New Action Plan development for Smart City Riga
Maija Rubina, REA Director

www.stepupsmartcities.eu
Europe’s new energy policy for promotion of energy efficiency

Climate change mitigation objective - >20-20-20 to 2020

Initiatives involving municipalities - Covenant of Mayors (Cities long-term sustainable energy action plan until 2020)
Signed by 5500 cities around the world, 17 from Latvia - Rīga, Jelgava, Jēkabpils, Liepāja, Jūrmala, Balvi, Ikšķile, Kārsava, Ķegums, Līvāni, Ludza, Ogre, Salaspils, Saldus, Tukums, Valka, Viļāni - SMART CITIES and districts (Smart Cities)

- Riga signed Covenants of Mayors on 30th of September 2008 (as a first EU capital city)

- In 2010 “Riga City Sustainable Energy Action Plan 2010-2020” were approved

- Every year monitoring reports are prepared and submitted (2010, 2011)

- Every year Riga Energy Days events is organized (October)
Sustainable development in cities

City’s sustainable development ensures today’s public needs, without threats for future generation’s opportunities to satisfy their needs

Sustainable development involves interacting public (social), environmental and economic dimensions.
SMART CITIES status

Smart cities and districts as the innovative partnership of the European Commission (EC) initiative is formulated in the EC 10.07.2012. document C (2012) 4701 final. Partnership cities and districts (cities) covers three areas - energy, transport and information and communication technologies. EC schematically represented this interaction between the smart cities as follows:
Joining the 7th Framework first call within smart city partnership municipality of Riga along with co cities - Glasgow (United Kingdom), Ghent (Belgium) and Gothenburg (Sweden) supported the international project STEP - Up (Energy Efficiency Strategic tools for urban planning) creating "Riga City Sustainable Energy Action Plan for Smart Cities 2014 to 2020" with objective to approach smart city status.
Action plan connection to Riga Council strategic planning

- Riga longterm strategy til 2030
- Riga development program 2014 - 2020
- Riga land use plan

STRATEGICAL DEVELOPMENT PLANNING DOKUMENTS OF BRANCHES

- Riga Sustainable Energy Action Plan for Smart Cities 2014 - 2020
- Riga City Heat supply development concept 2006 - 2016

- Power supply (JSC “Latvenergo”)
- Heat supply (JSC “Rīgas siltums”)
- Natural gas supply (JSC “Latvijas gāze”)
- Data on fuel (SRI “Institute of Physical Energetics”)
- Transport, mobility (RCC Traffic Department)
- City lighting (RMA “Rīgas gaisma”)
- IC technologies (RCC IT Centre)
- Public buildings (RCC Property Department)
- Residential buildings (RCC Housing and environment dep., LtD “Rīgas pilsētbūvnieks”, LtD “Rīgas namu pārvaldnieks”)
Actions Plan management structure

21 participants

REA Management Board

12 participants

5 full time peaple

SEAP Inter-institutional Working Group

Representatives from:
- REA
- JSC «Latvenergo»
- JSC «Rigas siltums»
- JSC «Latvijas gāze»
- IPE
- Riga Technical University
- LIKTA
- Energy efficiency Industrial Cluster Ltd «Lattelecom»
- City development Dep. of RCC
- Finance Dep. of RCC
- Property Dep. of RCC
- Transport Dep. of RCC
- Housing and Environment Dep. of RCC Ltd «Rigas gaisma»
- Riga Architectural Bureau of RCC
- IT centre of RCC
- Ltd «Rigas pilsetādēviens»
- Ltd «Rigas satiksme»
- Ltd «Rigas namu pārvaldnieks»

REA

16 participants

Public org. (NGOs, associations, etc.)

