Timetabling and Capacity Redesign (TTR)

TTR Pilots
Evaluation Phases 1 -3

Version 1.2

Please note that this TTR document is a working document and might be subject to changes based on further experience gathered in the pilots and findings of the TTR working groups.

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Versioning

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0.1	24-06-2020	Daniel Haltner	First proposal
0.2	16-07-2020	Daniel Haltner	Inclusion of text contributions from the Antwerp – Rotterdam and Brenner pilots and IT (ECMT)
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1.0	01-10-2020	Philipp Koiser	Finalization after approval by TTR PMO
1.1	09-03-2021	Philipp Koiser	Draft update with findings from phase 3
1.2	03-08-2021	Philipp Koiser	Draft enhanced with quantification from pilots phase 3

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1. Introduction to this document

The RNE General Assembly and FTE Plenary Assembly agreed to implement TTR. This implementation plan contained the need to conduct pilots to test new TTR components. The aim of this document is to analyse the experiences with the first two phases and to draw conclusions for the implementation of TTR.

2. Organisation and set-up of the TTR Pilots

The Pilots are conducted on three lines and one network:

- Mannheim – Miranda de Ebro on RFC Atlantic
- Munich – Verona on RFC ScanMed
- Rotterdam – Antwerp on RFC NS-M & High-speed line Zuid
- ÖBB Network

Each Pilot is organised in core teams and advisory boards, in which all stakeholders are included with their specific project role. To steer the four Pilots, a TTR Pilot Board has been set up. It consists of:

- Project leader
- Representative of the TTR Steering Committee
- Representative of the TTR Programme Management Office
- Pilot line representatives
- Experts from other TTR projects (project leaders and deputies)

3. Activities and deliverables

3.1 Governance

3.1.1 Mannheim – Miranda de Ebro (RFC Atlantic)

A project structure was created in the very early phase of this pilot. From the side of the applicants, four RUs were willing to participate actively in the Pilot organisation only. An increase of dedicated resources for the TTR Pilot as well as higher management attention within SNCF Réseau made it possible to get the Pilot in line after all.

3.1.2 Munich – Verona

The project organisation included not only the three involved IMs DB Netz, RFI and ÖBB but also a vast majority of the applicants on this line. In addition, the Regulatory Bodies add an active role. The involvement of the applicants took place primarily in form of workshops.

3.1.3 Rotterdam – Antwerp

Particularly noteworthy on this Pilot is the broad structure with an IM and RU core team each and an Advisory Group with the participation of various stakeholders (ministry of transport, regulatory bodies, terminals, ports, etc.).

3.1.4 ÖBB Network

In view of the fact that only one IM is involved in this Pilot, a broad-based organisation was not setup. The inclusion of potential participants (ministry of transport, regulatory body, applicants, neighbouring IMs) was situation or event-related.

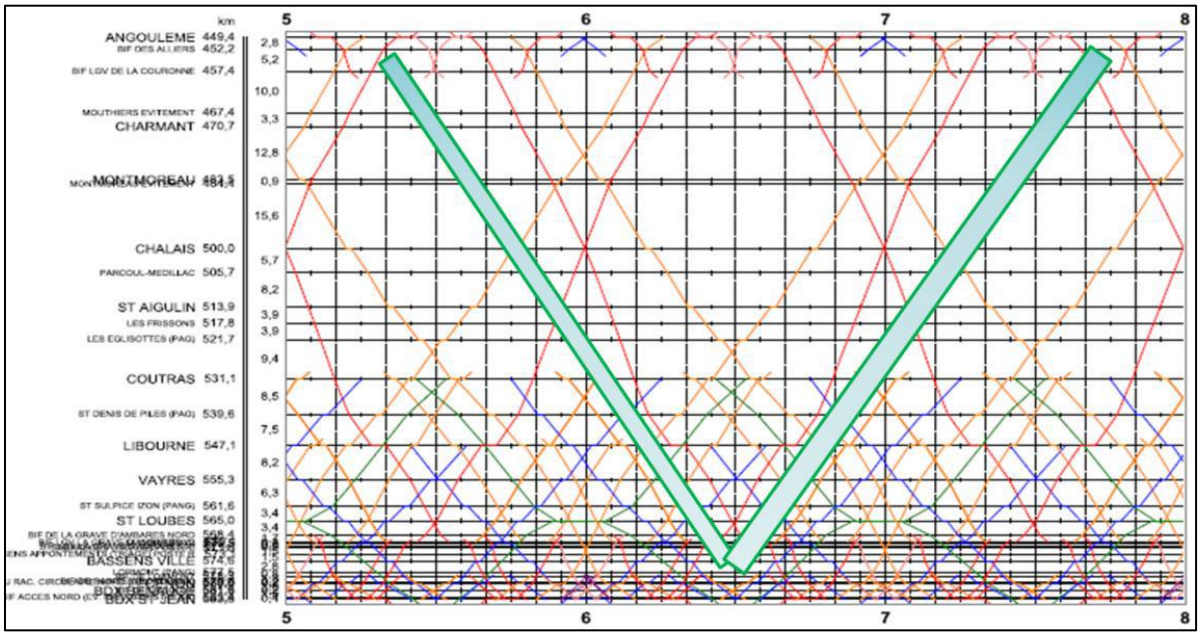
3.2 Phase 1: Capacity partitioning and capacity planning

The goal of pilot phase 1 is to create capacity models with capacity partitioning for TT 2020. The capacity models of the Pilot lines should be comparable with each other. The capacity models created in this phase will encompass the complete capacity on the pilot lines.

3.2.1 Capacity model

3.2.1.1 Mannheim – Miranda de Ebro (RFC Atlantic)

The preparation and implementation of capacity models for the TT 2020, 2021 and 2022 was due to the length of this Pilot line a very challenging topic, especially from the TCRs point of view. The creation of the first capacity model for TT 2020 had to be stopped due to too many TCRs that were not stable enough. In addition, it was not possible to change the working behaviour of the colleagues in the TT Dept. as they continued to work the traditional way. Based on the lessons learned from the elaboration of the first capacity model and also the increased knowledge about TTR on board level, the preparation of the next capacity model (for TT 2021) was more successful. However, due to TCRs with high impact in France the capacity offer (cap. bands) was of a low quality and also the volume was on a low level (4 cap. bands for ATT, 1 cap. band for RP traffic).

