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TO: Bill Martin, NSC Staff		
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TO: <input type="text"/> OGI/Energy Branch		
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REMARKS:

FYI

FROM: Harry Rowen, C/NIC		
ROOM NO.	BUILDING	EXTENSION
7E62	Hqs.	<input type="text"/>
FORM NO. 241 REPLACES FORM 36-B WHICH MAY BE USED.		

FROM: Harry Rowen, C/NIC		
ROOM NO.	BUILDING	EXTENSION
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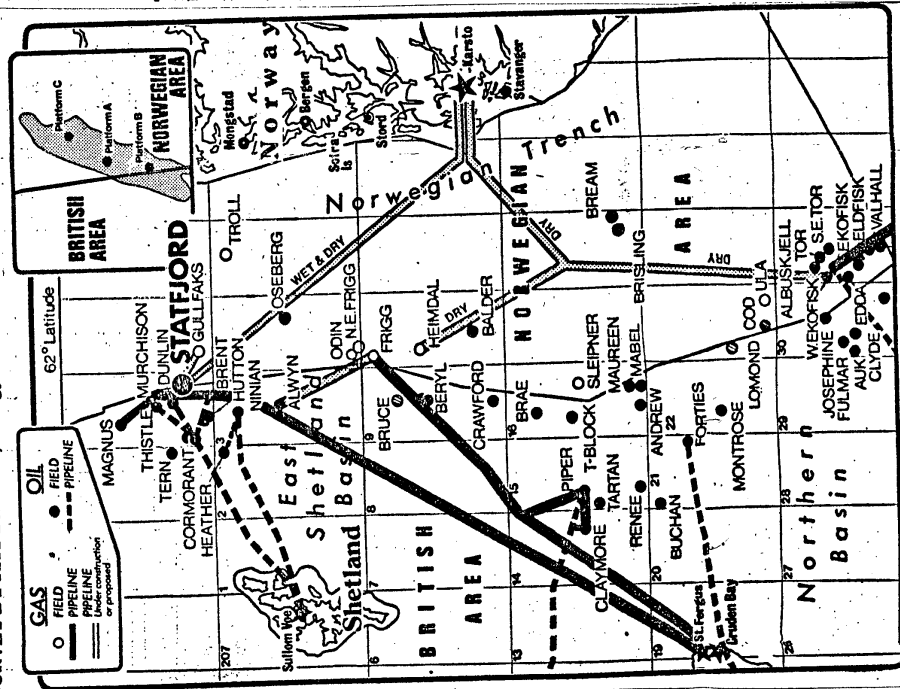
FORM NO. 241 1 FEB 55 REPLACES FORM 36-B WHICH MAY BE USED. (47)

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FINANCIAL TIMES SURVEY

Statfjord, the biggest commercial oil and gas development in the North Sea, reaches a new phase with the commissioning of the 800,000-tonne B platform. The venture has broken a number of records in terms of cost, extent of the reserves, size of the three platforms and rate of production. But the sheer scale of the operation raises questions about how the smaller fields which are required eventually to replace Statfjord can be developed in a climate of falling oil prices and steep taxation.

SURVEY BY RAY DAFTER, Energy Editor



Key development in the North Sea

THE HUGE Statfjord oil and gas field, which has just reached a new phase in its lengthy development, has become a veritable symbol for many in the North Sea oil industry on both the UK and Norwegian sides of the median line.

The 700 (44.4bn) Statfjord project is providing work for tens of thousands of employees in hundreds of engineering companies throughout the world. But it is the Norwegian offshore supply industry which is benefiting most from the development programme.

Statfjord has plumb in the official spokesman for the centre of the North Sea. The large amount of natural gas contained in Statfjord has also been the centre of an international tug-of-war, and one that still has not been fully resolved.

British Gas Corporation made a strong pitch for the total supplies of Statfjord gas. The field contains about 100 billion cubic metres (3.5 trillion cubic feet) of gas, of which between 70 billion cubic metres is expected to be available for sale — enough to meet about 10 per cent of Britain's gas supply needs for the next 15 years.

Bargaining

Norwegian nationalism and hard bargaining by gas-hungry Continental companies won the day. The Norwegian partners in Statfjord decided to transport the fuel through a new North Sea pipeline system.

The pipeline, now under construction, will link northern Norwegian gas fields with the Ekofisk complex at an estimated cost of \$2.5 billion. It will be the first gas pipeline to cross the median line between the UK and Norway.

In the UK, where the idea of a similar gas gathering network was dropped after a lukewarm response from oil companies, limits designation of the majority share of Statfjord gas. Plans are being made to sell the UK share to British Gas. But the deal may be caught in a much broader gas sales agreement now being considered on both sides of the North Sea median line.

schedule, in early November, and, at a cost of about \$1.9bn, three times Norway's daily consumption of oil products. Production capacity of the field in the second half of the 1980s will be almost 100,000 b/d, roughly on a par with the oil-exporting giant Qatar.

Within the oil industry, Statfjord is deemed to be a "giant", one of a select group of fields each containing between 500m and 8bn barrels of recoverable reserves. They represent just 0.8 per cent of the 30,000 fields now on stream around the world and a substantial proportion of total oil production.

