DAC as backbone for Full Digital Freight Train Operations in Europe

47. Tagung „Moderne Schienenfahrzeuge“

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DACcelerate 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. 101046857.

The DAC and automation benefits for EU

EUROPEAN DAC DELIVERY PROGRAMME
Enabled by Shift2Rail

ÖBB

rail freight sectoral

society & environment

Capacity

Smart capacity, more efficient than conventional extension & much faster

Productivity

Reduction of time/efforts (€),

increase of system speed and asset efficiency

Quality

Increased flexibility and reliability,

innovative customer services and information

Competitiveness

new markets and growth

worker's & rail safety

Automation of manual processes,

invest in human capital

Economics & employment

10+ bn EUR value creation in Europe

better work-places in rail

Green Deal

- 10 to -20 mn tons $CO_{2\ equiv.}$ p. a.

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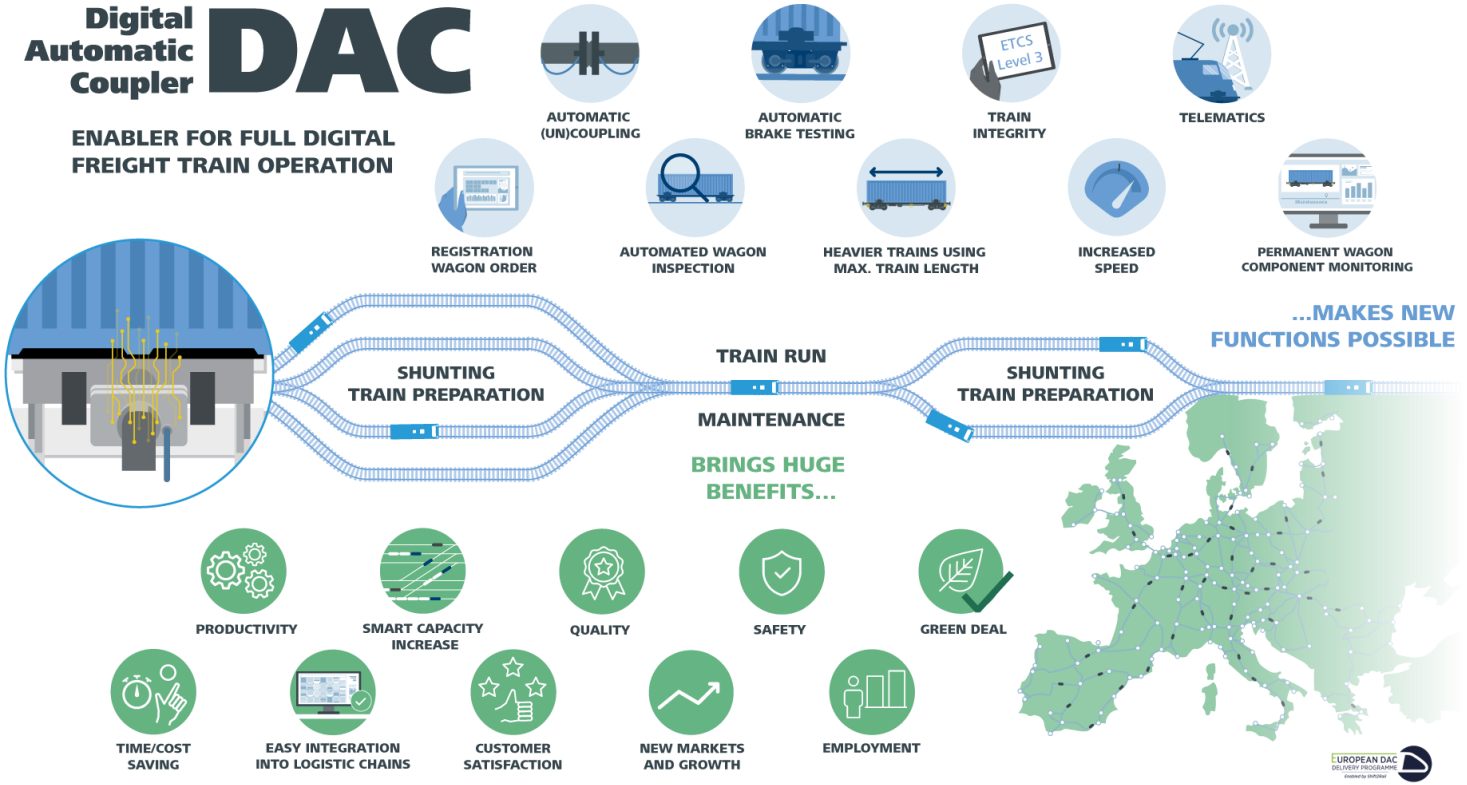
DAC for Full Digital Freight Train Operations



