Dynamic Train Planning

Innovation Competition Launch

4 October 2019

Welcome and Introduction

Presented by Luisa Moisio

R&D Programme Director

4 October 2019

Housekeeping

No fire drill scheduled today

Wear your lanyard at all times

WiFi: look for L39-Visitor

No password required

Please switch mobiles to vibrate / silent mode.

Interact throughout the day using…

#DynamicTrainPlanning

@RSSB_rail

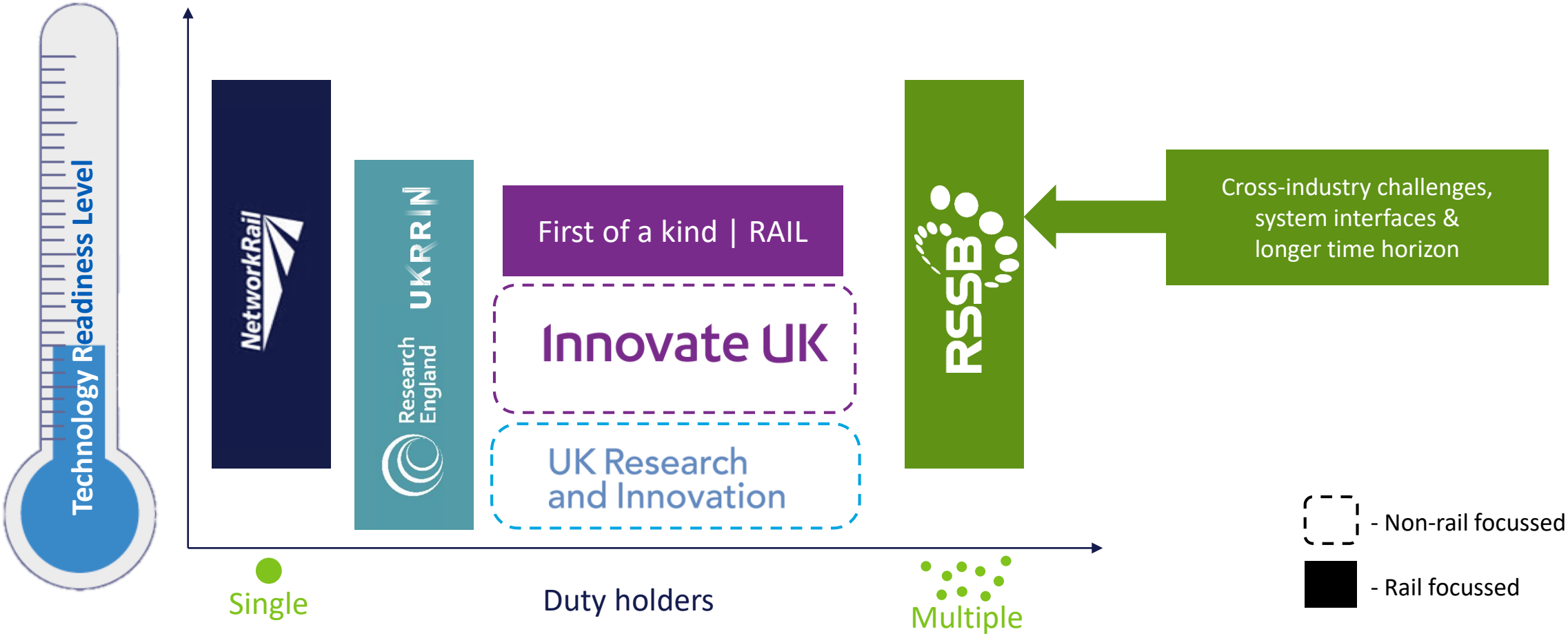
About RSSB

Independent expert body supporting the industry in:

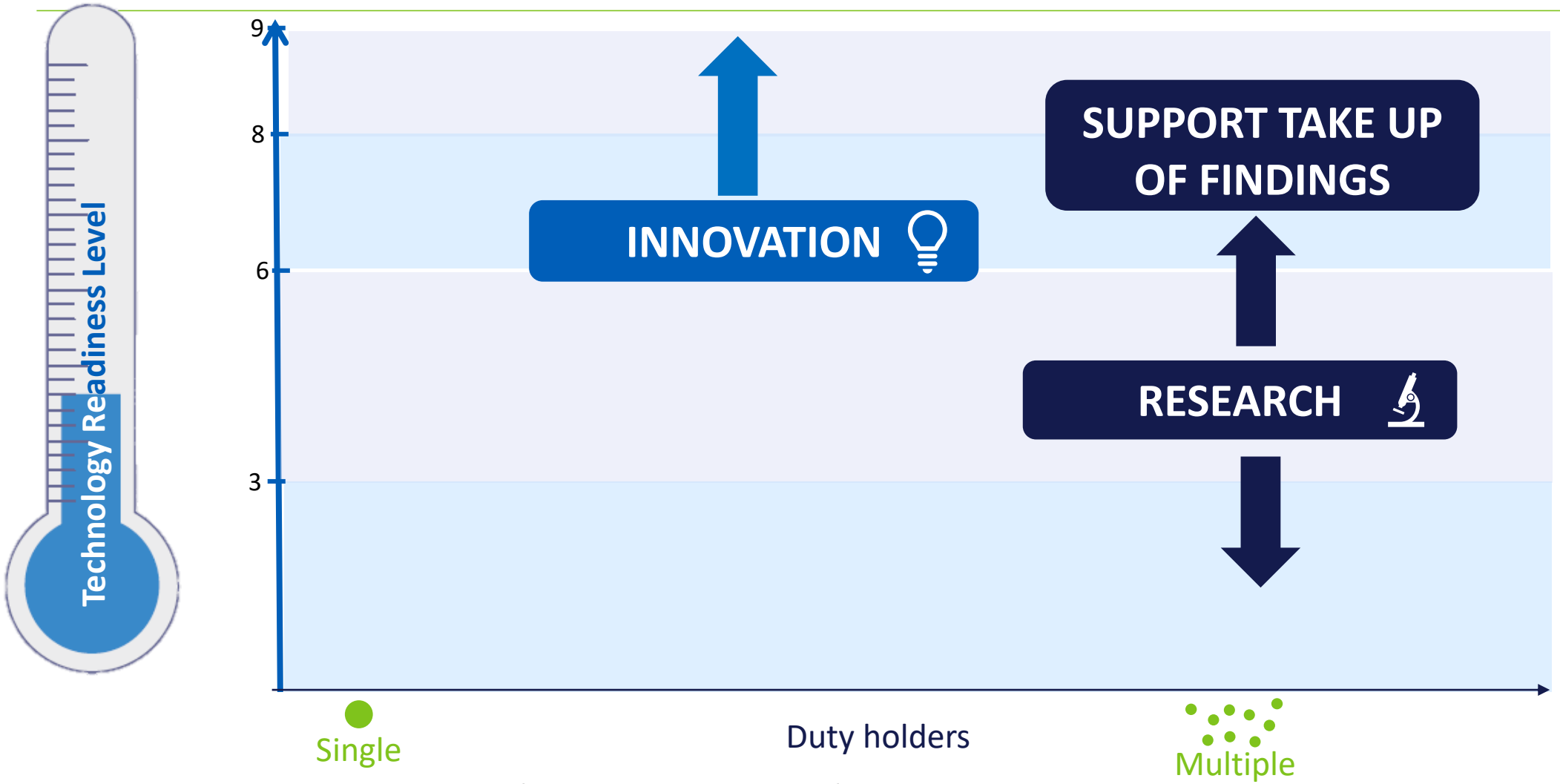
- Standardising and sharing best practice on technical interfaces;
- Continuously improving health and safety;
- Developing new knowledge and solutions that require cross-industry collaboration.

Through research, standards, and analysis we help our members deliver a better, safer railway

How do we fit in the GB Rail research and innovation landscape?

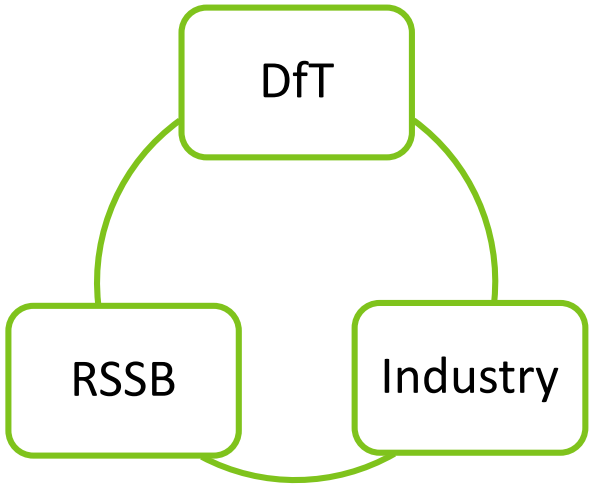


Zooming in on the RSSB Innovation and Research Programmes



RSSB: Research Programme

RSSB's R&D programme allows **industry to work together to explore and develop opportunities** and then we work to ensure the **insights make a real difference**.

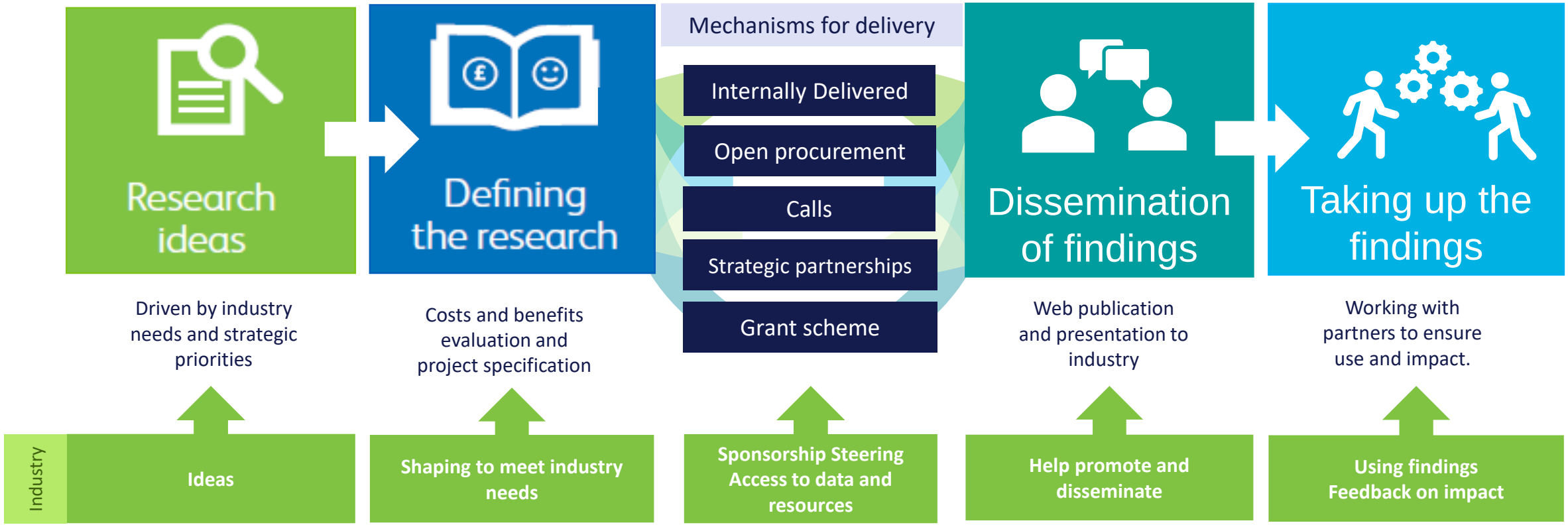


The RSSB's R&D Programme receives a £10m annual grant from DfT.

