

ENERGY EFFICIENCY BRIEF

Astrakhan, Russia

INTRODUCTION

Astrakhan is a Russian city located on the Caspian lowlands close to the Volga River delta, 1534 km southeast of Moscow. It is the oldest economic and cultural centre of the Lower Volga and Caspian regions and is often referred to as ‘South Venice’ and ‘the Caspian capital’.

The population of Astrakhan city is 531,000 (as of 2016). The climate is continental arid, with an average temperature of -10°C in the winter and +25°C in the summer.

The City of Astrakhan is the largest city of the Astrakhan region (or ‘oblast’), which includes 11 rural districts, 442 villages and settlements, and 6 cities with an overall population of 1,018,000 (as of 2016). The region occupies an area of 49,024 km², which is 0.3% of the area of Russia. Its gross regional product (GRP) in 2015 was RUB 304 billion (EUR 6.2 billion) compared to RUB 289 billion (EUR 5.9 billion) in 2014.

Russia has acknowledged energy efficiency as an important direction for its policy development. In 2008, an economy-wide target was set to reduce energy intensity by 40% by 2020 in relation to 2007. The target is supported by Federal Law 261 on Energy Savings and Energy Efficiency (2009) and the State Program on Energy Efficiency (2014). In 2014 and 2015, Astrakhan region and city respectively developed a Regional Program and a Municipal Programs, which outline indicators and measures for energy efficiency across different sectors in order to achieve the national target.

A number of existing barriers in Astrakhan might impede implementation of these measures without efficient policy development, including:

- Significant depreciation of energy consuming equipment;
- Scattered settlements and socially significant sites;
- Limited ability of end-users to understand opportunities of energy efficiency;
- Limited budgetary capacity and lack of effective market infrastructure for the provision of energy services; and
- Lack of experts in the field of energy efficiency.



ASTRAKHAN CITY INITIATIVES AND PARTNERSHIPS

- In 2017, Astrakhan was included in the list of cities under the UN Environment **District Energy in Cities** Initiative
- In 2016, Astrakhan joined the sustainable city development and eco-energy town initiative of the Clean Energy Ministerial, which supports transition of cities towards sustainable development through energy efficiency improvement, clean energy technologies and behavioral change
- In 2016, the city’s energy policy was approved with the aim to continuously improve energy efficiency and reduce energy consumption in the city of Astrakhan by 15% until 2020, to introduce energy management systems in accordance with ISO 50001 in all municipal institutions and support the introduction of such systems at industrial facilities and house management companies serving residential multifamily buildings
- In 2015, City Administration and UNIDO’s Center for International Industrial Cooperation in the Russian Federation made an agreement for the development and implementation of the Energy and Resource Saving Program on the basis of ISO 50001 in the city

Figure 1. Electricity consumption by sector (2015), GWh

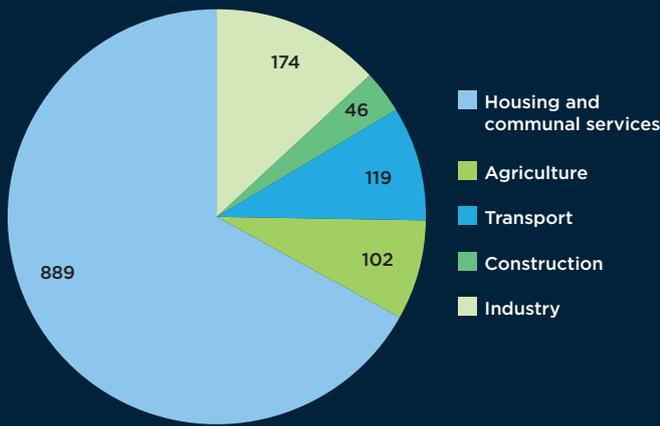
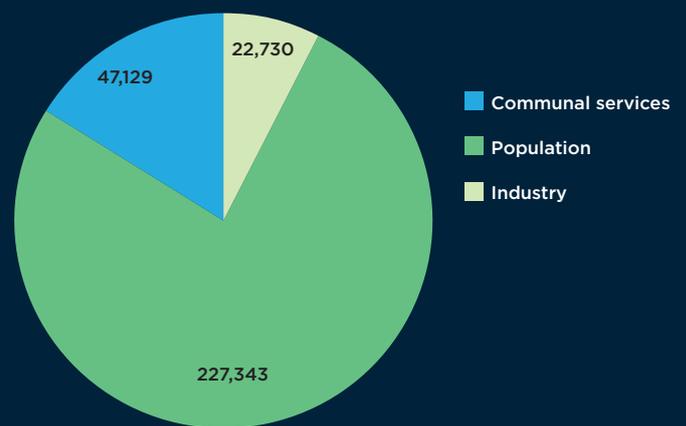