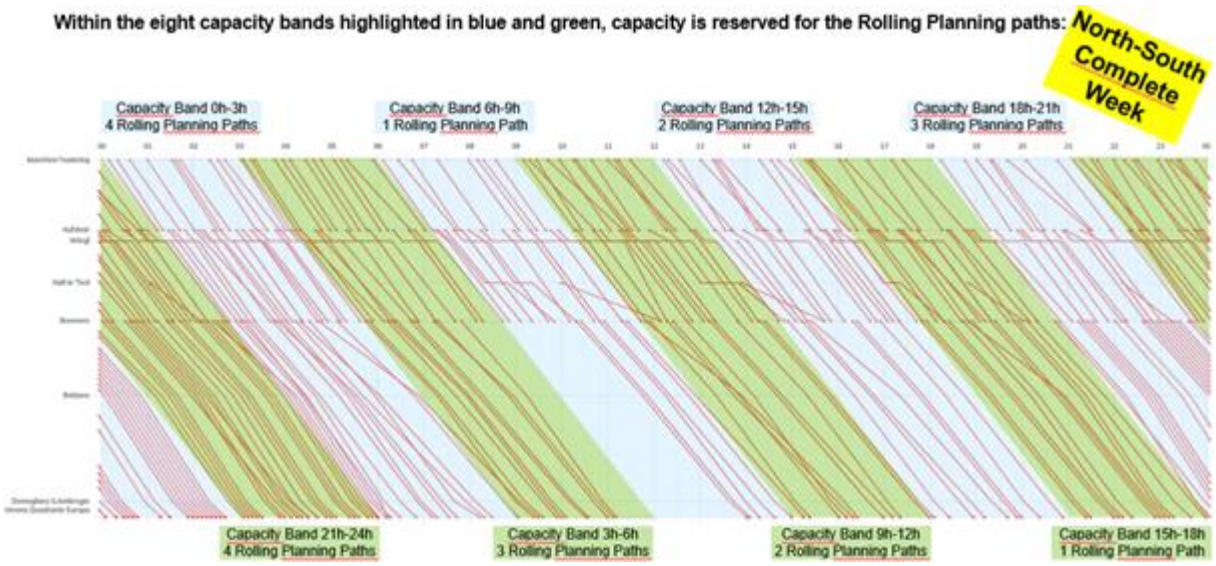


Possible visualisation of the cap. model for TT 2022

3.2.1.2 Munich – Verona

Applicants were willing to define their possible market needs in an early phase in order to support the preparation of the capacity model. Another influencing factor are the TCR. As on this line, there is already a well-rehearsed team of IM experts, the so-called “Brenner Group”. They took over the role of coordinating the TCRs. Based on all this information the capacity model was created for the first time for TT 2020. 20 paths per day and per direction (Munich

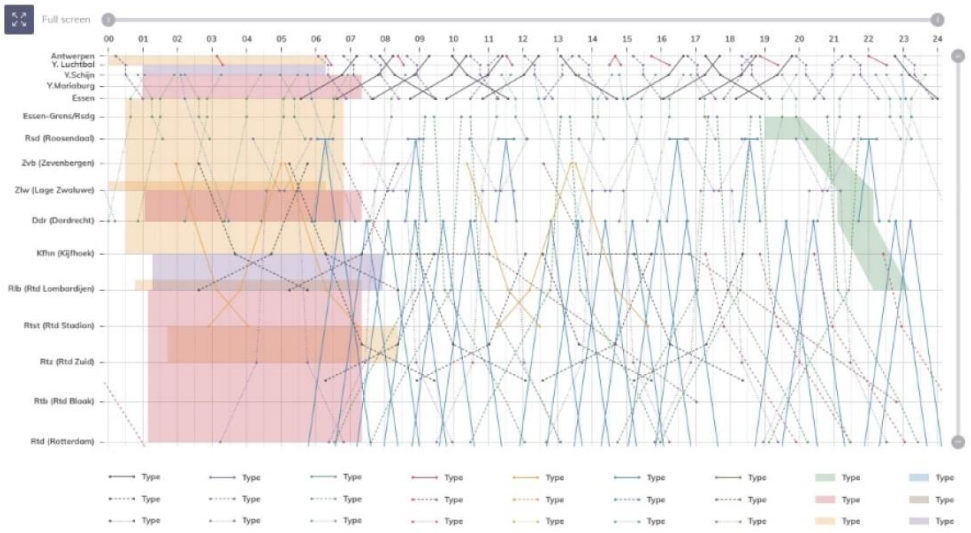
– Verona and Verona – Munich) were offered for TT 2020 and again for TT 2021. The capacity model consists of eight 3h-capacity bands during the whole day with different offers of Rolling Planning paths. Additional Rolling Planning paths were provided in the evening and at night at the request of the applicants. A later update of this model showed that the inputs of the applicants differed a lot from the early announcements.



Cap. model for TT 2020, indicating the capacities for freight traffic only

3.2.1.3 Rotterdam – Antwerp

The compilation of the market needs was mainly based on the experience of the two IMs, as path users – especially freight customers – had great difficulty in quantifying their future traffic. The very first capacity model consisted of several Excel spread-sheets: one for the first 12 hours of the day, another one for the second 12 hours, both of them for each day of the week and for both directions. A lot of human resources was necessary for the elaboration of the first capacity model (TT 2020).
These early experiences with the great manual effort involved in the creation of a capacity model have led to the development of an Electronic Capacity Model Tool (ECMT) at RNE. The availability of the ECMT tool has already led to a reduction of the effort for the creation of the 2nd capacity model (TT 2021). The capacity model for TT2021 includes all trains on the two lines, both national and international, passenger and freight. It also includes reservations for Rolling Planning slots, PaPs and freight paths for annual planning. Finally, TCR's and maintenance windows on the detailed level of calendar days, are included in the model. Conflicts between paths and TCR's are solved by adapting the validity of the paths.



Cap. model for TT 2021, visualised in ECMT

3.2.1.4 ÖBB Network

After it had already become apparent at the beginning of the launch of the Pilots that isolated solutions with a single route would lead to various problems (especially for trains which start/end outside the Pilot routes), ÖBB-INFRA offered to carry out another pilot with the entire network of the main routes. However, during the implementation it became clear that a gradual introduction would be more appropriate.

Therefore, the first capacity model focussed on the Austrian part of the Baltic – Adriatic RFC. The approach chosen was based on a systematisation of paths reflecting known market needs. The volumes for the capacity model were derived from traffic forecast 2025+ of the Austrian ministry of transport. The segmentation of the system path sections took the production and operation requirements of the applicants into account. The characteristics of the system path parameters referred to the corresponding line sections and derived from existing traffic.

