# EnMS implementation on Astrakhan Municipal Unitary Enterprise "Astrvodokanal"

Municipal Unitary Enterprise "Astrvodokanal" was created in 2003 after three water supply and sewarage enteprises of Astrakhan city had merged. Its main areas of work is water supply services and water sewarage for city populations, industrial facilities and social and cultural objects of Astrakhan city and neighboring agrarian areas. Astrvodokanal operates 1293 km of water supply networks, 722 km of sewarage, and maintains 78 boosting and 88 sewarage pumping stations.
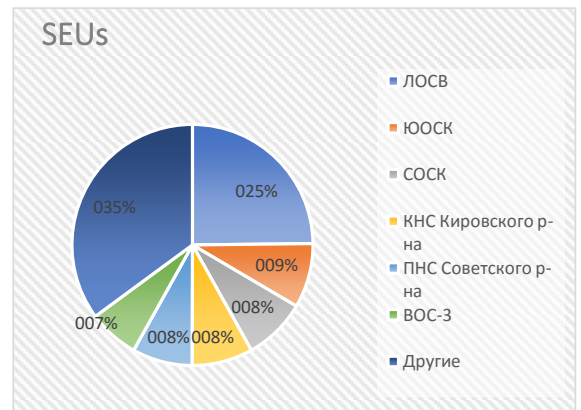


## EnMS implementation

### 1. Identification of Significant Energy Users (SEUs)

Astrvodokanal uses electricity, heat, hot water and natural gas in its operations. It was decided to include only electricity in EnMS scope, as other resources do not account for large energy costs.
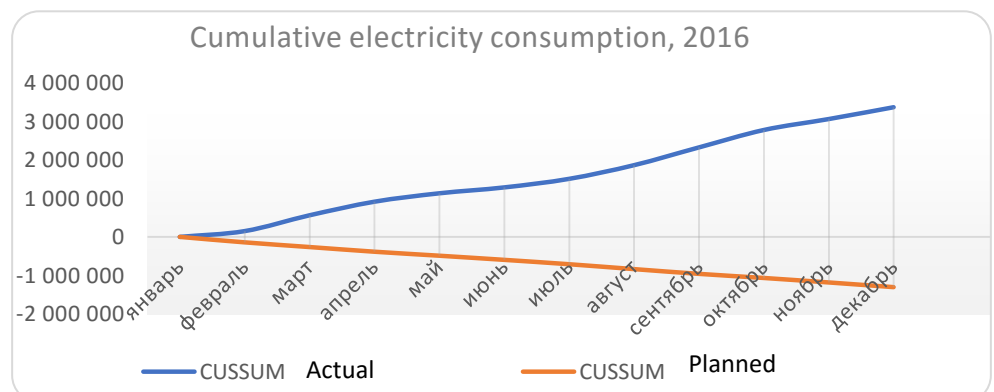
Then, six most significant energy users were identified for electricity, which in total account for 65% of energy consumption: Left bank water treatment facilities, Southern sewerage treatment facilities, Northern treatment facilities, Kirovsky district Sewerage pumping station, Sovetsky district boosting pumping station, Treatment facility No.3



SEUs

- ЛОСВ
- ЮОСК
- СОСК
- КНС Кировского р-на
- ПНС Советского р-на
- ВОС-3
- Другие

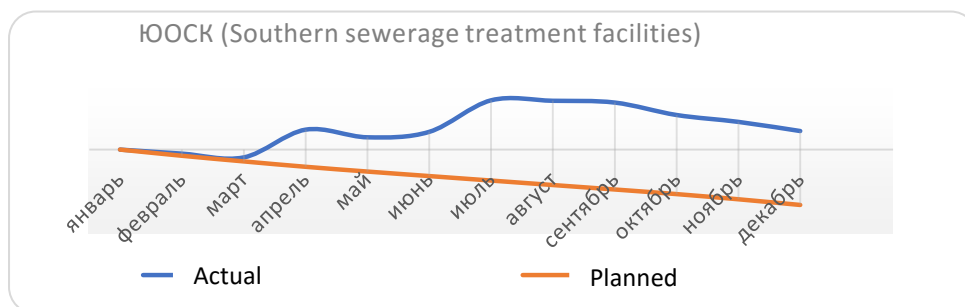025% 009% 008% 008% 008% 007% 035%

### 2. Building the regression models

For each SEU the variables (factors) affecting the consumption were identified, and regression analytical models were built.

