Feasibility study of express railway line construction in Lithuania

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Abstract

When Lithuania became a member-state of the European Union, the problems of railway development and their integration into the European railway network came to the forefront. According to the high-speed railway development plan EURAILSPEED 95, adopted at the VIC II congress in France in 1995, two European express railway lines should be constructed in Lithuania. The first line should link Warsaw – Kaunas – Riga – Tallinn/Helsinki (transport corridor Crete I), while the second should go through Klaipėda – Kaunas – Odessa (transport corridor Crete IX). The priority is given to the first new express railway line Warsaw – Helsinki called RAIL BALTICA, crossing four states – Poland, Lithuania, Latvia and Estonia. This line is aimed for both passenger and freight transportation. The maximum traffic speed can reach 250 km/h for passenger trains and 140 km/h for goods trains.

The project RAIL BALTICA is specified as the priority project of infrastructure development by the European Commission. This line should be constructed in three stages. At the first stage, including the period until 2010, the railway line in Poland leading from Warsaw to the frontier with Lithuania (Šeštokai station) should be upgraded and an express railway should be constructed to link it with Kaunas. At the second stage (up to 2014), an express railway from Lithuania to Riga should be constructed, while at the third stage (up to 2016) such a railway should be constructed on the route to Tallinn.
Keywords: express railway, freight and passenger transportation, network, transportation market, route, terminal, car.

1 The development of express railway in Europe

After a heated discussion it became clear that the economy of Western European countries cannot be successfully developed without railway transport, while the latter is inseparable from high speed.

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Competition can revive the market in general and the market of transport services and passenger transportation, in particular. An example of the 90's when the integrating Europe began the construction of a system of super-high-speed railways is perfect proof of this. In 1989, European Union of Railways (UIC) offered the Transport Committee of European Economic Community to construct a common network of super-high-speed railways. It is planned that about 12 500 km of super-high-speed railway lines (V>250 km/h) will be built in EC by 2010, including 14 000 km of upgraded lines (V=160+200 km/h) and 2500 km of the connecting lines [1].

The super-high-speed railways will increase the economic efficiency of the countries as well as allowing for the integration of the railway system into the global economic process by competing in speed, reliability and comfort of travel when providing transport services.

The conditions in Europe are favourable for developing super-high-speed railways because it has a lot of big cities and even agglomerations at a short distance from each other.

Super-high-speed railway lines are laid in the main corridors with large passenger flows. The following super-high-speed railway corridors which are currently used or being laid may be mentioned [2]:

- Frankfurt Am Maine (2.6 m of inhabitants) – Stuttgart (2.3 m), 150 km long;
- Paris (9.3 m) – Lyon (1.3 m), 390 km;
- Paris (9.3 m) – Lille (1 m), 190 km;
- Madrid (4.6 m) – Seville (0.9 m), 390 km;
- Rome (3 m) – Florence (1 m), 220 km;
- Paris (9.3 m) – Brussels (1.6 m), 260 km;
- Lyon (1.3 m) – Marseille (1.2 m), 270 km;
- Madrid (4.6 m) – Barcelona (3.1 m), 500 km;
- Milan (3.7 m) – Florence (1 m), 250 km;
- Rome (3 m) – Naples (3 m), 190 km;
- Cologne (agglomeration, 11 m) – Frankfurt Am Maine (2.6 m), 180 km.

It is interesting to note, that in Spain, where different track gauges and special trains with expanding and contracting chassis are used, new lines may be laid (e.g. on the route Madrid – Seville) and extended to other cities with Iberia's track gauge.

The laying of the Channel tunnel allowed Great Britain to link its super-high-speed railway to the continental railway network, thereby connecting London to Paris, Brussels, Cologne and Amsterdam. Speedy railways of Portugal, Spain, France, Italy, Germany, Switzerland, Austria, Belgium, Holland, etc. were also connected to form a unified railway system.

Scandinavian states also linked their railways to European railway network by laying the line Hamburg – Copenhagen – Stockholm.

UIC is extending two West – East lines – Berlin – Warsaw and Vienna – Budapest as well as two diagonal corridors – Berlin – Prague – Budapest

(Belgrade) and Vienna – Katowice – Warsaw [3] to include the states of the former Eastern bloc into the system.

It is planned to extend the corridor Paris – Brussels – Cologne – Berlin – Warsaw to Moscow (based on the European track gauge). A possibility of extending other railway lines to St. Petersburg, Kiev and Odessa is also studied. Russia is extending its railway further to the South via the corridor St. Petersburg – Moscow.

The railway association of the Eastern bloc OSShD is planning to extend the existing super-high-speed railways in 9 directions. The 9-th and 6-th directions are most important for Lithuania. They include Tallinn – Valga (Estonia) – Lugaži – Riga (Latvia) – Kaunas – Šeštokai (Lithuania) – Trakiški – Warsaw (Poland) and Klaipėda – Šiauliai – Kaišiadorys – Vilnius (Lithuania) – Minsk (Byelorussia) – Moscow – Nizhni Novgorod – Yekaterinburg – Omsk – Novosibirsk.

