Efficiency challenge for Signalling Projects

IRSE Scotland

A J Kitchen FIRSE

11/11/10

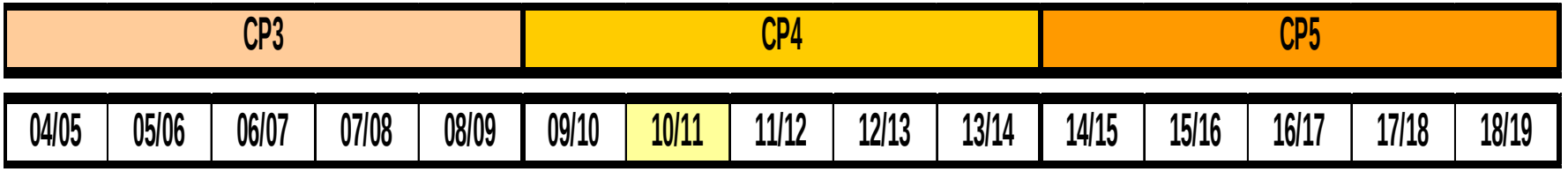
Agenda

1. CP 3 – CP 4 – CP 5 Challenges
2. Design Process Efficiencies
    - Design Tools
    - Design to Cost
3. Delivery Process Efficiencies
    - Modular
    - Lightweight signals
4. Testing Process Efficiencies
    - Plug and Play

CP3 – CP4 – CP5 Challenges

CP 3 – CP 4 – CP 5 Challenges

- Funding for NR is split into 5 year Control Periods where we agree targets with ORR



30% 23% ??%

- Delivery in CP 3 was mainly aimed at lowest construction cost
- For CP 4 and 5 and beyond we are delivering for whole life cost

  - Sustainability
  - Maintainability
  - PRAMS

CP 5 – key milestones

March 2014

CP5 Delivery Plan

February 2014

Network Rail respond to decision

•October 2013 ORR Final Determinations

September 2013

NR response to Draft Determinations

January 2013

•June 2013 ORR Draft Determinations

Strategic Business Plan

June 2011

•July 2012 HLOSs and SOFAs published

Initial Strategic Business Plan

October 2010

Comprehensive Spending Review

August 2010

Long Term Planning Framework

NR Signalling Efficiency Challenge

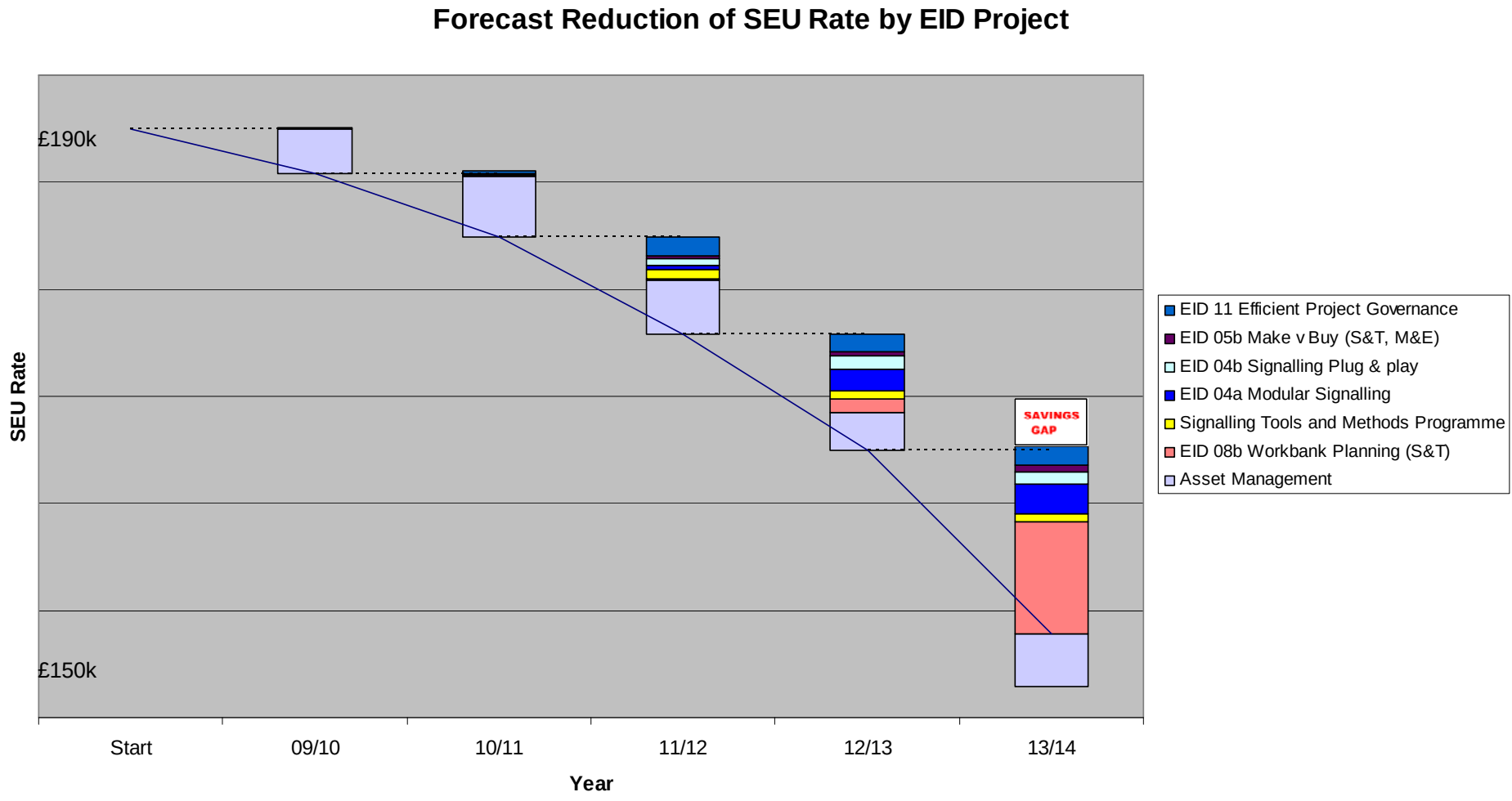
- We achieved our target of 30% savings for CP3.
- SEU rate per year, falling from end of CP2 down to the end of CP4.
- This falling rate has to be generated out of our efficiency schemes which add up to 23% in CP4
- Normal business practices will deliver some of this but not all of it
- Therefore we have a programme of initiatives under the umbrella of the Efficient Infrastructure Delivery (EID) programme

NR Signalling initiatives

Our main initiatives under EID are:

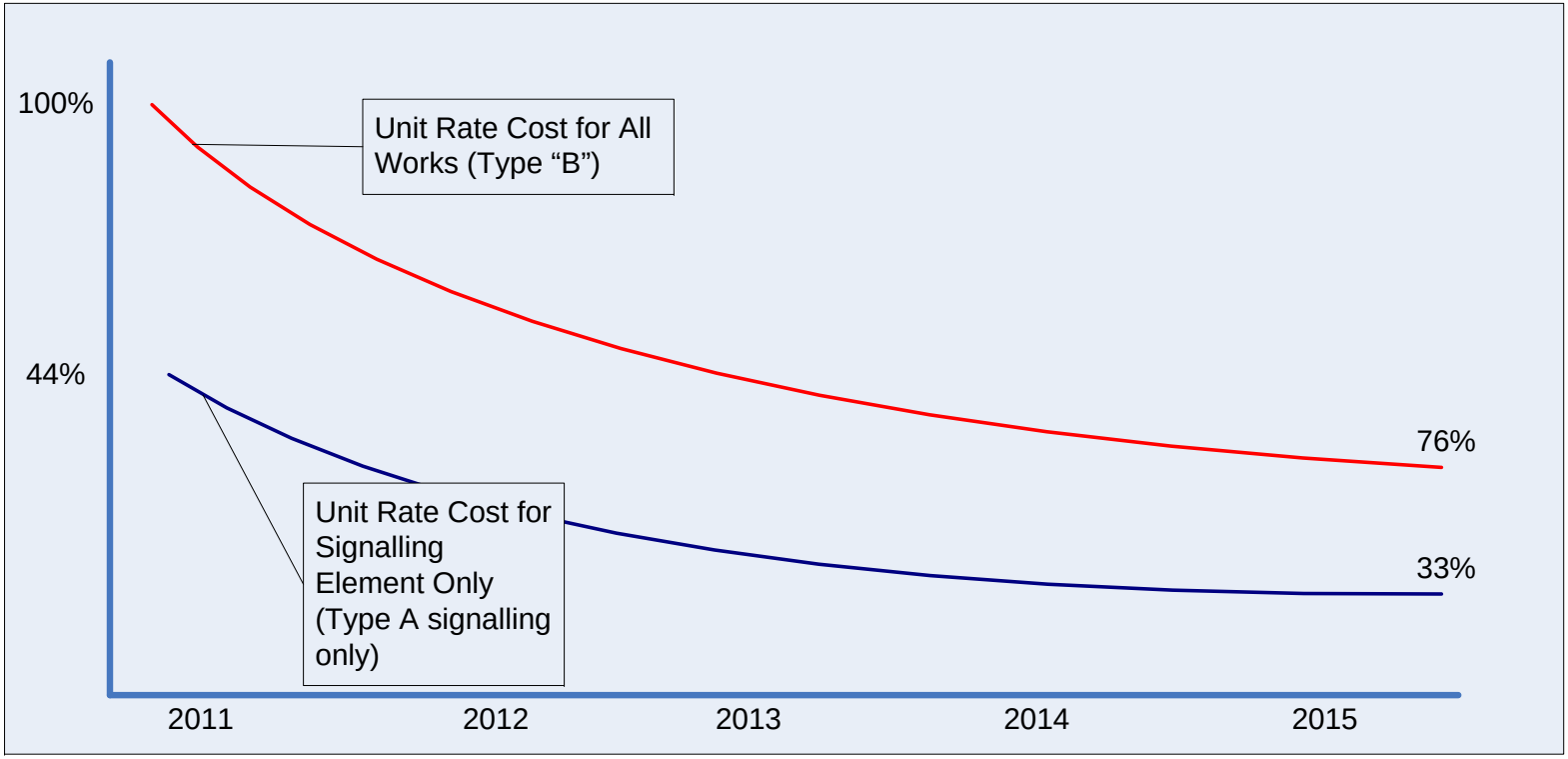
- Efficient Project Governance – how we organise ourselves and our delivery processes
- Make v Buy – what would be better done in house
- Plug and Play – Use of plug couplers and other mechanisms to reduce testing
- Modular Signalling – new ‘rules’ for signalling rural lines
- Workbank planning - smoothing the workbank
- Signalling Tools and Methods Programme (STAMP) – new design tools

