Plans of grid development in the North-West region of Russian Federation up to 2020

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Saint-Petersburg
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Restructuring of Russian power grid complex

Background

1st milestone
Four interregional distribution grid companies incorporation
2002-2004

Distribution grids management

2002-2012 гг.

IDGC of North Caucasus
IDGC of North-west
IDGC of the Center and Near Volga
IDGC of Siberia
IDGC of Ural
MOESK
Lenenergo
Yantarenergo
Tumenergo
Kubanenergo

2 milestone
JSC «IDGC Holding» incorporation, transfer of controlling interest of 8 operating IDGC, 5 regional power grid companies (RSK)
2004-2012

MES of Volga
MES of South
MES of Western Siberia
MES of North-west
MES of East
MES of Siberia

JSC «FGC UES»
8 branches

UNEQ management

RAO UES of Russia
Prior to 2002

Distribution grids management

March 23, 2013
ROSSETI

Background

2002-2012 гг.

IDGC
Trust stocks management
General Description

### Stockholder capital structure

<table>
<thead>
<tr>
<th></th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Russian Federation</td>
<td>85,31%</td>
</tr>
<tr>
<td>Free float</td>
<td>14,69%</td>
</tr>
</tbody>
</table>

#### Power grid complex

**JSC «Rosseti»**

**Distribution grids**
- 14 RSK – JSC “Rosseti” subsidiary
- MOESK
- IDGS of North Caucasus
- IDGS of Volga
- IDGS of Urals
- IDGS of Centre
- IDGS of Volga Region
- IDGS of Siberia
- IDGS of South
- Tyumenenerg

#### Transmission grids
- JSC “FGC UES” – JSC “Rosseti” subsidiary

### Distribution grid
- 68 regions

### Distribution grids indicators

| Operating Area, thousand of km² | 7 761 | 14 800 |
| Substations                    | 461 886 | 891 |
| Transformer capacity, thousand of MVA | 404 | 335 |
| Transmission lines length, thousand km | 2 110 | 132 |
| Electricity supply, billion kW*h | 649,9 | 498,3 |
| Energy losses, billion kW*h    | 52,7 | 21,9 |
| Energy losses, %               | 8,11 | 4,24 |
| Medium staff, thousand people  | 193,9 | 24,9 |

### Transmission grid
- 75 regions

**Operating Area**

**Substations**

**Transformer capacity**

**Transmission lines length**

**Electricity supply**

**Energy losses**

**Medium staff**
- Transmission and input of energy power with 11 neighboring states via 140 interstate power transmission lines
- 4 intergovernmental agreements on measures to ensure power system parallel operation
- 8 agreements on technological issue about power system parallel operation

### International activities

<table>
<thead>
<tr>
<th>Country</th>
<th>Actual power export million kWh</th>
<th>Actual power import million kWh</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2012</td>
<td>2013</td>
</tr>
<tr>
<td>1</td>
<td>Azerbaijan</td>
<td>55,770</td>
</tr>
<tr>
<td>2</td>
<td>Belarus</td>
<td>3,698,125</td>
</tr>
<tr>
<td>3</td>
<td>Georgia</td>
<td>517,049</td>
</tr>
<tr>
<td>4</td>
<td>Kazakhstan</td>
<td>2,284,458</td>
</tr>
<tr>
<td>5</td>
<td>China</td>
<td>2,630,173</td>
</tr>
<tr>
<td>6</td>
<td>Latvia</td>
<td>0,000</td>
</tr>
<tr>
<td>7</td>
<td>Lithuania</td>
<td>4,780,170</td>
</tr>
<tr>
<td>8</td>
<td>Mongolia</td>
<td>392,750</td>
</tr>
<tr>
<td>9</td>
<td>Ukraine</td>
<td>81,795</td>
</tr>
<tr>
<td>10</td>
<td>Finland</td>
<td>3,793,845</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>18,364,346</strong></td>
<td><strong>17,539,452</strong></td>
</tr>
</tbody>
</table>
Interstate power areas development

In order to ensure electricity export/import in/to neighboring states, as well as maintenance of neighboring states power systems and UNEG operation:

- **Vyborg converter reconstruction** (back-to-back complex 400 кВ)
- **Cross-boarder synchronous area BRELL links development**
- **Project development of links in the section of the Russia – Norway**
- «**Karelian power bridge**» project
- **Baltic NPP construction**
- Participation in CASA-1000 project in Central Asia
- Power links development projects between eastern regions of Russian and China, Republic of Korea, North Korea, Japan and Mongolia.
<table>
<thead>
<tr>
<th>Country</th>
<th>Consumption kWh</th>
<th>Generation kWh</th>
<th>Peal loads MW</th>
<th>Total capacity MW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estonia</td>
<td>7.8</td>
<td>11.4</td>
<td>1517</td>
<td>2700</td>
</tr>
<tr>
<td>Latvia</td>
<td>6.8</td>
<td>5.6</td>
<td>1419</td>
<td>2566</td>
</tr>
<tr>
<td>Lithuania</td>
<td>11.6</td>
<td>4.8</td>
<td>1900</td>
<td>3737</td>
</tr>
<tr>
<td>Belarus</td>
<td>37.6</td>
<td>31.9</td>
<td>6300</td>
<td>8970</td>
</tr>
</tbody>
</table>

**Kalinigradskaya PS**

<table>
<thead>
<tr>
<th>Other Information</th>
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<tbody>
<tr>
<td>Consumption kWh</td>
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<tr>
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<tr>
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</tr>
<tr>
<td>Total capacity MW</td>
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</table>
“North power bridge” project
Electricity export from Kola peninsula Nickel substation to Norway the nearest 400 kv substation
Composition: 
-330 kv and 400 kv OHL (according to feasibility study) through Russian territory to Russia-Norway border; 
- DC link in Nickel substation area of 300 MW
Expected annual volume – 2, 4 billion kWh

Expansion project of existing electricity power export to Norway

HPP Pazskiy cascade allocation to radial operation with Norway

“Kola Power bridge” project

“Karelian Power bridge” project

Finland
Baltic countries
Poland
Belarus
The construction of new power transmission between Russia and Finland with the installation back-to-back complex 150 MW

Project implementation in 2 stages:
- Stage 1: 80 MW, export up to 700 million kWh per year;
- Stage 2: extension of up to 150 MW, export to 1.1 billion kWh per year

Capital construction under the project includes:
construction of 220/110 kV back-to-back complex in the substation Sortavala, 110 kV cross-border power transmission line through the Russian (28 km) and Finnish (22 km) of territory

In order to realization of the second stage also requires significant strengthening of the Finnish grids (preliminary, a new 110 kV overhead line length the construction of about 100 km)

Negotiations with the Finnish Transmission System Operator “Fingrid” are fulfilled.
The project «Karelian power bridge» is recognized as technically feasible
Starting stage: the selection of HPP Jovskaia units (2x48 MW) and Kuma HPP (2x40 MW) on the parallel operation with the Scandinavian energy system.

Conditions:
Part length of 114 km of 220 kV transmission line from state boarder to Pirttikoski, on the territory of Russia the area of 220 kv transmission line length of 63, 5 km from substation Allakurti to state boarder.

Transmission power - up to 160 MW.
«North power bridge» project («Pechenga power bridge»)

- Purpose - electricity power export from Kola power system from 330kV Nikel substation to Norway

- Composition: 330 kv and 400 kv OHL (according to feasibility study) through Russian territory to Russia-Norway border, DC link in Nikel substation area of 300 MW

- «North power bridge» project provides electricity power delivery to Norway in bulk of 2,4 billion kWh in a year (capacity 300 MW).

- Negotiations with the Norwegian side for electricity supply are of preliminary nature.

- This project requires detailed feasibility studies and assessments of the economic and commercial efficiency.

- Promotion of the project associated with construction of Kola NPP-2 under the terms and conditions.
Baltic NPP power output

- Purpose of the project – the possibility to provide export of electric power from Baltic NPP.

- The plant consists of two units with the total power of 2300 MW.

- General scheme of power objects allocation provides for possibility to ensure power export from Baltic NPP starting from 2020 in bulk of 11.3 billion kWh per year (1800 MW).

- Negotiations are taken place thus far, scheme of power output from Baltic NPP could be determined (adjusted) taking into consideration concluded capacity delivery agreements. It may be necessary to ensure additional power grid construction to the west – cable lines to Germany and Sweden across Baltic sea or grid reinforcement for power transmission to Unified Energy System of Centre and North-west.
Baltic NPP power output (follow up)

Stage 1
Baltic NPP – 1150 MW.

Stage 2
Baltic NPP – 2x1150 MW
Thank you for attention!