3.2.1.5 Electronic Capacity Model Tool (ECMT)

As already described in the creation of the capacity model for the Antwerp – Rotterdam Pilot, the enormous resource requirements for the preparation of a capacity model was the main point of criticism in phase 1. RNE has made itself available to remedy this by developing a relatively easy-to-use tool for supporting the Pilots. The version of the ECMT was using the Excel file as a presentation layer and MS Access as a database layer of the application. The data management was originally created in the Excel file, but later put in the MS Access forms, that was much manageable. The first capacity models, using this version of the tool were published in the January 2019.
Even though the capacity models were successfully created and published in the first version of the tool, it was realized that the tool should be developed as a web application to support some additional functionalities. The reason for that were the limitations in the Excel to implement all the necessary functions and possibility to be used by multiple users in the same time. Therefore, the new version of the ECMT was developed as a web application. The most important and main functionality of the application is the space-time diagram presentation of the selected lines and objects according to the search criteria. Users can zoom among the axis (vertical axis for locations and horizontal axis for the time), to present more details.

Currently, the application is stand-alone that means that all the objects (lines, locations, TCRs, capacity bands, pre-arranged paths, paths, etc) must be entered manually or imported via Excel file. The plan is that, by the end of the 2020, the topology infrastructure data will be synchronized with RNE BigData database. Also, the application is well prepared to exchange TCR data with the TCR Tool and only the interface in the TCR Tool is expected. The ECMT will be able to show the conflicts between TCR days and published capacity, which will be a huge benefit to see which paths and capacities are affected by the TCR.
It is plan that the ECMT serves as the 'Capacity Hub' module, defined in the TTR IT Landscape, and covers all the defined functionalities. In the TTR Pilots, the ECMT was also used to describe the capacity supply, not only for capacity models.

3.2.2 Capacity planning

3.2.2.1 Mannheim – Miranda de Ebro (RFC Atlantic)

Good quality paths have been designed based on customers' requirements on the journey Mannheim – Miranda de Ebro. Indeed, due to the high volume of TCRs in this scope, with bottlenecks on some nodes this capacity couldn't be offered through regular paths. In order to fulfil market needs and TCRs for renewal/maintenance that had to be done, some virtual bandwidths have been defined in order to contain TCRs during the entire TCRs scheduling process (starting from X-30, bandwidths are defined considering paths requirements with an additional margin in order to prevent critical "unknown" TCRs that might pop-up).

As existing IT Systems do not handle properly those capacity bandwidths, so-called support paths have been designed. Those paths are coordinated between IMs and monitored regularly through TTR Atlantic Pilot steering meetings (RU/IMs meeting and IM's taskforce). Those paths cannot be requested "directly" by RUs, instead the published "average path" should be used for the request.

ECMT has not been used to TT 2021, as it was impossible at this time to deal with path with overnight criteria. For that reason, TTR Atlantic Pilot Capacity Model was published within its Pilot Information Document (PID).

3.2.2.2 Munich – Verona

The origin for the capacity planning is always the work of the Brenner Group. This trinational group prepares every November the planning for the construction of all possible rail freight paths on the Brenner route. Also, the TCRs on the Brenner route are coordinated by the Brenner Group. The RUs are asked how big the share of their whole traffic on the Brenner route is dynamic traffic (potential for Rolling Planning) and if they expect a growth of their traffic. On the Brenner Pilot it is an agreement between the IMs and RUs to offer 20 paths per day and per direction. This is the basis for the capacity model which is published x-11 on the RNE homepage and in the ECMT.

3.2.2.3 Rotterdam – Antwerp

The capacity planning in the capacity model has been synchronised with the hourly patterns for system paths in the planning systems of Infrabel and ProRail. Rolling Planning paths and reservations for PaPs were added to the national systems. TCR's were added to the model and were updated afterwards based on the formal TCR publication of ProRail and Infrabel.

3.2.2.4 ÖBB Network

For the Pontebbana Pilot route, ÖBB-INFRA started the capacity planning with taking all freight capacities used in the previous year into consideration and furthermore planned

additional system paths on that route. With the resulting path offer, the capacity model was created and published. After the path allocation for TT 2021, an update on available capacity and an evaluation of the use of the different TTR products by the customers will be carried out. As freight customers requested more or less the same number of paths, a first assumption leads to the tendency that there won't be a lot of demand for Rolling Planning paths.

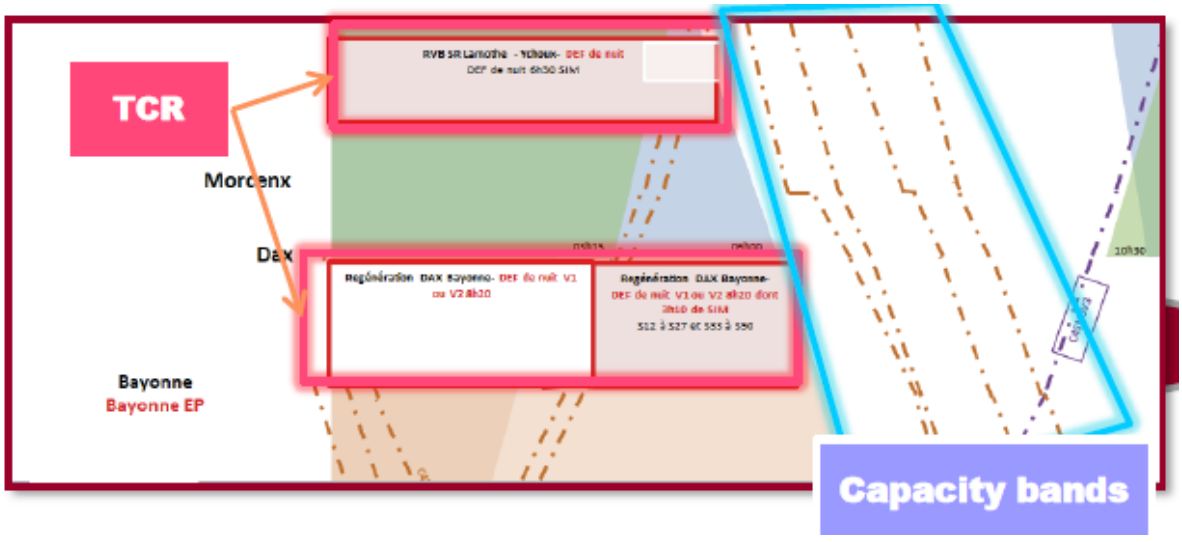
3.3 Phase 2: Capacity publication and capacity requests

3.3.1 Publication (Capacity supply)

The developed capacity model was also used to publish the available capacity supply. Unfortunately, the term has not been changed either. This has given the impression that the capacity model is the same as that for the bookable offer. For the future, the term "capacity model" should no longer be used after X-16 (start of cap. planning). This is because it is not necessary that an IM publishes all capacities for ATT and RP that are partitioned in the capacity model for future requests. Instead of "capacity model", the term "capacity supply" should be used for the publication.

