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Railway Projects: How not to miss the Point

Presentation to INCOSE members

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Structure of this Presentation

1 Planning processes and objectives
2 Timetable processes
3 Some examples of where it's gone wrong
4 So what should planners & engineers know?
5 Conclusions

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1 Planning Processes & Objectives

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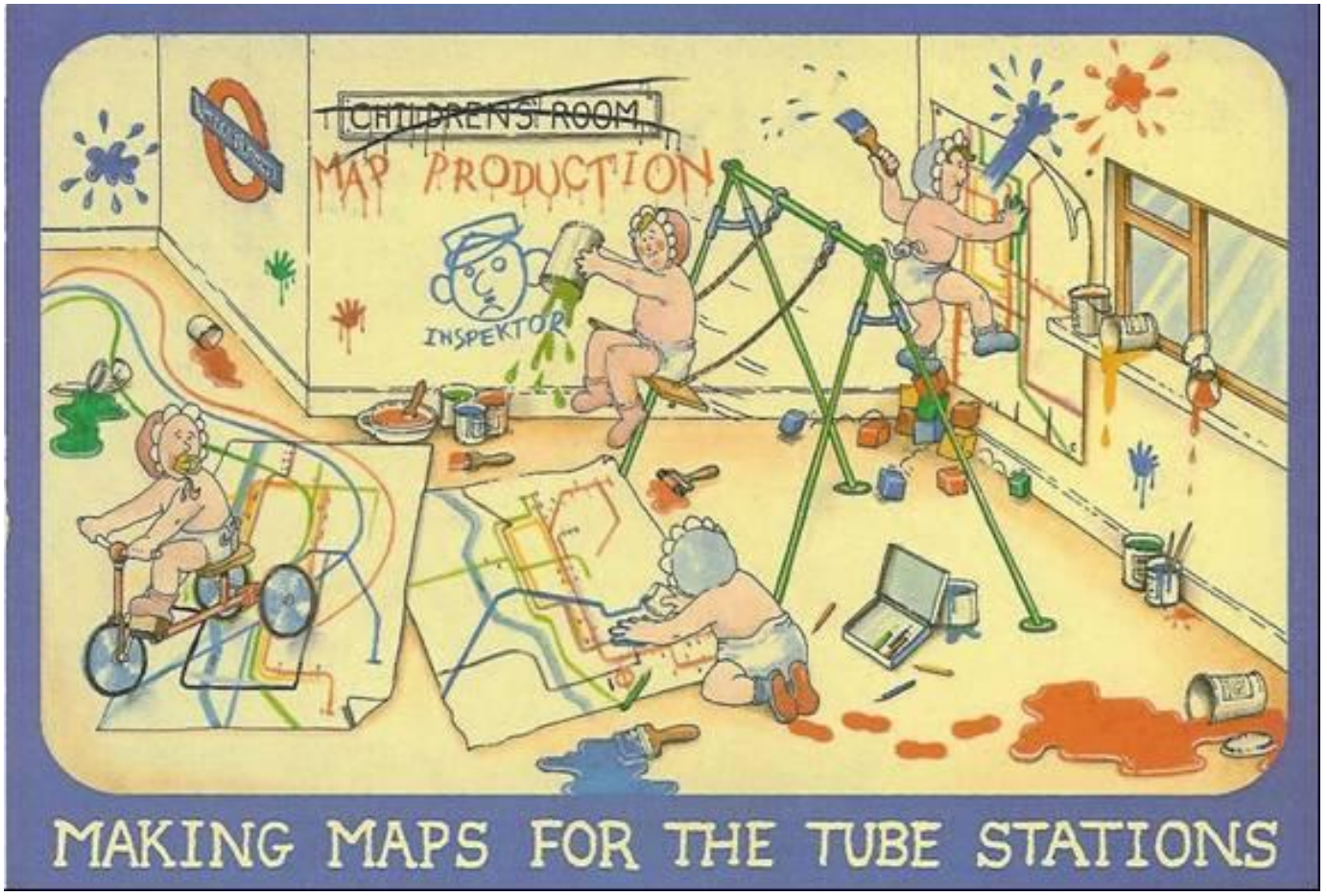
The Planning Process?