As one can see from the graph, total cumulative electricity consumption was higher than expected. Main cause of excess use is high weariness of pumping equipment, which resulted in high number of accidents and stoppages, at the time of which inefficient equipment was in operation.



Cumulative electricity consumption, 2016

4 000 000
3 000 000
2 000 000
1 000 000
0
-1 000 000
-2 000 000

январь февраль март апрель май июнь июль август сентябрь октябрь ноябрь декабрь

CUSSUM Actual        CUSSUM Planned

***Example of SEU, where actual consumption was higher than expected:***

**ЮОСК (Southern sewerage treatment facilities)**



янВарь февраль март апрель май июнь июль август сентябрь октябрь ноябрь декабрь

— Actual    — Planned

Periods of excessive electricity use correlate with the periods when higher number of accidents occurred on smaller motors of Southern treatment facilities, at the time of which additional motors were switched on.
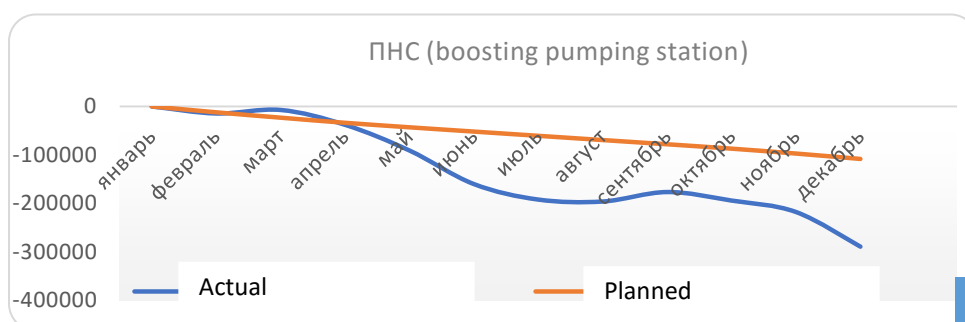
***Example of regression for the SEU, where actual savings exceeded planned values:***

This SEU has undergone equipment modernization,

**ПНС (boosting pumping station)**



| 0 |
| -100000 |
| -200000 |
| -300000 |
| -400000 |

янВарь февраль март апрель май июнь июль август сентябрь октябрь ноябрь декабрь

— Actual    — Planned

frequency converters and motors with lower power were installed, resulting in 290 MWh of savings.

## 3. Implementation of energy-saving measures

Examples of implemented low- and no-cost energy saving measures within EnMS implementation:

- ✓ Lowering water pressure in pipeline at night time;
- ✓ Installing a photo relay for street lighting;
- ✓ Installing motion sensors for automatic switching of lighting at household and production premises;
- ✓ Procuring materials to prepare buildings and constructions for maintenance in winter season (insulation);
- ✓ Replacing filament lamps with energy efficient LED models;
- ✓ Monitoring electricity consumption.

## Conclusions

Overall, despite total actual energy consumption exceeding the base line values, energy management system implemented by UNIDO methodology on Astrvodokanal provided for system approach to the management of energy consumption.

At the core of system approach - use of energy consumption analysis from last (base) year, building of regression model (base line) from base year's data and subsequent analysis of

### Barriers encountered by Astrvodokanal:

→ Insufficient communication between subdivisions regarding identification of low-cost saving opportunities. In addition to identification and analysis of such measures, it is important to establish a mechanism for their evaluation and further implementation.

→ Some of the SEU operators lack awareness that their daily work directly impacts energy performance of the enterprise. To overcome this barrier, it is necessary to introduce training on efficient operations on all the production lines.

→ Low involvement of production personnel in implementation of measures within EnMS.

→ The staff lacked knowledge in the field of energy efficiency improvements.

actual consumption against the base line. Regression models takes into account all the factors (variables) affecting energy use, eliminating the influence of seasons, degree days, production volumes and other factors.