3.3.1.1 Mannheim – Miranda de Ebro (RFC Atlantic)

A virtual path in the middle of a broad unique bandwidth was published in January 2020 in PCS. This template can be used by the applicants to set-up a path request based on their needs.



Cap. supply for TT 2021

3.3.1.2 Munich – Verona

On this Pilot, the available capacity for freight trains for both TT periods 2020 and 2021 was published in the same format as the capacity model (see figure in 3.2.1).

3.3.1.3 Rotterdam – Antwerp

The first publication for the available capacity for TT 2020 was an Excel overview including pre-arranged paths as well as paths for ATT and Rolling Planning needs.

note	parameter code	arr	dep	arr	dep	arr	dep	National ID	parameter code	arr	dep	arr	dep	arr	dep
	05PROR05		00:04	00:44	00:44	00:52		68201	02INFRA32		00:52		01:08	01:13	
Tuesday to Saturday from Roosendaal	05PROR04		00:34	01:14	01:17	01:26		68203	02INFRA32		01:26		01:43	01:47	
Path reserved for TTR pilot Rolling Planning: available as RFC NSM PaP from X-4 via PCS ; Tuesday to Saturday from Roosendaal	05PROR05		01:04	01:44	01:44	01:52		62101	02INFRA32		01:52		02:09	02:13	
Tuesday to Saturday from Roosendaal	05PROR04		01:34	02:14	02:17	02:26		68205	02INFRA32		02:26		02:43	02:47	
Tuesday to Saturday from Roosendaal	05PROR05		02:04	02:44	02:44	02:52		62103	02INFRA32		02:52		03:09	03:13	
Tuesday to Saturday from Roosendaal	05PROR04		02:34	03:14	03:17	03:26		68207	02INFRA32		03:26		03:43	03:47	
Path reserved for TTR pilot Rolling Planning: available as RFC NSM PaP from X-4 via PCS ; Tuesday to Saturday from Roosendaal	05PROR05		03:04	03:44	03:44	03:52		62105	02INFRA32		03:52		04:09	04:13	
Tuesday to Saturday from Roosendaal	05PROR04		03:34	04:14	04:17	04:26		68209	02INFRA32		04:26		04:43	04:47	
Tuesday to Saturday from Roosendaal	05PROR05		04:04	04:44	04:44	04:52		68211	02INFRA32		04:52		05:09	05:13	
Path reserved for TTR pilot Rolling Planning: available as RFC NSM PaP from X-4 via PCS ; Tuesday to Saturday from Roosendaal	05PROR04		04:34	05:14	05:17	05:26		62107	02INFRA32		05:26		05:43	05:47	
aP published for RFC North Sea - Baltic (RFC8) direction EW ; connection to Bad Bentheim	08PR6	04:44	05:04			05:52		68361	02INFRA32	05:52	05:52		06:09	06:13	
	05PROR04		06:34	07:14	07:17	07:26		62109	02INFRA31		07:26		07::43	07:47	
Path reserved for TTR pilot Rolling Planning: available as RFC NSM PaP from X-4 via PCS	05PROR04		07:34	08:14	08:17	08:26		62111	02INFRA31		08:26		08:43	08:47	
aP published for RFC North Sea - Baltic (RFC8) direction EW ; connection to Bad Bentheim	08PR6	07:44	08:04			08:52		68351	02INFRA31	07:52	07:52		08:09	08:13	
aP published for RFC North Sea - Baltic (RFC8) direction EW ; connection to Bad Bentheim	08PR6	07:44	08:34			09:26		68351	02INFRA32	08:52	08:52		09:09	09:13	
	05PROR05		10:04	10:44	10:44	10:52		62113	02INFRA32		10:52		11:09	11:13	
Path reserved for TTR pilot Rolling Planning: available as RFC NSM PaP from X-4 via PCS	05PROR04		10:34	11:14	11:17	11:26		62115	02INFRA32		11:26		11:43	11:47	
Path reserved for TTR pilot Rolling Planning: available as RFC NSM PaP from X-4 via PCS	05PROR05		12:04	12:44	12:44	12:52		62117	02INFRA32		12:52		13:09	13:13	
Path reserved for TTR pilot Rolling Planning: available as RFC NSM PaP from X-4 via PCS	05PROR04		12:34	13:14	13:17	13:26		62119	02INFRA32		13:26		13:43	13:47	
	05PROR05		14:04	14:44	14:44	14:52		62121	02INFRA32		14:52		15:09	15:13	
Path reserved for TTR pilot Rolling Planning: available as RFC NSM PaP from X-4 via PCS	05PROR04		14:34	15:14	15:17	15:26		62123	02INFRA32		15:26		15:43	15:47	
	05PROR04		15:34	16:14	16:17	16:26		68213	02INFRA31		16:26		16:43	16:47	
aP published for RFC North Sea - Baltic (RFC8) direction EW ; connection to Bad Bentheim	08PR6	15:44	16:04			16:52		68355	02INFRA31	16:52	16:52		17:09	17:13	
	05PROR04		16:34	17:14	17:17	17:26		68215	02INFRA31		17:26		17:43	17:47	
aP published for RFC North Sea - Baltic (RFC8) direction EW ; connection to Bad Bentheim	08PR6	15:44	16:34			17:26		68355	02INFRA32	17:26	17:26		17:43	17:47	

Cap. supply for TT 2020

For TT 2021, the capacity was again published in an Excel table, but this time with an indication on the availability for every single calendar day.