NR Signalling initiatives



The new framework challenge

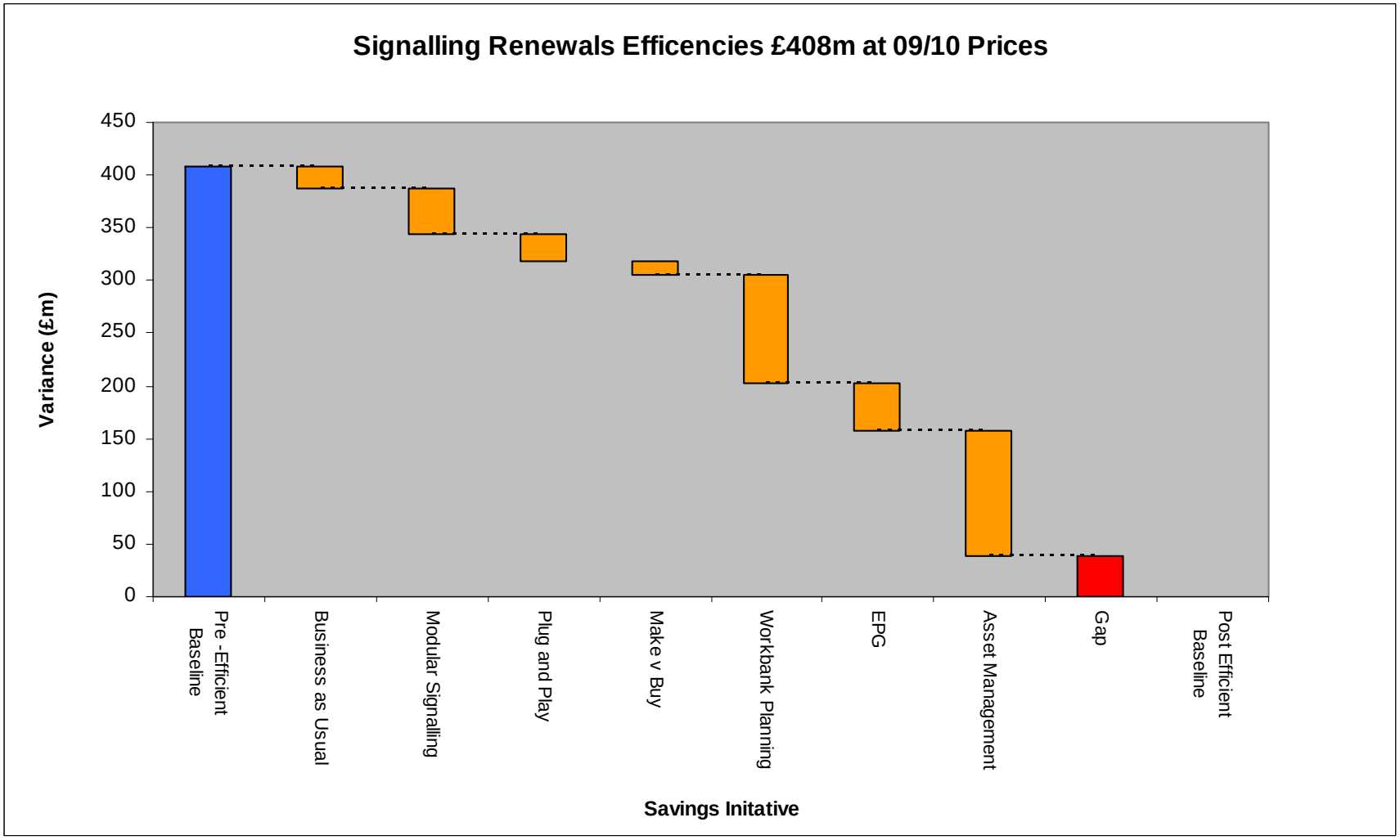
- We will have two target SEU cost curves one for the Type B and a lower one for the signalling portion only of the Type A's



Our Efficiency Challenge and the Gap

- We have to deliver a minimum of 23% savings in CP4
- This equates to an efficiency target of £408m with a total outturn of £2,221m for Signalling renewals
- We are currently forecasting to deliver efficiencies of £369m in Signalling
- This equates to a current shortfall of £39m in Signalling

Waterfall – Efficiencies - Signalling



Volume Delivery Challenge

- The S&E asset renewal volume continues to grow in terms of forecast annual delivery through CP4
- Annual Signalling Renewals delivery forecasts are set to increase from around £500m in 2010/11 to around £850m in 2013/14
- The volume of enhancements that we deliver in conjunction with those renewals will increase from 25% of our portfolio to 50%

NR Signalling Efficiency Challenge

What does all this mean to the Signalling Engineer working on NR projects?

Design Process Efficiencies

Design Process Efficiencies

Signalling Tools

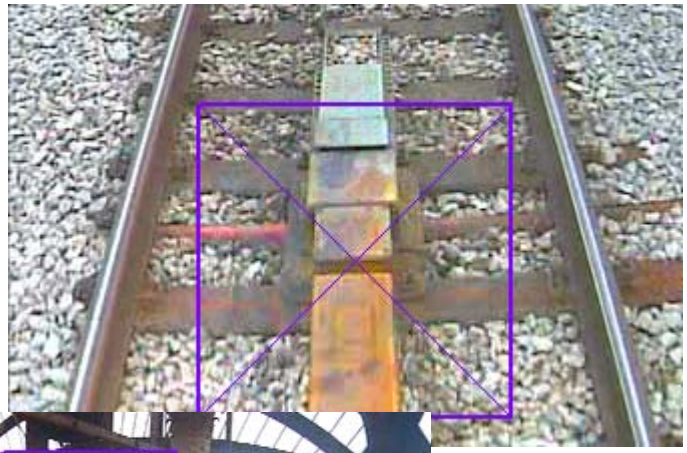
Design Process Efficiencies

Significant Developments in Signalling Design Tools

- Signalling Overrun Risk Assessment Tool (SORAT) – Nov 2011
- Signal Sighting Form Tool (SSiFT) – Upgrade – Mar 2012
- Tactical (for GK/RT0075) Signal Spacing Model (SSpaM) – Mar 2011
- Strategic Signal Spacing Model (SSpaM) – Apr 2012
- Intelligent Scheme Plans (ISP-Scheme) Release 3 – Jan 2012
- Electrical Load Power Distribution (ELPOD) – Dec 2010
- Class II Protection System Design & Safety Case – Apr 2011
- Automatic Image Recognition (AIR) – proof of concept completed

Automatic Image Recognition

Asset Capture or Profiling from HD Video carried out by Humans.



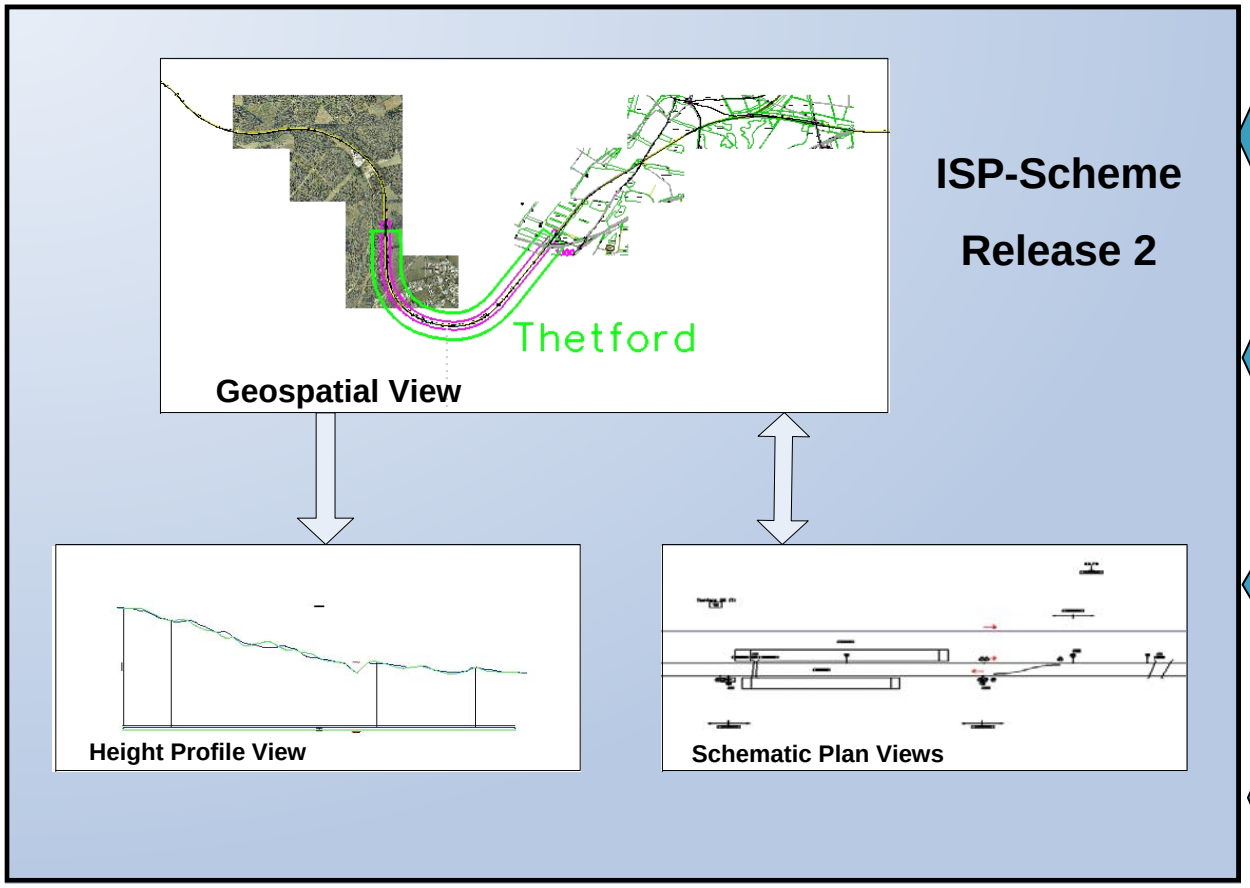
Proof of Concept to exclude the human and capture assets via automatic process

