

# Managing Banedanmark's signalling programme

**PROGRESS** With the four main framework contracts for the resignalling of Denmark's entire rail network now in place, the focus for the project team is changing from procurement to implementation.



Morten Søndergaard and Jost Lükking\*

The announcement on January 24 of a preferred bidder to supply onboard ETCS equipment for the main line resignalling marks a significant milestone for Banedanmark's Signalling Programme. All four of the main supply elements have now been awarded: the contracts covering the København

S-bane, Fjernbane East, Fjernbane West and Onboard Systems were all due to be signed by the end of February.

Over the next few months the main focus for the SP team will change from tendering and procurement to design and implementation. The first sections of line are due to be equipped and tested in 2013-17, with the S-bane CBTC to be fully operational in 2018 and the rest of the network to be resignalled with ETCS by 2021.

Launched in 2009, the Signalling Programme is unique in scope and objectives, calling for replacement of the national rail network's entire train control system, and consolidation of traffic management into two new national control centres (RG 3.09 p39). To roll this out in little more than a decade requires an efficient programme organisation and a reliable contractual framework.

The total investment is estimated at €2.4bn, excluding contingencies. Manufacturing and installing the

physical assets will account for half of this — 34% for the signalling infrastructure and onboard equipment, and 18% for other elements such as GSM-R, the fixed transmission network, buildings, and decommissioning of the old signalling and communications systems. Provision has also been made for network extensions, such as the new København – Ringsted line and a future rail connection to the Fehmarn Belt fixed link.

The other half of the budget will pay for brainpower: design and development, engineering, testing, approvals, education and training, and management. In many ways, the Signalling Programme is much more like an IT project than a typical asset-heavy railway infrastructure project.

## Strategic challenges

The total replacement strategy, including new train control technology, a new traffic management

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organisation and a complete set of new operational rules, is a major challenge. Getting it all done by 2021 is equally ambitious. And there are also technical issues. To date, ETCS Level 2 has largely been installed on isolated sections of route, and not on an entire network. The Danish application must work in stations as well as on plain line, which should be facilitated by the ERTMS Baseline 3 specifications, required under the contracts. But given that Baseline 3 is not expected to be adopted by the European Railway Agency until the end of this year and the compatible hardware will not be ready for some time after that, work will have to start using the current Version 2.3.0d.

A major organisational challenge is the sheer number of institutional stakeholders. Banedanmark is the main infrastructure manager, but some lines including the Storebaelt and Øresund links are owned by other companies. Within Banedanmark, business units such as operations, asset management and maintenance are involved in setting standards, planning and implementation as they will ultimately become responsible for operating and maintaining the new systems.

The most important stakeholders are the 25 or so train operators using the Danish network, notably DSB, who will have onboard equipment installed on their vehicles, and who must train their staff to use and maintain it. Under the Onboard Systems framework contract, most of the onboard equipment will be procured and owned by Banedanmark and leased to the train operators. However, we will not reimburse the costs incurred by freight train operators or maintenance contractors offering their services in the open market.

The primary political stakeholder is the Ministry of Transport, both as the policy-setter and funder of the Signalling Programme, and as the principal certification agency through its transport authority Trafikstyrelsen (p47). There are also interfaces with various organisations in Germany and Sweden.

### Contract structure

There are four large framework contracts at the core of the programme:

- with Siemens for the København S-bane CBTC infrastructure and onboard systems;
- with Alstom for the Fjernbane East



infrastructure;

- with Thales/Balfour Beatty Rail for the Fjernbane West infrastructure;
- with Alstom for the ERTMS onboard systems.

Other large and small contracts are being awarded for development and implementation of the GSM-R infrastructure, building the traffic control centres, the safety assessor, consultancy, legal support and so on. Our first large-scale contract was awarded in 2009, when the Rambøll - Atkins - Emch+Berger - Parsons consortium was selected to act as consulting engineers, supporting the planning, tendering, design and implementation. Stakeholders' rights and obligations are governed by back-to-back agreements.

The main framework signalling contracts cover design, build and maintain over the entire life cycle of the new systems. Train operators will be able to choose various options for co-operation with the suppliers in terms of vehicle fitment, staff training and maintenance of the onboard equipment. The clear-cut contract layout with well-defined limits is

intended to minimise interface problems. Under the turnkey contracts, the suppliers are responsible for systems integration within their own domain, whilst responsibility for integration between the suppliers remains with Banedanmark. The fixed-price contracts are governed by performance indicators to ensure efficient delivery and maintenance as well as functionality. Having two contractors for the Fjernbane infrastructure provides a measure of competition during the implementation phase, as well as a fall-back should one under-perform.

