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ЭКОСИСТЕМА ТРАНСПОРТА: ОБЩЕСТВО, ГОСУДАРСТВО И ГЛОБАЛЬНЫЕ ВЫЗОВЫ

Report
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Report on the plenary session of the VI Betancourt International Engineering Forum "High-speed railway line St. Petersburg — Moscow: Challenges, solutions, personnel"

On December 2, 2024, on the 215th anniversary of the foundation of Emperor Alexander I St. Petersburg State Transport University (PGUPS), the Sixth Betancourt International Engineering Forum was held. For many years, it has been held on this date which is a big day for the country's first transport university. Traditionally, participants of these scientific and engineering meetings discuss current issues in the development of transport and engineering education. In 2024, the forum organizers — the Ministry of Transport of the Russian Federation, the Federal Agency for Railway Transport, Russian Railways, and Emperor Alexander I St. Petersburg State Transport University — proposed the topic "High-speed railway line St. Petersburg–Moscow: Challenges, solutions, personnel".

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Репортаж

Репортаж-отчет о пленарном заседании VI Бетанкуровского международного инженерного форума «Высокоскоростная железнодорожная магистраль Санкт-Петербург – Москва: вызовы, решения, кадры»

2 декабря 2024 г., в 215-ю годовщину основания Петербургского государственного университета путей сообщения Императора Александра I (ПГУПС), состоялся VI Бетанкуровский международный инженерный форум, который на протяжении многих лет проводится в этот знаменательный для первого транспортного вуза страны день.

По традиции на этих научно-инженерных встречах участниками обсуждаются актуальные вопросы, связанные с развитием транспорта и инженерного образования. В 2024 г. организаторы форума — Министерство транспорта Российской Федерации, Федеральное агентство железнодорожного транспорта, ОАО «Российские железные дороги» и Петербургский государственный университет путей сообщения Императора Александра I — предложили тему «Высокоскоростная железнодорожная магистраль Санкт-Петербург – Москва: вызовы, решения, кадры».

Для цитирования: Репортаж-отчет о пленарном заседании VI Бетанкуровского международного инженерного форума «Высокоскоростная железнодорожная магистраль Санкт-Петербург – Москва: вызовы, решения, кадры» // Транспорт БРИКС. 2025. Т. 4. Вып. 2. Ст. 2. https://doi.org/10.46684/2025.2.2. EDN MNOTZW.

Held in the big physics lecture hall of PGUPS, the panel discussion was attended by representatives of the scientific community, heads of a number of research, education, government, transport, industrial, and design organizations and institutions involved in the implementation of the project of Russia's first high-speed railway (HSR) both as speakers and experts on the issues discussed.

Fig. 1. Plenary session of the VI Betancourt International Engineering Forum. Big physics lecture hall at PGUPS. December 2, 2024. (Unless indicated otherwise, all photos are courtesy of Valentin Belikov)

The participants discussed topics related to the design and upcoming construction of the high-speed railway and the creation of rolling stock for it.

Given the importance of the project and the great interest shown to it by the general public, the editors publish the presentations of the participants[1*], including **Oleg Valinsky**, Rector of Emperor Alexander I St. Petersburg State Transport University; **Alexander Sakharov**, Head of the Federal Agency for Railway Transport; **Oleg Toni**, General Director of VSM Dve Stolitsy LLC; **Sergey Chernogayev**, Chairman of the Federation of Independent Trade Unions of Russia, Chairman of the Russian Trade Union of Railway Workers and Transport Builders[1]; **Oleg Pokusayev**, Head of the Department of Advanced Engineering Schools of the Higher Engineering School of Russian University of Transport (RUT (MIIT)), Director of the High-Speed Railway Academy Advanced Engineering School (VSM Academy AES); **Andrey Romanchikov**, General Director of TMH Smart Systems LLC.

The panel discussion was attended by invited experts whose presentations are published too. These include: **Dmitry Van'chkov**, Deputy Chairman of the Committee for Transport of St. Petersburg; **Alexander Galkin**, Rector of the Ural State University of Railway Transport; **Viktor Golomolzin**, Head of the October Railway, a branch of RZhD OJSC; **Evgeny Kozin**, Head of St. Petersburg Metro State Unitary Enterprise; **Denis Minkin**, Director of Gorelektrotrans State Unitary Enterprise of St. Petersburg; **Anton Petrov**, General Director of the High-Speed Transport Directorate of Russian Railways; **Natalia Shishlakova**, Deputy General Director for Corporate Development and Project Activities, Member of the Management Board of the Administration of TMH LLC.

The panel discussion was moderated by **Dmitry Shabelnikov**, Deputy Head of the Information Department of the Administration of the Governor of St. Petersburg, Vice President of the North-West Transport Union.

[1] The positions of Sergey Chernogayev are specified as at the time of his speech at the Forum. Currently, the Chairman of the Russian Trade Union of Railway Workers and Transport Builders is Dmitry Shakhanov.
[*] Presentations of the Forum participants are given in the authors' original language.

Fig. 2. Speakers at the plenary session. From left to right: Oleg Valinsky, Oleg Toni, Alexander Sakharov, Oleg Pokusayev, Andrey Romanchikov, Sergey Chernogayev

Roman Starovoyt, Minister of Transport of the Russian Federation. Photo courtesy of the Ministry of Transport of Russia. URL: https://mintrans.gov.ru/ministry/structure/starovoyt-roman-vladimirovich

At the opening session, Minister of Transport of Russia **Roman Starovoyt** greeted the Forum participants with a video address and congratulated the staff of the country's oldest transport university and all the participants on the 215th anniversary of Emperor Alexander I St. Petersburg State Transport University and the beginning of the development of higher transport engineering education in the country.

The minister noted that *"the country's oldest industry-specific university has come a long way, accumulated a huge research and teaching experience, and preserved the best traditions in higher education. Graduates of the institute / university include politicians, inventors, builders, scientists, and engineers. The largest innovative university complex in the North-West Region of Russia continues to develop, passes on invaluable knowledge and skills to the younger generation, augmenting its scientific and pedagogical potential, and enhancing the image of the industry. In appreciation of professors and academic advisors for training highly skilled professionals who can adequately represent the profession of a transport worker, I would like to wish you health, prosperity and further fruitful work for the benefit of the transport sector and this country!"*

In his video address to the conference, General Director and Chairman of the Board of Russian Railways OJSC, Chairman of the Board of Guardians of PGUPS **Oleg Belozyorov** congratulated everyone on the 215th anniversary of the first transport engineering university in Russia.

Oleg Belozyorov, General Director — Chairman of the Board, RZhD OJSC; Chairman of the Board of Guardians of PGUPS. Photo courtesy of Russian Railways. URL: https://ar2020.fpc.ru/ru/company/message-ceo)

In his speech, Mr. Belozyorov noted the following: *"In 1809, the institutor and first rector of the then Institute of the Corps of Railway Engineers Agustin de Betancourt articulated the key purpose of the institution: "Supply Russia with engineers who could be assigned to any work in the Empire immediately after their graduation". The purpose has remained the same throughout the glorious history of the University.*

For more than two centuries, the University has been one of the major hubs of science and education training engineers, specialists in logistics, economics, management and construction for the transport sector. On this festive day, I would like to wholeheartedly thank the administrators, academic researchers, teachers, long-service employees, alumni, students and the entire staff of St. Petersburg State Transport University for your achievements and creative work. Your professionalism and sincere love for your cause contribute to a unique atmosphere of scientific inquiry within the walls of the University, securing the continuity of the best traditions in railway education.

During the many years of cooperation between us, the University has shown itself as a reliable partner of RZhD OJSC. Thanks to a historically high standard of training, graduates from PGUPS are able to stay at the forefront of their profession, make great strides, and gain access to a broad range of career opportunities. Some of my deputies are graduates from PGUPS.

Dear Friends, The topic of this plenary session at the Sixth Betancourt Forum is "High-speed railway line St. Petersburg–Moscow: Challenges, solutions, personnel". It was chosen for a reason. At Russian Railways, we work together with our partners to solve high-profile national goals set by President of Russia Vladimir Putin. One of these is to design and build the first high-speed railway line in this country. Everybody, from leading engineers to university students, works to achieve the goal.

I am glad that we are collaborating with you in addressing these important matters. It is a pleasure to note that young scientists are keenly and enthusiastically getting into designing state-of-the-art technologies and adapting them for real-life applications in railway transport. I wish you all the success in this work, as it is innovations that shape competitive advantages and determine the future of Russian railways in the modern world.

May you have creative juices and be productive in your scientific inquiry, and you will undoubtedly succeed in it all, dear Colleagues! Certainly, the great contribution of the University staff to the development of other railway lines deserves our highest consideration and respect.

I am sure that the scientific and teaching staff of Russia's oldest transport university will consistently work with creativity and full commitment to improve the educational process and actively contribute to the development of railways. From the bottom of my heart, I wish the staff of Emperor Alexander I St. Petersburg State Transport University, everyone who works and studies here, good health, inspiration, new achievements and wins for the benefit of railway transport and this country as a whole. Happy holiday!"

Dmitry Shabelnikov, Deputy Head of the Information Department of the Administration of the Governor of St. Petersburg, Vice President of the North-West Transport Union

Moderator: Good afternoon, dear Friends and Colleagues. I think I will express the feelings of all of the Forum participants by extending heartfelt thanks to Minister of Transport of the Russian Federation Roman Starovoyt and General Director and Chairman of the Board of Russian Railways Oleg Belozyorov for the greetings, congratulations, and wishes for successful work we just heard.

I am joining them in congratulating you on the 215th anniversary of the first higher education institution for transport in Russia — the University I have been professionally connected to for many years.

I sincerely welcome the participants of the Betancourt International Engineering Forum, which is already the sixth in the row. Emperor Alexander I St. Petersburg State Transport University is not just the oldest engineering university in the country, it is the oldest and traditional forum for professionals from different countries to discuss problems and find solutions to challenges in transport and transport construction. And often, it is not even tomorrow or the day after tomorrow — the future is being built here and now. This year, the topic for discussion is relevant and close to each of us. It is fitting that the prospects for building the first high-speed railway line in Russia are being discussed at the university the graduates of which created the first fastest railway in this country between St. Petersburg and Moscow as early as the mid-19th century.

For as long as 215 years, our graduates have been building highways, railways, ports, canals, bridges, and carving transport tunnels to that very future. And now I would like to give the floor to Rector of Emperor Alexander I St. Petersburg State Transport University Mr. **Oleg Valinsky**.

Oleg Valinsky, Rector of Emperor Alexander I St. Petersburg State Transport University

Oleg Valinsky: Thank you Mr. Shabelnikov.

Dear Colleagues, I would like to congratulate everyone on this wonderful date — the 215th anniversary of the foundation of the Institute of the Corps of Transport Engineers. Over these 215 years, our University has come a long way of development and trials. It has lived a long life with the country and has done important work in St. Petersburg and Russia. Today, the University carries its banner with honour. For the railway St. Petersburg–Moscow — now it is facing the need for getting faster.

IKIPS, LIIZhT or PGUPS — regardless of the name the institution had in different years, it has always been, and still is, involved in this work: to speed up traffic on this line and on all railways of the country. Many know that as railway transport developed in Russia, our cooperation with the Ministry of Railways of the Russian Empire, then with that of the USSR, and currently with Russian Railways OJSC, grew stronger.

Moderator: Mr. Valinsky, while we are talking about anniversaries, I cannot help but recall another one. In your recent interview to Kommersant, you said that the first high-speed traffic experiments that were supervised by scientists from LIIZhT began in 1964. And 60 year is also an anniversary.

Oleg Valinsky: In the mid-1960s, the collaboration between professors and teachers of the then Leningrad Institute of Railway Engineers (LIIZhT) and specialists of the USSR Ministry of Railways and the October Railway for increasing the speed of railway transport was formally established by setting up the Public Research Institute (ONII) which brought together specialists and scientists of the October Railway, LIIZhT, and the Railway Research Institute (VNIIZhT) under the auspices of the USSR Ministry of Railways. The unique team of scientists and specialists designed and created the ER200 high-speed train and reconstructed the infrastructure of the October Railway for traffic at 200 km/h.

In 2014, researchers at PGUPS developed the Project Specific Technical Specification (STU) for the design and construction of the Moscow–Kazan high-speed railway commissioned by RZhD OJSC; and in 2021, they developed the Project Specific Technical Specification (STU) for the design, construction and operation of the Moscow–St. Petersburg high-speed railway. The Technical Specifications were confirmed with the Ministry of Construction of Russia. The work was completed by

Fig. 1. Departure of the experimental high-speed train No. 5/6 Leningrad–Moscow on June 12, 1963
(Photo by Science and Technology Library (NTB) of PGUPS)

Fig. 2. Commemorative coupon for tickets of the first passengers of the regular express train No. 5/6 Leningrad–Moscow
(Photo by Science and Technology Library (NTB) of PGUPS)

University's scientists — a total of 92 employees of the University, 12 departments and research divisions.

Since the legislation changed and the regulatory concept "Project Specific Technical Specification" was abolished in 2024, PGUPS works, on commission of RZhD OJSC, to develop a corporate standard (STO) — the STO Rulebook of RZhD OJSC "HSR Infrastructure" on the basis of available STU specifications. The Rulebook will provide the basis for the development and state expert review of design documentation. PGUPS also provides technical support for the Moscow–St. Petersburg High-speed Railway project.

Certainly, today we are doing our best to keep abreast. PGUPS scientists and experts contribute to the creation of necessary components for the infrastructure that can withstand travel speeds of up to 400 km/h.

Oleg Pokusayev will tell us about the activities of the High-Speed Railway Academy Advanced Engineering School (AES). Russian Transport University has won the right to set up a school and has become the basic scientific centre for high-speed railways. We will collaborate with them in the implementation of the HSR project. In the near future, a modern railway line will

connect two metropolitan cities, the hinterlands of which are home to 30 million people, to make the two major cities of Russia more accessible to each others' residents and the country as a whole. I think this is going to be a fruitful joint effort of scientists from the two universities and their future graduates.

Moderator: Improving transport accessibility is an extremely important task.

Oleg Valinsky: In my opinion, it is a naturally advancing process. As a young man, I remember going to concerts in Moscow — we were attracted by the concert environment in the capital.

And it was so disappointing to leave for a night train in the midst of the long-awaited encore performances. But we had to leave; the train would not wait... And we left in tears. I remember Paul McCartney playing for an encore... And we left for a train... While he was still singing...

When high-speed trains between the two capitals run frequently, on the so-called "clock basis", you will be able to come to a station and leave at any time. In fact, even though many colleagues travel by air, the total door-to-door travel time is approximately the same today. You can choose between train and plane for convenience, depending on where you live, what district of Moscow or St. Petersburg.

I am looking at Mr. Petrov [Anton Petrov, Head of the High-Speed Transport Directorate, a branch of RZhD OJSC — Editor's note] and I would like to say that in 15 days, we will be celebrating another wonderful date: 15 years since the launch of the Sapsan high-speed train service.