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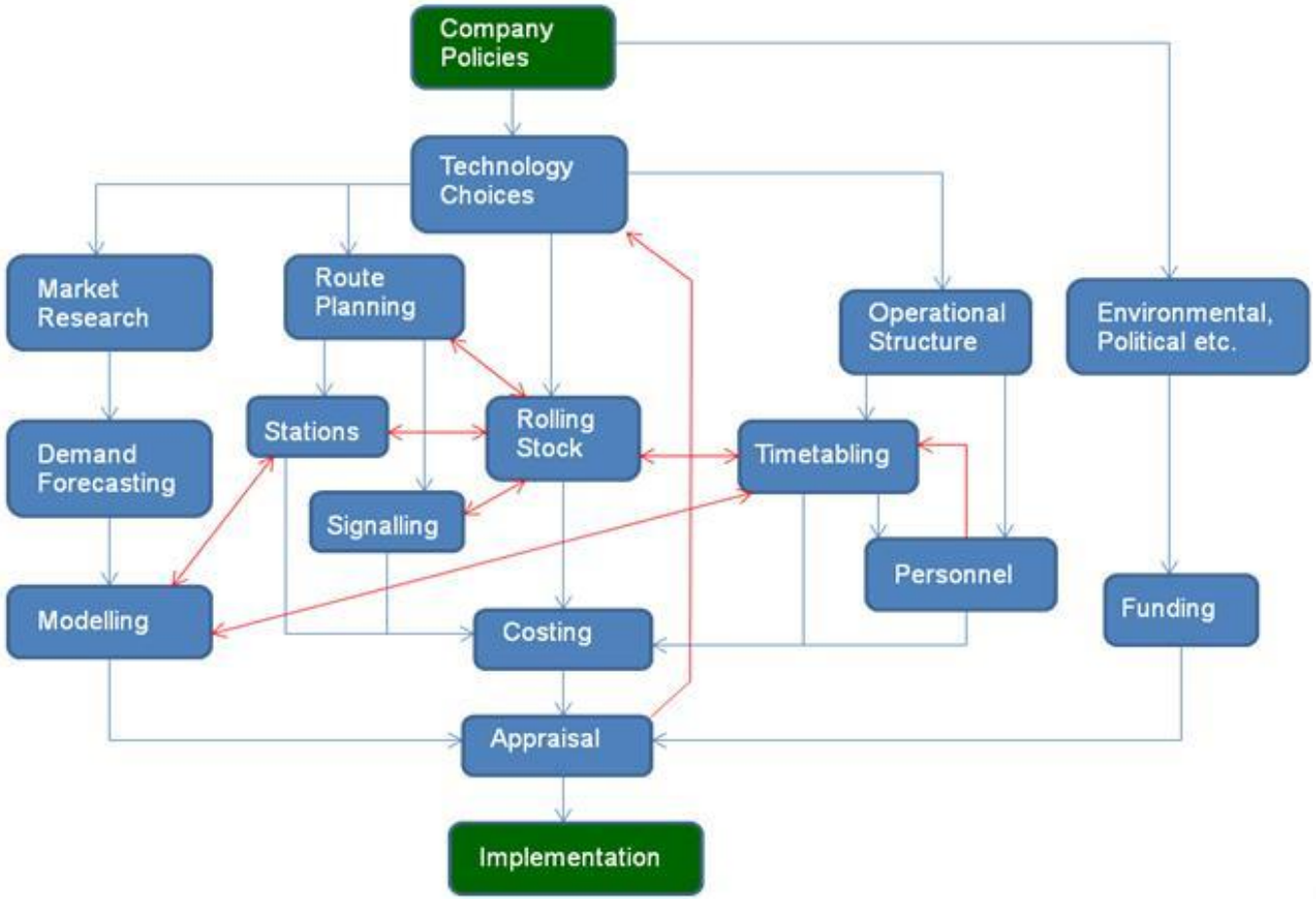
The Proper Planning Process?



