Russian innovative economy: is it real?

Dmitry Akhanov, CEO and President of RUSNANO USA
September 5, 2012
Macroeconomic conditions in Russia
After a sharp drop in 2009, Russian GDP has recovered and is now expected to continue growing.

GDP development and structure

**GDP DEVELOPMENT [USD bn]**

<table>
<thead>
<tr>
<th>Year</th>
<th>Real GDP in 2005 prices [USD bn]</th>
<th>Real GDP growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>764</td>
<td>6</td>
</tr>
<tr>
<td>2007</td>
<td>826</td>
<td>8</td>
</tr>
<tr>
<td>2009</td>
<td>897</td>
<td>9</td>
</tr>
<tr>
<td>2011</td>
<td>944</td>
<td>5</td>
</tr>
<tr>
<td>2013</td>
<td>905</td>
<td>4</td>
</tr>
<tr>
<td>2014</td>
<td>942</td>
<td>4</td>
</tr>
<tr>
<td>2015</td>
<td>977</td>
<td>4</td>
</tr>
<tr>
<td>2016</td>
<td>1,016</td>
<td>4</td>
</tr>
<tr>
<td>2017</td>
<td>1,059</td>
<td>4</td>
</tr>
<tr>
<td>2018</td>
<td>1,102</td>
<td>4</td>
</tr>
</tbody>
</table>

**GDP STRUCTURE, RUSSIA, 2010 [%]**

- Services: 40%
- Natural resources: 16%
- Production: 19%
- Retail: 11%
- Construction: 6%
- Other: 8%

Russian GDP (PPP): 6th in the world

GDP (PPP), USD trillion

USA: 15.07
China: 11.32
India: 4.47
Japan: 4.40
Germany: 3.09
Russia: 2.38
Brazil: 2.31
UK: 2.25
France: 2.22
Italy: 1.83

Source: IMF
Economic indicators: facts and forecasts

**INFLATION [%]**

- **2000**: 20.1%
- **2005**: 6%

**FINANCE AND DEBT**

- International reserves (as of 16.03.2012): $505.4 bn
- National Wealth Fund and Reserve Fund, aggregate amount (as of 01.03.2012): $152.2 bn
- Gross government debt, % of GDP (2012, forecast): 14.1%

Trends in nanotechnology enabled market niches
Pharma and Biotech: high growing 4.5 bn USD market

(BIO)PHARMACEUTICALS (excl. vaccines)

- Upside potential
- Strong CAGR
- Government support

MARKET 2011-2015 [USD bn]

2011: 3,00
2015: 14,00

Key trends:
- Strong medical need, especially in cardiovascular and oncology treatments
- Government aims to localize manufacturing due to currently high share of imported drugs (77%)

VACCINES

- Upside potential
- Strong CAGR
- Government support

MARKET 2011-2015 [USD bn]

2011: 0,20
2015: 2,00

Key trends:
- Growth of vaccines market depends mainly on government plans for including new vaccines in National Immunization Calendar
- Unclear how many and what type of vaccines will be included

MEDICAL SERVICES

- Moderate potential
- Demand from commercial segment

MARKET 2011-2015 [USD bn]

2011: 0,60
2015: 1,00

Key trends:
- Demand for IVD services is mainly driven by the commercial sector
- Significant R&D base, experienced scientific teams
- Clinical trials in Russia are high quality and less expensive and quicker than in the EU/US

Source: Roland Berger Strategy Consultants

1) window of opportunity (potential)
Energy: new segments of up to 8 bn USD worth

### Market attractiveness

**ENERGY STORAGE**
- High potential
- Strong CAGR
- Government support

**POWER GENERATION**
- Upside potential
- Huge future market share

**ENERGY HARVESTING AND CONVERSION**
- Moderate potential
- Strong CAGR
- Government support

**ENERGY DISTRIBUTION**
- Stable potential
- Moderate CAGR

### Market 2011-2015 [USD bn]

<table>
<thead>
<tr>
<th>Year</th>
<th>ENERGY STORAGE</th>
<th>POWER GENERATION</th>
<th>ENERGY HARVESTING AND CONVERSION</th>
<th>ENERGY DISTRIBUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>0.97</td>
<td>3.16</td>
<td>0.46</td>
<td>0.83</td>
</tr>
<tr>
<td>2015</td>
<td>2.90</td>
<td>1.11</td>
<td>1.11</td>
<td>1.07</td>
</tr>
</tbody>
</table>

