ALAN Smart4Energy

System for monitoring, analysis and forecasting of electricity consumption level in apartment buildings and budget-funded entities

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Introduction

Energy and utility sector drivers until 2021

- Big Data
- Internet of Things
- Machine Learning
- Mobile devices
- AI

**according to Redenex report «Energy on the Threshold of Big Data»*

Introduction

The majority of energy company's management recognize the key role of new ways of data analyzing

80%

of companies see **new opportunities for business development** in Big Data analytics

75%

of companies consider *Big Data* analytics as **mandatory for business success**

**according to Redenex report «Energy on the Threshold of Big Data»*

Introduction

The percentage of implementation of new solutions in practice

20%

companies have implemented Big Data Analytics

32%

companies are in process of implementing Big Data Analytics

41%

Companies do not implement Big Data Analytics

**according to Redenex report «Energy on the Threshold of Big Data»*

ALAN Smart4Energy

Analytical service Smart4Energy is a reliable "digital" assistant in the issues of management, analysis and forecasting of energy consumption level.

Monitors the quantity and quality of consumed energy at the levels:

- region
- city
- district
- appartments
- consumers

Functions

- **Automated commercial accounting** of electricity consumed by apartment buildings and budgetary objects by measuring quantitative, qualitative and regime parameters of energy carriers
- **Centralized automated collection and storage** of measured data from house and apartment meters
- **Monitoring of emergency situations** (for example, grids disruptions) based on operational data
- **Monitoring the state of energy consumption,** revealing thefts, differences between plan/fact consumption

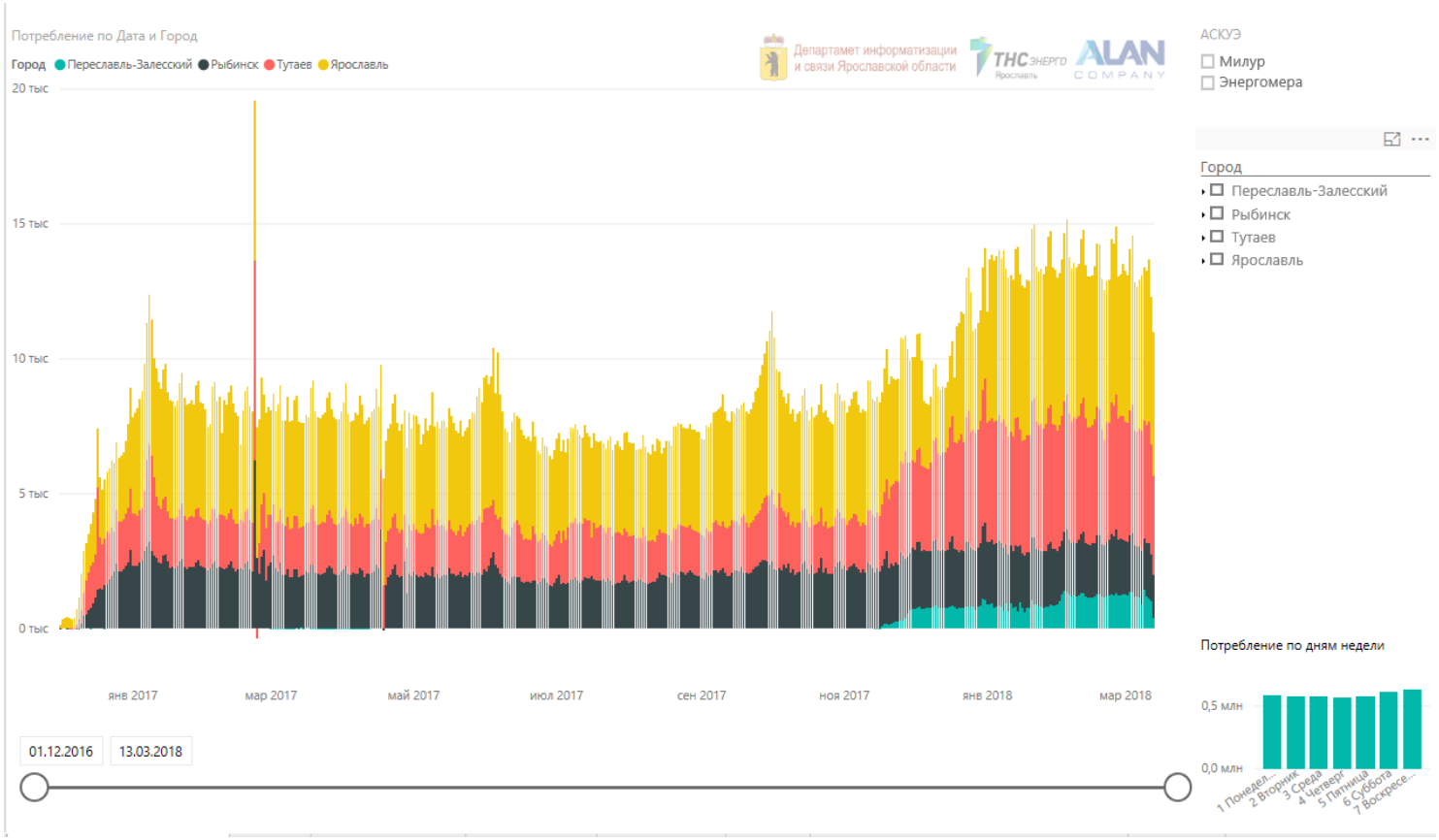
Data Sources:

- IoT meters, АСКУЭ
- External factors, for example, weather forecast
- state information system of housing and communal services
- Open data of regional Government
- Other sources

The more data sources, the higher the accuracy of forecasts

Issues to solve

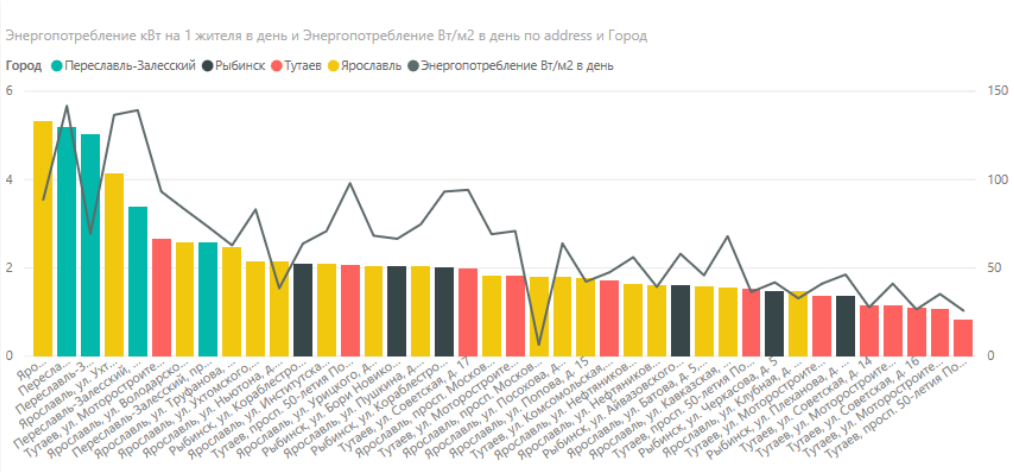
Automates collection and analysis of data in real time

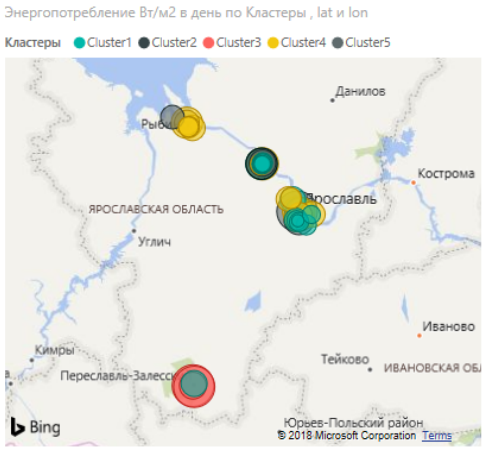


The system gathers and analyzes the data coming from housekeeping and individual metering devices once per hour (or at specified intervals according to the schedule)

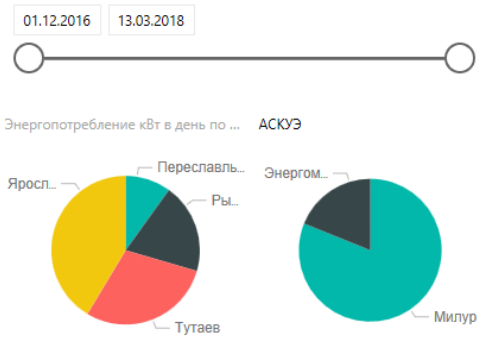
Issues to solve

Conducts consumption statistics by consumers’ and house’s meters





address	Площадь	Энергопотребление кВт на 1 жителя в день	Энергопотребление Вт/м2 в день	Энергопотребление кВт в день	Количество помещений	Средняя площадь квартиры	Число жителей	Количество дней потребления	s
Переславль-Залесский, просп. Лесной, д. 3	2 927,30	2,58	73,17	214,20	40	73,18	83	162	Н
Переславль-Залесский, просп. Лесной, д. 5	2 860,20	5,20	141,75	405,43	40	71,51	78	119	К
Переславль-Залесский, ул. 50 лет Комсомола, д. 12	5 724,00	5,03	69,41	397,30	79	40,31	79	44	к
Переславль-Залесский, ул. Красноэховская, д. 12	3 290,40	3,40	139,31	458,38	60	54,84	135	162	и
Рыбинск, ул. Айвазовского, д. 3	9 482,00	1,62	58,00	549,96	160	59,26	340	465	Н
Рыбинск, ул. Бори Новикова, д. 23	4 802,00	2,03	66,52	319,44	80	53,20	157	457	1
Рыбинск, ул. Кораблестроителей, д. 12	3 663,40	2,01	93,24	341,57	87	39,52	170	459	к
Рыбинск, ул. Кораблестроителей, д. 14	3 861,30	2,10	63,78	246,26	86	38,69	117	456	к
Рыбинск, ул. Плеханова, д. 34	4 911,00	1,36	46,27	227,24	91	27,32	167	458	к
Рыбинск, ул. Черкасова, д. 5	10 046,10	1,49	41,85	420,45	146	50,66	283	454	Г
Тутаев, просп. 50-летия Победы, д. 18	3 343,35	2,07	97,98	327,57	60	54,26	158	461	К
Тутаев, просп. 50-летия Победы, д. 20	5 620,60	0,83	25,80	145,03	72	54,20	175	245	п
Тутаев, просп. 50-летия Победы, д. 7	3 001,80	1,54	36,40	109,27	32	54,40	71	135	к
Всего	**243 968,95**	**1,41**	**40,46**	**9 871,00**	**3558**	**1 993,10**	**7018**	**468**	



