Preparation of the Operational Plan

Global Forum Rail Baltica

Vilnius, 04/04/2019

Co-financed by the European Union
Connecting Europe Facility

Aim of the study

Traffic Study

- Freight Transport Demand
- Passenger Transport Demand
- Freight Services
- Regional passenger services
- Long-distance passenger services

Operational Plan

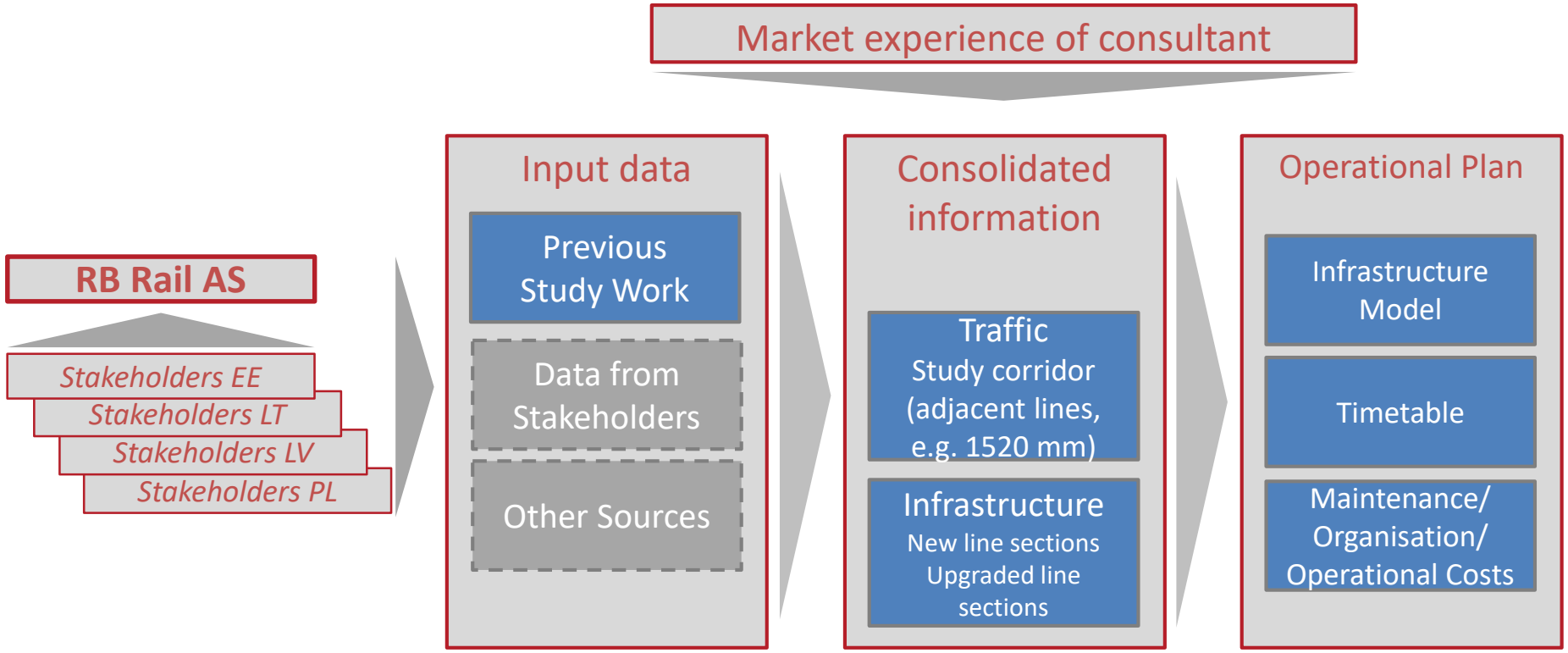
- Rolling Stock Fleet Train Consists
- Draft Timetable
- Track Layout / Station facilities
- Assessment of line and station capacity
- Traffic Management / Signalling
- Staffing Plan
- Operational Costs (Infrastructure operation)

Maintenance Plan

- Rolling Stock Maintenance Strategy
- Infrastructure Maintenance Strategy
- Maintenance Vehicles Maintenance Facilities
- Maintenance Organisation
- Staffing Plan
- Operational & Investment Costs

Viable and feasible best-practise solution as input for the engineering design

Input data – Workflow and (simplified) main categories

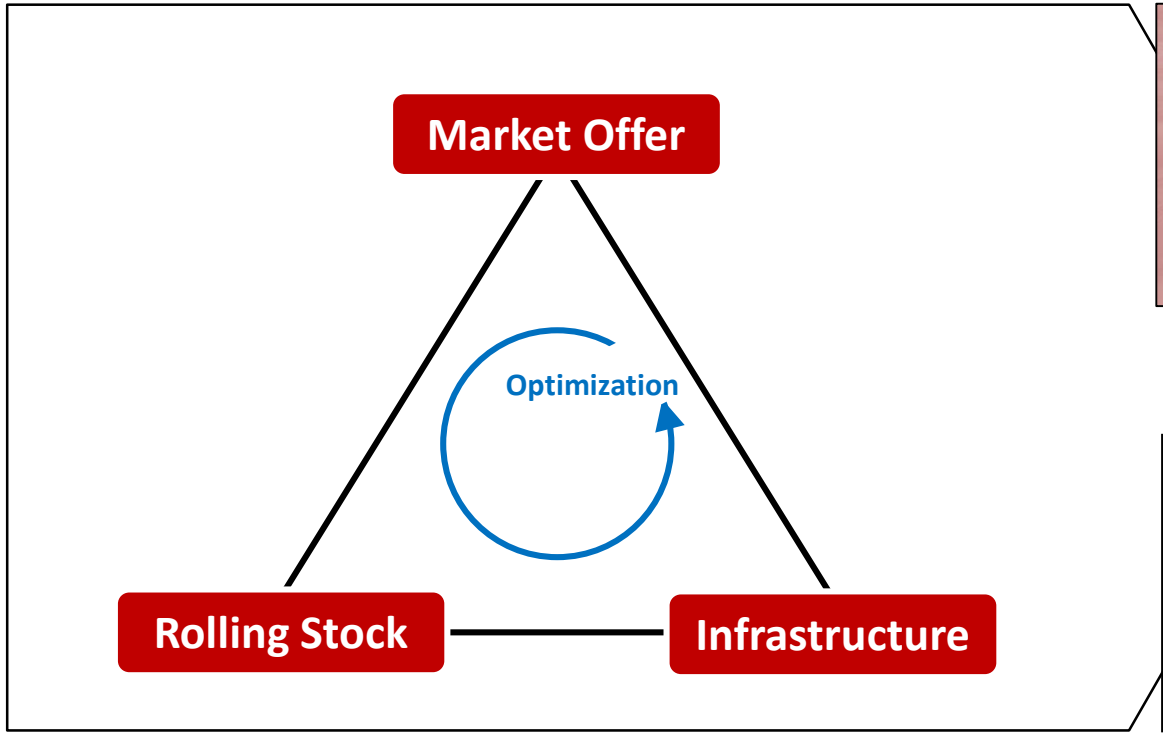


Agenda

1. General Planning Principles
2. Traffic Studies
3. Track layout
4. Rolling Stock
5. Timetable Planning
6. Infrastructure & Rolling Stock Maintenance
7. Conclusions