The money comes with requirements to:

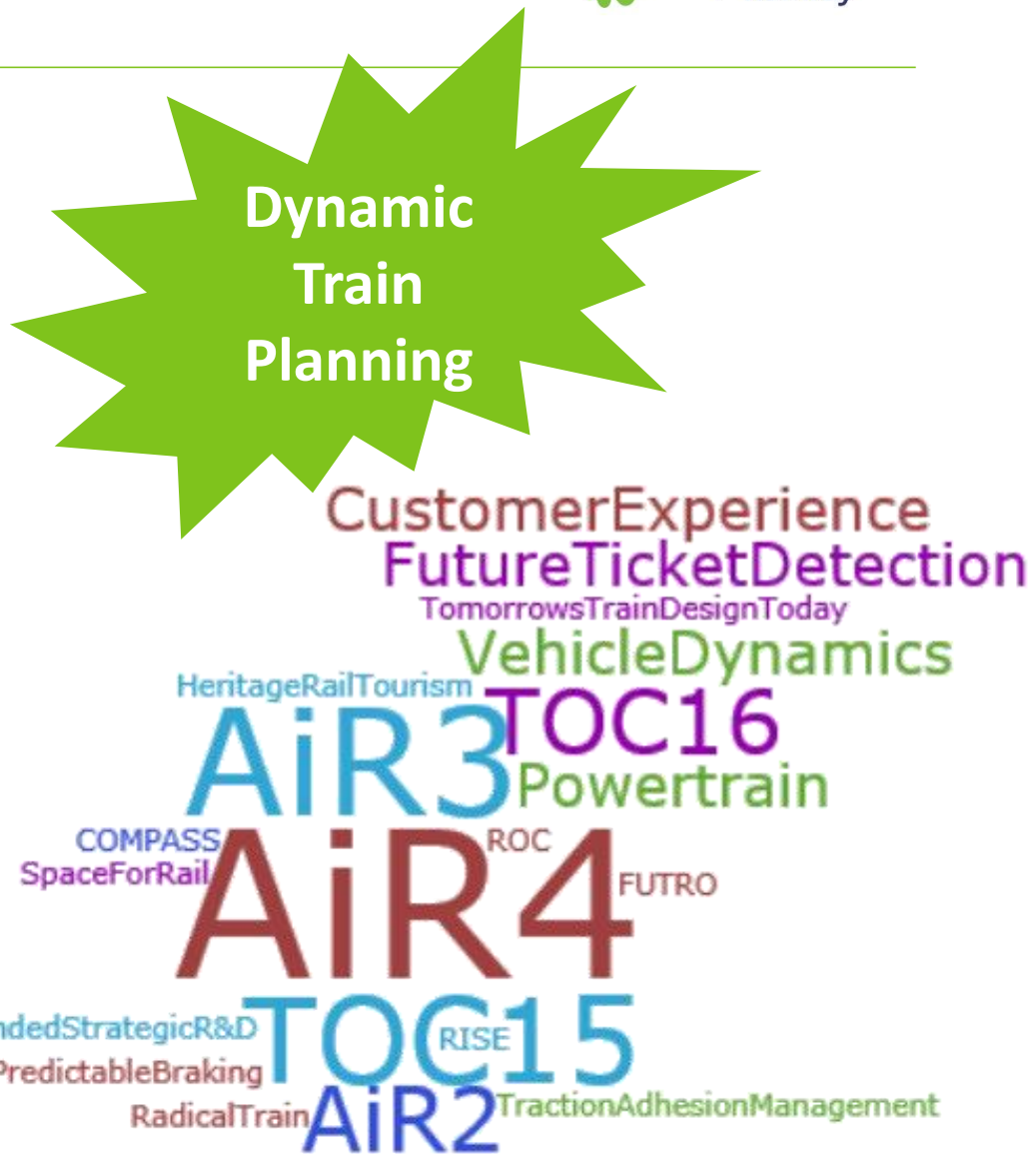
- **Fund truly cross-industry research**
- **Have mix of high impact/high uncertainty research and shorter term/incremental research**
- **Leverage co-funding when appropriate**

RSSB research: from idea to making an impact



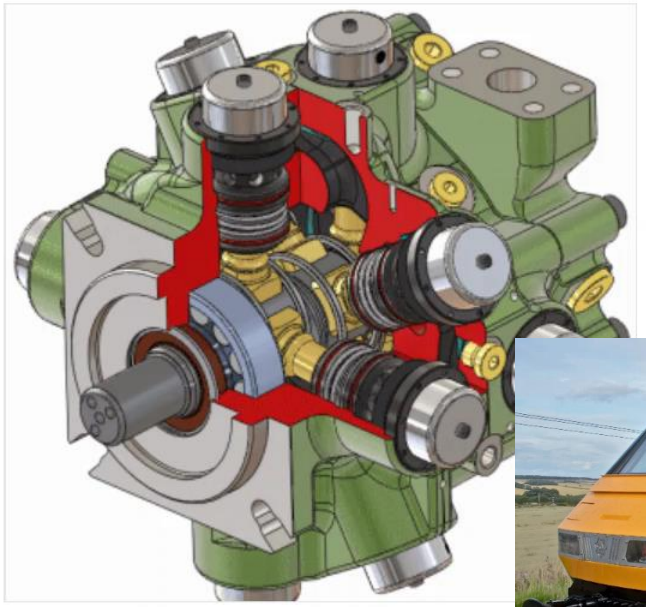
RSSB: Innovation Programme

- Managed the delivery of £100m investment in innovation competitions through DfT and Network Rail funding.
- Funded 150+ projects, across over 200 partners and consortia.
- Aim to bring together TOCs, FOCs, owning groups, ROSCOs, Tier 1s, SMEs, Universities and Network Rail.
- Innovators / consortia own the IP however RSSB are here to facilitate introductions and encourage industry take-up.

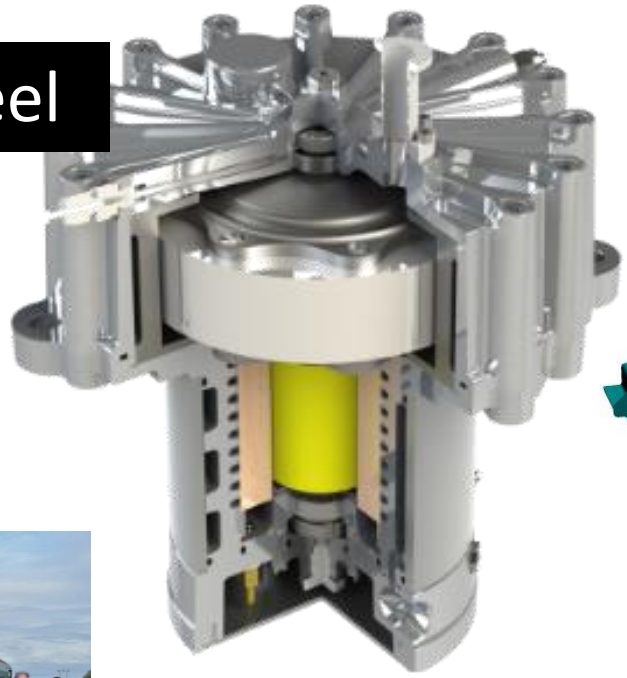


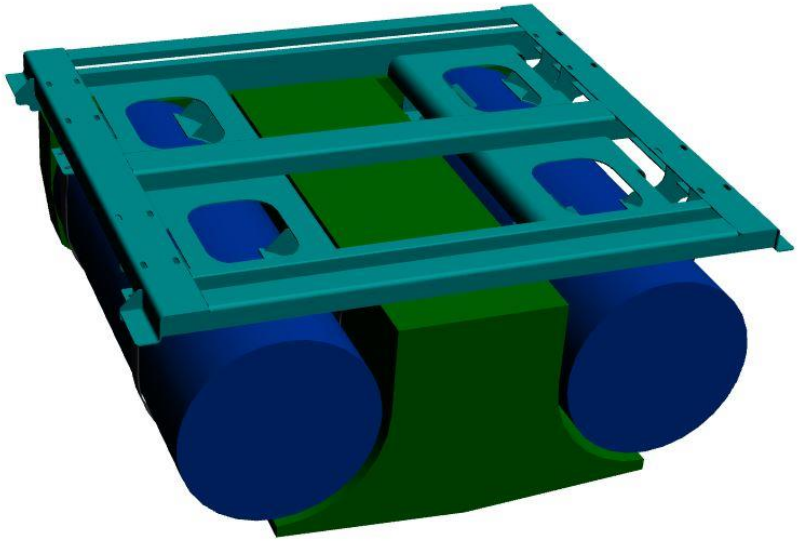
Innovation: decarbonisation solutions

DBS Flywheel



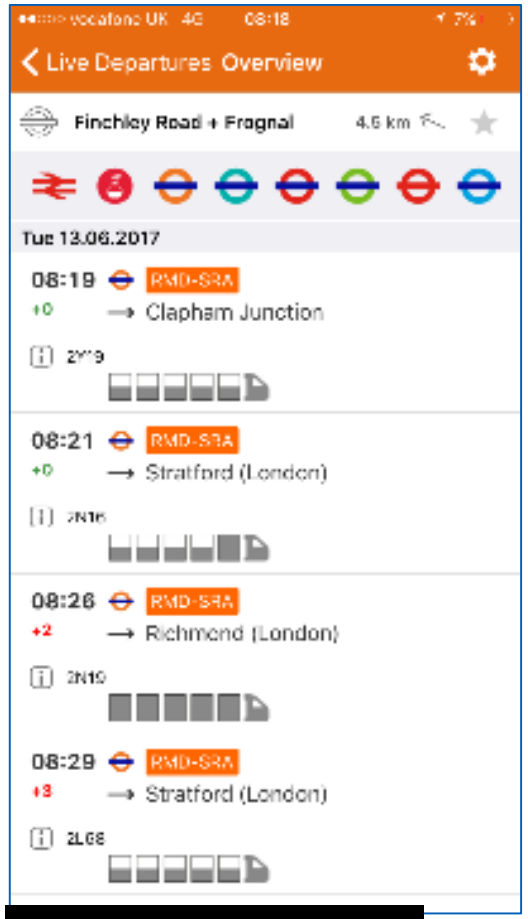
Artemis Digital Displacement Technology



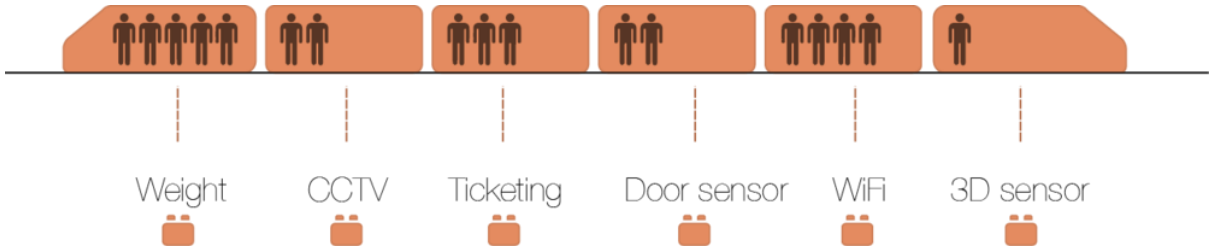


G-volution Dual fuel solution

Innovation: on train information



Orinoco ARL



OpenCapacity

MyJRNY

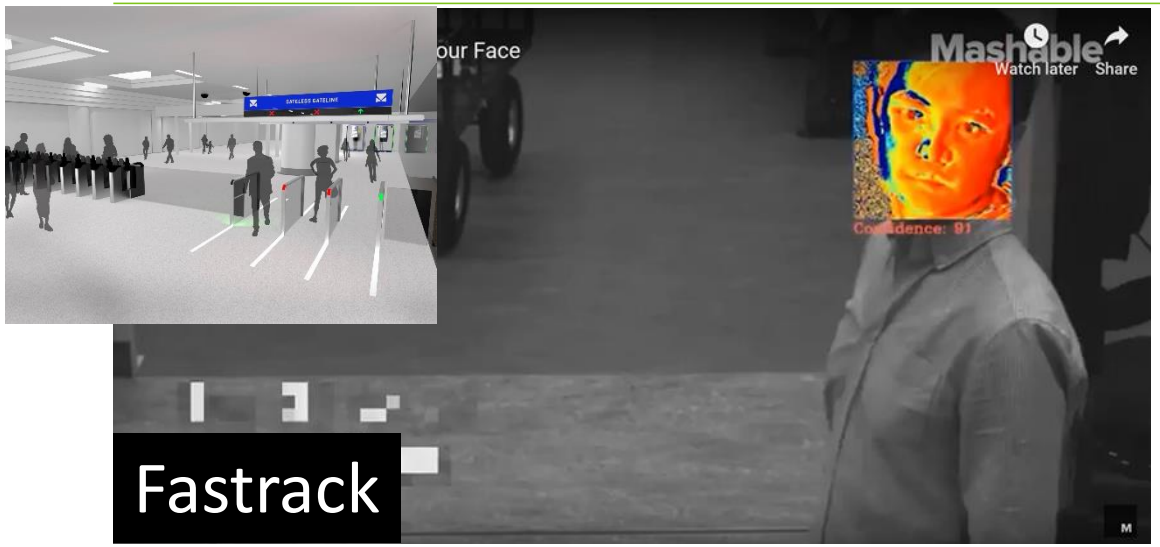
Understanding passenger numbers in real-time

Innovation: seating

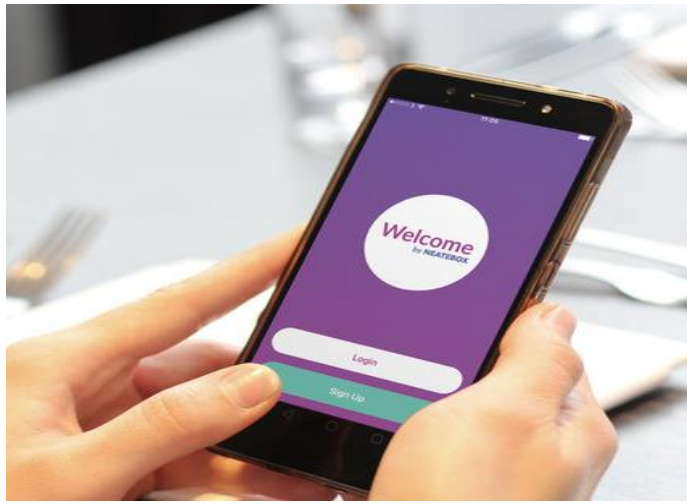
Horizon seat

Adaptable Carriage

Innovation: gateline



Innovation: improving accessibility



- Improving accessibility of rail for people with dementia
- App providing two way communication and alert when passengers enter station
- Pilot at Edinburgh Waverley

- Improving accessibility of rail network for deaf people
- Toolkit provides BSL training for staff and app providing key messages in BSL
- Looking for Route to Market opportunities

aubin

- Improving rail journeys for people with autism
- App providing users with stress related preferences over time and cost
- First Beta version is available from October 2019.