Intelligent Scheme Plans

- **ISP – Sketch Release 3 (scheme optioneering tool)**
  - Layout, Traffic & Robust Train Protection (RTP) Sketches
  - Manages TimeFrames & Signalling Equivalent Units (SEU) counts
  - Exports in Signalling Data Exchange Format (SDEF)
  - Drives analysis tools

- **ISP – Scheme Release 2 (Signalling Plan tool)**
  - Uses Auto Mapping survey data
  - Uses topographical survey data
  - Mapped to Ordnance Survey mapping & aerial imagery
  - Mapped to digital images (Release 3 will be mapped to High Definition video models)
  - Height profiles
  - Allows re-scaling from the Geographic Information System (GIS) view

ISP-Scheme Release 2 (Nov '09)



Designer Interface

Survey Data

OMNISURVEYOR OS3D

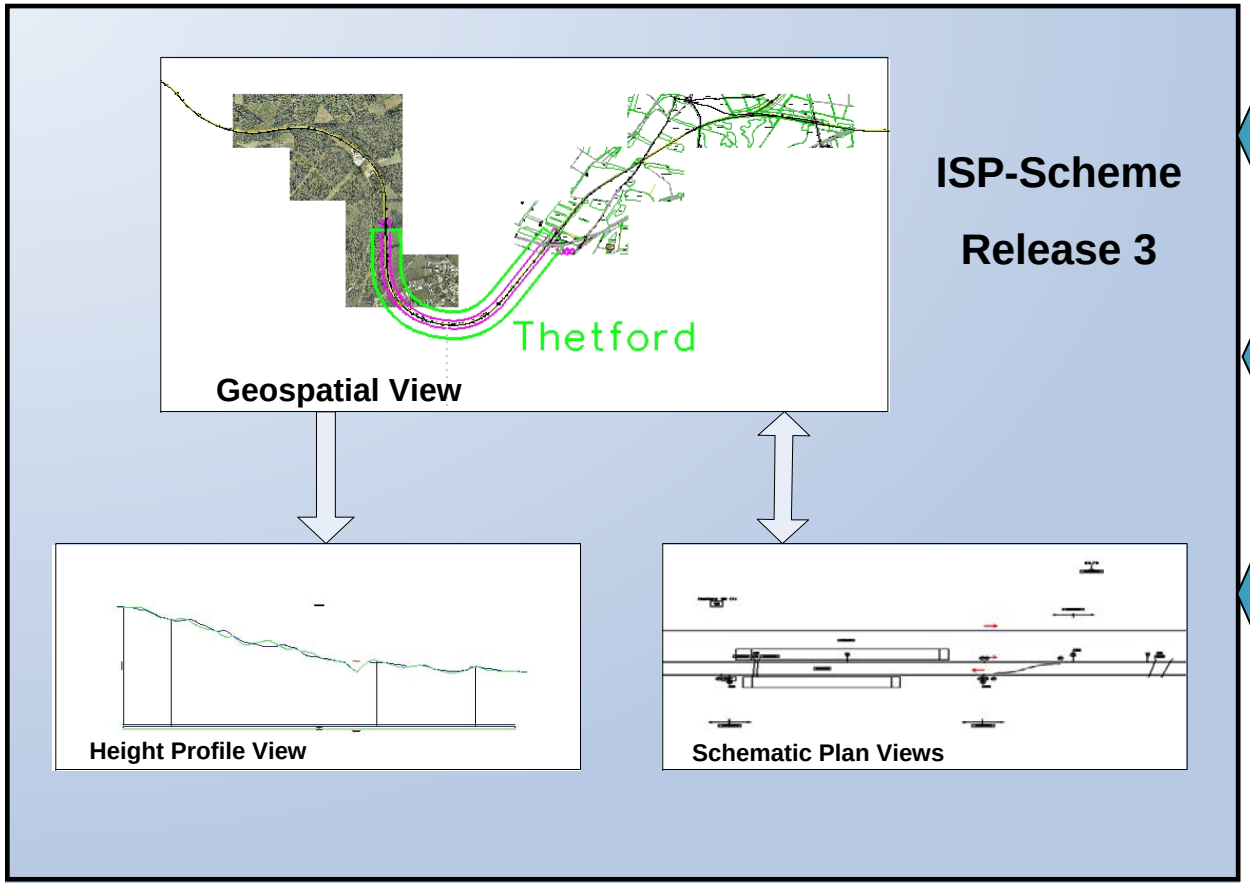
Digital Photo Store

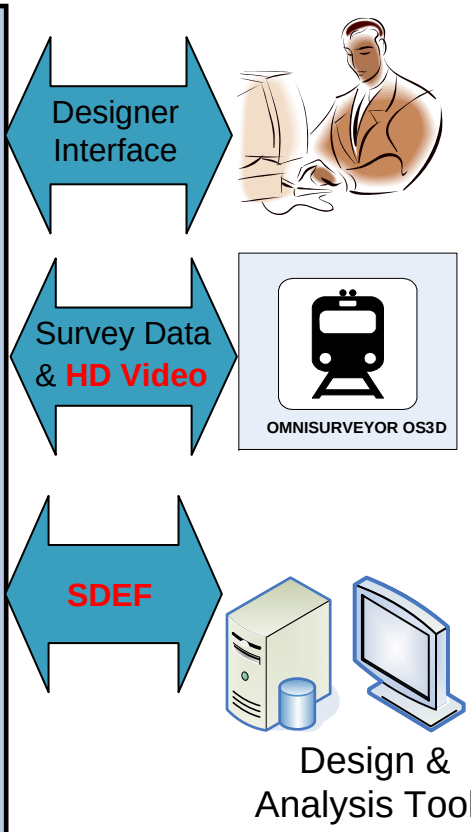
Export as PLANS

MicroStation Design Tools

Schematic Plan Views include:
- Survey Signalling Plan
- Signalling Plan

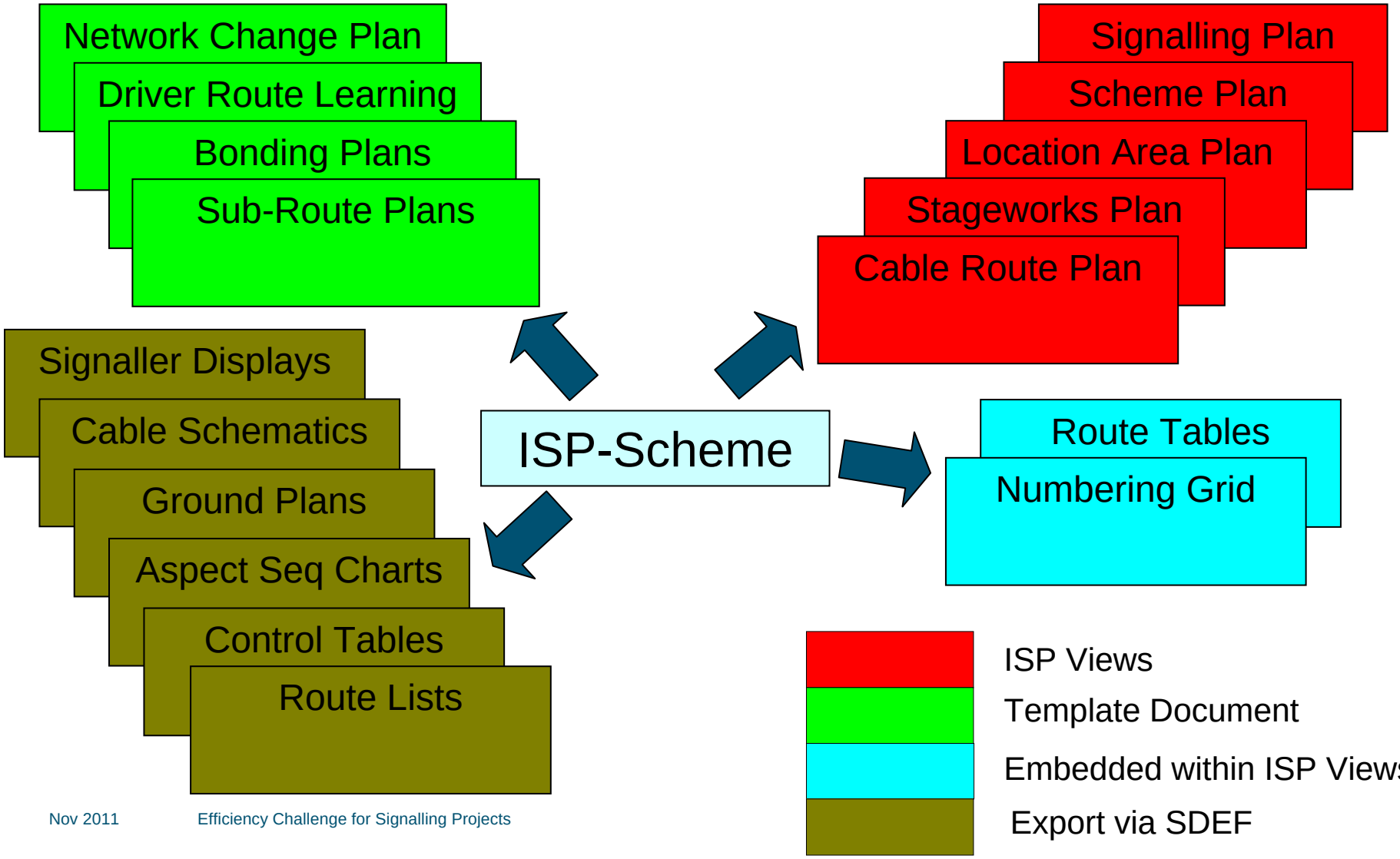
ISP-Scheme Release 3 (Jan '12)





