European Freight DAC Delivery Programme

enabled by Europe's Rail

Moving European Rail Freight Forward

Meeting, place, xx month 2022

Version 12 July 2022

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DAC introduction

2

EDDP structure

The challenges for EU rail freight

Capacity

+ 50% rail freight

- 55% GHG emissions

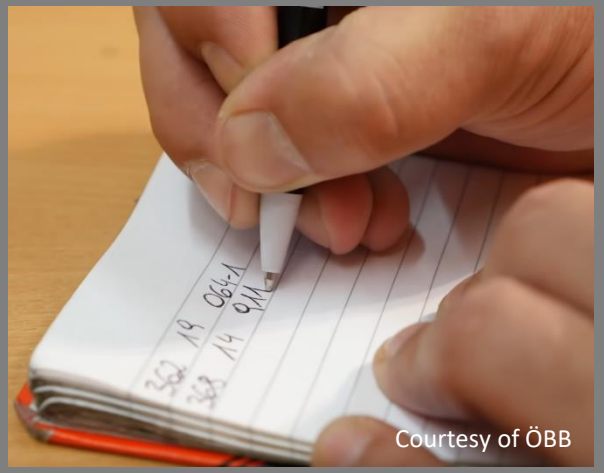
by 2030

from bottleneck
to green backbone

Productivity

from manual intervention
to automation

Quality



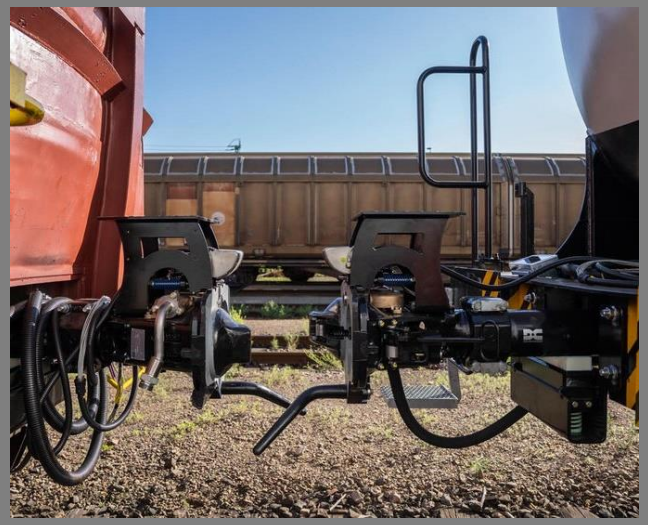
from paper
to digital

Processes today – and tomorrow

manual freight wagon coupling

Courtesy of ÖBB

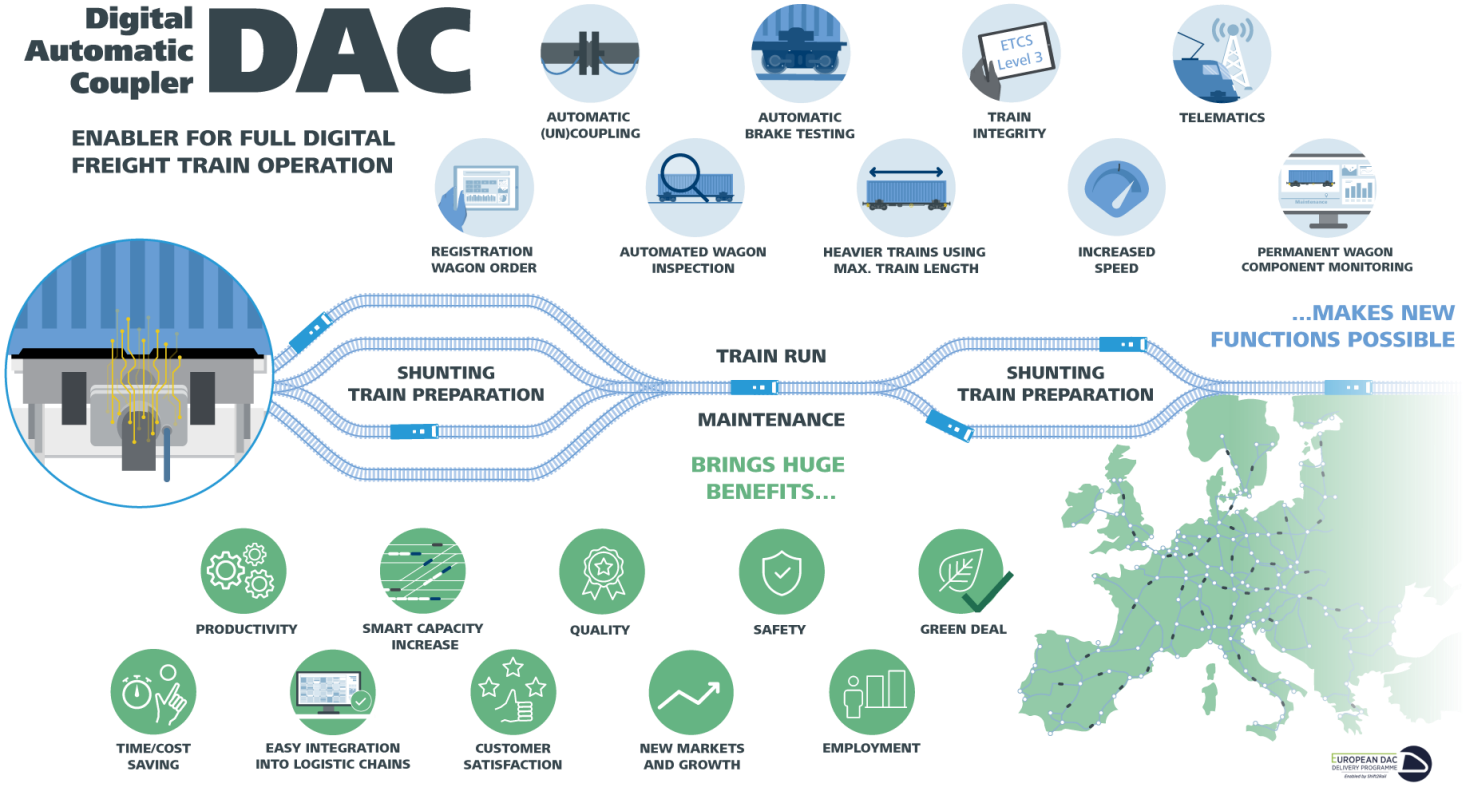
automatic freight wagon coupling



mechanical, pneumatical, energy & data coupling

Courtesy of DAC4EU consortium

DAC for Full Digital Freight Train Operations



- DAC is **more than just a coupler**
- DAC is a key and unique **enabler for numerous applications**
- DAC is not a stand-alone technology but the backbone for **“full digital freight train operations”** to achieve the ambitious transformation in European rail freight
- This will allow the DAC to enable even more **use cases** and to **generate** a max. possible **benefit**