In order to encourage competition, we tried to ensure that the specification was tailored to the market, and maintained as much dialogue with potential suppliers as possible. We are justifiably pleased that all of the major European signalling suppliers bid for each of the four packages, from prequalification through initial tenders to best and final offers. The period between the first tenders and the final offers allowed for extensive feedback, such as clarifications, corrections and initial price negotiations. Although the process

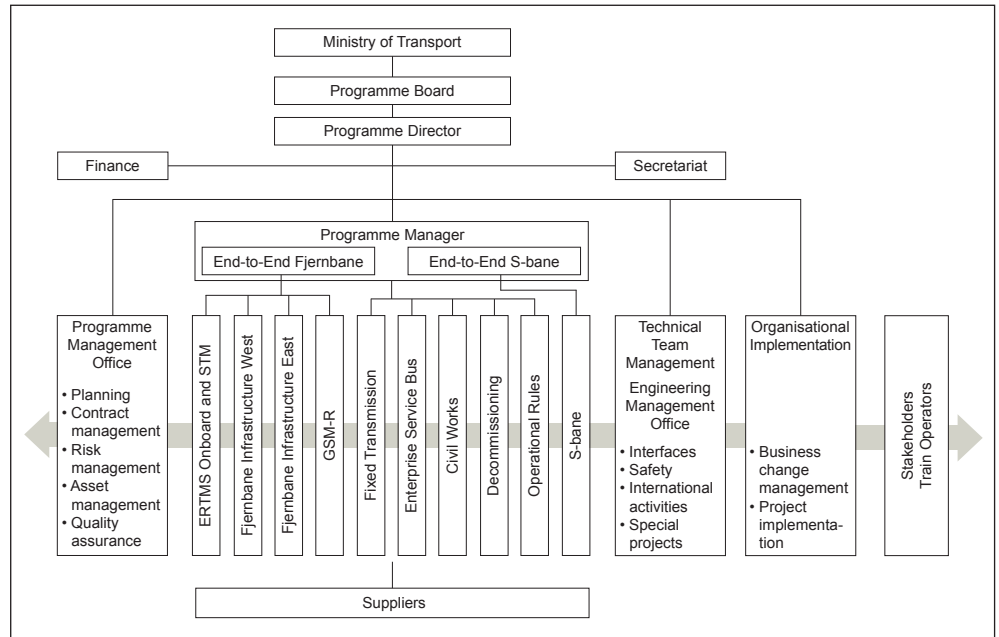
consumed a lot of time and resources from all parties, it was very beneficial in ensuring competitive bids.

**Management organisation**

The Signalling Programme organisation (Fig 1) includes a number of sub-projects related to either the Fjernbane or S-bane systems. Other sub-projects provide infrastructure or services for both, whilst three organisational units provide cross-sector functions. A technical team or Engineering Management Office handles tasks like safety management, stakeholder interfaces and international relations. The Programme Management Office is responsible for overall planning, management support and quality assurance, whilst another team handles business change management and project implementation. The line organisation is led by a Programme Manager and two end-to-end managers for the Fjernbane and the S-bane programmes.

Overall leadership lies with the Programme Director, who answers to a Programme Board which is led by Banedanmark's CEO and includes the senior financial management. Ultimately, the whole organisation is answerable to the Ministry of Transport.

Project governance follows the



Managing Successful Programmes methodology developed by the UK Cabinet Office. Programme development and delivery is driven by a clear picture of the capability of the train control and traffic management systems and a permanent focus on realising the benefits. This has strong commercial implications, as the new signalling is expected to provide much better reliability and punctuality for

the whole railway; there are explicit targets for reducing the cost of network maintenance and operations.

Apart from the necessity to replace aging equipment, the commercial objectives explain why an early delivery is important. In order to achieve the benefits, cultural change is needed, which requires early and comprehensive engagement from all the stakeholders. And the Signalling Programme must

**Fig 1. Organisational structure for Banedanmark's Signalling Programme management teams.**

**The entire main line network will be managed from two new control centres.**



Image: Tranberg Arkitekt



The current S-bane control centre will be replaced when CBTC is introduced in 2018.

have the organisational capabilities needed to bring this about.

### Budget and risks

Right from the political decision to launch the programme, a detailed investment budget was developed, even at a stage when the technical options were only a basic outline. This so-called 'anchor budget' nevertheless forms the basis for all quantities and unit costs until the end of the programme delivery; it is the basis for the annual appropriations and financial accounting. The original anchor budget was based on fairly detailed models, and has now been updated to reflect the actual contracts, but it goes far beyond just the signalling.

International cost benchmarks have been used where possible, but the size and scope of the programme, along with technical development and the learning curve have made the budgeting difficult. Planning for the engineering, supervision and management tasks — which have a major impact on programme costs — required a special approach, with top-down targets and bottom-up resource estimates.

In parallel with financial control comes risk management. At the moment, we are monitoring about 150 project risks, of which 20 are considered severe. The majority come in organisation and management, contracting and external factors, but the technical and implementation risks are assessed as more serious, in terms

of both probability and consequences. The risk register and mitigation measures are regularly re-assessed, and the risk management process will become a joint undertaking with the suppliers.

Investment to mitigate risks is explicitly identified and included in the anchor budget, but there is no explicit contingency provision. Instead, the national investment process in Denmark adds a fixed percentage as a reserve to project funding. A small part of this is made available directly to the Signalling Programme, and the rest goes into a common fund to cover all cost overruns for public works projects.

### Lessons learnt

Over the past three years, we have reached an important milestone with the successful conclusion of the tendering process on time. With the contracts in place, a lot of the original uncertainty has been removed, and the programme baseline has become much clearer. Our original models for planning and budgeting have proved quite robust, with no unpleasant surprises. Both the timescale and financial framework supporting the political decision to proceed with the project seem to be holding up well.

Our approach to procurement has ensured good technical solutions and encouraged the suppliers to think about leaner processes. Competition has been fierce and has brought the anticipated economies of scale. Of course, tight financial control and contract management will still be essential to ensure that the benefits are delivered in practice. ☞

For more information visit <http://uk.bane.dk>

Fig 2. Over 150 risks have been identified in the Signalling Programme, ranging from procurement and project management to technology development and the installation programme.

