Consolidated construction estimate

1. Background

This document compares the two construction estimates for a cable-stayed bridge and an immersed tunnel solution and presents the profitability calculations based on the current construction estimate.

It should be emphasised that the construction estimate is the best possible based on the information currently available. It cannot be excluded that new information, authority requirements, political requirements or delays arising from complaints etc. could result in modifications to the project, the timetable and, consequently, to the price estimate. In this connection, it should be emphasised that this construction estimate has been drawn up ahead of the implementation of the Environmental Impact Assessment. The final construction budget will be determined during the passing of the Construction Act.

2. Overall construction estimate

The two construction estimates show that overall a tunnel solution is around EUR 80 million cheaper than a bridge solution before the inclusion of the EU subsidy, and around EUR 70 million cheaper after inclusion of the EU subsidy.

Table 1 Construction estimate

2008 prices	**Immersed tunnel**	**Cable-stayed bridge**
Construction costs	EUR 3.5 billion	EUR 3.5 billion
Other works	EUR 0.3 billion	EUR 0.3 billion
Total construction costs*	**EUR 3.8 billion**	**EUR 3.8 billion**
Project management, operational preparations etc.	EUR 0.7 billion	EUR 0.7 billion
Reserves	EUR 0.6 billion	EUR 0.7 billion
Total gross costs*	**EUR 5.1 billion**	**EUR 5.2 billion**
Expected EU subsidy	EUR 0.6 - 1.1 billion	EUR 0.6 - 1.1 billion
Total net costs*	**EUR 4.0 – 4.5 billion**	**EUR 4.1 – 4.6 billion**

* The total can differ from individual items as a consequence of rounding up.

The construction estimates cover the period 1 April, 2009 until the opening of the fixed link in 2020, c.f. timetable. The estimate compares, therefore, the already earmarked resources for the planning phase of EUR 252.5 million.

3. Construction costs

The construction costs of the two sketch plans are based on the estimates that the two consultants, Rambøll-Arup-TEC JV for the tunnel solution and COWI-Obermeyer for the cable-stayed bridge have drawn up. Both construction estimates have been examined by the Femern organisation in respect of the technical and the financial aspects. This has resulted in a number of adjustments for both projects so that the two projects are comparable in respect of meeting both the technical requirements and the basic calculation assumptions such as, for example, the price of concrete, steel and labour costs.

The construction costs cover all the expenses to be paid by the company to the contractors for constructing a fixed link across the Fehmarnbelt. However, the reserve for the contractor's risks are not included under this item, but under reserves.

The construction cost for the cable-stayed bridge is calculated on the basis of a model for similar work which has been scaled to account for a project of Fehmarnbelt's magnitude. The construction costs for the tunnel project, however, have been calculated based on the outline tunnel project's calculations of time and materials. The two different calculation methods will result in the greatest possible precision and transparency in the estimate for a tunnel solution. In respect of the estimate for the bridge solution, Femern A/S has carried out a client adjustment of EUR 170 million because Femern A/S believes that the estimate has not allocated adequate resources for adhering to the tight timetable.

In their estimates, the consultants have assumed that the concrete and steel works should be undertaken where it is cheapest to do so, currently in Poland and China.

4. Other works

The budget item comprises the construction activities that fall within the client's responsibility and therefore do not form part of the sketch plan and activities that are necessary to implement the project but are not part of the actual construction. The costs have been identified on the basis of the experience from the Øresund project. Other works thus comprise the following:

- Navigational safety in the form of a VTS system, buoyage and/or temporary lighthouses – approx. EUR 33.6 million
- The client's leasing of monitoring boats – approx. EUR 13.4 million
- Investigations and compensation measures (environment, archeology, removal of explosives etc) – approx. EUR 10.1 million.
- Replacement and purchase of soil (purchase of soil, compensation for affected farmers, fishermen and other enterprises – approx. EUR 40.3 million
- All-risk insurance of the construction – approx. EUR 53.7 million
- Toll station and payment system in Denmark – approx. EUR 47.0 million
- Facilities for customs and border control in Denmark and Germany – approx. EUR 13.4 million
- Visitor centres in Denmark and Germany – approx. EUR 6.8 million

It should be noted that the costs of a number of items are difficult to assess, e.g. the need for removing explosives, the need for marine archeological studies and compensation.

5. Project management, operational preparations etc.

Project management, operational preparations etc. cover the client organisation's own costs for salaries and operations, etc., costs for external consultants and the preparations for operations.

Most of the funds will be used to cover the costs of external consultants. During the project phase, these costs will comprise, for instance, the preparation of the sketch plans, the environmental investigations and geotechnical surveys while during the construction phase costs will be incurred for client consultancy, supervision and environmental monitoring.

Around one third of the costs for project management etc. are expected to be incurred during the planning phase. The company already has the authority to incur these costs by virtue of the Planning Act and the document of 3 June, 2010, c.f. Table 2.

Moreover, costs will be incurred in relation to the preparation of the tender of almost EUR 40.3 million.