Figure 2. Heat consumption by sector (2015), Gcal



BUILDINGS SECTOR

CURRENT STATUS

As of 2015, the housing stock of the Astrakhan region is 23.3 million square meters, with 69% of the floor area located in urban areas. The total floor area in Astrakhan City in 2016 is 13 million square meters. There are 5,198 multi-family residential buildings in the city of Astrakhan, 70% of which require capital repairs.

Dilapidated and emergency housing stock accounts for 758,000 square meters in the city.

In 2016, 334,000 square meters of housing was added in the city. It is estimated that the total newly constructed building floor space will increase by 79% between 2014 and 2029. The increase in the floor space of residential buildings for this period is estimated to be 73%, with two-thirds of the increase comprised by multi-apartment residential buildings, while growth in public and business buildings is estimated at 15%.

Most (80%) of the residential housing stock is privately owned, and is supplied with heating mainly through district energy systems, with remaining buildings relying on individual heat generation. 76% of the city's heat is provided by five large suppliers. Overall installed capacity in 2016 was 744 MW and 1988 MW for electricity and heat, respectively. According to the Municipal Programme on Energy Efficiency, in 2015 multi-family buildings consumed 720 kWh/person of electricity, 51 m³/person of cold water, 0.16 Gcal/m² of heat and 245 m³/person of natural gas, on average.

Federal Law on Energy Efficiency No.261 requires mandatory metering of water and energy (natural gas, heat, electricity) use in buildings. However, the number of installed energy meters in Astrakhan region remains relatively low, especially in multifamily buildings (20-40% in different municipalities). Therefore, most of the residential energy consumers are billed for the normative value of energy consumption per square metre, determined by the local authorities, rather than their actual energy use. Before July 2016, such a value was unified for all residential buildings in the city (at the level of 0.02916 Gcal/m²) and all residents were subject to the same energy tariffs. After that a new system has been adopted, which differentiates energy tariffs in accordance with type of multi-family building, number of floors, construction materials and the year of construction.

EXISTING INITIATIVES

The Municipal Programme on Energy Efficiency (2015) sets targets, indicators and measures for improving energy efficiency in municipal buildings till 2020, for example:

- To reduce energy consumption in municipal budgetary institutions and apartment buildings.
- To increase the share of resources accounted for by energy meters in the total energy consumption to 97% for thermal energy, 65% for cold water, and 67% for natural gas.

PRIORITY OPPORTUNITIES

- **Strategy.** Develop the medium- and long-term strategy for capital repairs of existing buildings with performance-based guidelines or standards for energy efficiency renovations
- **Regulation.** Work on enforcing the requirements adopted in the Decree of the Federal Government No.275 of 7 March 2017. According to the Decree, all new buildings and buildings undergoing capital repairs (except for residential buildings) should have equipment enabling the automatic control of energy consumption for space heating and ventilation depending on the ambient air temperature.
- **Leading by example.** In collaboration with international and local experts, develop a programme for improving energy efficiency in municipal buildings; create a dedicated position in the City Administration and ensure that municipal buildings lead by example, which can be replicated in the residential sector.
- **Energy metering.** Provide targeted incentive programs to support energy meter roll-out. One of the main barriers for scaling up the installation of energy meters is high upfront costs, which, according to the legislation, need to be covered by the property owners.
- **District energy.** Most of the buildings in the city are supplied by heat through district energy networks. Most of the related infrastructure was built during the Soviet period and requires substantial modernisation due to high energy losses. Insulation of pipes, transition from steam to water with lower temperatures, utilisation of pressure and flow controllers would significantly improve efficiency of heat supply to buildings.
- **Information and training.** Facilitate training (involving international and local experts) for local banks to enhance their understanding of opportunities to lend for energy efficiency projects; work with energy services companies (ESCOs) and home-owners; initiate awareness raising campaigns among home owner associations, house management companies and the general public about benefits of energy efficiency improvements and options for accessing finance.