- 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**
- **Scharfenberg design selected to be the DAC standard**

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

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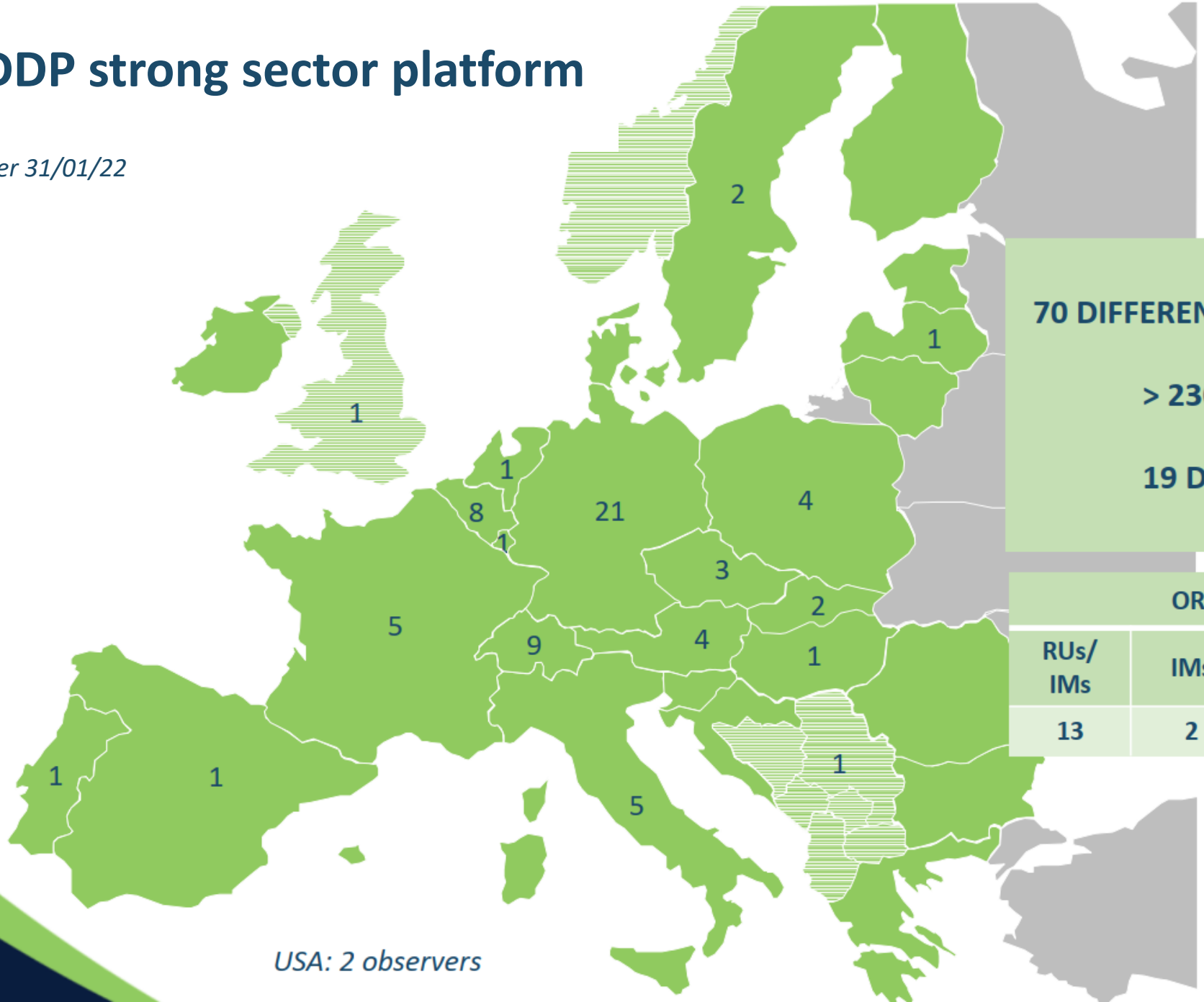
Implementation: DAC and automation use cases

