменений в отдельные законодательные акты Российской Федерации в связи с укреплением платежной дисциплины потребителей энергетических ресурсов»*). The background of this law is the low payment level of energy invoices – from households, businesses and public utilities. Due this, a strict penalty system is developed. According to the representatives from Finnish building management companies, this change can become a remarkable driving force to improve energy efficiency of buildings, especially in commercial and industrial sector.

5.1.3 Energy efficiency implementation in St. Petersburg, Energy audits and ESCO

The realization of energy audits in Russia and also in St. Petersburg seems not to work as it was expected to work or how the model is working for example in Finland. The whole idea of the mandatory energy auditing has not been working as planned. In the worst cases, the building energy audit have been ordered from the Internet without site visit nor proper orientation to the building facts.

This problem has led into a situation where the ESCO model is seen as the solution to improve energy efficiency of the buildings rather than mandatory energy audits. ESCO model has been carefully analyzed and developed in Russia starting from 2013. More active development of the ESCO financing model started in 2014 and it is connected to the Capital Refurbishment of housing sector Programme.

In connection, a Russian association of energy service companies (RAESCO) (*Ассоциация энергосервисных компаний (РАЭСКО)*) was established. In the end of 2015 RAESCO had about 30 companies as members with about 75% ESCO market share in Russia. The project portfolio of RAESCO is covering all industry sectors, public utilities and housing sector. The association has also developed a criteria and some project development expertise for applying external financing.

5.1.4 Energy efficiency in the water supply and sewerage

Energy consumption in water supply system in St. Petersburg in 2012 was 0,52 kWh per m³ of distributed water. The biggest part of energy consumption in supply system is in the processes of water transfer.

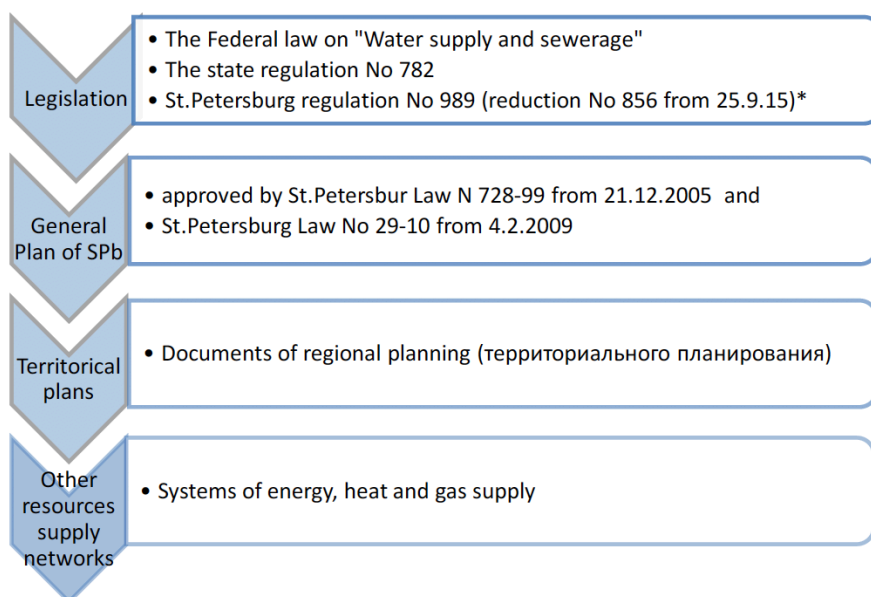
As the activities for the energy efficiency improvement in the water supply system in St. Petersburg, there are planned projects of development of complex management systems. Also needs for renewing the pumping system, installation of metering equipment and developing of control systems has been identified.

5.1.5 Investments into energy efficiency in St. Petersburg

“FIRST St. Petersburg Energy Service Company” OOO (further “FIRST”) was established and introduced to the market as one of the most promising concepts in improving energy efficiency in Russia. The partners are NP “St. Petersburg House Property Owners Association” and the Norwegian investment company Green Energy One AS. Each partner owns 50% of the shares. FIRST wishes to further develop the business and to grow the company by inviting new partners and investors into the company. FIRST analyzes and finds saving solutions based on the most efficient technology – without any cost or obligation for the customer. The customer and FIRST make an Energy Service Contract, where FIRST takes care of financing, installation of equipment, operations and maintenance and all the practical work for the contract period. FIRST also operates and manages the investment and reports and documents the savings. The savings will give smaller energy bills to the customer and will also be used to pay back the money that the investors have used to pay for the investment.