INDUSTRY SECTOR

CURRENT STATUS

The main industries of the Astrakhan region are mining (59.9%), petroleum products (9.7%), shipbuilding (5.7%), food industry (3.9%) and chemicals (2.5%). A gas condensate field located in the region provides the operation of many gas refinery facilities and a gas processing plant.

EXISTING INITIATIVES

Astrakhan has been making progress on implementation of energy management systems (EnMS) and related training and capacity building activities mainly through collaboration with UNIDO. The municipal enterprise responsible for water supply in the city, 'Astrovodokanal', has been in the forefront of testing EnMS on its facilities. In 2016 it contracted Schneider Electric JSC to survey and develop integrated energy-efficient projects for water and sewage treatment plants, through installation of energy efficient high-performance pumps with frequency control, replacement of blowers, and process automation.

PRIORITY OPPORTUNITIES

- **Energy management.** Implementation of EnMS (e.g. ISO50001), especially at large energy consuming facilities and companies, will help to significantly reduce energy consumption at low costs. The process should be accompanied by building and strengthening capacity of energy managers through dedicated education programs.
- **Small and medium size enterprises (SMEs).** SMEs can be engaged through establishment of energy efficiency networks, within which companies get opportunities to learn from each other, cooperate in the field of energy efficiency, and develop standardized procedures and tools (e.g. contract templates, checklists, manuals, etc.).
- **Waste to energy.** Utilization of municipal solid waste for production of energy can help to mitigate urban waste problems and reduce consumption of fossil fuels. During the incineration of waste, dedicated plants offer the opportunity for co-generation of heat and electricity that can be fed into the district heating system and the electrical grid.

TRANSPORT SECTOR

CURRENT STATUS

The Astrakhan region plays an important role in the system of inter-continental transport routes. The region is located at the intersection of two major Euro-Asian transport routes: the North-South corridor (NOSTRAC) and the West-East corridor. The NOSTRAC connects Europe via the Caspian Sea and the territory of Iran with India, and the West-East corridor runs from Europe through the Astrakhan region and Kazakhstan towards China.

One of the key features of the Astrakhan region is its multi-modal (sea, river, road, air and rail) capability in freight transportation. At the same time, a lack of financing from the federal budget and private sector investments into transport infrastructure development, as well as a high degree of deterioration of transport infrastructure, remain key barriers for sustainable development in this sector.

The network of streets in the city of Astrakhan is estimated to be 822,900 km in length. According to the Registry of munic-

ipal routes for regular transport in the municipality "Astrakhan City", the route network consists of 113 regular routes. As of 2016, transportation of passengers and baggage on municipal regular routes was carried out by 71 large buses, 16 trolleybuses and 1408 small buses. There is also a network of electric trains, which support people's mobility between the city and suburban areas.

EXISTING INITIATIVES

- The Astrakhan General Plan by 2025 recognizes the importance of developing the public road and public passenger transport networks, with the goal of providing movement through the urban area with an average time of no more than 35-40 minutes for 80-90% of the population. The Plan also stipulates that development of public transport will be accompanied by the increase in safety and reliability of all types of movement, and reduction of the negative impact of transport on the environment in accordance with national and international standards. It also includes proposed development of pedestrian areas and 30 km of bicycle routes.
- On 17 May 2016, Decree No. 3219 approved the planning document for public transportation in the City of Astrakhan for 2016-2018, which lists a range of activities for improving the quality of public services on regular municipal routes.
- This document also sets the basis for the research work on optimization of a route scheme for public urban passenger transport, to determine the optimal number and types of vehicles on municipal routes.

