





NANOSTRUCTURED MODIFIED GEOMATERIALS OF NGS SERIES

Project Manager and Director of PC+ LLC
Managing Partner of Pronano Ltd:

*Vladimir RUDASHEVSKY,
PhD in Geology and Mineralogy*

Project Team (Russia) – PC+ Ltd

<p>Vladimir Rudashevskiy PhD in Geology and Mineralogy (Lomonosov MSU)</p>	<p>PC+ Ltd, CEO and Co-founder Graduated from St. Petersburg State University, Geological Faculty, Mineralogy Department, as a geologist, mineralogist, geochemist. Co-author of 3 RF patents for devices for technological processing of raw materials for nanostructuring. Author of over 100 publications in Russian and foreign peer-reviewed journals. Discoverer of six new minerals.</p>	
<p>Aleksey Shebanov Doctor of Geology (Uppsala University, Sweden)</p>	<p>PC+ Ltd, Leading researcher, microprobe and XRD analysis He graduated from St. Petersburg State University, Faculty of geology. Specialist in the field of material science. Experience (more than 40 years) work on modern analytical equipment including: CAMSCAN, Rigaku XRD etc.. Role in the project: the incoming control of raw materials for nanostructuring.</p>	
<p>Nikolay Rudashevskiy Doctor of Science in Geology and Mineralogy (Russian National Geological Institute, St. Petersburg)</p>	<p>PC+ Ltd, Head of EPMA Laboratory, Co-founder Graduated from Leningrad State University, Geological Faculty, Mineralogy Department. Experience (over 40 years) of work using advanced analytical equipment, including: microprobe analyzers CAMECA, CAMEBAX, CAMSCAN, etc. Author of over 250 publications in Russian and foreign peer-reviewed journals. Fellow of the Russian National Mineralogical Society. Discoverer of over 30 new minerals. Co-author of 3 RF patents for devices for technological processing of raw materials for nanostructuring.</p>	
<p>Mikhail Mastin (St. Petersburg State Technical University)</p>	<p>PC+, Director Graduated from St. Petersburg State Technical University, construction engineer. Experience (15 years) of managerial and administration work in business organizations.</p>	

Project Team (Finland) – NanoGeo Finland Oy

<p>Prof. Olaf Eklund PhD, (Abo Academi University, Finland)</p>	<p>Geology and Mineralogy Professor at Geological Faculty, Turku University</p> <p>Graduated from Abo Academi University, Finland, and Master's degree program at Geneva University (Switzerland). Experience in geology (over 20 years): research in sheet silicate mineral, developing vermiculite nanomodification technology, promotion of geomaterials application to clean ammonia-containing waste water, further after-products use as fertilizers, etc. Author of multiple scientific publications (over 30 scientific articles and 2 treatises), reports and public speeches regarding the project at European media radio and TV channels. Patent author for vermiculite nanostructuring and the project's main scientific consultant.</p>
<p>Stefan Sandbaka MSc, (Abo Academi University, Finland)</p>	<p>President, NanoGeo Finland Oy</p> <p>Graduated from Master's degree program of two faculties in Abo Academi University: geology and non-organic chemistry. Over 30 years of experience in management, consulting and production quality control in environmental projects. The role in this projects is development and promotion of engineering solutions for GS products application. Author of several patents and developments.</p>
<p>Taina Laiho PhD, (Turku University, Finland)</p>	<p>Researcher, Turku University, Physical Methods and Material Study Laboratory</p> <p>Graduated from Turku University, over 15 years of focus on material study subjects and methods of research. The role in the project is to determine solid nitrogen content using AFM method, study vermiculite nanostructured products, to commercialize the project product. Over 20 scientific publications.</p>
<p>Timo Fors MBA, (Abo Academi University, Finland)</p>	<p>Over 20 years of experience in commercially successful innovation companies – European brands developer (Bioska, Pack and Save, etc.). The role in the project is to represent the Finnish party at top management level of GS client companies and technology users, commercialize and do the product marketing in Europe.</p>