	use cases and functionalities	former UC #	Technical Enabler as defined in ER JU MAWP and AWP22	description of additional components
DAC - CORE SYSTEM				
DAC - CORE SYSTEM (Coupling & uncoupling & train configuration)				
1	Automated coupling & manual uncoupling and digital backbone	1	I.4.1 DAC type 4 (incl type 5 upgradability)	
			I.4.2 DAC (hybrid) coupler for loco	
			I.4.3 DAC energy supply & data/ communication solution/ backbone	
			I.4.7 DAC wagon retrofitting	specific solutions for existing wagons, where standard retrofit is not possible
2	Recording of train composition	3	I.4.5 train composition detection/management system	communication system, with wagon-ID
3	Automatic (remote) uncoupling	12	I.4.4 DAC type 5	type 5 actuator + uncoupling control system (incl. Loco interface)
4	Heavier & longer trains (within existing infra limitations)	4	(comes with coupler, no further technical enabler needed)	
5	Increased payload	5	(comes with coupler, no further technical enabler needed)	(elimination of buffers, modified new vehicle design)
6	Increased speed via improved longitudinal forces	7	(comes with coupler, no further technical enabler needed)	
DAC - Applications				
DAC - Train preparation				
7	Automatic brake test & calculation of brake capacity	2	I.4.6 automated/automatic brake test system	automatic brake test system
8	Automated technical wagon inspection	13	II.4.2 digital wagon inspection (incl RST+INF assets)	wagon telematics, sensors (+ video gates, checkpoints)
DAC - Shunting				
9	Automated parking brake	11	II.4.1 automated parking brake system	automatic parking brake system
10	Draining of auxiliary air tanks	**new**	not adressed within FA5 but will be considered in system architecture	air valve control
11	Automated air valve	**new**	not adressed within FA5 but will be considered in system architecture	air valve control
12	Rear view camera for train driver	**new**	not adressed within FA5 but will be considered in system architecture	camera on the coupler (comms via 5G?)
13	Proximity detection	**new**	not adressed within FA5 but will be considered in system architecture	radar on the coupler
14	Sound signals when train in motion	**new**	not adressed within FA5 but will be considered in system architecture	sound device
DAC - Train run				
15	Tail light (train integrity prior OTI function availability)	3	I.4.5 train composition detection/management system	tail light control device
16	Train end device (intermediate solution?)	6	III.4.1 DAC based train integrity + train length determination	EOT device connection
17	Vital on train integrity (OTI), enabling ETCS L3 moving block operations	6	III.4.1 DAC based train integrity + train length determination	OTI device
18	Increased speed via better braking performance	8	II.4.4 electro-pneumatic brake	ep brake
19	longer trains up to 1500m	14	II.4.5 distributed power concepts and solutions	distributed power control (on loco)
20	Derailment detection	9	not adressed within FA5 / will be considered in syst. arch+ FA2 interface	derailment detection device
DAC - Telematics (wagon & goods monitoring)				
21	Predictive / preventive maintenance	9	II.4.3 DAC based telematic applications	wagon telematics, sensors
22	detection of cargo condition (humidity, temperature…)	10	II.4.3 DAC based telematic applications	wagon telematics, sensors
23	Cargo surveillance, intrusion alarm	10	II.4.3 DAC based telematic applications	camera, sensors
24	Wagon data and loading information on mobile device (possibly incl. safety-related loading information warning system)	**new (3)**	not adressed within FA5 but will be considered in system architecture	note: merger of the three new use cases: displaying wagon information on handheld display (technology openness), warning lights for displaying safety-related status information, additional displays, e.g. status of wagon components; wagon & loading telematics, sensors, data/information system and display/end-device
DAC - Loading and unloading				
25	Automatic loading/unloading processes, e. g. replacement of hydr./pneum. components, electro-mechanical actuators for bridge plates, automated cargo securing, heating elements for defrosting	**new**	not adressed within FA5 but will be considered in system architecture	energy management system (+ external supply)
26	Illumination, e. g. for worker's safety, interior illumination	**new**	not adressed within FA5 but will be considered in system architecture	lighting