General Planning Principles

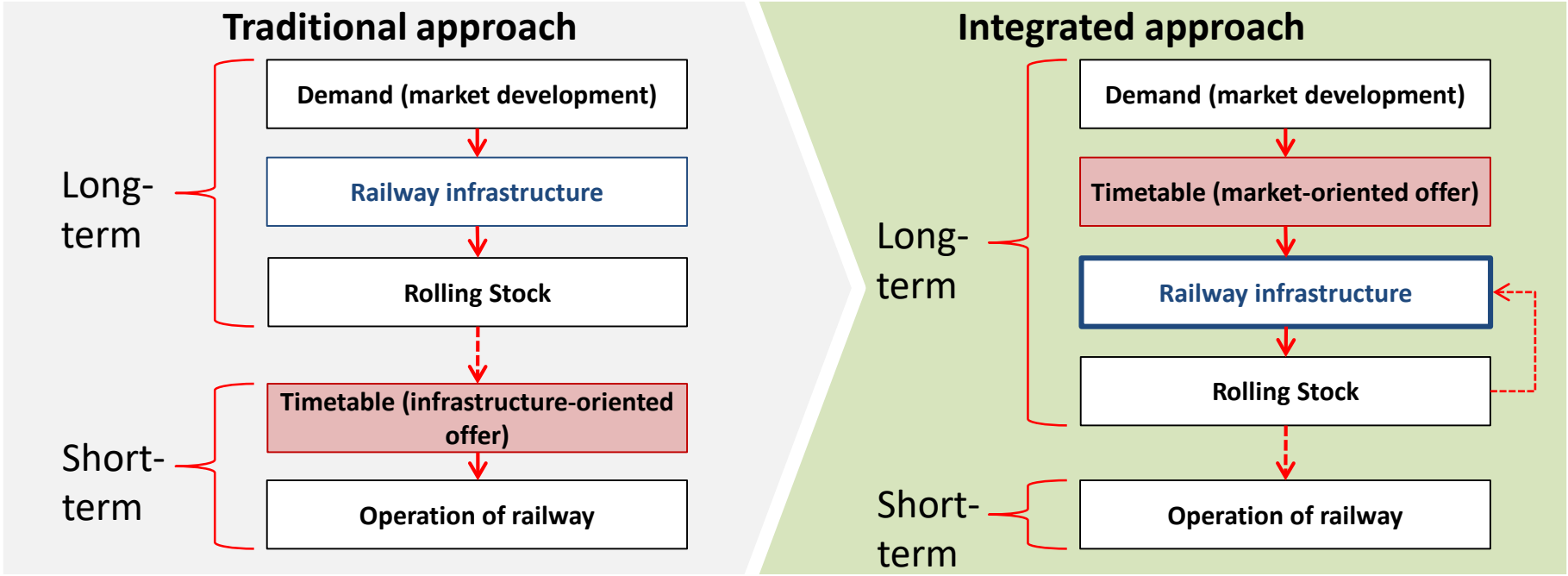
Integrated infrastructure optimisation means…..



….evaluating changes in each of the elements to optimize the system as a whole

….gaining information on the relationship of the elements and their ability to meet the market demands

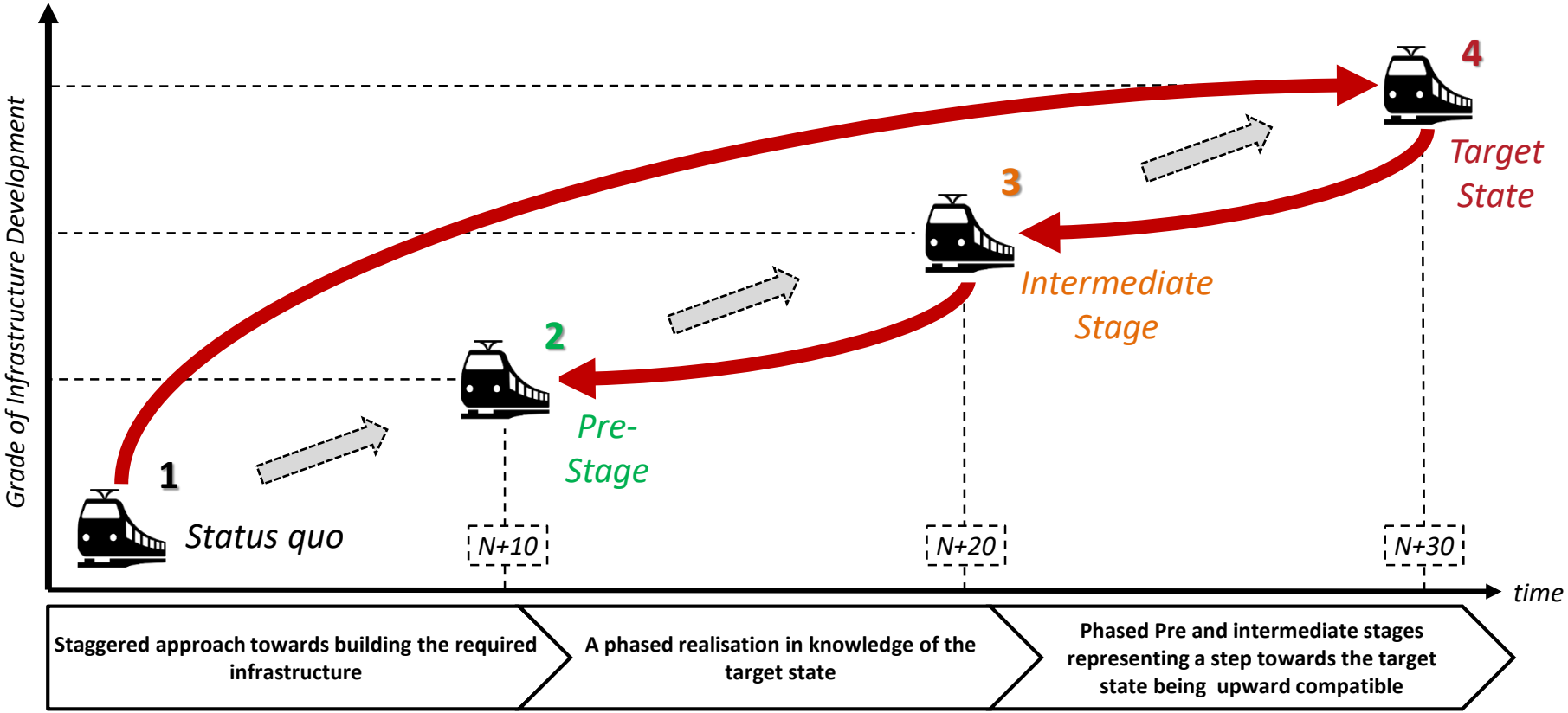
From traditional planning to an integrated approach - the + model



Integrating a market-oriented offer into the long-term planning process allows for an optimal infrastructure planning and realization

Source: BAV

Implementing an integrated infrastructure planning process



Traffic Studies

Freight train service

- **Consolidated forecast of freight volumes** based on **CBA** and **terminal studies** (Muuga, Salaspils, Kaunas)
- Overall **volumes translated** to **number of sample paths** to provide for **required flexibility** along the line
- Most of the **market potential** can be **expected to be raised** within the **first 10..15 years** of operation (2036/46)
- **Introduction of FinEst** link would **induce further traffic growth**, also on Lithuanian line sections
- Naturally, **highest volumes** expected on section **Palemonas – border PL/LT.**

→ **Provision of sufficient capacity with focus on time horizon 2036/46 and support for optional further growth (FinEst link scenario)**

→ **At least 2 freight paths per hour per direction (3 for 2036/46) required on section Kaunas - Poland to provide for necessary flexibility in timetabling and handling of traffic peaks**

Freight train service

Consolidated freight forecast

Line section	Total number of trains [train pairs/day]			
	2026	2036	2046	2056
Muuga - Salaspils	12	13	16	24
Salaspils - Kaunas triangle	14	15	18	25
Vaidotai - Kaunas triangle	13	15	16	18
Kaunas Triangle - Palemonas	19	22	26	31
Palemonas - border PL/LT	27	31	36	42
Kaunas Triangle East - Kaunas Triangle North	*4*	*4*	*4*	*6*
Kaunas Triangle North - Kaunas Triangle South	*10*	*11*	*14*	*19*
Kaunas Triangle South - Kaunas Triangle East	*9*	*11*	*12*	*12*