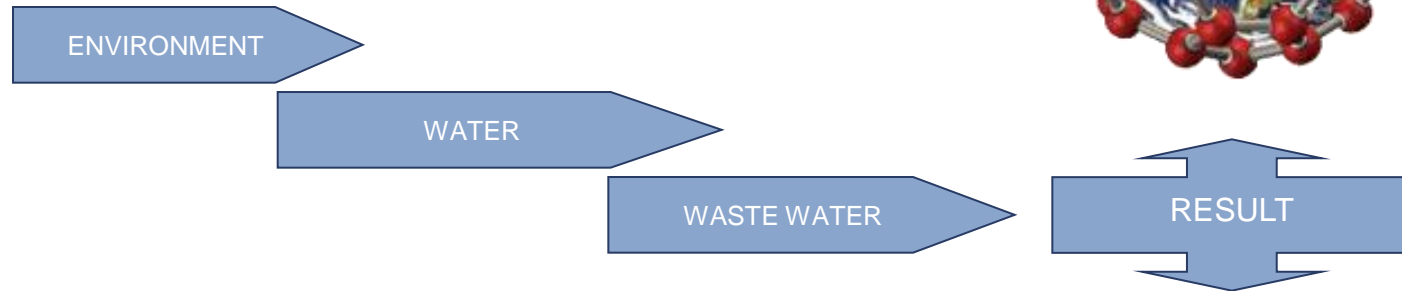
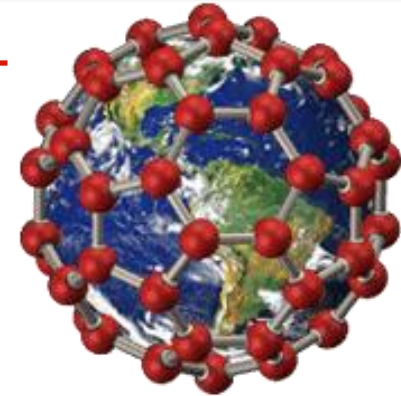


Project's Place in International Cooperation



EUROPEAN
COMMISSION

NANO GEO PROJECT



**EC Directive (Council Directive 91/271/EEC dated 21 May 1991/
Ratified as amended as follows / to come in force as of 2011)**

- ☐ Member States shall ensure that urban waste water entering collecting systems shall before discharge be subject to secondary treatment at least for agglomerations of more than 10 000 people
- ☐ Primary treatment: means treatment by a physical and/or chemical process involving settlement of suspended solids, or other processes in which the BOD₅ of the incoming waste water is reduced by at least 20 % before discharge and the total suspended solids of the incoming waste water are reduced by at least 50 %
- ☐ Secondary treatment: means treatment of urban waste water by a process generally involving biological treatment
- ☐ Appropriate treatment: means treatment of urban waste water by any process and/or disposal system which after discharge allows the receiving waters to meet the requirements of relevant Community Directives
- ☐ Total nitrogen in urban waste water entering all urban waste water treatment plants should be reduced at least by 75 %.



NGS-1 PRODUCTION QUALITY CONTROL, MARKETING AND SALES IN EU AND RUSSIA

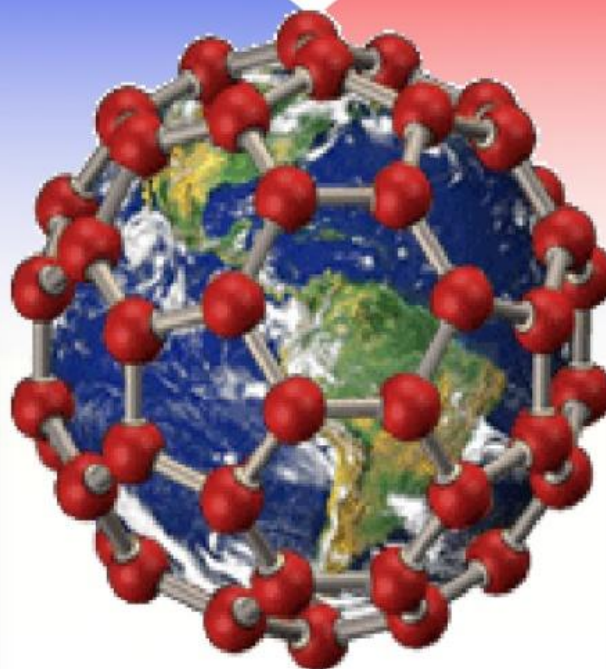


Assets and competence:

1. An exclusive license for production including Russia
2. EU and WW Marketing
3. Sales Management (website)
4. Engineering solutions (B2B)

Assets and competence:

1. IP used for mineral processing
2. Lab and production equipment
3. Scientific-analytical competences
4. Pilot-scale production of NGS-1
5. Russian Marketing
6. Production scale-up
7. Engineering solutions (B2B)



The project company "NanoGeo"

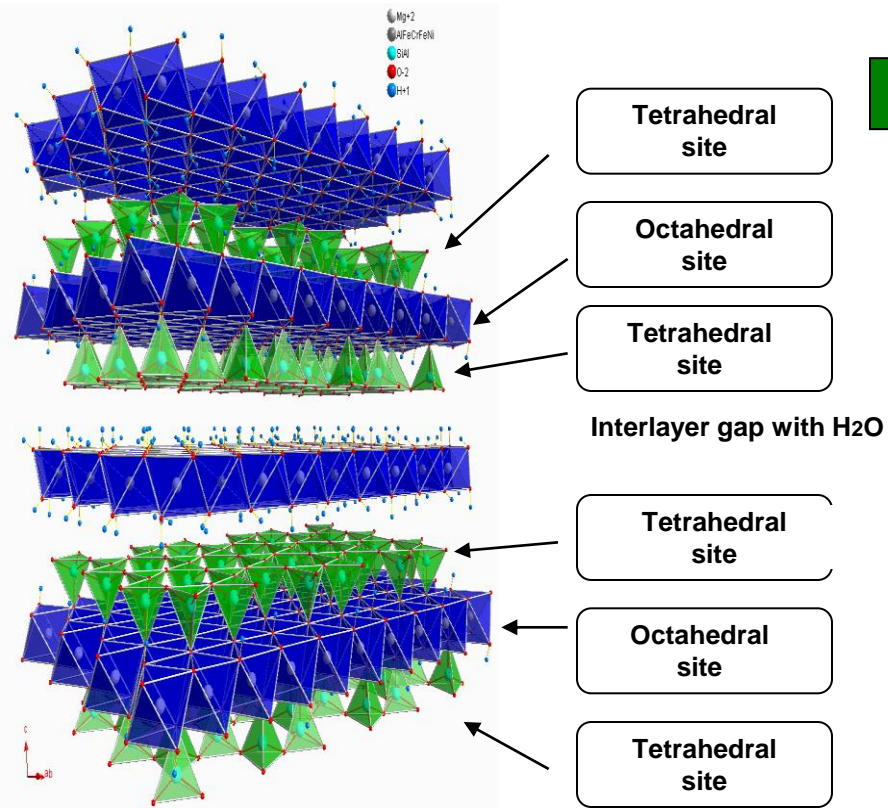


ELECTRIC PULSE
DISAGGREGATOR CNT SPARK-2

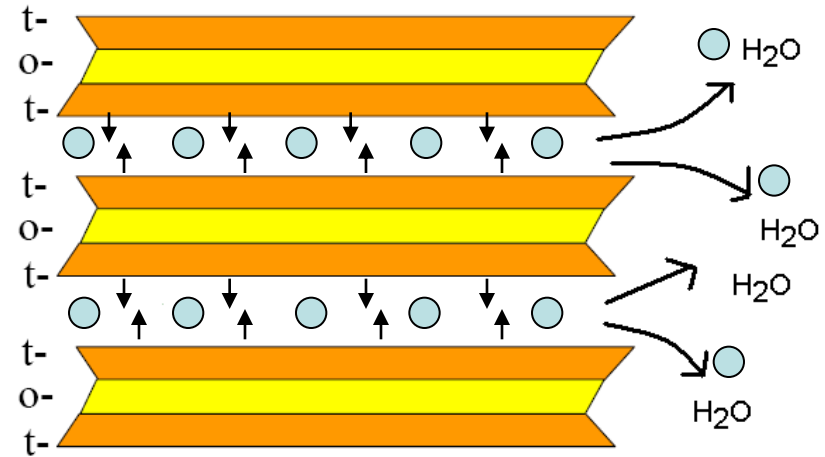
Nanotechnological Component - natural "nanoreactor"

Thermal treatment leads to water molecules displacement and smaller size of interlayer gap, which gives new sorption and selectivity to the material

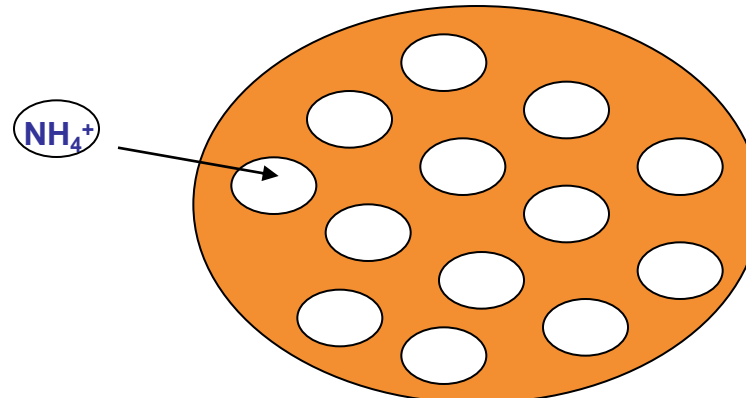
Untreated vermiculite



Thermal treatment