FIRST has together with Green Energy One AS and the St. Petersburg House Property Owners Association made an agreement about the energy efficiency investments in 250 000 m² apartment buildings in St. Petersburg, estimated 20–25 buildings and investments of up to 125 million RUB. The estimated savings from projects are in the range of 15–30% of annual energy use, depending on type of project and condition of buildings. Typical simple payback time for projects are 2–5 years, some also less than this. The first investment was completed in June 2015, with equipment from Danfoss (DK) and Ecoterm (RUS).

5.1.6 Clean water



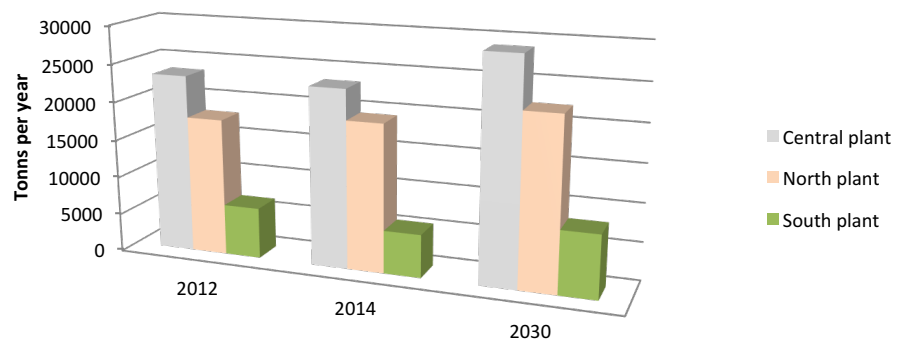
Full version of supply and sewerage schemes (in Russian) are available on the official web-site of Government of St. Petersburg (<https://gov.spb.ru/law?d&nd=822402702&nh=1>, read 7.3.2016). Water supply scheme is described in the report's Attachment 1 (Приложение N 1. Основные положения схемы водоснабжения и водоотведения Санкт-Петербурга на период до 2025 года с учетом перспективы до 2030 года по разделу «Водоснабжение») and sewerage in the Attachment 30 (Основные положения схемы водоснабжения и водоотведения Санкт-Петербурга на период до 2025 года с учетом перспективы до 2030 года по разделу «Водоотведение»).

Waste water (WW): 77% of WW is not treated completely (regarding to the norms of quality for drinking water). The weak points: biological purification from biogens elements.

Table 4 Technical parameters of waste water sludge burning plants of St. Petersburg

Technical parameters	Central plant	North plant	South plant
Implementation year	1997	2007	2007
Capacity in 2012, tonns of sludge/day	50	60	44

Figure 30 Volumes of ash produced in waste water sludge burning plants in St. Petersburg



There are three investment projects planned in modernisation of waste water sludge burning plants in St. Petersburg.

6. Decision making framework



Figure 31 Regional decision making framework in St. Petersburg

7. Ongoing investment programmes and initiatives

7.1 St. Petersburg regional programme “Capital refurbishment of multifamily buildings”

The capital refurbishment programme is a national programme where every region in Russia will develop their own regional programme. In St. Petersburg the programme was developed in 2014 and will be running for the next 25 years. Every year the more detailed so called short-term programmes will be developed.

In 2015 the programme included refurbishment of 1702 buildings with total of 7 billion RUB.

The volume of St. Petersburg capital refurbishment programme for 2016:

- 1388 buildings
- The volume of one contract will be maximum 20 million RUB
- 48 % of all budget goes to engineering services
- The total budget in 2016 is 9,13 billion RUB. (<http://www.spbdnevnik.ru/news/2015-12-21/k-kapremontu-v-peterburge-podoydut-s-uchetom-oshibok-2015-goda/> , <https://gov.spb.ru/gov/otrasl/gilfond/news/79405/>, read 22.2.2016).