Required freight train paths (timetabling flexibility)

Line Section	Freight train paths per hour per direction			
	2026	2036	2046	2056
Muuga - Salaspils	1	1	1,5	2
Salaspils - Kaunas triangle	1	1,5	1,5	2
Vaidotai - Kaunas triangle	1	1,5	1,5	1,5
Kaunas Triangle - Palemonas	1,5	1,5	2	3
Palemonas - border PL/LT	2	2,5	3	3

Assumption: 22 operating hours per day on average

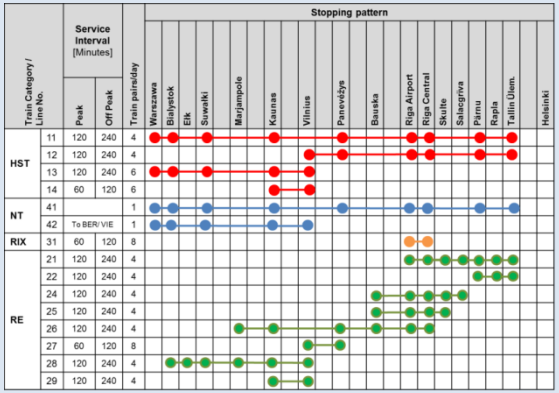
Passenger Train Service - 3 types of services

Long Distance High Speed Trains HST (234 km/h)	Night train services NT (200 km/h)	Regional Express trains RE (200 km/h)
▪ Direct trains Warszawa – Tallinn, Warszawa – Vilnius, Vilnius – Tallinn ▪ Basic headway: 120‘ (2026/2036/2046: not all slots used) ▪ Extension to Helsinki with opening of FinEst-Link	▪ 2 train pairs/d (Warszawa – Tallinn, Berlin/Vienna – Vilnius)	▪ Forecast carried out for the operational plan reveals significant potential in all three Baltic states ▪ Basic headway: 120‘ / partially 60‘ ▪ Integrated timetabling solution with RIX shuttle (30’/15’) ▪ Service designed to complement high speed train service (interconnectivity, filling timetable gaps) ▪ Assumption: Trains stop at all proposed intermediate stations

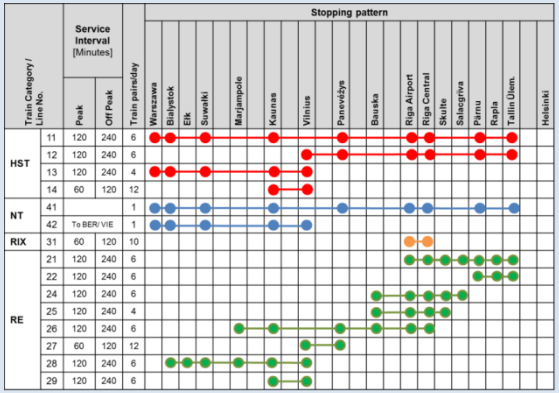
- Potential for substantially more passenger traffic compared to global CBA, also for Lithuania (e. g. regional trains to Panevėžys, Marijampolė, Kaunas - Vilnius)
- Interconnectivity regional trains / HST to be considered at Kaunas Central station as major hub and also at Vilnius, Panevėžys, RIX, Riga, Tallinn.

Passenger Train Service Pattern

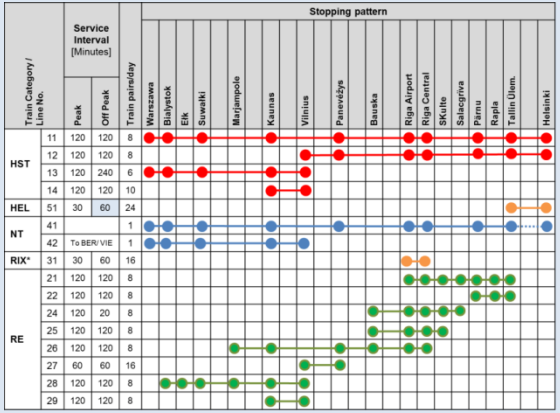
2026



2036/46

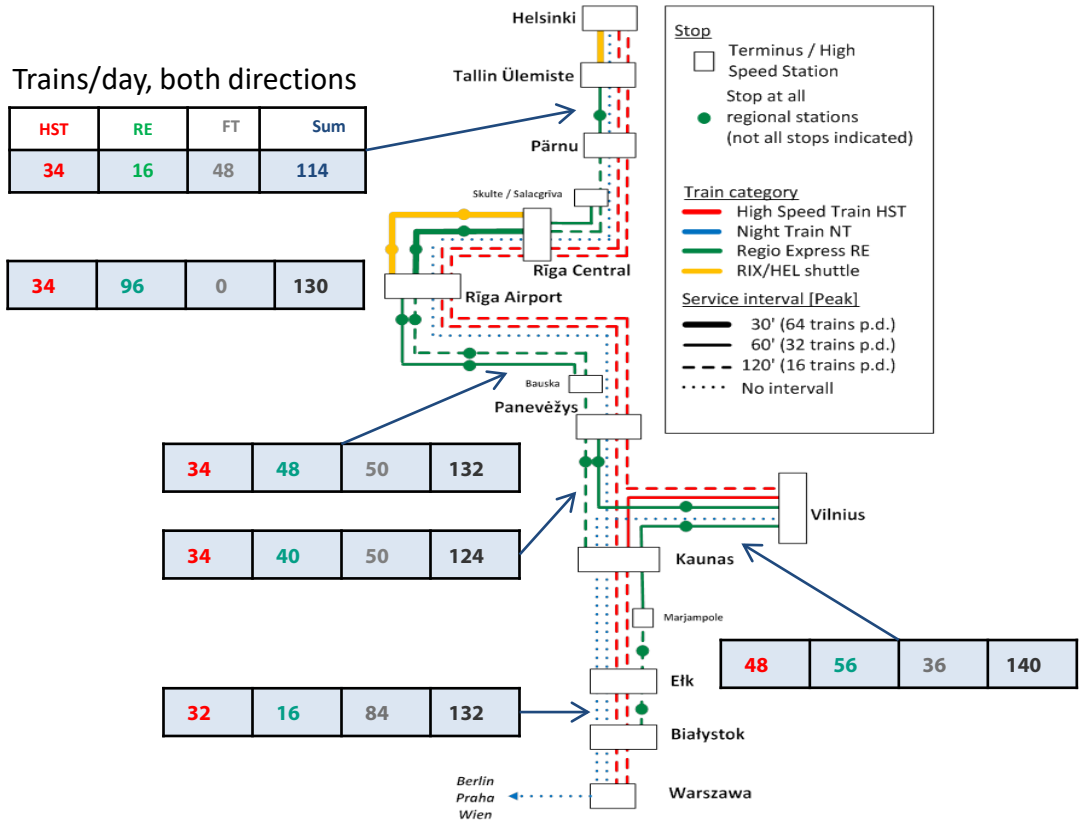


2056



- **Line-based concept** with fixed interval timetables following offer-oriented approach
- **All lines** assumed to be **operational** within **first ten years** of operation
- **Ramp-up of demand** within first 10 years of operation expected
- **Development of regional traffic** subject to further **implementing decisions by national authorities** in EE, LT and LV
- **Concept 2056** for passenger services as **realistic upper boundary**, not only dependant of FinEst link
- **Differences** between time periods mainly **regarding off-peak services** (more trains later)