The first Sapsan departed from St. Petersburg on December 18, 2009. Let's congratulate everybody and especially the Directorate of High-Speed Transport. It is symbolic that we are holding this conference today, on the eve of such a wonderful date.

Fig. 7. The locomotive crew of the first regular ER200 train on the platform of the Moscow Railway Station in Leningrad before departure on March 1, 1984. From left to right: M. Dubrov, O. Malinovsky, V. Borunov, A. Marin (Photo by Science and Technology Library (NTB) of PGUPS)

Fig. 8. The commemorative medal issued by the October Railway in honour of the ER200 train service launch. 1984. (Photo by Science and Technology Library (NTB) of PGUPS)

There are other important events in the history of conquering speed we need to recollect. We have probably forgotten about them somehow. The first ER200 high-speed train began its regular service on March 1, 1984. It was quite a difficult experience. The train ran once a week; it was one pair. On Thursday it ran from St. Petersburg, i.e. from Leningrad, to Moscow, and on Friday it returned back.

But this was a very important application. I was lucky. At that time, I was Deputy Head for Traffic at the St. Petersburg branch of the Railway — it was then known as Leningrad–Moskovskoye. Our traffic safety regulations required us to travel with locomotive crews at certain intervals per quarter. I rode ER200 several times. Our area of responsibility ended halfway, we got off the train in Bologoye and went back.

It was a wonderful experience for everyone: trackmen, traffic management workers, power supply workers, wagon workers, traction workers. We began to understand what a speed of 200 km/h was. Notably, the total time the train ran at this speed was only about 20 minutes, but it was the real speed.

Moderator: I do remember that I saw "212" on the display screen on ER200.

Oleg Valinsky: It was an electronic board, sometimes it failed. We had no right to run at a greater speed...

Moderator: It's a pity. You have just ruined my dream...

Mr. Valinsky, I have one more question. Today, you are heading the Transport University. As we know, in fact, it's all about the workforce. Everything begins with a dream that is conceived in minds of professionals. Next, professionals know how to implement the dream, build a specific plan, and then build a railway line. What kind of professionals are you training today? What do you put into minds of your students? It is them who will operate the high-speed railway tomorrow — perhaps, someone will still be there to take part in its construction.

Oleg Valinsky: They will definitely make it, because I think it will develop later as well.

Apparently, those who joined us as university students on September 2, 2024 will complete their gradu-

ation qualification works and prepare for the presentation of their diploma projects in 2028.

Our current junior students are those who will operate the infrastructure of the high-speed railway, which will already have been built, and they will continue to develop it. I am sure that the project will not be limited to the St. Petersburg–Moscow line. The geography of prospective high-speed railway lines in Russia is broad. Therefore, of course, our University's AES (or PISh in Russian)[2], which was called "ISKRA" (many of you have attended its opening ceremony today), is designed, among other things, for the implementation of these projects. ISKRA is the abbreviation of the full name *"Integrated System* (for train traffic control) *of integrated distributed architecture"* (of computing facilities)[3].

Today, on the birthday of the University, we and our industry partners RZhD OJSC, Transmashholding JSC, V. Tikhomirov Scientific Research Institute of Instrument Design JSC, and the Research Institute of Informatization, Automation, and Communications in Railway Transport (NIIAS), opened ISKRA AES — a training, research and production complex jointly created with the support from the Governments of the Russian Federation and St. Petersburg. We became part of the Advanced Engineering Schools of the Russian Federation programme by winning a competition in 2023 along with 50 other engineering universities. The premises of the Advanced Engineering School include educational and research laboratories, modern classrooms for general lectures and group classes that are fitted with state-of-the-art equipment.

Fig. 9. The glorious moment. Pushing the symbolic button to supply power at the premises of laboratories and classrooms of ISKRA Advanced Engineering School at PGUPS. On the photo, from left to right, are Professor Alexander Nikitin, Head of ISKRA AES; Kirill Polyakov, Vice Governor of St. Petersburg; Alexander Sakharov, Head of the Federal Agency for Railway Transport; and Oleg Valinsky, Rector of PGUPS. December 02, 2024. Photo by PGUPS

We will build an experimental section and will have ambitions to go further. I think that high-speed traffic will use the innovative solutions that will be found in our ISKRA Advanced Engineering School. We have to train people who will, firstly, work in companies dealing with building, preparing or operating the rolling stock and infrastructure while still in their pre-graduation years. By their graduation, they will be well adapted to the environment which will not be something new to them. They will have been socialized in the company — I have no idea what it will be called, perhaps a "High-Speed Railway Directorate" or something else. They will be socialized and technically prepared to work on devices that will be put into operation by that time.

Moderator: Mr. Valinsky, I cannot help but ask you, as an experienced railway worker who has come a long way. Please, tell me your opinion — what is the first priority: responsibility or professionalism? What should students take away from their studies in the first place?

Oleg Valinsky: Firstly, responsibility is hardly possible without professionalism. What will you be responsible for, if you do not understand what you are doing? This is charlatanism, to put it mildly.

But, on the other hand, it is a professional who understands what should be done. I immediately remember a case from the past, a parable. When the first train ran on a new bridge, its builders would stand underneath on a boat or rafts, thus guaranteeing with their lives that the structure they had built is secure.

Moderator: Thank you, dear Mr. Valinsky.

Applause.

Moderator: My next question is for Mr. Oleg Pokusayev, Head of the Department of Advanced Engineering Schools of the Higher Engineering School of Russian University of Transport (RUT (MIIT)), Director of HSR Academy Advanced Engineering School.

Oleg Pokusayev: Presently, Russia has 50 advanced engineering schools — the PISh abbreviation [for AES (advanced engineering school) in Russian — *Translator's note*] is well known in engineering universities.

Oleg Pokusayev, Head of the Department of Advanced Engineering Schools of the Higher Engineering School of Russian University of Transport (RUT (MIIT)), Director of HSR Academy Advanced Engineering School

[2] Advanced Engineering School.
[3] It is designed to build state-of-the-art digital systems to control complex operations and facilities, including in transport.

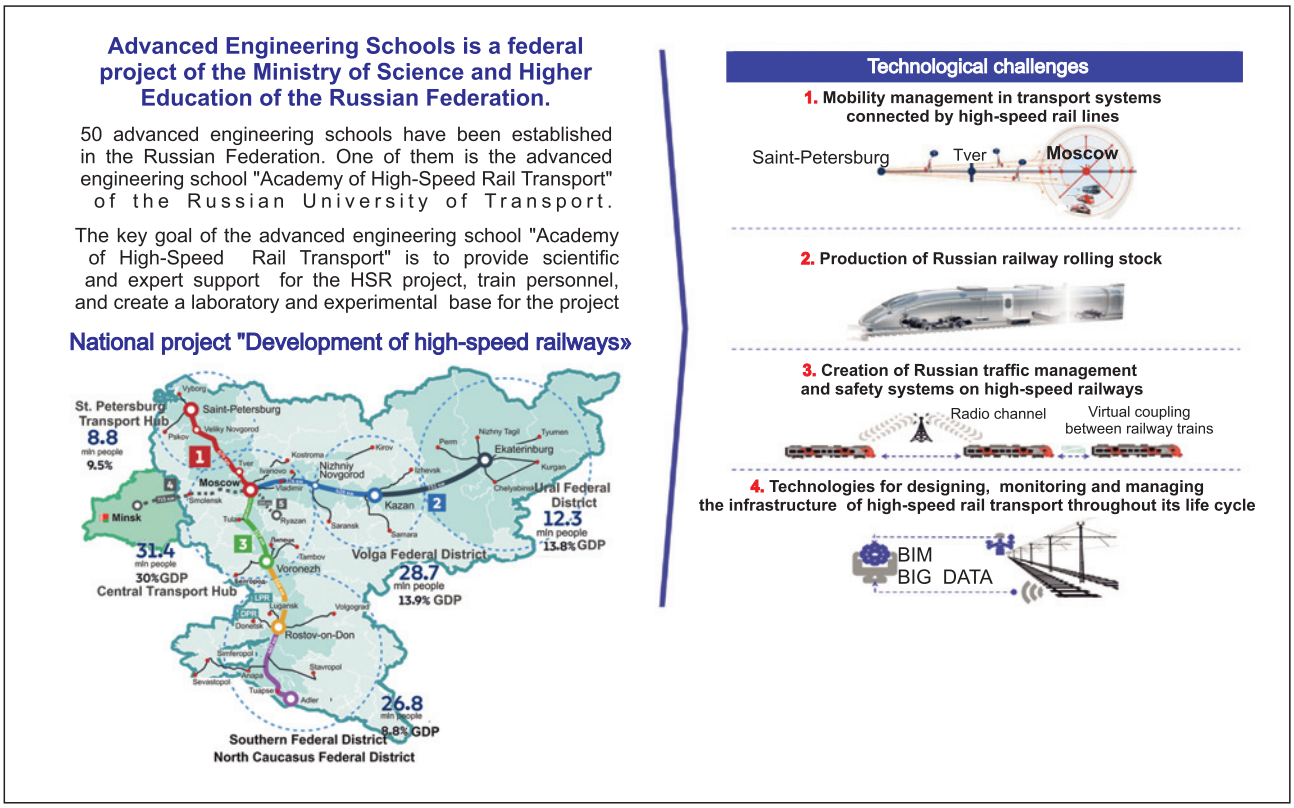


Fig. 1. Main objectives of HSR Academy AES at RUT (MIIT)

One of them, ISKRA AES, was opened at PGUPS and one was set up at Russian University of Transport and is specifically designed for the Moscow–St. Petersburg high-speed railway project (*Fig. 1*).

The HSR project has four key high-level groups of tasks:

- Infrastructure and construction;
- Rolling stock;
- Traffic control, traffic support, and train traffic safety systems;
- Tasks involved with the integration of the HSR into the transport systems of St. Petersburg and Moscow metropolitan areas.

The implementation of the project requires a special system for workforce training, expert review of project solutions, and scientific research. This is provided by the HSR Academy Advanced Engineering School.

Let us consider the task of personnel provision (*Fig. 2*).

The country has a sound experience in the field of railways: 215 years of the history of PGUPS and 128 years of Russian University of Transport (RUT (MIIT)), plus younger universities that were established in the Soviet era.

Today, new requirements have been put forward and urgent tasks for personnel training have been set taking into account the specific features of high-speed railways. Figuratively speaking, we need to "add specialization" to construction engineers who were trained by us for decades; students studying rolling stock; those trained by us in the field of train traffic control, signalling and communications, and railway automation.

We have identified specializations in the above specialties and select fourth- and fifth-year students of RUT (MIIT) to be trained in them. We work with the professionals involved in the implementation of the HSR project to develop curricular and syllabuses, organize internships and practical training, thus combining our efforts in training students.

In addition, we offer a Master's degree programme and additional professional training programmes.

Several centres have been established to support necessary research (*Fig. 3*).

The HSR Expertise Centre. We were assigned the role of the Technical Expert in the concession.

The HSR Competence Centre operates under the auspices of the Government of Moscow which is actively involved in the project and has their own position in terms of expert support.

The Digital Twin Centre deals with the creation of a digital model of the entire HSR.

The Centre (active since 2017) deals with issues of the Central Transport Hub.

In addition, there are individual new projects, or rather *sub-projects*, which were brought into life in the

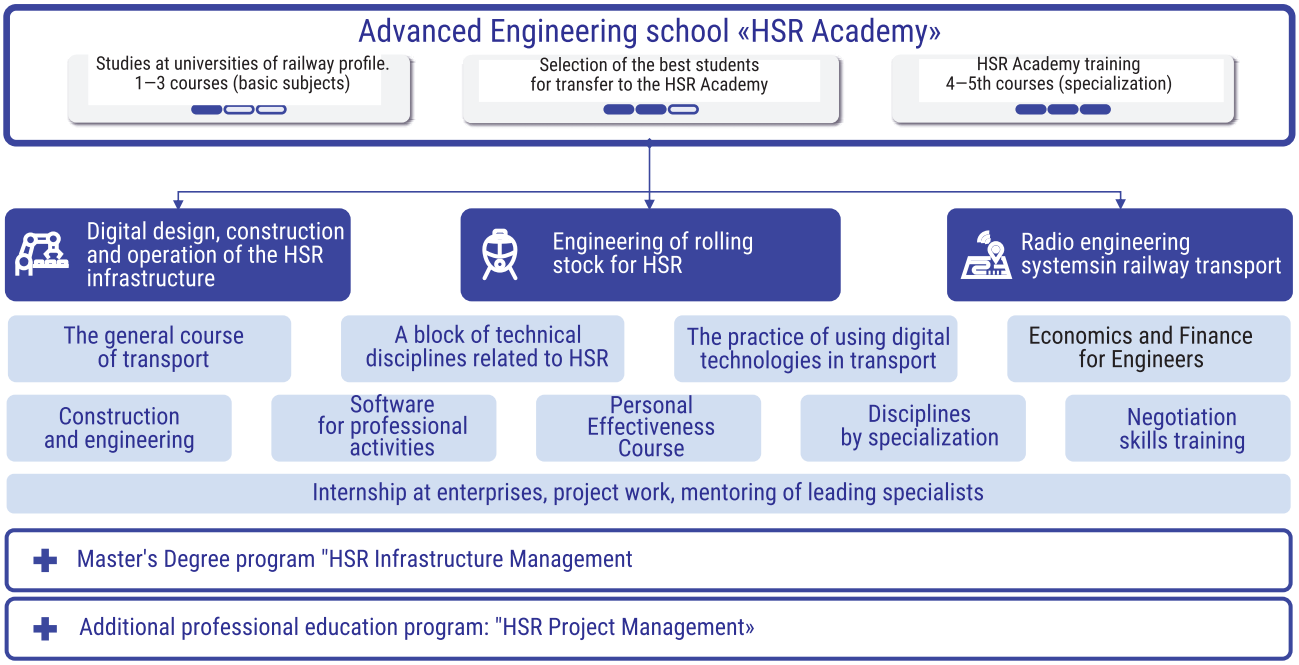


Fig. 2. The structure of training personnel for the Moscow–St. Petersburg HSR project