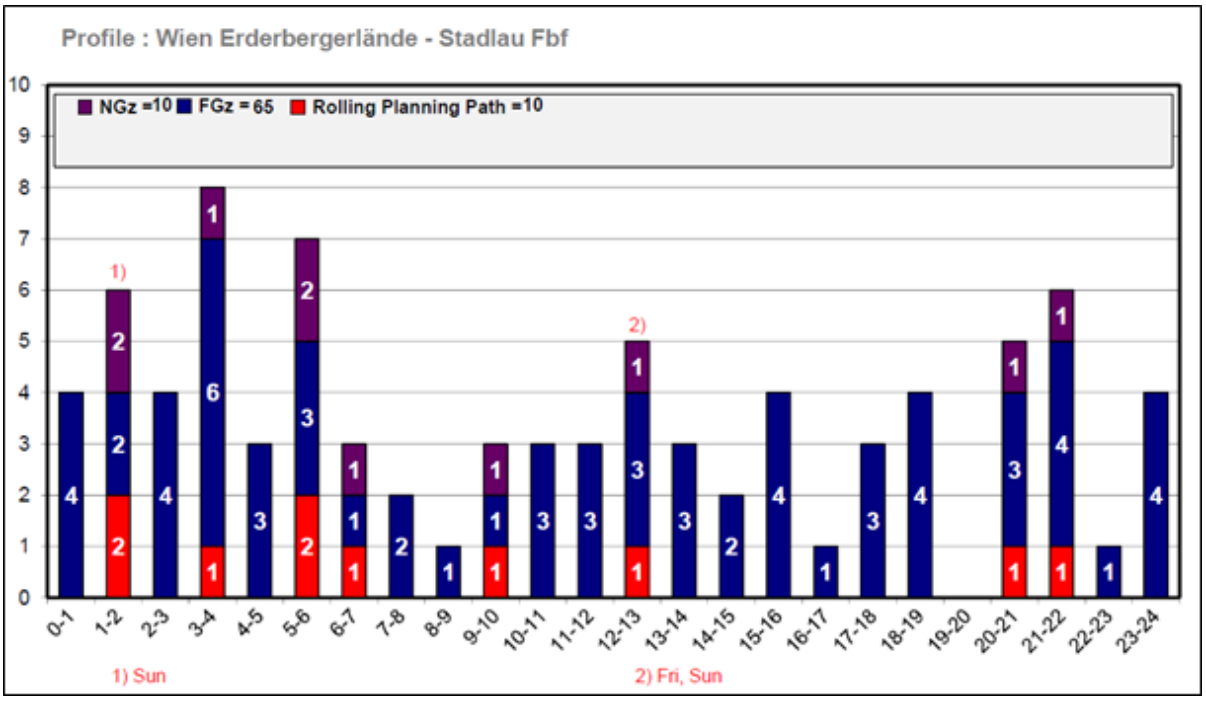
National ID Infrabel	parameter code	Essen Grens	Y St Mariaburg	Y Schijn	December																													Januar									
		run through	run through	arr (run through)	13.12.20	14.12.20	15.12.20	16.12.20	17.12.20	18.12.20	19.12.20	20.12.20	21.12.20	22.12.20	23.12.20	24.12.20	25.12.20	26.12.20	27.12.20	28.12.20	29.12.20	30.12.20	31.12.20	01.01.21	02.01.21	03.01.21	04.01.21	05.01.21	06.01.21	07.01.21	08.01.21	09.01.21	10.01.21	11.01.21	12.01.21	13.01.21	14.01.21	15.01.21	16.01.21
					su	mo	tu	we	th	fr	sa	su	mo	tu	we	th	fr	sa	su	mo	tu	we	th	fr	sa	su	mo	tu	we	th	fr	sa	su	mo	tu	we	th	fr	sa
68251	02INFRA32	00:26	00:43	00:47			x	x	x	x	x			x	x	x	x	x			x	x	x	x			x	x	x	x	x			x	x	x	x	x
68253	02INFRA32	00:52	01:09	01:13			x		x	x	x			x		x	x	x			x		x	x			x		x	x	x			x		x	x	x
62151	02INFRA32	01:26	01:43	01:47					x	x						x	x						x	x						x	x					x	x	
68313	02INFRA32	01:26	01:43	01:47			x	x			x			x	x			x			x	x			x			x	x			x						x
62151	02INFRA32	01:52	02:09	02:13			x	x			x			x	x			x			x	x			x			x	x					x	x			x
68313	02INFRA32	01:52	02:09	02:13					x	x						x	x						x	x						x	x					x	x	
68255	02INFRA32	02:26	02:43	02:47			x		x	x	x			x		x	x				x		x	x			x		x	x	x			x		x	x	x
62153	02INFRA32	02:52	03:09	03:13			x		x	x	x			x		x	x				x		x	x			x		x	x	x			x		x	x	x
68257	02INFRA32	03:26	03:43	03:47			x		x	x	x			x		x	x				x		x	x			x		x	x	x			x		x	x	x
62155	02INFRA32	03:52	04:09	04:13			x		x	x	x			x		x	x				x		x	x			x		x	x	x			x		x	x	x
68259	02INFRA32	04:26	04:43	04:47			x		x	x	x			x		x	x				x		x	x			x		x	x	x			x		x	x	x
68261	02INFRA32	04:52	05:09	05:13			x		x	x	x			x		x	x				x		x	x			x		x	x	x			x		x	x	x
68301	02INFRA32	05:26	05:43	05:47			x	x			x			x	x			x			x	x			x			x	x			x			x	x			x
62157	02INFRA32	05:52	06:09	06:13			x		x	x	x			x		x	x				x		x	x			x		x	x	x			x		x	x	x
68301	02INFRA32	06:26	06:43	06:47					x	x						x	x						x	x						x	x					x	x	
62159	02INFRA31	07:26	07:43	07:47		x	x	x	x	x			x	x	x	x	x			x	x	x	x	x		x	x	x	x	x			x	x	x	x	x	
62159	02INFRA32	07:26	07:43	07:47							x						x							x							x							x
68263	02INFRA31	07:52	08:09	08:13		x	x	x	x	x			x	x	x	x	x			x	x	x	x	x		x	x	x	x	x			x	x	x	x	x	
68263	02INFRA32	07:52	08:09	08:13							x						x							x							x							x
68303	02INFRA32	08:26	08:43	08:47			x	x	x	x	x			x	x	x	x	x			x	x	x	x	x			x	x	x	x	x			x	x	x	x	x
62161	02INFRA32	08:52	09:09	09:13		x	x	x	x	x			x	x	x	x	x			x	x	x	x	x		x	x	x	x	x		x	x	x	x	x	x	
68265	02INFRA32	09:26	09:43	09:47		x	x	x	x	x	x		x	x	x	x	x	x		x	x	x	x	x	x		x	x	x	x	x		x	x	x	x	x	x

Cap. supply for TT 2021

In addition, the capacity supply was published also in the ECMT.

3.3.1.4 ÖBB Network

ÖBB-INFRA followed the proposal which is presented in the long version of the process description. However, due to time pressure between the finalisation of the capacity model elaboration and the publication deadline, the capacity supply was presented identically as the capacity model.