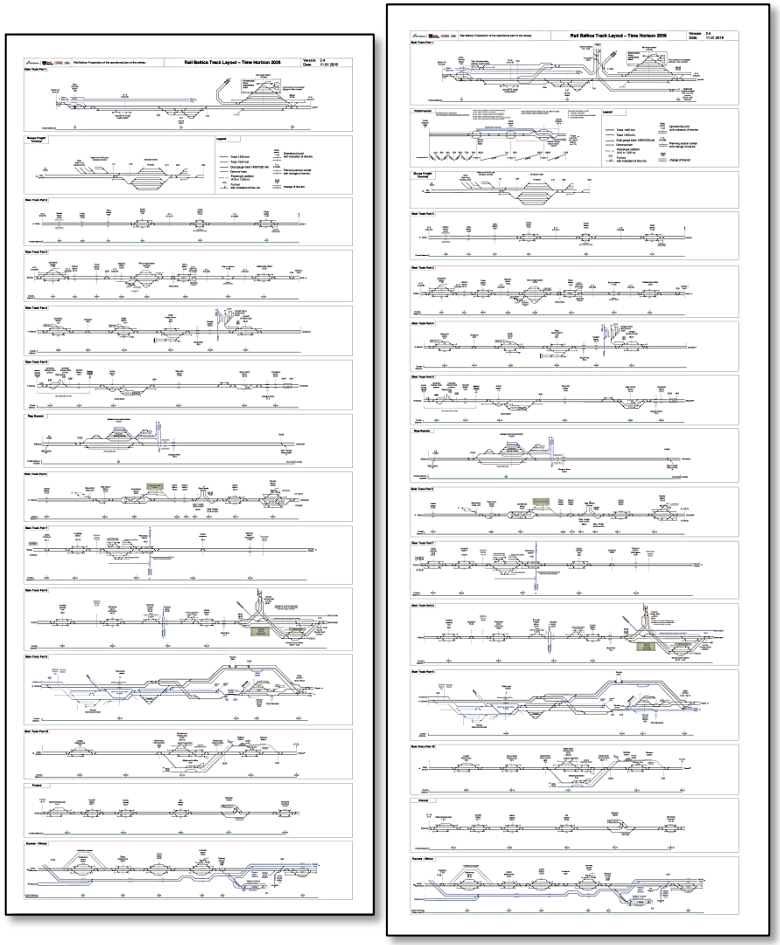
Passenger Train Service Pattern 2056



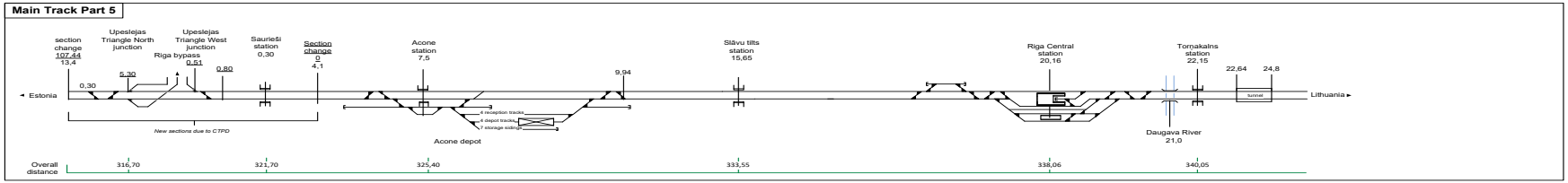
Track Layout

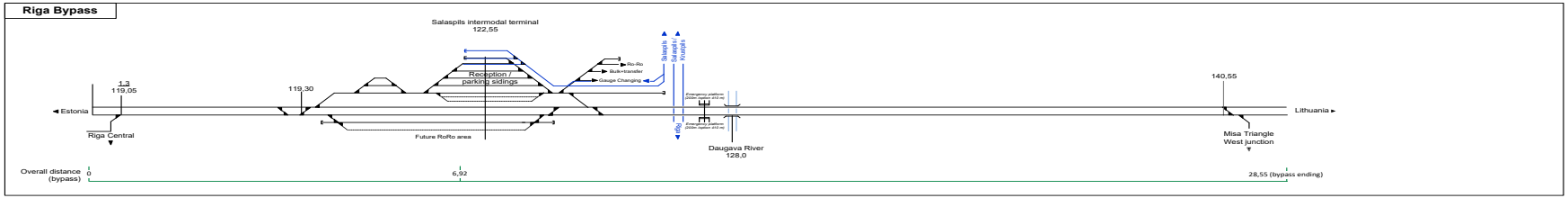
Track layout

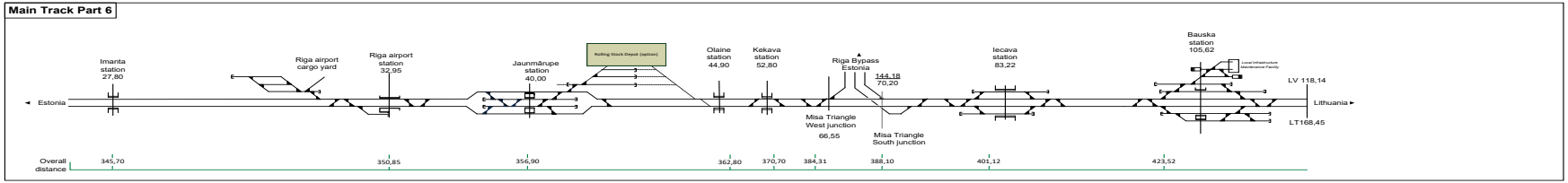
- **Iterative development** of a **track plan** based on the Preliminary Design for the Rail Baltica alignment in the three Baltic states including additional information from the stakeholders
- **For all time horizons** 2026/2036/2046/2056
- Overview of the infrastructure as **schematic track layout** indicating the **location of all operational points** (stations, passing loops, emergency crossovers, junctions, passenger stops).
- To be **updated** with the **continuation** of the **design and implementation process**



