NorTex Petroleum Cluster

An Industry/Academic Partnership to Develop the Energy Professionals of the Future

Chapter Outline

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THE MOTIVATION

Norway is a resource-rich country where the vast majority of their energy comes from hydroelectric power. In 2012, Norway was the third largest natural gas exporter and the ninth largest exporter of crude oil globally.\(^1\) Its interest in the current and future dynamics of the energy industry is significant.

For those involved directly in the energy industry (including energy-related academics) it is clear that a new energy mix is emerging and the energy landscape is changing fast. This is having a significant impact today on the economy in Norway. Energy exports have historically been a critical part of Norway’s economy. Until recently, the country expected to continue to export oil and gas to the USA but because of developments within the last 6–8 years in the production of oil and gas from shale, US imports of hydrocarbons from Norway have diminished.

It is vital that the knowledge base in Norway is broad enough to allow for an informed exploration of every aspect of the energy industry so that the economic future for the country is safeguarded regardless of changes to the energy

landscape. For this to happen, students currently studying and researching various aspects of the industry need to be equipped to take the right decisions within the industry, they need to understand all aspects of the energy mix globally and their knowledge must extend beyond the fossil fuels that have historically been the mainstay of the industry in Norway. The energy professionals of the future need to understand renewables, shale and unconventional energy sources and should be at the forefront of research and thinking in relation to the future of the energy business. This will place Norway in a strong position to build on the existing energy skills base it enjoys.

Meeting this challenge in Norway required an improvement in the communication and collaboration between industry and academia. By forging partnerships between international institutions and companies at the forefront of energy production and research, students would be able to develop a deep understanding of global energy trends as well as understanding local issues relating to the changing energy mix. In this way, the talent pipeline would be nurtured and populated with young people who were able to grasp future energy challenges and become the next generation of energy professionals.

The only way to achieve these objectives was to broaden the circle of experience, expertise and knowledge for those currently engaged in energy education at postgraduate level. By putting current industry challenges in front of these students and engaging people from industry as teachers—and by building international academic alliances—the experience would transform the knowledge, understanding and competence of the next generation of energy professionals and academics and create a breeding ground for new research, ideas and solutions to the energy challenges we all face.

A further dynamic informed this context. The demand for talent within the energy industry meant that many of those studying energy-related courses would leave relatively early in their education journey as energy companies were able to offer candidates well-paid positions within the industry. To build the knowledge and research base for the sector, a country needs a critical mass of students who will complete studies to PhD level. If a student can spend 3 years earning good money rather than writing a thesis, it can be difficult for academia to compete. One way of addressing this is to incentivise students to continue their studies by making the experience more dynamic, offering students the chance for international exchange and demonstrating to them the quality and relevance of their studies. This was another driver behind the development of the NorTex initiative.

THE CONTEXT

The idea of establishing an industry/academic collaboration between Norway and Texas focused on energy relates back to the Transatlantic Science Week 2012, which was held in Houston, when approximately 200 Norwegian academics came to Texas to meet with American counterparts to enhance transat-
Atlantic cooperation in research, innovation and higher education. The Norwegian delegation included rectors from five major universities: University of Oslo, University of Bergen, University of Stavanger, University of Tromsø and The Norwegian University of Science and Technology (NTNU) in Trondheim. Their participation was driven by a desire to identify common interests and explore academic collaborations.

University of Bergen. Photo: Marianne Røsvik; Copyright: University of Bergen.