EUROPEAN DAC DELIVERY PROGRAMME
Enabled by Shift2Rail

‘Scharfenberg’ latch-type design selected for future Europe-wide Digital Automatic Coupling (DAC) standard coupler head

Source: Dellner & Voith

Use cases: DAC Core system and DAC applications (Full Digital Freight Train Operations)

benefits =

gains in the processes (time, system time, cost savings, capacity, reliability, quality, safety)

+ induced modal shift

DAC Core system

- Automated coupling & manual uncoupling and digital backbone
- Recording of train composition
- Automatic (remote) uncoupling
- Heavier & longer trains (within existing infra limitations)
- Increased payload
- Increased speed via improved longitudinal forces

DAC train preparation

- Automatic brake test & calculation of brake capacity
- Automated technical wagon inspection

DAC telematics (wagon & goods monitoring)

- Predictive / preventive maintenance
- detection of cargo condition
- Cargo surveillance, intrusion alarm
- Wagon data & loading information on mobile device

DAC shunting

- Automated parking brake
- Draining of auxiliary air tanks
- Automated air valve
- Rear view camera for train driver
- Proximity detection
- Sound signals when train in motion

DAC train run

- Tail light (train integrity prior OTI function)
- Train end device (intermediate solution?)
- Vital on train integrity (OTI), enabling ETCS L3 moving block operations
- Increased speed via better braking performance
- Multiple loco traction and trains up to 1500m
- Derailment detection

DAC loading & unloading

- Automatic loading/unloading processes (replacement of hydr/pneum components, electro-mechanical actuators for bridge plates, automated cargo securing, heating elements for defrosting, …) via ext. energy supply
- illumination for worker's safety & interior

DAC lays the basis for the logistics challenges of the future – and for rail freight growth

basic requirements

High ship-ment speed

High reliability and robustness

Competitive costs

value added

Digital services for our customers

New logistics offers

Flexibility and simplicity

pictures source: RCA Group

The apps for the customer’s logistics and for the future

additional **displays**, information polling, deep integration into IT systems

telematics and **goods monitoring** with highest reliability add customer value

optional **signals** and **workplace illumination** increase work safety

interfaces to customer systems support customer digitalisation activities

Surveillance of high value goods opens new markets

data analysis for condition-based maintenance increases productivity further

opportunities for digitalisation add real value to customer’s and shipper’s logistics processes

pictures source: DB Mediathek

DAC for Full Digital Freight Train Operations

Video Link: Digital Automatic Coupling - YouTube

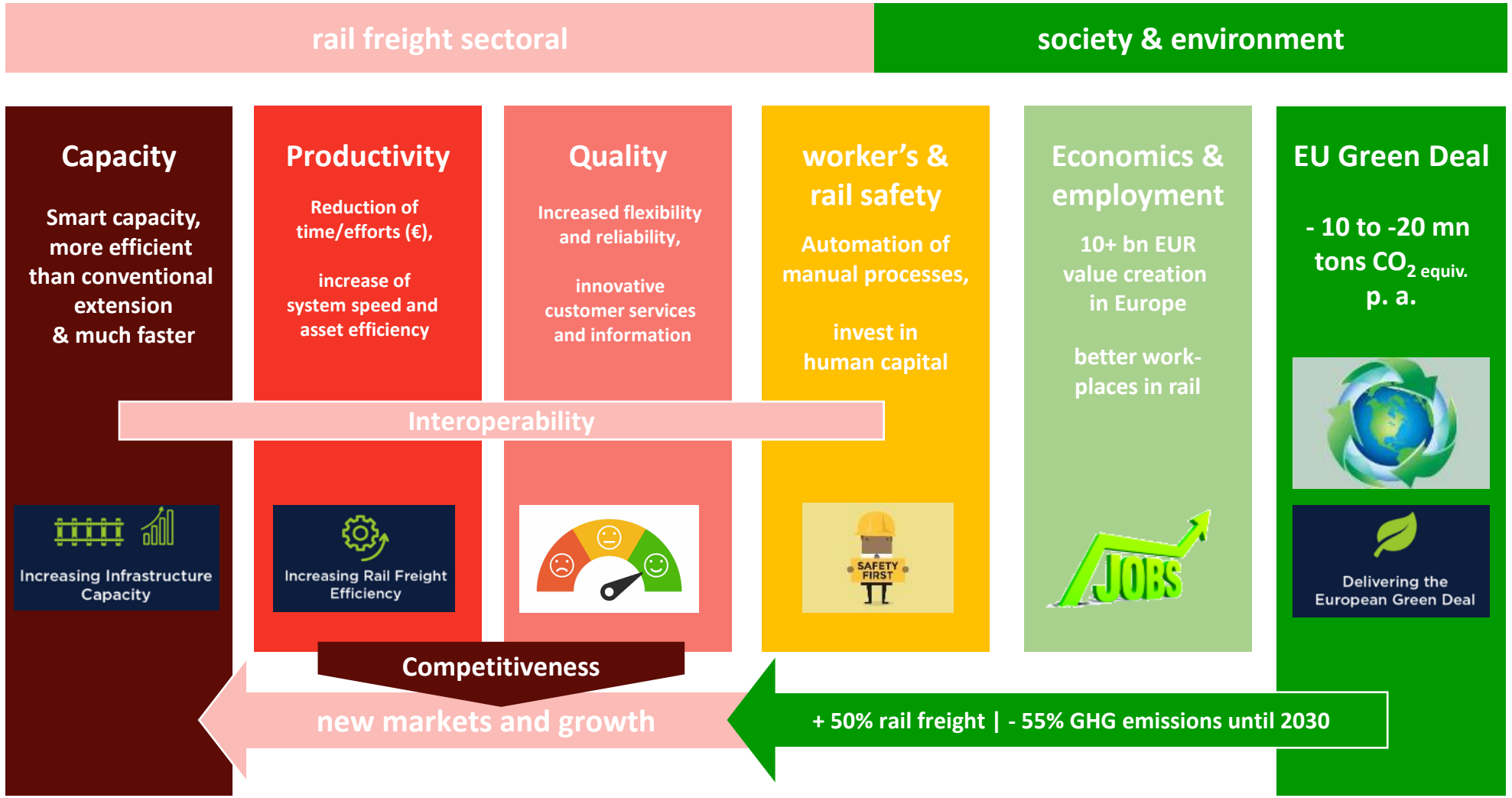
This project has received funding from the Shift2Rail Joint Undertaking under the European Union's Horizon 2020 research and innovation programme under grant agreement no. 101046657.