Track layout







Rolling Stock

Passenger traffic - fleet size

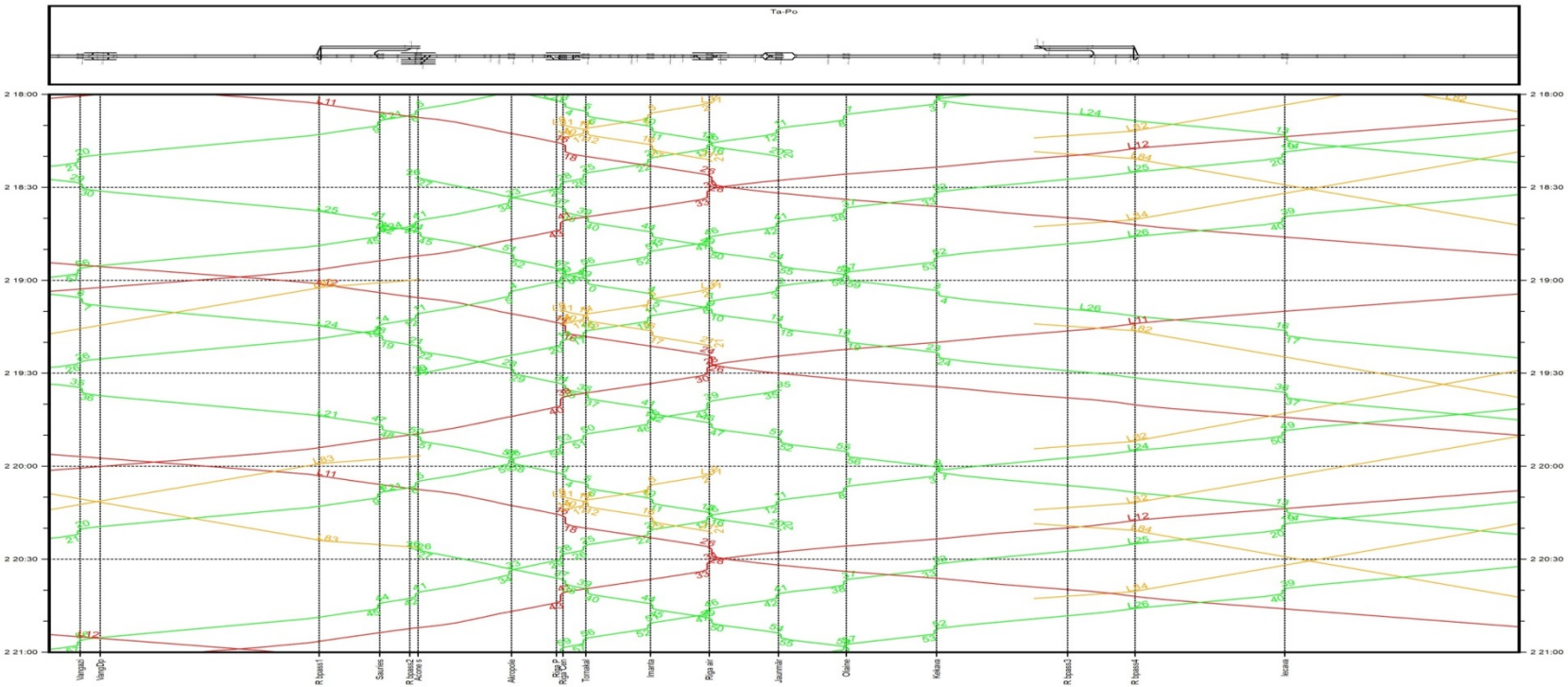
Train type	Line	Turnarounds and fleet size			
		2026	2036	2046	2056
HST	11 Warszawa - Tallinn/Helsinki	4	6	6	8
	12 Vilnius - Tallinn/Helsinki	3	5	5	7
	13 Warszawa - Vilnius	5	3	3	5
	14 Kaunas - Vilnius	3	6	6	5
	Total	15	20	20	25
	Reserve (15%)	3	3	3	4
	Total with reserve	18	23	23	29
NT	41 Warszawa - Tallinn/Helsinki	0	2	2	2
	42 Warszawa - Vilnius	0	2	2	2
	Total	0	4	4	4
	Reserve (15%)	0	1	1	1
	Total with reserve	0	5	5	5
RE/RIX/HEL	21 RIX - Tallinn	3	3	3	4
	22 Pärnu - Tallinn	1	2	2	2
	24 Bauska - Salacgrïva	1	2	2	2
	25 Bauska - Skulte	1	1	1	2
	26 Marijampolé - Riga	3	3	3	4
	27 Vilnius - Panevezys	3	3	3	4
	28 Bialystok - Vilnius	3	3	3	4
	29 Kaunas - Vilnius	1	1	1	1
	31 Riga - RIX	1	1	1	2
	51 Helsinki - Tallinn	0	0	0	4
	Total	17	19	19	29
	Reserve (15%)	3	3	3	5
	Total with reserve	20	22	22	34

List of possible EMU (excerpt)

Model	Builder	Train Control System	Electric current	Track gauge	homologated for track/structure clearance, structure gauge	Height	Axle arrangement (UIC classification)	Number of axles
Pendolino ED250	Alstom	ERTMS, SHP, Mirel, LZB/PZB	3 kV DC, 15 kV 16 2/3 Hz, 25 kV 50 Hz	1435	GB	4100	1A'A1'+1A'A1'+2'2'+2'2'+ 2'2'+1A'A1'+1A'A1'	28
SMILE EC 250	Stadler AG	ERTMS + 1 national	15 kV AC 16 2/3 Hz, 25 kV AC 50 Hz, 3 kV DC	1435	GB	4255	2'Bo'Bo'2'2'2'2'Bo'Bo'2'2'2'	24
Flirt3 (8 cars)	Stadler AG	ERTMS + 1 national	Multiple Possibilities	1435	GB	4185	Bo'2'2'2'2'+2'2'2'2'Bo'	20
Zefiro 300 (8 cars)	Bombardier Transportation	ERTMS + National Systems	15 kV AC 16.7 Hz., 25 kV AC, 50 Hz, 3 kV DC, 1.5 kV DC	1435	GB	4080	Bo'Bo'+2'2'+Bo'Bo'+2'2'+2'2'+Bo'Bo'+2'2'+Bo'Bo'	32
Dart	PESA	ERTMS, ETCS, SHP	15 kV AC, 16.7 Hz, 25 kV AC, 50 Hz, 3 kV DC, 1.5 kV DC	1435	GB	4300	Bo'2'Bo'2'2'2'2'Bo'	18
ICE 4 (7-cars)	Siemens Mobility	ERTMS, LZB, PZB	15 kV AC 16 2/3 Hz, 25 kV AC 50 Hz, 3 kV DC, 1,5 kV DC	1435	GB	4115	2'2'+Bo'Bo'+2'2'+Bo'Bo'+Bo'Bo'+2'2'+2'2'	28
Velaro D (8 cars)	Siemens Mobility	ERTMS + additional	15 kV AC 16 2/3 Hz, 25 kV AC 50 Hz, 3 kV DC, 1,5 kV DC	1435	GC	4343	Bo'Bo'+2'2'+Bo'Bo'+2'2'+2'2'+Bo'Bo'+2'2'+Bo'Bo'	32
Talgo 250	Patentes Talgo / Bombardier	ETCS L1, L2, LZB, ASFA	3 kV DC 25 kV AC 50 Hz	1435/1668	GB	4030	Bo'Bo'+1'1'1'1'1'1'1'1'1'1'1'+Bo'Bo'	20
Talgo 350	Patentes Talgo / Bombardier	ETCS L1, L2, LZB, ASFA	25 kV AC 50 Hz	1435	GB	4000	Bo'Bo'+1'1'1'1'1'1'1'1'1'1'1'1'+ Bo'Bo'	21
Talgo Avril	Patentes Talgo	ETCS L1, L2, LZB, ASFA	25 kV AC 50 Hz	1435/1668	??	??	Bo'Bo'+1'1'1'1'1'1'1'1'1'1'1'1'+ Bo'Bo'	21
Oaris (8 cars)	CAF Alstom	ERTMS + additional	15 kV AC 16 2/3 Hz, 25 kV AC 50 Hz, 3 kV DC	1435/1668	??	??	??	32
AT 300 (5 cars, 7 cars)	Hitachi Rail	ETCS L2 + additional	25 kV AC 50 Hz and diesel engine MTU 12V 1600 R80L	1435	GB	??	??	??
Javelin (A Train)	Hitachi Rail	ERTMS	25 kV AC 50 Hz 750 V DV	1435	GB	3820	2'2'-Bo'Bo'-Bo'Bo'-Bo'Bo'-Bo'Bo'-2'2'	24