The system processes the data and displays the results in the form of understandable interactive reports: graphs, diagrams, etc.

Visualization

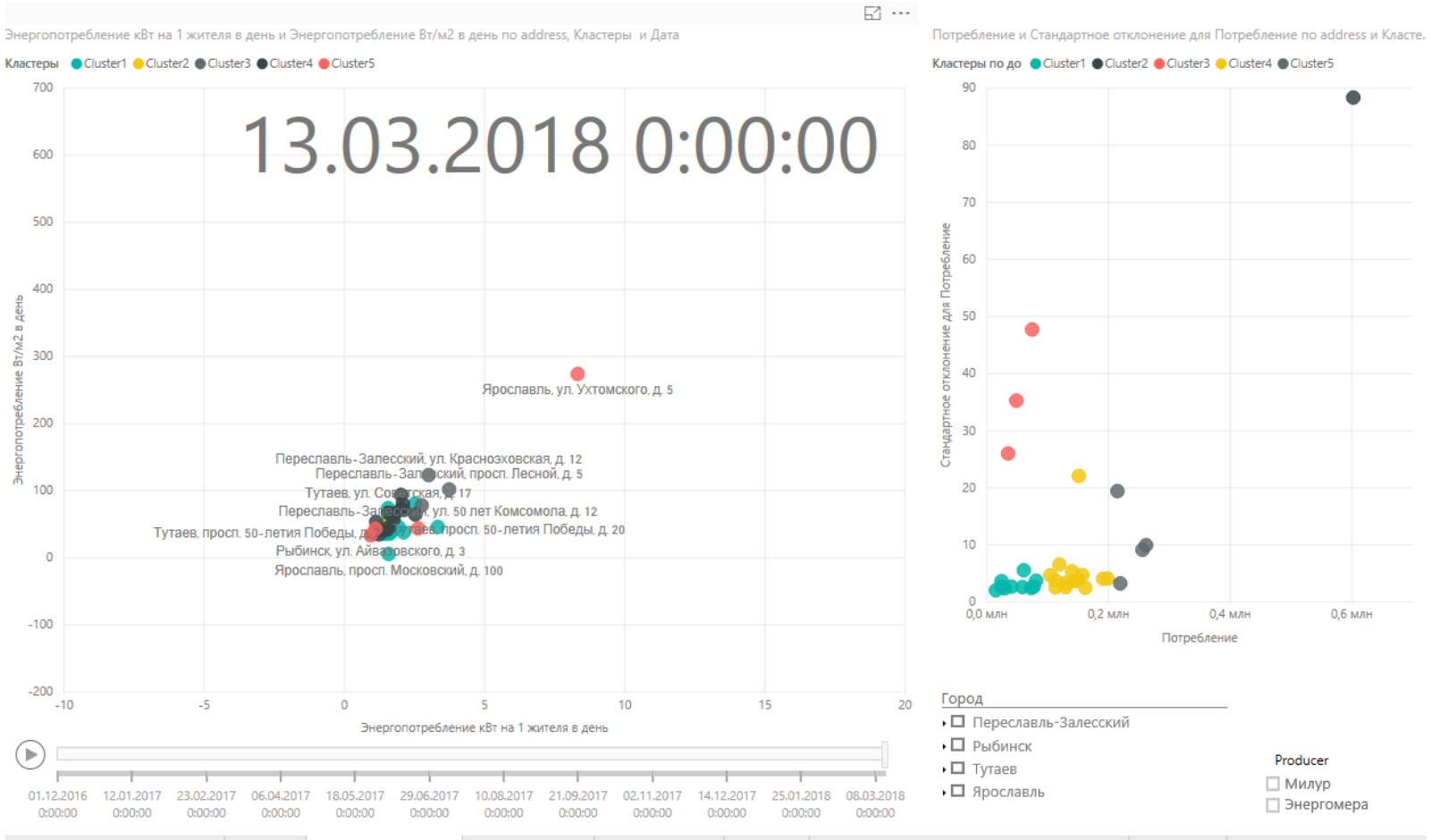
Information is displayed on the following levels:

- region
- city
- district
- real estate object
- consumer

The depth and type of the report can vary depending on the requirements for a particular level.