Innovation: improving accessibility

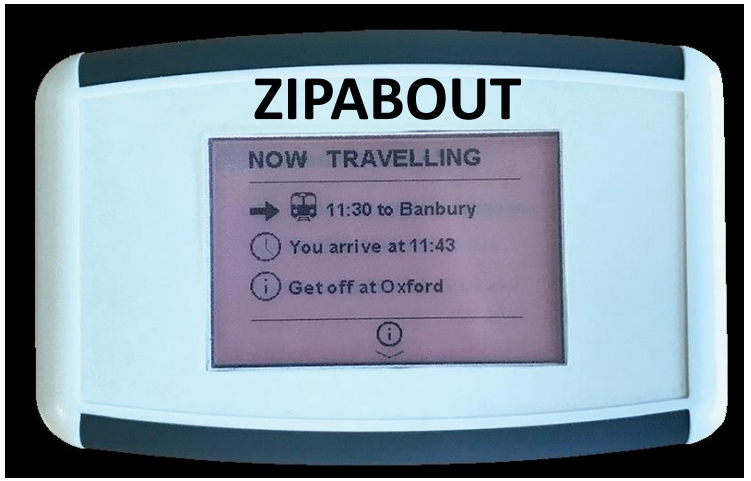
access

ACCessibility Evaluation Survey for Stations

- Tool to assess accessibility at a station and identify improvement priorities.
- ‘Traffic light’ rating for simple and quick assessment, self explanatory.
- Looking to develop App/Website

STATION PARTNER

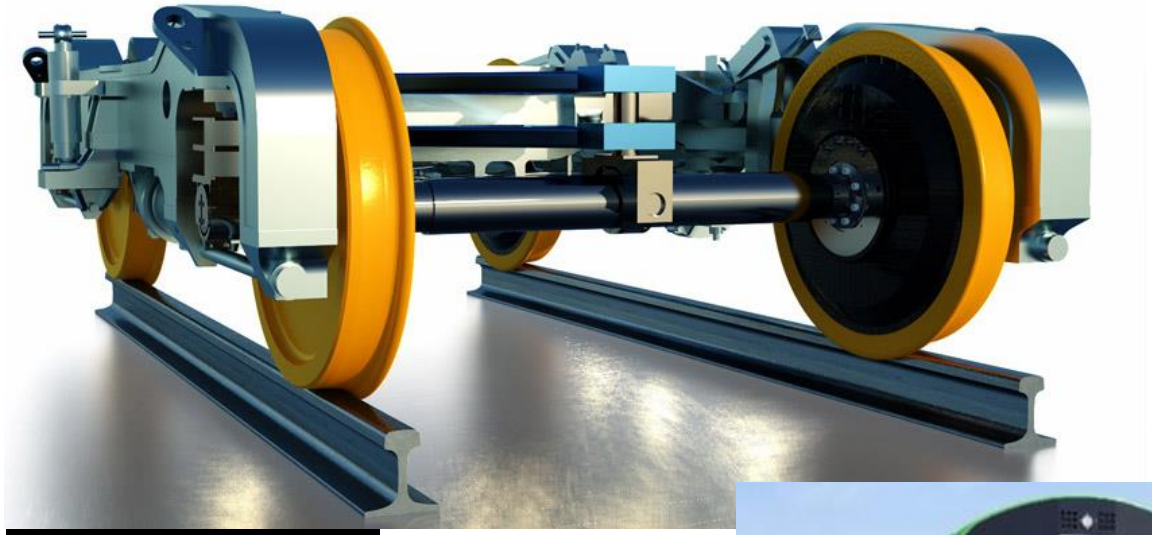
- Enabling people with LVIs to use rail services with greater ease
- Created a learning digital environment for passengers, familiarise through gameplay
- Data collected can be used by rail staff to increase awareness



- Improving accessibility of rail for people with LVI
- Device providing in the moment guidance, no need to interact; no GPS or telecom connection needed.
- Pilot with GWR

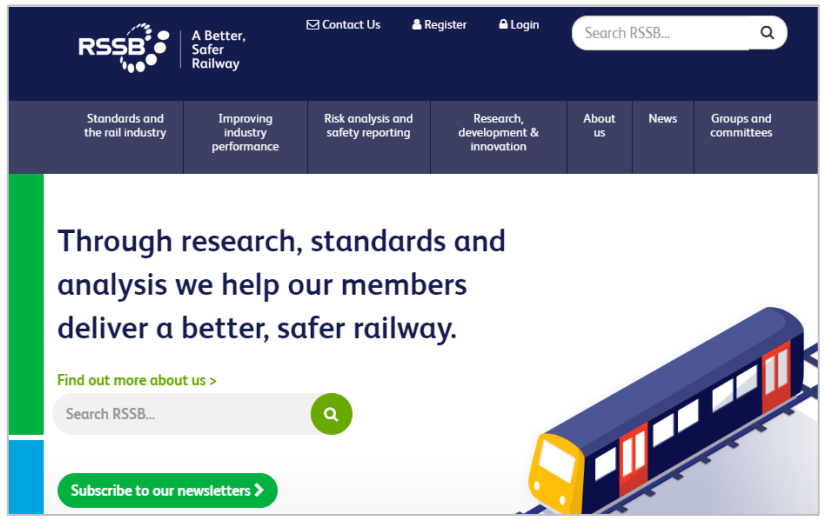
Innovations keep coming…

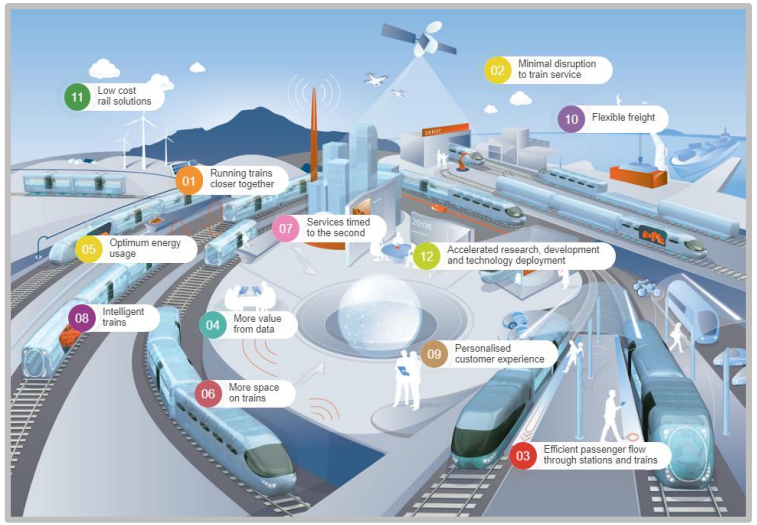
Adhesion Digital Solution



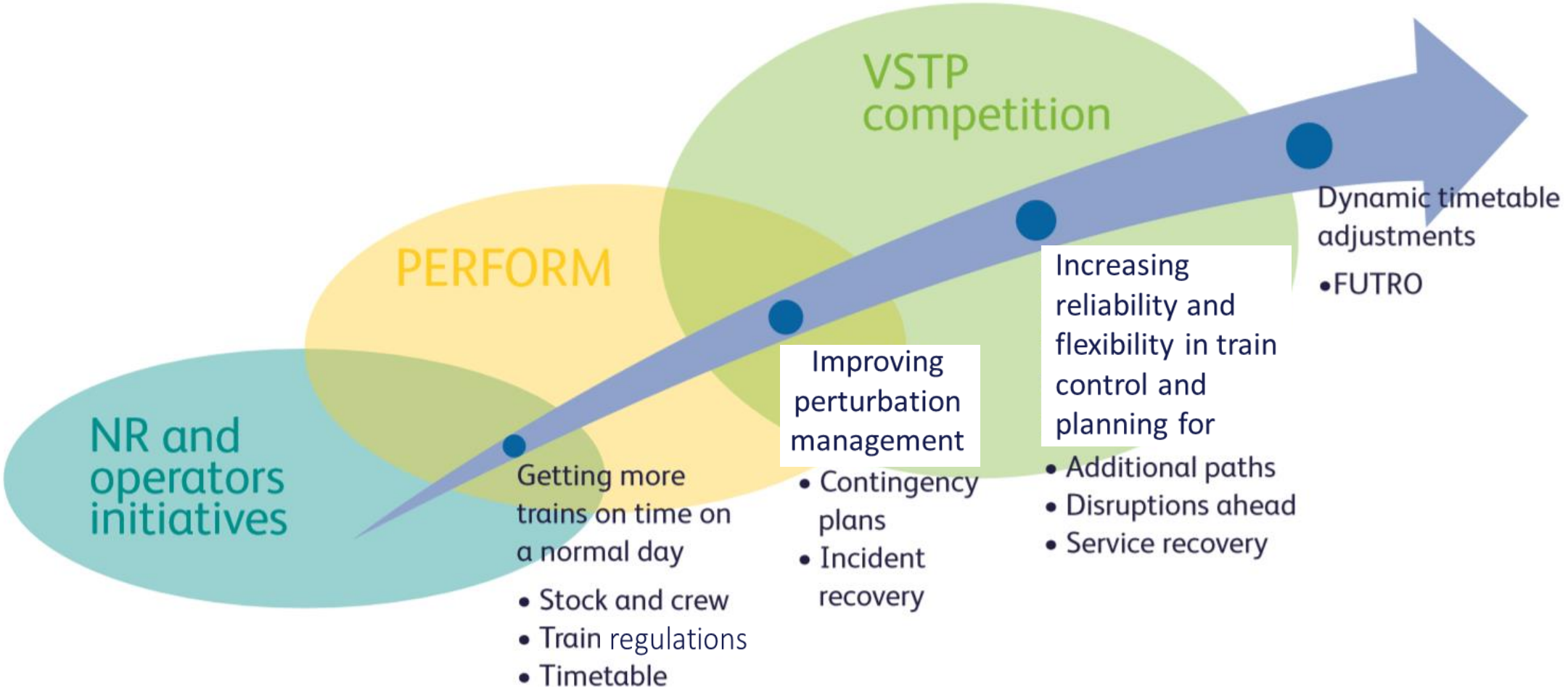
ActiWheel

Where to find out more…





Dynamic Train Planning - Competition



Thank you

Dynamic Train Planning Very Short Term Planning - The Challenge Explained

Andrew Pennington

Head of Planning: South Western Railway & Network Rail Wessex Alliance

&

Kris Alexander

Programme & Support Services Director: Capacity Planning – System Operator

System Operator

Planning a better network for you

“Very Short Term Planning” is….?

When:

- Long Term Planning – May and December
- Short Term Planning – Informed Traveller T18/T12
- Train Operator Variation Requests (Spot Bids)
- VSTP = Post Day A for Day C

Who needs it:

- Train & Freight Operators
- Route Controls
- Passengers & Freight Customers

Comprises:

- Timing Information
- Integrated with available stock and crew resources – which may need adjusting

Drivers of VSTP

- Short notice flow of traffic – freight or passenger
- Weather Events – Wind and Snow
- Traction & Traincrew Resource Shortages
- Infrastructure Out-of-Use
- Major Service Disruption
- Unable to be delivered by Capacity Planning (New items & Offer/Response)

It’s not just Short Term Planning made agile

- Minimise the duration of the changes
- VSTP needs to confine the extent of the alterations
- Reflect traincrew rostering agreements and stock allocation needs
- Be able to work across days – but only do this by exception
- Have its’ own set of “Controller’s Planning Rules”
- Not incentivise late planning

Capability Demanded

- Integrate with TOC/FOC planning and control specifiers
- Download into TOC resourcing systems
- Eliminate need to use multiple disconnected systems
- Save plans (as overlays) – so they can be used again
- Download into Network Rail systems to facilitate Train Running, Signalling and Passenger Information
- Balanced risks – quality vs availability of a plan

The Future means……

- Respond to incidents
- Able to mitigate risks
- Minimise footprint/duration of plans
- Integrate into stock and crew resourcing
- Distribute plans for operational and customer needs
- Provide a store of previous, consistent and tested plans

VSTP: an operator's point of view

Kris Tucknott
Head of Performance (Arriva Trains UK Bid Team)

arriva

a DB company

Background

- 16 years railway experience
- Predominately in and around Performance Teams
  - Variety of operators
  - Measure & understand delivery of the plan (Long & Short term plan)
  - How close have we been to delivering our promise to the passenger?

VSTP

- In light of sometimes significant operational challenge and to sometimes exceptionally short notice
- Falling outside of any (robust) train planning process
- Picked up (within) Control Rooms
  - Often challenging environment
- We will introduce services into the plan that sometimes fall outside of any contractual measurement process (due to time and the need to let the passenger know in advance)
- We do so adopting and accepting the notion of 'it's better to do something than nothing'

Risk

- VSTP comes with a risk
  - Can the new / revised / amended service fit into the current timetable?
  - We revise and upload a plan at short notice not fully understanding as to whether it fits or what the delay impact has the potential to be
  - Reactive
  - In response to an operation challenge

Examples

- From my experience the process has been employed in response to –
  - A particular piece of infrastructure that can no longer be used
  - A significant weather event
  - An ongoing Fleet availability defect (SWT)
  - Traincrew issues (ARN)

What could we do?