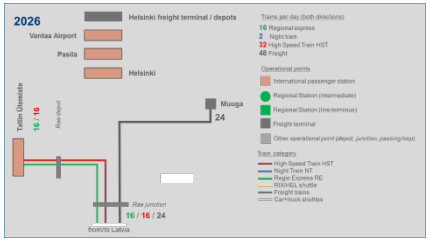
Timetable Planning

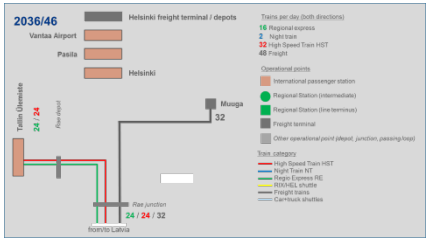
Timetable Vangazi - Iecava 2056

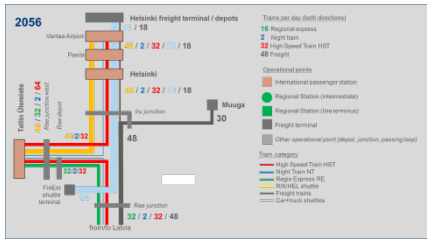


Timetable construction Tallinn

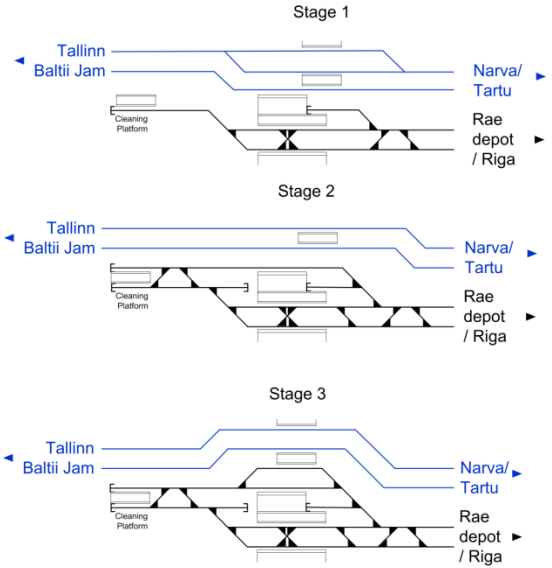
Tallinn node – traffic flows



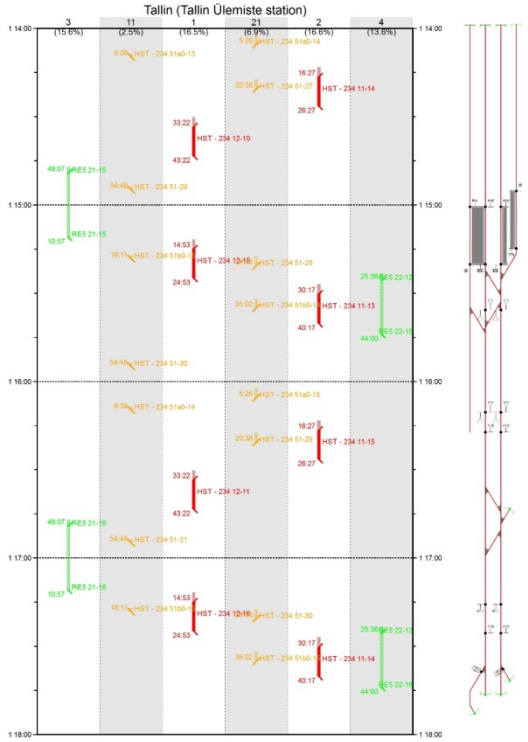




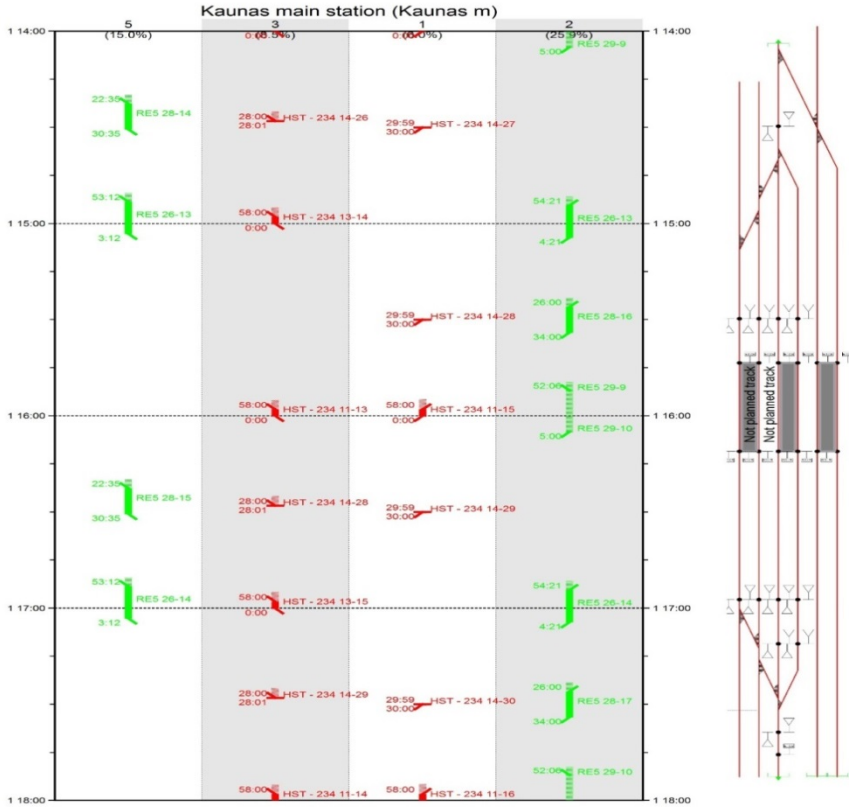
proposed track layout for Tallinn Ülemiste

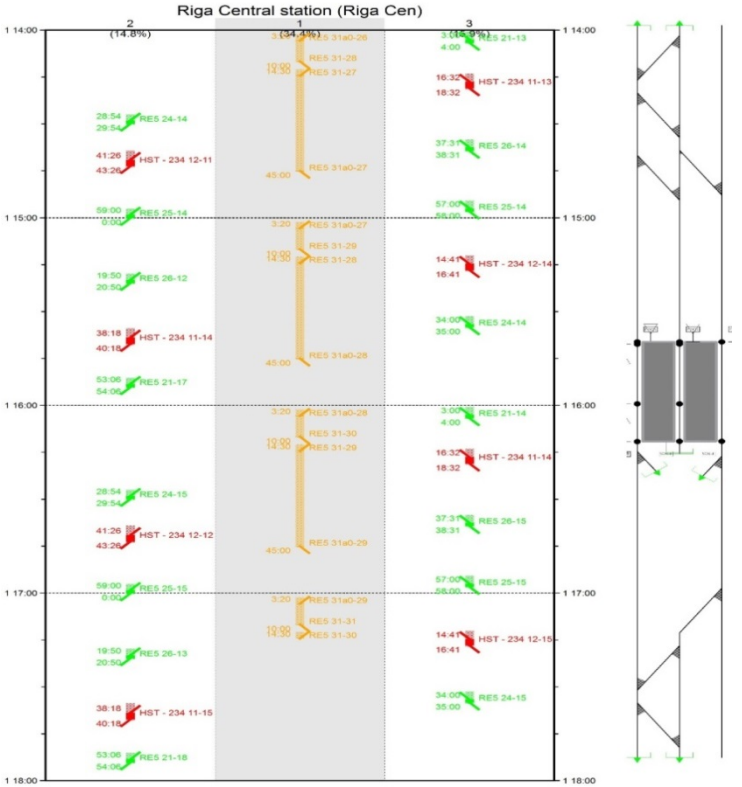


track occupation Tallinn Ülemiste – timetable 2056



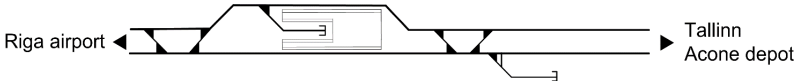
Timetable construction Kaunas & Riga





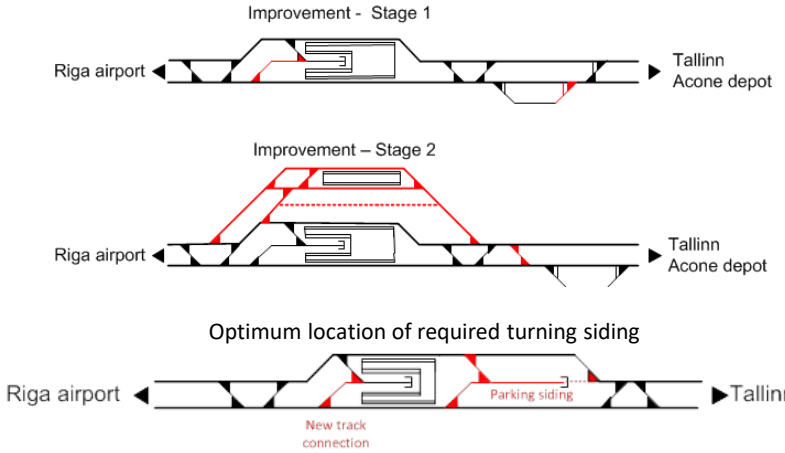
Infrastructure improvement at Riga Central Station