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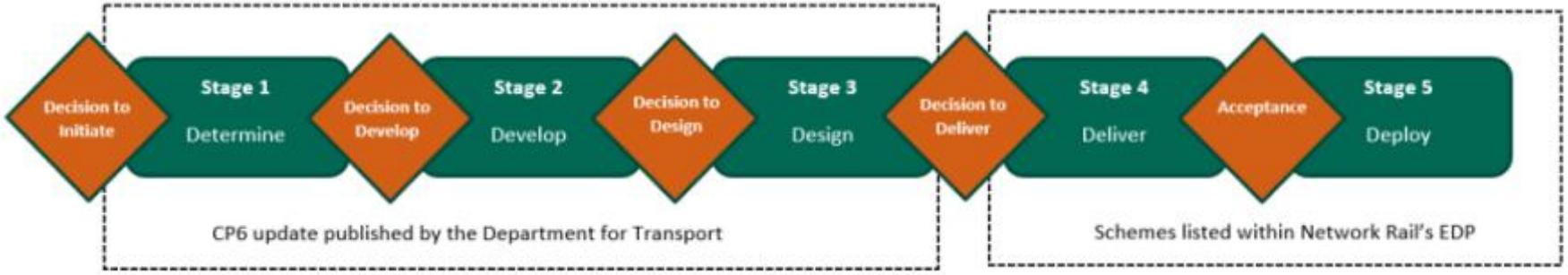
1 Processes

- Rail planning thinks through and tests the benefits and costs of doing things on the railway – are ideas worthwhile?
  - e.g. as measured by the Benefit: Cost Ratio (BCR)
- It is necessarily iterative
  - There is no point examining lots of detail for options which aren't going to be progressed
- GRIP stages 1-8
- DfT Decisions



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1 Objectives: What are we trying to do?

Maximise profit?

Maximise traffic by minimising generalised cost?

Reduce travel time e.g. by reducing road traffic congestion?

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1 Objectives: …but

- Save time?
  - Metz (2024): people use up the time with longer-distance travel
- Reduce road traffic congestion?
  - Wardrop (1952): traffic is generated to reconstitute that level of congestion: equilibrium is achieved again, within the service levels of local area. Only improvements to public transport can solve this

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1 Objectives: What are we trying to do?

Maximise social benefit and/or employment?

Enable military access?

Minimise the environmental impact of transport?

Increase economic activity? (local/ national)

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1 Objectives: What are we trying to do?

“ To maximise net social benefit within a defined gross margin.”

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1 Objectives: What are we trying to do?

- Multiple objectives are common in the railway
  - Especially those subject to a financial constraint, which may be relatively straightforward
- ‘Run these services with safety ALARP’
  - What is reasonable safety?
- Railways have multiple positive externalities
  - So perhaps it’s not unreasonable for stakeholders to want to ensure that projects do deliver some of these
  - Locally-based social value has come to the fore recently

1 Objectives: What are we trying to do?

- Whatever the objective(s), need to be
  - supported by adequate funding
  - consistent over the medium-term
  - consistent with other (e.g. land-use, taxation) policies
  - regularly checked to see if specific projects do indeed fit the policy
- Objectives might reasonably be set out in
  - User requirements
  - System requirements
- …and therefore described in output (not input) specifications
- But who decides which of the objectives should be dominant?