REA Advisory Board

16 participants
Structure of the Action Plan

**CO₂ emissions calculations and forecasts**

Main chapter

Basic chapters

**Introduction fostering measures of Riga SEAP for SC**

Management structures of Riga SEAP for SC introduction
Innovative ICT for EE improvement

Society involvement in fulfilment of SEAP for SC
Financial support tools of SEAP for SC introduction

Necessary amount of financial resources for introduction of SEAP for SC

EU, state and municipal support measures
Necessary legislative and regulatorily documents
Assessment criteria of SEAP for SC aims fulfilment

**Energy consumption reduction, energy efficiency improvement and RES use attraction forecasts and actual use values in Riga:**

Energy production & transmission
- Heat supply
- Power supply
- Natural gas supply
- Fuel consumption, including local (decentralized) heat supply sector

**Energy consumers**
- Residential building sector
- Public building sector
- Streets and parks lighting
- Public transport

**Urban development planning measures for energy consumption reduction**
## Action plan’s introduction part

- Progress by parts, year 2012
- Innovative Smart City projects with integrated ICT solutions
- Aims defined in Action Plan

<table>
<thead>
<tr>
<th>Measure</th>
<th>Introduction schedule</th>
<th>Responsible for introduction</th>
<th>Introduction amounts</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. City decentralized heat sources data base creation including of wood pellets boilers, solar collectors, ground source heat pumps with vertical probes, e.t.c. local heat sources</td>
<td>2013.-2020</td>
<td>REA, Cooperation partners</td>
<td><strong>/</strong><em>/</em>__ %* share from total</td>
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<tr>
<td>2. Promotion of solar collectors installation on building roofs for hot tap water preparation and integration with district heating, e.t.c. heating system</td>
<td>2013.-2020.g.</td>
<td>REA, Cooperation partners</td>
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<tr>
<td>3. Attraction of solar energy for hot tap water preparation in buildings, thousands MWh/year</td>
<td>2020.g.</td>
<td>Building owners</td>
<td><strong>/</strong><em>/</em>__ ^*</td>
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<td>4. Promotion of ground source heat pump - with vertical probes – installation for heat supply of buildings</td>
<td>2013.-2020.g.</td>
<td>REA, Cooperation partners</td>
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*) minimal, optimal, maximal forecast
Innovative Smart City projects with integrated ICT solutions (included in REA project e-catalogue)

1) Energy consumption management in multi apartment buildings

2) Energy consumption management in public buildings

3) Local biogas cogeneration with heating in greenhouse complex

4) Programmed LED city lightning with distance control function

5) Heat recover from the flue gas within district heating system

6) Automated energy consumption distance data mining within district heating system

7) E-ticket system implementation and reduced price tickets available for different social groups using public transport

8) Database for Riga living households

9) Thermal pump with heat controllers for efficient building heating

10) Automated wood chips biomass boilers with output value over 100%

11) Electric cars for municipal technical units

12) Sun battery system on building roofs over the city

13) Energy Efficiency for household using Smart technologies

14) Solar pumps for building heating

15) Heat recover from waste water in multi apartment houses

16) Smart distance controllers for electricity supply data gathering
CO₂ emission reduction between 1990 and 2012

1990 is the base year (reference) selected by Riga municipality un Kioto protocol guidelines. CO₂ emission (by defined calculation method) in Riga reached 51.85% in year 2012.

2013 - 53%. Forecast: 2020 - 55-60%; 2030 - 70%; 2050 – up-to 90%. 
Riga municipality electricity supply

Electricity supply in Riga municipality is implemented by JSC “Latvenergo” using 3 main sources:

**Rīgas TES-1** (modernized - 144 MW\textsubscript{el.}-88%)

**Rīgas TES-2** (outside Riga borders– 833 MW\textsubscript{el.}-89%)

**Rīgas HES** (outside Riga borders– 402 MW)
Renewable energy resources produced by cogeneration stations

Cogeneration stations using biogas:

- Wastewater filtering station “Daugavgrīva” (Ltd. “Rigens”) – 2,1 MWe. (2,6 MWth)
- Ltd. “Getliņi EKO” hard-waste (sadzīves) polygon – 5,3 MWe. (6,8 MWth)

Cogeneration station using biomass (wood chips):

- HC “Daugavgrīva” – 0,6 MWe.
- HC “Ziepniekkalns”- 4 MWe. (22 MWth)
Solar energy in energy production