DAC = Digital + Automation + Coupling

this is a major transformation project

- push EU rail freight operations from heavily relying on human factor to 21st century world benchmark
- rail freight automation with DAC is ***the*** chance for Europe and ***the*** offer to European policy makers

The DAC and automation benefits for EU



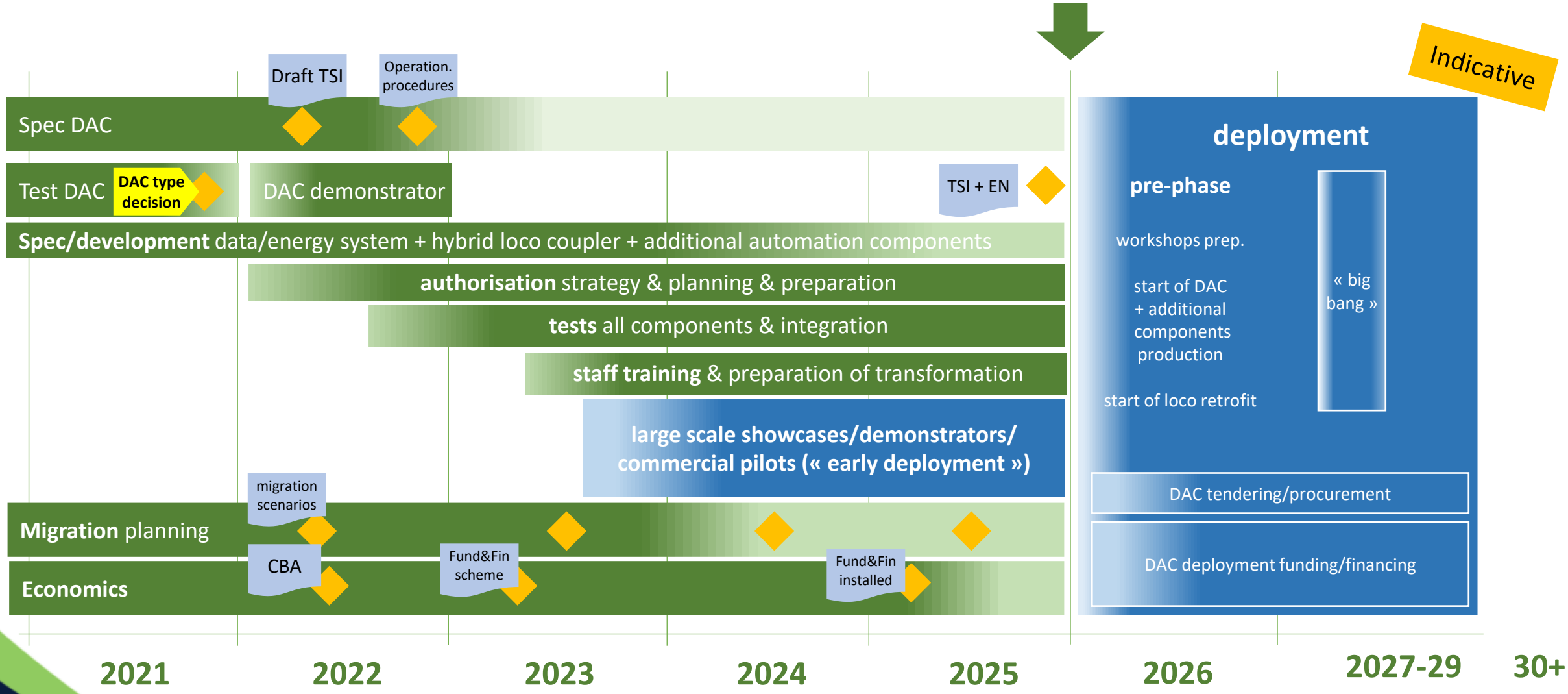
Implementation: DAC as employment booster

EUROPEAN DAC DELIVERY PROGRAMME
Enabled by Europe's Rail

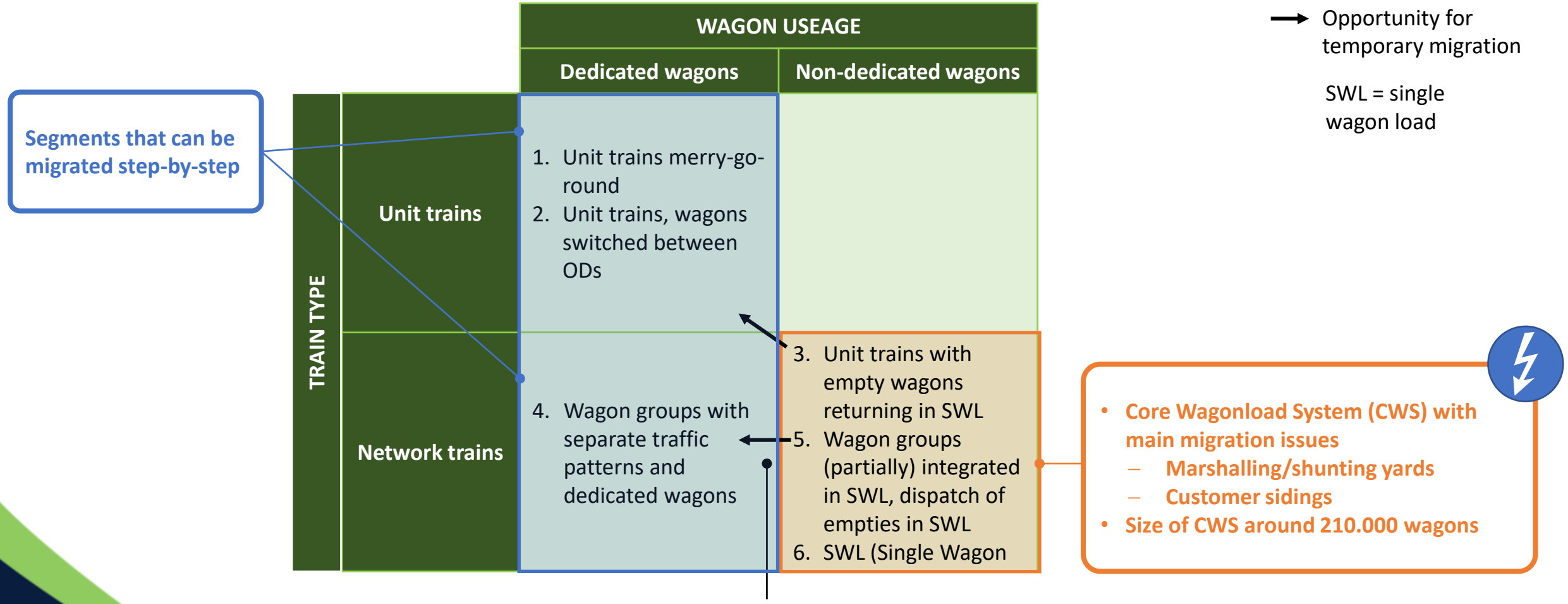
material	to be produced:				
	› 900k – 1 mn	DAC	(wagons)	€ 5-6 bn	€ 7,6 – 8,9 bn + *tbd*
	› 450k – 500k	automation components	(wagons)	€ 2,2 - 2,5 bn	
	› 34k - 40k	hybrid couplers	(locos)	€ 0,4 bn	
	› xx	buffer stops, …		*tbd*	
labour	to be retrofitted:				
	› 450k - 500k	freight wagons		€ 1,4 – 1,5 bn	€ 1,5 – 1,6 bn + *tbd*
	› 17k - 20k	locos		€ 0,1 bn	
	› xx	buffer stops, …		*tbd*	
	produced in EU retrofitted in EU countries				€ 9,1 – 10,5 bn + *tbd*

