Low-cost SOFC power plant for distributed generation

Sergey Shubenkov
Director of “Energy Factor”
1. Industry trends

Decentralized generation (DG) is growing much faster than the centralized generation industry.

Renewable and low-carbon generation technologies are main drivers of DG growth though they still have a number of disadvantages.
2. Solution

Small (1 ÷ 15 kW) heat and power plant based on low-cost SOFC technology as common as personal car

1. SOFC power plants are efficient (up to 60%), ecological, noiseless, cheap in maintenance and long-living

2. Key customers: householders, building developers, utilities services enterprises, agricultural enterprises and telecom companies

3. The envisioned power plant’s pay-off period is 2-5 years depending on the type of usage and configuration
3. Market

Basic market for SOFC-plants is global and fast-growing

1. The market value for DG technologies based on fuel will reach $74.3 billion by 2015, with a CAGR of 18.2%.

2. Global demand for fuel cell power plants is projected to reach $2.6 billion in 2017 with a CAGR of 54.6%.

3. Cost advantage is the key competitive factor on the stationary fuel cell market
4. Competition

Small natural gas power plants

- SOFC and PEMFC plants (2017)
- BlueGEN
- Bloomenergy
- Ene-farm

Limited market supply

- Gas reciprocating power plants
- Micro-turbines
- ENERGY FACTOR

Installed capacity price, $/kW

Installed capacity, kW

2015

2017
5. Competitive advantages

Cost effective Solid Oxide fuel cell synthesizing technology and tubular design of cells provide competitive advantages

Lower cost of fuel cells

More simple (economical) & reliable plant construction

Wider power range of plants
6. Technology

SOFC production technology had been developed for 17 years and now it’s ready for industrial implementation.

Looking simple technological process contains multiple «know-hows».

- **1. Construction materials preparation**
- **2. Cathodes compaction**
- **3. SOFC layers deposition**
- **4. Baking of SOFCs in furnace**
7. Team

The project team has competence in technology development, production launch and new products brand-management

Key persons:

Sevastyanov Vladimir, Senior Researcher, has an experience of successful implementation of innovative industrial technologies in the USSR

Sergei Shubenko, Project Director, has an experience of small venture business administration and brand management
8. Business model

We plan to arrange joint venture with European or American global partner to develop and promote solutions for different geographical markets.

The targeted geographical markets are: North America, Germany, Russia, Eastern Europe, South Korea, India, Turkey.

**Energy Factor** will develop technology up to pilot production and then invest IP rights in joint venture.

Joint venture will adjust the power plant to partner’s technology standards, will adopt the product to specific regional requirements and will produce and promote it using partner’s channels.
9. Current status and next steps

SOFC production technology development - the most venturous stage of the project – has finished

<table>
<thead>
<tr>
<th>Stage</th>
<th>Technology</th>
<th>Invstd</th>
<th>Req</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low-cost SOFC technology</td>
<td>250 W prototype</td>
<td>$2 mln</td>
<td>$0.7 mln</td>
<td>May 2013 Dec. 2013</td>
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<tr>
<td></td>
<td>3 kW power plant</td>
<td></td>
<td>$1.8 mln</td>
<td>Q1 2015</td>
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<tr>
<td></td>
<td>Pilot production</td>
<td></td>
<td>$3.2 mln</td>
<td>Q4 2015</td>
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<tr>
<td></td>
<td>Serial production</td>
<td></td>
<td>~$11 mln</td>
<td>2017</td>
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10. Investment offer

Buying additional stock issue for $2.5 mln, the investor will get >40% in the project.
11. Contact Information

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