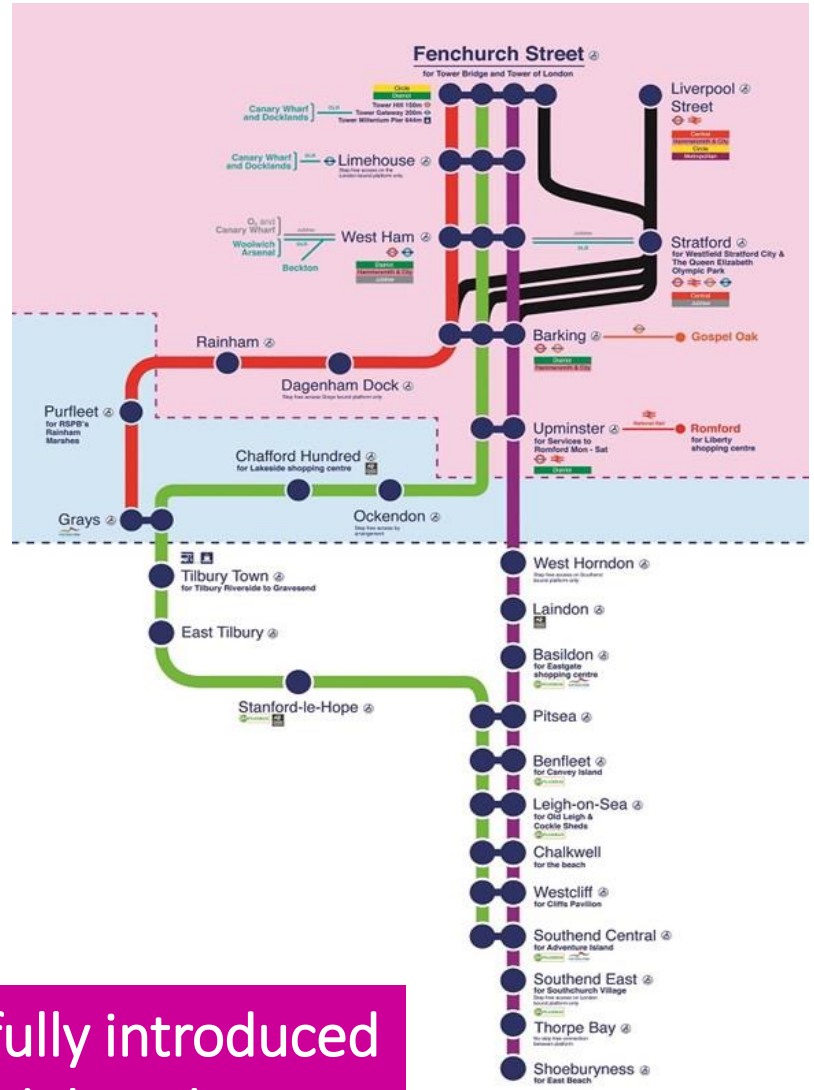
- Make the current more effective -
  - Reduce Controller workload
  - Reduce time for the 'Checking process'
  - Reduce conflicts / potential for delay minutes to be caused
  - Standardise (one Railway) – Consider the impact on all rail operations on the day
  - Consider tomorrows start of day service
- Move process to allow the railway to be more proactive –
  - Assuming Stock, Crew and infrastructure are available
  - Could we introduce a system or process where we deliver our plan whilst understanding the imminent demands that our railway may face and dynamically changing our plan
    - Increased passengers travelling into a city centre in a morning peak, over and above expected levels. They'll need to get home in the evening, could we introduce (on the day) services, that work with the current plan to mitigate the demand that will come?
    - Allow the railway to support a special event that has been over subscribed, create a better passenger experience, rather than suffer the cramped conditions, excess dwell and the poor experience (CrossCountry)?

Implications of VSTP on Traffic Management

Jack Rumbold, Service Delivery Manager c2c

Essex Thameside

- Thameside established as one of the top performing railways in Britain
- Commuter railway – runs at 100% capacity during peak hours.
- Major timetable change introduced in 2015
- c2c awarded a 15 year franchise & became part of Trenitalia group



Traffic Management was successfully introduced in April 2019 to help our people deliver best in class operational performance.

What is Traffic Management?

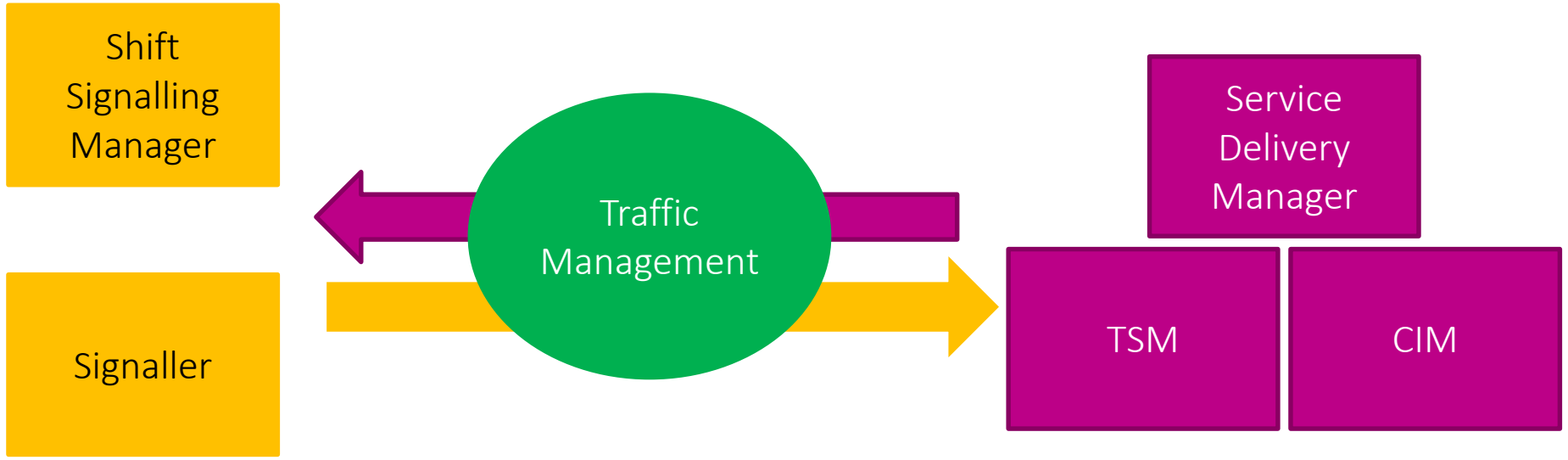
- Traffic Management is made up of four key elements:

	**Train Graph** – shows the current and future planned train paths.
	**Line Graph** – provides a special overview of the infrastructure and displays; track signals and points and route sets etc.
	**Platform Docker** – provides a geographical view of trains arriving and departing from each station.
	**Process Data Editor** – gives a key tabular view for displaying train running information and displays the planned schedule in a variety of graph and table views.

Traffic Management facilitates quicker, and conflict free VSTP application.

How is Traffic Management used?

- **Technology** – Provided by *Thales* Traffic Management solution (ARAMIS).
- **New Operating Model** – Enabled by c2c control staff, and Network Rail signalling staff at Upminster IECC.



Benefits of Traffic Management (so far!)

- Reducing service recovery times.
- Assisting in making proactive decisions to benefit the train service.
- Signaller delay codes (OC / OH) starting to decline.
- Dynamic modelling of the timetable has been used to assist in the prioritisation of removing ESR's, and to insert conflict free paths for VSTPs.
- Reduction in delay minutes and schedule 8 costs as a result.

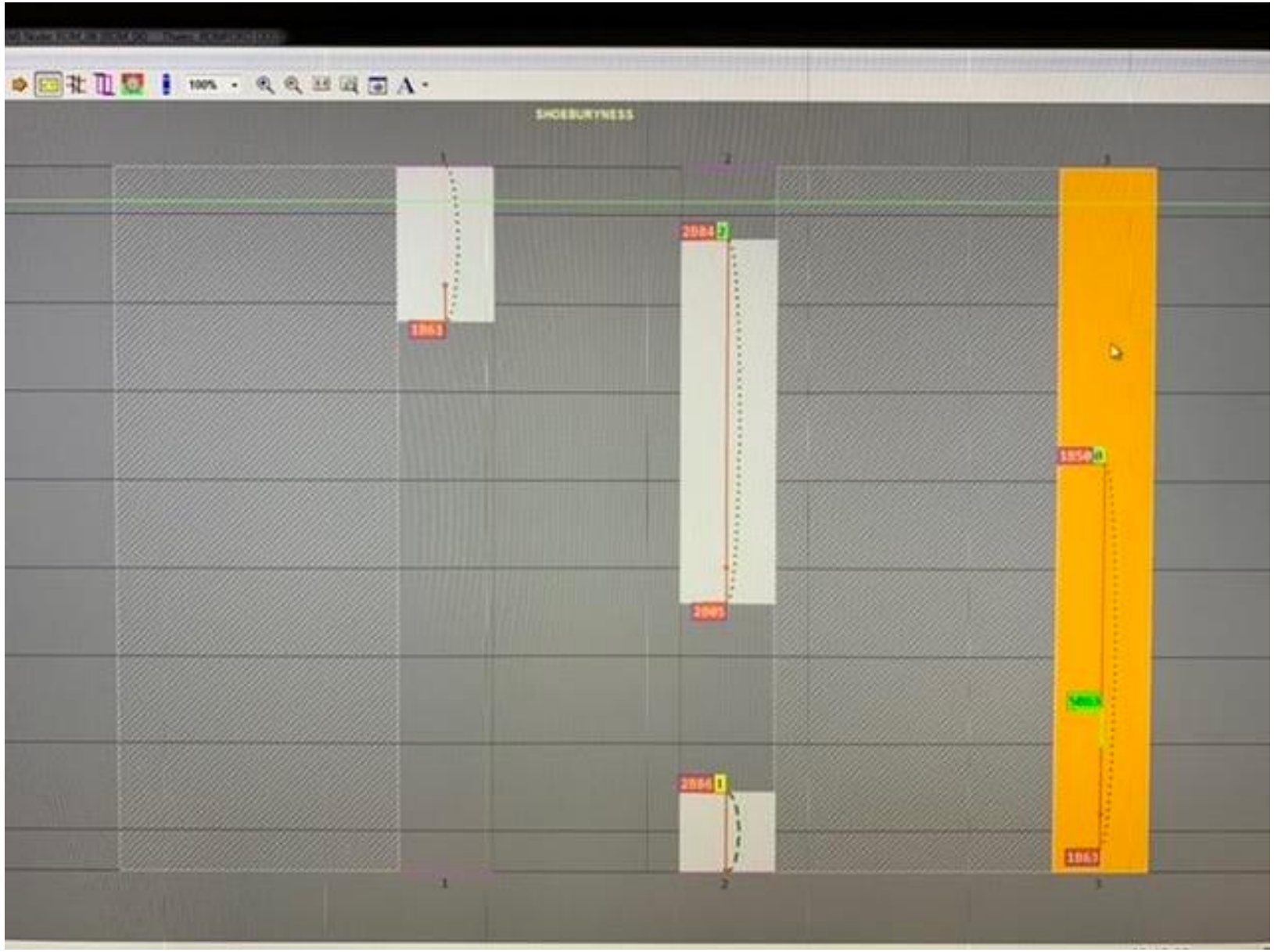
But there is a lot more we could do with TM if it had more data and links to other systems (e.g. stock management and customer information).

c2c

Case Study – Platform Restrictions

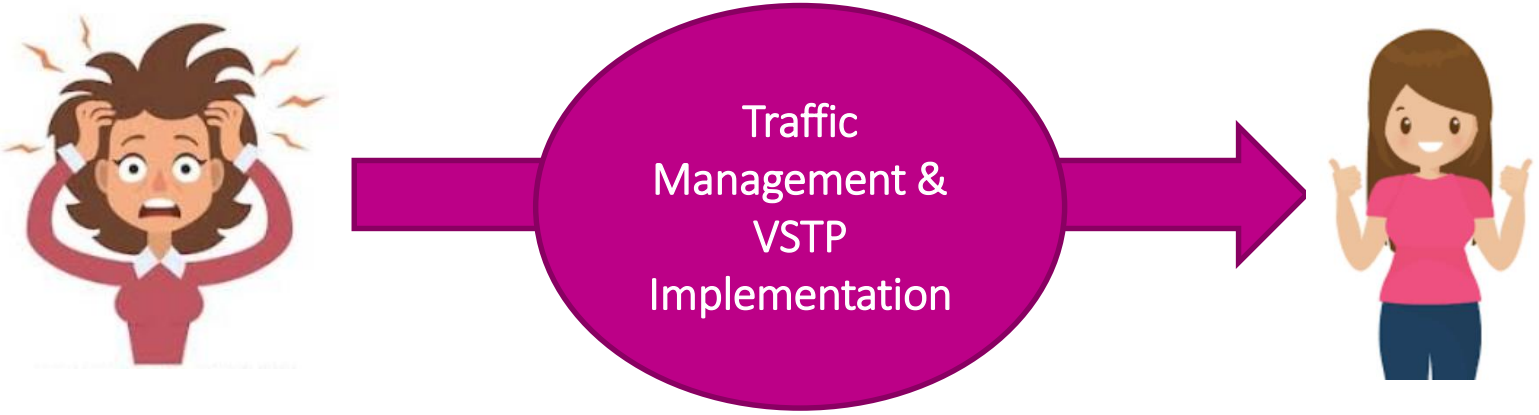
- On 25/09/19, platform three was lost throughout the day at Shoeburyness due to a cracked set of points. This is equivalent to 33% of platform capacity.
- A heavily amended train plan was constructed within 90 minutes for the whole day – using the platform docker feature in tandem with the train graph.
- This involved multiple VSTP amendments. TM enabled efficient and conflict free VSTP.