all numbers indicative and under assessment

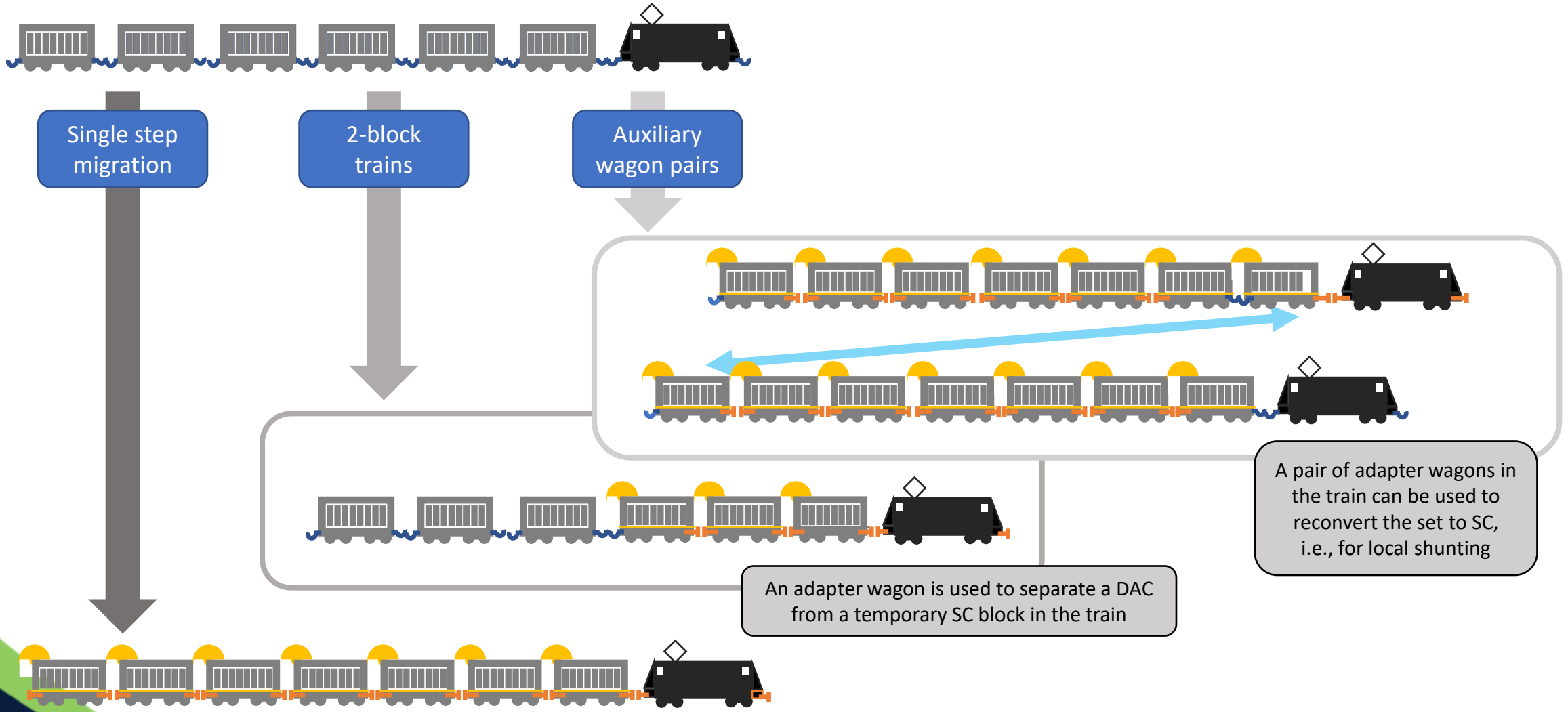
Indicative overall time plan



The main DAC migration challenge resides in the Core Wagonload System (CWS) that cannot be operated in a mixed mode

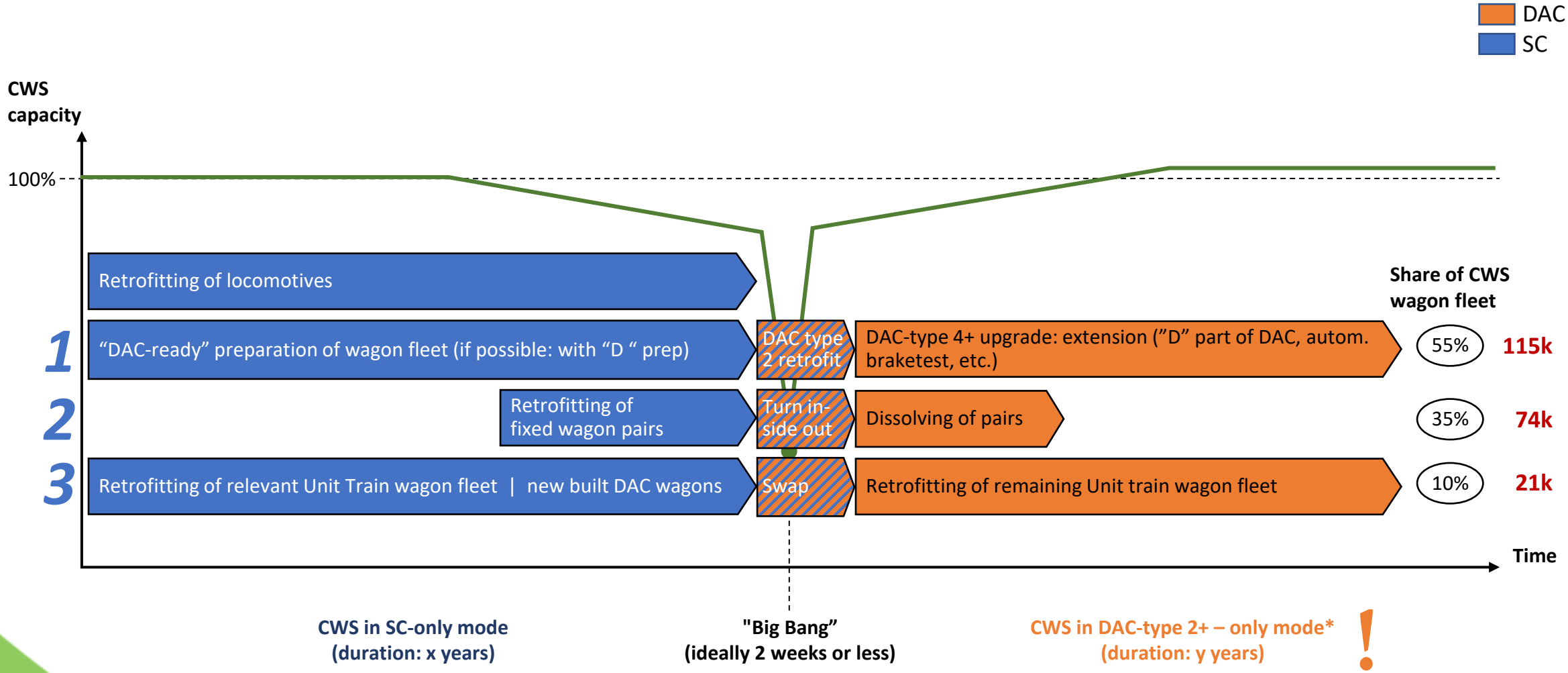


The segments with dedicated wagon fleets may be migrated step-by-step based on different alternatives