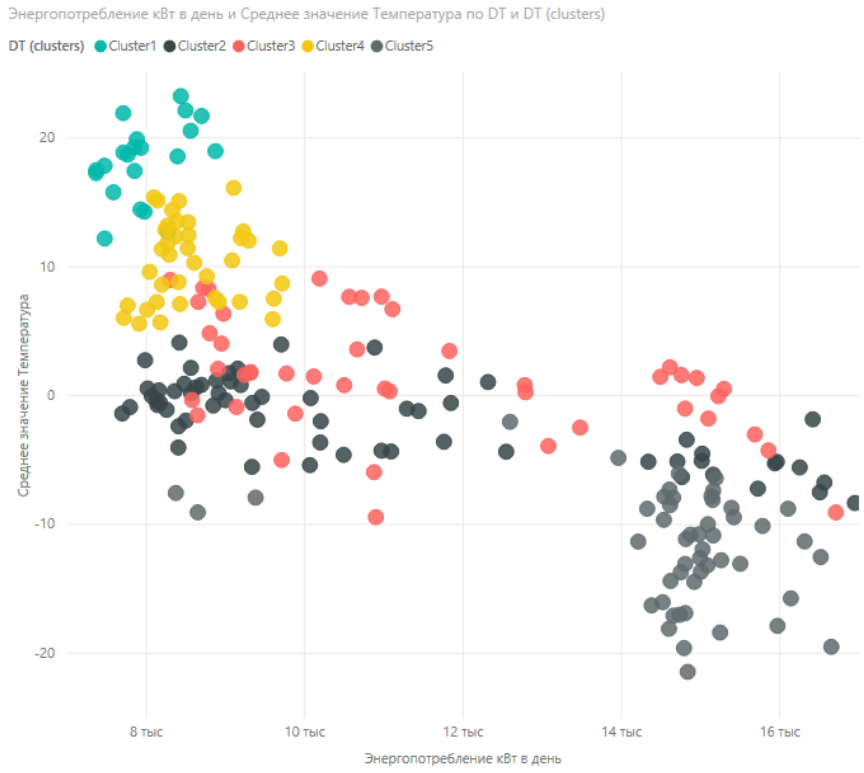
Report Visualization. Examples

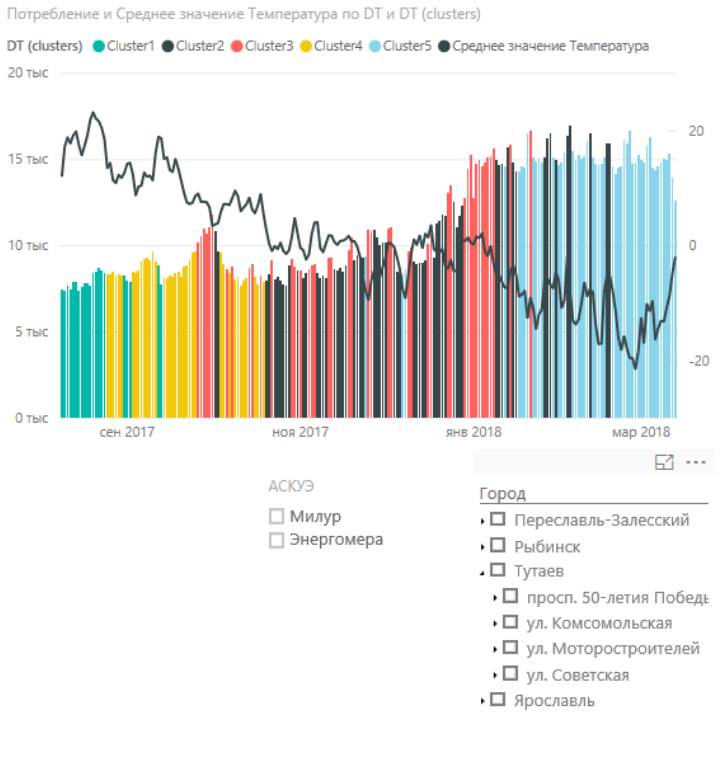
Split of home consumption into clusters with the possibility of time analysis