However, current restrictions within TM still puts reliance on slower and more traditional processes……


SHOEBURYNESS

Opportunities & Next Steps

- Traffic Management presents significant potential to streamline the VSTP process:
  - Reduce conflicts.
  - Faster application.
  - Efficient communication.
- Enrich Traffic Management with as much data as possible (i.e. Stock and crew systems).
- Working with Network Rail and supplier for plan for improvements – identified by TM users.
- Adapt our processes and technology to enable VSTP for the next day.
- Opportunity to streamline and standardise the TM & VSTP process.



Current and Future Deployments of CDAS and Junction Optimisation

Mark Wardell

Operational Specialist

Contents

- System Overview
- System Trial
- Current Deployments
  - FHT - SDAS
  - TPE - SDAS
  - SWR - CDAS
  - GWR - CDAS
- Future Opportunities

System Overview

- Driver Advisory System (S-DAS)
  - Cab Based DMI
  - Route characteristics (line speeds, gradients, curvature)
  - Train characteristics (Mass, power, TE and RR)
  - Working Time Table
  - Advice given is **sectional speed** and **coast point**
- Shore based system (Back Office) is provided to:
  - Update route characteristics (e.g. temporary speed restrictions)
  - Daily timetable updates
  - Host the database of data logs downloaded from the trains
- Junction Scheduler/Optimiser (C-DAS)– Traffic Management Component
  - Monitors approaching trains at key junctions to identify possible conflicts
  - Updates DAS with modified schedule to reduce/resolve conflicts

Service Trial Nov/Dec 2014 – Heathrow Airport Junction

- Baseline conducted using 986 passenger services (Nov 14)
- Results showed that 10% were delayed at HAJ (less than 10kph)
- During 4 week trial (Dec 14) 315 services were updated and schedules amended
- Reduction in delays down to 1.6%
- 36% additional improvement in energy efficiency
- 95s improvement on arrival times into London Paddington

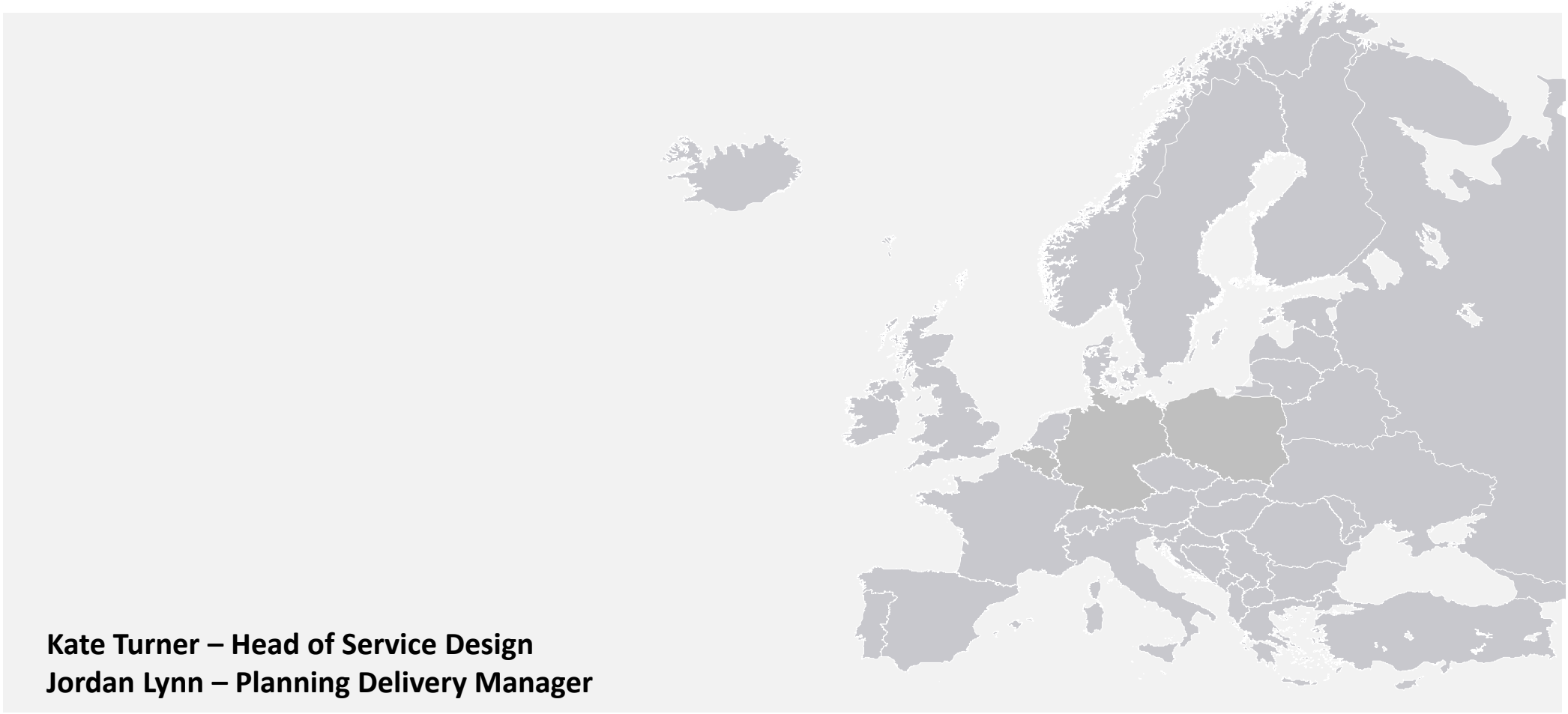
Current Deployments

- First Hull Trains
  - Cab Based DMI
  - Standalone DAS
- Transpennine Express
  - Tablet Based DMI
  - Standalone DAS
- South Western Railway
  - Tablet Based DMI
  - Connected DAS
  - Berrylands Junction, New Malden, Clapham Junction and Woking
- Great Western Railway
  - Cab Based DMI
  - Connected DAS
  - Heathrow Airport Junction

Future Opportunities

- Integration into Customer Information Systems
- JO deployment across the at key junctions
- Integration into Traffic Management
  - Real-time timetable updates from shore base
  - Modified arrival times at key junctions
  - Potential to regulate traffic through key nodes
- Timetable optimisation
  - Energy efficiency
  - Regulation
  - Enhanced capacity

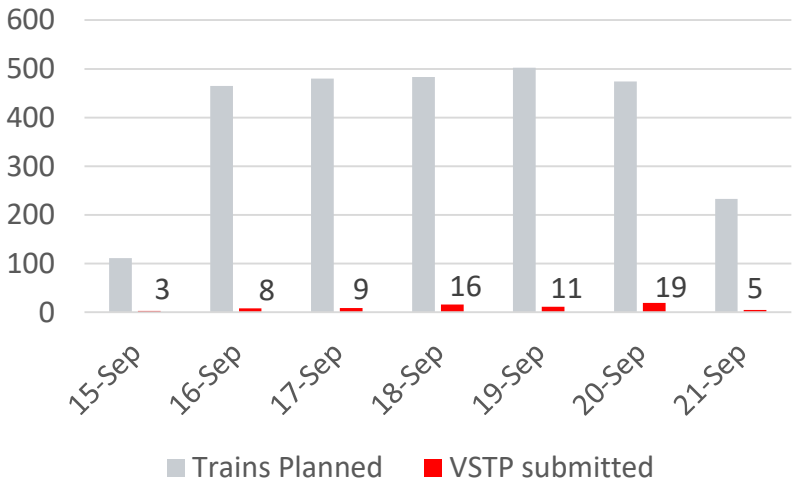
Thank You

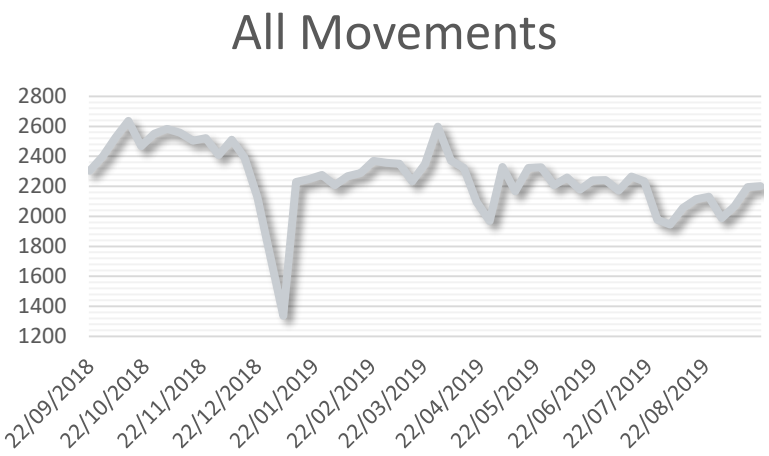


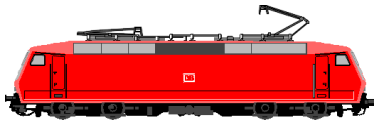
Kate Turner – Head of Service Design
Jordan Lynn – Planning Delivery Manager

How will Freight benefit from a robust VSTP service?

Context: Freight Industry Market Overview







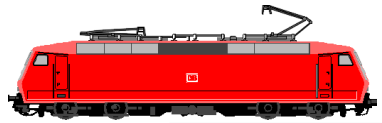
The Rail Freight industry is highly volatile having high peaks and troughs in demand, an interchangeable weekly order and services travel to all corners of England, Wales and Scotland. From St Blazey in Cornwall to Georgemass in Northern Scotland and all areas in-between. Also operating through the Channel Tunnel.

- ❑ Intermodal – Stable plan
- ❑ International – Stable plan
- ❑ Steel & Scrap – Intermediate, i.e.: depends on market price for the product
- ❑ Construction – Flexible market, i.e.: Major Projects

What are the current challenges?

1. Customer Change

1. Plant Breakdown at customer terminals
2. Fully stocked depots and diverting product to elsewhere
3. Late request from a customer to run an additional service outside the planning window
4. Late presentation of traffic / Customer Operational Issues
5. Customer request, for extension of terminal time



What are the current challenges?

2. Internal Issues

1. Route knowledge
2. Driver Vacancies leading to the retiming of a service
3. Recovery of previously cancelled service
4. Driver Sickness /Driver unavailability / Late
5. Loco / Wagon maintenance & ad-hoc moves required for failures

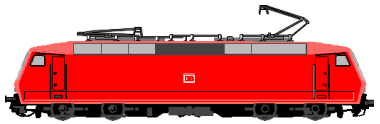
What are the current challenges?

3. Capacity on the Network

1. Planning rejections 15:00 Day A for day C – the order has already been accepted by this point

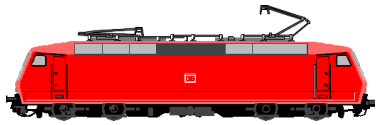
2. Informed Traveller process

3. Customer request after 10:00 Friday morning for Sun, Monday & Tuesday is automatically a VSTP (This process increases the number of VSTPs).



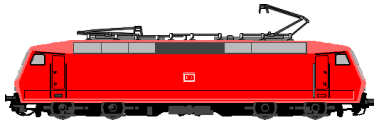
Positives & Negatives for the Freight Industry

Positives of VSTP	Negatives of VSTP
Increased flexibility for customer	Risk of service being rejected
High acceptance of services bid	Sometimes the response is only a few moments before departure (i.e.: speed of response)
Provides a ‘safety net’ for failings	Sometimes the VSTP offered, even though Network Rail have done their best, does not fit resource identified or customer request
	Conflict between control teams due to increased stress
	No intermediary planning process between A4C and VSTP

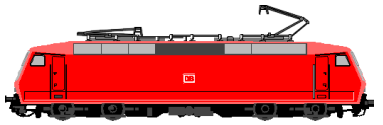


How will Freight benefit from a robust VSTP service?

"Agile Strategy and Cultural Change for Freight"



Any Questions?