Insist

But then the Norwegian Government insisted on a review of safety arrangements. At one stage it seemed likely that the UK might be forced to build an accommodation platform separate from the production unit. But at the end of 1976 the Norwegian Petroleum Directorate agreed on a single platform but with a major reduction in throughput. A safety platform will be the most beautiful platform ever designed, the prettiest and the safest ever built.

The \$2.4bn C platform, now under construction, will also be a large self-contained unit, although it will be designed to accommodate 20,000 b/d. Details of its progress are due to be given in London within the next few days but it seems that work is on schedule to meet the December commissioning date of the field.

As oil companies have already explored in most of the more promising areas, new fields of such proportions are becoming increasingly elusive. This is especially the case in the North Sea.

"We love to hunt for elephants but most of these have now been found in the North Sea," said the exploration manager of a major international oil corporation. It now made more economic sense to seek out the UK gas "elephants" — "pink elephants" in the North Sea.

His comments underline a growing concern and frustration among North Sea explorers. But oil companies are not alone. The governments of Norway and the UK are also anxious about rising unemployment, and are keen to see a continuation of the offshore supply industries.

Their anxiety was highlighted a few weeks ago. Norwegian Government was putting pressure on an oil consortium to order a major piece of oil field equipment in Norway, rather than in West Germany, where the work could be done more cheaply.

CONTINUED ON PAGE III

STATFJORD FIELD II

The first platform, the A structure, and Platform C, demonstrate the strength of the Norwegian offshore supplies industry

Rigours of the North Sea demand careful planning

TERRY WELBORN, 56, the Statfjord Project Manager, was born in Missouri, and grew up in the Midwest. He says he has a "major reason why he now lives in the sea."

"Having been born in the middle of the U.S., I have come to realise that living by the sea is much more interesting," he said.

It is also more challenging, especially if you are appointed to one of the biggest oil companies in the world—to manage the biggest single project in the history of development programmes.

Mr Welborn makes no pretence at being a "workaholic." His experience as project manager on major oil refinery construction sites had taught him the importance of delegation, careful planning and effective monitoring of progress.

"In the North Sea the main

problem is maintaining the tempo of the job," he said. "Schedules can be particularly tight in the winter months. When you are working to a fine weather window of four months, there is always a danger of an eight months delay."

There was also the sheer logistical problem associated with a major project that involved hundreds of suppliers and tens of thousands of workers in many different countries.

In spite of the complexities of the project, construction of the C platform, though, was finished four months late because of... Norwegian companies received about 70 per cent of the orders — in gross value terms — placed for the first Statfjord platform, the A structure. In net terms, Norwegian companies were responsible for 62

per cent of the contract values. (Some of the Norwegian orders were handled by overseas subcontractors).

The C platform, now under construction, has an even bigger Norwegian work content: about 75 per cent of the value in gross terms and about 70 per cent net.

The Statfjord development demonstrates the strength and scope of the Norwegian offshore supplies industry. In mid-1973 there were about 6,500 people in Norway employed in oil-related activities. The present number is nearer 40,000.

Main contractor

Mobil employed two overseas companies to oversee the project services on the Statfjord A platform. Matthew Hall of the UK was the main engineering contractor while the U.S.-based Brown and Root, provided project services for the

important offshore construction work. The A platform was constructed in a different way from B and C in that the deck assembly work was carried out onshore.

But if overseas companies played the key roles in the construction of Statfjord A, Norwegian groups provided most of the materials. Norwegian Contractors and Aker Contracting were involved in outfitting the deck was constructed by other Norwegian concern, Stord Verft.

Norwegian groups were also heavily involved in fabricating the modular units fitted on the deck. They included Leirvik Sveals, which built the living quarters, Kvaerner Brug, Kvaerner/Sterkoder, Bomek and Vigor.

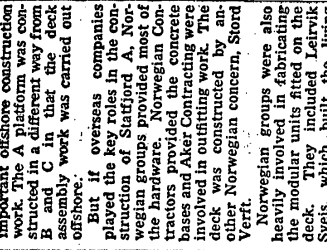
French module fabricating companies were also prominent, including CFEM of Le Havre, Constructions Navales et Industrielles de la Mediterranee, and Constructions Metalliques de Provence.

The Dutch group Rijn-Shelde-Vermole was also involved in the module building programme.

The offshore loading unit was designed and built by Equipement Metallique Hydraulique with Kvaerner in association with Brown and Root and Aker formed a joint-venture organisation to undertake the important platform hook-up and commissioning work, while the lifting of equipment from barges to the platform deck was the combined effort of Brown and Root (U.S.), Heerema (Holland), Micoperi (Italy) and Sea Troll (Norway).

Production drilling on the Statfjord A platform was carried out by Loffland Brothers of the U.S. while the floating hotel Foly manner was provided by Einar Rasmussen of Norway.

The main companies involved in the construction of the B and C platforms are mentioned in the article below. But already a



fast army of workers, employed by hundreds of suppliers, are well along the road towards construction of the C platform. The base unit and deck are due to be mated in 1984 in time for the 650,000 tonnes assembly to be towed to the field that summer. Target date for the start of oil production from Statfjord C is December 1985.

As with the previous two platforms, two companies have been awarded the key contracts for project services: Norwegian Petroleum Consultants and the UK arm of the U.S. group Foster Wheeler.