Report Visualization. Examples

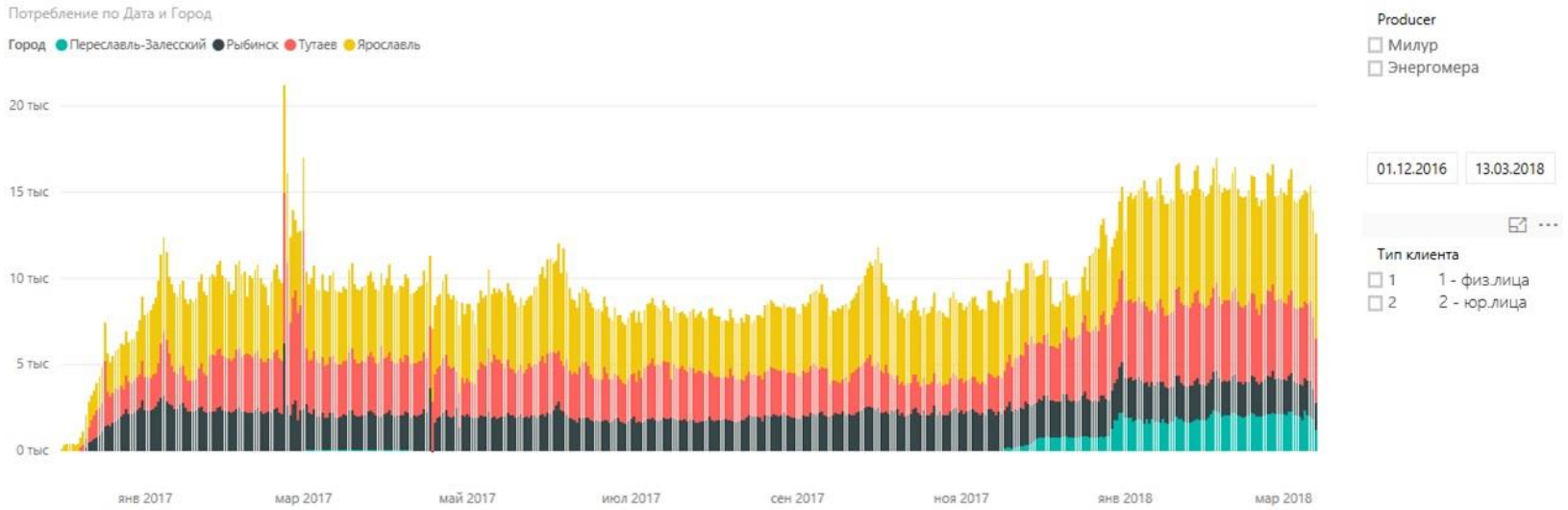
Analysis of energy consumption depending on external conditions (temperature)





Report Visualization. Examples

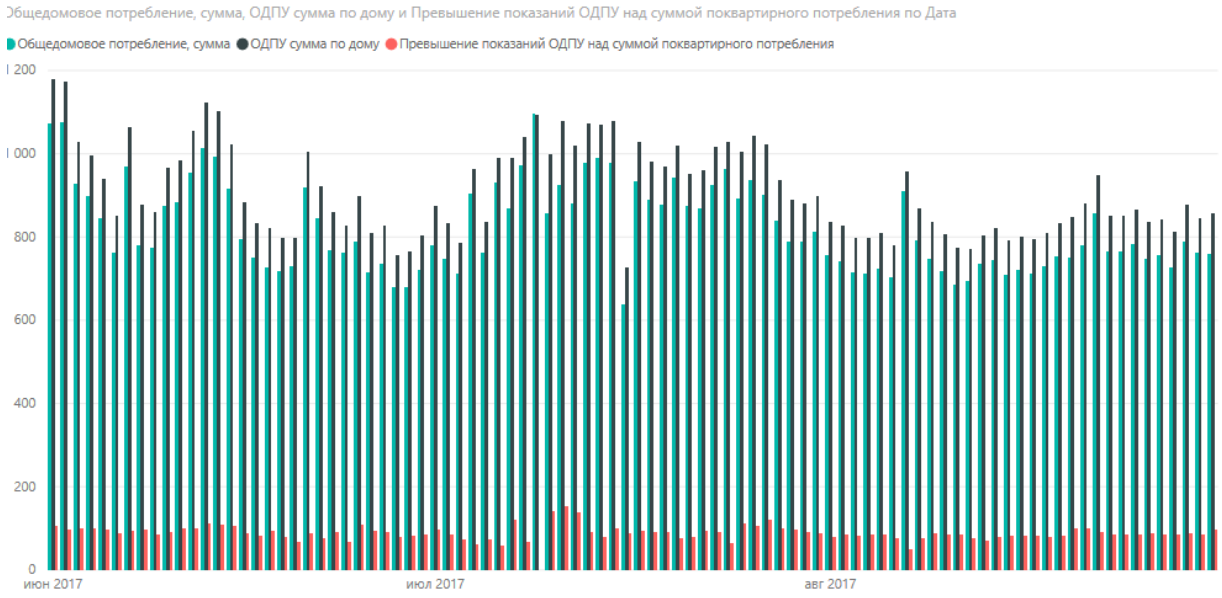
Comparison of events with the level of energy consumption