GS-1

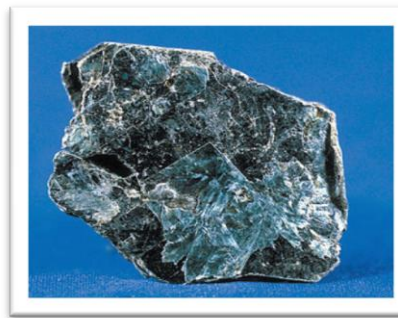


Cell size in the modified vermiculite exactly meets the size of ammonia ions

NGS-1 Project Product: Characteristics

NGS-1 is the ion-exchange nanostructured (with 1-2 nm interlayer gap) geomaterial, nanofilter and ammonium immobilizer.

1. Ammonium ion (NH_4^+) selectivity
2. Capable to operate in highly ammonia nitrogen contaminated environments (ranging from 1,700mg/l and higher, where other methods do not work)
3. Capable to clean the pollutant from the media to meet the level acceptable for further application of traditional treatment technologies (e.g., biological treatment)
4. $\text{Cd}_{002} = 0.99 - 10.5 \text{ nm}$
5. Absorption capacity is 2.5-3.9%% mass (up to 4.7% mass)
6. Cation exchange velocity is 20–60 min
7. Exothermal reaction
8. Recommended pH <8.