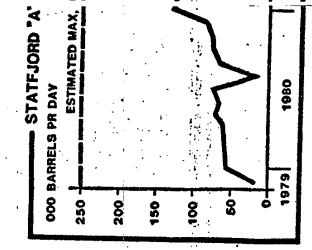
Deck

Similarly Norwegian Contractors have again been awarded the order for the concrete base of the platform. The Kvaerner/Rosenberg joint venture has been responsible for fitting out the base structure. Another Norwegian group, Moss Rosenberg Verft, was awarded the contract for erecting and fitting out the deck.

But two overseas companies — Howaldswerke of West Germany and McDermott of the UK — were chosen to build the deck trusses. In the same vein Fergal of Italy was chosen to undertake the pipe fabrication and Tri-Ocean of Canada is involved in the drilling engineering.

Work on the pre-assembled base and accommodation modules is also being undertaken by Hollandse Constructie Groep in Holland and Belleli in Italy. The nine groups of prefabricated modules are being built in four countries by: Belleli of Italy; Bomek, Vigor, Leirvik Sveals, Kvaerner/Moss Rosenberg and Oil Industry Services in Norway; William Press in the UK; and Mercon and Hollandse Constructie Groep in the Netherlands.

As with Statfjord B, Single Buoy Moorings of Switzerland is providing the offshore oil loading structure.



Birth of a platform

Above: the gravity base structure of Platform C taking shape at Hinna vagen, near Stavanger and (left) the structure afloat in Gandsfjord last May. The base section is due to be mated with the deck next year, then the entire 650,000 tonne structure will be towed out to the field

About 300 companies, and many subcontractors, have worked to create the giant platform

IT IS difficult to exaggerate the scale and complexity of the Statfjord B project. Rough estimates suggest that more than 40,000 people were involved at some point in providing goods and services for the platform.

The full extent of industry's involvement is impossible to quantify, however. Although about 300 companies were directly associated with the project, they in turn were supported by any army of subcontractors.

As Hakon Lavik, of Statoil's pointed out: "Those 40,000 exclude people who made off-the-shelf equipment, like bathroom mirrors and there are about 200 bathrooms on the platform." The main Nkr 1.5bn (\$206m) project services contract for this colossus was awarded jointly to Brown and Root of

the U.S. and Norwegian Petroleum Consultants. The two companies have provided the complete project management, engineering, procurement and construction management for the platform.

For NPC Statfjord B has been a launching pad for contracts in the North Sea and as wide afield as China, Senegal, Barbados, India and Peru for the company was created largely with the encouragement of the Statfjord partners—Statoil in particular—early in 1977. NPC, formed by 10 leading Norwegian engineering companies, epitomises the growth of Norway's own offshore services industry.

NPC points out that whereas Norwegian-based products accounted for only about a quarter of the work on the early Ekofisk oil and gas field, they represent well over 60 per cent of the orders placed for the Statfjord B and C platform.

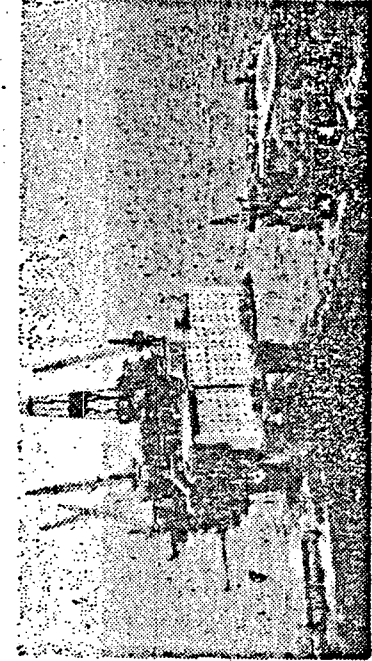
According to Statoil, 81 per cent of the Statfjord B orders (in terms of monetary value) were placed with Norwegian companies although some of the work was sub-contracted to overseas manufacturers. In net terms, Norway probably filled about three-quarters of the Statfjord B order book.

Concrete base

The biggest single item—the concrete gravity base constructed in Norway under a Nkr 900m (\$124m) contract won by the Norwegian Contractors group. This group comprises F. Selmer, Hoyer-Elletsen and Thord Furuholmen, three construction companies which joined forces to build the Ekofisk storage tank.

The mechanical outfitting of the platform's concrete structure was undertaken by Moss Rosenberg of Stavanger under a Nkr 700m (\$96m) contract. The same company was originally worth about Nkr 1.4bn but because of design changes and the late arrival of some of the pre-assembled equipment modules the final bill was nearer Nkr 2.5bn.

The steel deck itself comprises two main decks and a third, smaller deck slightly higher. The two identical main deck frames were built by Kvaerner Brug, of Egersund, and Fredrikstad Mekaniske



General view of Statfjord B. Three-quarters of the orders, in monetary terms, were placed with Norwegian companies.

STATFJORD FIELD PLATFORMS

GRAVITY BASE	'A'	'B'	'C'
Base area (sq metres)	7,900	18,200	13,000
Weight:			
Dry (tonnes)	600,000	735,000	643,700
Submerged (tonnes)	240,000	320,000	390,000
Crude storage (m barrels)	1.3	1.9	1.9
DECK			
Deck levels	3	2	2
Cellar deck areas (sq metres)	5,360	6,270	6,270
Deck operating areas (sq metres)	21,000	28,900	28,900
Weight—towout (tonnes)	19,500	39,800	41,500
Weight—operating (tonnes)	48,000	50,100	52,000
OPERATING DATA—NOMINAL			
Process design barrels of oil per day	300,000	180,000	210,000
Water injection barrels/day	340,000	272,000	296,000
Living quarters accommodation	200	200	278
Well slots number	42	42	42
Rigs number	1	1	1
Main power generation MW	57	38	38

Verkedet at a total cost of Nkr150m. A UK group—CJB/Earl & Wright—designed the deck and conducted strength checks.