Source: EDDP WP 3

A big bang migration facilitated by 3 “tricks” is the only operationally feasible option for the Core Wagonload System



The big bang retrofit and the creation of fixed pairs can be performed in mobile “DACcination” centers

- After vehicles have been made "DAC ready", the big bang retrofit needs to be as quick as possible
- Benefits of mobile DACcination centers:
  - Creation of temporary additional retrofit capacity
  - Retrofit close to customer/marshalling yard to reduce long transport times to/from the workshop
- Center can be used for building of fixed wagon pairs pre/post big bang and for big bang retrofit
- Demonstration/testing planned for this summer at DB Cargo
- approx. 150 locations required all over Europe

DAC migration/deployment: summary

Principles:

- No compatibility between screw coupling and DAC
- No hybrid couplers for wagons

- Migration period as short as possible (2026-2030)
- Scope: in principle all wagons to be retrofitted (actual number considering productivity gains)
- Locos to be retrofitted before migration with hybrid loco couplers

- Preparatory measures for production of DAC and retrofitting capacities before migration
- Aligned and available funding / financing & regulation (e.g. TSI= for synchronised migration in Europe)

“Instruments”/methods/tools

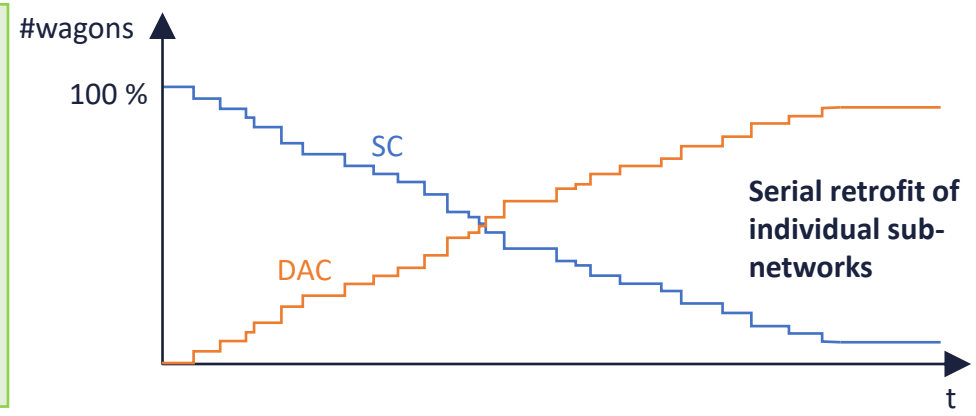
to make migration/ deployment operationally/technically/ economically feasible:

- Block trains, closed systems, etc. :
  migration in continuous step-by-step approach
- Mixed/network traffic: migration in “Big Bang” approach (max. preparation, min. migration time)
- "DAC-ready": prepare wagons during regular maintenance and then DAC “plug and play conversion” during Big Bang
- Temporary fixed wagon pairs (to be turned inside out @ Big Bang)

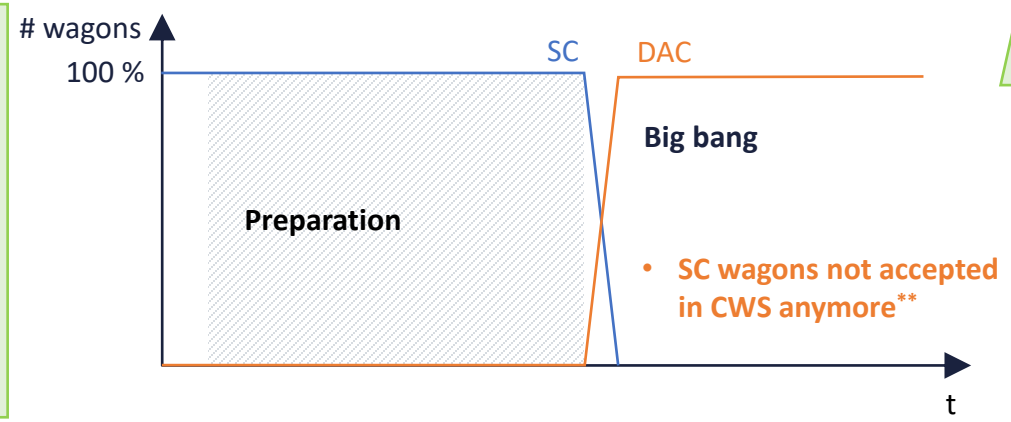
- *Large wagon pool for exchange wagons during workshop stay (funded)*
- *Scrapping bonus*

The overall migration path will be a serial migration of unit/block train fleets with a mixed/network system fleet big bang at the soonest possible point in time

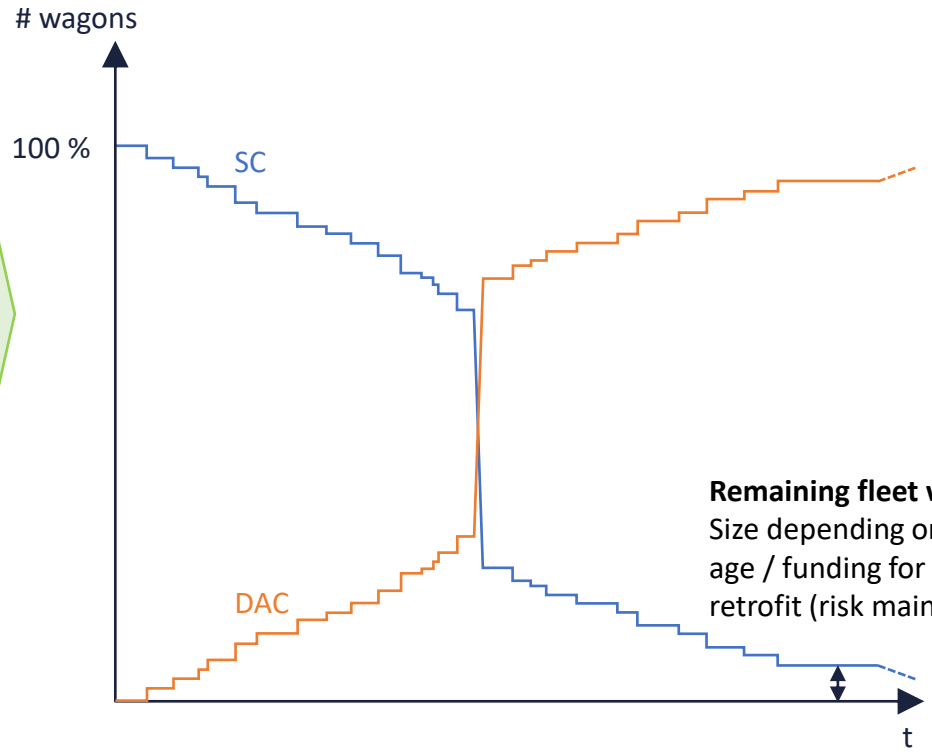
Unit trains block trains CT etc.