address	SerialNumber	№ кв.	Число жителей	Декабрь 2016	Январь 2017	Февраль 2017	Март 2017	Апрель 2017	Май 2017	Июнь 2017	Июль 2017	Август 2017	Сентябрь 2017	Октябрь 2017	Ноябрь 2017	Декабр
Ярославль, ул. Ухтомского, д. 1, корп. 2	16105 00000541 3	1		106,37	137,88	147,51	84,11	62,82	58,46	45,52	53,28	57,25	54,96	71,06	69,80	
	16105 00000541 4	5		162,04	180,06	158,32	147,44	124,64	111,08	47,07	70,03	88,64	173,40	171,96	119,21	
	16105 00000541 5	2		133,74	197,54	162,82	153,46	166,39	162,33	104,30	85,97	102,82	127,14	121,16	135,12	
	16105 00000541 1	2		115,25	156,20	134,76	135,36	135,22	111,25	65,21	67,20	75,30	106,01	140,73	137,76	
	16105 00000541 2	7		60,61	73,13	65,61	78,99	73,38	63,92	110,88	64,14	66,22	88,87	81,78	67,69	
	16105 00000541 3	1		127,21	146,71	120,31	116,72	85,13	85,47	68,15	73,91	61,16	83,74	100,16	82,73	
	16105 00000541 4	8		130,35	168,78	142,70	148,69	155,66	155,75	147,19	151,89	153,57	152,07	172,69	178,59	
	16105 00000541 5	0		73,69	120,83	111,82	117,80	117,10	114,34	115,37	113,91	115,54	101,72	111,83	112,52	
	16105 00000541 0	5		64,79	83,89	75,99	82,13	78,79	82,62	71,47	80,34	77,08	69,14	94,41	89,32	
	16105 00000541 8			74,62	84,41	63,19	74,20	74,25	79,56	67,60	76,17	57,93	85,39	80,12	67,33	
	16105 00000541 9	3		131,10	166,00	135,62	134,31	140,64	121,51	112,17	111,33	102,20	100,55	130,47	121,48	
	16105 00000541 4	6		100,95	143,75	133,32	131,88	108,09	187,53	303,17	176,92	113,99	329,04	171,64	132,55	
	16105 00000541 5	7		78,97	97,72	77,68	78,12	69,18	54,66	70,39	66,95	68,16	74,08	92,14	91,49	
	16105 00000541 0	1		95,15	128,20	108,15	113,45	107,98	107,92	99,26	104,43	105,11	95,53	109,57	116,76	

Report Visualization. Examples

Analytics of exceeding the indicators of communal meters over the amount of consumer's indications



address	Тутаев, ул. Моторостроителей, д. 72			Всего		
Месяцы	ОДПУ сумма по дому	Общедомовое потребление, сумма	Превышение показаний ОДПУ над суммой поквартирного потребления	**ОДПУ сумма по дому**	**Общедомовое потребление, сумма**	**Превышение показаний ОДПУ над суммой поквартирного потребления**
Июнь 2017	27 826,80	25 071,67	2 755,13	**27 826,80**	**25 071,67**	**2 755,13**
Июль 2017	30 079,91	27 255,52	2 824,39	**30 079,91**	**27 255,52**	**2 824,39**
Август 2017	25 833,78	23 250,78	2 583,00	**25 833,78**	**23 250,78**	**2 583,00**
Всего	**83 740,49**	**75 577,97**	**8 162,52**	83 740,49	75 577,97	8 162,52