The vast production and accommodation complex squeezed on to the deck were constructed in 10 "packages" comprising a total of 29 pre-fabricated modules.

The Aker Group was among those heavily involved in this module-building programme, constructing units at four Norwegian yards—Verdal, Trondheim, Arendal and Stord. Other companies involved in module building included: Bodo Mekaniske in Bodo, Norway; Constructions Navales et Industrielles de la Mediterranee in the South of France; Constructions Metalliques de Provence, also of France; Fredrikstad Mekaniske in Eastern Norway; the Kvaerner

Thyssen Industries, with four German sub-contractors; Blohm and Voss, Thyssen Nordsee-werke, Maschinenfabrik Augsburg-Nürnberg (MAN), and Howaldtswerke. The unit was delivered to Norway in three pieces and assembled by Offshore Repair and Maintenance (part of Leirvik Sveis) using Howard Doris's big Togmor crane barge.

It was the first contract undertaken by Togmor which was later to become more popularly known for its work on the raising of the Mary Rose wreck from the bed of the English Channel.

Hook-up

A bigger lifting operation—part of a Nkr 500m contract—was associated with the positioning of modules on the platform deck. The lifting and fitting together of the pieces ("hook-up" in oil industry parlance) was undertaken by a Norwegian/Dutch joint venture, Haugesund/de Groot with all the major lifts being done by another Norwegian/Dutch venture, Heerema Seaway using the barges Balder and Hermod.

The completed platform is one of the most sophisticated structures ever to be positioned offshore. The whole computer-based control, information and environmental system was designed, manufactured and installed by yet another joint venture: Kongsberg Vapenfabrik of Norway and Siemens of West Germany.

It is a measure of the complexity of the platform's facilities that when a UK company Armstrong World Industries of Uxbridge, Middlesex, came to insulate the air conditioning, heating and plumbing pipe lines it found it had to cover nearly 10 miles of piping.

Virtually everything about Statfjord B comes jumbo-sized. The 245,000 tonnes of sand and gravel and 56,000 tonnes of cement used in the platform's construction would have been sufficient to make about 5,400 apartments to accommodate 20,000 people. The 31,500 tonnes of steel used for reinforcing the concrete, could have provided several more Eiffel Towers.

Contract prices were provided by Statoil and recalculated at the following conversion rates: Nkr 7.21 = \$1; Nkr 12.1 = £1.

STATFJORD FIELD III

Much of the gas will be used as fuel on the production platforms, but selling the rest could create a new spirit of cooperation

Options for exploiting big gas reserves yet to be agreed

A TEMPORARY brake is being applied to the oil production from the Statfjord B platform. The Norwegian partners in Statfjord have decided to transport their share to West Germany by coasting—significantly higher, but it would mean flaring—and wasting a large amount of natural gas produced in association with the oil. And the Statfjord gas only 1.2m cubic metres a day from the platform.

If all goes well, the Mobilised oil consortium will be able to begin re-injecting gas into the reservoir sometime in January. Later the gas will be produced and carried away through one or two new pipelines.

There is a great deal of gas in Statfjord. Estimated recoverable reserves are without doubt in excess of 100bn cubic metres. However, much of this gas will be used as fuel on the production platforms and as an input to the recovery of crude oil or flared into the atmosphere. Consequently, it is expected that 70bn-80bn cubic metres will be available for sale.

The Norwegian Petroleum Directorate has been more cautious in its estimates, describing 40bn cubic metres of recoverable reserves. The field is being developed by a consortium of British, Norwegian and Dutch companies. The UK share is 33 per cent, the Norwegian 45 per cent and the Dutch 22 per cent.

The UK option would be expensive given that the oil is being produced at a rate of about 600 cu ft a day (17m cu metres a day). As a yardstick, British Gas currently sells on average 4.5bn cu ft a day and expects demand to rise to about 6bn cu ft a day by the mid-1980s. British Gas has always had an aggressive pricing policy, borne out of its monopoly right to acquire UK gas, and as a result the Statfjord partners are concerned that their sales to the UK will be lower than their Norwegian counterparts.

According to stockbrokers Wood, Mackenzie, Continental buyers will pay about \$5.50 per thousand cubic feet (in mid-1980 prices) for gas from the Norwegian portion of Statfjord. The price is linked to crude and fuel oil prices. But British Gas has been paying nothing like this price for its supplies.

However, gas producers have been told by British Gas that its pricing philosophy is changing. In 1980s and 1990s to meet increasing demand and to offset exploring contracts. Its more competitive stance could help to create a new spirit of co-operation in the North Sea, one in which Norwegian producers might be more inclined to sell gas to the UK.

In a sense Norway has become embarrassed by its gas riches. Companies have been finding natural gas faster than they have been discovering crude oil. (Petroleum Advertising in Norway 1982) shows that gas currently accounts for about 75 per cent of Norway's confirmed recoverable petroleum reserves. In terms of developed reserves still to be developed the share is nearer 90 per cent.