CWS* (mixed/ network traffic)



Resulting overall



Remaining fleet with SC:
Size depending on vehicle age / funding for old vehicles retrofit (risk mainly for CWS)

* CWS: Core Wagonload System
** Share of SC wagons in CWS would strongly impact the economic viability of CWS operations and DAC business case benefits

DAC migration/deployment: outlook

Challenges/uncertainties:

› Fleet data wagon & locos (type and size and technical status)

› Foreseen actual fleet in use (productivity 2030)

› Special types: Retrofit technically complex/not possible

› Additional Operational costs

› Limiting factors: capacity of industry, workshops, wagon availability and workforce (!)

Next steps

› Draft migration roadmap for deployment until 2030: June 2022

› Consultation of partners across Europe on migration roadmap

› Create basis for development of migration plan (starting 2023)

support needed

>> gathering fleet data
>> analysing operations & WS capacities
>> promote "smart" & short migration

Implementation: DAC funding/financing to ensure business case

costs	benefits	business case	propositions
CAPEX OPEX	capacity productivity quality beneficiaries: RUs, IMs, WKs, socio-economic	huge benefits but small margin business benefits do not yet lead to business case by itself safeguarding a good balance between funding/financing	› Observation time for return on cost <10 years › CAPEX funding › Additional OPEX funding › distribution of costs/benefits between actors

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DAC introduction

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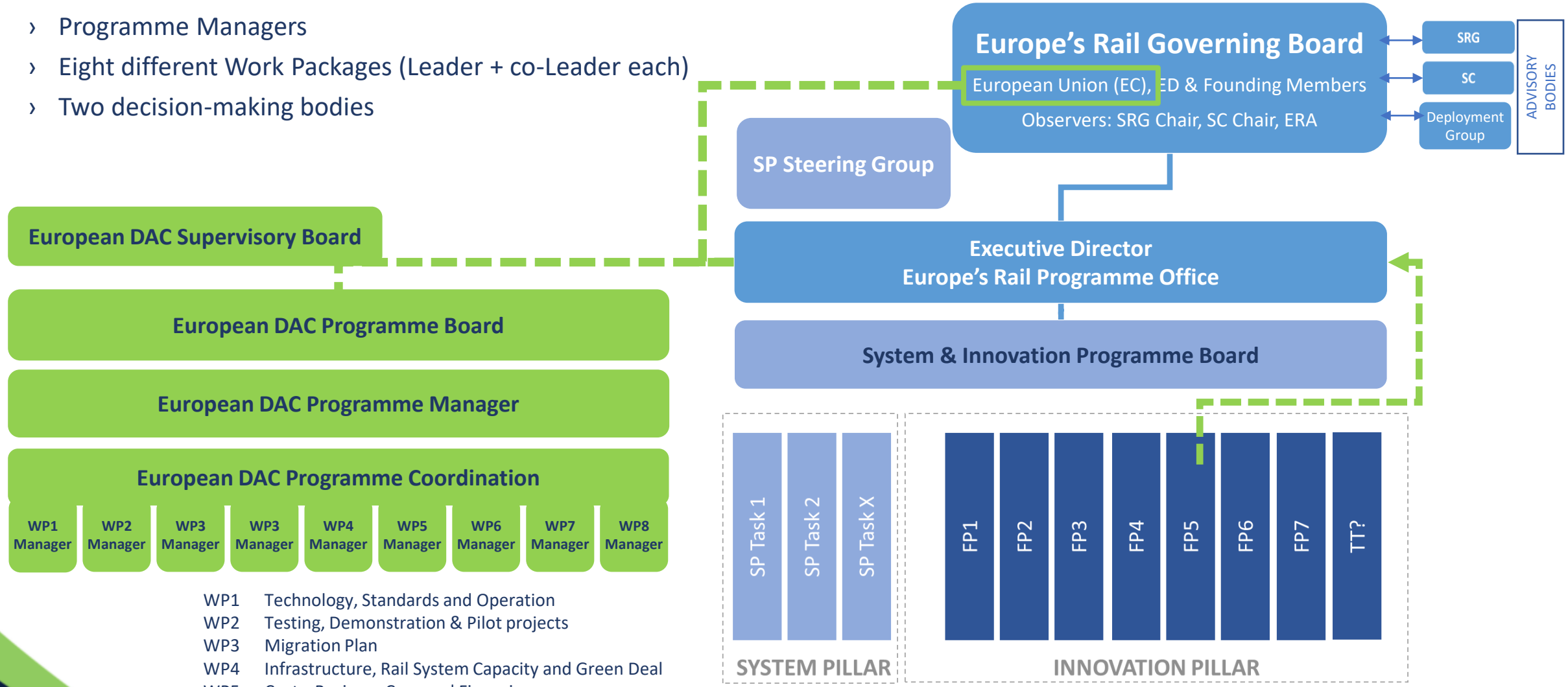
EDDP structure