2 Timetable Processes

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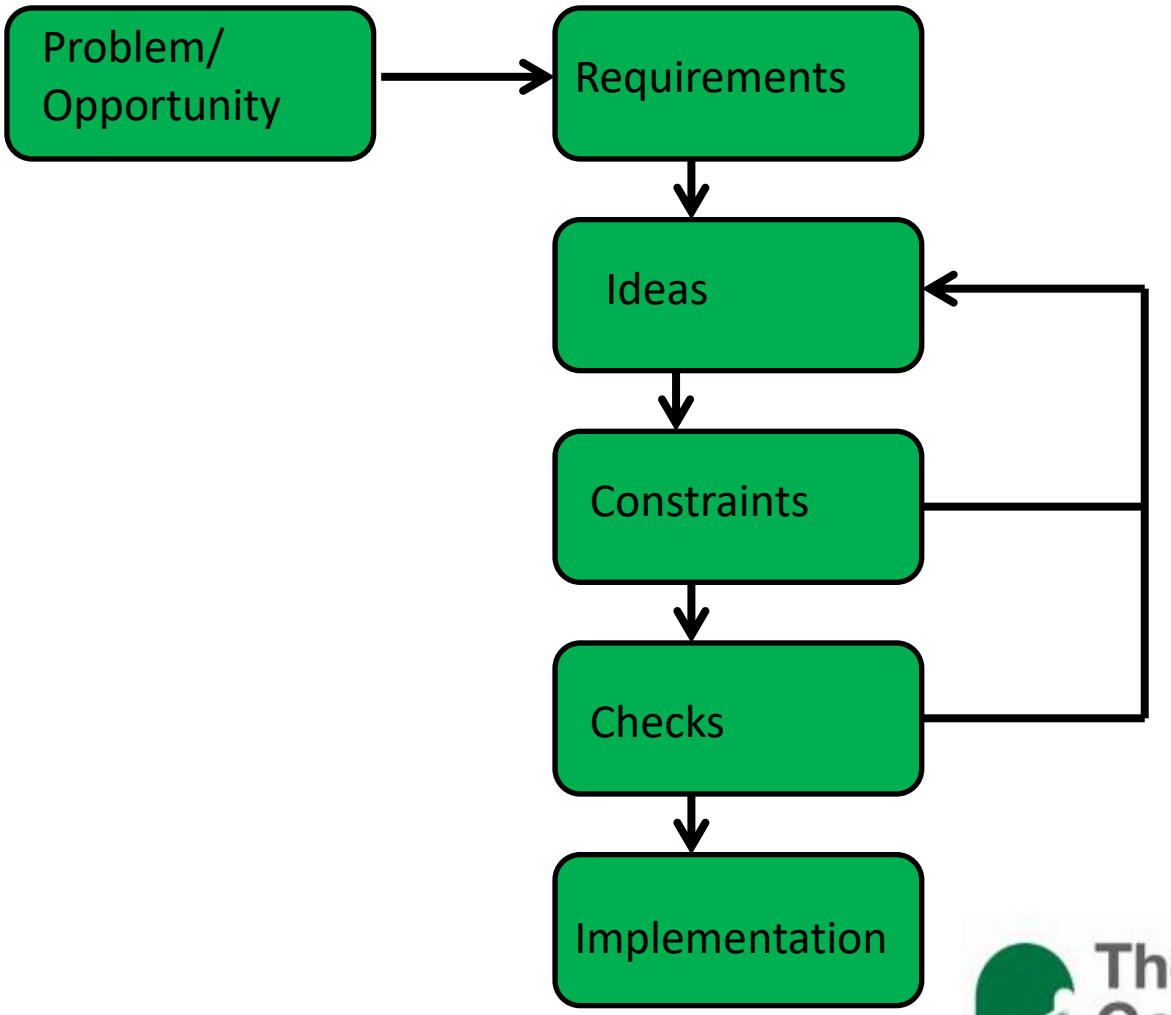
2 The Timetabling Process