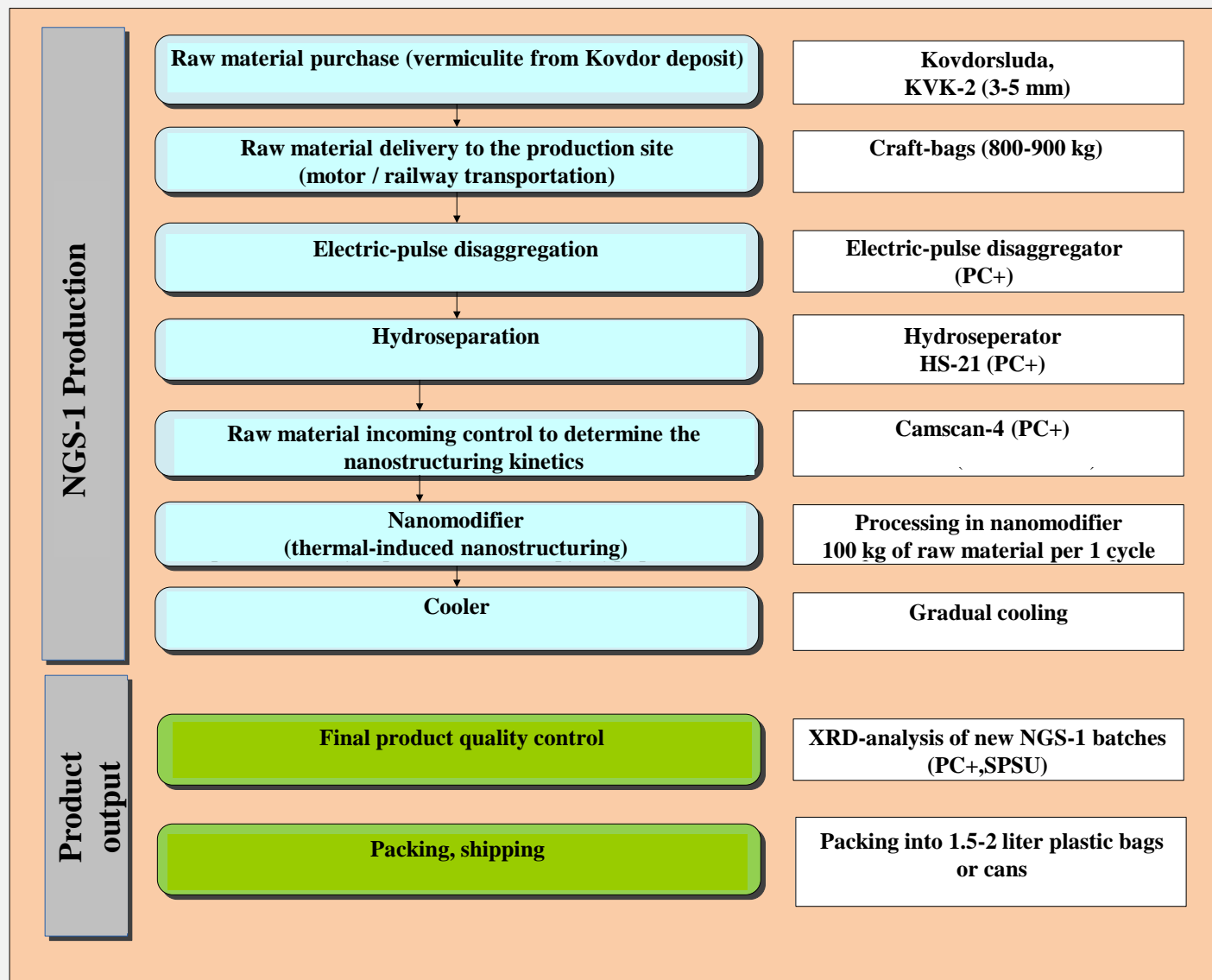
NGS-1 Project Product: Application

1. Livestock/poultry/fish farms/plants
(ammonia contamination with urine and manure; ammonia contamination of water, waste water and air)
2. Chemical production (environmental catastrophe prevention and NGS-1 stockpile for catastrophe response)
3. Urban sector (environmental activities to clean NH_4^+ -contaminated water bodies)
4. Other industrial NH_4^+ -contaminated waste water and sludge
5. Biotoilet fillers
6. Ammonia immobilizer for biogas stations
7. Cleaning water bodies to prevent algal formation



NGS-1 Production – 1st year

NGS-1 Production Flow Chart for small pilot plant (12 tons/month)