Schematic Plan Views include:
- Survey Signalling Plan
- Signalling Plan
- Scheme Plan, Location Area Plan, etc, see next slide
- Bonding Plan

ISP-Scheme Release 3 Deliverables



Design Process Efficiencies

Design to Cost (D2C)

D2C Objective & Anticipated Benefits

Objective:

- To ‘commodify’ the design process through use of **standard designs**
- An attitude change in designers to **design to funding** limits and stick to the remit

Benefit:

- Reduction in bespoke or repeat design by promoting ‘catalogue engineering’
- Reduction in construction & asset lifecycle (eg maintenance) cost
- Elimination of cost escalation through addition of unfunded enhancements

Safety Enhancements:

- Safety enhancements have the potential to starve other projects from funding

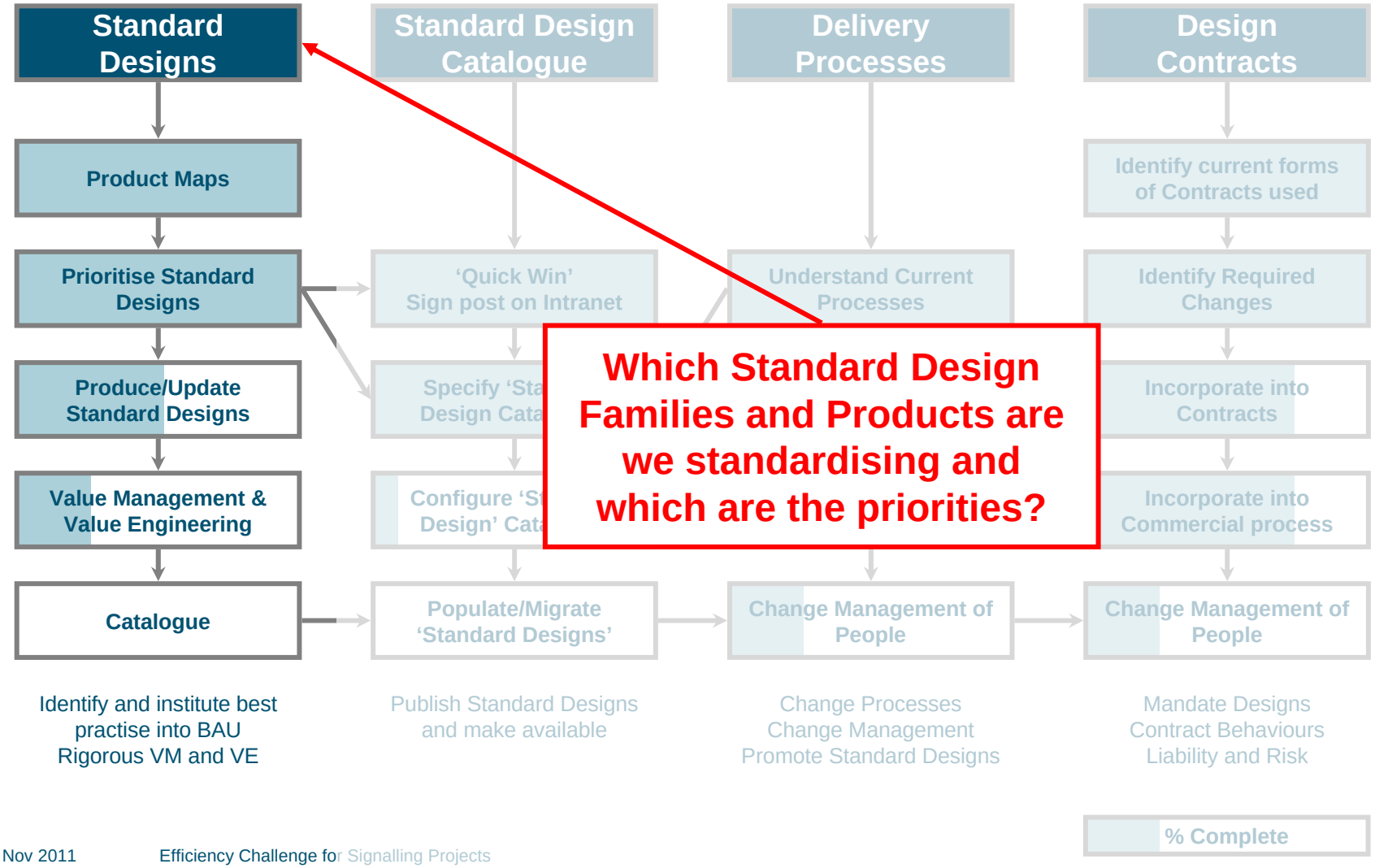
Unnecessary Enhancement

Standard Design - Definition

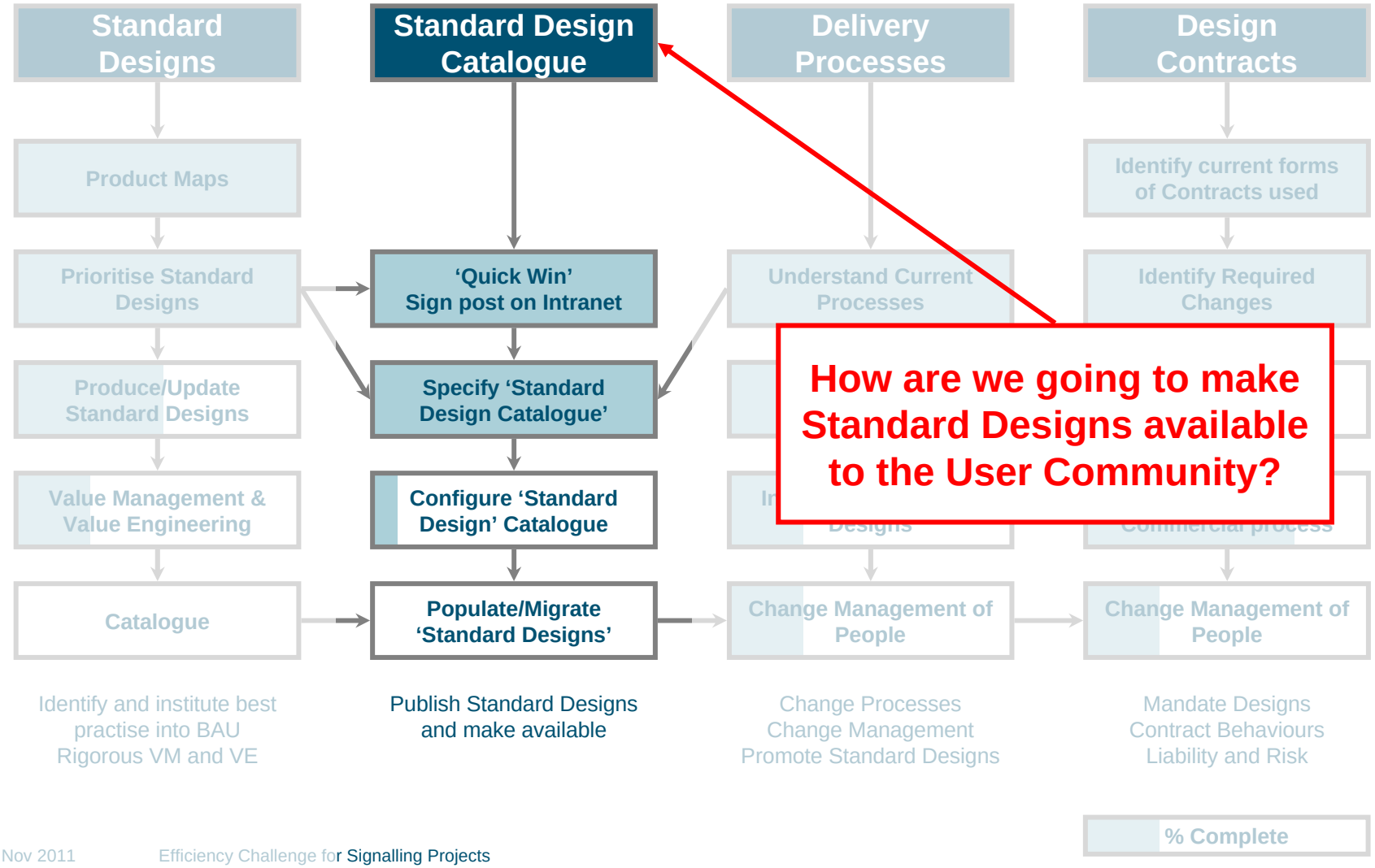
A major element of ‘Design to Cost’ is to promote the application of ‘Standard Design’ (SD), which …