The EDDP structure

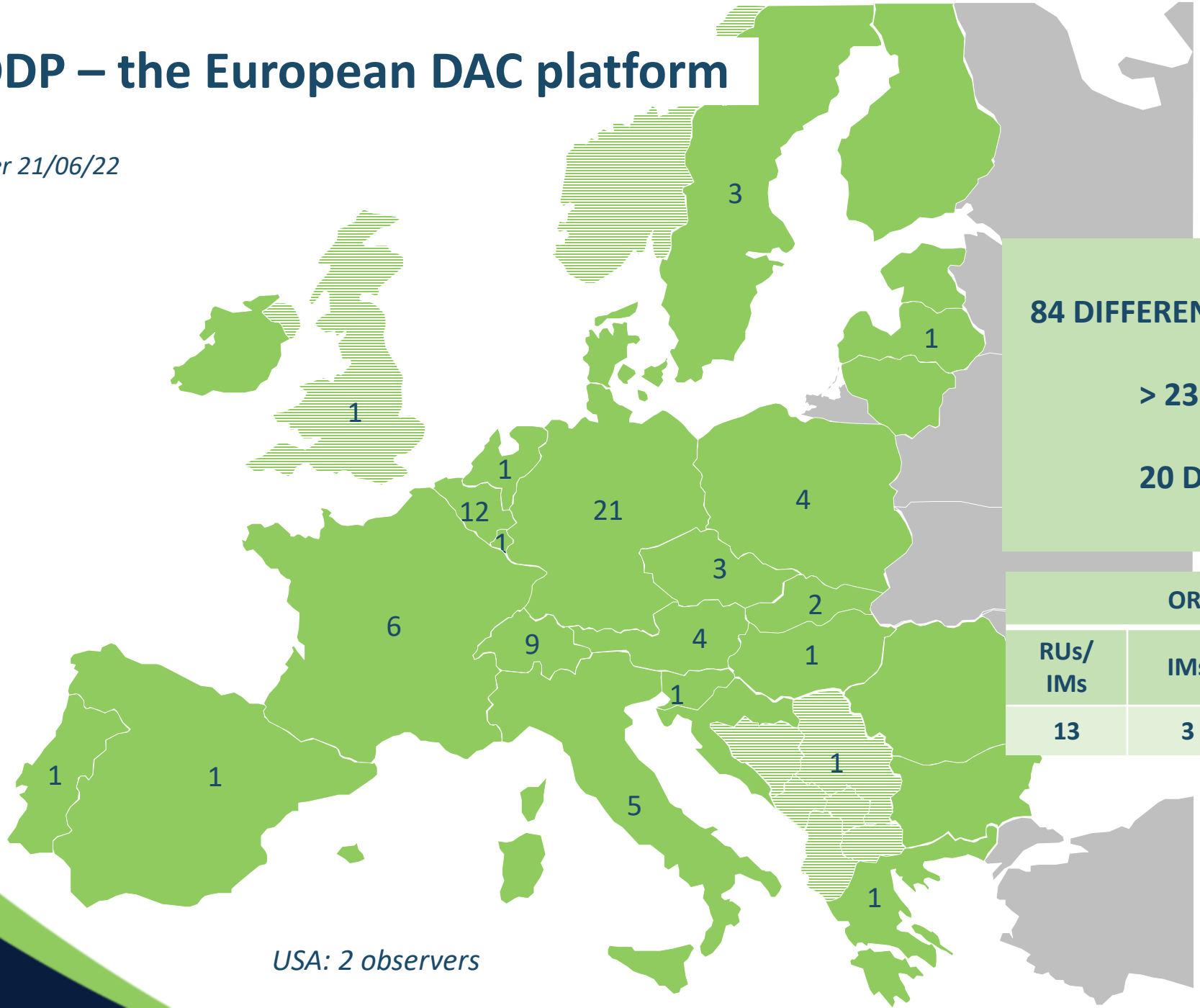
- Programme Managers
- Eight different Work Packages (Leader + co-Leader each)
- Two decision-making bodies



WP1	Technology, Standards and Operation
WP2	Testing, Demonstration & Pilot projects
WP3	Migration Plan
WP4	Infrastructure, Rail System Capacity and Green Deal
WP5	Costs, Business Case and Financing
WP6	Communication and Dissemination
WP7	Intelligent Rail Freight (future additional automation)
WP8	Authorisation strategy for retrofit of wagons & locos

EDDP – the European DAC platform

as per 21/06/22



84 DIFFERENT ORGANISATIONS (04/22)

> 232 PARTICIPANTS

20 DIFFERENT COUNTRIES

ORGANISATIONS BY TYPE

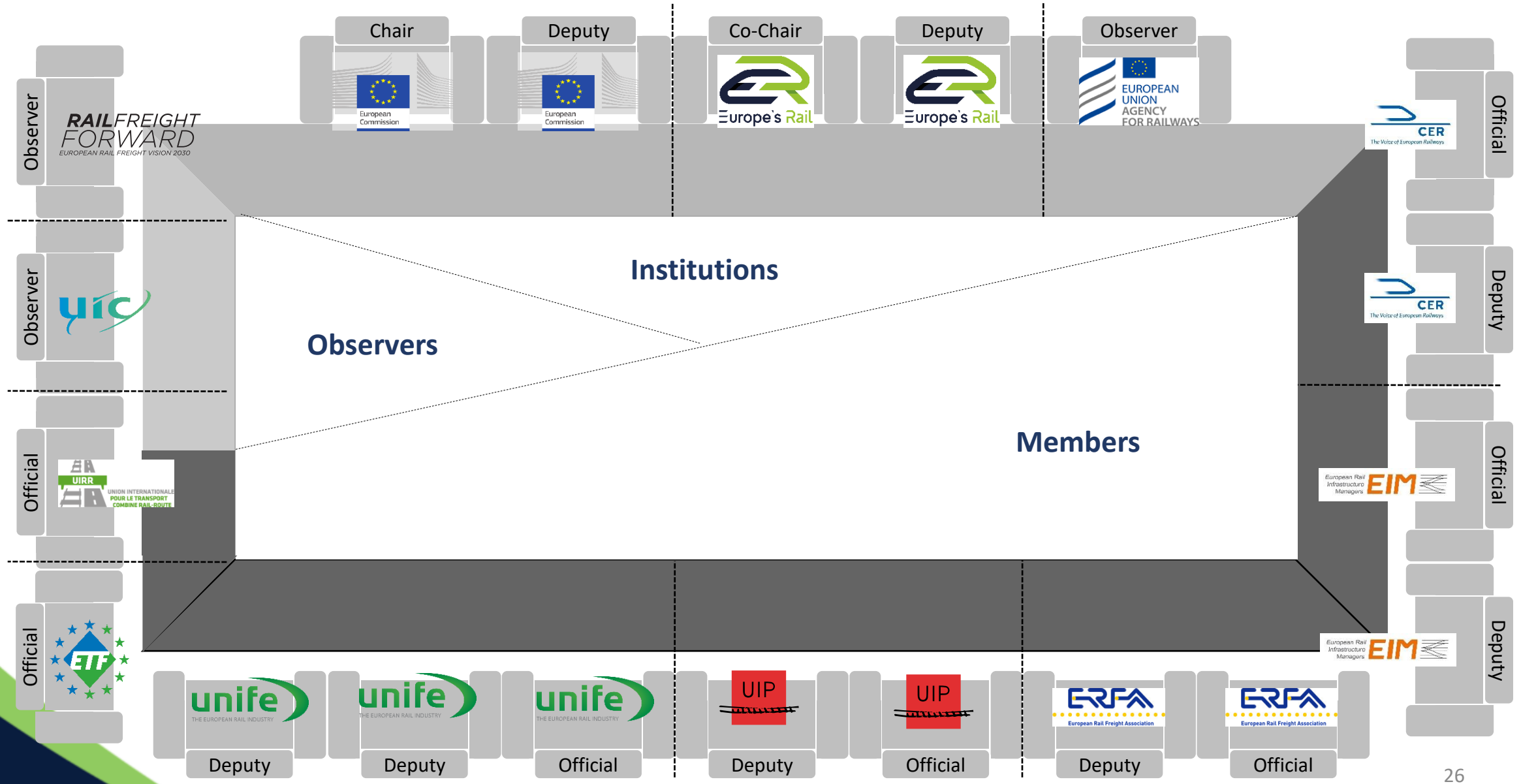
RUs/ IMs	IMs	WKs	INDU-STRY	OTHER
13	3	16	17	35

w/o US, UK

USA: 2 observers

EDDP Governance – Programme Board

EDDP Governance – Supervisory Board



EU DAC Governance – programme and WPs

Programme Management

Mark Topal-Gökceli (ÖBB)