EDDP strong sector platform

as per 31/01/22



70 DIFFERENT ORGANISATIONS (01/22)

> 230 PARTICIPANTS

19 DIFFERENT COUNTRIES

ORGANISATIONS BY TYPE

RUs/ IMs	IMs	WKs	INDU-STRY	OTHER
13	2	16	14	26

w/o US, UK

USA: 2 observers

Operational DAC4EU tests in Europe

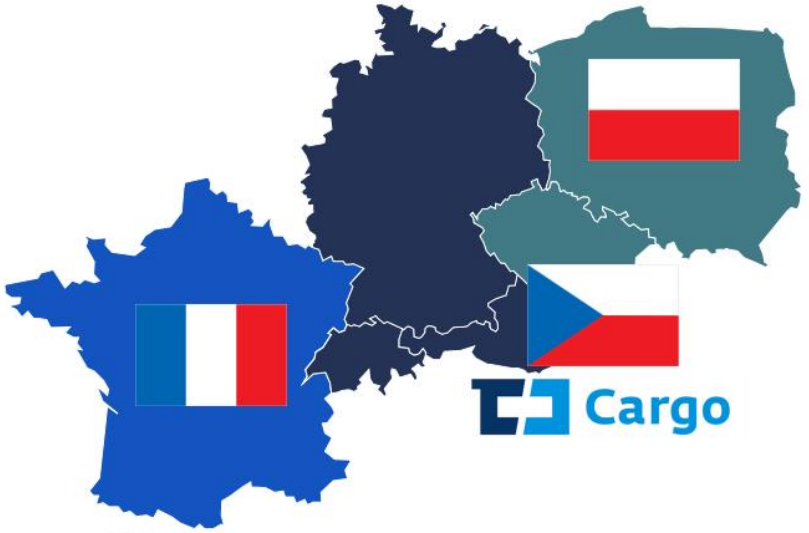
Testing with the fully equipped demonstrator

- Challenging sites per country
- Inclusion of local staff
- Support by DAC4EU test crews

- **Scope**: coupling tests, coupling under winter conditions, flat yard shunting, shunting with challenging track topology (narrow curves), shunting tests on marshalling yard with hump

- Developing common view on DAC
- Identification of country- or site -specific issues for DAC operations
- Demonstrator train as show case (events, etc.)

CEO support received.
Detailed planning going to start.



Positive feedback received;
still, conditions to be clarified

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Austrian DAC test train

pictures of the shown video

Beauftragt und finanziert durch:
Bundesministerium für Digitales und Verkehr

DAC4EU

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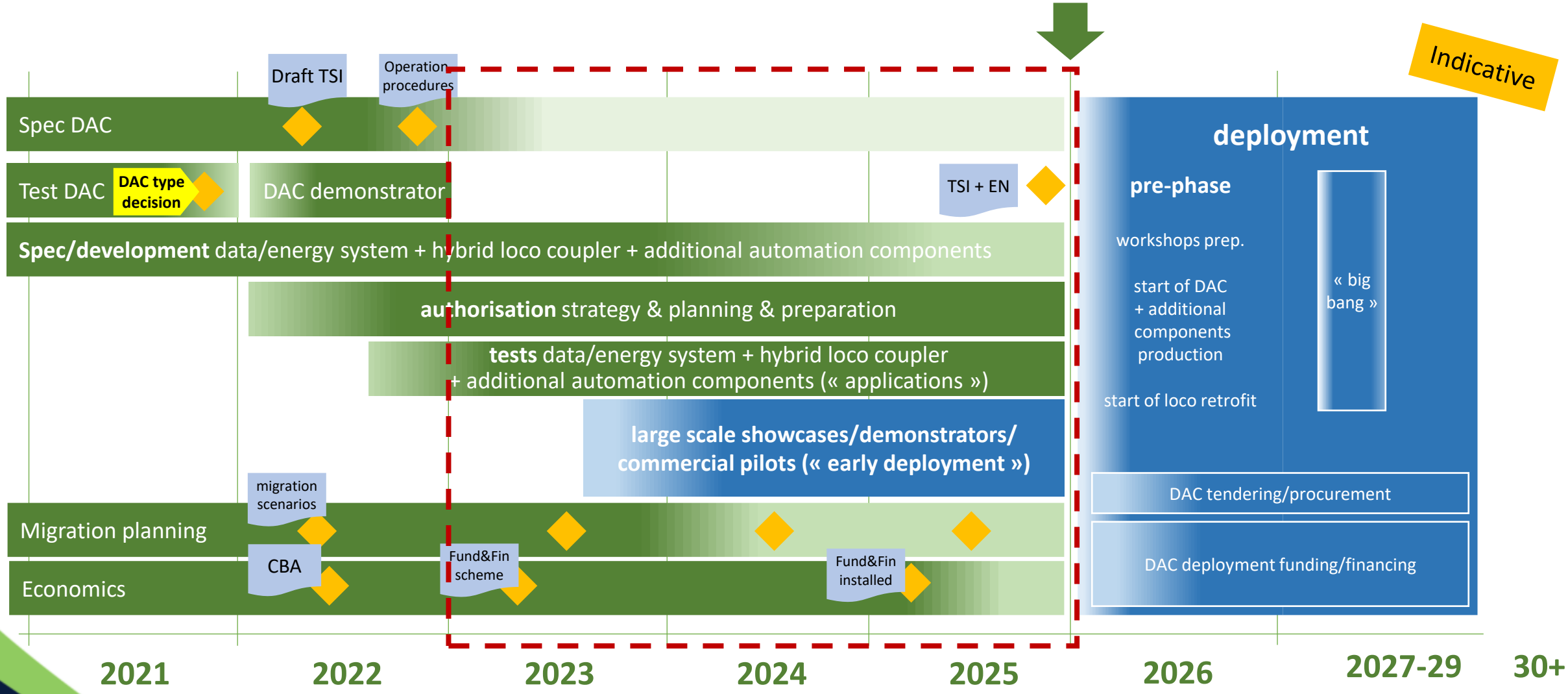
Indicative overall time plan