- require the minimum possible site-specific adaptation
- represent the best possible value solution
- clearly specify the criteria for their application
- have secured approval by the relevant NR Professional Head

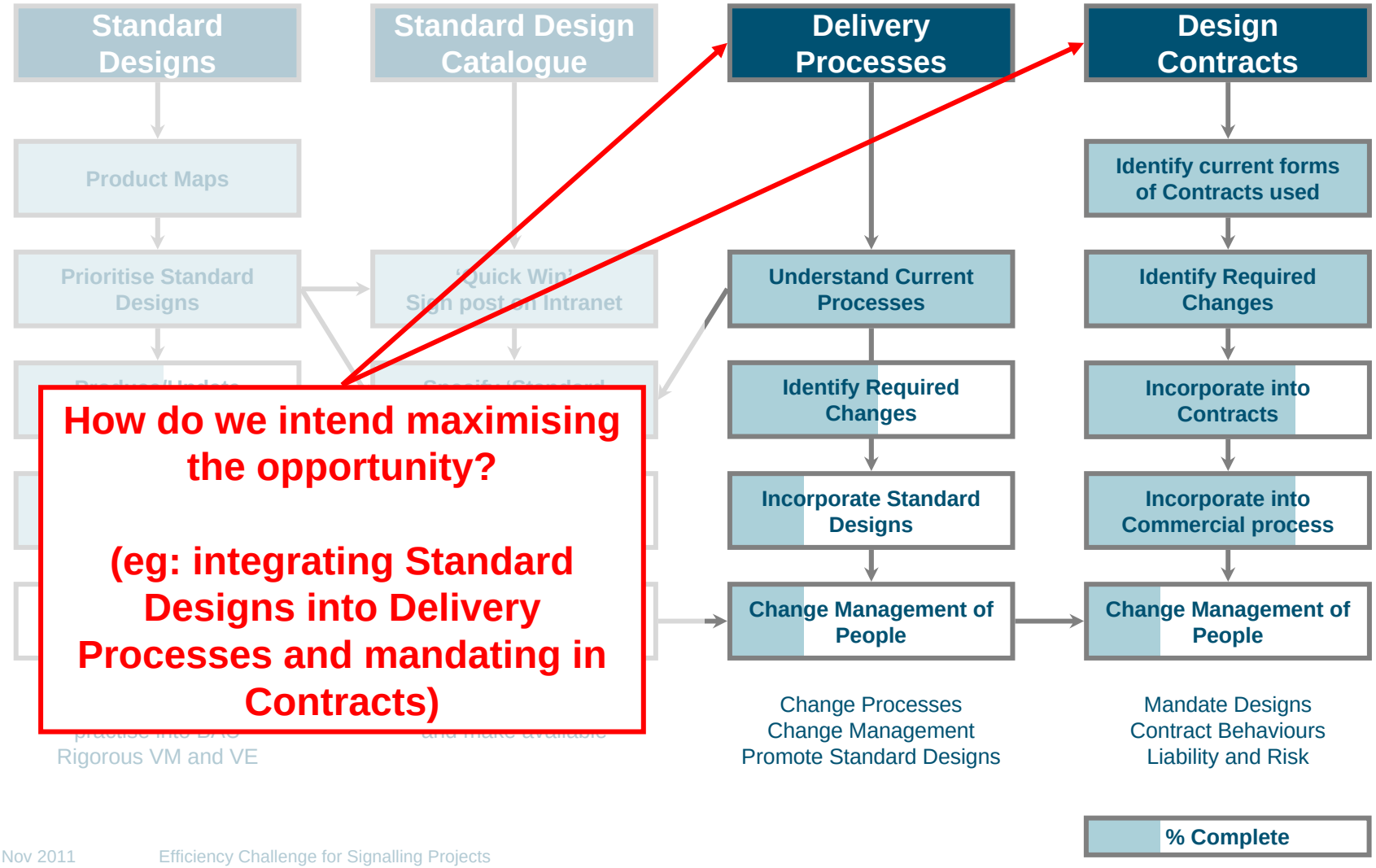
D2C Project Strategy and Progress:



D2C Project Strategy and Progress:



D2C Project Strategy and Progress:

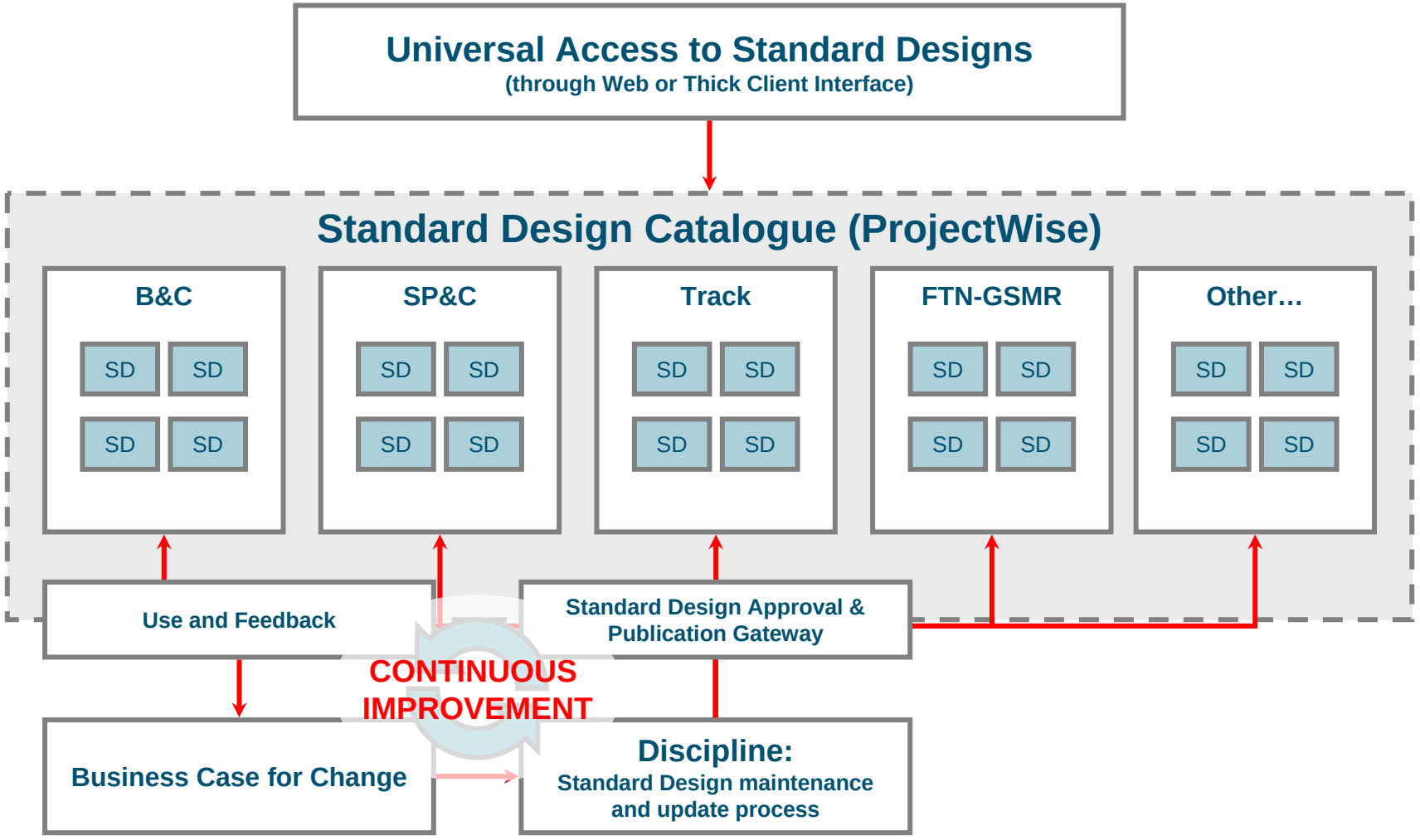


Standard Design Products

- Which Standard Designs are we targeting for Signalling?