Месяцы

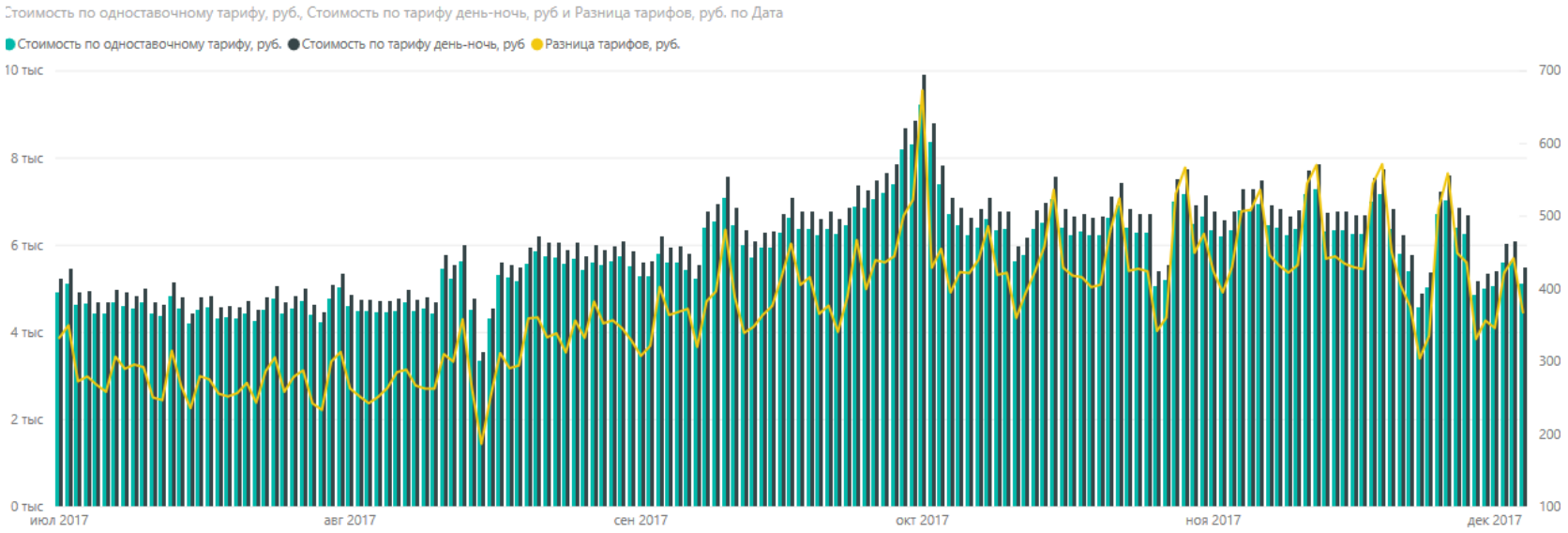
01.06.2017 — 31.08.2017

Город

- Переславль-Залесский
  - просп. Лесной
  - ул. 50 лет Комсомола
  - ул. Красноэховская
- Рыбинск
- Тутаев
  - просп. 50-летия Победы
  - ул. Комсомольская
  - ул. Моторостроителей
    - 49
    - 61
    - 63
    - 72
    - 78

Report Visualization. Examples

Area tariff analysis



Стоимость потребленной электроэнергии, рублей

address	Стоимость по одноставочному тарифу, руб.	Стоимость по тарифу день-ночь, руб	Разница тарифов, руб.
Ярославль, ул. Клубная, д. 48	52 749,08	56 338,95	3 589,87
Ярославль, ул. Попова, д. 15	76 107,68	81 014,89	4 907,21
Ярославль, ул. Нефтяников, д. 15	97 700,20	103 868,31	6 168,11
Ярославль, просп. Московский, д. 119	146 329,64	155 114,86	8 785,22
Ярославль, ул. Батова, д. 5, корп. 2	135 420,09	144 315,36	8 895,27
Ярославль, ул. Кавказская, д. 47	202 023,13	214 852,24	12 829,11
Ярославль, ул. Ухтомского, д. 5	192 523,27	206 084,06	13 560,79
Всего	**902 853,09**	**961 588,66**	**58 735,57**

01.07.2017 15.12.2017

Месяцы

- Июль 2017
- Август 2017
- Сентябрь 2017
- Октябрь 2017
- Ноябрь 2017
- Декабрь 2017

Потребление кВт, 1 - одноставочный тариф, 2 - дневная зона, 3 - ночная зона

address	1	2	3
Ярославль, просп. Московский, д. 119	42 661,70	32 200,21	10 461,49
Ярославль, ул. Батова, д. 5, корп. 2	39 481,08	30 416,50	9 064,58
Ярославль, ул. Кавказская, д. 47	58 898,87	45 020,39	13 878,48
Ярославль, ул. Клубная, д. 48	15 378,74	11 948,67	3 430,07
Ярославль, ул. Нефтяников, д. 15	28 484,02	21 743,10	6 740,92
Ярославль, ул. Попова, д. 15	22 188,83	17 020,20	5 168,63
Ярославль, ул. Ухтомского, д. 5	56 129,23	43 979,94	12 149,29
Всего	**263 222,48**	**202 329,01**	**60 893,46**