Monthly solar radiation total amount over North Europe (kWh/m²)

Largest solar battery is installed by Ltd “Zajā Latvija” with total of 1200 m² (120kW)

In 2012 more then half of energy consumption was ensured using renewable energy resources
Electro energy consumption in 2012 increased by 2.6% to year 2011.
Electro energy for eco-transport development

http://www.latvenergo.lv/portal/page/portal/Latvian/latvenergo/main_page/korp_atbildi/UZLADES_PUNKTU_KARTE

Fast-refuel and slow-refuel station infrastructure
Households energy consumption management system
Controllers for household energy consumption measurement
Smart controller with distance data gathering function

- All installed smart controllers maintains > 100kW
- Prior for household with energy consumption over 2500 kWh
Energy consumption for municipal lighting

- 2005.g.: 27.30
- 2006.g.: 30.80
- 2007.g.: 26.65
- 2008.g.: 28.29
- 2009.g.: 25.66
- 2010.g.: 26.48
- 2011.g.: 26.43
- 2012.g.: 27.33

GWh
Municipal lighting energy efficiency increase

Riga lighting system uses single-case programming method also as implemented distance management system to control lighting intensiveness

• In 2013 amount of lighpulps reached 2000
• In is planned to install 7000 LED lighpulps by year 2017
Natural gas consumption dynamics

- Natural gas consumption dropped by over 49% within 3 years period
- Also TES-2 consumption decreased by 28% over past 3 years.
Main type of heat supply - central heating 76% of total consumption;

Main fuel - natural gas;

70% of the heat supplied Riga TEC-1 and Riga TEC-2;

30% of heat developed by “Rigas Siltums”:
- 5 heating plants
- 38 gas boiler houses;

90% of heat developed within highly efficient cogeneration process; Heat losses in heating networks reduced down to 13%.
BIOMASS - timber woodchip for heat production

The aim by year 2015 is to increase the share of biomass in the operator's fuel balance by 20%:

• 28.02.2013 fully automated bio-fuel CHP was put into operation in heating plant "Ziepniekkalns";
• On May 2013 water supply heating boilers with total heat capacity of 20 MW (110% efficiency) were put into operation water in HP "Zasulauks";
• There is a large modernization over the next several years designed for HP „Daugavgrīva“ to increase energy production efficiency (for heating boilers with heat capacity of 20 MW and condensate economizers with capacity of 1MW).
Biomass use dynamics
Energy efficiency improvement measures in the district heating system

- Condensate economizers were implemented in heat sources to recover heat from the flue gas;

- Powerful absorption-type heat pump for heat recovery from cogeneration block cooling flow was installed in heating plant "Imanta"
District heating system automated remote data reading used by “Rigas Siltums” (1)

Principle scheme
District heating system automated remote data reading used by “Rigas Siltums” (1)

86 base stations and transponders network:
Ground thermal resources
Waste and waste water as a resources for heat energy production

Biogas cogeneration polygon “Getliņi” with thermal complex
(300 000 tons of waster per year)

Riga waste water filtering complex “Daugavgrīva” – 350 tonn/m³ (8-15°C) per daynigh
Municipal housing stock renovation

- Overall number of apartment houses urgent needs for renovation is 6 000 with total the total area about 12 billions m²

- By 2013 56 households with total area of 145 044 m² were renovated:
  - up to 2008 - 12 households (46 987 m²);
  - from 2009 to 2012 – 28 households (68 807 m²);
  - 2013 - 7 households (29 249 m²);
  - 9 social multi apartment houses (39 495 m²).