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Key development in North Sea

CONTINUED FROM PAGE 1

that they hope to place over 70 per cent of the development work with UK companies. North Alwyn is one of the very few field developments projects to emerge in recent years. So eager was the Government to see it progress that it recently sanctioned the whole £120m development only days after the application was submitted and Elf is taking a total of £100m at a time of oil price uncertainty. They have emphasised in talks with the Government that they are able to make a sound economic case for the development only if so, if the present high rate of oil production is to be maintained into the next century. So far, the companies and the Treasury have been unable to agree on a tax structure that would provide the Government with a fair share of the field's wealth while giving an incentive for the exploitation of small, marginal fields.

A compromise has to be found if the North Sea is to be exploited to its full potential. For it is a sobering truism that it would take more than 50 marginal fields to replace the reserves now being exploited in Statfjord.

because of tax credits earned within the Frigg field. As a "one project, North Alwyn might have been left undeveloped, classified as an economically marginal field. And there is the rub. Oil companies on both sides of the median line complain that the taxation terms in all prices are making it uneconomic to develop small and medium-sized fields. The problem is particularly acute in the UK sector, where a large number of small fields will have to be developed in the next ten years or so, if the present high rate

NORWEGIAN OIL AND GAS RESERVES

(Confirmed remaining recoverable reserves)

	Oil (m tons)	Gas (bn m ³)	Total (m tons oil equivalent)
Ekofisk area	115	167	282
Frigg (Norway)	—	92	92
Statfjord (Norway)	276	40	316
Valhall	35	28	63
Murchison (Norway)	—	—	7
North-East Frigg	—	—	8
Odin	—	22	22
Block 34/10 Delta	19	32	35
Reserves under development...	594	409	1,003
Other recoverable reserves	233	2,172	2,405
TOTAL RECOVERABLE RESERVES	827	2,581	3,408

Note: 1,000 cubic metres of gas are approximately equal to one ton of oil equivalent in energy terms.

Source: Norwegian Petroleum Directorate and Bergen Bank.

The total amount of confirmed recoverable Norwegian gas is put at 2,581bn cubic metres, which can be conveniently converted to the energy equivalent of 2,581m tons of oil. That is enough gas to meet unaltered the whole of Western Europe's requirements for a full 14 years. It is certainly not a slight exaggeration to say that the UK's natural gas does not itself a user.

All told, Troll could contain between 1,200 bn and 1,600bn cubic metres (42,350bn-56,500bn cubic feet). These are astonishing quantities which could transform North Sea gas supplies.

But the gas prospects do not stop there. There is evidence of substantial gas reserves on blocks 30/2 (Statoil); 30/4 (British Petroleum); 30/7 (Norsk Hydro); 30/6 (the so-called Silver Block now called the Osberg Field); 34/10 (the Golden Block); 35/6, 35/8, 15/6 and 15/7 (the Steiner Field); 7/12 (the Ula Field); 30/10 and 25/1 (North East Frigg and Odin Fields).

These are in addition to the fields already on stream or close to production: Ekofisk, Frigg, Statfjord, Valhall, Murchison and Heimdal. This is an impressive collection of gas reservoirs.

And yet the Norwegian Government and the offshore industry are faced with a dilemma. How can they transport all of this gas to the main gas-consuming market in the heart of Europe?

Swatpipe will help, collecting perhaps one which caters for



Drilling on A platform. It is still not known whether the gas in the UK section of the field will be mixed with the Norwegian gas and put into the Statfjord system, or transported directly to Scotland.

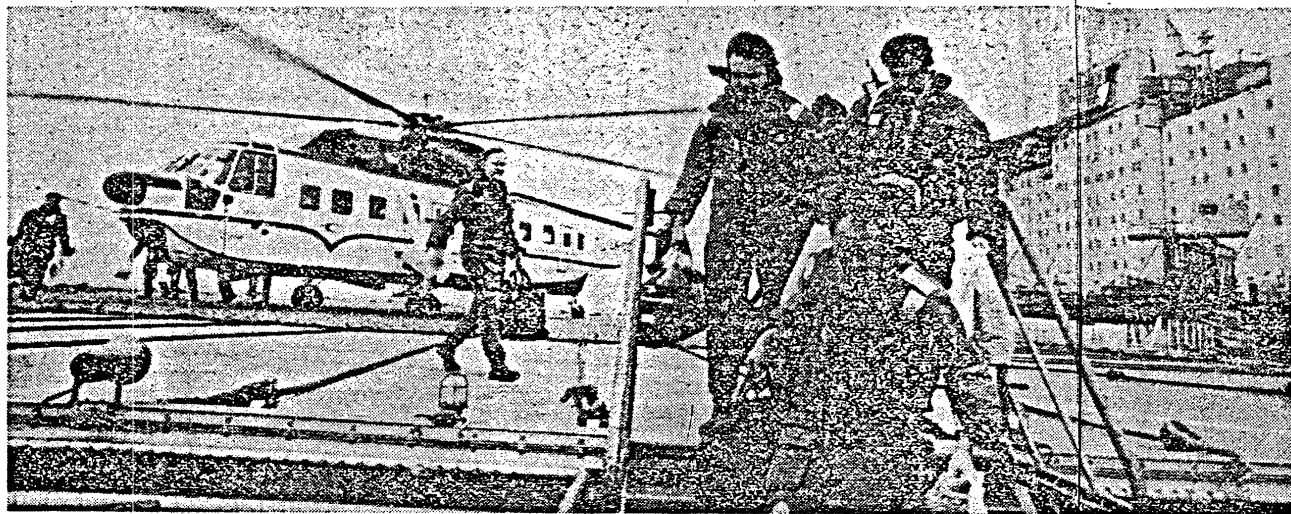
the output from Statfjord, Gullfaks and Heimdal. But the exports to both the UK and the Continent. It is not inconceivable, for example, that Troll gas could be exported in both directions—via the Frigg line to the UK and via the Statfjord-Frigg-St. Fergus pipeline to the UK. Together these pipelines give Norway the export capacity of between 200 and 300 million tonnes a year. It will need to be fully exploited if it is to be fully exploited.