Original solution



- Entering the bay platform leads to train-path conflicts
- One turning track in the east usable only for regional trains (usable length < 200 m)
- Terminating longer trains from the south need to proceed as far as Acone depot (+11.6 km)
- Trains from the north are required to continue further south to Riga Airport station, which will also have very limited station track capacity, or alternatively to Jaunmārupe
- No room to handle additional trains during peak hours in 2056
- Change of train sequence not possible since there is no free waiting track for the train to be overtaken. Thus no prioritization possible of long-distance over regional express trains needed in case of failures and delays

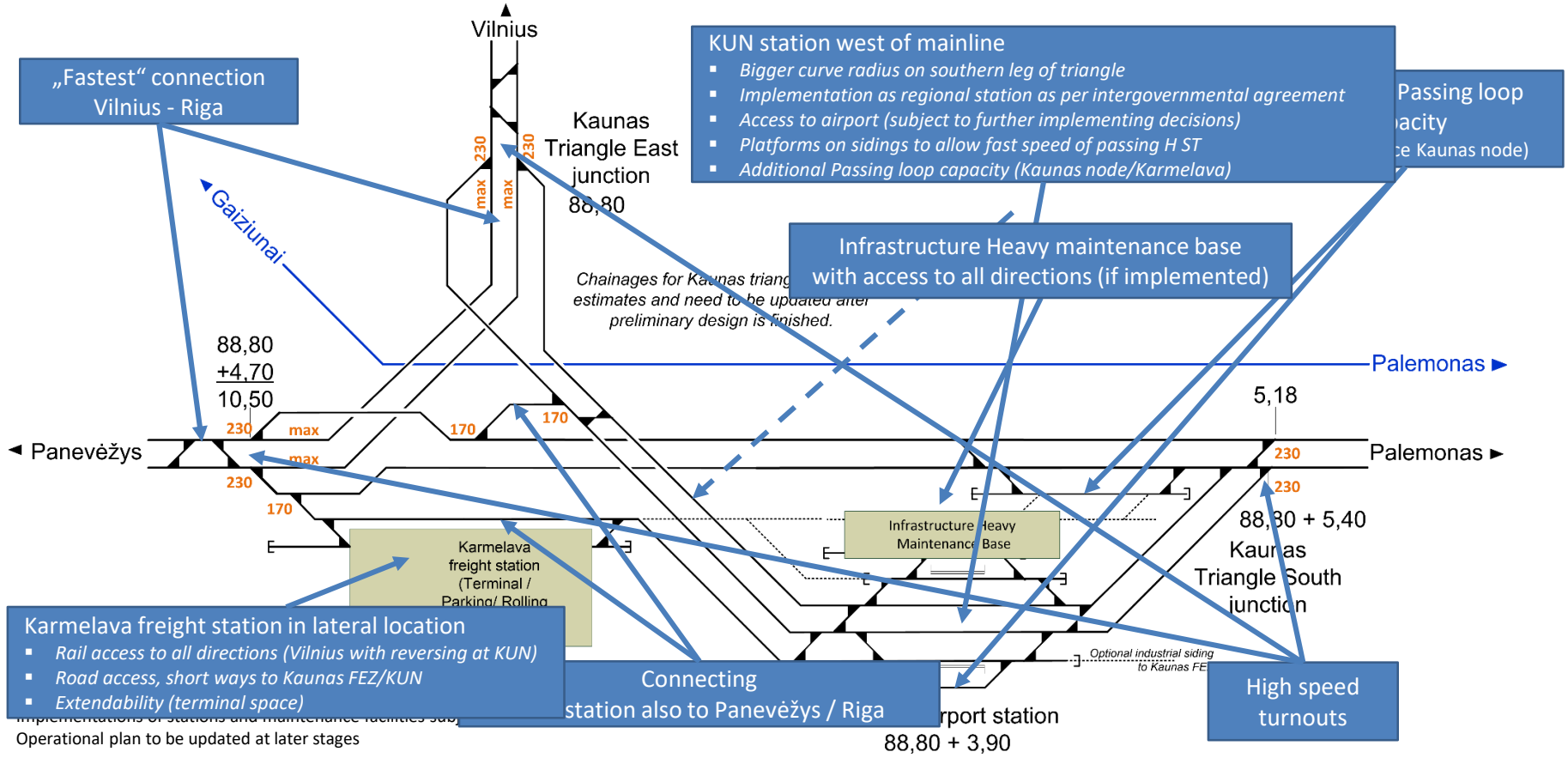
Suggested layout improvement



Advantages

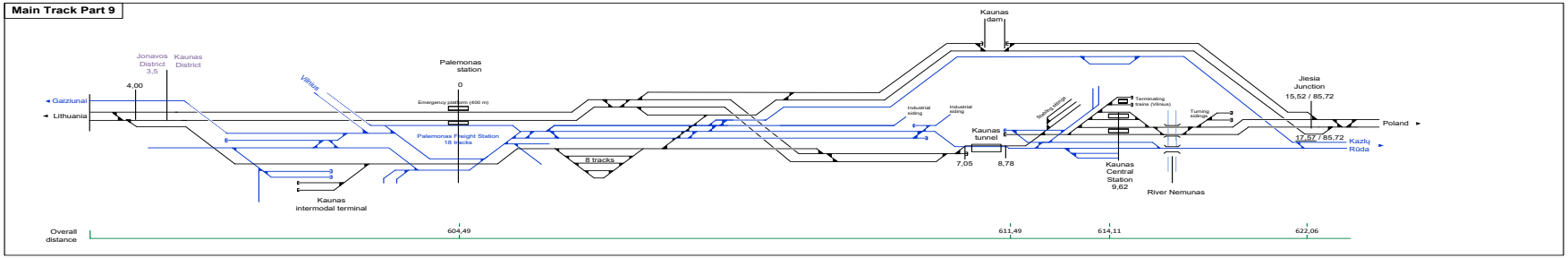
- Overtaking of delayed train in Riga Central station possible
- Beginning/terminating passenger train runs in the morning and evening, which might require additional platform occupation time
- Direction change of terminating services at the platform, also for HST services if needed
- Providing interconnectivity between 1435 mm HST and regional trains using adjacent platform edges
- Providing reserve capacity in case one platform tracks needs to be closed down for infrastructure maintenance work etc.
- Allowing longer scheduled stops of train services, e.g. to synchronize with 1520 mm timetable
- Providing additional capacity in case of prolonged platform occupation time