### Key trends

- Opening up of the electric vehicles market
- Growing demand on grid storage demand from power distribution companies
- USC technology power stations will be built in Russia starting from 2015
- Technology will account for more than 30% of total power capacity installed
- Growth driven by overall growth of advertising and construction markets
- Growth rate of non-residential property market 2011-2015 is 18.6%
- Segment is driven by import substitution for power transformers and high level of overall investment in energy
- Industry leaders plan to localize transformer production in Russia

Source: Roland Berger Strategy Consultants
# Electronics and Photonics Sectors:
Estimated market potential of USD 5.7 bn USD in 2015

## Key Trends

### INTEGRATED CIRCUITS AND CHIPS

- **Market Attractiveness**
  - High potential
  - Strong CAGR
  - Government support

- **Market 2011-2015 [USD bn]**
  - 2011: 0.46
  - 2015: 3.07
  - Growth: +61%

- **Key Trends**
  - Many areas of application, including transportation, pharmaceuticals, logistics, etc.
  - Massive government support via ERA GLONASS project and implementation of RFID in all pharma products, transportation and postal systems

### OPTOELECTRONICS

- **Market Attractiveness**
  - Moderate potential
  - Moderate CAGR

- **Market 2011-2015 [USD bn]**
  - 2011: 0.38
  - 2015: 0.75
  - Growth: +18%

- **Key Trends**
  - Market is driven by LED, which will mainly be used for lighting systems
  - Government support via the restriction of incandescent light bulbs and changes in construction codes enabling the use of LEDs in buildings

### TELECOMMUNICATIONS

- **Market Attractiveness**
  - Stable potential
  - Moderate CAGR

- **Market 2011-2015 [USD bn]**
  - 2011: 0.12
  - 2015: 1.85
  - Growth: +98%

- **Key Trends**
  - Massive market growth mainly due to transition of mobile operators to 4G networks by applying LTE base stations
  - Growth in fiber channel market is moderate and driven by the increasing number of broadband service users

---

Source: Roland Berger Strategy Consultants
Construction Materials: 14.6 bn USD opportunity in polymers and additives

<table>
<thead>
<tr>
<th>ATTRACTIVENESS</th>
<th>LOW EMISSIVITY GLASS</th>
<th>THERMAL INSULATION</th>
<th>POLYMERS AND ADDITIVES</th>
<th>WATER TREATMENT MEMBRANES</th>
</tr>
</thead>
<tbody>
<tr>
<td>MARKET 2011-2015 [USD bn]</td>
<td>&gt; Strong CAGR</td>
<td>&gt; Large market volume</td>
<td>&gt; Large market volume</td>
<td>&gt; Mostly government financing</td>
</tr>
<tr>
<td>2011 2015</td>
<td>&gt; Massive market potential</td>
<td>&gt; Stable market growth</td>
<td>&gt; Stable market growth</td>
<td>&gt; Moderate growth potential</td>
</tr>
<tr>
<td>0.10 1.20</td>
<td>+86%</td>
<td>+16%</td>
<td>+15%</td>
<td></td>
</tr>
</tbody>
</table>

KEY TRENDS

> Tighter regulations on thermal resistance of windows for new buildings from 2016
> Share of low emissivity glass expected to grow
> Overall construction growth and changes in energy efficiency regulations for new buildings are driving market growth
> Great need of insulation for refurbishing existing residential stock
> Growth is driven by overall construction development
> Good prospects for increased application of new materials (composites, nano-additives, etc.)
> Demand for water treatment membranes mostly determined by governmental spending
> Strong need for refurbishing existing infrastructure

Source: Roland Berger Strategy Consultants
RUSNANO: goals and outlook
Russian nanotech industry 2010-2015: late start, but huge potential

Goal for Russia: move into the “major league” by 2015

Source: Lux Research, RUSNANO
5 Years Progress

- 100 projects invested
- RUSNANO’s commitments - 6.2 bn USD
- Total investments - 18.6 bn USD