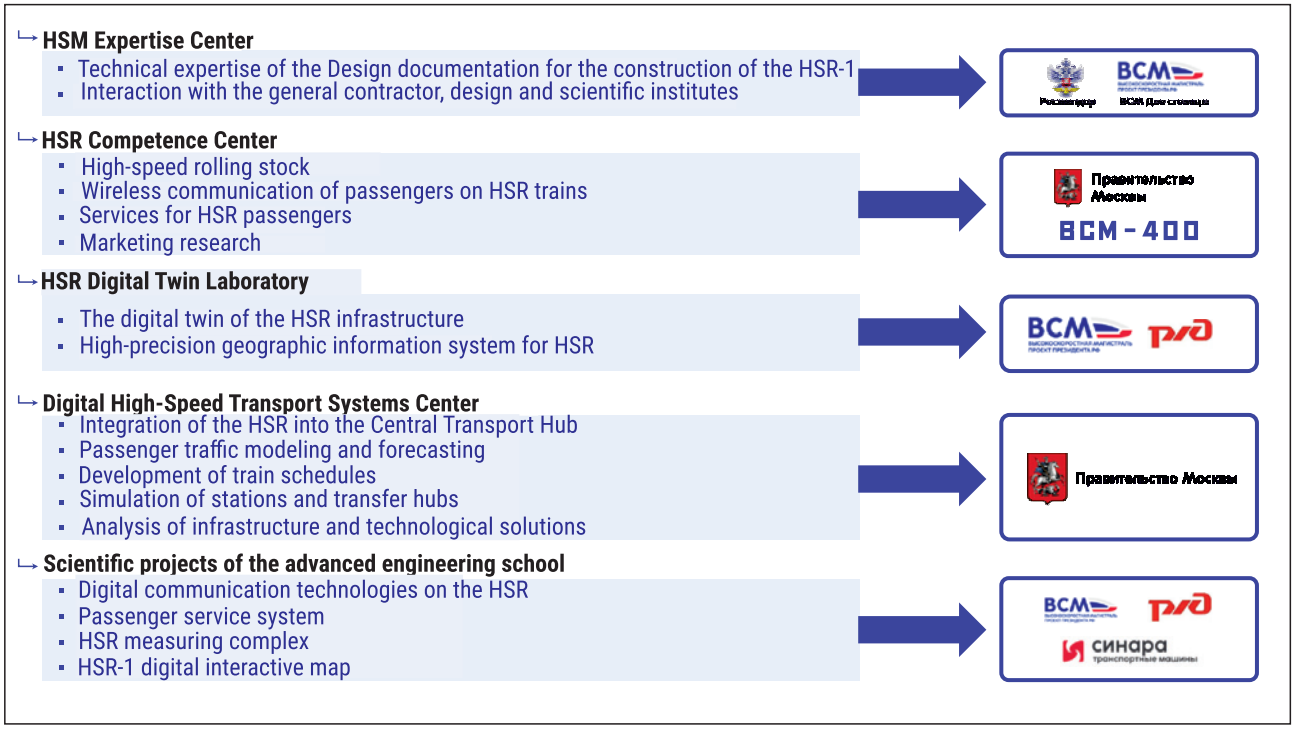


Fig. 3. Areas of research in HSR Academey AES of RUT (MIIT)

framework of the HSR Academy Advanced Engineering School.

Creation of digital twins is an important matter for HSR (*Fig. 4*). We have to complete high-precision construction, we cannot go wrong. The requirements of Project Specific Technical Specifications (STU) for infrastructure require detailed and fine engineering analysis and, most importantly, monitoring in the course of construction and operation in order to meet all the applicable requirements and necessary geoinformation models, geodetic equipment, etc. When it comes to technical review, a great challenge is the review of design documentation which is currently delegated to the Concessionaire.

We work together with the Concessionaire and Grantor to assess what has been designed. The Russian

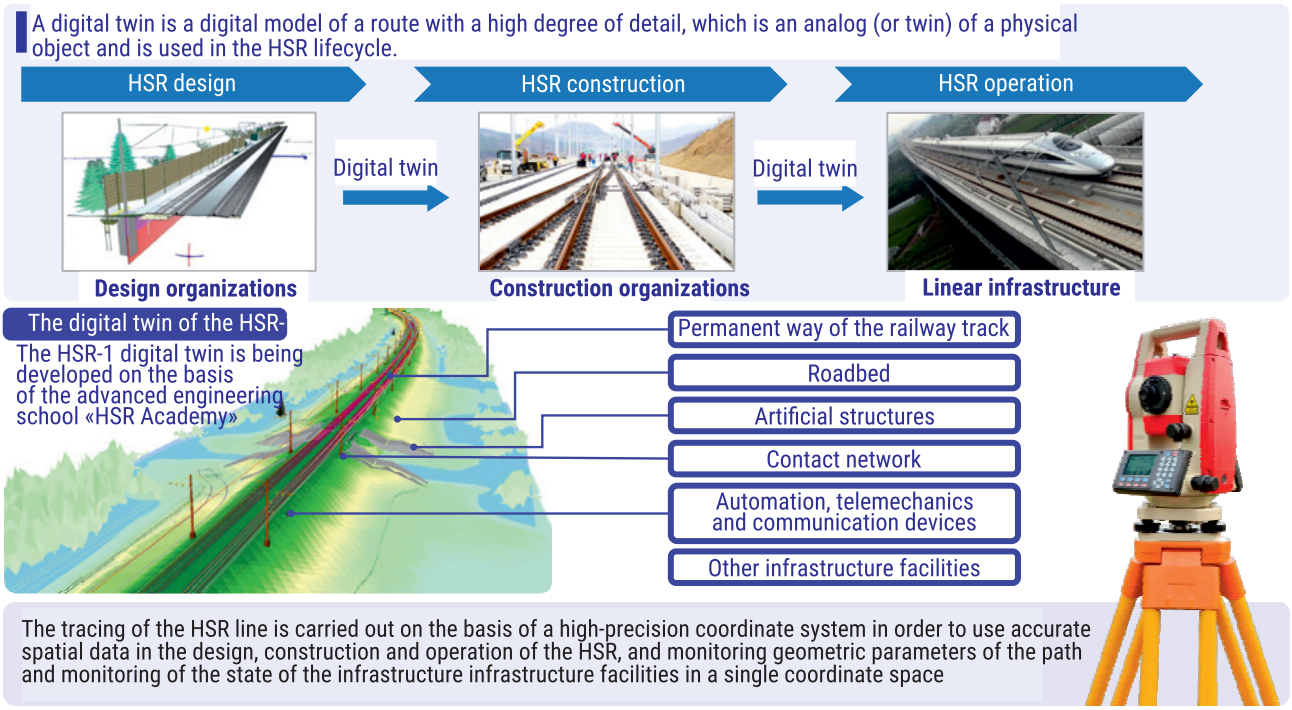


Fig. 4. Developing HSR-1 digital twin

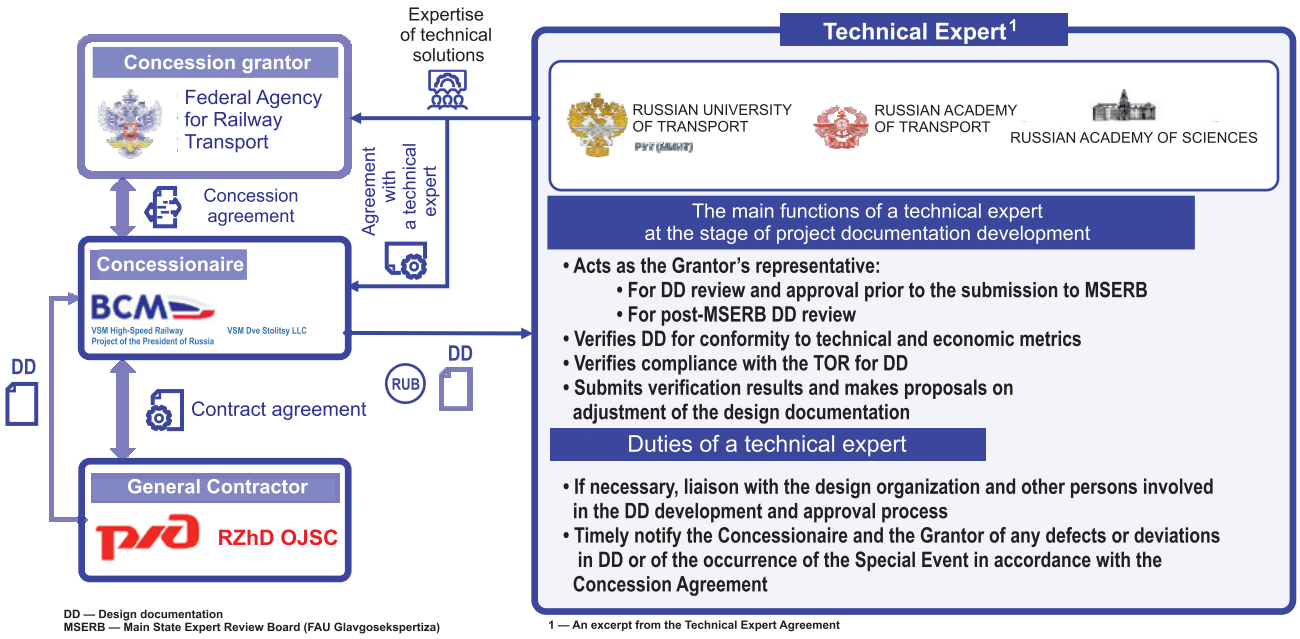


Fig. 5. Technical evaluation of the HSR-1 project at the development stage

Academy of Transport and Russian Academy of Sciences are part of our consortium, too (*Fig. 5*).

In conclusion, I would like to articulate the basic topics and areas that require, in our opinion, our focus (*Fig. 6*).

We believe that the role of Chief Engineer / General Designer of the HSR project has not been completely defined. This role is important, because many things at the junction of infrastructure and rolling stock require an integrated approach.

Creating a digital twin of the HSR as the basis for further monitoring, construction and operation is a separate matter. There is a large group of questions that need to be addressed jointly. It involves developing elements of the infrastructure together with factories and manufacturers.

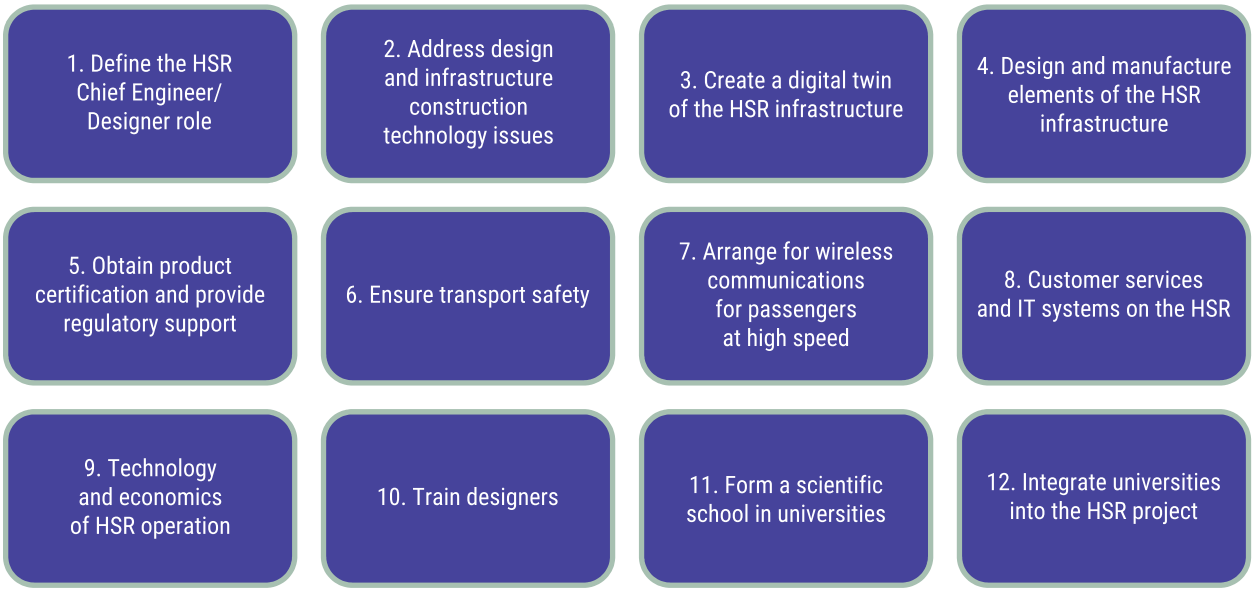


Fig. 6. Key focus areas in the HSR-1 project

There is an enormous amount of work on certification and general regulatory support of the HSR project. We have to build a testing ground and prepare regulatory documents.

Ensuring transport safety is relevant. How should it be ensured in the project and how should it be implemented?

The next group of problems is related to arranging for wireless communications for passengers on-board. We all want a train to have Internet. All this should work at a speed of 350 km/h.

We have to address things such as services and IT systems, biometrics, ticketing systems, services at railway stations, and seamless services.

Many answers have been currently given at the investment stage; everything must be considered in the context of the lifecycle.

Now, it is important to focus on training of design engineers. For decades, railway universities have been to a great extent tooled for training of railway operation engineers. And we really need developers, designers of both rolling stock and infrastructure elements of the HSR. In general, today the design competence should be put at the top of the list and, perhaps, in conjunction with other universities, cross-industry cooperation for the development of relevant scientific schools, and deeper integration of our universities. It is also important to set up research and production associations and provide manufacturers with actual access to universities. A good example here is the ISKRA Advanced Engineering School at Emperor Alexander I St. Petersburg State Transport University which has set an example of how to combine production and science. Thank you for your attention.

Applause.

Moderator: The Moscow–St. Petersburg HSR is not the only concession railway which is under construction in modern Russia. Let us note that the first railway in Russia, Tsarskoselskaya Railway, was built in 1837 as a joint-stock company, i.e. under a concession. But almost two centuries have passed since then.

And so, we are returning to a very convenient, as far as I know, comfortable and effective financial instrument.

My question is for Mr. Alexander Sakharov, Head of the Federal Agency for Railway Transport (Roszheldor). At what point is the project now and to what extent has the concession been an innovation and a new financial instrument for your Agency?

Alexander Sakharov: It is not the first concession, but, of course, it is the largest one so far. It is the first time that this kind of concession is used for large-scale passenger transportation. In recent years, concessions have been granted in the north of the country, and in the south, in particular, in Taman. But all of them were mainly for managing freight transportation, not for passenger traffic. In this sense, we are definitely pioneers.

Alexander Sakharov, Head of the Federal Agency for Railway Transport

On April 5, 2024, President of Russia Vladimir Putin approved a list of instructions following a meeting on

the construction of the Moscow–St. Petersburg HSR-1 which took place on February 15, 2024.

On June 5, 2024, Chairman of the Government of Russia Mikhail Mishustin signed Executive Order of the Government of the Russian Federation No. 1397-r on approval of the main terms of the Concession Agreement that forms the basis for the current implementation of the project.

The Concession Agreement between Roszheldor as the Concession Grantor on behalf of the Government and VSM Dve Stolitsy LLC as the Concessionaire was signed on July 5, 2024. The term of the Concession is 40 years.

In accordance with the terms of the Concession Agreement, financing agreements and the Financial Closure Certificate are to be signed before January 1, 2025, and a favourable conclusion on the project is expected to be obtained from the Main State Expert Review Board of Russia before June 30, 2025.

The commissioning of the Moscow–St. Petersburg high-speed railway infrastructure is scheduled for April 1, 2028. It is the prescribed deadline that we cannot miss.

The project is to build a 682 km long railway line which will run through six constituent entities of the Russian Federation: Moscow, St. Petersburg, the Moscow, Tver, Novgorod, and Leningrad Regions. We have agreements with each of them.