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Outlook

Japan, 1925

nach retrofit

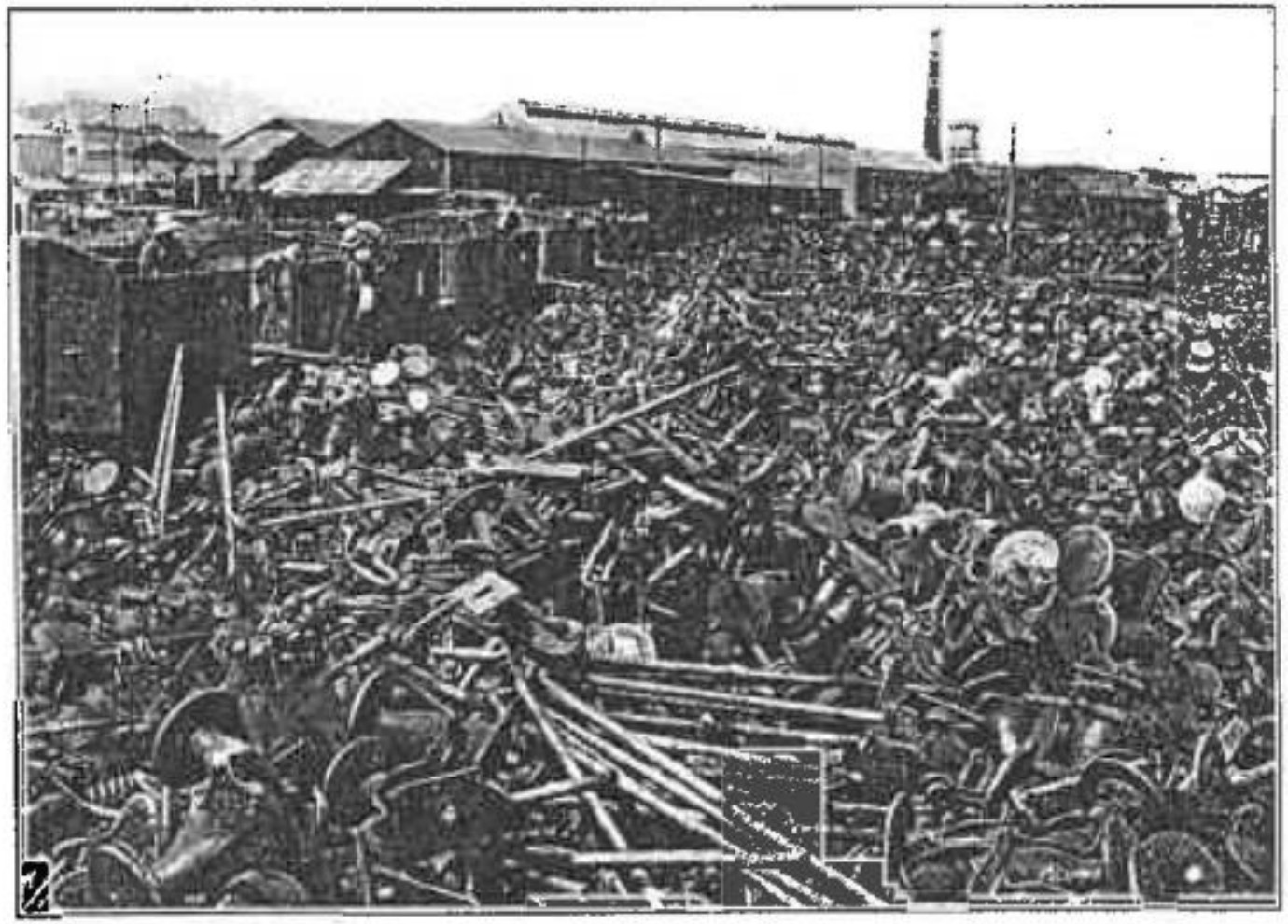

Fig. 22. Heaps of removed materials.

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Any questions?

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

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