PRIORITY OPPORTUNITIES

- **Transit Oriented Development.** Given the expected growth in building stock, a high proportion of which is projected to be in suburban residential buildings, it is important that developments are transit-oriented and retain public transport connectivity with major existing centres of housing, shopping, employment, education and recreation. This will minimise the number and length of trips, as well as utilisation of private cars.
- **Control of car population and utilisation.** Astrakhan has an estimated 300 private cars per 1,000 inhabitants (one of the highest levels in Russia), that aggravates problems with traffic congestion, air pollution and greenhouse gas emissions. The City Administration could pass the requirements for car ownership restraints and car usage restriction measures, for example, through parking fees and road pricing.
- **Improvements in road design.** Wider roads with priority lanes for public transport, bike lanes, and road junctions with grade separation will reduce private vehicles usage and encourage the shift towards public transport.
- **Encouragement of cycling and walking.** Development of a network of bicycle rental and parking facilities, dedicated traffic lights, and expansion of the bike lane network and walking areas will increase attractiveness of these kinds of transportation.
- **Traffic signals management.** Computer controlled traffic light management systems provide opportunities to adjust the timing of traffic lights depending on the volume of traffic, and to give priority crossing to public transport.
- **Parking policy.** Increased parking fees in the most congested areas, optimized and/or multilevel parking spaces will help to reduce driving time.
- **Smart technologies.** Mobile applications for planning trips inside and outside the city with public transport will increase the attractiveness of this means of transport.



IN CONCLUSION

The Copenhagen Centre on Energy Efficiency functions as the global thematic Energy Efficiency Hub of Sustainable Energy for All (SEforALL), and accordingly works directly to support the SEforALL objective of doubling the global rate of improvement in energy efficiency by 2030.

The Copenhagen Centre fulfils its mission through:

- assisting policy change in countries and cities, with knowledge, insights and technical support
- accelerating action through innovation in project development and finance
- raising the profile of energy efficiency by communicating success stories and supporting outreach.

For more information, please visit www.energyefficiencycentre.org or contact us at c2e2@dtu.dk.

Regarding our work in Russia, Eastern Europe, the Caucasus and Central Asia, please contact **Ksenia Petrichenko** at ksepe@dtu.dk

Visit Copenhagen Centre's Knowledge Management System at kms.energyefficiencycentre.org

- Astrakhan has ambition to become a flagship sustainable city recognised both nationally and internationally. Driven by the strong motivation of the city administration as well as engagement of local and international experts, the city is developing a holistic 'Astrakhan – Sustainable City' program to achieve higher living standards for its residents, with energy efficiency being one of the program's key components.
- Energy efficient renovation of existing municipal and residential buildings together with modernization of heat supply and distribution facilities will offer a synergetic effect for increasing the city's sustainability, together with other benefits such as higher levels of comfort, energy cost savings, increase in property values, job creation, and improvement of health and productivity.
- The City would benefit from joining international city energy efficiency networks (such as the SEforALL Building Efficiency Accelerator and C40); actively working with existing national platforms in Russia (e.g. under the G20 and Clean Energy Ministerial processes); and establishing a network of cities in the Caspian region to share the lessons learnt and provide the base for further replication.
- Having a strong knowledge base on international energy efficiency best-practices, and building on local experience accumulated in Russia during on-going and completed projects (e.g. *UNDP's Building Energy Efficiency work* and the *EBRD Russian Sustainable Energy Financing Facility*), the Copenhagen Centre on Energy Efficiency is supporting the efforts of the City of Astrakhan. The Copenhagen Centre links the city's demand for international expertise and implementation partners to the supply of knowledge and investment resources available through the Centre's broad network of partnerships and engagements. The Centre helps to place the work at the city level into the context of achieving the goals of the Paris Agreement, Sustainable Development Goals and Sustainable Energy for All and strengthens the connection between the actions at the local, national and global levels.