Overview of the path supply for TT 2021 per hour and line section for all kind of freight trains

3.3.2 Communication

All four Pilots published in January their own “Pilot Information Document (PID)”. The aim of a PID is to provide applicants with information on the scope and the procedures being tested on the corresponding pilot line in order to enable them to actively participate in the pilot project and to request this dedicated high-quality capacity. It focuses on the description of the innovative TTR elements that are tested in the relevant pilot and on explaining in which concrete points the process on the Pilot line differs to the respective national process. When new and existing processes interact in some points, the PID describes which procedure will be enforced. The PID is applicable to one timetable year. It is revised at least every year, based on the experiences in the Pilot.
The PIDs of all four Pilots are published in CMS (https://cms.rne.eu/#/space/25967; see corresponding libraries of the four Pilots).

3.3.3 Capacity requests

3.3.3.1 Mannheim – Miranda de Ebro (RFC Atlantic)

As the pilot on RFC Atlantic published dedicated capacity for the first time in January 2020 for TT 2021, the first request can be expected in 2020 only.

3.3.3.2 Munich – Verona

Customers insisted on being able to place orders for RP capacities not in PCS but in the three national path ordering tools. The first requests placed for RP capacity arrived shortly after the opening of the booking possibility at X-4. These requests were for paths for new services. After an initial wave of eight path applications, which arrived within a short period of time from mid-August, things became relatively quiet with further orders. Fortunately, all applications were provided with a draft timetable within the promised maximum response period of 30 days as foreseen by TTR.

3.3.3.3 Rotterdam – Antwerp

The very first requests on the pilot in PCS were not really usable. The applicants for paths first had to be instructed how and in what form the available RP capacities were to be applied for. Since the first possibility for requesting RP capacity, several requests were placed.

3.3.3.4 ÖBB Network

Referring to the project timeline in this pilot, the first requests will be received by 2020 only (for TT 2021).

3.4 Phase 3: Capacity requests in running TT 2020

3.4.1 Munich – Verona

The main focus of the analysis of the Munich-Verona pilot was put on the volatile freight traffic. The project team estimated that 65 – 70 % of scheduled freight trains were allocated exactly on slots as published in the capacity model on the Brenner route.

3.4.2 Rotterdam – Antwerp

The majority of Rolling Planning requests for TT2020 were placed at the start of the ordering phase, in the months of August to October 2019. A total of 9 requests were placed. The major weak point of the current Rolling Planning process still is the same as last year, in that the hybrid situation of having multiple processes on the same line complicates the timetable process. However, two main conclusions were drawn by the pilot core team:

- The rolling planning process can be fruitful if it can be implemented to its full extent (multi-annual character, complete shift for freight capacity from ATT to RP and Ad Hoc)
- Working in this difficult hybrid situation teaches us valuable lessons in how executing the repartitioning of the capacity in the capacity model, the way capacity is being ordered and allocated internationally, and the raising awareness of the added values of the future TTR landscape at IM and RU side.

A comparison between the scheduled train runs at the border compared to the slots at the border published in the capacity model for TT2020 resulted in:

- High Speed Line (only passenger):
    - 75% of scheduled trains were allocated exactly on slots as published in the capacity model
    - 94% of scheduled trains were allocated on slots or +-1 minute as published in the capacity model

- Classical line (passenger & freight mixed):
    - 62% of scheduled trains were allocated exactly on slots as published in the capacity model (82% passenger and 44% freight)
    - 65% of scheduled trains were allocated on slots or +-1 minute as published in the capacity model (84% passenger and 48% freight)

4. Experiences and findings

4.1 Management of the individual TTR Pilots

In the initial phase of the pilots, the know-how regarding the new TTR process and the aim of the pilots was not yet widely spread within the IMs, both at management and expert level. As a result, the commitment and motivation for fruitful cooperation was largely lacking among the IM internal departments involved. TTR will have an impact on processes and traditional working methods. Various employees are therefore critical of TTR. Effective change management is a mandatory requirement in this context.
Through the project managements established on the individual pilots, a structure was implemented which took over the role as leading entity. On the other hand, the majority of the stakeholders actively involved in the Pilots in one form or another (applicants, ministries, terminals/ports, regulatory bodies) played a constructive role.
In order to launch a pilot successfully, management support – ideally on top level – is needed from the very beginning.

4.2 Involvement of stakeholders

Involvement of all interested applicants (known and potential applicants) in the process of design of the capacity model is key to ensure non-discriminatory design of such models. Thus, the involvement of applicants should be organized in a way that does not only allow applicants invited by the IMs but also all other interested applicants (including potential applicants) to participate in the process. One way of doing so would be to e.g. announce in the network statement the envisaged timing for capacity needs announcements and to include information on how interested applicants/customers can participate in this capacity needs announcement. As an additional channel of communication, a dedicated announcement on the company website of the IM or a newsletter sent to all IM customers and RU-customer information events can be used as well.

4.3 Temporary Capacity Restrictions (TCR)

The TCR planning will probably never be entirely stable, so the exact capacity partitioned for ATT and Rolling Planning cannot be guaranteed for 100%.
The planning of TCRs are a crucial input for the capacity model. It is natural and inevitable, that

- only TCRs with major and high impact can be planned in advance (i.e. X-24)
- not all TCRs are stable from the first and early planning status and there is a need for mechanism how to take this into account in the capacity partitioning
- coordination of TCRs between IM and RUs as well as neighbouring IMs is very time consuming and requires identical planning procedures and deadlines on both sides of the network borders, otherwise it leads to negative impact on available cross-border capacity.

Despite these facts, without a stable and as much as possible complete evaluation of the capacity consumption of all TCRs, the capacity model will have only a limited value. The capacity model should be reliable, if it is used as a base for a stable ATT supply as well as for the safeguarding capacity for Rolling Planning.
Annex VII to Directive 2012/34/EU demands a good share of the necessary activities to stabilize and coordinate TCRs but leaves freedom to IMs for decision which creates room for interpretation. Hence, TTR must attempt to integrate in its capacity model all TCRs – known and unknown – and/or leaves room for TCRs with medium and minor impact through precise rules. There has to be a transparent process for TCR planning and adequate IT tools for

coordination/consultation/publication of TCRs, to visualise and evaluate the capacity consumed by TCRs.