The line will significantly reduce the travel time between the end points. In the period until 2060, a tax effect from the project is expected to reach RUB 13 trillion. The total growth of gross domestic product is estimated to be RUB 43 trillion. Almost 4 million square metres of spaces in various real estate projects will be built thanks to new points of attraction in the regions where the railway will run.

The project for the construction of the Moscow–St. Petersburg HSR will have impact not only on the immediately adjacent areas. 15 regions of Russia will contribute to the manufacturing of trains. The average yearly requirement for construction machinery in the period of construction is expected to be 12.2 thousand units. The construction will involve more than 40 thousand people. The project will involve capital investments in the amount of RUB 1.75 trillion, excluding VAT.

The sources of financing will include a RUB 28.5 billion capital grant for land acquisition, which is, in fact, financed by the state represented by Roszheldor; equity capital from the regions and RZhD JSC in the amount of RUB 328.5 billion; RUB 300 billion from the National Welfare Fund; RUB 648.9 billion of debt financing from a syndicate of banks; and RUB 450 billion of debt financing from non-state pension funds. In addition, the government support of RUB 299.4 billion will be provided at the stage of operation from 2031 through 2038.

It should also be noted that the project will create 122 units of rolling stock, including two first trains of the series, to be purchased by Russian Railways OJSC.

It should also be noted that the project will create 122 units of rolling stock, including two first trains of the series, to be purchased by Russian Railways OJSC.

A high-speed electric multiple unit train will have 8 carriages with 454 seats, and operating speed of 360 km/h and the maximum speed of up to 400 km/h. Ural Locomotives LLC in Verkhnyaya Pyshma, Sver-

Fig. 1. Target indicators of the Moscow–St. Petersburg HSR project

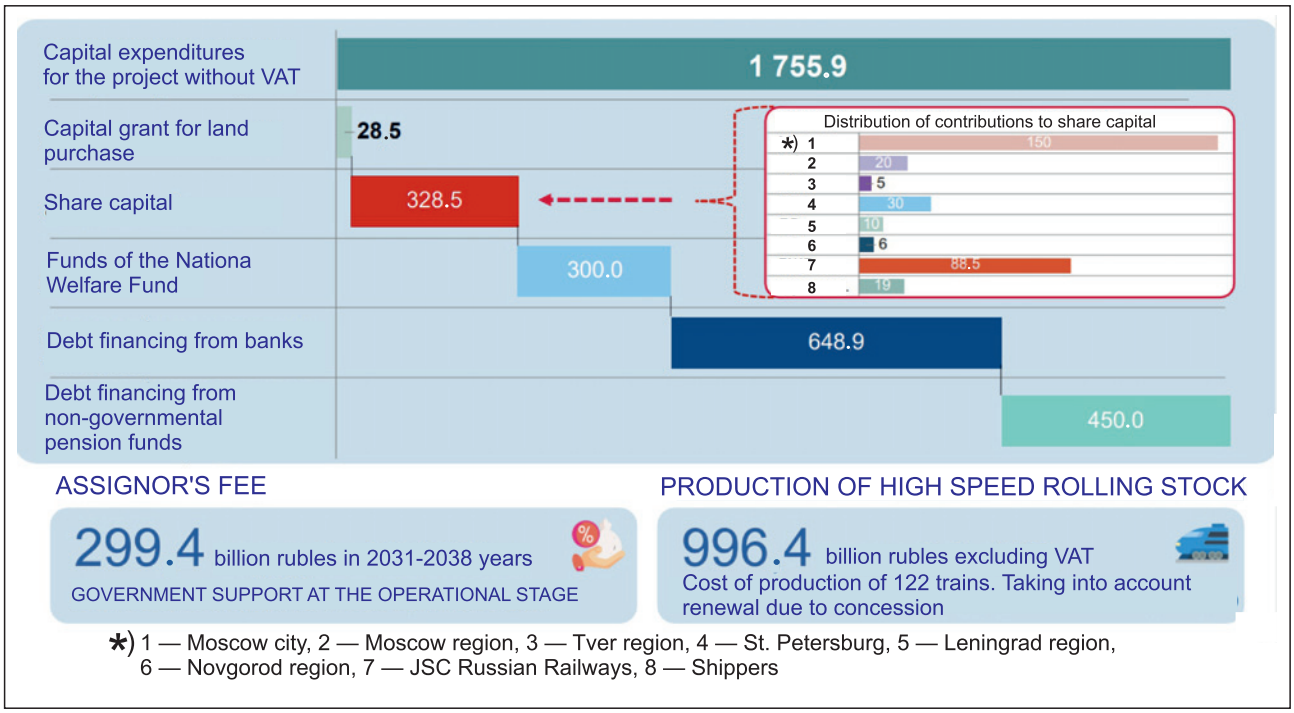


Fig. 2. Sources of financing for the Moscow–St. Petersburg HSR project, RUB billion

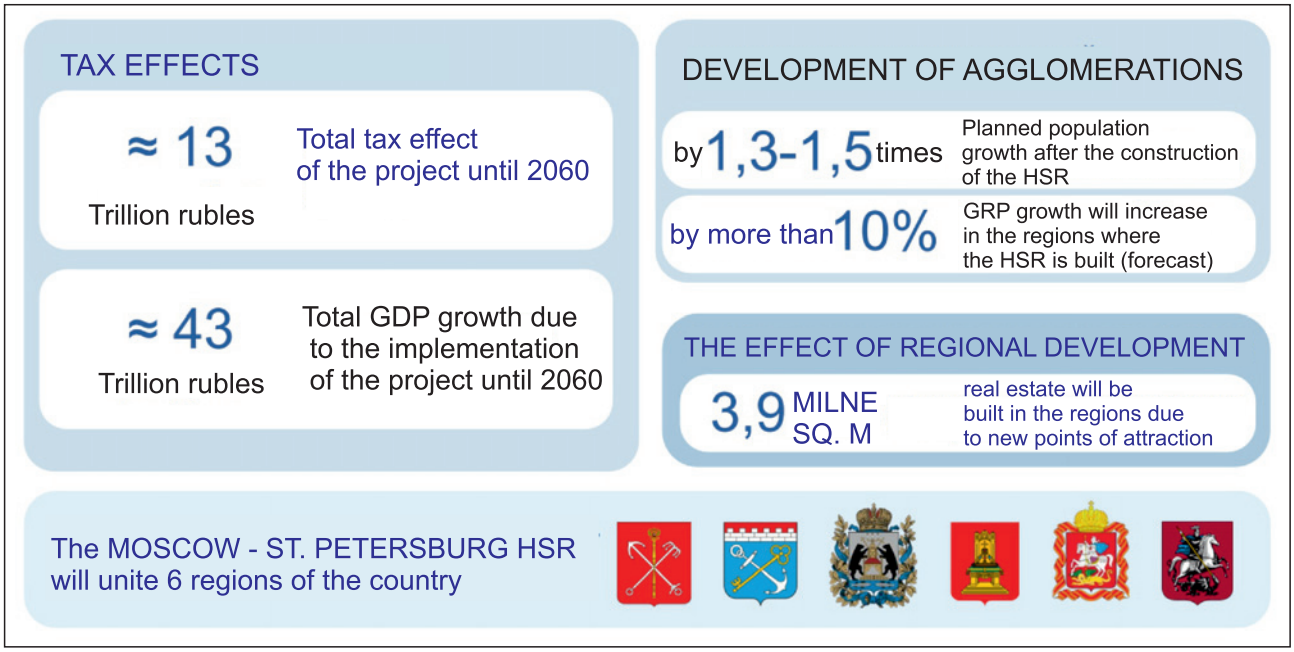


Fig. 3. Effects of the Moscow–St. Petersburg HSR Project

dlovsk Region, will be the main site to manufacture trains. The company will build two new workshops and a testing track. In the near future, 450 high-tech jobs will be created, which over time are expected to attract about 1.5 thousand qualified specialists for the project implementation purposes.

More than 6,000 land plots with a total area of over 8,000 hectares need to be allocated in order to build the HSR. In 2024, the Concessionaire was granted a capital grant of RUB 3 billion, as mentioned in the list above, to perform the acquisition of these lands for public use.

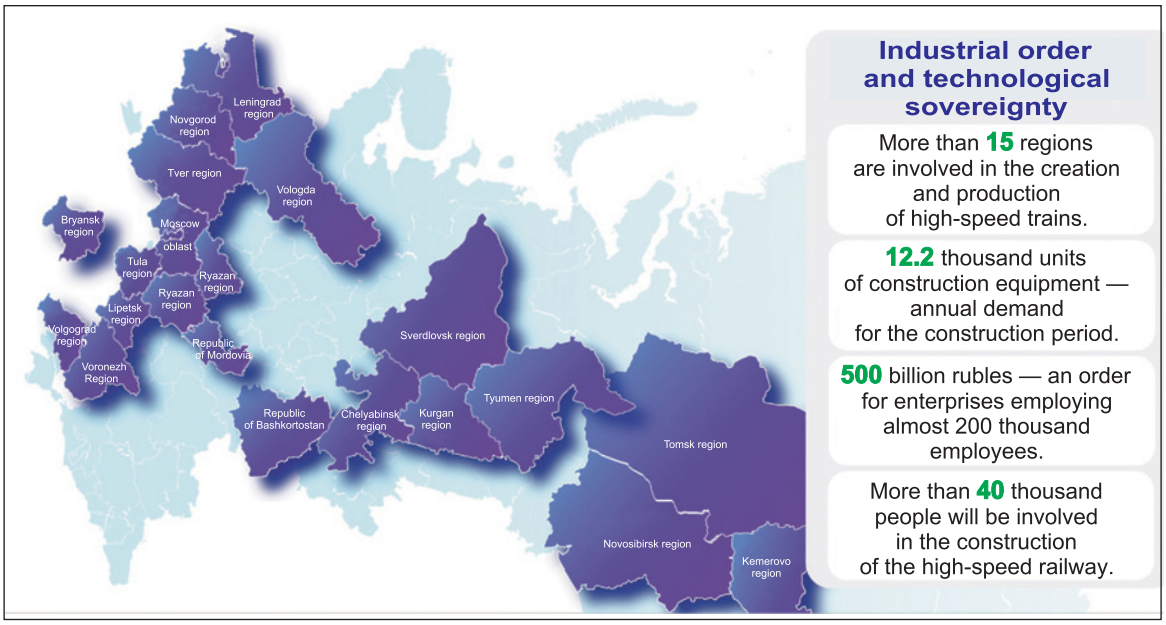


Fig. 4. Effects of the Moscow–St. Petersburg HSR-1 project on industries and regions of the country

Fig. 5. Main parameters of rolling stock for the Moscow–St. Petersburg HSR

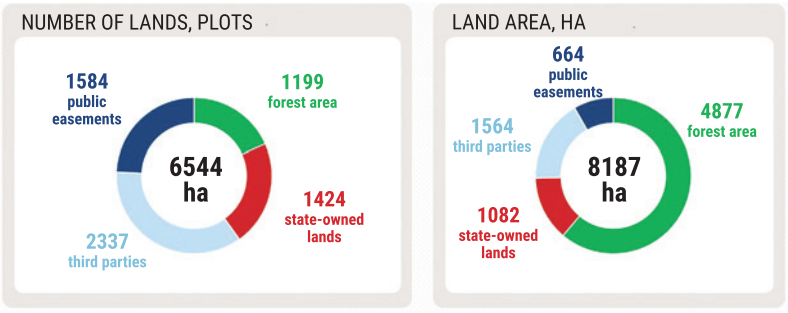


Fig. 6. Structure of land and other assets by quantity and area of land plots. The number of plots will be specified during the preparation of the land allocation schedule on the basis of approved land planning documentation

In 2024, we plan to allocate about 1,000 lands for the project with a total area of 700 hectares. Many thanks to the regions for their support.

Thank you for your attention.

Applause.

Moderator: I have a few questions for Mr. Oleg Toni, General Director of VSM Dve Stolitsy LLC.

Mr. Toni, high-speed railways are often abbreviated as "VSM"; but we can also come across the abbreviation "VSZhM" [Both abbreviations are the Russian names for HSR — Translator's note]. Which one is correct?

Oleg Toni: It all started with the abbreviation "VSZhM" which stands for high-speed railway line. Gradually, we came to the conclusion that "VSM" sounds simpler. We can already see it in the name of the company — "VSM Dve Stolitsy", and in various articles, for example, "The VSM unites the country". It is clear that it refers to railway transport and we have decided that "VSM" will be the basic one.

Moderator: So, Colleagues, let us remember, VSM.

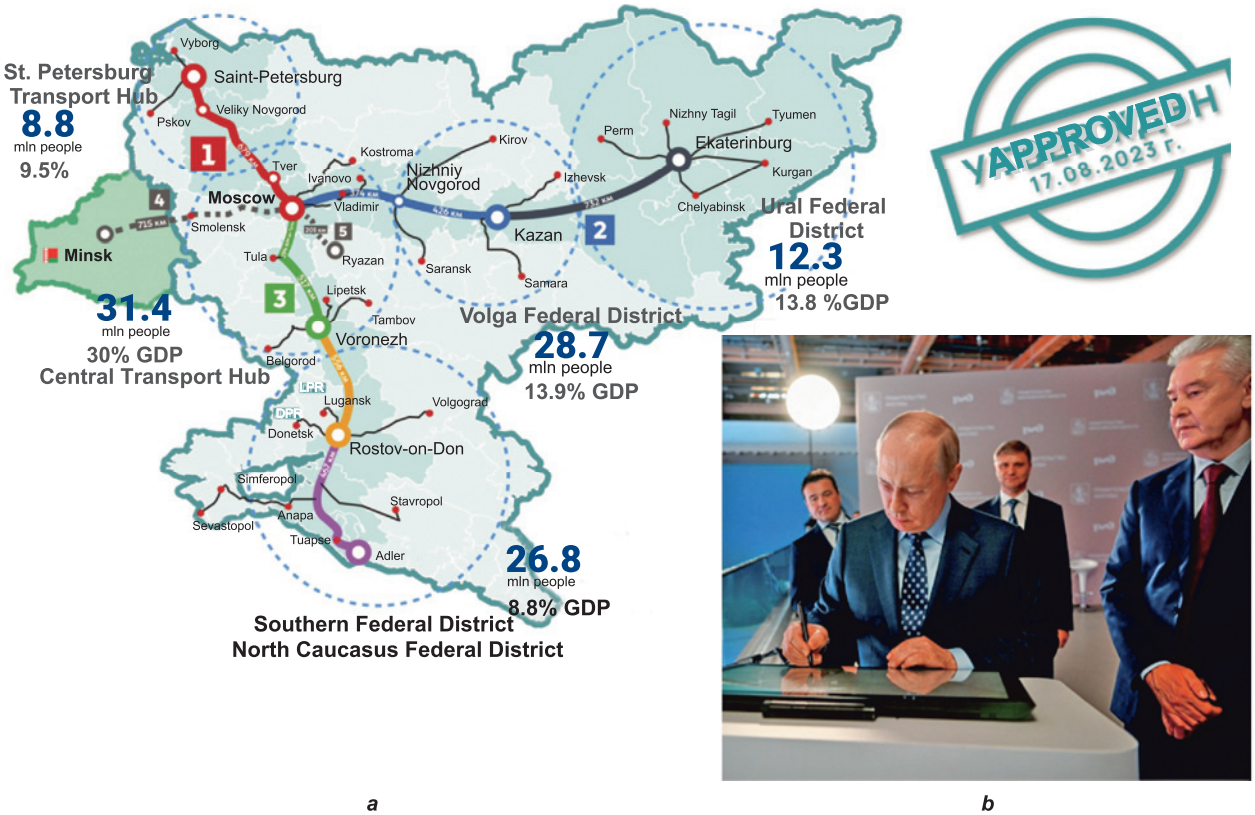
Next question. Mr. Sakharov has just clearly told us: the line will open on April 1, 2028. We understand that it is a large construction project — or rather a very large one. Are there any factors that could postpone the commissioning date? Please tell us more about the project and how we will arrive at the date: after all, it is a little over three years away!