Portfolio Breakdown Structure (committed, mn USD)

- Nanostructured Materials: 34%
- Nanoelectronics: 23%
- Nanophotonics: 12%
- Life Sciences: 11%
- Nanoparticles production: 10%
- Infrastructure: 6%
- Funds: 2%
RUSNANO’s key results and plans: Production

- **2011:** 13 new factories in 10 Russian regions
- **2012:** 16 new factories in 9 Russian regions
US-based VCs Co-Investors

- OAK INVESTMENT PARTNERS
- NanoDimension
- SEQUOIA CAPITAL
- FLAGSHIP VENTURES
- BOULDER VENTURES
- SIGMA+ PARTNERS
- I2BF
- SOFINNOVA VENTURES
- Venrock
- Siemens Venture Capital
- DAG VENTURES
North America – Russia Venture Funds

4 funds

$1.4 bn
(incl. $0.65 bn of RUSNANO’s investments)
North America – Russia Industrial Projects

14

Investments of

$2.5 bn

($0.6 bn of RUSNANO’s investments)
In 2010 RUSNANO signed an investment agreement with IPG Photonics, the world’s leading developer and producer of high-performance fiber lasers for materials processing, telecommunications, medical and other advanced applications. RUSNANO’s investment was about $45 mln.

RUSNANO’s primary role was not only to provide financial capital for scaling up the manufacturing, but also to share all the risks related to doing business in Russia.

Another of RUSNANO’s contributions to this project was supporting the company in negotiating with local potential customers.

Only in 2 years IRE Polyus, a subsidiary of IPG Photonics, has increased its production capacity by 5 times and enlarged its customer base in Russia across oil and gas, electronics, telecommunications, automotive and transportation industries.

In June 2012 IPG Photonics decided to purchase RUSNANO’s stake in IRE Poluys equity. The exit generated an IRR of 27% (in Russian currency) on RUSNANO’s investment.
Nanotechnology Ecosystem Development
RUSNANO: Investment Division & Development Arm

Open Joint-Stock Company RUSNANO:
$10 B Investment Fund

Direct investor and fund of funds
- Government contribution: $ 4.1 bln
- State guaranteed debt: $ 5.7 bln
- Late stage VC, Growth/PE fund

Foundation for Infrastructure and Educational Programs:
Nonprofit organization
Innovative infrastructure
- Government contribution: $1 bn
- Infrastructure projects and programs
- Demand Management
- Foresight, roadmaps
- Standardization, certification, metrology
- Education
Setting up Nanotechnology Centers: 12-15 Nanotechnology Centers to create 400 new tech start-ups

Average financing amounts for a Nanotechnology Center:
- Investments in equipment — $37 mn
- Investments in operation budget (3-5 years) — $9 mn
- Number of start-up created (5 years) — 50
Nanotechnology Centers: essential part of innovative ecosystem

- Intellectual property
- Scientific research
- R&D work
- Prototyping
- Small-scale production
- Mass production

- Research Institute & University
- Business Incubator
- Technology Park
- Special Economic Zone
- Nanotechnology Center

Market

Intellectual property → Scientific research → R&D work → Prototyping → Small-scale production → Mass production

Nanotechnology Centers: essential part of innovative ecosystem
Collaboration with Nanocenters

**What we offer:**
- Technology co-development together with the US technology incubators and acceleration centers
- Sharing our pipeline of high-technology projects
- Opening Russian market opportunities

**What we are looking for:**
- Technology partners for start-ups and R&D projects
- Expertise in business incubation
- Seed financing for early stage startup companies
- Marketing analysis for Nanocenters’ technologies
- International development opportunities for Nanocenters’ companies
Demand Management in Nanotechnology Industry: changing and setting up regulations

**RUSNANO plays vital role in setting up policies to enable nanotechnology products:**

- Supporting international collaborations: changing customs regulations
- Removing regulatory obstacles: changing construction code to enable usage of LED lights in buildings
- Collaborating with federal authorities to expand R&D expenses in government controlled companies: *1% of revenue to be spent on modernization in state controlled companies, creating 30 bn USD market for innovative products*
- Collaborating with regional authorities: Introduction of nanotech products for local manufacturing and municipal needs, enabling significant demand on new technologies: Moscow, Tatarstan, Krasnoyars, Perm and many other regions of Russia
- Popularization of nanotechnology enabled solutions
Demand Management in Nanotechnology Industry: collaboration with leading industrial companies