- By year 2013 the Latvian Innovation and Development Agency (LIDA) signed about 40 contracts for European Union structural renovations attracting co-financing. Entries shall be mainly completed in 2014.
Renovated multi apartment houses in Riga
Renovated apartment house location within Riga municipality

- Renovated buildings 2012
- Renovated buildings 2013
Multi apartment house renovation dynamics
Main energy efficiency measures for multi apartment houses

- Attic, coupled roof, building’s plinth also as basement slab and external wall insulation;

- Window replacement over common multi apartment areas;

- Exterior door replacement or insulation (under the current Latvian Construction Standard LBN 002-01 requirements);

- Ventilation system renovation without heat recovery;

- The hot water system renovation or replacement through the riser insulation;

- Home heating line renovation or replacement (all municipal multi apartment houses were equipped with modern heating hubs by 2008);

- Renovation of heating systems by replacing radiators with one-pipe systems equipped with a bypass thermostat and allocators (heat distributors) or other devices for racking heating consumption in case of the absence of the two-pipe system with heat controller;

- one-pipe systems approximation to a two-pipe system, t.i., thermostat installation for steady heating balancing using return risers with automatic temperature controllers.
Main energy efficiency measures for multi apartment houses (2)

- Apartments are equipped with modern automated individual substations which allow to set the desired temperature;
- An innovative solution of system balancing problem is a riser return temperature controlling system with automatic load balancing mechanisms.
Measures for energy efficiency increase for residential block houses (3)

Thermostatic valve is mounted on the return riser cable allowing to set the desired return temperature (Ltd. “Danfoss”)
Measures for energy efficiency increase for residential block houses (3)

Realized action Gauja Street 29, Riga
Measures for energy efficiency increase for residential block houses (4)

Apartment individual consumption regulation within installation of a thermostat over the heaters and heat cost allocators:
Measures for energy efficiency increase for residential block houses

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<th>Dzivoklis</th>
<th>1. kāpņu telpa</th>
<th>2. kāpņu telpa</th>
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<td>0.18</td>
<td>0.21</td>
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Public apartment house energy efficiency database

- Riga Energy Agency implemented via website a publicly available database of residential buildings which are connected to the city district heating.
- The database records are arranged (by the street names) in alphabetical order showing the following data:

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<td>1.</td>
<td>Vesetas iela 8</td>
<td>4794,88</td>
<td></td>
<td>967,61</td>
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Sāsinājumi: n.f. – nedzīvojamais fonds
Public apartment house energy efficiency database (2)

- *For the comparison within the database an average actual specific energy consumption of 101 kWh/m² of year 2012 is taken*
- Example: Useless overdrawn and overpaid (as a percentage) heat in non-renovated house (Vesetas str.8, Riga, year 2012) with consumption of 202 kWh/m²/a
  
  \[
  \frac{202 - 101}{202} \times 100 = 50% 
  \]

- Initially the database included 2,856 multi apartment houses managed Ltd. “Rīgas namu pārvaldnieks”
- In 2012 average, average actual specific heat consumption over non-renovated multi apartment houses in Riga was 201 kWh / m²/a
Public apartment house energy efficiency database (3)

Renovated buildings actual specific energy consumption compared with 7 sets of excessive profits by effective specific heat consumption (red line)
Data base on heat consumption by building (4)

REA database of 2,856 buildings distributed into specific energy consumption groups (year 2012)
Municipal support measures for renovation

- REA implemented Energy Efficiency Information Center

- Riga City Council issued binding rules on the procedure for the Riga municipality provides assistance for energy efficiency measures in residential homes

- 80% co-financing on energy audits (102 audits already made)
  - Technical documentation such as forms for energy audits, technical surveys, technical renovation projects were developed (total 12 common forms);

- REA is initiating the group of 3 energy auditors with aim to ensure actual energy performance indicators to reduce energy consumption to the extent possible

- From 2014 free municipal monthly newspaper about opportunities to increase energy efficiency is published

- Municipal Ltd. “Rīgas namu pārvaldnieks” (4300 buildings) offers renovation services as ESCO.
ESCO and EPC operational scheme

- Baseline
- Guaranteed savings
- Reduced costs due to performance-based solutions
- Additional savings of energy price increase
- Customer savings

- Start of positive environmental impact
- Duration of program
- Time (years) Customer to retain all savings
R你好
Support measures to finance renovations

• Cohesion and EU structural funds – in February 2014 Latvian government approved an operational program "Growth and Jobs" (indicative funding of 4.4 billion) with the program "The transition to a low carbon economy in all sectors" which is intended to support the national and improving energy efficiency in residential buildings:
  
  - national/public buildings - 100 billion EUR
  - multi apartment houses – 150 billion EUR

• National revolving fund for energy efficiency measures

• ESCO involvement

• Implementation of administrator service

• Involvement of power supply companies in order to increase household energy efficiency
Energy efficiency measures in public sector (1)

There are more than 400 municipal building in Riga including 136 schools and 159 kindergartens.