During the construction phase, it has been assessed that costs of almost EUR 60.4 million per year

will be incurred for project management etc. The assessment is based on experience from Øresund. As the construction period for an immersed tunnel is half a year longer than the construction period for a cable-stayed bridge, the costs of project management etc. have been assessed at approx. EUR 26.85 million higher with a tunnel solution.

In addition are the costs relating to the preparations for the construction phase of around EUR 40.3 million which include expenses for the preparation and establishment of the permanent operational organisation and expenses for the training of Danish and German speaking personnel, the establishment of contingency measures, market development, co-ordination etc. The assessment is based on experiences from the Øresund link.

Table 2 Project management, operational preparations, etc.

2008-prices	**Immersed tunnel**	**Cable-stayed bridge**
Planning phase*	EUR 231 million	EUR 231 million
Tender preparations	EUR 39 million	EUR 39 million
Construction phase	EUR 389 million	EUR 360 million
Operational preparations	EUR 41 million	EUR 41 million
Total	**EUR 700 million**	**EUR 671 million**

*Already granted by virtue of the Planning Act and the document of 3 June, 2010

6. Reserves

The total reserves have been calculated on the basis of two risk assessments of the contractor's risks and the client's risks. As a consequence of the fact that the risk allocation in future contracts has not yet been determined, the specific assessments obviously carry some uncertainty. Both assessments have been undertaken with the help of so-called Monte Carlo simulations which build on a review of all identifiable risks, an evaluation of the probability of them occurring as well as an assessment of their financial consequences. The reserves also include the planning phase's reserves and the reserve for the tendering phase.

The estimated reserve requirements in respect of a tunnel solution is expected to amount to EUR 640 million while the estimated reserve requirements in respect of a bridge solution are estimated at EUR 740 million. This equates to an addition of 15-16 per cent to the overall costs.

Table 3 Reserves

2008 prices	**Immersed tunnel**	**Cable-stayed bridge**
Planning phase*	EUR 21 million	EUR 21 million
Tender preparations	EUR 5 million	EUR 5 million
Contractor risks	EUR 208 million	EUR 290 million
Client risks	EUR 361 million	EUR 361 million
Free reserves	EUR 54 million	EUR 54 million
Total	**EUR 649 million**	**EUR 731 million**

* Already granted by virtue of the Planning Act and the document of 3 June, 2010

The reserves cover the already allocated reserves in connection with the planning phase of EUR 21 million. In addition is EUR 5 million in reserves for the tendering phase.

The major reserve items cover the contractors' risk, which will be the price the company will pay over and above the construction costs with a view to getting the contractors to assume the risks relating, for example, to weather, design responsibility, known geotechnical issues, machinery errors, breakdown in production facilities etc. The item is included under reserves although there is an expected

contractual payment to the contractor as this gives the most accurate picture of the total reserves. The payment thus reduces the company's risks and thereby the size of the client's risk.

The client's risk covers the risks that the company has assumed. This relates, for example, to the risks in connection with extreme weather conditions or cost increases which are due to changes in legislation etc. A number of risks will be covered by the company's insurance and there is, therefore, no need to allocate reserves to cover these risks.

In addition, there is a free reserve of EUR 53.7 million to cover unforeseen events. As a result, the risk calculations cannot take account of all eventualities which, in one way or another, would have implications on the costs for the project. The free reserve equates to around 1 per cent of the overall project sum.

An additional reserve of approx. 16 per cent of the total project sum is significantly lower than the reserves that are typically allocated for government road and rail projects. That a need for a larger reserve has not been assessed is due to the fact that the detailed work in the planning phase helps to identify the risks and, to a large extent, takes account of these in the final project, which reduces the overall risk. Moreover, as a starting point, a major project like the Fehmarnbelt link would be more robust than smaller construction projects in that the probability of individual events having a significant impact on overall costs is less.

7. EU subsidy

The Fehmarnbelt link is a priority project under the EU's TEN programme which means that the company can obtain grants for the planning of the link and for the construction work itself.

The TEN subsidy is granted to infrastructure projects within the framework of the funds allocated in the EU budget's 7 year financial perspectives. The current funding period covers the period from 2007-2013 while the future funding period will cover the period 2014-2020, when most of the costs for the establishment of the fixed link are expected to be incurred. As the framework for the next funding period will only be determined during 2013, it is not possible to accurately assess how much EU subsidy the project would obtain.

In connection with the adoption of the Planning Act, it was assumed that the project would be able to obtain 50 per cent funding of the planning costs and 10 per cent in support for the construction costs. Using current assumptions, this means that both a bridge link and a tunnel link would obtain EUR 600-620 million in EU subsidies.

It has turned out, however, that the subsidy for the Fehmarnbelt project during the current funding period (2007-2013) has been significantly higher because the project has been awarded 50 per cent subsidy for planning costs and approx. 24 per cent for construction costs. The possibility exists, therefore, that the company – in the subsequent funding period – would be able to achieve a higher subsidy for the construction costs than previously anticipated. Assuming that the project can receive 20 per cent subsidy for the construction costs, this would mean that the bridge project would receive a subsidy of EUR 1.13 billion while a tunnel project would receive EUR 1.10 billion.

