ACCELERATING DELIVERY OF A COMPLEX FESTOON SYSTEM ALONG THE SOUTHERN COASTLINE OF NORWAY

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Abstract: Securing permits for the installation of a festoon submarine cable system spanning 750 kilometers along the southern coastline of Norway presented a highly complex challenge. The route intersected 6 government authorities, 5 counties, 21 municipalities, 5 national parks, 6 archaeologically or environmentally sensitive sites, and 135 third-party submarine infrastructure crossings. Despite the regulatory complexity, Tampnet successfully completed the permitting, design, and installation of the NORFEST system within 18 months. This paper outlines the strategies and methodologies employed to achieve this, including stakeholder engagement, risk mitigation, route optimization, and environmental considerations. It also presents key lessons learned and recommendations for future projects navigating similarly stringent regulatory landscapes.

1. INTRODUCTION

Tampnet has been designing, installing, and operating subsea fibre optic infrastructure in the North Sea for over 25 years. To support continued growth and ensure long-term network resilience, a new high-capacity backhaul route was required between key nodes in Tampnet's existing infrastructure and to interconnect with recently built international routes. After an extensive technical and commercial evaluation, a subsea route was selected as the preferred option due to its inherent reliability, physical protection advantages, and overall design flexibility compared to terrestrial alternatives.

From Business Case approval to live traffic transmission, the NORFEST project was executed within 18 months—making it one of Tampnet's most efficiently delivered infrastructure deployments to date. This paper presents a case study of the permitting and approvals process, which was both ambitious in scope and executed on a compressed timeline.

2. DESIGN

Given Norway's challenging topography—characterized by fjords, mountainous terrain, and severe winter conditions—achieving geographical and network diversity with terrestrial routes was not feasible without compromising resiliency or cost-efficiency. Furthermore, Tampnet's operational experience over eight years with third-party terrestrial paths revealed an incidence of faults, delays in restoration, and seasonal accessibility issues that was higher than the company's own 4,000 km of subsea infrastructure in the region.

The NORFEST cable was designed to largely remain within the 12-nautical-mile territorial boundary, thereby benefitting from the protective oversight of the Norwegian Coast Guard. Its alignment through the Norwegian Trench, with water depths of 300–600 meters, provided additional shielding from anthropogenic threats such as anchor strikes and fishing activity. Existing survey and soil data investigation showed that the selected route had predominantly very soft clay and some areas with bedrock, soil conditions well suited for this type of installation and allowing a dynamic installation strategy using a Capjet and, enabling real-time avoidance of high-risk areas. The benefit of this ability to micro-route through challenging sections of the route significantly increased the probability of a achieving the target of 100% burial of the cable, avoiding any remedial work such as rockdumping. Horizontal directional drilling (HDD) was used at landfall points requiring heightened environmental sensitivity or added protection. Preliminary burial depth target was 1 metre, ultimately an average of 1.5 metre was achieved along the entire route.

The sections that follow delve into the permitting process in detail, highlight project execution milestones, and explore the critical factors that contributed to the success of the NORFEST deployment.

Figure 1: Burial depths along the Norfest cable system [features not to scale].

3. PARTNER SELECTION

Tampnet made the decision at an early stage to use local/regional partners for this project with extensive territorial experience as well as the ability to engage in face-to-face meetings with local authorities and explain the justifications and impact of the system rather than relying on planning documents to stand on their own. This method of "extreme engagement" paid dividends even allowing for an additional landing of the cable to be added to the programme at a very late stage.

The relationships that Tampnet have nurtured as an operator with a significant presence in the North Sea were supplemented by JTD Associates for permitting support. In addition to JTD our approach included deep research of existing survey data from government sources as well as other surveys performed along the route. This open-access approach to relevant information enabled us to limit the survey needs significantly. Our installation partner Cecon Contracting played an important role in this work and were able to both investigate, analyse and acquire relevant survey data.