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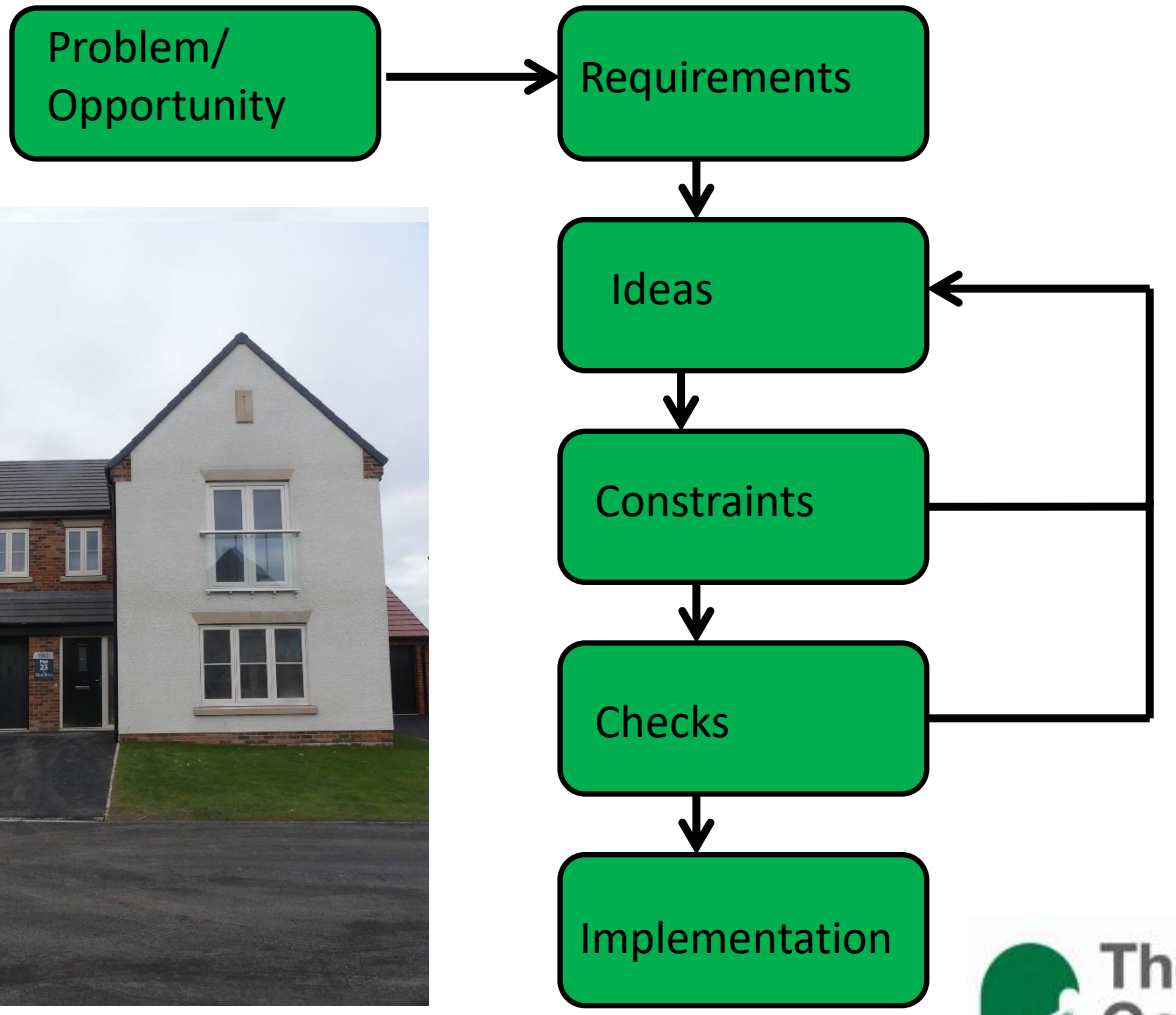
2 The Timetabling Process



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Different Service Types

- Important to understand that the process/duration of timetabling isn't the same for
  - Retiming existing franchised services
  - New service requirements being added to franchises
  - Temporary (e.g. engineering) amendments to existing services
  - Open access operators
  - Long- & short-term ('spot bid') freight contracts
  - Very Short Term (inc. emergency) train movements

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The (LTP) Process

- When considering the development of a completely new service, the overall process usually takes ≈a year
- ‘Open access’ proposals being worked up from scratch usually take longer, as there are more hurdles to jump

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The (LTP) Process

- (Get safety case & banking facilities);
- Develop a business case for the service at a particular frequency (T-72 to T-60);
- Persuade ROSCO to acquire vehicles (T-60);
  - Potentially critical, as there are almost no spare trains
- Get formal approval (train operator/DfT) (T-56);
- Recruit/train relevant staff (T-52);
- Bid for slots (T-55 →T-47);
- Negotiate with Network Rail about access charges, performance regime, detailed timings (T-34 to T-26)
  - If you're unlucky/the timings are difficult, this step alone could take 18 months

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The Process

- Timetable ‘locked down’ (T-22)
- Send draft track access contract to Regulator (T-20);
- Market service/create fares & seat reservations (T-12);
- Network Rail produce public timetable (T-12);
- Lease rolling stock and finalise staff training (maintenance staff, driver route knowledge) (T-8);
- Create staff rosters (T-8);
- Create rolling stock diagrams/platform working (T-4);
- Get access contract approved (T-2);
- Timetable date T.
- *At all these stages, things can go wrong and we might need to reiterate*