Oleg Toni, General Director of VSM Dve Stolitsy LLC

Oleg Toni: We have indeed started the implementation of the project for the first of the five approved high-speed railways in the country — HSR-1 between Moscow and St. Petersburg (*Fig. 1*).

A very interesting project connects the country's two major hubs — the Central Hub and the St. Petersburg Hub. More than 40 million people live in the hinterland of the HSR (*Fig. 2*).

Timing and resources are the two main challenges in the implementation of the project. We don't only have to build the line, but also to adequately address



a *b*

Fig. 1. The scheme of the main HSR projects in Russia in accordance with the National Project "The Development of High-speed Railways (HSR)" (a) President of the Russian Federation Vladimir Putin approves the National Project "The Development of High-speed Railways". Inauguration of the Third Moscow Central Diameter (MCD-3) in Moscow. August 17, 2023. (b) On the photo, from left to right: Governor of the Moscow Region Andrey Vorobyov, President of the Russian Federation Vladimir Putin, General Director and Chairman of the Board of Russian Railways JSC Oleg Belozyorov, Mayor of Moscow Sergei Sobyanin. URL: https://xn---2--edd7ardtwel5cxd.xn--p1ai/#index

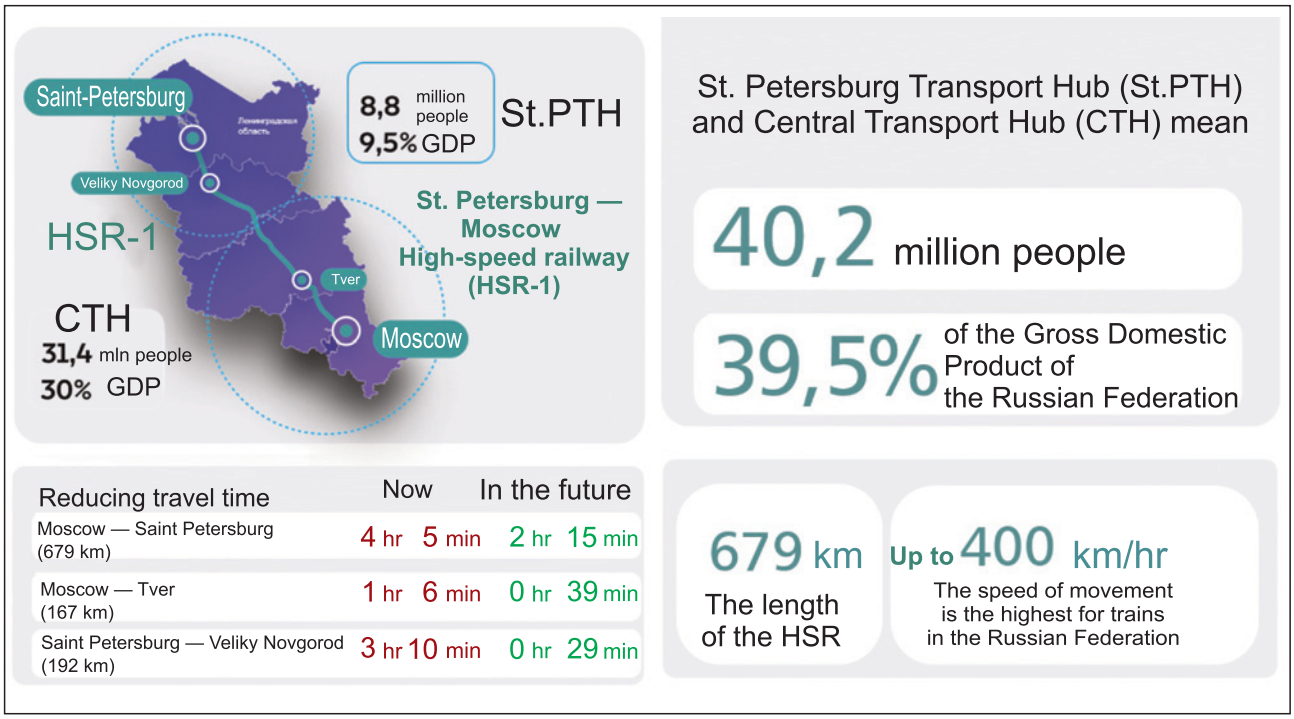


Fig. 2. Main characteristics of the Moscow–St. Petersburg HSR-1 project

the aspects of its certification and testing. As the customer, our role is, on the one hand, to work with our counterparts to manage the activities in such a way so that we can meet the deadlines and not exceed the budget, and on the other, we should be ready to address any further challenges that may arise in the course of the implementation.

Mr. Sakharov has noted that if we had worked as usual — exchanging letters and so on — we would not have been able to get the results that we have today. The Concession Agreement would probably have not been signed.

Of course, the implementation of the HSR-1 project is not only a large construction project, but it also involves new Russian high-speed rolling stock, which is being designed by Engineering Centre of Railway Transport JSC and will be manufactured by Ural Locomotives LLC. The components for the train will be made in Russia. This is also a real challenge for our manufacturing sector and it will give a good boost for its development in the future.

Let me emphasize that any challenge is also a chance to show your worth. I have been working in construction for my entire life, but I have never met such a complex set of facilities before. This is probably a challenge for each one of us. I am sure that our current team is eager to succeed and we will be able to make the project a success.

I would like to thank the Government of St. Petersburg. The main decisions enabling the positioning of the project in St. Petersburg have been made in a very short time span. In particular, the decision to reconstruct the Tsimbalinsky overpass is an important one as its design solutions are linked to the arrangement of tracks for the entrance of the HSR to St. Petersburg (*Fig. 3*).

Moderator: Mr. Toni, while there are some high-speed railways in the world, for Russia, it will be the first of a kind. My question is, the tasks we are solving, the technologies that you mentioned — is this something that will enable us to catch up with others? Or will we be able to look into tomorrow and create a high-speed railway of tomorrow, not just to catch up with our counterparts in other countries, but perhaps even surpass them?

Oleg Toni: It is hard to comment on whether we can "catch up or surpass". In my opinion, the line is unique. The speed of up to 400 km/h will require a ballastless track which is completely new for Russia, as well as special overhead wiring, switch assemblies for high-speed trains, and elevated structures. I mean, when it comes to what we are doing, we are doing everything new, adjusting the globally existing experience to our realities (*Fig. 4*).

The design activities and technical expert review of the HSR project are taking place in parallel. A decision of the Main State Expert Review Board (FAU Glavgosekspertiza) on all stages of the Moscow–St. Petersburg HSR-1 project is expected to be issued by July 1, 2025.

I would like to particularly mention the contribution of the team of scientists and experts of Emperor

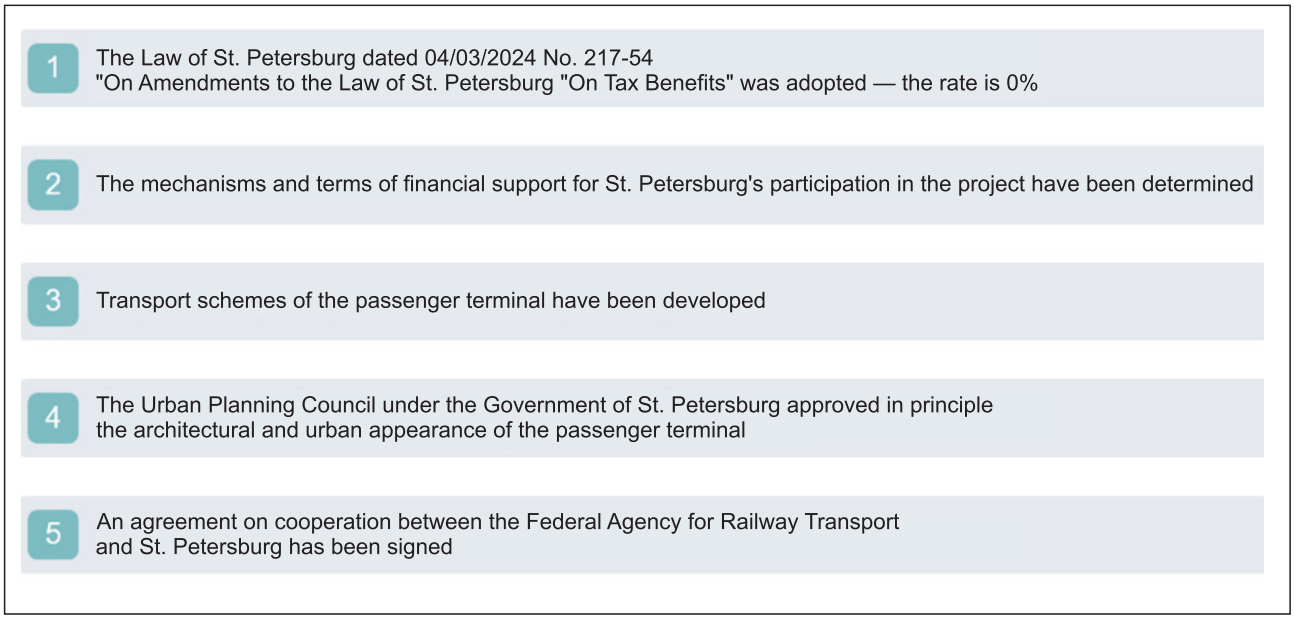


Fig. 3. Legislative and administrative decisions on the implementation of the Moscow–St. Petersburg HSR-1 project made in St. Petersburg at the end of 2024

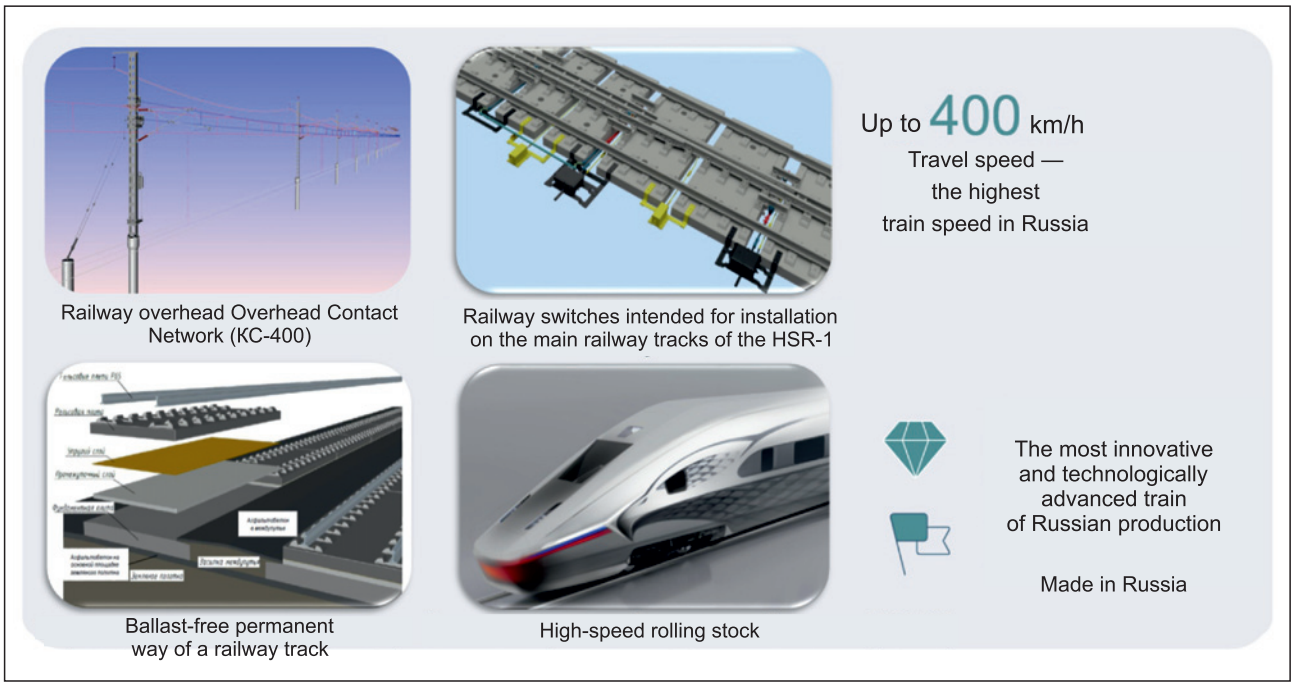


Fig. 4. Innovations in the infrastructure and rolling stock of the Moscow–St. Petersburg HSR-1 project

Alexander I St. Petersburg State Transport University. The current design work would not have been possible without the Project Specific Technical Speciation (STU) for the design and construction of the Moscow–St. Petersburg HSR-1 that was developed by the University. PGUPS is doing a great job training personnel for design, construction and operation of high-speed railways (*Fig. 5*, *6*).

We are building our own unique domestic product which is referred to as the "Complex of a high-speed railway line and special rolling stock for it". We are creating it for the first time. But having completed all the stages of design, construction and commissioning once, we will be able to use and replicate the outcomes in the design and construction of any other high-speed railway line, whether in Russia or abroad.