Workstream	Delivery Date
Civil Engineering	
Spread Concrete Foundations	Dec 10
Signal Structures	Dec 10
Cable Routes & Miscellaneous	Sep 10
Signalling Power	
Methods & Processes	Oct 11
Standard Document Templates	Dec 10
Signalling Power Supply Architectures	Nov 10
Equipment Specifications	Nov 11
Standard Circuits	Dec 10
Installation Methodology	Feb 11
Class II Equipment	Mar 11
Signalling	
Equipment Cell Library	Mar 11
Equipment Housings	Aug 11
Circuitry Design	Sep 11
Analysis & General Schematics	Mar 11

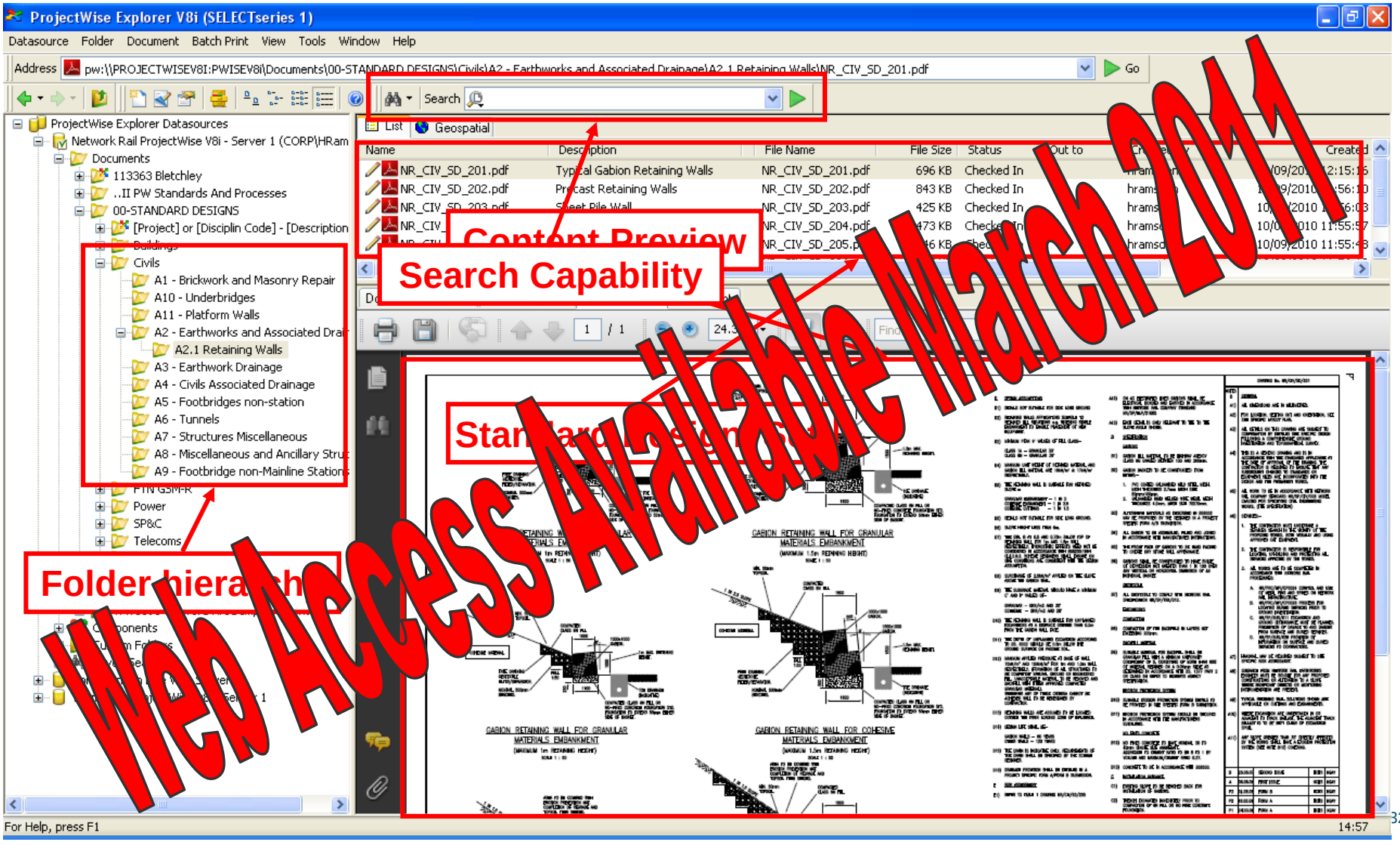
Access to Standard Designs



Access to Standard Designs

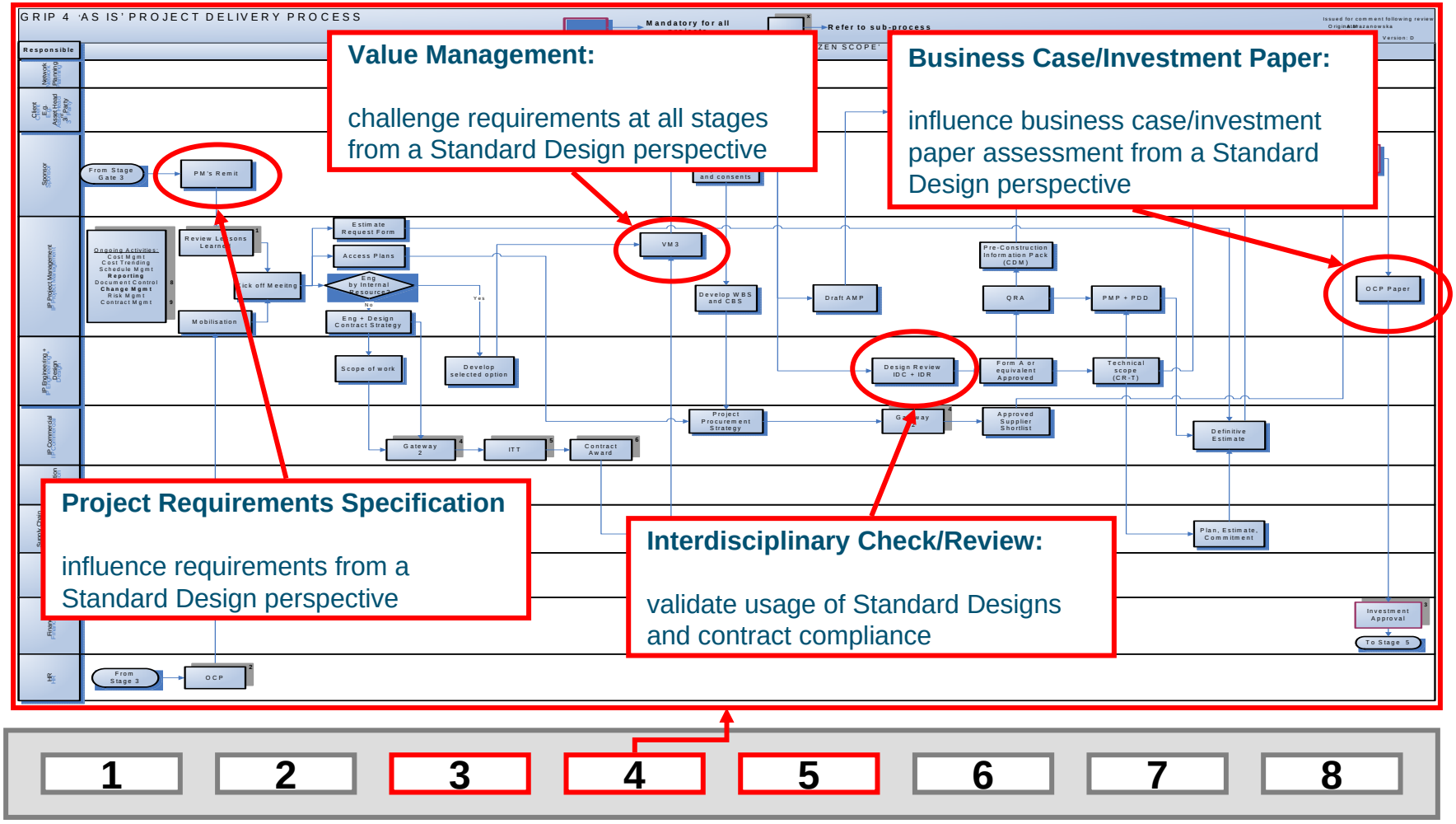
- What does this look like in reality?