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3 Some Examples of Where it's gone Wrong

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Gross Political Interference

- Railways need to be very robust against this
- Australian railway ordered new EMUs with air-conditioning
- Fleet size naturally matched the requirements for the line they were intended for
- Minister of Transport noted that these were not for his constituency, which still had older trains, so ordered the railway to use the new trains for his line
- This meant that the fleet was the wrong size, so had to be split, losing further synergies with stabling and maintenance requirements

Middlesbrough

- DfT asked LNER to run 2-hourly services to Middlesbrough
- Feasibility work showed that a new siding was needed
- LNER and Network Rail agreed this
- LNER planned to run the trains in 2022, only to discover…
- NR were planning to install the siding in the next Control Period

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Great Western services

- DfT asked GWR to run 7 IEPs per hour via Swindon
  - 4 Bristols @ 15-min intervals (Bath/Parkway)
  - 2 South Wales (Cardiff/Swansea)
  - 1 Cheltenham
- …but there are also 2 freights/hour, one semi, one slow
- Challow – Swindon is double-track & 12 miles long
- If signalled headway = 4 mins
- Max variation in timings = 15-4-4=7 mins
- But if passenger trains take 6 mins (@120mph) and freights @ 60mph take 12 mins, but more from a stand (14 mins?),
- this can't work (14-6 = 8, which > 7)
- Stops at Didcot had to be juggled to increase some headways

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Original HS2 routeing

- HS2 team originally tasked with finding the fastest route @ 400kph London – Manchester
- 40ish options, found it
- Did we ever properly evaluate 360kph?
  - Lower costs from tighter curves and smaller tunnels, from a minimal increase in journey time
- High-level objectives then changed to include socio-economic benefits e.g. regeneration
- Route via Stoke would have done that – but no-one told the route planning engineers

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2024 Review of HS2 routeing

- Early 2024 review of HS2 project further reduced its scope
- HS2 is expensive – no question
- But the core Acton – Curzon Street section costs the same, irrespective of the branches
- Chopping off all the branches therefore reduces the value of the core
  - No link to HS1 and Europe/direct link to Heathrow (transfer from air?)
  - No improvement Birmingham – Manchester (‘levelling up’?)
  - No link to the East Midlands (regional connectivity?)
- Unclear if PM & advisors understood the systems implications of their one-off decisions

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2024 Review of HS2 routeing

- It also failed to understand the network benefits of HS2
  - WCML capacity (Stafford – Crewe (6→→2); Wigan)
  - Service enhancements elsewhere (e.g. Newcastle – London)
  - Other expenditure wrapped up in it (e.g. Crewe station)

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HS2 Rolling Stock

- HS2 needs to procure trains which have a higher top speed than anything else currently running in Britain
  - These could also take advantage of the larger loading gauge of HS2
- However, HS2 services will also run onto the ‘classic’ network
  - Such trains cannot be bigger
  - ➢ *either* HS2 will need two sub-fleets, thereby losing economies of scale
  - ➢ *or* all their trains will be ‘classic-compatible’, being smaller than necessary for the HS2 route itself
- Current WCML trains need to tilt, to cope with the curvy track esp. through the Lake District
  - But HS2 trains won’t have tilt fitted
  - ➢ ‘Classic-compatible’ HS2 services will be slower between Crewe & Glasgow

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Locally-specific fleets

- Many regions have effectively described city-specific trams, and not just at a detailed level (e.g. colour)
- This increases capital and maintenance costs
- Are cities really that different from each other?

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4 So what should Planners and Engineers know?