Track layout Kaunas triangle from an operational point of view



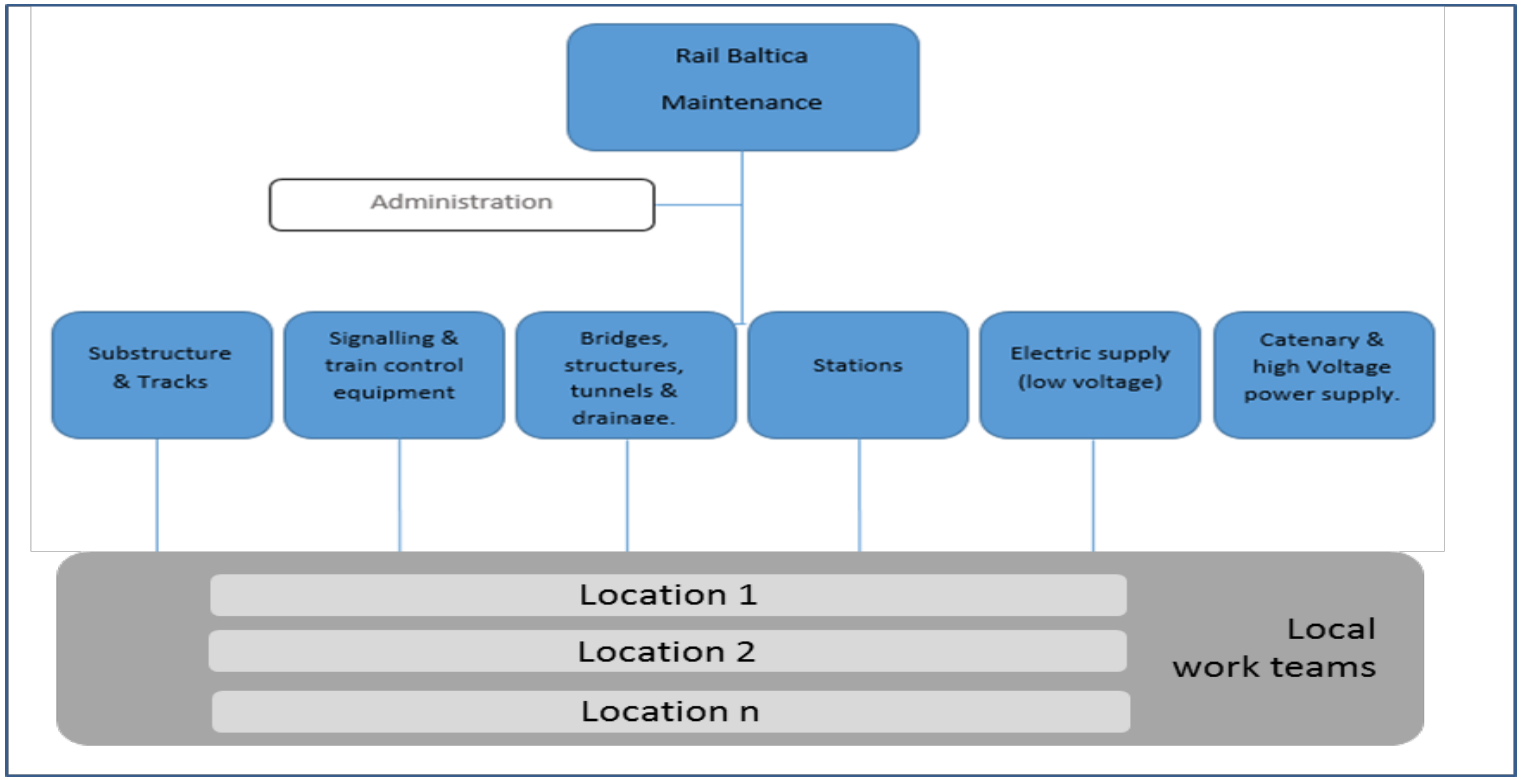
Conclusions on Kaunas Node

- Starting with single track solution is sufficient
- Detailed design study for Kaunas Central station to be carried out taking into account 1435mm/1520mm requirements
- With growing traffic double tracking 1435 mm Palemonas – Kaunas Central recommended
- Double tracking Kaunas Central – Jiesia lower priority, also depending on decision on Kaunas Central station layout (turning facility south of Nemunas river)
- Double track option to be considered in station/junction layouts (Palemonas, Kaunas Central, Jiesia)
- Timeline subject to decisions on regional traffic and service provision on Kaunas – Vilnius line

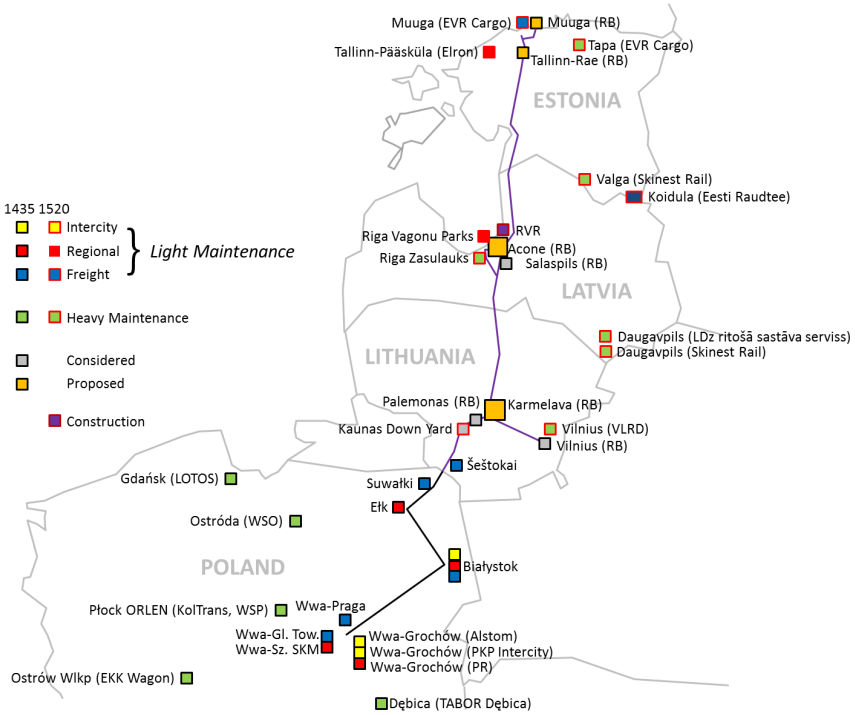


Infrastructure & Rolling Stock Maintenance

Infrastructure maintenance organisation



Existing, planned and proposed Rolling Stock Maintenance Facilities



Conclusions

Conclusions - I

- The **service pattern of regional services** has **to be confirmed and further developed** by the **regional and national authorities** as soon as possible to size infrastructure for first 20 years of operation.
- The **transnational train services** and **operational rules** between the **Baltic States and Poland** must be **coordinated** including the planning by **PKP PLK**, the **national** and **regional authorities** in **Poland**.
- The **future operation on the 1520 mm network** should be **further developed** in order to analyse the **interdependencies with operation on Rail Baltica** in more detail.
- **Need and technical requirements for freight train service** shall be **further elaborated** taking into account all relevant stakeholders. This process shall be **embedded in ongoing market research** activities for the **North Sea – Baltic rail freight corridor**.

Conclusions - II

- **Future 1435 mm network south of Kaunas** needs to be **finally decided** regarding **interconnectivity** to already existing single track line sections (Trakiszki -) Mockava – Šeštokai – Marijampolė -Kazlų Rūda– Jiesia and **future location** of the **regional passenger station at Marijampolė**.
- More **detailed investigations** incl. **timetable stability analysis** to prove functionality of proposed **infrastructure layout in Kaunas node** and to choose the final infrastructure layout.
- **Station track layout and location of passing loops** shall be **further detailed** based on **elaboration of operational plan** during further design stages (spatial planning, technical design).

Operational plan should be updated annually to reflect the latest planning stages