In 2012 - 55 schools and 46 kindergartens were renovated, that is 36% from total number of educational institution buildings. It is aimed to finish mentioned sector’s renovation in 5 years.
There are unique cultural institution buildings Opera House, City’s theatre, etc.), sport complexes, governmental and public buildings in Riga. Renovation and modernization were partially implemented also in this segment (Russian Drama Theatre, cultural center “Ziemelblazma”, National museum and others).
Riga municipality eliminated coal boiler houses and installed heating with geothermal pumps equipment in two pre-schools buildings:

Pll “Kastanītis” Bišumuižā – 10 borehole with 120m thermoprobes
Two-stage heat pump
57,5 kW
Energy efficiency measures in public sector (3)

Kindergartner Mežaparkā -
12 boreholes with thernoprobes – 80m;
Two 29 kW heat pumps
Energy efficiency measures in public sector (4)

Computerized energy consumption management systems:
The new low-energy buildings

In 2013 in the competition “long-term sustainable building project 2013” two Riga projects were successful - the office building "Upmalas biroji" Mukusalas Street 101, and living house "Futuris" Antonijas street.

„Upmalas biroji energy efficiency - 110 kWh/m²/year (heat and electricity consumption); „Futuris” (7318,3 m²) – 55,52 kWh/m²/ year (heat and electricity consumption);
Urban transport development using zero-emission vehicles (1)

Passenger transport services, % in 2012

- Predominant is electric transport -> 54%
- 19 trolley lines with 267 combinations
- 9 tram lines with 267 tram combinations, 26 low-floor trams
- Fleet renewal and modernization is implementing
- City buses are using fuel (2012) with 3.6% of biofuel. The biomass admixture in 2020 is planned near to 10%.
Urban transport development using zero-emission vehicles (2)

- Electric vehicles used in the tourism sector
- Riga municipal technical services in 2013 used 8 electric vehicles
  public electric car charging infrastructure is developed
- It is planned to increase the number of electric vehicles in the municipality at least by 12 units until year 2020
In 2013 Riga has joined HyER as an associate member;

- In 2014 Riga in cooperation with the partner has prepared and submitted to the TEN-T program project "HIT-2 - Korridors" designed to address the deployment of hydrogen filling stations network development

- The local government solves the feasibility of introducing hydrogen vehicles
- Bycycles is an important component of urban transport in Riga
- 44 km or marked bicycle routes were constructed and the expected network will expand by 100 miles up to year 2020
Urban transport infrastructure development hierarchy

pedestrian - bicycle - public - private - freight transport
Criteria for Action Plan achievement evaluation

The following is adopted as a criterion for assessment of implementation of energy efficiency measures:
1) production of additional energy per year in MWh, without combustion of fuel;
2) decrease in consumption of energy in MWh per year;
3) extent of introduction of specific measures – % of the number of renovated buildings;
4) number of the renovated residential houses and public buildings in the city;
5) number of buildings in the city which have undergone energy audits;
6) electricity consumption savings from city lighting, % of the total consumption.

The following is adopted as a criterion for assessment of introduction of renewable energy sources:
1) share of biofuel used, % of the total fuel consumption in public road transport;
2) number of introduced electric cars and hybrid cars, and % of the total number of public road transport vehicles;
3) production of additional energy from renewable sources in MWh per year;
4) use of renewable energy sources for production of heat in the district heating system, % of the used volume of fuel (MWh) per year;
5) volume of energy in MWh produced from renewable energy sources per year;
6) number of heat pumps installed in the city for local heating;
7) number of buildings renovated.
Thank you for Your attention...

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