Unlike other jurisdictions Norwegian approvals are largely issued at a local level and rarely appealed for non-controversial projects. The key factor was submitting with adequate time, sharing the rationale and societal impact of the system and following up with sufficient insistence in person. Anticipating the questions and follow-up requests that could delay approvals was a priority during the preparation of the initial application and in many cases no supplementary information was required.

Organisation	Requirement	Responsible party	Approval status
National Authorities			
Kystverket	Permission required	Cecon	
Forsvaret	Notification	Kystverket	
Miljødirektorat	Notification	Kystverket	
NKOM	Registration	Tampnet	
NVE	Notification	Cecon	
Nærings- og Fiskeri departementet	Not known. Discuss with Kystverket	Cecon	
Fisheries			
Fiskeridirektorat	Notification	Cecon	
Fiskarlaget Vest	Consultation & Agreement	Cecon	
Fiskarlaget Sør	Consultation & Agreement	Cecon	
National parks, protected & sensitive areas, archeology			
Ytre Hvaler Nasjonalpark	Dispensation required	Cecon	
Færder Nasjonalpark			
Raet Nasjonalpark	Permission required	Cecon	
Norsk maritimt museum	Notification	Cecon	
Stavanger maritime museum	Notification	Cecon	
Fylke (County) administrations			
Statsforvalter Oslo & Viken	Notification	Cecon	
Statsforvalter Vestfold & Telemark	Notification	Cecon	
Statsforvalter Agder	Notification	Cecon	
Statsforvalter Rogaland	Notification	Cecon	
Local Government Municipalities			
Oslo Kommune	Construction permission	Cecon	
Bærum Kommune	Notification	Cecon	
Nesodden Kommune	Notification	Cecon	
Asker Kommune	Notification	Cecon	
Frogn Kommune	Notification	Cecon	
Vestby Kommune	Notification	Cecon	
Moss Kommune	Construction permission	Cecon	
Horten Kommune	Notification	Cecon	
Tønsberg Kommune	Notification	Cecon	
Råde Kommune	Notification	Cecon	
Fredrikstad Kommune	Notification	Cecon	
Hvaler Kommune	Notification	Cecon	
Færder Kommune			
Larvik Kommune	Construction permission	Cecon	
Arendal Kommune	Construction permission	Cecon	
Kristiansand Kommune	Construction permission	Cecon	
Farsund Kommune	Construction permission	Cecon	
Eigersund Kommune	Construction permission	Cecon	
Kvitsøy Kommune	Notification	Cecon	
Stavanger Kommune	Construction permission	Cecon	

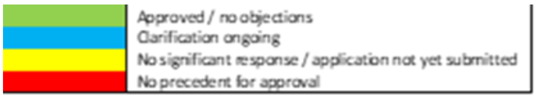

Figure 2: Simplified approval matrix the way it looked 12 months before RFS

4. HANDLING ENVIRONMENTAL QUESTIONS ON LAY TECHNIQUE

Because of the suitability of the terrain in the Norwegian trench but also to minimize the impact to other seabed assets (or asset owners). NORFEST was installed using the Capjet System, which not only controlled stress on the cable during installation but also allowed for less interruption to seabed ecosystem. These techniques enhance cable longevity and reliability by minimizing physical strain, which was critical for maintaining performance over the expected 25+ years of operational life of the system.