A big question mark still hangs over the destination of higher gas. It could be carried in the Statfjord system but this may unbalance the whole of the Norwegian network. Statfjord is relatively southerly. If its significant output is routed via Statfjord then all the more northerly portions of the pipeline would have to remain under-used. It would make much more sense for the Stepper gas to be transported to the UK. This provides considerable advantages for negotiations. A solution now being considered, might be a deal involving both Statfjord and Stepper. Under this emerging arrangement the UK receives of Statfjord Gas would be fed into the northerly portion of Statfjord and about 1980—when British Gas will be badly needing fresh supplies—Statfjord gas would be routed to the UK.

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STATFJORD FIELD IV

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Oil workers arrive at Statfjord B. The 700 people working on the platform are shuffled backwards and forwards from Bergen by Norwegian helicopter operators. Their helicopters are able to land in all but the most severe weather

Offshore fields do not come bigger or more expensive than Statfjord Venture highlights economic risks

THE STATFJORD FIELD has been dubbed the biggest "marginal" discovery in the North Sea. For much of the development period analysts questioned whether its backers would reap a just financial reward for their enormous investment.

Development work was started in 1974, just after the four-fold increase in oil prices that followed the first major energy crisis. Statfjord probably would have been left untapped but for that sudden escalation in oil prices.

But as the 1970s progressed, and the real value of oil began to decline again, the project began to look more and more suspect as a profitable money-spinner.

Just as Mobil and its partners were preparing to start production from the first platform—in December 1979—another energy crisis emerged to give oil prices a further boost. Between 1978 and the end of 1980 the average price of oil produced by the Organisation of Petroleum Exporting Countries shot up from \$12.94 to about \$32 a barrel. Statfjord's economics were underpinned once more.

Now there are signs that oil prices are fading again. No one knows how low they will fall over the next few years. If some of the pessimistic forecasts emanating from the U.S. come true, and world oil prices do drop to about \$12-\$15 a barrel, then Statfjord would certainly become an economically marginal prospect.

It is estimated that it costs \$6-a-barrel just to produce the field's oil without making any allowance for servicing and repaying debt, paying taxes, and taking a profit.

Statfjord highlights the risks associated with a major project, with its long development lead



THE STATFJORD GROUP

NORWEGIAN SECTOR		UK SECTOR	
Company	%	Company	%
Statoil	42.0	Norske Shell	8.4
Mobil Exploration	12.6	Conoco Norway	8.4
Esso Exploration and Production Norway	8.4	Saga Petroleum	1.6
		Amerada Corporation of Norway	0.9
		Amoco Norway Oil	0.9
		Texas Eastern Norwegian	0.9
		Britoil	5.3
		Conoco North Sea	5.3
		Gulf Oil	2.7
		Gulf (UK) Offshore Invs.	2.7

time, in a rapidly changing economic environment.

And offshore fields do not come much bigger, or more expensive, than Statfjord. The total development cost is estimated to be about \$7bn although fluctuating exchange rates make it difficult to be precise. This sum includes the cost of three production platforms, about 90 production and injection wells, and the Statfjord group's 7 per cent share of the Statpipe gas transmission system.

For this prodigious investment the Statfjord partners expect to recover at least 3.3bn barrels of oil and 3,400bn cu ft of natural gas. This production will represent an oil recovery efficiency of about 51 per cent, compared with a worldwide average of about 30 per cent.

Statfjord's oil is contained in two different reservoir rocks, the Middle Jurassic Brent sandstone, containing nearly 4,950m barrels of oil, and the Lower Jurassic Statfjord sandstone, containing 1,420m barrels. The Mobil-led consortium can extract such a big proportion of this oil because of the high quality of the reservoir rocks. The oil itself is also attractive, being

light with little sulphur and no wax.

The field's potential became apparent on June 5 1974 when the discovery well, sunk in Norwegian block 33/9, tested high-quality oil of 38.5 degrees API at various rates, some over 10,000 barrels a day. The Statfjord A platform marks the spot where that discovery well was drilled.

Plugged

Across the median line in the UK sector, an exploration well had been drilled in block 211/24 a year earlier. But this was an unsuccessful venture and the well was plugged and abandoned. It transpired that the well had just missed the southern portion of the field which was successfully penetrated early in 1975. By this time the Norwegian interests in blocks 33/9 and 33/12 had already initiated a development plan.