**RZD:**
- Designing smart railway station enabling the use of energy efficient technology and scaling up this design among RZD’s stations

**Gazprom:**
- Wear, abrasion and Vibration resistant materials to increase properties of certain equipment
- Detectors for explosive gases
- Catalysts to remove Sulfur from hydrocarbons

**Avtodor:**
- LED lights for highways and city roads to improve the quality of lights and increase power efficiency
- Composite materials for external reinforcement of road infrastructure objects
- Solar modules: to provide energy sources for road infrastructure systems

**AvtoVaz:**
- Supplying ActoVaz production capacities with LFP batteries to manufacture EI-Lada – Russian EV

…and many others, including Rostelecom, Federal Grid Company, Lukoil, etc
Education: Human Capital is one of the key components to success

1. Training personnel to launch production
2. Training personnel to scale up manufacturing
3. Training personnel in a particular field by requests from nanotechnology companies

Number of educational programs (cumulative)

<table>
<thead>
<tr>
<th>Year</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>11</td>
<td>38</td>
<td>63</td>
</tr>
</tbody>
</table>

Specialized programs for certain companies’ needs:
- Nanotechnology in construction
- Metrology of products in nanophotonics
- New research methods in bionanomedicine and bionanopharmacology
- Innovation Management in an enterprise
- VC funding nanotechnology projects
- Corporate communications, brand management
- Stimulating demand for nanotech products;
- Formation of an effective sales system for nanotechnology products

Technological structure of educational programs:

- Nanomaterials: 24%
- Nanophotonics: 29%
- Nanoelectronics: 16%
- Nanomedicine: 3%
- Technology and special equipment: 17%

Education: Human Capital is one of the key components to success
Contact Information

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Land: +7 495 988 5363
10A Prospekt 60-letiya Oktyabrya, Moscow, 117036
Russian innovative economy: it is real!

On your way to a great deal

Source: Roland Berger Strategy Consultants
Appendix: Several Russian Nanotechnology Enabled Projects
Pharma and Biotech:

**FINANCING:**

- **RUSNANO** committed capital - 1.1 bn USD (as of Jan, 2012)
- **Private investors** - 1.6 bn USD (as of Jan, 2012)

<table>
<thead>
<tr>
<th>COMPANY</th>
<th>PRODUCT</th>
<th>TECHNOLOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PHARMACEUTICALS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SinBio</td>
<td>BioBetter class of pharmaceuticals</td>
<td>Biodegradable nanocomposite materials</td>
</tr>
<tr>
<td><strong>VACCINES</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NT Pharma</td>
<td>Flu nanovaccines</td>
<td>Technology based on pseudo-adenoviral nanofractions and special nanostructures</td>
</tr>
<tr>
<td><strong>DIAGNOSTICS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PET-Technology</td>
<td>National chain of PET diagnostic centers in Russia</td>
<td>Nuclear medicine, new diagnostic methods</td>
</tr>
<tr>
<td><strong>TECHNOLOGY TRANSFER</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Domain Associates</td>
<td>Therapeutic products for the treatment of viral infections, cardiovascular diseases, cancer</td>
<td>GMP-standard manufacturing</td>
</tr>
<tr>
<td><strong>TECHNOLOGY TRANSFER</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Celtic Pharma</td>
<td>Innovative medications in hematology, endocrinology, cardiology, oncology</td>
<td>GMP-standard manufacturing</td>
</tr>
</tbody>
</table>