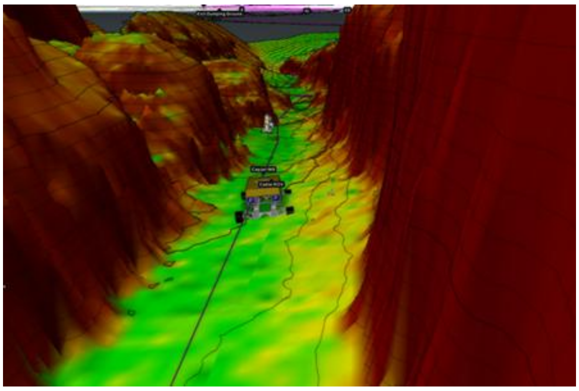
Figure 3: Capjet microrouting

The method also allows laying and protecting in the same run, unlike traditional trenching methods where a trenching ROV does its burial run after the cable is initially surface laid. Micro-routing, a real-time routing technique made possible by state-of-the-art installation equipment, allowed Tampnet to sensitively navigate around potential high-risk zones in real-time during laying, ensuring that the NORFEST cable avoids freespans and hazardous areas. This strategic route selection was made possible by installation equipment that introduced enhanced cable lay precision that further reduces the risk of accidental cable disturbances. The choice of methodology and precision of routing and burial was a contributing factor when negotiating permits through sensitive parts of the route.


Figure 4: Bottom trawling (blue) along the Norfest route (green) from Jan-Nov 2024

Designs G96/G144 — ø5.6 — SA3.6 / DA3.6 3.6	Nominal Thickness [mm]	Nominal Outer Diameter [mm]
Cable Core G96 and G444		
Optical fibres, single mode, 9or14off	0.25	5.6
Stainless steel tube, filled with water-blocking and hydrogen absorbing compound		
Copper conductor forelectroding	0.3	
Polyethylene insulation	3.6	10
SA3.6 Armouring:		
Galvanised steel wires (11off)		
Interstices filled with bitumen.Tape	3.6	17.8
Outer protection, PP-yarn	—	
DA3.6 3.6 Armouring: (11 off)		
Galvanised steel wires (11off)Tape	3.6	25.4
Outer protection, PP-yarn	—	30

Table 1. FO cable physical characteristics (typical)

4.1. Burial Depth

In the North Sea, cables are typically installed in water depths ranging from 0 to 5-600 meters and burial depth is normally targeted at 1 meter. This is considered sufficient for avoiding damage from repeated use of fishing equipment in this region. The recommended burial depth for protection against anchors is based on the frequency of shipping, water depth, seabed geology and anchor fluke penetration, however.

- 95% of the route for the main trunk was in a water depth deeper than 60m, thus the threat for anchoring was low.
- 91% of the route for the branches was in a water depth deeper than 60m, thus the threat for anchoring was low.

4.2. Consideration for a less intrusive burial method

Horizontal Directional Drilling (HDD) landfalls were chosen for certain NORFEST landings where a straight-in protected cable landing was not possible, ensuring the cable was safely brought to shore with minimal environmental impact. This process protects the cable during shore crossing, reduces the risk of damage in shallow waters, and preserves the integrity of the shoreline. Further securing this infrastructure, Tampnet's hut design for NORFEST houses essential electronics and provides reliable power, creating a stable and monitored environment that strengthens the overall security and uptime of the network.

Figure 5: Tampnet Equipment Hut along NORFEST system.

4.3. Benefits of a Near Shore System

The nearshore Norwegian Trench offered:

- Natural protection from human interference
- Regulatory simplicity within national waters
- Close proximity to shore-based PoPs and amplifier locations

This configuration combined the best of terrestrial and subsea terrestrial spans for electronics, and a deeply buried, low-maintenance subsea backbone.

4.4. Urban Challenges

An Oslo landing was initially planned for outside the city but extended to a central location after the permitting process had commenced. A decision that the benefits of a diverse route into the city outweighed the challenges of installing a cable through a busy harbour and under the main train station and connectivity hub in the country. Permitting the route was more complex than any other city and required the approval of a greater number of grantors (including ferry providers and defence forces) than any other landing but the stakeholder engagement approach that had already been established at other locations approval turnaround was quick enough to allow us include this segment in the initial campaign.