Initially it was reckoned that the partners in the UK block 211/24 — Conoco, Gulf and British National Oil Corporation (now Britoil) — held a 11.1 per cent interest in the Stat-

fjord Field. But in October 1979, following further exploration and appraisal drilling, the UK partnership's share was increased to 15.9 per cent. The allocation of reserves may well be amended again, given fresh data from producing wells.

The \$1.4bn A platform, placed roughly in the centre of the field, began producing oil at the end of 1979 and by early this summer was yielding an average 250,000 barrels a day. The A structure has the largest production capacity of the three Statfjord platforms, capable of producing 300,000 b/d. Indeed, on August 17 this year the platform produced a record 309,650 b/d.

The \$1.9bn B platform, although larger than A, has only 180,000 b/d capacity due to Norwegian Government safety regulations. This structure was towed to its southerly position in the field on August 1981 and began production early in November — about a month ahead of the schedule set in autumn 1978.

Owing to gas-flaring restrictions, the platform has been yielding only 55,000 b/d but once the gas reinjection equipment is working, probably by

January, Mobil will be able to increase oil output towards the designed level of 180,000 b/d.

The \$2.4bn C platform, now under construction in Stavanger, Norway, is due to be towed to its position in the north of the field in 1984. Production should begin the following year.

Output from the C platform is due to reach a plateau of 210,000 b/d in 1987. By then the field as a whole should be producing oil at a rate of 550,000 b/d, more than three times Norway's daily consumption of oil products. (Peak output is expected to be between 550,000 b/d and 600,000 b/d.) Natural gas should also be flowing to the Continent via the Statpipe system.

No one can be sure how long Statfjord will be kept on stream. Companies involved in the project hope that eventually they might be able to extract more than 51 per cent of the oil that is there. Present estimates indicate that Statfjord production will end in about 2015.

The platforms have been designed so that they can be floated away from the field once the work has been completed. In many ways the removal of these huge, concrete gravity structures will be easier than the dismantling of more conventional steel platforms. But can we be sure of this? Will the platforms really be removed? These are questions which are being asked more frequently now that the North-Sea oil industry has reached maturity.

The answer was provided by a blunt Norwegian oilman, supervising work on Statfjord B: "It seems to me that it has never been a problem for one generation to destroy what another generation has built before."

Accommodation in the de luxe class

JORUND KARLSEN, service superintendent on Statfjord B, equates the platform's standards of comfort and catering to those of a three-star hotel. But when compared with other offshore oil installations, Statfjord B must be elevated to the de-luxe class.

The corridors in the 200-bed hotel unit provide the first impressions. They appear wider than usual and are pleasantly decorated with colourful prints. Offshore staff wear thin overshoes to protect the wall-to-wall carpeting from the grease and

grime of the platform's working areas.

The men and women on the platform sleep two to a room (equipped with all mod cons) whereas in other parts of the North Sea staff might expect to share a bedroom with three other people.

Facilities include a comfortable cinema where a different film is shown every day—and screened several times a day to accommodate those working different shifts. There is a library, a room for television and video shows, recreation room, a well-equipped keep fit gymnasium, and saunas.

A disco is held every fortnight on the floating hotel permanently moored alongside the platform. Although only alcohol-free beer is sold, it is easy to feel tipsy with the dance floor heaving in sympathy with North Sea waves.

The semi-submersible hotel is needed because there are currently 700 people working on Statfjord B, involved in commissioning work, drilling and the day-to-day running of the platform.

Shuttled

They are shuttled backwards and forwards from Bergen by Norwegian helicopter operators. Helicopter Service, which provides 12 return flights each day for the Statfjord A and B platforms. The helicopters are able to land in all but the most severe weather; indeed the major factor influencing flights is whether or not passengers are able to move safely across the exposed helicopter decks.

Catering and hotel services on Statfjord B are provided by Norske Chalk, the Norwegian branch of a French-owned British catering group. The company has a Nkr 50m-a-year catering budget for the 700 on board the platform and floating hotel—which works out at about Nkr 195 (\$27) per person each day.

Those working on Statfjord B eat well. Reindeer goulash and steak tartar are among the culinary delights on offer. Everyone on the platform

works the normal North Sea shift system of 12 hours on and 12 hours off. But leave entitlement on Statfjord B—and other Norwegian platforms—is more generous than the usual two weeks on/two weeks off system applied in other offshore areas. Statfjord staff have three weeks at home for every two weeks offshore. Under Norwegian law they are allowed to work a maximum of 1,733 hours a year on a continuous shift basis.

The standards and conditions affecting life on Statfjord B have been influenced by the Norwegian Petroleum Directorate, by the three main unions which represent offshore workers—NOPEF, Norsk Olje- og Gassmedarbeiderforbund, and OFS—and by Norway's long seafaring tradition.

The Norwegians have always insisted on high standards in their ships. And they have taken it for granted that women have a natural right to work offshore. On Statfjord B there are about 50 women employed in a wide variety of jobs, ranging from mud-logging, technicians, secretaries and dispatchers to hotel service assistants.

Miss Solveig Jensen, a 35-year-old secretary, says that life is not that much different from working on-shore. She dismissed claims that she earns 40 per cent more than she could on the mainland (although it is reckoned that some offshore workers are earnings this sort of bonus). She is more attracted by the work schedule. "You have a lot of time off and I like to travel," she said.