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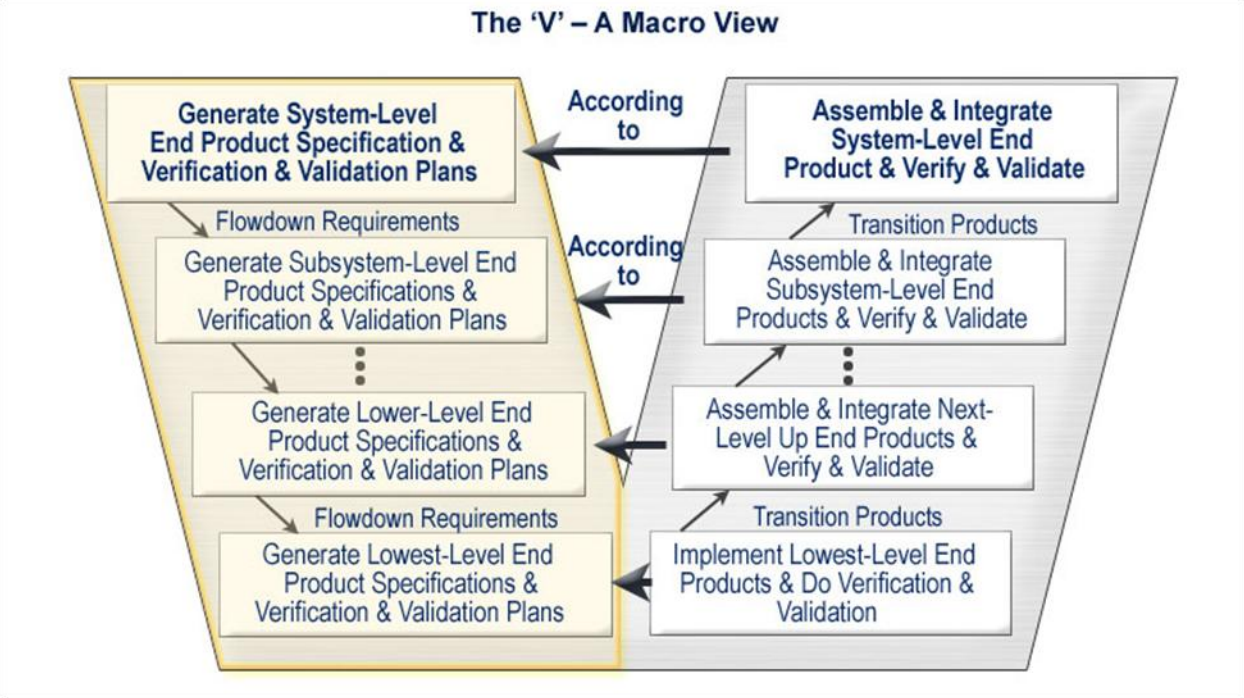
Planning Principles

- Transport planning is a systems discipline
- Rail projects take a long time – need to get consensus
- The lifecycle of a scheme does not start with the engineering – it starts *much* earlier



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Project Slide

- If benefits or costs change during a project (for whatever reason), project scope and value may need to be reviewed
- But what if this makes the BCR < Minimum Viable Product i.e. a level where the project isn't worth doing at all?
  - Need a lot of nerve to stop a project then
  - And what if BCR isn't the right test? as with the JLE?
  - In a congested country like England, later changes to land uses may enable relatively-poor projects to succeed in the medium term?

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Challenge Standards: down

- Professional engineers design to default high-quality standards … but what if these aren't affordable?
- Standards need to be challenged if minimal deviations would save considerable cost e.g.
- King's Cross footbridge 100mm too low regarding proximity to OHLE: £1m to raise …or £10k to paint with reflective paint

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Challenge Standards: down

- NR Group Standards: new stations must have
  - straight & level platforms
  - >3m wide if single-sided, >5m wide if double-sided
  - Long run-off to buffers at terminal platforms
- Tracks with platforms both sides no longer in favour
- ‘Grandfather’ rights enable the continuation in service of inadequate facilities

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Challenge Standards: up

- Pointwork is expensive
- Pressure from government or regulators for infrastructure authorities to reduce costs can lead to shorter turnouts
  - Cheaper to install (crane in)
- But this leads to a reduction in line capacity
- Systems engineers should be able to spot this

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5 Conclusions

Conclusions

- There should be a proper process for planning railways
- Multiple objectives are common – but who decides which?
- Railways are systems: do highlight where changes to specification lead to changes in outputs
- Challenge standards
- Need to keep objectives ‘in line of sight’ as projects develop
- Behind-the-scenes p.r. can help generate a political consensus, very useful when railway projects are likely to span more than one parliament

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