The financing of capital refurbishment has two mechanisms (Figure 34). The majority of buildings will be refurbished with the investment model 2 in the figure.

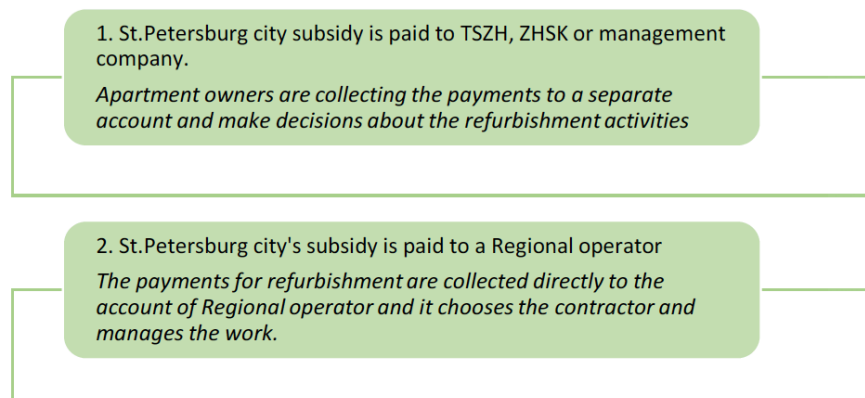


Figure 32 Mechanism of financing of capital refurbishment of multifamily buildings in St. Petersburg

In 2016 the total budget of the capital refurbishment in St. Petersburg is around 9 billion of rubles with financing from the city about 7 billion / 75–80% of total budget. The rest 20–25% will be collected from the apartment owners.

7.1.1 Energy efficiency in capital refurbishment programme

According to the vice-mayor of St. Petersburg Igor Albin (<http://www.spbd-nevnik.ru/>, 29.9.2015), the main focus in the refurbishment of the buildings is in improving energy efficiency of technologies and materials

The mandatory energy efficiency activities that are expected to be implemented in multifamily buildings in St. Petersburg are:

- Installation of energy efficient lighting equipment and lighting sensors in the common areas of the building
- Improving the insulation and balancing the heat supply network
- Installing thermostatic valves in every radiator
- Modernization of the radiators
- Elevators should have energy efficiency certificate <http://ktostroit.ru/news/232747/> (29.9.2015)

7.2 Programme "Development of Built-up Areas in St. Petersburg"

"SPb Renovation" company was established in 2009 by private investors. The company has signed a contract with the administration of St. Petersburg about developing and construction of about 900 hectares in St. Petersburg, including construction of new housing, as well as development of physical and social infrastructure. In this large-scale project the "hrushevkas" of 22 blocks in 9 districts of St. Petersburg will be demolished and 1 200 of new residential buildings will be built. The volume is equivalent to 10% of the existing housing stock in the city.

7.3 Investment programme for water supply and sewerage system

This development programme is implemented during 2015–2025.

Full document of the Investment programme of St. Petersburg "Vodokanal" (November 2015): http://www.tarifspb.ru/media/kt/documents/document/file/%D0%98%D0%9F_%D0%92%D0%BE%D0%B4%D0%BE%D0%BA%D0%B0%D0%BD%D0%B0%D0%BB_%D0%92%D0%9E_%D0%B8_%D0%92%D0%A1_2016-2020_%D0%B2%D1%8B%D1%80%D0%BE%D0%B2%D0%BD.pdf

Some examples of planned activities in the investment programme:

1. Reconstruction of CCA in the North basin
2. Reconstruction of 2 WW treatment facilities (КОС г.Колпино, КОС пос. Понтонный) in the South basin
3. Construction of WW treatment facilities for the "city-sputnik Juzny" in the South basin

4. Construction of storm waters treatment facilities in the recently urbanized areas.
5. Organizing of regulative reservoirs where accumulation of WW needed for further fluent distribution to the treatment facilities