A joint project of European super-high-speed railways is a daring venture, especially as concerns the Eastern European part. However, it is important for the EC member-states allowing them to coordinate plans of transport development and to satisfy the demand of European railway market. The network of European super-high-speed railways will be a major factor of its economic and social development.

2 The market of super-high-speed railways

According to experts, super-high-speed trains will gain about 6% of passenger transportation market from cars in the near future [4]. This may be accounted for the fact that rapid growth of the number of personal cars resulted in traffic jams on the road, especially in large cities which, in turn, led to slower speed of travel and longer trips.

Super-high-speed railways are also the rivals of air transport. The latter has a number of drawbacks including the time needed to get to and from the airport, documents and luggage control, etc. Therefore, super-high-speed trains may compete with air transport (though its speed is even higher) gaining [2]:

- more than 80% of market on the trips taking about 2 hours by train;
- more than 50% of market on the trips taking about 4 hours by train;
- 20-30% on the trips taking about 4-5 hours.

Trips between cities at a distance about 300-500 km from each other make the ideal market for super-high-speed railways. Travel 'from door to door' at a distance of 500 km takes about less than 3 hours by both air and railway transport. However, the cost of railway transportation makes only about the half of air transport. This is a factor attracting large flows of passengers to super-high-speed railways.

For passengers choosing a means of transport the cost and time of travel are items of top priority. A traveller seeks minimum expenses which consist of cost of travel and the value of time spent.

The comparative analysis of road transport, super-high-speed railways and air transport allowed us to conclude that:

- road transport has a leading position in trips up to 300 km;
- super-high-speed railways dominate in trips of 300-900 km;
- super-high-speed railways can compete with air transport in the range of 900-1400 km;
- air transport has the priority in travel for more than 1400 km.

3 Feasibility study of super-high-speed railway introduction in Lithuania

To make Lithuanian railway competitive on the European market of transport services, the system should be restructured to meet the EC requirements.

The transport system of Lithuania is relatively well developed, and the country's geopolitical position is advantageous, therefore, at the second European conference of transport ministers held in Crete (Greece) in 1994 it was decided to link major Lithuanian railway lines to nine multimodal corridors (known as Crete corridors) of Central and South-Eastern Europe.

Two of Crete corridors also cross Lithuania: corridor I (from North to East on the route Warsaw – Šeštokai – Kaunas – Šiauliai – Tallinn – Helsinki) with IA branch (Šiauliai – Pagėgiai – Tilžė – Kaliningrad) and branch IXB of corridor IX (in West – East direction) (Klaipėda – Vilnius – Minsk – Kiev) and branch IXD (Kaišiadorys – Kaunas – Kaliningrad).

The fact that two Crete corridors come across Lithuania is favourable for Lithuanian railway system to integrate into the European super-high-speed railway network. One of the main ways to do this is to lay a super-high-speed railway line of European standard in Crete corridor I.

In October 4-5, 1995 the 1st UIC (Railway Transport Organization) congress in Lille, France, adopted EURAILSPEED 95, the programme for developing super-high-speed railways in Europe according to this plan, two European super-high-speed railways in Europe according to this plan, two European super-high-speed railways will go through Lithuania: the first is Warsaw – Tallinn/Helsinki (transport corridor I), the second will link Klaipėda – Odessa (transport corridor IX). Both lines will go through Kaunas [3].

The priority is given to a new super-high-speed railway RAIL BALTICA of corridor I, linking Warsaw – Tallinn/Helsinki. It will cross four countries – Poland, Lithuania, Latvia and Estonia [4].

To be competitive on the market of transport services, railway transport should have more technical and economic advantages, as well as ensuring:

- considerably shorter time of travel;
- quality services and higher comfortability in the train and at railway stations;
- well-thought of and flexible cost system;
- higher safety of passenger transportation, etc.

Super-high-speed railways have all these advantages. Their introduction in Eastern Europe and Lithuania will give the following positive results:

- new lines will connect large European cities;
- the time of leisure or business trips will be shorter;

- super-high-speed railway will be able to offer more comfortable and easy travel than personal cars and to provide higher freedom of movement and personal contacts than air transport;
- the turnover of passengers will increase due to the reduced time of travel.