Access to Standard Designs



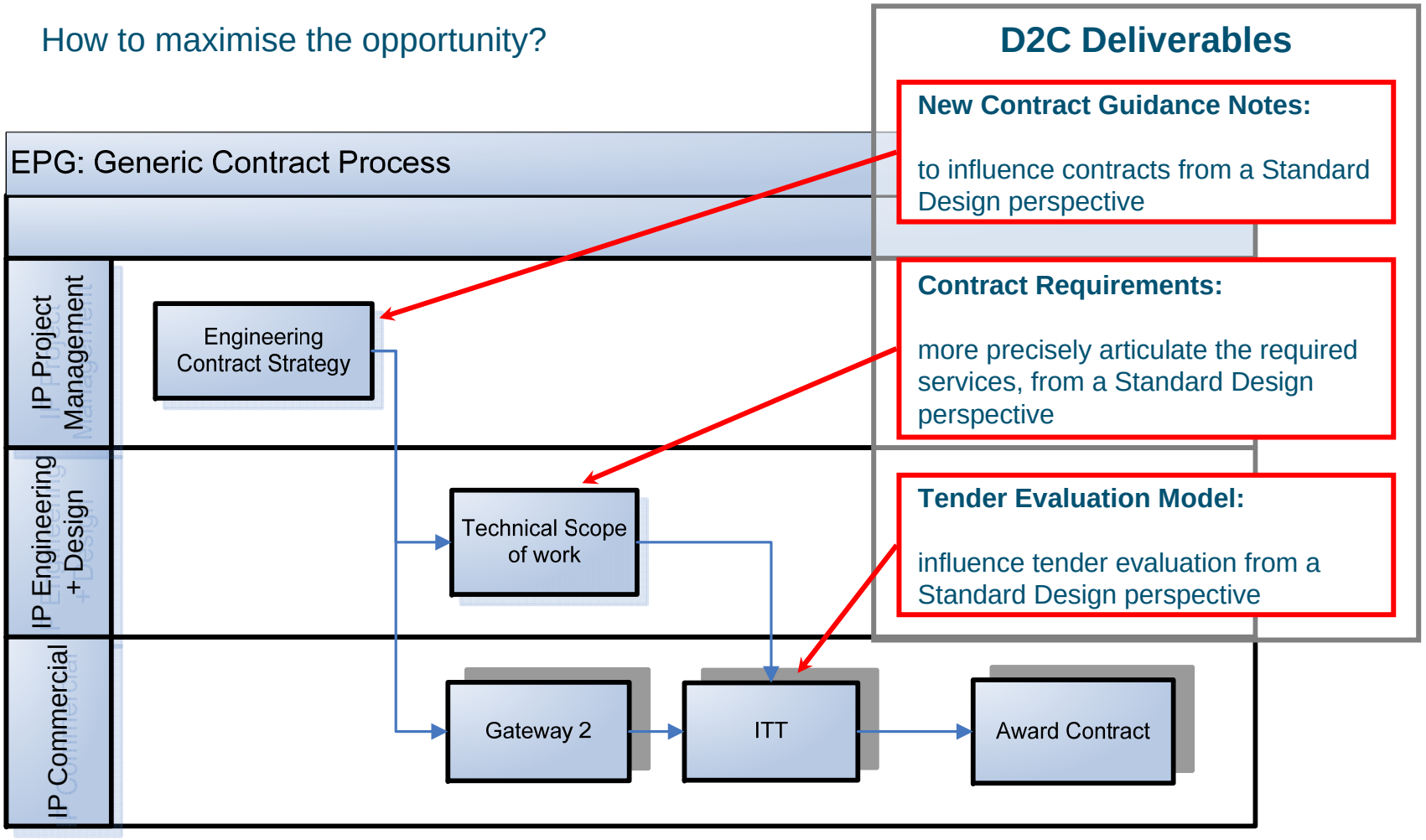
Delivery Processes & Standard Designs

- How to maximise the opportunity?



Design Contracts & Standard Designs

- How to maximise the opportunity?



Examples : What's in it for me?

NR Engineer
"How can I mandate a Standard Design?"

NR Buyer
"How do I ensure NR only buys what it needs?"

Supplier Engineer
"Which Standard Designs MUST I consider?"

Scope of Works / Services

Design Liability

Insurance Indemnity

Intellectual Property Rights

Defects

Statute of Limitations

Supplier CEO
"What is the liability to the company?"

Supplier Designer
"How do I promote/offer an alternative, innovative design?"

Supplier Bid Team
"How can we maximise our competiveness?"

Delivery Efficiencies

Delivery Efficiencies

Modular Signalling

– a **design philosophy** which enables the resignalling of rural routes at a lower unit cost than other current methods.

Modular Signalling

- The system includes:
  - New processes and procedures
  - Standardised architectures
  - New tools
  - New hardware

- Elements of the system, both process and hardware can be used in applications where a cost saving can be made.

Modular Signalling

- Aims and objectives
  - Drive efficiencies in signalling renewals
  - Making replacement of mechanical signalling viable
  - Facilitate Network Rail's operating strategy
  - Reduce development and design time
  - Reduce testing and site activities
  - Standardise signalling deployment

Key targets

- Key targets
  - Cost effective delivery (At least 50% reduction in rates)
  - Allows future efficient functionality enhancement
  - Short timescales from launch to delivery
  - Migration to a roll out programme at target prices
- The required changes are either:
  - Group Standard changes
  - Company Standard changes
  - Culture, ‘custom and practice’ changes
  - Process and procedure changes
- The scale of change is considerable!

Modular Signalling Handbook

- Key issues -
  - Limited layout options
  - All data is carried over the Fixed Telecoms Network.
  - Efficient development, design, testing and implementation

Modular Signalling Components

Modular Signalling Components

Modular Signals and AWS

Next Steps

- Pilot schemes due for commissioning 2011 – 2012.
- Product approvals.
- Development of GRIP 5 – 8 processes, with the Suppliers, through the Pilot schemes.
- Focus on commercial and procurement processes, to generate further cost savings.
- Development of maintenance and training support.
- Modular Signalling Handbook to be published Qtr1 2011.

- Introduction of individual features from Modular Signalling to conventional projects – some 30 plus opportunities have been identified.

Delivery Efficiencies

Lightweight Signals

1. **Lightweight (& minimum maintenance) signal head**
   [for attachment to ‘standard’ or ‘lightweight’ signal structures]

2. **Lightweight straight post** signal structure, no ladder
   access [for use with a lightweight signal head, the two items may be integral]

3. **Modular Signal**
   [part of the Modular Signalling project, includes integrated locs, etc, & is ‘separate’ to 2 & 3 above]

Introduction

- This initiative includes signals that cater for:
  - Modular Signalling
  - Conventional re-signalling schemes
  - Maintenance replacements (backwards compatible)

Product Acceptance

- Product Acceptance is ongoing and a single application covers all the variants from each manufacturer.
  - PA05/04240 Dorman Lightweight Signals
  - PA05/04327 VMS Lightweight Signals

- Operational trial of three heads & a Position Light Junction Indicator (PLJI) commenced in August 2010.

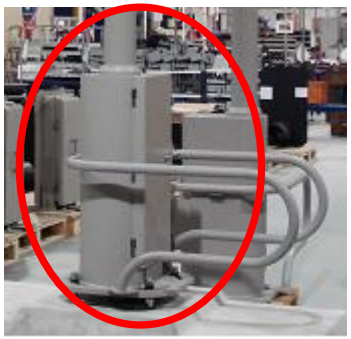
Range of Products

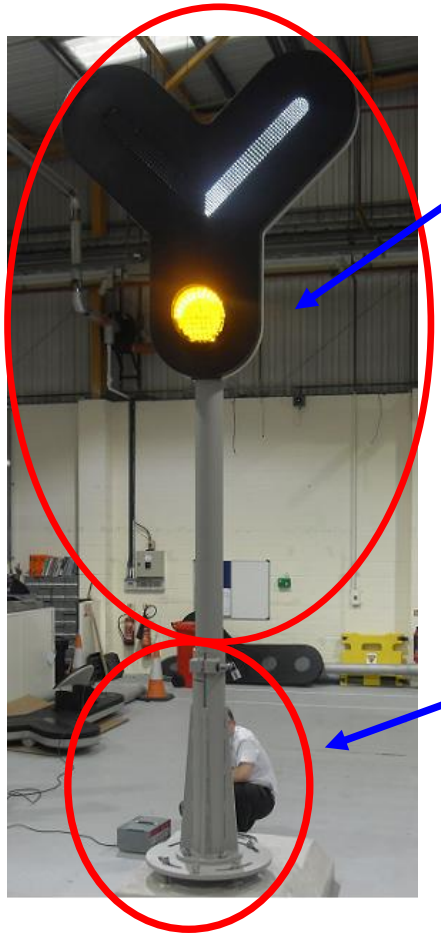
- Manufacturers are designing 3 & 4 aspect searchlight signal heads and Positions 1, 4 or 1 & 4 PLJIs.

- The following slides show the different configurations that are available.

Dorman

Cabinet base for modular schemes





Integrated (moulded) Lightweight signal head, PLJI & post. Available as 3 or 4-aspect and with or without the PLJI (s).
(Version of head being developed to fit existing structures)

Trunnion base for conventional schemes, fits on standard concrete base bolt centres

VMS

Signal & PLJI can be mounted using standard mounts

Lightweight 4-aspect signal head

Lightweight PLJI

Simple straight post with brackets to bolt signal & PLJI to it

Base unit fits standard concrete base bolt centres

Versions

- The signals can be mounted to the lightweight post, or with brackets to fit standard mounts on existing structures
- For modular applications a 24Vdc version will be available
- For all other applications the 110Vac signal will be used
- ‘Lamp’ proving is by provision of voltage free contacts
- A version that is compatible with traditional current proving is also available

Further developments

- Position Light Signals (subs) and Main Aspect Route Indicators (MARIs) will be developed as they are required by Modular

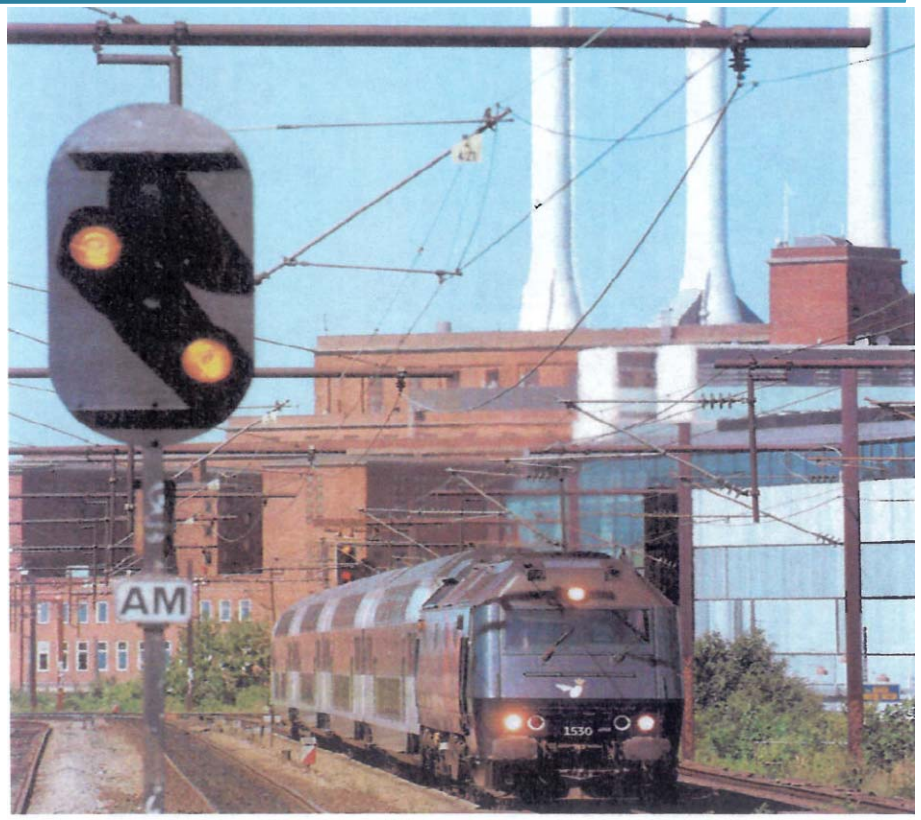
- Other positions for the Position Light Junction Indicator (PLJI) will be assessed as these will be required for conventional renewals projects.