According to Mr Karlisen, in charge of the platform's services, women apply in their thousands for work offshore. "They are attracted by the prospect of steady work, by the good pay and the time off," he said.

He is pleased. For he has seen how women can improve the environment and instil a greater sense of cleanliness and tidiness among the men. On some all-male platforms and rigs, oilmen can often be seen sloping around unkempt, sometimes in just their underwear.

Not on Statfjord B, where the scent of aftershave wafts through the hotel corridors.

But is all this necessary? Some seasoned oilmen (and most seasoned men tend to be Americans) claim that the Statfjord B personnel are being pampered. No one associated with the project seemed able to say hand on heart, that productivity on the platform was higher than on other North Sea structures.

Acceptance

On the other hand there was an acceptance, particularly among overseas members of the Statfjord consortium, that when in Norway they should readily accept Norwegian standards and conditions.

Even so, senior oilmen are questioning how much further

the industry can progress in improving comfort and amenities for those stationed offshore. Within the industry it is estimated that on modern platforms only 15 per cent of the weight and cost of the structures can be ascribed to oil and gas production. The remaining 85 per cent is needed for support services.

The offshore oil and gas industry is still evolving. Perhaps companies with a long history of exploiting reserves on land have yet to fully appreciate that offshore work demands new economic criteria and fresh appreciation of needs in an isolated and often harsh environment. Perhaps one day the standards on Statfjord B will be accepted as the norm for the whole offshore industry.

FT Energy File— Surveys in 1983

A FULL programme of surveys covering all the main developments taking place on the international energy scene will appear in the FT in 1983.

Early in the New Year in a survey on COAL TECHNOLOGY, FT writers will focus on the new methods developed over recent years for the extraction and processing of coal, and on the techniques being used to make it a more manageable fuel for industrial use, enhancing the economic advantage it already holds over its main rival, oil.

In late spring, trends in offshore technology will be examined in a survey on OIL EXPLORATION AND PRODUCTION. In a separate survey later, on REFINING AND MARKETING, the way in which the major oil companies have adapted to changes in the marketplace will be analysed, giving special attention to the extensive programme of refinery upgrading taking place in the UK and elsewhere.

In August, to coincide with the 11th World Petroleum Congress in London, the FT will publish its annual WORLD OIL survey, to be followed in the autumn by further surveys on developments in the INTERNATIONAL GAS INDUSTRY AND INTERNATIONAL NUCLEAR INDUSTRY. A guide to latest practices and developments in fuel saving will appear in a survey on ENERGY MANAGEMENT, also in the autumn.

During the year too, there will be a number of other surveys tied to the opening of new oil fields in the North Sea and elsewhere and to developments in other energy sectors.

Jim Gafken supervised the start up of operations on Statfjord B. He talks about his work

Top troubleshooter at home in North Sea

JIM GAFKEN has a reputation for being one of the top troubleshooters in the oil business. It has been his lot to supervise the start-up operations on Statfjord B. He did the same on the Statfjord A platform and on Mobil's Beryl Field in the UK sector of the North Sea.

It is a job that has taken him to the four corners of the world and to many of the oil industry's biggest and most complicated projects.

"But in all my 28 years in this industry I have never been on anything like this," he explained, surveying the operations and living quarters on Statfjord B. The standards adopted for the platform illustrated the way in which the offshore industry was progressing. And yet, he said, he had no doubt that in 20 years' time Statfjord B would look old-fashioned.

Not one for hyperbole, Mr Gafken is nevertheless impressed with the way the North Sea oil industry has grown over the past decade. "It is getting quite crowded out here. On a clear day you can see rigs and platforms on the Brent, Dumlin, Murchison, Thistle, Ninian, Cormorant, Magnus and Heather fields.

"The pioneering spirit has gone. On the other hand, a tremendous support industry has been established on both sides of the median line. From the support standpoint, it is as good here as in the Gulf of Mexico."

Aged 48, Mr Gafken was born in West Virginia. His



Jim Gafken: impressed with North Sea oil industry growth over past decade

home is still in the U.S. although, as he says: "I live in airplanes, bouncing back and forth between operations."

Oilmen love to talk of the "learning curve," the acquisition of knowledge and experience. And Statfjord provides an example of such progress.

Team

Mr Gafken recalls that when Statfjord A was commissioned Mobil, as operator, flew a team of ten of its top

men from the U.S. "The medical department must have had a fit. Most of them were over 50."

The commissioning of Statfjord B needed no such assistance. It was done with the local development team, most of them Norwegian. The operation went so smoothly that oil was flowing within 12 minutes of the Government's formal production approval.

Careful planning is all important, he said. "When you are offshore it is a logistics game. You have a lot of advance planning. You need to know what you need and when you need it."

"You have to do forward planning to handle 99 per cent of the problems. But there is a danger of over-planning and preparing for things which may not happen."

"We had our problems and teething troubles. When you have items of machinery that go up and down or round and round, you always have the potential for failure. But on the whole the start-up has gone smoothly. One of our biggest technical problems has been re-injecting gas into the reservoir."

Now Mr Gafken is preparing to work on the commissioning of the Statfjord C platform. In the interim he will fly in and out of a variety of countries, looking at projects needing the attention of Mobil's Senior Consultant Engineer for Production Services. "As you can see, we are big on titles."