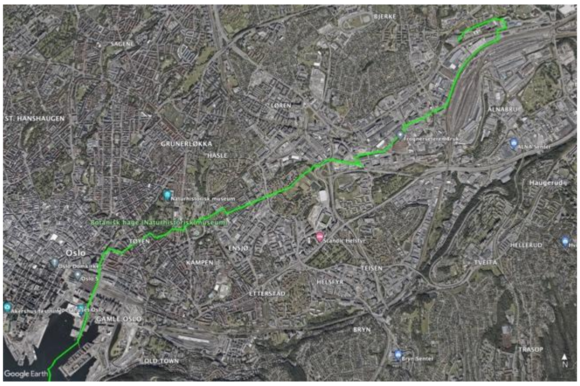

Figure 6: Routing through busy port & urban areas

Figure 7: Surveying under Oslo main station for the transition to river deployment

5. IMPACT OF CAMPAIGN SEQUENCE ON PERMITTING

In order to mitigate the effects of the seasons and minimise the risk of any weather downtime a decision was made at an early stage to split the campaign into two discrete sections. This had the additional benefit of avoiding activity during the tourist season along what is known as the Norwegian Riviera and demonstrated a sensitivity to the local grantors that the project would not adversely impact the summer experience of residents or visitors alike.

6. CABLE INSTALLATION AND CONFIGURATION

Tampnet had a unique advantage: as the owner of operational cables along the route it could monitor the effect of NORFEST's installation on its existing infrastructure using fibre sensing technology. This provided real-time data demonstrating that the installation posed no threat to operational systems.

This capability:

- Reduced the need for third-party validation
- Increased confidence in permitting discussions
- Accelerated approval of third-party infrastructure crossings

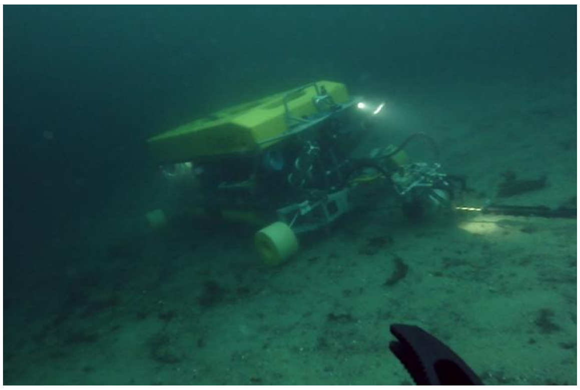

Figure 8: Trenching over operational Tampnet cable during NORFEST installation

7. EXPERIENCE FROM 25 YEARS IN THE NORTH SEA

Drawing from 25 years of North Sea operations, Tampnet brought proven insights into NORFEST's design:

- Inclusion of Branching Units (BUs) enabled future landings to be added with minimal disruption. One such landing was added mid-project without impacting RFS, another was pre-installed along the route.
- The festoon design offers high resilience and modular growth potential.
- Long-term performance data shows limited degradation after 25+ years for Tampnet's seabed-buried cables.

Based on previous research and evaluation from the cable manufacturer NORFEST is expected to remain in service for 50 years. [1]

8. CONCLUSION

The NORFEST project demonstrates that even in highly regulated and environmentally sensitive regions, submarine infrastructure can be permitted and delivered on aggressive timelines—if approached strategically and with a partner mindset to approvals as a key element in the project plan.

The key enablers were:

- Early alignment with local authorities through in-person engagement
- Selection of low-impact and adaptive installation methods
- Use of real-time data and environmental foresight to reduce regulatory friction
- Strategic use of existing relationships and operational history to accelerate trust

Perhaps most critically, Tampnet's commitment to collaborative permitting—viewing authorities not as obstacles but as stakeholders—transformed a fragmented regulatory landscape into a coordinated process. The lessons from NORFEST can be readily applied to future subsea infrastructure deployments worldwide, where permitting speed is increasingly a competitive differentiator.

9. REFERENCES

[1] SUSTAINABILITY OF SUBSEA OPTIC FIBRE CABLES
IN THE NORTH SEA
Rolf Bøe, Jagoda Zajic, Steinar Bjørnstad, Anders Tysdal,