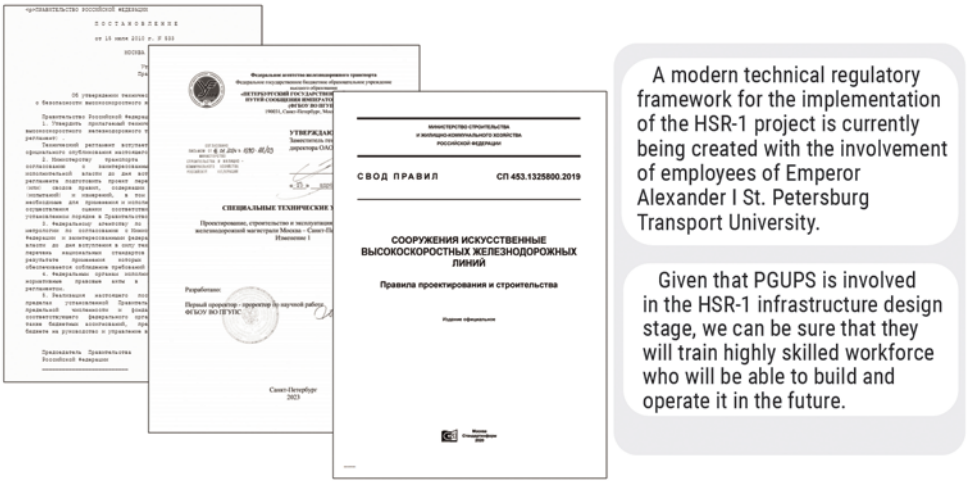


Fig. 5. Involvement of PGUPS scientists and experts in the preparation of regulatory acts for the Moscow–St. Petersburg HSR-1 project

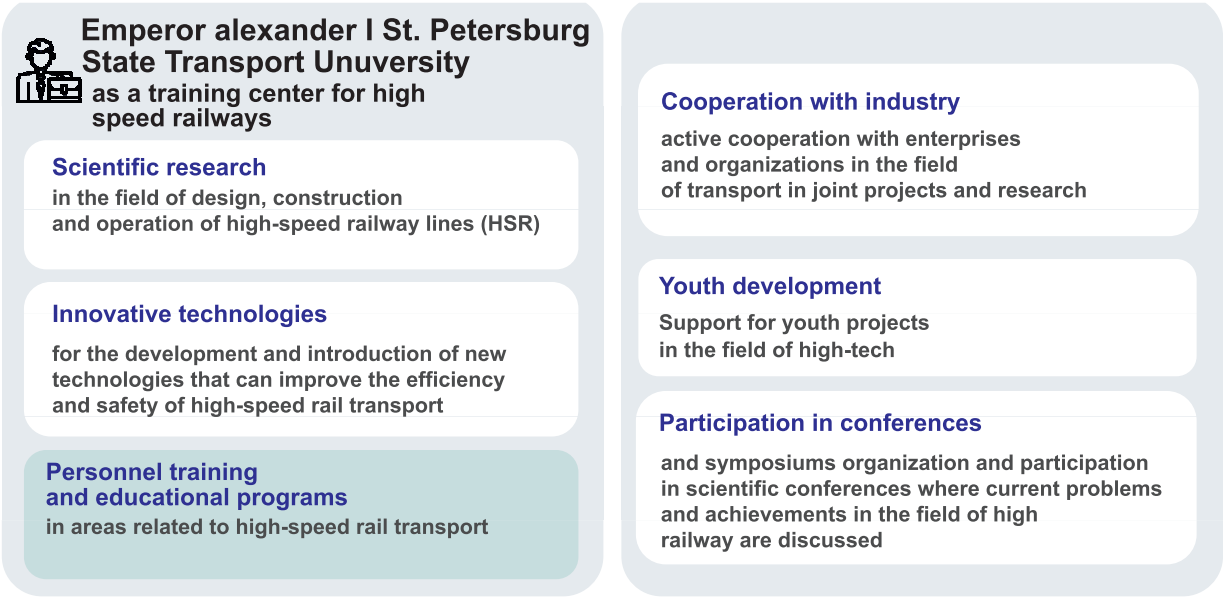


Fig. 6. Training highly skilled personnel for HSR

Moderator: Thank you, Mr. Toni, for your detailed answer.

Applause.

Moderator: We have a large construction project ahead. Will it affect the operation of the October Railway? I would like to ask this question to Mr. Viktor Golomolzin, Head of the October Railway.

Viktor Golomolzin: First of all, I would like to join in congratulating PGUPS on the 215th anniversary of its foundation. For more than a century, this leading transport university based in the Northern capital of Russia has been cooperating with the October Railway, promoting innovation in operations of Russian Railways. Many achievements within the operating domain of the October Railway have resulted from fruitful interactions between railway professionals and the scientific community of transport universities.

When the President made a decision on building a high-speed railway line between St. Petersburg and Moscow, the experience and developments implemented on the operating domains of the October Railway, namely the operation of ER200 high-speed trains followed by the advent of Sapsan high-speed trains, provided the foundation

Viktor Golomolzin,
Head of the October Railway,
Branch of RZhD OJSC

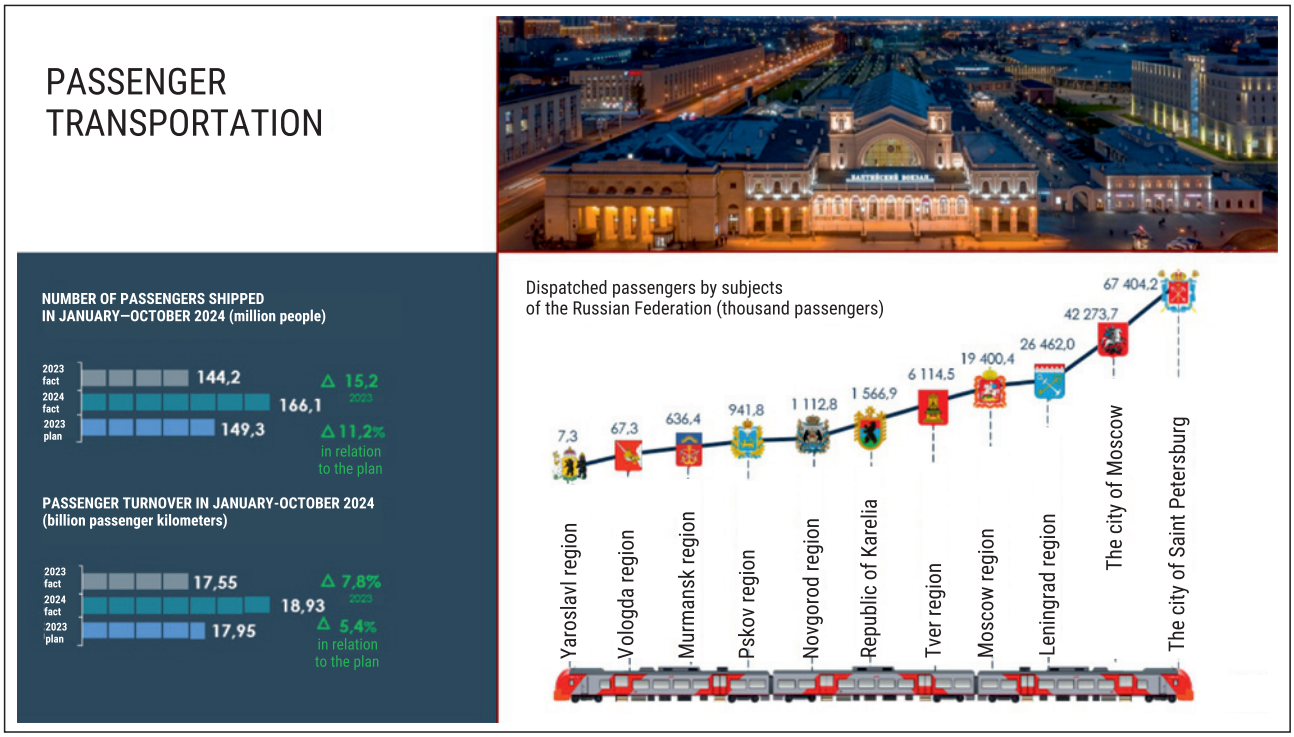


Fig. Passenger traffic on the St. Petersburg–Moscow line

which is currently used to create a new chapter in the history of the railway industry in this country.

It is important to note that the construction of the high-speed railway will include measures to minimize impacts on the current operating activities of the railway. The central section of the line, from Alabushevo to Obukhovo-2, will be greenfield construction, so there will be no need to interrupt train services.

Two additional tracks are to be built on the section between Obukhovo-2 and St. Petersburg. Besides, when the line is put into operation, the commuter traffic from Moscow Railway Station is planned to be channelled to Volkovskaya Station, which will be more convenient for passengers and will reduce the load on the infrastructure.

The construction of the busiest section between Alabushevo and Moscow, which has over 300 pairs of passenger trains running daily, including MCD-3 commuter trains, is already underway. At the moment, there are no factors that could complicate field operations.

Thus, an elaborate approach to managing the design and construction of the HSR will help ensure consistent operation of the October Railway both during the project implementation period and subsequently during the operation of the line.

Moderator: My next question is for a representative of the transport sector of St. Petersburg, Deputy Chairman of the Committee for Transport of St. Petersburg Dmitry Van'chkov.

Mr. Van'chkov, how will the HSR change St. Petersburg?

Dmitry Van'chkov, Deputy Chairman of the Committee for Transport of St. Petersburg

Dmitry Van'chkov: I would split the question into two parts. First, there are opportunities that open up in terms of construction and creation of new infrastructure facilities. A number of new streets and an underground crossing will emerge, some streets will be reconstructed. So, there will be significant changes in the city infrastructure and landscaping. All this will certainly promote road construction in St. Petersburg. It should be noted that there will also be a new above-ground entrance and a surface section at Ligovsky Prospect II metro station. It is planned that the construction of the new entrance which will be connected directly to the HSR terminal will be completed by 2028.

And, of course, there is an important second aspect — reduced travel times, which will increase passenger flows and attract a large number of tourists to the city.

The implementation of such large-scale projects creates new jobs and boosts the regional economy. Of course, new opportunities will open up for the Pulkovo Airport, which will actively develop new destinations

in China, India and other countries that are particularly popular with tourists. I am sure that domestic flights in Russia will also become more attractive.

The construction of the HSR is a comprehensive solution aimed at developing St. Petersburg, and today we have to do everything to get the project implemented.

I would like to thank Mr. Toni for the high appreciation of the efforts of the Government of St. Petersburg in contributing to the implementation of such an important project that he expressed in his presentation.

Applause.

Moderator: Thank you Mr. Van'chkov.

I would like to ask my next question to Managing Director for Development of Intelligent Control Systems of Transmashholding JSC (TMH) and General Director of TMH Smart Systems Andrey Romanchikov.

Transmashholding JSC is one of the world leaders in manufacturing of railway rolling stock. What new engineering solutions will your company is going to offer us in the coming years? How do you select such solutions?

Andrey Romanchikov, Managing Director for Development of Intelligent Control Systems of Transmashholding JSC (TMH) and General Director of TMH Smart Systems

Andrey Romanchikov: Mr. Valinsky has just introduced the participants of the HSR project. You have probably noticed that TMH JSC is not among the project participants.

However, our company is the leader in transport engineering in Russia, and therefore this project for the construction of a high-speed railway cannot be implemented without us.

We see our role as a technological partner who contributes to the creation of the HSR at all levels. This concerns both the manufacturing of components for rolling stock and training of highly skilled personnel. For us, the HSR is a field for cooperation, because the project of this scale can only be implemented successfully by joint efforts of various specialists and organizations.

Today, we have an excellent, clear example of cooperation between the Ministry of Education of Russia, higher educational institutions and industrial enterprises — I am talking about ISKRA Advanced Engineering School (AES).

As part of the partnership with PGUPS, TMH has established a modern lab at ISKRA AES, which will be an important part of practical training of students. In the laboratory, young specialists can get acquainted with advanced technologies and equipment that provide safety on rail transport. This will not only increase the level of their knowledge, but will also give them an opportunity to use their theoretical skills in practice.

Apart from all the joint projects mentioned earlier, there is one that is important to mention. Next year, together with PGUPS we are planning to open a Technopark as part of the Advanced Engineering School at Oktyabrsky Electric Car Repair Works (OEVRZ) in St. Petersburg, which is the oldest enterprise of Transmashholding JSC and will turn 200 years old in 2026.

We are creating the Technopark in order to enhance the connections between the educational process and production activities, so that we could become closer to you — professors, teachers and students at your site, and you could become closer to us, practitioners, at the production and technology site of OEVRZ.

The Technopark at Oktyabrsky Electric Car Repair Works is a joint project of production and the university. This is a unique opportunity to create a new innovative production site in St. Petersburg.

Applause.

Moderator: Thank you so much, Mr. Romanchikov. Your story about the involvement of Transmashholding in the project will be continued by Ms. Natalia Shishlakova, Deputy General Director for Corporate Development and Project Activities, Member of the Management Board of TMH JSC.

Natalia Shishlakova, Deputy General Director for Corporate Development and Project Activities, Member of the Management Board of TMH JSC

Natalia Shishlakova: Colleagues, what we are discussing today is very important and, as you know, fortune favours those who are ready.

I would like to start the today's meeting with something that we at TMH JSC implemented in 2023 — the opening of the Advanced Engineering School in PGUPS. The key purpose of setting up an institution in such a format is to proactively train a new breed of engineers and to create smart safety systems for operating domain-based management of railway transport of the new generation.

I can say that it is by far not the first advanced engineering school opened in this country over the last few years. Therefore, we should understand the need to ensure synergy and preparation for any large infrastructure projects. The challenges the country faces can only be resolved in partnership between real manufacturers and educational institutions. I am grateful to the

Ministry of Education of the Russian Federation and Minister of Education Mr. Falkov with whom we have been talking for several months and preparing to address these challenges. Advanced engineering schools are one of the parts of the efforts made by the infrastructure companies, businesses, you and us as professionals. The industry and industry businesses, such as TMH, do this together with their partners in education; in particular, we are collaborating with PGUPS. We train future employees.

As a matter of example, Transmashholding is preparing for significant change in advance. My second role is the Corporate University Director. The educational project we are implementing in a huge corporation is intended to train specialists not only for ourselves but also for the infrastructure, including infrastructures of partner companies. One of its features is a well-developed system of project management within the corporation. This allows Transmashholding to train high-end professionals in different areas for a specific task.

The name "Oktyabrsky Electric Car Repair Works" was mentioned today. At the moment, TMH JSC is working with its partners and the administration of St. Petersburg to open a new industrial park at their site, which will form the basis for innovative pilot production facilities and a site for innovative practical training of future specialists.

We are working a lot with educational institutions of St. Petersburg, such as Peter the Great St. Petersburg Polytechnic University, St. Petersburg Stieglitz State Academy of Art and Design, Emperor Alexander I St. Petersburg State Transport University, and industry-specific departments of other universities in St. Petersburg. Growth points, research work, individual educational projects within the framework of these serious associations are only possible in an environment that PGUPS already has. Thank you very much Mr. Valinsky: with your support we have been implementing the project for more than one year. And, of course, both current and future students of the advanced engineering school are trained not only to work in infrastructure projects of our partner, but we are looking forward to seeing them in TMH.

We are not only investing our efforts and money in this project, but also a strategic thought. After all, we are, essentially, not just going to implement a large-scale project to provide our railways with rolling stock, but our efforts are primarily focused on increasing the engineering potential of Russia. To this end, TMH Corporate University collects engineering competencies that are localized in the Russian corporation that deals with rolling stock on absolutely all areas. Let me remind you that the technologies that we are working with here are multiplied, that is they are applicable to both urban rail transport and locomotive stock. Surprisingly, they are currently intersecting. Traction and rolling stock technologies, the use of new technology to manufacture carriages, digital technology and artificial intelligence — all this should be used in training of various specialists, these are intersecting competencies. And this is good news, because we can then multiply our current knowledge and experience.