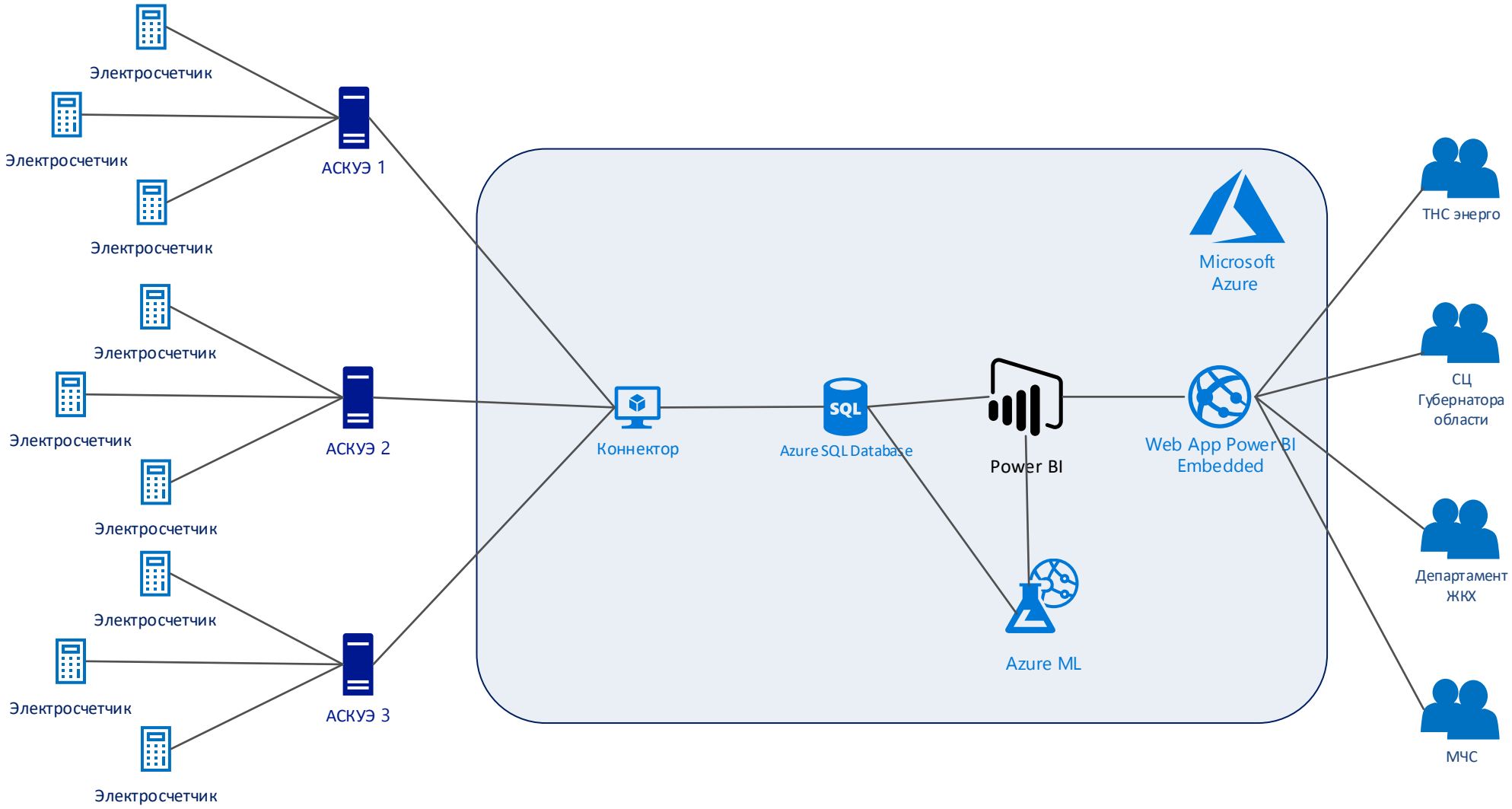
Monitoring consumption parameters

Smart4Energy displays

- Operational data (once per 30 minutes)
- Historical data
- Predictive extrapolations

Graphs' parameters are customizable – user can select and visualize the data that he needs.

Architecture



Service users

- State authorities and supervisory bodies
- Utility providers
- Consumers (property management companies, municipal and budgetary organizations, federal and antimonopoly regulators, supervisory authorities)

Service users. State authorities.

Problem

The lack of comprehensive systems for collecting and analyzing data on resource consumption at the municipal and regional levels.

Solution

Implementation of smart meters, АСКУЭ and analytical system of energy consumption.

Consumption Management

1. Substantiation of tariffs
2. Determining the feasibility of applying energy-saving technologies
3. Involving citizens in energy saving

Usage scenarios in state authorities

Analysis of communal use indicator

1. Communal use indicator exceed standard → the basis for including the house in the schedule of thorough overhaul.

2. By the end of thorough overhaul communal use indicator exceeds standard → a signal that repairs are made poorly → a basis for verifying the work of the contractor.

Usage scenarios in state authorities

Analysis of communal use indicator

3. Operational Acceptance of apartment building after thorough overhaul→ communal use indicator lower the standard level, and then tends to exceed→ a signal of poor service.

4. Comparing communal use indicators between the same apartment buildings.

Example

Three houses in the same district with the same equipment. Communal use cost per month:

- First house — 10 rubles,
- Second house — 150 rubles,
- Third house— 400 rubles. →

The basis for checking houses in regards of unauthorized connections or loss in grids.

Service users. Energy suppliers

Creation of network of metering devices will enable to accurately determine the level of consumption within a particular period:
during a day/week/month/year.
Based on this data, it becomes possible to "adjust" tariffs for a certain object, introduce flexible tariffs (day/night, winter/summer, weekdays/weekends).

The system of smart analytics will allow:

- Analyzing the grid loads in real time
- Identifying pre-failure states of grids and equipment
- Failures forecasting
- Improving the planning on future procurement on electricity wholesale market.

Energy suppliers

Results

Short-term benefits – money saving as a result of effective procurement planning for the coming period.

Long-term prospects for regulators – optimization of tariff policy**.**

Achieved results

Social

- Involving citizens in active energy saving
- Optimization of expenses for housing and communal services due to the possibility to independently control the level of consumption
- Transparency of charges

Managerial

- Minimizing the risk of errors due to the transparency of data gathering
- Money saving as a result of effective procurement planning
- Formation and implementation of energy saving and energy efficiency measures

Economic

- Fee for actually consumed resources
- Reducing the level of process losses,
- Reducing costs by controlling deviations

Thank you!

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