Source: Roland Berger Strategy Consultants
## Energy Storage

**FINANCING:**
- **RUSNANO** committed capital – 0.9 bn USD
- **Private investors** – 1.3 bn USD

<table>
<thead>
<tr>
<th>COMPANY</th>
<th>PRODUCT</th>
<th>TECHNOLOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ACCUMULATORS</strong></td>
<td>Lio tech</td>
<td>High capacity lithium-ion batteries</td>
</tr>
<tr>
<td></td>
<td>Accumulators for electric vehicles and power sector</td>
<td></td>
</tr>
<tr>
<td><strong>SUPERCAPACITORS</strong></td>
<td>Nesscap Energy Inc</td>
<td>Carbon microwave steam activation of nanopore electrode structures</td>
</tr>
<tr>
<td></td>
<td>High-capacity energy supercaps</td>
<td></td>
</tr>
<tr>
<td><strong>TRANSDUCERS</strong></td>
<td>Profotech</td>
<td>Nanostructured fiber-based optic current and voltage measurement and monitoring sensors</td>
</tr>
<tr>
<td></td>
<td>Fiber optic metering systems for power grids</td>
<td></td>
</tr>
<tr>
<td><strong>PHOTOVOLTAICS</strong></td>
<td>Hevel</td>
<td>Thin film tandem a-Si and u-Si structure</td>
</tr>
<tr>
<td></td>
<td>Solar modules</td>
<td></td>
</tr>
</tbody>
</table>

Source: Roland Berger Strategy Consultants
## Microelectronics and Photonics

### FINANCING:
- **RUSNANO** committed capital – 1.1 bn USD
- **Private investors** – 2.0 bn USD

<table>
<thead>
<tr>
<th>COMPANY</th>
<th>PRODUCT</th>
<th>TECHNOLOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td>NTO IRE-Polus</td>
<td>Fiber lasers and telecommunications equipment in Russia</td>
<td>Fiber lasers</td>
</tr>
<tr>
<td>Optogan</td>
<td>Light emission diodes</td>
<td>High-brightness light-emitting diodes for a large variety of applications</td>
</tr>
<tr>
<td>Crocus Technology SA</td>
<td>Magnetoresistive memory</td>
<td>Innovative memory production technology</td>
</tr>
</tbody>
</table>

Source: Roland Berger Strategy Consultants
## Construction

**FINANCING:**

- **RUSNANO** committed capital – 0,5 bn USD
- **Private investors** – 1,0 bn USD

<table>
<thead>
<tr>
<th>COMPANY</th>
<th>PRODUCT</th>
<th>TECHNOLOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LOW EMISSIVITY GLASS</strong></td>
<td>STiS</td>
<td>Low emissivity glass</td>
</tr>
<tr>
<td><strong>COMPOSITES</strong></td>
<td>Galen</td>
<td>Composite reinforcement and fittings</td>
</tr>
<tr>
<td><strong>ADDITIVES</strong></td>
<td>Unicom</td>
<td>Additives for bituminous concrete and asphalt</td>
</tr>
</tbody>
</table>

Source: Roland Berger Strategy Consultants
Our Funding Activity

Overall amount of project funding (progressive total), 2008 – 2011, $ billion

- 2008: RUSNANO 0.007, Coinvestors 0.0003
- 2009: RUSNANO 1.1, Coinvestors 0.6
- 2010: RUSNANO 2.2, Coinvestors 1.4
- 2011: RUSNANO 3.42, Coinvestors 3.4
392 applications from 37 countries

As of Sep, 2012

- USA: 152
- Germany: 44
- Israel: 36
- Ukraine: 15
- Canada: 11
- Switzerland: 12
- UK: 14
- Finland: 10
- Others: 98

392 applications from 37 countries as of Sep, 2012
Focusing on 25-100 mn USD projects

- $2-10 mn: 9 projects
- $10-25 mn: 19 projects
- $25-50 mn: 32 projects
- $50-100 mn: 46 projects
- $100-500 mn: 28 projects
- > $500 mn: 11 projects

as of Sep, 2012
RUSNANO USA, Inc.

Mission

- RUSNANO USA, a subsidiary of RUSNANO, was founded in December, 2010 in CA, USA to represent the interests of RUSNANO in North America

Goals

- Bridging ideas, technologies, capital, and expertise overseas by leveraging opportunities that are not available separately
- Originate projects in North America
  - Search for ideas, technologies or projects that might be interesting to bring to the Russian market
  - Attract venture capital / private equity firms to co-invest in projects
  - Negotiate with stakeholders of target companies
- Support RUSNANO’s project companies in the US and Canada
  - Negotiate with partners / suppliers / co-investors
  - Promote project company products and assist with entry into North American markets
  - Look for investors and M&A opportunities at the exit stages