In conclusion, I can say the following. Transmashholding is one of the few companies in Russia that has a corporate university capable of training engineering personnel. We have been accumulating educational resources for our programmes for more than 25 years. Over the years of existence, we have not only accumulated competencies, but also considerably improved our engineering capabilities that are available through our own engineering centres that are focused on the development of Russian transport.

I sincerely believe that the Ministry of Education, the Ministry of Transport, RZhD OJSC and our other partners will participate in these educational projects. I am sure that through them and, in particular, through the advance engineering school, we will develop several key competencies we have now conceived. It's not only about training engineering personnel in the basic areas of transport engineering, but first of all, it's about new technologies that connect us to big data, research, research work in automation, digitalization, provision of rolling stock with AI technologies, etc.

Let me remind you that we live in a huge country and I am sure that there will be a lot of other projects like this one. We are currently practicing in setting up new generation educational programs in St. Petersburg in order to then pass the experience on to the Far East, Urals and Siberia. We have been training specialists in transport for a few years, and we have to build a pool of talent for ten years to come.

Thank you very much.

Applause.

Alexander Galkin: Thank you Mr. Shabelnikov. Dear Forum Participants, I am joining the previous congratulations and would like to wish success to the teachers, employees, students and graduates. Our university was created in 1956 in response to the challenge of the time. There was mass-scale electrification of railways in the Urals at that time; and there was an acute need for engi-

Alexander Galkin, Rector of Ural State University of Railway Transport

The purpose of creating the Institute of Transport Engineering — satisfaction of the branches of transport engineering and railway transport in highly qualified personnel, scientific research and engineering developments.

Objectives of the Institute:

— development of a multi-level training system for specialists capable of wide application of high-tech technologies in the field of transport engineering;

— infrastructural support, corresponding to modern principles of organization of scientific, technical and innovative activities in the field of transport engineering;

— ensuring the level of scientific research and development that makes it possible to avoid borrowing technologies and products of transport engineering from abroad;

— increasing the susceptibility of the economy and society to innovations in the field of transport engineering by attracting investments in intangible assets;

— scientific support for the development of modern transport engineering products.

Fig. 1. The goal and objectives of the Institute of Transport Engineering strategic project

neering personnel, electrical engineers. The first name of the university was the Ural Electrical Institute of Transport Engineers. Today, the Ural region features a high concentration of transport engineering enterprises and, accordingly, we see it as a new challenge that we have to respond to. The goal is to meet demands of the transport engineering and railway transport sectors for training highly-skilled specialists, as well as in research and development.

The goal will be achieved by creating the Institute of Transport Engineering. Today, the project is being implemented. It is designed to address a number of challenges, from the development of a multi-tier system of training to scientific support of projects. The development of the Institute's structure relied on the process-based approach (first, the processes were described and then the infrastructure was designed and tailored to them). The model includes a number of centres which, in turn, bring together laboratories, academic and scientific departments.

The project allows for expanding the infrastructure of the university campus, provide an environment for the generation and dissemination of new knowledge, new digital transformation of the educational laboratory building, and creating modern research and academic facilities. I am talking, inter alia, about the spaces shown on *Fig. 3*. I would like to draw your attention to the fact that these include high-tech equipment, modern software and other resources. Today, we are already implementing the levels of training, such as the Bachelor's degree and Specialist's degree programmes in the areas of training and specialties "Mechatronics and Robotics", "Railway Rolling Stock" (the corresponding profiles and specializations are "Engineering and Information Technology in Transport Engineering", "High-Speed Land Transport").

The Institute's centers

— Digital technologies for transport
— Engineering, digital twins and mathematical modeling
— Mechanical engineering
— Traction power plants
— Standardization and certification of transport
— Management systems
— Organization of production of transport engineering products

Fig. 2. Structure of the Institute of Transport Engineering at UrGUPS

The University is planning to take part in the competition for government-funded student places — the so-called "budget-funded admission targets" — and seeks to get 30 government-funded places to open the admission to these specialties. Some of the specialties are already available at UrGUPS. In particular, we train specialists in high-speed railway transport, and many of them are already employed with transport engineering companies. For example, our past graduates work at Ural Locomotives, and not only as engineers, but also in a management team. We have established a basic department in cooperation with the company and this enables us to use network technologies for training students. This is where our students undergo their technological, production and pre-graduation practical training, prepare their graduation projects based on assignments from the production facility, and our teachers can have work placements. Employees of the company deliver lectures to our students and also study at the university. Five employees of the company are currently working on their dissertations; one dissertation has been defended. I believe that this kind of cooperation should yield good results both in training highly skilled workforce for the industry and in terms

Fig. 3. Scheme of institutional transformation of UrGUPS

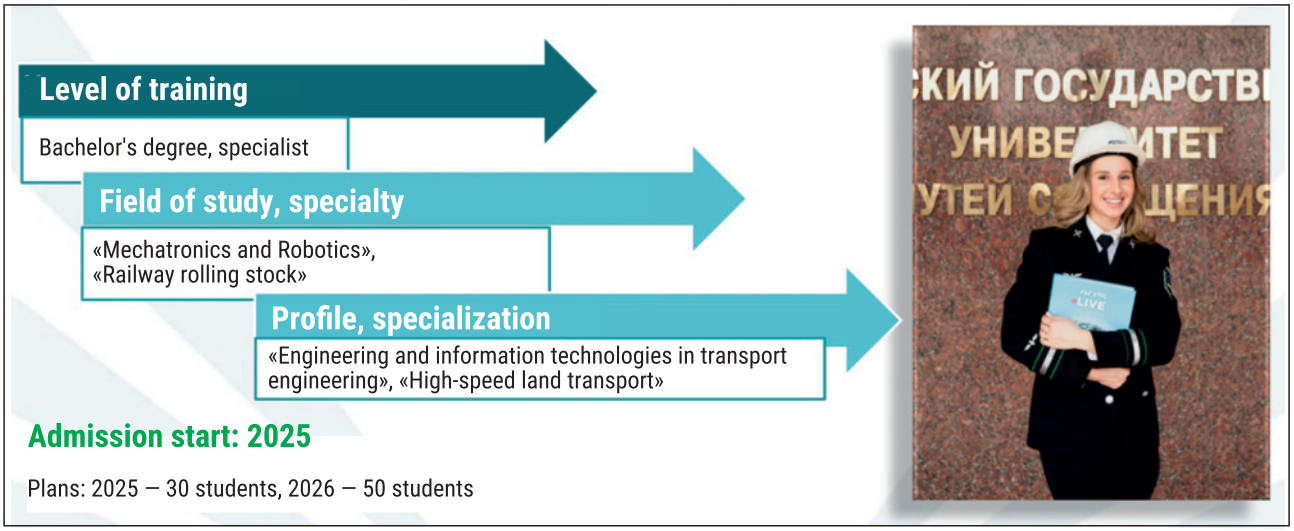


Fig. 4. Educational activities of the Institute of Transport Engineering

of fulfilling operational assignments for research and engineering developments.

The project has been designed to an adequate level of detail. *Fig. 5* shows the layouts of lecture rooms and laboratories, including equipment arrangement. The construction of the facility has not yet started, but the procurement of equipment for the institute is underway. For example, we have purchased and installed an entire line of additive technologies [Additive technology is the generic name for all 3D printing technologies. They allow any product to be manufactured layer by layer based on a computer 3D model. This process of creating an object is also referred as "growing", because the process is gradual — *Editor's note*]. This includes a 3D printer that prints with metal, a scanner, and equipment for nitrogen preparation and annealing of finished items. All these are already in use by scientists and post-graduate students of UrGUPS who perform research for the creation of a future vehicle [rolling stock — Editor's note], and mathematical models for ensuring the stability of current pick-up at speeds of up to 400 km/h. There is a new area of activity: in 2024, we signed an agreement with Ural University of Architecture and Arts for designing the interiors/exteriors of express and high-speed trains. A team of young scientists and students has been set up.

Researchers of UrGUPS are involved in the following research and development projects:

- Creating a future vehicle with a wheel traction control system with motorized wheels on the basis of synchronous motors;
- Mathematical digital models for assessing and forecasting the technical condition of high-speed trains;

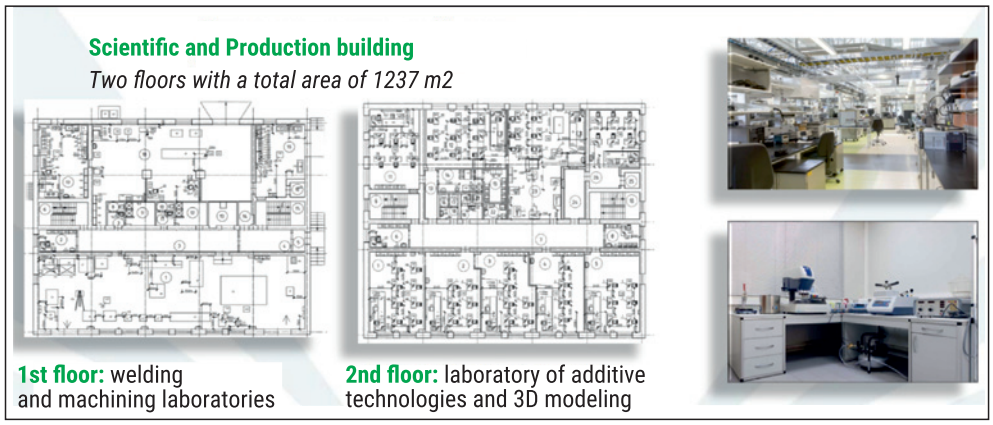


Fig. 5. Infrastructure of the Institute of Transport Engineering

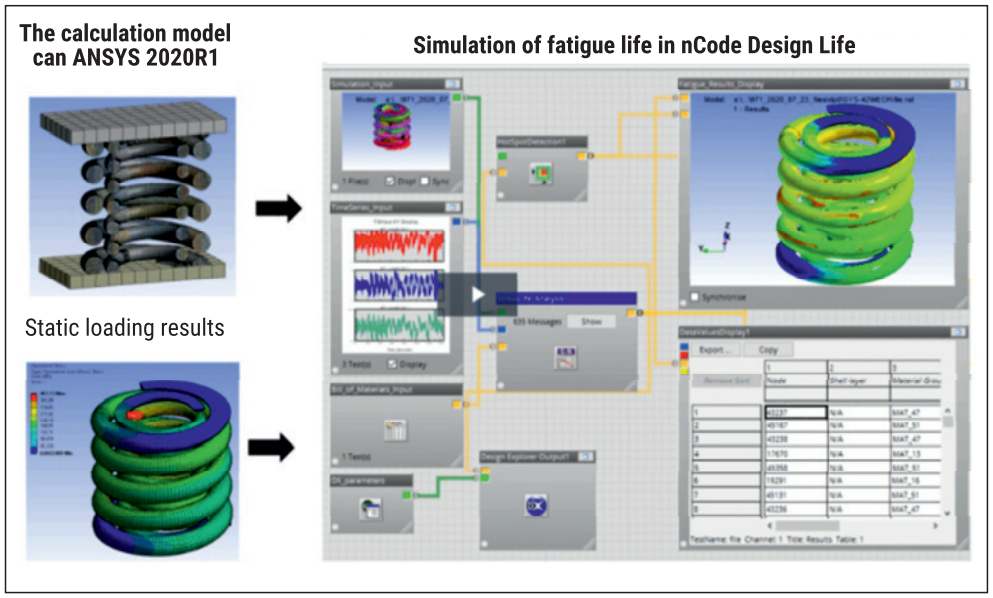


Fig. 6. Examples of scientific research results at UrGUPS. The results of research and analysis by nCode Design Life have confirmed the service life of springs at 25.27 years (≈25 years)

- Ensuring the stability of current pick-up at speeds of up to 400 km/h;
- Solutions for train autonomy using traction batteries;
- Designing and testing Jacobs bogies for a low-floor commuter train.

Another example of a study commissioned by the manufacturer is examining the durability of springs. The slide presents the results of calculations which are confirmed by service tests. An agreement to create a consortium "The Development of Russian Transport Engineering" involving companies of Sinara – Transport Machines holding, Ural State University of Railway Transport, Ural Federal University, and Siberian State University of Railway Transport was signed at the Innoprom International Industrial Exhibition in Yekaterinburg [Innoprom is an international industrial exhibition held annually in Yekaterinburg, Russia, since 2010. In 2012, the Government of Russia assigned the exhibition the federal status — *Editor's note*].

I believe that the implementation of all the programmes will enable us to address the challenges and achieve the main goal of the University, which is to train highly skilled workforce and perform research and development projects required by the industry. Thank you for your attention.

Applause.

Moderator: Thank you, dear Mr. Galkin for your very interesting story about the university's actual involvement in the creation of a Russian high-speed train on the basis of the unity of science and production and simultaneous training of personnel for future operations.

To continue with the subject of equipping the future HSR with state-of-the-art equipment and technology, I would like to refer to the example of urban high-speed

transport, i.e. metro systems, and the urban tram system, where we can see interesting pioneering solutions.

St. Petersburg Metro and Gorektrotrans State Unitary Enterprise make a lot of efforts for the development of driverless transport in the city. We are all aware of the automatic train operation system used in metro and of smart trams running our streets. Now, I would like to ask two heads of the city's major transport companies: What approaches, technologies and, perhaps, methods and solutions are you ready to recommend for a high-speed railway line? I would like to first ask this question to Head of St. Petersburg Metro Mr. **Evgeny Kozin**.

Evgeny Kozin,
Head of St. Petersburg Metro
State Unitary Enterprise

Evgeny Kozin: Good afternoon, dear Colleagues. First of all, I would like to congratulate my alma mater on the significant date, its 215th anniversary. I wish success to all the students, professors and teachers and also enhancement of our partnerships.

Next year, 2025, the St. Petersburg (formerly Leningrad) Metro will turn 70 years old. It was created — designed, built, developed — and is currently operated with the active involvement of researchers and specialists of LIIZhT/PGUPS, as well as its graduates.

Today, we cooperate with major universities and institutes in St. Petersburg (not only transport universities) to develop a number of research areas and applied disciplines and adopt theoretical frameworks and achievements that we, in particular, saw today in the Advanced Engineering School of PGUPS. Undoubtedly, they will be adopted in the practice of transport companies.

To answer your question, let me note this. The automatic train operation system is certainly a step toward the future. It is the "unmannedness" — I think the term was first introduced by Mr. Denis Minkin, Head of Gorelektrotrans in St. Petersburg.

But for the unmannedness, it is essential to determine the balance between the safety of transportation with and without a real driver who sits at the controller and controls the train. It is evident that absolute safety should be the key aspect of this balance.

Any activity bears a risk. However, using hardware and software systems for modelling threats and risks in combination with timely compensatory measures can maintain the required standard of safety and allow us to speak about the introduction of unmannedness. This approach involves the assessment of all components of the transportation process and corresponding actions both automatically (on an unmanned basis) in the system using the same AI technology, and by an onboard train engineer who would take certain action in case of any contingency or emergency.