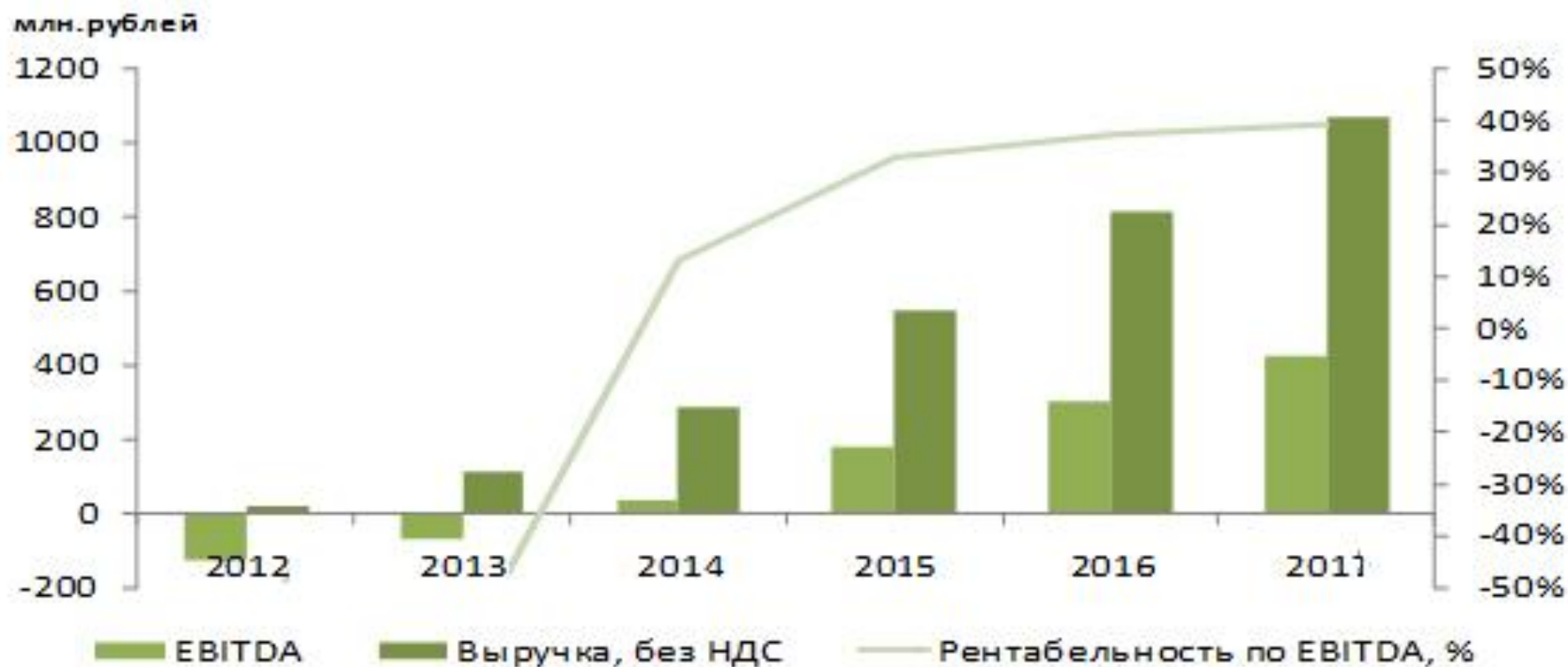


Financial Key indexes (forecast) (1)

Investment of 400-450 MRub from Rusnano and co-investors in 2012-2013 will lead to 1000 MRub sales of NGS-1 in 2017.

Чистая прибыль	284 941 тыс руб
Привлеченные инвестиции (2 раунд)	379 900 тыс руб
Рентабельность продукции	219,69%
ROS	9,98%
Срок операционной самоокупаемости проекта	38 месяцев
PB	60 месяцев
NPV	205 595 тыс руб
IRR	65,00%
Рассматриваемый период выполнения проекта	6 лет

Financial Key indexes (forecast) (2)



THANK YOU FOR YOUR ATTENTION!

Materials used:

Rusnano

NanoGeo Finland Oy

PC+ Ltd

Pronano Ltd

Spinverse Oy

СПАСИБО ЗА ВНИМАНИЕ!