4.4 Capacity models / cap. partitioning

In addition to the explanations in chapter 4.2, the draft capacity model established by the IM should be consulted with applicants, which should be given a chance to provide comments on the draft. The IM should take into account any such comments. That way, the IM's final decision, in order to definitively allocate rail infrastructure capacity, is more likely to be based on the applications submitted by the operators and the preferences indicated by them.
These explanations refer to an ideal case. The first experiences with the Pilots have shown that early announcements made by applicants should not be considered as the sole input as they are requested too early to provide reliable data, primarily for the freight business. Because of this, the prediction of the needed capacity to be taken into account when preparing the capacity model must be done by the IMs themselves through observation of the real traffic and of a market evaluation, global and together with their customers.
There is also concern that IMs will have too much or too little capacity available for ATT and RP when the capacity model is created. To manage this risk, an IM should only have capacity available in the ATT or RP for one particular traffic. It should therefore be avoided that a customer is offered capacity which does not fit to requested parameters.

4.5 Publication of capacity

The capacity supply for the upcoming TT period was published in various forms on the involved pilots:

- RFC Atlantic: Virtual path within a capacity bands for freight traffic in PCS for ATT and RP requests
- Munich – Verona: Capacity bands with a defined number of paths for RP traffic
- Antwerp – Rotterdam: Detailed paths for PaPs, ATT and RP traffic, published via ECMT and in form of an Excel table
- ÖBB Network: Number of paths with detailed parameters for freight traffic for every line section and hour for ATT and RP

A direct comparison would not produce reasonable results. Path applicants could be asked how they assess the strengths and weaknesses of these variants. On the other hand, with the planned introduction of the 'Capacity Hub', the available capacity will be published in a different, new form. The current forms of publication are an intermediate solution, which will be replaced with a revised approach in the TTR IT landscape (module 'Capacity Hub').

4.6 Pilot Information Document (PID)

Originally, the main purpose of a PID was to inform applicants for paths about changes in the TTR process compared to the conventional timetable process. During the creation of the first version it became apparent that a document with a certain legal value is advantageous for the binding declaration of individual necessary process steps. With the definitive transfer of TTR into the standard process, the conditions must be published in the Network Statement. Those conditions are to be taken from the current PIDs.

4.7 Capacity requests

The number of requests for RP capacity for the first test year (TT 2020) on the two Pilots Antwerp – Rotterdam and Munich – Verona has only reached a modest level (~20 orders).

This is not due to a lack of interest on the part of potential applicants for train paths, but mainly for structural reasons:

- The two Pilot routes are relatively short. The majority of freight trains, for which the pre-constructed RP system paths would be predestined, start and/or end far from Munich and Verona. This would have meant that the section from the origin to Munich or Verona and the continuation of the journey from Verona or Munich would have had to be ordered in the conventional process (i.e. X-8, hybrid process). This would have resulted in a difficult to handle process with a time gap of up to 4 months for all parties involved. It was thus concluded that for further pilots and in the full rollout of TTR hybrid processes must be avoided.
- With PaPs and ATT paths with more or less identical parameters, an alternative capacity supply was available. In order not to fall behind competitors, requests were placed early, although the exact details for ordering was not yet fixed, as in all previous years. Since later adjustments could be made without financial consequences (no or limited costs for later changes and cancellations), there was little incentive to apply for RP capacities at a later date.

Due to the “first come – first served” principle for RP requests and based on the low demand for RP capacities, the proposed allocation rules did not have to be applied in the case of conflicts that could not be resolved.

4.8 Multi-annual Rolling Planning requests

Multi-annual RP requests are highly demanded by the market. However, due to missing legal support for multi-annual requests, the possibility for requesting RP capacity for more than one TT period was not possible in the Pilots. As already indicated in the long version of the process description, Framework Agreements do not fulfil the needs of the main users for RP, the freight applicants, due to the long lead time between the declaration of interest for a Framework Agreement and the first day of operation (at least 15 months).

4.9 Legal issues

Finding a sound legal basis for conducting TTR Pilots constituted a key challenge. In particular the reservation and protection of capacity for rolling planning requests ahead of and throughout the annual scheduling process initially seemed difficult to reconcile with the current legal framework. To support TTR Pilots in this regard, the FCA based on the RFC Regulation was amended. However, as the FCA must be in line with the key principles of Regulation (EU) 913/2010 and Directive 2012/34/EU, the possibilities to allow for testing of innovative TTR elements based on the FCA was limited. Thus, most TTR Pilots refrained e.g. from offering a multi-annual rolling planning product.
Nevertheless, rolling planning capacity was offered by some Pilots at least in its “basic version”, i.e. only for one TT year. These Pilots found that in some countries it would be incompatible with the existing legal framework to set aside and protect rolling planning capacity throughout the annual scheduling phase. While DG MOVE stated in early 2020 that the offer of rolling planning requests could be based on existing provisions on reservation of capacity for ad hoc requests (Article 48(2) of Directive 2012/34/EU and Article 14(5) of Regulation (EU) 913/2010 respectively), it appeared that the relevant provisions were not transposed in some countries or complemented by additional national rules limiting the possibilities to test the rolling planning concept (e.g. only certain amount of capacity can be reserved/only for specific types of traffic). Also, there was no common understanding as to whether capacity dedicated to rolling planning would have to be taken into consideration in a coordination process in case an annual timetable request was placed regarding capacity initially set aside for rolling planning requests. One Pilot observed that the application of

different national priority rules in such cases would also constitute a major risk of destroying harmonised RP capacity offer.
Another topic intensively discussed was the question of publication of information on TTR Pilots. In principle, based on Article 27 of Directive 2012/34/EU conditions for access to the infrastructure should be published in the network statement. Thus, a priori, also information on TTR Pilots should be included in the network statement. At the same time, some Pilots had concerns about the potential reaction of regulatory bodies; thus, dedicated Pilot information documents were created to meet the objectives of providing information on access conditions to all applicants in a transparent and non-discriminatory manner.
Despite the intention of some Pilots to test a new set of commercial conditions (= TTR CC, which deviate from the ones applied on the rest of the network) this idea could not be realised due to incompatibility with the existing legal framework (in particular Articles 29(2) and 35(2) of Directive 2012/34/EU).
It should be noted, that despite the lack of a clear legal framework supporting TTR Pilots, DG MOVE repeatedly encouraged the Pilots, emphasizing that lessons learnt from the Pilots should allow to identify the need for adjustments to the legal framework (if any) to enable TTR full roll out.[1] In this context, DG MOVE also acknowledged the relevance of a pragmatic handling of Pilots by regulatory bodies to allow Pilots to come to the relevant findings. Experience from TTR Pilots shows, however, that this approach was not followed by all regulatory bodies.