Q&A panel

Andrew Pennington, SWR

Kris Alexander, NR

Kris Tucknott, Abellio

Jack Rumbold, c2c

Mark Wardell, First Group

Kate Turner and Jordan Lynn, DB

Coffee break (15 mins)

Dynamic Train Planning- Our Vision for the Future

Clive Burrows

Group Engineering Director

Contents

- Today's Challenges
- Planning Process
- Dynamic Optimised Timetables
  - What we need to do
  - Where we need to be
- Delivering the Vision – Information Systems
- Information Flows in the Future

Today's Challenges

- Complex and Inflexible System
- Slow Process to Plan and Introduce Changes
- Unable to respond quickly to Freight or Passenger Customer Demands
- Flexibility achieved through Constraining Capacity
- Inability to Quickly Simulate System Effects of Changes
- Long term recognition of the need for detailed and high quality train planning
- More recent recognition of:
  - Need for flexibility and agile re-planning - When things change, it's a struggle to achieve what normally takes over 40 weeks in less than 40 hours…….and at times less than 40 mins
  - Benefit from having the ability to optimise the plan for a variety of factors that will have varying importance at different times

Where we are with the planning process now

TIMETABLE DEVELOPMENT DATES – December 2018 and May 2019 TIMETABLES

Timetable Development Dates	Principal Change	Subsidiary Change
D73 - Formal Notification of Process Dates	14/07/2017	
Revision of Timetable Planning Rules		
D64 – Start of NR Consultation of Proposed Changes to Rules	15/09/2017	23/02/2018
D60 – End of NR consultation of proposed changes to Rules	13/10/2017	23/03/2018
D59 – Publish 'Draft Rules'	20/10/2017	30/03/2018
D54 – Operator Responses to 'Draft Rules'	24/11/2017	04/05/2018
D54 to D44 – NR review Operator Responses		
D44 – Publish 'Final Rules'	26/02/2018	13/07/2018
D41 – End of Period in which an appeal can be made for the 'Final Rules'	23/02/2018	03/08/2018
Initial Consultation Period		
D55 – Publication of Strategic Capacity Statement	17/11/2017	27/04/2018
D55 – Notification by TT Participants of major TT changes * Timetable Participants will submit template circulated on 30th September 2016 covering known significant timetable changes (as defined within the template) for the Principal 2018 Timetable Period. ** Timetable Participants will submit template circulated on 10th March 2017 covering known significant timetable changes (as defined within the template) for the Subsidiary 2018 Timetable Period.	17/11/2017	27/04/2018
D55 – Start of Initial Consultation Period	17/11/2017	27/04/2018
D45 – NR to provide copy of 'Prior Working Timetable'	26/01/2018	06/07/2018
D48 – Notification of Provisional International Paths	05/01/2018	
D40 – Priority Date	02/03/2018	10/08/2018
Timetable Preparation Period		
D40 – Start of Timetable Preparation Period	02/03/2018	10/08/2018
D37 - Timetable Change Risk Assessment Group	23/03/2018	31/08/2018
D32 - Timetable Change Assurance Group	27/04/2018	05/10/2018
D26 – NR Publish New Working TT	08/06/2018	16/11/2018
Timetable Commencement Date	09/12/2018	19/05/2019
Timetable End Date	18/05/2019	14/12/2019
Other Notable Dates (Non Contractual)		
New WTT and associated system files available to ATOC	08/06/2018	16/11/2018
Operator responses to new WTT	22/06/2018	30/11/2018
D22 – End of Appeal Period 'New Working Timetable	06/07/2018	14/12/2018
D15 - Timetable Briefing process complete	24/08/2018	01/02/2019
D14 - CIF Electronic Data available	31/08/2018	08/02/2019
D9 - Timetable Impact taken for NRT Edit	05/10/2018	15/03/2019
D8 - Corresponding Day Timetable Dates Proposed to Operators	12/10/2018	22/03/2019
D4 - NR Data sent to publishers	09/11/2018	19/04/2019
Calendar of Events (D7)		
D64 – Publication of draft Calendar of Events	15/09/2017	23/02/2018
D54 – Publication of Final Calendar of Events	24/11/2017	04/05/2018
International Freight Train Notice (D9)		
D70 Publish the Initial International Freight Train Notice	04/08/2017	
D70 to D65 NR Consult the Initial International Freight Train Notice	08/09/2017	
D60 NR to provide an updated International Freight Train Notice	13/10/2017	

VSTP SCHEDULE REQUEST FORM

Network Rail

(Note: only use for trains required to run within 48 hours)

TO: NETWORK RAIL CONTROL: WESTERN (CARDIFF) DATE: 14/11/2017 TIME: 1400

FROM: A TOC
A TOC House
123 Railway Road
London
RA11 WAY

REF:
Tel No: B.R.T.:
Tel No: B.T.:
Fax No:
TOPS LATA

TRAIN DETAILS Requested

Reporting Number: 5W14 Days Run: ThO Dates: 14/11/2017 Instruction Type: 220

Train Category: PE - Empty Coaching Stock | Sector: 27 | Sub-sector: 01 | Train Service Code (Profit Centre): Voyager/HST ECS moves

Origin Location	Stanox	Requested Departure Time
Bristol Barton Hill Depot	81432	0530

Destination Location	Stanox	Requested Arrival Time
Birmingham New Street	65630	0720

Requested Route ("via") and Comments:
No driver relief required. Set to form 1W14 0745 Birmingham New Street - Camp Hill. To depart depot North end.

Max speed of slowest vehicle: 125 mph | Number of Vehicles: 4

Driver Only Operation: YES | Is return working involved? NO | If yes, Number of forms attached

Intermediate Calling Points NOTE - Network Rail to input all other timing, passing and TRUST points as required.

Location Name	Stanox	Requested Arr/Dep/Dwell	Type of Consist	Power Change?	Remarks/Reversal Points etc.
None					

The Above Additional Train Movement To The Publicised Timetable is Requested To Run.

Representative (Print Name): A CONTROLLER Signature: A Controller

Position/Job Title: ROUTE CONTROLLER

NETWORK RAIL CONFIRMATION
The above additional train movements to the publicised timetables is AGREED/DECLINED

Train Reporting No: (WTTID) _____ Departure Time: _____

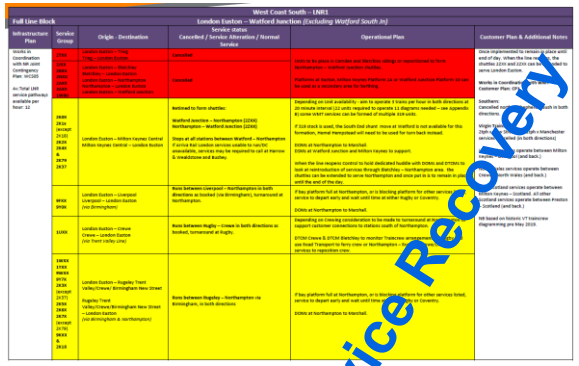
Will be run by Regional Control arrangement and every endeavour will be made to meet the schedule requested but pathway and performance cannot be guaranteed. NOTE: The completed document forms a contract.

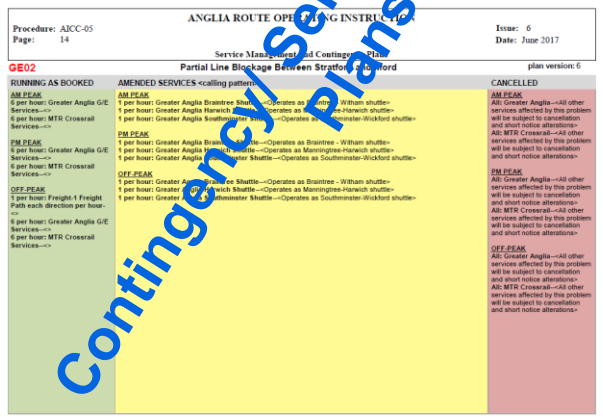
Representative (Print Name): _____ Signature: _____

Reference Number: _____ Date & Time Request Received: _____

Any queries regarding this pathway should be made to the above Regional Control on:

Telephone No: _____ Fax: _____ TOPS LATA: _____





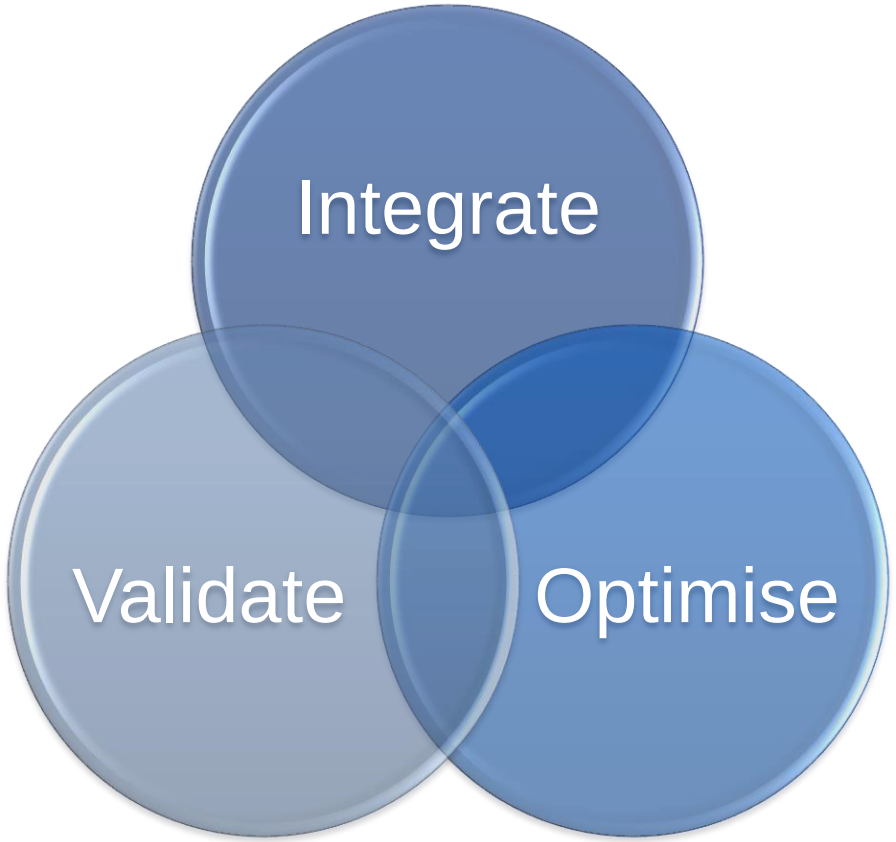
Long Term Planning Production Schedules

Very Short term Planning Process

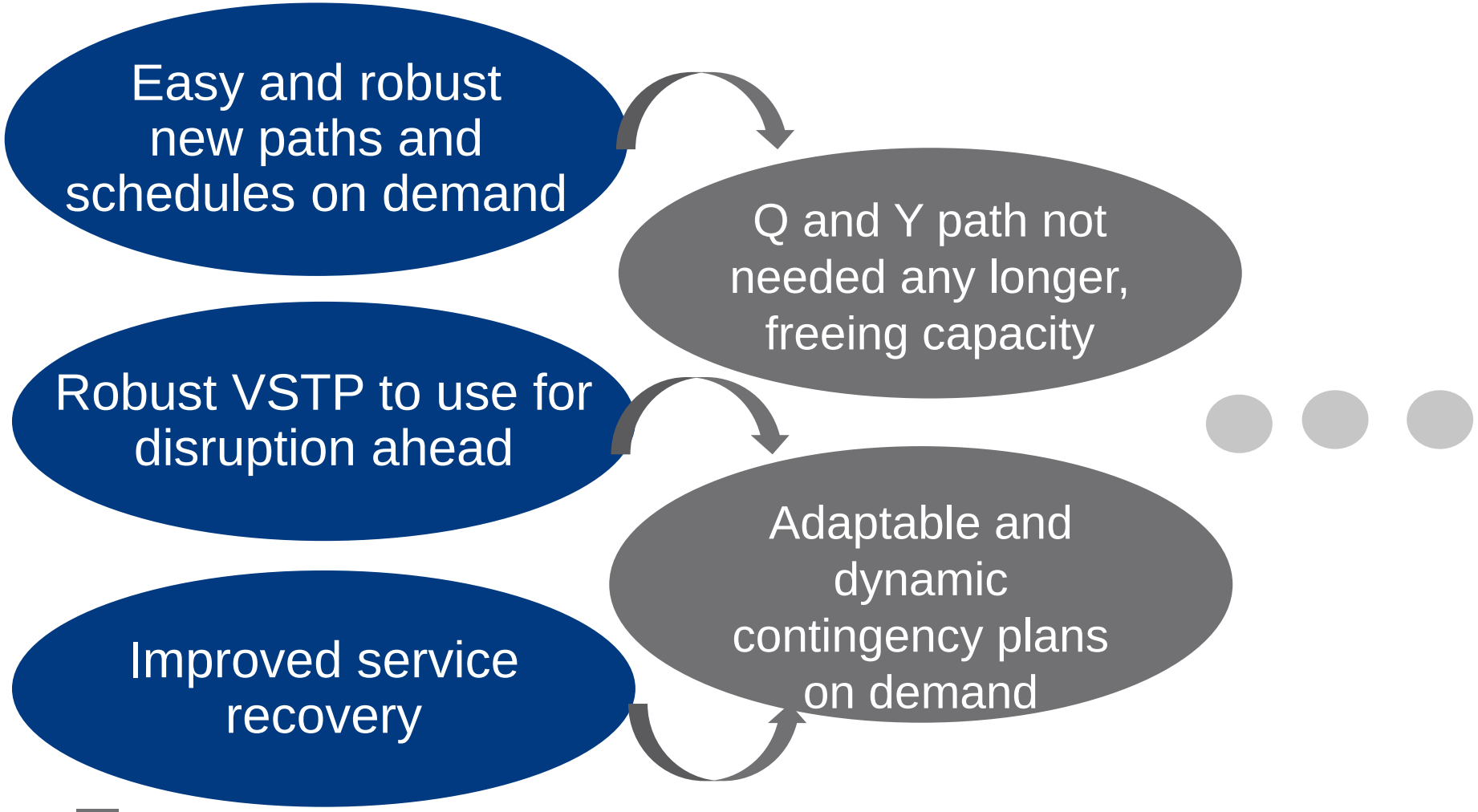
Contingency/ Service Recovery Plans

What we need to do

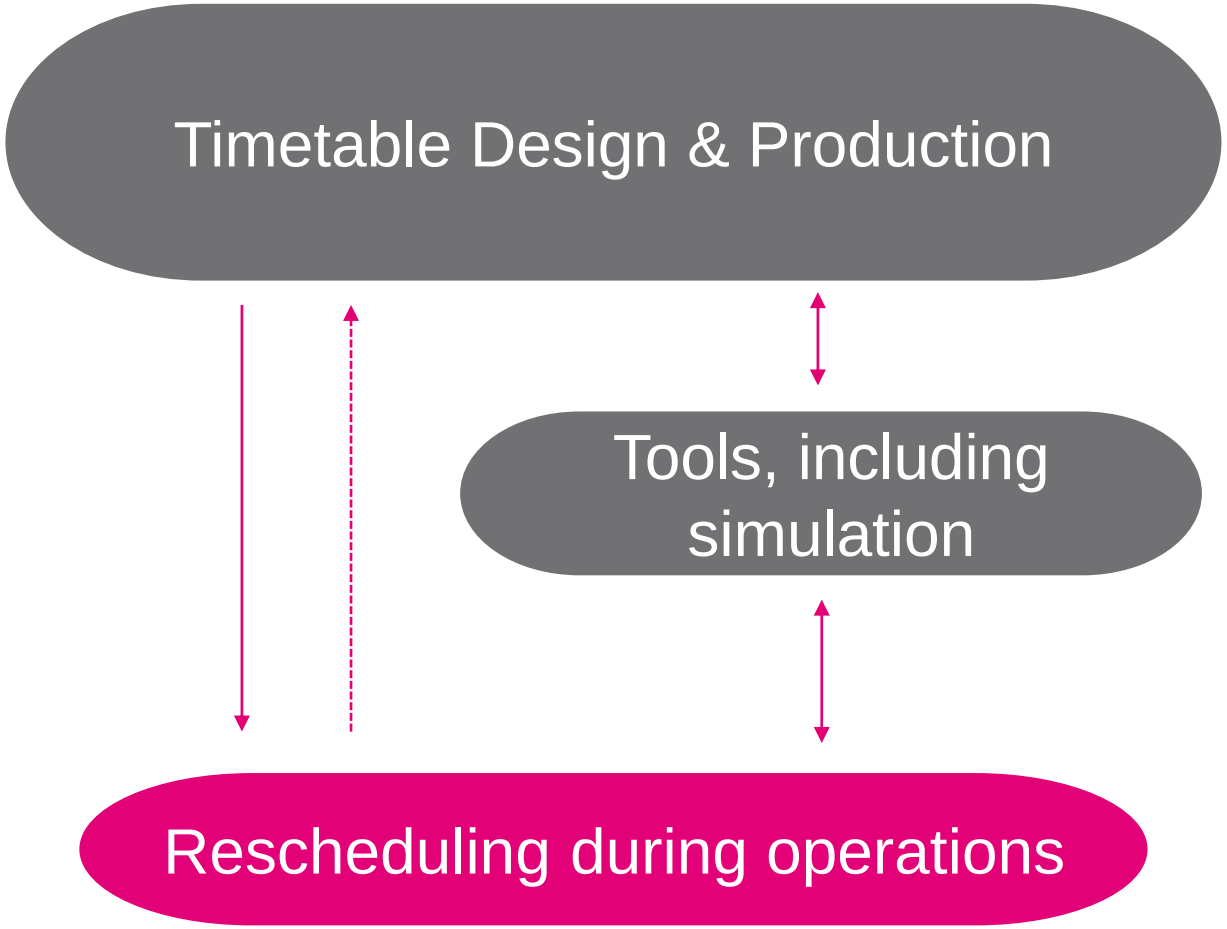
We have the science and systems to do a better job at …



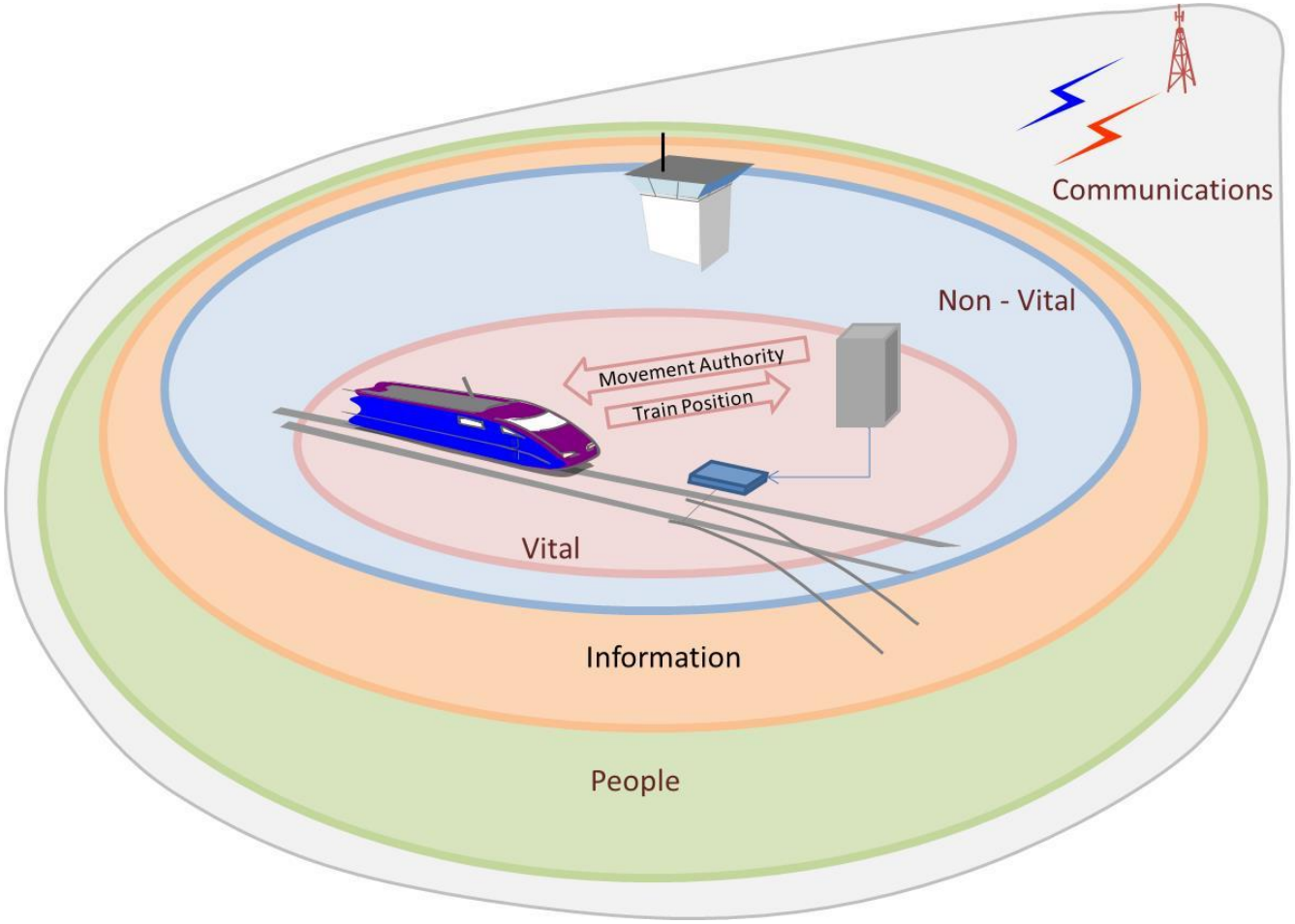
Where we need to be



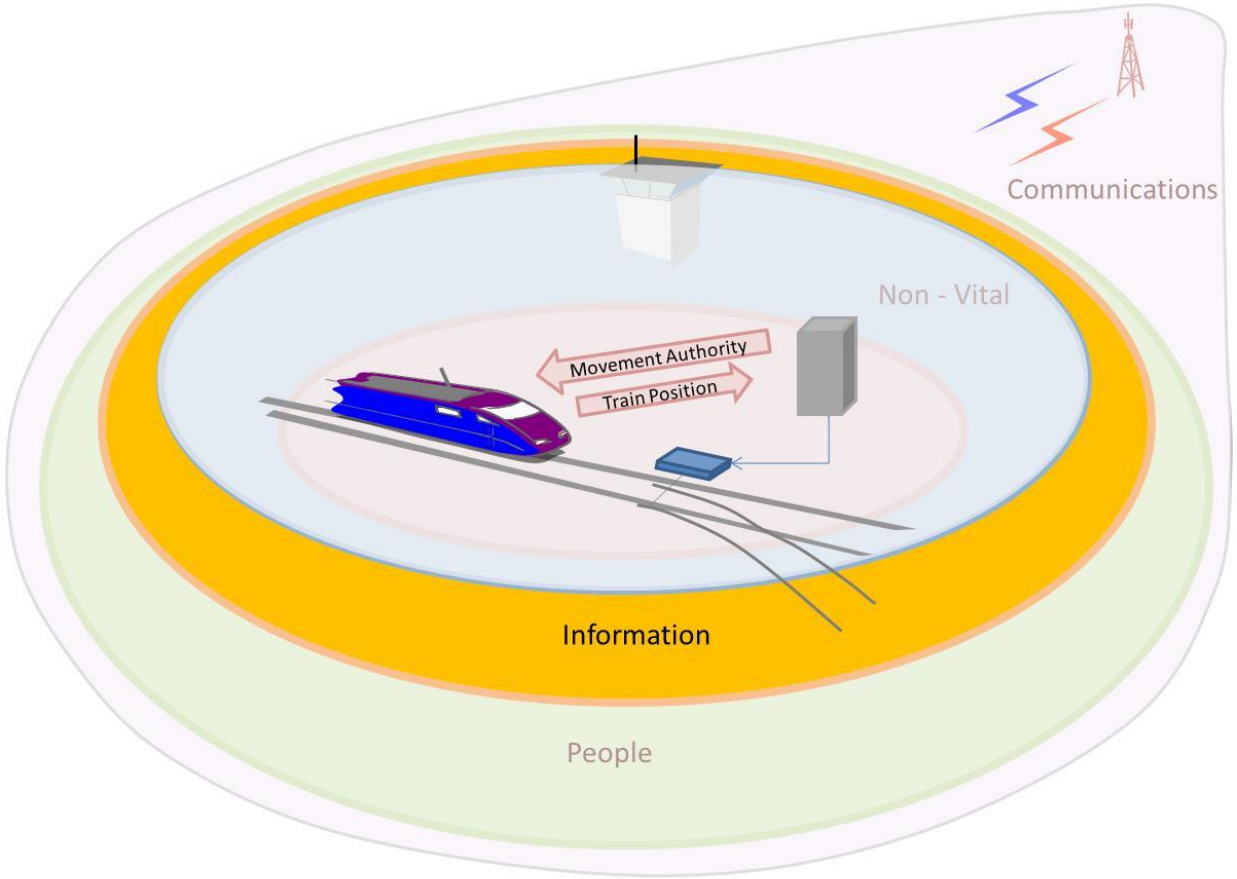
Dynamic optimised timetable



Railway Systems



Control, Operational & Customer Information Management



Delivering the vision – information

Variable - train

Load

Capability

Braking

Accel-eration

Max speed

Passenger

Predicted Timings

Stopping Pattern

Planned Path

Planning

Consist

Train length

Tare Weight

Electric/Diesel

Gauge Profile

Fixed - train

Location

Speed

Direction

Service ID

Movement Authority

Safe control

Electrification (system)