7.4 Investment programme for modernization of heating supply system

Planned investment projects of St. Petersburg "Vodokanal" in water sewerage system, in Million RUB (estimations made in the prices of 2014)	108027,2	99264,9
Centralized sewerage system 1	104237,5	72396,4
1. Production of drinking water from WW (Мероприятия, выполняемые на КОС)	24754	3693,7
Including WW sludge treatment (storaged in landfills)	2550	
2. Distribution of WW in sewerage system	79483,5	68702,7
Networks modernization	16935,8	16763,2
Improvment of Energy efficiency	4930,6	1372,4
Modernization and construction of centralized sewerage system for stormwaters	3789,7	26868,5
Planned investment projects of St. Petersburg "Vodokanal" in the water supply system, in Million RUB (estimations made in the prices of 2014)	98669	119999
1. Production of drinking water	34153,7	13089,6
2. Distribution	64515	106909,4
Part of new construction	8739,9	30625,1
Part of refurbishment	14895	12843,3

237 billion RUB	The total estimated needed investments of "GUPTEK SPb" in 2014–2027	
80 billion RUB	34 %	Investments into heat generation process
46 %	Refurbishment and modernization of existing heat generation plants (working on natural gas)	
26 %	Construction of mini-CHP and small scale heat plants in newly urbanized areas	
20 %	Taking out of use of not effective plants (mainly working on coal and oil)	
11 %	Automation, management and other needs	
157 billion RUB	66 %	Investments into heat distribution process
74 %	Renewing of networks in poor condition	
10 %	Automation and optimization of central heating units	
7 %	Construction of new networks in newly urbanized areas	
9 %	Closing of hot water cycle	

8. St. Petersburg Cleantech, Water and other Clusters

8.1 Cleantech cluster

SPb cleantech cluster (www.spbcleantechcluster.nethouse.ru/) was established in October 2014. The cluster is international consortium which aims at developing the St. Petersburg housing sector and creating new collaboration and business models in the region. The main objective is to prepare and implement development project. The cluster has been open from its start also to companies located outside St. Petersburg and Russia, meaning that it is an international network of businesses. Green Net Finland represents the cluster in Finland and is a member of the board in it.

8.2 Water cluster

Water cluster was founded by SUE "Vodokanal of St. Petersburg" and 234 water supply and sewerage companies from Russia.

http://www.vodokanal.spb.ru/presscentr/news/gubernator_peterburga_posetil_demonstracionnovystavochnyj_centr_vodnogo_klastera/ 30.11.2015

8.3 NGO "Greenstroï"

The association was founded in 2010 by producers of systems and materials that are used in sustainable/green construction. (<http://greenstroï.ru/about/> 9.12.2015)

9. Conclusions, energy efficiency and water solutions business possibilities and challenges

Energy efficiency business possibilities

- St. Petersburg and Leningrad region are growing rapidly.
- The renovation programme for buildings started in 2014 will create remarkable business opportunities in housing renovation business also for foreign companies.
- The interest towards energy efficiency has been growing recently and is expected to grow even more in the near future.
- St. Petersburg cleantech cluster was established and it could create new partnerships in the region.
- Finnish companies have a good reputation in Russia.
- There are new penalties introduced to the market if certain energy efficiency goals are not achieved. This creates new interest and demand for energy efficiency solutions.
- Residential construction (management of buildings, part of infrastructure inside the object, equipment and materials) is nowadays a private investment issue.
- Interest in alternative energy (heat) sources – i.e. heat pumps in the individual building sites.
- Safe location for businesses in an industrial park developed by a Finnish construction company YIT – YIT Greenstate.

Specific challenges related to energy efficiency:

- Lack of understanding of economic effect from energy refurbishment project by the customers/decision makers.
- Laws, regulations and norms can change unexpectedly.
- Weak motivation of customers especially in the public utilities and housing sector.
- Building ownership issues in so-called “communal flats”.
- Poor technical understanding, terms are understood differently than i.e. in Finland.

Clean water business possibilities:

- planned modernization of wastewater treatment facilities.
- planned modernization of stormwater treatment facilities and networks.
- interest in improving the system metering and management.