4.10 Commercial conditions

A respective TTR project could not find an agreement on one common set of commercial conditions. Therefore, one of the Pilots attempted to create and test commercial conditions on its own.
However, it was not possible to test any commercial conditions in the Pilots. One of the main reasons is the different responsibilities for this topic:

- Regulatory Bodies
- Ministries
- Infrastructure Managers

In addition, trains on a Pilot line use in most cases also lines outside of the Pilot. Handling of hybrid situations without any legal support and any supporting IT solution were the other blocking points.

4.11 IT

Initially, the Pilots started without any IT support to avoid loss of investment due to temporary use. However, it became obvious in the early project stages that handling the complexity of capacity planning without IT would lead to massive manual work. Consequently, a prototype for a capacity model tool was developed in Excel/Access, which was later further developed into a stand-alone system – the Electronic Capacity Model Tool (ECMT).
It was concluded that such a tool is necessary for the creation of capacity models and capacity supplies. The ECMT should serve as blueprint for the anticipated IT module ‘Capacity Hub’, even if some minor issues remain in that system. Additionally, the Pilots concluded that for more data exchange interfaces to national systems are required. Thus, investment in IT is obligatory to achieve the efficiency of TTR, even in the test phases.

[1] An initial attempt of DG MOVE to revise Annex VII to Directive 2012/34/EU to provide a more solid legal basis for TTR Pilots was discontinued based on the conclusion that the existing legal framework would already allow to test a number of elements, such as e.g. setting aside of capacity for rolling planning requests.

4.12 Experiences and opinions from the applicants

FTE collected the inputs of some of the RUs involved in the Pilots. Here is a summary of their feedbacks:

- Capacity model:
  - Inputs (Cap. Needs Announcements) collected, but on some Pilots, there was no real involvement in analysing and reflecting the needs nor the TCR impacts (e.g. RU remarks not considered, RUs not actively approached)
  - Different methodologies used by the Pilots: Supports the searching for the best practise but makes it difficult to cross-evaluate
- Rolling Planning supply and requests:
  - To avoid hybrid situations, long stretches should be offered
  - On the Atlantic Pilot, RUs expected more RP capacities to be planned and made available to the RUs/applicants for requesting. Therefore, the RFC Atlantic Pilot postponed its start to TT period 2021.
  - Multi-annual RP orders is one of the key success elements of TTR for the freight business. Regret that this could not be tested due to lack of legal basis.
  - No approach or benefit yet for passenger traffic
- TCRs:
  - Experiences in Pilots show that stability of TCRs is still a challenging issue
  - No reference to the implementation of Annex VII was noted in the Pilots.
- Commercial Conditions:
  - No Commercial Conditions tested at all. No method to steer the path ordering process on the TTR Pilots.
- Various issues:
  - There was no reasonable way to define meaningful KPIs to evaluate the Pilots' effectiveness. KPIs which were defined anyway on some Pilots are not measurable, reachable, realistic and defined within a time slot and no measurable key learning for evaluation
  - Missing questionnaires to determine RUs'/applicants' satisfaction in the TTR Pilots
  - Not enough IT support for the relevant components to be tested (except ECMT)
  - Independent Pilot escalation board/level is missing; One steering party to solve the conflicts
- Summary:
  Only single components of TTR could be tested, but not TTR as a complete process. Therefore, these Pilots don't allow the drawing of final conclusions yet. A more complete picture is required and not yet harmonized components (e.g. different capacity models) must be aligned.

4.13 Management of all Pilots

There is a strong will by the Pilots to cooperate and align in the TTR Pilot board. The attitude of the individual Pilots towards the TTR governance was positive. It was noted that there are also big differences in the perception of how TTR components must look like (in detail). It was welcome to develop their own ideas and innovations in regards of the design of TTR components. An alignment of the final design of the TTR components must be done after Pilot phase 3 in order to avoid non-matching procedures.

5. Inputs for further development of the TTR Timetabling process

Based on the feedback of the stakeholders, the TTR Programme Management Office (PMO) came to the following conclusions regarding the further implementation of TTR:

- To avoid mismatches and lack of harmonization, the TTR programme must ensure that main and distinct parameters are defined for all TTR components, which must be implemented by all IMs/ABs. Interpretation of these parameters must be clear and additional particularities must be avoided.

- All stakeholders of the process must be sensitized to fulfil their respective role in all phases of the process. They must also stick to the defined timelines in order to avoid disturbances.

- Leading entities are required to steer the process. Without leading entities, there would be a lack of pressure to harmonize processes.

- TCR processes must be implemented and become mandatory. These processes must cover the complete process from capacity model and capacity supply to operation (how to include TCRs in the respective product). Details process descriptions are still missing for several of the TTR process phases.

- IT is mandatory/needed already in early stages (pilots/migration) to progress the large amount of data and provide all stakeholders the means to understand and evaluate the TTR elements and progress the related data. Due to the large amount of data involved, interfaces must be established.

- The IMs/ABs must ensure that information of the process and the possibility to get involved is available in due time and via accepted channels (particularly via Network Statements).

- A clear description to differentiate between capacity models and capacity supply is required and must be promoted.

- It must be possible to display capacity models and capacity supplies in a comprehensive way (e.g. filter, zoom function, etc.)

- Multi-annual planning must be ensured for RUs/applicants due to high market demand. A test of the methods for the multi-annual aspect of RP requests is necessary.

- In the design of the capacity supply, IMs/ABs must avoid that the same capacity is available via different products. Provide the capacity supply to RUs/applicants in a way that only the dedicated capacity is visible and correct products are booked. Still, RUs/applicants should have a comprehensive overview of available capacity.

- In some cases, the Legal Framework does not support TTR components (e.g. multi-annual RP requests). European and national legislators must adapt this framework accordingly. TTR main stakeholders (IMs/ABs/RUs/Applicants) must promote this adaption. Missing legal possibilities also restrain the TTR Pilots, which consequently allows the Proof of Concept for only parts of the TTR components. For a full evaluation, the legal framework must be widened to cover all TTR components.

- Commercial conditions are mandatory to steer the request and allocation process and to stabilize TCRs and other components of the capacity model.

- Hybrid situations (i.e. coexistence of different/mismatching processes) must be avoided as much as possible. New Pilots should seek to reduce mismatches by applying effective adapting/interfacing mechanisms. In the full rollout, IMs/ABs must respect agreed rollout concepts and timelines.

- The scope of elements to be tested must be widened. The currently tested elements represent only a fraction of the TTR process. Further extensions must include passenger traffic, multi-annual aspect, commercial conditions, TCR processes, etc.

- A strong central steering in the implementation of TTR components is required to ensure the aligned timing and matching process contents.

- Some processes still require finetuning, such as the alteration process.