Proposed Maintenance Free lightweight signal portal structure

Conventional Equivalent

Why are we doing this?

Denmark



Norway

Because this is unaffordable……

Kentish Town

St Albans

Testing Process Efficiencies

Plug and Play

What is Signalling Plug & Play?

- Current technology
- Move as much installation and testing activity from lineside to the factory
- Detail site survey
- Cables cut to length, fitted with plug couplers, tested in factory
- Lineside equipment fitted with plug couplers, tested in factory
- Connect equipment and tail cables with plug couplers on site
- 10% installation and continuity check
- Correspondence test and commission.

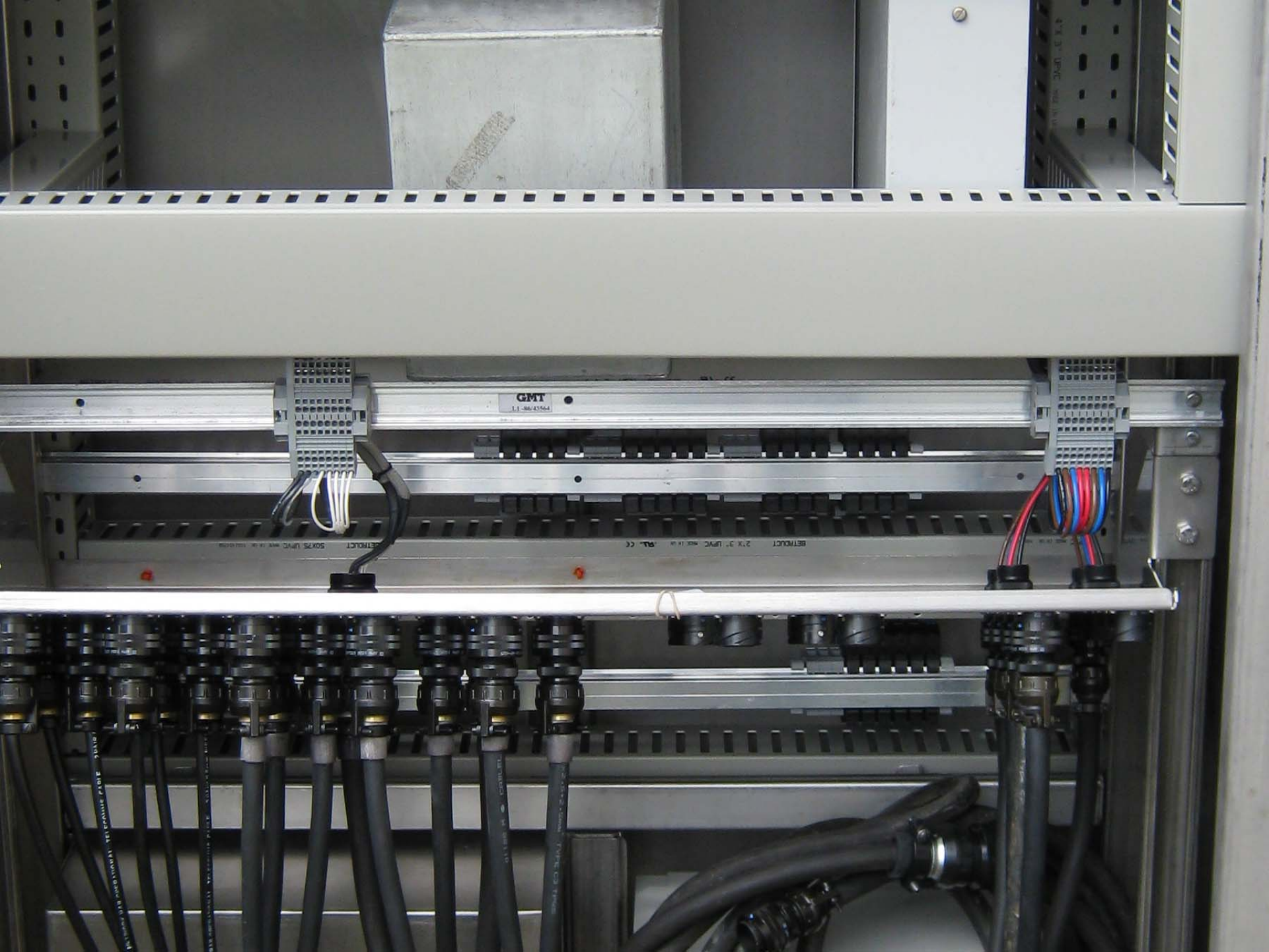
Plug Couplers

Plug Couplers

Product Specification – Plug Couplers for Connection of Cables to Lineside Signalling Equipment NR/L2/SIG/30027

- Specify military spec MIL5015
- Connectors are robust and have been in use for 20 years.
- Used in many different industries
- Multiple suppliers

Specification is currently being updated for multicore (B2) cable


GMT

Signalling Works Testing Handbook (SWTH)

Updated SWTH has been published, full compliance from 6/6/10

- No duplicate cable testing.
- Cable testing to be carried out by suitably qualified installers.
- Reduced installation and testing trackside
- Improved efficiency of stage works
- Documentation appropriate to the level of testing – significant reduction for minor works
- Testing of repetitive minor works will not be bound by shift lengths.
- No requirement of a test train to commission signalling

Where are we now?

- Product approval for Plug Couplers
- Trial at Barry
- Standard circuit drawings
- LX signal circuit drawings
- Technical specification for Plug & Play
- We are now in a position to let contracts with Plug & Play.

What are we doing next?

- Trial site at the old Leicester Training Centre
- Workshops with signalling suppliers
- Product acceptance for new applications of plug coupled equipment.

- Roll out Plug & Play to Projects

Projects with Plug & Play

Trial since Mar 10	Barry Trial Site
Contract Award	Paddington freight siding
Tender Review	Stourbridge-Hartlebury
Tender	Newport Area Signal Renewals (Phase 2)
Tender	Hartford Loop
GRIP 4	Harrogate
GRIP 4	Nottingham

Summary

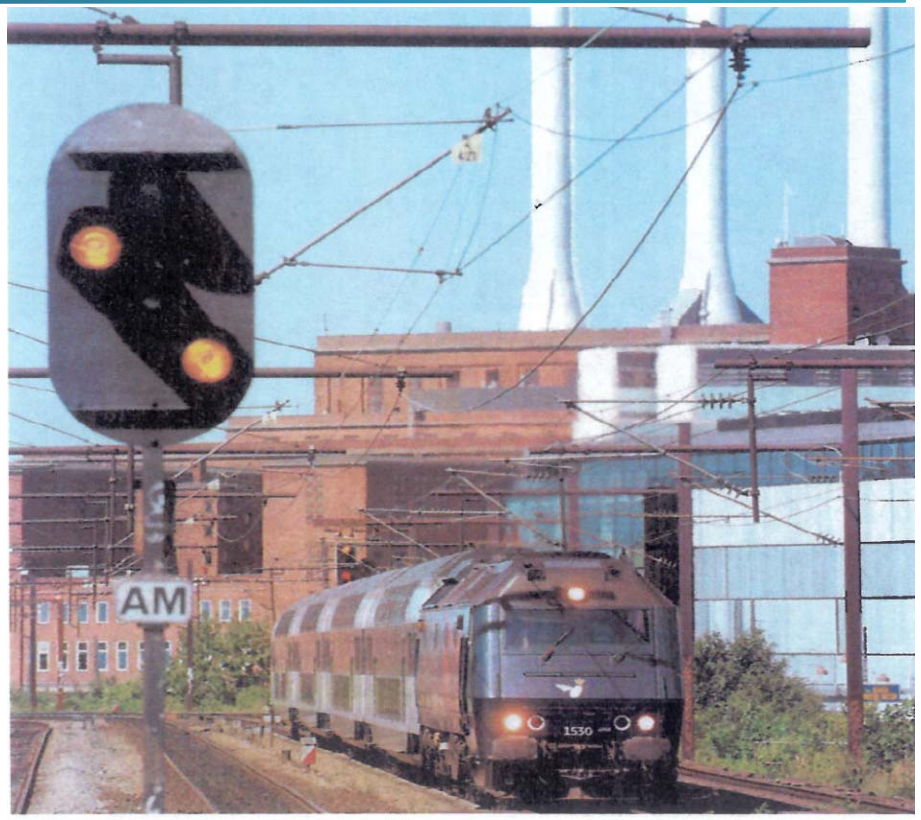
Summary

- We have a huge challenge ahead going into CP5
- We are pushing ahead with efficiency initiatives on many fronts
- We are still short of our target
- We need cross industry effort to get there

We can't afford to keep on doing this

We need to start doing more of this

Denmark



Norway

……..and this

Innovation

……..and this

Keep it simple

But – get it right!

Questions?