Jens Engelmann (railiable)

WP 1	WP 2	WP 3	WP 4	WP 5	WP 6	WP 7	WP 8
Technology, Operations and Standardisation	Testing & Demonstrators & Pilot Projects	Migration	Rail System Capacity and Green Deal	Costs, Business Cases and Financing	Communication and Dissemination	Intelligent Rail Freight	Authorisation strategy

EDDP overview

EDDP since 09/20

Open European DAC Delivery Programme enabled by Europe's Rail

- For the **successful and effective implementation** of the Digital Automatic Coupler for European rail freight
- Offers a **unique European platform** for such cooperation and collaboration → **Strong platform:** 65 organizations, 230 participants, 19 countries
- **Bringing all DAC related initiatives together**

EDDP as of Q3/22

ERJU FA 5 and ERJU SP take over specific tasks

- **ERJU FA5-FDFTO** project (Full Digital Rail Freight Operations): development of technology, testing, demonstration
- **ERJU (system pillar)** : further activities regarding OPE procedures, standardization/TSI
- **EDDP** : focus on deployment plan based on migration scenarios and CBA as well the funding/financing needs

→ **remaining** as the **open platform** for
- → **cost-benefit** issues
- → **migration**
- → increase **acceptance** and commitment by all actors involved

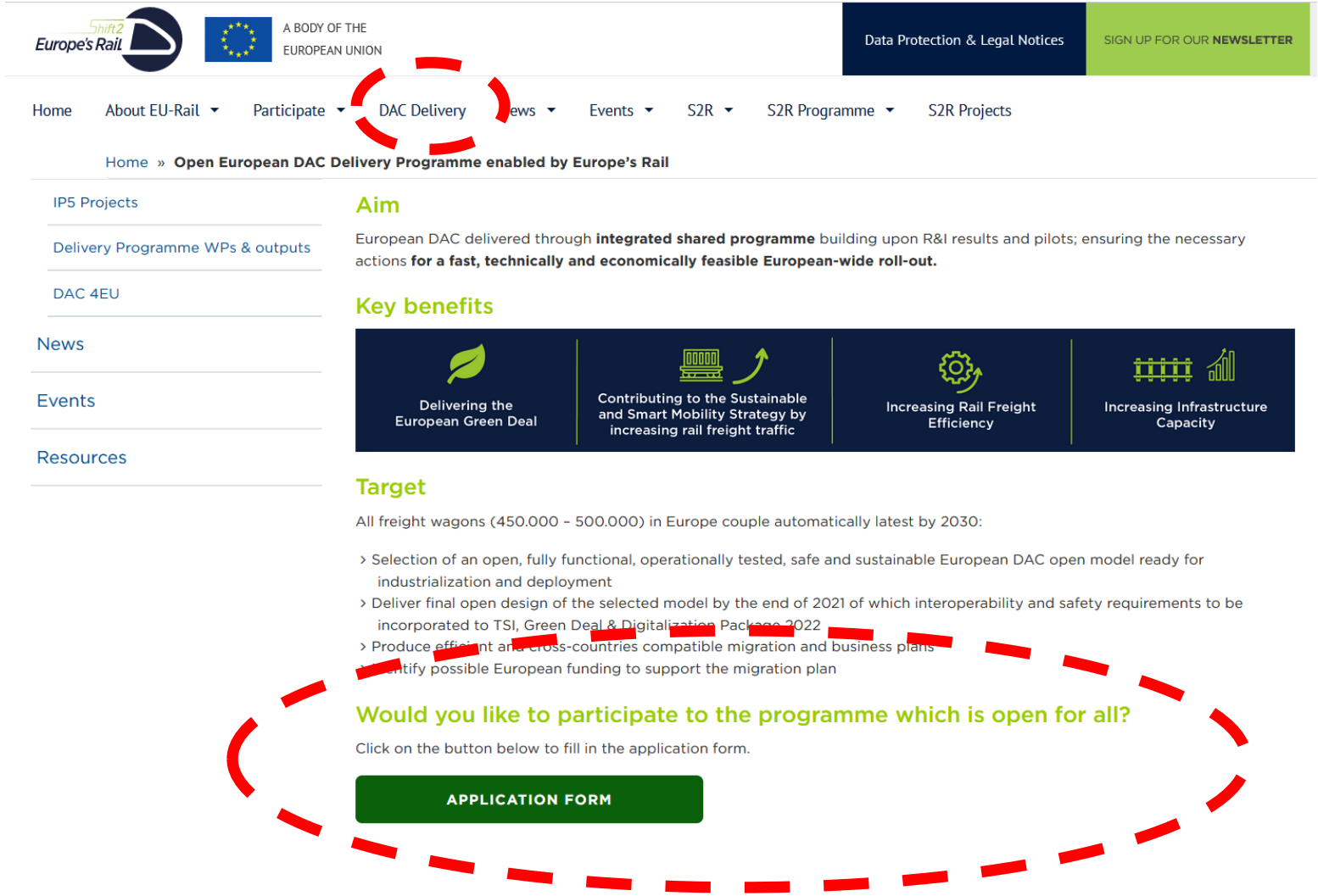
On-going connected activities

DAC4EU BMVI	Project officially started after receiving € 13mn from German Government in June 2020 *[DB / DB Cargo, SBB Cargo, Rail Cargo Group, Ermewa, GATX Rail Europe, VTG]*. Couplers from four different manufacturers under DAC mechanical, pneumatic, electrical and communication tests, implying a freight train formation of 12 wagons coupled with DACs. Dynamic testing until July 2021. Demonstrator train in Europe (24 wagons) with selected DAC type in phase 2.
DAC Winter Tests	All DACs are tested under winter conditions, including telematics in winter 2020/21, organized by Trafikverket with the aid of Green Cargo and enabled by Shift2Rail. A train formation will be tested in marshalling yards and in circulation through different places in Sweden. Possible phase 2 is industrial business case in a real environment.
IP5 Shift2Rail	FR8RAIL II DAC Type 4 Prototype final Test Bench Tests completed. FR8RAIL IV under study and pre-approved, will support DAC Trafikverket tests.
ERA	Has started the TWG Freight for the TSI Revision 2022. Sector is expected to deliver the necessary input to ERA for the adoption of the DAC in the respective TSIs that regulate interoperability and railway approvals / authorizations in EU.
CEN	WG for developing a new standard for “Automatic Coupler for Freight”

Political supports: Berlin declaration ministries of transport, MoU of major Freight operators & keepers

A single entry point for all Europe and beyond

https://rail-research.europa.eu/european-dac-delivery-programme/



Any questions?

Europe‘s Rail EDDP Programme Management

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More information: https://rail-research.europa.eu/european-dac-delivery-programme/