Table 4 EU subsidy

2008 prices	**Immersed tunnel**	**Cable-stayed bridge**
Planning expenses*	EUR 232 million	EUR 232 million
Construction expenses*	EUR 4,929 million	EUR 5,022 million
Total expenses*	**EUR 5,161 million**	**EUR 5,254 million**
Subsidy planning (50 per	EUR 116 million	EUR 116 million

cent)** Subsidy construction (10 per cent/20 pct,)	EUR 493 / 986 million	EUR 502 / 1,004 million
Total subsidy	**EUR 609 / 1,102 million**	**EUR 618 / 1,120 million**

*Subsidy entitled expenses including administration overheads, which is why the figures differ from the construction estimate

** The calculation does not account for any consequences of the EU Commission's TEN-T mid-way assessment

8. Operations, maintenance and reinvestment

Operations, maintenance and reinvestment are not included in the construction estimate but are a pre-condition for carrying out profitability calculations,

Femern A/S has chosen to base the operations, maintenance and reinvestments on experience from the Øresund Fixed Link which comprises a cable-stayed bridge and an immersed tunnel. This was the same method that was used for the calculations of the repayment time, which was carried out in 2008 ahead of the adoption of the Planning Act.

Table 5

2008 prices	**Immersed tunnel**	**Cable-stayed bridge**
Operations, maintenance and reinvestments (annual)	EUR 74 million*	EUR 61 million*

* Calculated annual average based on the expected reinvestments in the link's first 40 years.

9. Profitability calculations

Based on the current construction estimates and assumptions for the construction time, as shown in table 7, profitability calculations have been carried out on the basis of the overall repayment of costs for both the coast-to-coast link and the landworks

The assumptions that underpin the Planning Act's financial analysis are unchanged, c.f. appendix, apart from the coast-to-coast link's construction estimate and the construction estimates for the landworks. It should be noted that the starting point is a stand-alone calculation where no account has been made for joint taxation with the Sund & Bælt group.

It is anticipated that the Danish landworks will be repaid through dividend from Femern A/S and that the dividend payments will start when the equity has been re-established and constitutes one third of the year's profits. After Femern A/S' debt is repaid, the year's profit will be paid as dividend.

With conservative assumptions of a TEN subsidy of 10 per cent of the construction costs and real interest of 3.5 per cent, the coast-coast link will be repaid after 30 years with a tunnel solution and 29 years with a bridge solution. The landworks will be repaid after 36 years with a tunnel solution and 34 years with a bridge solution.

The higher capital investment in the bridge solution will, therefore, be offset by a shorter construction period (½ years) and lower operating and maintenance costs compared to the tunnel solution.

If the real interest over the period is lower than 3.5 per cent and/or if the project achieves a higher TEN subsidy, this will mean shorter repayment times.

Table 6 Assumptions for profitability calculations

2008-prices	**Immersed tunnel**	**Cable-stayed bridge**

Coast-coast link	EUR 5.1 billion	EUR 5.2 billion
Landworks	EUR 1.1 billion	EUR 1.1 billion
Construction period	6.5 years	6.0 years

Table 7 Repayment times for the two sketch plans

Number of years	**Immersed tunnel**		**Cable-stayed bridge**	
	Coast-coast	Landworks*	Coast-coast	Landworks*
10 per cent. TEN subsidy/3.5 per cent real interest	30	36	29	34

* The repayment time for the landworks is calculated on the basis on the overall investment in the coast-coast and landworks.

Appendix – assumptions in the profitability calculations

In connection with the profitability calculations, the same basic assumptions have been used as in the financial analysis prepared in 2008 for the Planning Act.

The profitability calculations are, however, based on the current construction estimates for a bridge, tunnel and landworks. The calculations are also based on the link opening in 2020, which has an impact on the traffic assumptions and price level (both are projected with 2 years forecast inflation and 2 years expected traffic development).

The TEN subsidy has been calculated on the basis of the same subsidy assumptions (50 per cent for the planning costs and 10 per cent for the construction costs), but based on the current construction estimate costs.

Construction costs bridge	EUR 5.2 billion
Operation and maintenance costs bridge	EUR 61 million per annum
Construction costs, tunnel	EUR 5.1 billion
Operation and maintenance costs tunnel	EUR 74 million per annum
Construction costs landworks	EUR 1.14 billion
Equity (EUR million, 2008 prices)	500
Real interest	3.5 % p.a.
Inflation	2.5 % p.a.
Discount rate	6.1 % p.a.
Depreciation	Historic original cost depreciated on a straight-line basis over 100 years
Dept redemption profile	Annuity
Corporation tax (project company)	25 %
Growth rate for road traffic in the first 25 years of operation	1.7 % per year
Guarantee commission	0.15 % p.a.
”Ramp-up”-period – road traffic	4 years

Annual rail payment (EUR million 2008 prices)	47.0
TEN-subsidy (planning costs/construction costs)	50 per cent / 10 per cent