Weight limit

Gauge limit

Cant

Curvature

Line Speed

Junction

Plain Track

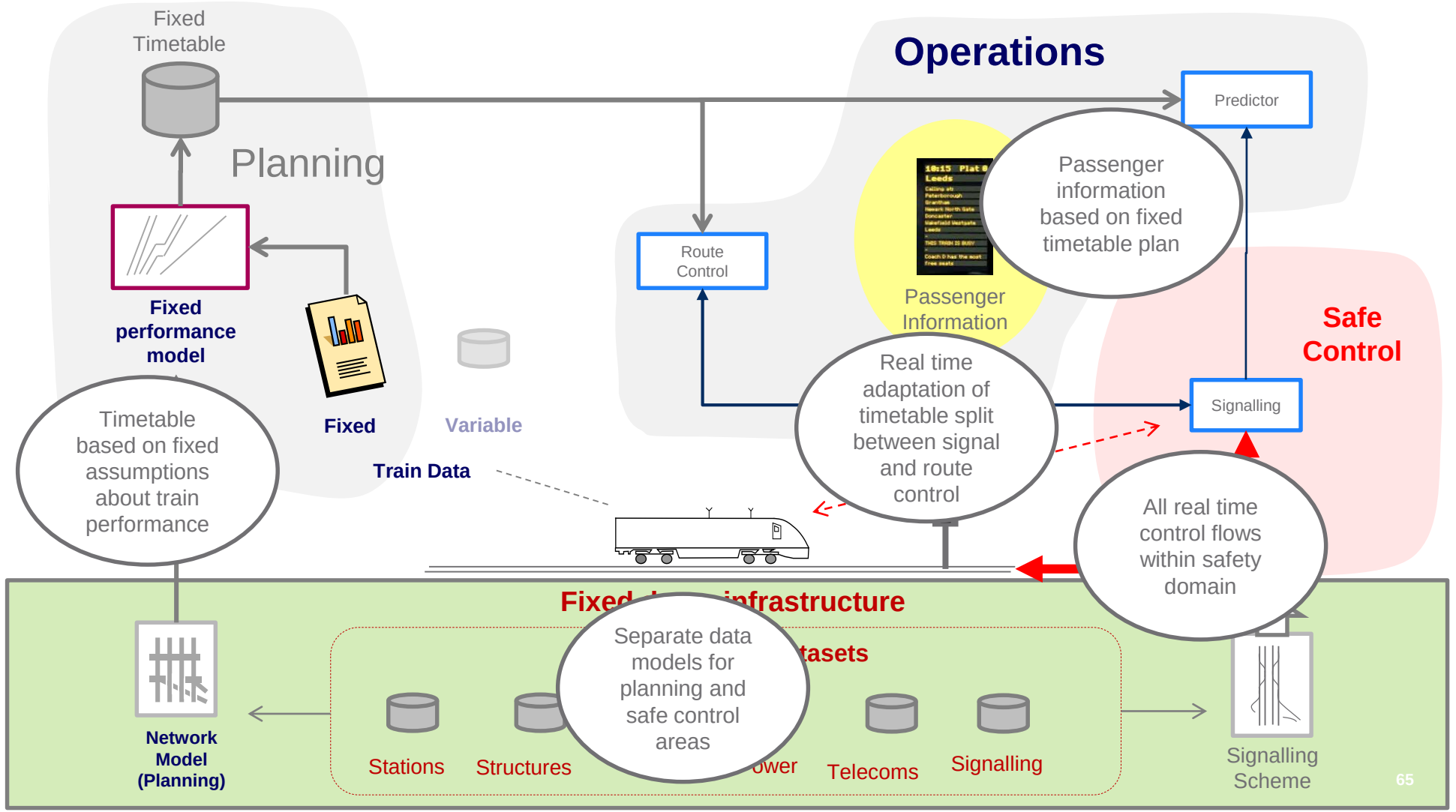
Fixed - infrastructure

Speed Restriction

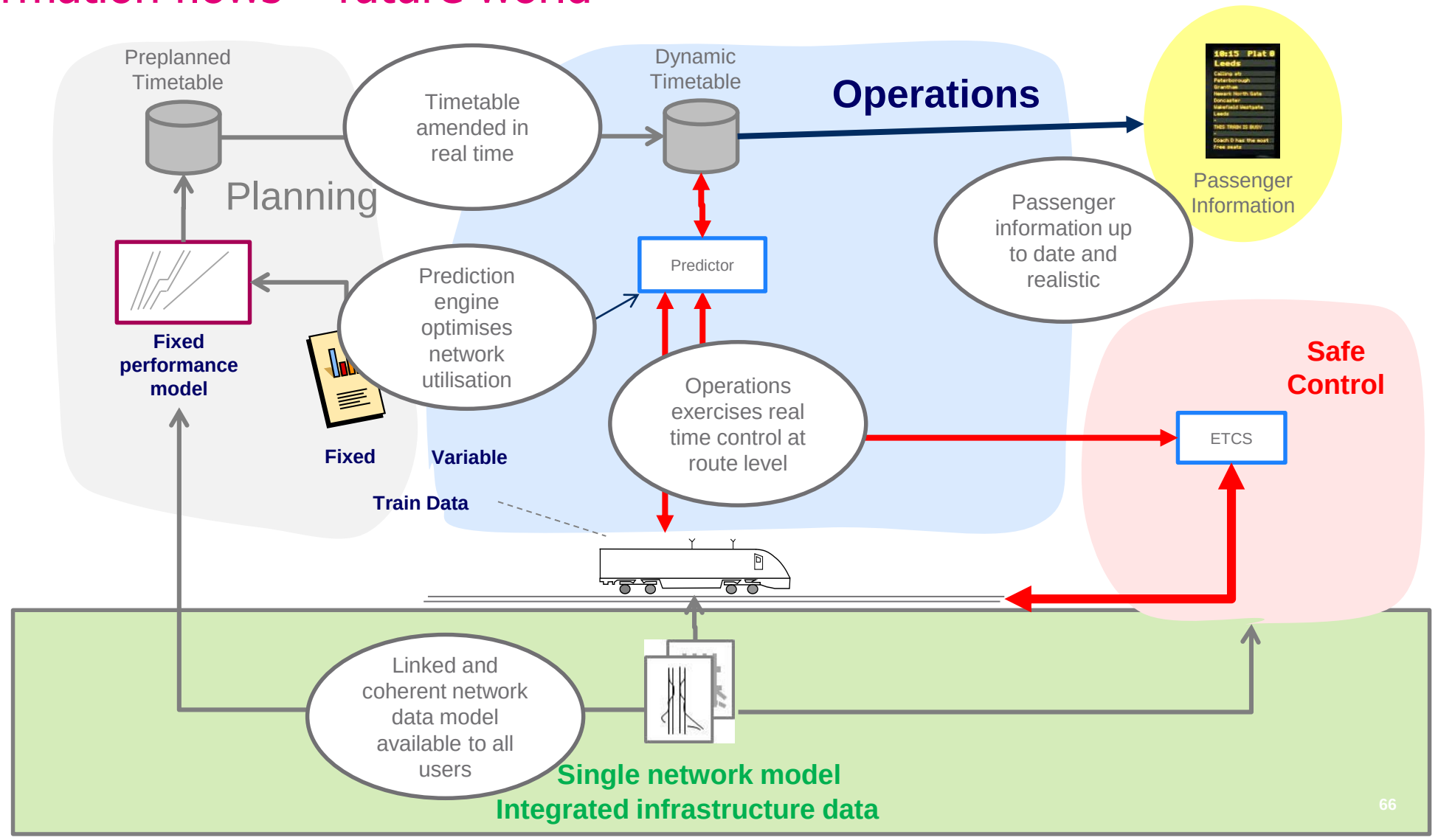
Availability

Variable infrastructure

Information flows – old world



Information flows – future world



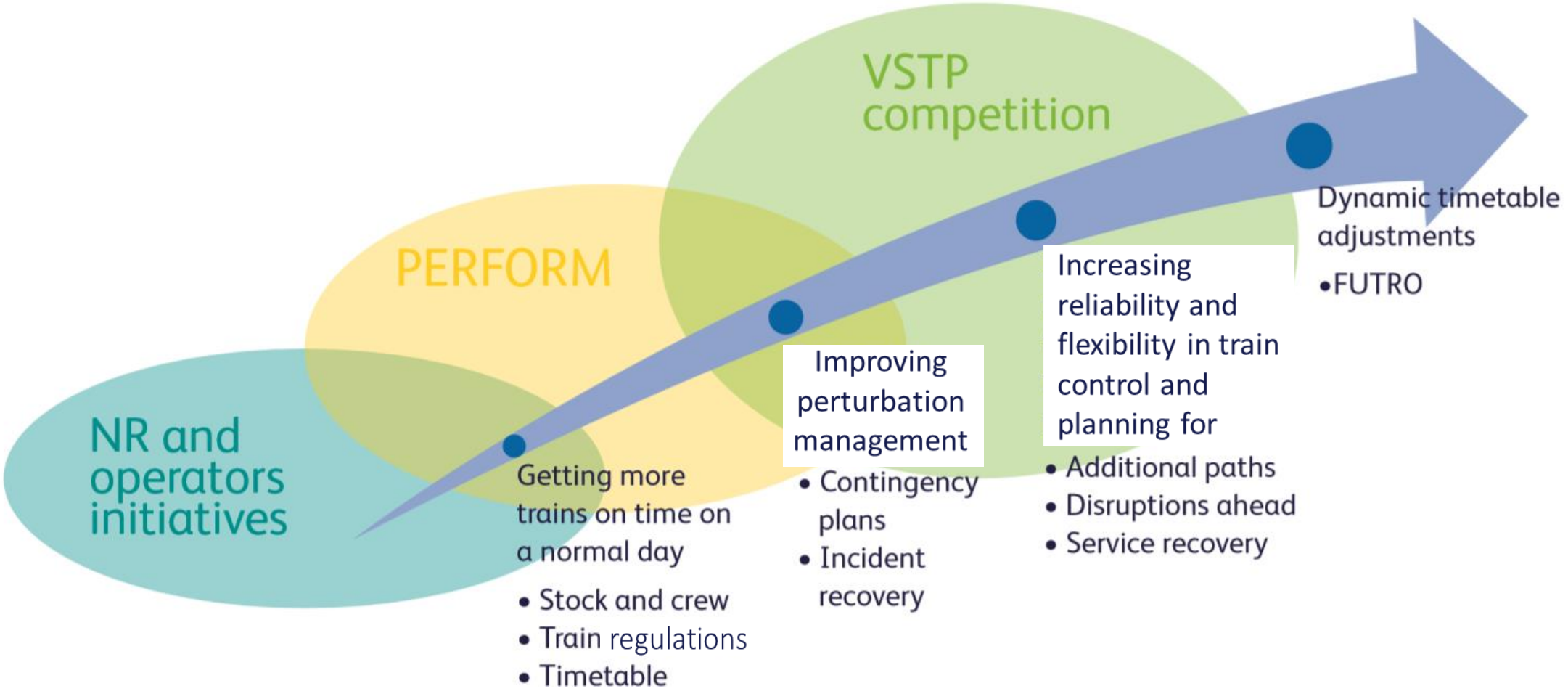
ANY QUESTIONS?

- **Test Case for Dynamic Train Planning?**

Competition Guidelines

Presented by Michelle Holley
01 October 2019

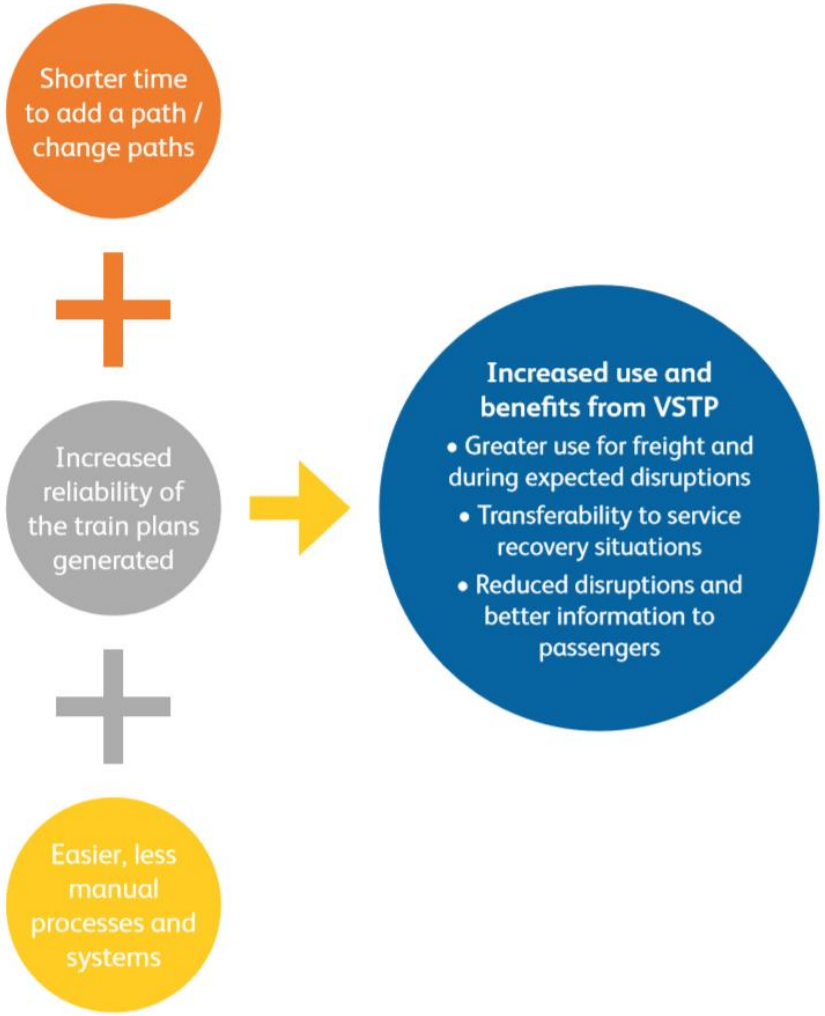
Scope of the call



Aim of the call

The aim of the call is to:

- Establish how we can implement more VSTP schedules in a robust and validated way with an allocated and de-conflicted path for each train service
- Reduce the time required to administer the VSTP process.



Funding

RSSB has allocated up to £3.1 million to fund innovative demonstrator projects as part of the 'Dynamic Train Planning' innovation competition.

These percentages represent the maximum allowable that RSSB can contribute to eligible project costs

Category	Small & Micro Enterprise	Medium Enterprise	Large Enterprise
Industrial Research			
Base aid intensity	70 %	60 %	50 %
Additional aid intensity where: • The project involves effective collaboration, or • The results of the project are widely disseminated	80 %	75 %	65 %
Experimental Development			
Base aid intensity	45 %	35 %	25 %
Additional aid intensity where: • The project involves effective collaboration, or • The results of the project are widely disseminated	60 %	50 %	40 %

To be eligible for funding

Projects must fall under the ‘industrial research’ and/or experimental development’ classification.

Collaborations must be business-led and address the specific requirements of the competition as outlined in the competition brief.

Working as part of a consortium is welcome

- International partners
- Universities and research orgs.

What are we looking for?

We are primarily looking to fund projects that are currently within TRL 4 to 7.

RSSB expects to fund 2 to 3 projects

It is expected that projects will last approximately 12 to 24 months.

Clearly defined aims, scope and benefits with evidence of your capability to deliver the work

Consideration of the application of the work – collaboration with a duty holder

Next Steps

Formal launch	1 October 2019
Submission deadline	3 January 2020
Invitation to evaluation panel	w/c 27 January 2020
Presentations to the evaluation panel	w/c 3 February 2020
Applicants informed of outcome	w/c 10 February 2020
Work to start by	1 April 2020

Contact Details

Michelle Holley

RSSB Project Manager

Michelle.Holley@rssb.co.uk

02031425515

Please submit proposals to:

researchcompetitions@rssb.co.uk

Thank you

Questions?

Closing remarks and next steps

REMINDER!

Submission deadline	3 January 2020
Invitation to evaluation panel	w/c 27 January 2020
Presentations to the evaluation panel	w/c 3 February 2020
Applicants informed of outcome	w/c 10 February 2020
Work to start by	1 April 2020

Thank you