As for high-speed transportation, with such a significant length of the high-speed line, in my opinion, we should provide for an infrastructure control system at the stage of operation, which will be several times longer than the design and construction period that is planned to be completed in 2029 as was mentioned today. If I am not mistaken, the line will run through six regions, crossing areas with various geological profiles; quite a large number of infrastructure facilities, such as river crossings and overpasses, will be built. It will be simply impossible to provide solely human monitoring of the infrastructure condition and changes in the system.

It is already now that we should be providing monitoring systems for the operation stage that will be capable of forecasting change in the natural and technical systems in the most risky areas.

The subsequent forecasting of possible conditions and taking measures in case of undesirable change in the system, where both the rolling stock and the infrastructure facilities operate, will help meet the main requirement for transportation — safety. By introducing AI-based technology, humans will be able to prevent emergencies on the basis of change forecasts, and timely respond to possible deviations in the functioning of rolling stock and infrastructure facilities. I think this is the future and we should already be offering such systems for assessing the condition and conformity of the infrastructure now. Thank you.

Applause.

Moderator: Thank you Mr. Kozin. I would like to ask the same question to Mr. Denis Minkin, Director of Gorelektrotrans State Unitary Enterprise of St. Petersburg. What is the relevance of the idea of smart trams and trolleybuses in St. Petersburg? How is it currently promoted? Can these solutions be useful for managing high-speed trains?

Denis Minkin: Thank you. Frankly speaking I smiled when the conversation turned to artificial intelligence and you invited me and Mr. Kozin... But first, my congratulations to professors, teachers and students of the famous educational institution. Best wishes to the University for its 215th anniversary — this is a significant date both for the city and the country as a whole.

Denis Minkin, Director of
Gorelektrotrans State Unitary
Enterprise of St. Petersburg

As for exchanging experience, as an urban rail service, St. Petersburg's tram is a younger brother of the railway. And it would be incorrect for me to give any advice in this regard. Although, in terms of age, we are older than the metro.

The railway will take care of their engineering solutions without us. I am absolutely sure of that. But in general, the key idea of this Forum, in my opinion, is the one written on this panel above the stage — we just have to adjust the punctuation marks. What it says is, "High-Speed railway line Moscow–St. Petersburg. Challenges, solutions, personnel". I would put a colon, not a full stop here: Challenges, solutions: Personnel". Because both challenges and major points of concern are related to personnel and it is always personnel who find solutions. And the role PGUPS plays in this is enormous.

I have not yet remembered the abbreviation for your new school Iskra, whether it is VSHIP or PISH. It does not really matter, as long as it becomes a real effective thing, not a "damp squib" ["PSHIK" in Russian — *Translator's note*].

We still have to work on this — in all areas, especially in high-tech fields. Personnel is the key — especially in the context of such an important project as the HSR.

Maybe it is not the best comparison, but it is like a late child in the family, when the parents are already adults and here he (or she) comes, and everyone has been waiting for him (or her). The value of such a child is not only that he (or she) is long awaited, but also that the whole family is trembling around him (or her). It's a new way of loving, a new way of feeling, a new interest in life, and so on. What do I mean? There are many, many new things around the HSR project: business arrangements, an increased interest, new forms of activity, and, of course, the development of areas of research that may not have existed before.

The automation is obvious: the speed is 400 kilometres per hour or 111 metres per second. What are the human capabilities there? Obviously, automatic control systems will act as an autopilot which is known as artificial intelligence.

The second thing is educational processes. Higher educational institutions, including the oldest ones, should give a boost to new educational programmes; the demand for learning knowledge-intensive professions should revive. This is the role the project will play for us and for the city.

And urban electric transport — trams and trolleybuses, along with the underground and buses — will have to, figuratively speaking, take these passengers away. HSR trains will pump railway stations with people in bursts, like arteries do. Passengers will "spill out" into the city. What will be their number? Let's say one train will have one thousand passengers. This is a large group of people — they need to be picked up and transported around the city. So, first of all, it is for the underground. But the role of the ground electric transport is also important. Therefore, we should all be together.

Let me address my colleagues who mentioned me for some reason. The science and education cluster that Transmashholding is devising is exactly what we need now. Because we need integration between industry, education, science and, preferably, a production site, where real life and field operations are taking place. This should be in place and this is actually extremely relevant and timely. And please do not forget to call upon us, urban transport people, because this is not only limited to railways.

And the final thing I would like to say is this. Can you imagine how slow an airplane from Moscow to St. Petersburg is if passengers have time to read a boring, incidental interview with Minkin, as one of the speakers noted today? It's time for trains to overtake planes. Thank you.

Applause.

Moderator: Thank you Mr. Minkin.

I would like to return to the topic of artificial intelligence. **Mr. Anton Petrov**, Head of the High-Speed Transport Directorate of Russian Railways, please tell us when we will finally get driverless trains on high-speed railways. Will we have them at all?

Anton Petrov,
Head of the High-Speed
Transport Directorate
of Russian Railways

Anton Petrov: Good afternoon, dear Colleagues. I am glad to greet everyone and congratulate my university of origin on its 215th anniversary. We have prepared a small present. One of our trains, Lastochka, was decorated with the symbols of the University. The train will run between St. Petersburg and Moscow and remind us all of this wonderful date, the anniversary. Congratulations!

Answering the question about driverless traffic, you know, this is a long and thorny path. And, of course, many of the speakers have mentioned this; this is the path that can be taken by synchronizing the efforts of science, manufacturers and operation. But we have already embarked on this path today. The area of responsibility of our Directorate includes a project — the Moscow Central Circle (MCC) — where one of the trains is fitted with equipment with the Grade of Automation 3

(GoA3)[1]. In practical terms, this means that the train fully controls itself, maintains the necessary speeds itself, arrives at a station and brakes (stops) in a specific position at the platform, opens/closes the doors, detects any obstacle on the track in front of it, monitors the spaces between carriages (for foreign objects or people) (the so-called "train surfers" — *Editor's note*), and assesses the condition of its equipment. This level of automation already exists. Of course, the driver is present, because the current level of automation does not allow for unmanned operation. Besides, this needs to be legitimized, permitted for use by relevant regulatory documents.

By taking this path and, figuratively speaking, "collecting" mistakes [in order to analyse, systemize, classify and avoid them in the future — *Editor's note*], we will be able to perfect the technology.

In the future, the Moscow Central Circle will definitely have unmanned traffic on a closed track circuit with everything necessary for it.

For high-speed railway and future high-speed trains, by using this practice today, by acquiring the experience on the Moscow Central Circle, we are making a foundation for the future. I mean, for example, devices, obstacle detectors, speed control systems and plotting speed curves based on the environment in which the train runs. This will provide an opportunity to use one-person operation[2]. I am sure that in the future this will allow for fully automatic train control. But after a while we all will have to cross the psychological line, when we realize that the train is controlled by a machine, not a human. This is something, in my opinion, we should think about. Thank you.

Applause.

Moderator: Thank you Mr. Petrov for your interesting story. You have clarified the situation for those who are not very familiar with the problem. Indeed, although the world already knows automatic driverless trains, for example, in the metro in Dubai, UAE, the psychological aspect is certainly significant. I think for passengers it is important to know that there is someone in charge on the train — a conductor, an attendant or a train manager, no matter what the job title is — who will take control of an emergency, if necessary.

High-speed travel is a great responsibility, and special requirements for employees. I would like to address my question to Mr. **Sergey Chernogayev**, Chairman of the Federation of Independent Trade Unions of Russia, Chairman of the Russian Trade Union of Railway Workers and Transport Builders: How will trade unions participate in the large and very complex work of training and retraining personnel?

Sergey Chernogayev: Thank you for your question. Firstly, a high-speed railway is a large-scale project with a great social and economic potential. A trade union is, first of all, the workers who create technology and rolling stock — those who support the operation and maintenance of both the infrastructure and rolling stock.

Sergey Chernogayev, Chairman of the Federation of Independent Trade Unions of Russia, Chairman of the Russian Trade Union of Railway Workers and Transport Builders

Therefore the implementation of a high-tech project will create high-tech jobs. We are already hearing that artificial intelligence will change professions. The rolling stock will be controlled by an operator, not a driver. And this means completely different working conditions, different training of workforce, different education.

For workers, better training will also mean higher remuneration. Correspondingly, taking into account the current shortage of workforce, the demand will lead to new social programmes, the social climate will be better both in teams and around the HSR project. I am not even talking about the social effects that the project will create for individuals and society. First of all, it is the opportunity to move fast. Today, we are only talking about the Moscow–St. Petersburg high speed railway. Other destinations are to follow. This will influence all spheres of life — not only business, but also recreation, communication between people and everything this involves.

New jobs and technologies will require modern tools, equipment, overalls and approaches to occupational health and safety. This means it will have an integrated effect that will in general bring improvements

[1] GoA3 is the degree of automation of train traffic control for metro and commuter trains according to the classification of the International Association of Public Transport (French: *Union Internationale des Transports Publics, UITP*). Grade of Automation Level 3 (GoA3), Driverless, is one of the four grades (with level 4 being the highest) where starting, stopping (target braking) and speed control are performed by *an automatic control system*, and *a conductor/attendant* closes the doors before the departure and drives the train in case of emergencies.

[2] On railways, one-person operation (OPO) means that a driver controls the locomotive or a multiple-unit train alone, without an assistant driver

to the working environment for workers and the creation of more comfortable workplaces.

Of course this cannot but have an impact on trade unions which always advocate for these things — for providing comfortable, safe workplaces and a good remuneration system. And having heard everything that has been said before me today, I have no doubt that we will be doing this. I am absolutely sure that the project we are talking about today will definitely be implemented. I would like to wish us all the success in its implementation.

A high-speed railway line is a seamless technology for life that allows you to move from your comfortable state, such as, for example, of relaxing, to a comfortable state of working and then also comfortably come back without experiencing any problems or changes in your life. Because today, when it comes to an airplane, it is like an interrupted life, isn't it? You completely fall out of communication for a while. And a high-speed railway is the technology that will enable people to always stay in touch.

Thank you for your attention.

Applause.

Moderator: Thank you very much, dear Mr. Chernogayev. This is exactly what we counted on when asking you to close our conversation with your presentation about people, workforce, and social issues. Equipment, technology, organizational innovations — all this is important but everything should be done for people and for the benefit of people.

I cordially thank all the speakers and experts who elaborated on the topic and added their important perspectives on the set of problems relating to the creation of Russia's first high-speed railway line; and also the audience and forum participants who were so attentive and engaged. Let us wish all of us success in the implementation of this grandiose project and, I am sure, we will meet at the Betancourt International Engineering Forum in December 2028 to discuss the results of the construction of the just opened first Russian high-speed railway between Moscow and St. Petersburg.

Applause.

CONCLUSION

In accordance with the approved work plan to implement the Moscow–St. Petersburg high-speed railway line project, the financial closure for the concession, which is the largest in the history of Russia, took place in December 2024.

As reported on the official web-site of Sberbank on December 20, 2024, the financial closure for the Moscow–St. Petersburg HSR construction project was completed[1]. Agreements raising in total RUB 1.799 trillion of project financing have been signed.

As Minister of Transport of Russia Roman Starovoyt noted, the team comprised of representatives of the Government, Ministry of Transport, Federal Agency for Railway Transport, regions and all the project participants does everything needed to implement the instruction of the President of Russia Vladimir Putin on the construction of the high-speed railway line. Sberbank acts as the arranger of a syndication of banks and financial institutions who are also contributing to financing the project.

The head of the Ministry of Transport of Russia emphasized that passengers, regional economies and the country as a whole will benefit greatly from the HSR. *"Vigorous efforts are underway to implement the project, in particular, with respect to the basic documentation. The main agreements that ensure the procedure of the project financial closure and bring us closer to the line launch have been executed. All the participants act within the same legal framework, they formalize their obligations in the project,"* Roman Starovoyt said.

Sberbank acts as an arranger of two syndicated loans for the construction of the infrastructure and financing of procurement of high-speed rolling stock. The syndication of banks also includes VTB, Sovcombank and other financial institutions. The Borrower for the first loan is the project's Concessionaire VSM Dve Stolitsy LLC. The borrowers of the second loan are the customer of the serial train of State Transport Leasing Company Group (GTLK). The loans are extended for 21 and 25 years, respectively.

Sberbank is also involved in the project as a Loan Manager, Security Agent, and Intercreditor Agent. In addition to syndicated loan agreements, a number of documents have been signed to ensure the project's functioning during the investment and operation stages. These include the Shareholder Agreement, the Transportation Management Agreement, an Addendum to the HSR Concession, and a direct Agreement between the project's Lenders and the Government.

Alexander Vedyakhin, First Deputy Chairman of the Management Board of Sberbank noted: "This is quite literally a historic event. The largest public-private partnership project in the history of Russia was provided with financing. The project is raising unprecedented financial resources, with extra-budgetary investments exceeding RUB 1.7 trillion. It took more

[1] December 23, 2024. Sberbank. The financial closure for the Moscow–St. Petersburg high-speed railway, the largest concession in the history of Russia. URL: http://www.sberbank.ru/ru/sberpress/business/article?newsID=7777de48-a3c4-4119-bb55-59b0e7d92e84&blockID=8a17129a-cf00-4b6d-b8b8-fe57ee628586&regionID=77&lang=ru&type=NEWS

Participants of the financial closure event for the Moscow–St. Petersburg HSR project. Moscow. December 20, 2024. Photo courtesy of the Ministry of Transport of Russia. URL: https://mintrans.gov.ru/press-center/news/11648

than five months after the execution of the Concession to formalize all the relations between the project participants by binding contracts, and this is a very short period for such an amount of documentation. More than 10,000 pages of various documents were signed by 15 organizations and they affixed more than 1,000 signatures. The contracts signed are intended to govern in detail the relations between the parties for many years to come.

We can say that the HSR project has completed its preparation stage and entered the investment stage. In the coming six years, huge resources from banks, pension funds, shareholders and the state are to be spent for the construction of the project infrastructure and supply of rolling stock. All investment in the project is made on the basis of payback from project returns in the following years. The borrowings are for terms of up to 25 years, which is unprecedented for the Russian financial market".

The 679 km long HSR will encompass six regions: Moscow, St. Petersburg, the Leningrad, Novgorod, Tver and Moscow Regions. After the commissioning of the line, the passenger traffic between the cities in its area of influence is expected to increase and reach 23 million people by 2030. With the new HSR, it will take you 2 hours 15 minutes to get from Moscow to St. Petersburg; 29 minutes to travel from Veliky Novgorod to St. Petersburg; and the travel time between Tver and Moscow will be reduced to 39 minutes. The project will use Russian solutions and equipment.

The Presidential Instruction defining the start for the HSR project was issued in April 2024. Earlier, Vladimir Putin repeatedly referred to a high significance of the project for the economy, industry, and extending the infrastructural and technological potential of Russia. It is planned to launch several high-speed railway lines in Russia. New lines will connect Moscow with St. Petersburg, Yekaterinburg, Adler, Ryazan, and Minsk.

The Report is prepared for publication by I.P. Kiselev

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