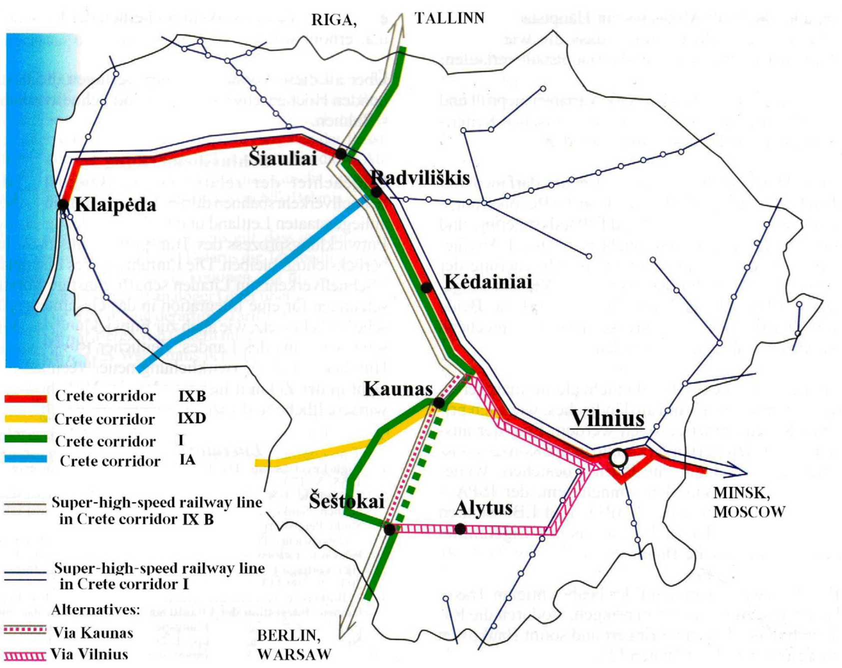

Figure 1: Crete Transport corridor.

The European Commission referred RAIL BALTICOS to the priority infrastructure projects. In the near future, a feasibility study will be made to consider the main problems associated with this project. The European Commission approved of the main stages of its implementation: the first stage – to upgrade Polish railways from Warsaw to the state border and to lay the super-high-speed railway line from it to Kaunas in Lithuania by 2010; the second stage – to lay the super-high-speed railway line to Riga by 2014; the third stage – to extend it to Tallinn by 2016.

According to the draft plan, RAIL BALTICA line in Lithuania will be 258 km-long, with the line laid at the 1st stage (to Mauručiai) reaching 71 km. This is an expensive project requiring large investments. The preliminary calculations show that the construction of the super-high-speed railway will cost about 1.4 billion EUR, including about 0.35 billion EUR at the first stage. The cost of rolling stocks is 0.42 and 0.1 billion EUR, respectively (the cost of railway infrastructure is calculated based on the actual costs of laying the cheapest SNCF South-East super-high-speed railway line Paris – Lyon in 1992–1994). Some parts of the project including an intermodal terminal, logistics centre, locomotive repair shops, rolling stocks, etc. (about 70 %) will be covered by the EC funds. The remaining portion will be paid from loans and state budget.

A super-high-speed railway line was laid to Berlin in 1997 and should be extended from Berlin, Šeštokai, Kaunas or Vilnius, Šiauliai, Riga, Tallinn via Warsaw. Therefore, this project should be implemented by Baltic states and Poland. The length of the international Crete transport corridor in Lithuania on the route Warsaw – Šeštokai – Kaunas – Riga – Tallinn is 332.7 km (191.9 km of which are one-track and 140.8 km – two-track railways).

The super-high-speed railways crossing Lithuania via Crete corridor I should not be used only for passenger transportation. The density of population in Lithuania is much lower than that in Western Europe. Lithuania is not a large country either, therefore, the need for travelling long distances and passenger flows can hardly be large enough to make this line profitable. Hence, the experience of Germany and Italy, where profitability of super-high-speed railways is ensured by a certain type of freight train with the speed up to 140 km/h should be studied because higher speed freight trains can win their market share. Based on the experience of these foreign countries, the super-high-speed railway line going through Crete corridor I should be designed as a mixed line aimed both for freight and passenger transportation. Freight trains should be integrated into passenger transportation schedules whenever possible.

On May 23, 1997 the Government of Lithuania approved of the project to extend European-standard railway from the border with Poland to Kaunas, giving it top priority. The traffic speed is 160 km/h and higher, achieving 250 km/h for passenger trains and 140 km/h for freight trains in the future.

In developing the project, the type of cars to be used should be determined. The options are classical cars, leaning cars according to Swedish standard X2000 or Italian pendolino cars of super-high-speed trains.

Implementation of super-high-speed railways will result in redistribution of international passenger transportation market. Applying formalized models it was possible to determine the market redistribution in the following way [6]:

- super-high-speed railway would take 15–30% of passengers usually travelling by car to Warsaw and Riga and 40–60% of passengers going to Berlin and Tallinn;
- super-high-speed railway would win more than 80% of market share of passengers from air transport for trips taking about 2 hours by super-high-speed train (on the routes to Warsaw and Riga); more than 50% of the market for trips taking about 4 hours (to Tallinn) and 20–30% of the market for trips up to 8 hours (to Paris);
- super-high-speed railway would take from road transport about 40–50% of the market in travels for about 300 km (to Warsaw and Riga) and 60–90% of the market in trips for more than 300 km (to Tallinn, Berlin, Hamburg, Amsterdam, Paris, etc.).

4 Conclusions

The super-high-speed railway line via Crete corridor I should be designed for mixed transport including both passenger and freight transportation. The implementation of this project in the Baltic States, including Lithuania, will allow them to integrate into European transport network. It will be an important factor of economic and social development of the Baltic region, strengthening its ties with Western Europe.

The laying of super-high-speed railway will contribute to economic and business development in Lithuania. It will also help to create new workplaces in Kaunas and Šiauliai, where passenger transport stations and freight and intermodal terminals will emerge. The project RAIL BALTICA will also promote the restructuring and upgrading of the Baltic States railways.

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