Prof George Hirasaki, Dept. of Chemical and Biomolecular Engineering, Rice University, Texas, and Prof Arne Graue, Dept. of Physics and Technology, University of Bergen. Photo: Ingrid Opdal; Copyright: University of Bergen.
The relationship between Norway and Texas has both social and industrial roots. Houston—the largest city in the state of Texas—is considered Norway’s most important energy hub outside Norway. There are nearly 150 Norwegian companies operating in the Houston area with the majority playing a part in the energy and shipping sectors. Companies active here include Statoil, DNV, Aker Solutions, Kongsberg, Energy Ventures, DNB and NOV. As a consequence, Houston has become one of Norway’s most important economic areas, particularly in the energy sector. The growth of Norwegian business in Texas has driven significant migration over the years. It is estimated that between 8000 and 10,000 Norwegian expats currently live in the Greater Houston region, making it the largest Norwegian expat community outside Scandinavia. Houston, which is twinned with Stavanger, has become an important gateway for Norwegian businesses in the US.

Although Texas and Norway may seem very different, the economic and industrial context is remarkably similar. Both are experiencing economic growth at a time when neighbouring states are struggling. And both have seen huge value emerging from the oil, gas and shipping sectors. The evolution of the energy industry is also driving developments in associated sectors with Norwegian companies becoming active in Texas in the field of environmental technology.

The political and economic importance of Texas from a Norwegian perspective is reflected in the fact that there has been significant diplomatic activity over recent years in support of partnership and collaboration. This has involved the visit of Norwegian parliamentary delegations, Ministers of Health and Care Services, Ministers of Education and Research and the Minister of Petroleum and Energy. The University of Austin is a recipient of Statoil’s investment programme in academia with the Norwegian energy giant providing the University with US$1 million dollars a year for 5 years to fund the promotion of research.

As a consequence of the increased presence of Norwegian companies and the cultural and economic ties this has generated between Norway and Texas, the concept of collaboration and partnership has gained traction and makes sense for both parties. It is within this context that the idea for NorTex was born.

The broader political agenda is also relevant here. The Norwegian government believes that knowledge institutions in Norway should play a role in helping address the challenges faced by those beyond their shores. This will be achieved, in part, through understanding and engaging with the realities of future energy consumption and exploring the relationship this has to climate concerns. Furthermore, the talent gap in developing economies—particularly those with hydrocarbon reserves—is growing rapidly as energy consumption

2. Connecting the North Star with the Lone Star: A Pilot Study proposing the launch of NorTex, Norwegian Consulate General, Houston.
3. Connecting the North Star with the Lone Star: A Pilot Study proposing the launch of NorTex, Norwegian Consulate General, Houston.
increases and long-term hydrocarbon reserves diminish. There is a global challenge to support the generation of new energy sources through education and research. This is particularly true for Africa where the majority of countries need to find ways of developing their own energy resources.

With the drive for establishing NorTex coming initially from the Norwegian Consulate General based in Houston, it is clear that the political will to support this type of collaboration was strong and was critical in making NorTex a reality. Finding a way of building national energy knowledge and capacity through education and research has steadily risen up the political agenda. NorTex is a reflection of this.

THE SOLUTION

The NorTex Petroleum Cluster was established in 2013. The objectives of the Cluster are

- to initiate, strengthen and coordinate collaboration on petroleum-related education and research cooperation between Norway and Texas.
- to assist in facilitating industry funding for adjunct and chair positions at the collaborating universities.
- to create and maintain a PhD exchange programme between universities in Norway and Texas as a way of broadening the knowledge and experience of the next generation of energy professionals.

NorTex is a collaboration between three distinct groups:

A group of three universities in Norway:

- University of Bergen;
- Norwegian University of Science and Technology and
- University of Stavanger.

A group of four universities in Texas:

- Rice University;
- University of Houston;
- University of Texas at Austin and
- Texas A&M University

Two industry partners:

- Statoil and
- Schlumberger.

The idea to establish a petroleum cluster consisting of universities and the petroleum industry in Texas and in Norway was first proposed by Professor Arne Graue (Chairman of the Executive Board of the Petroleum Research School of Norway) during Transatlantic Science Week (TSW12) in 2012, in part as a response to the ideas for collaboration and partnership on petroleum-related research generated at that event.
The initial idea for NorTex revolved around a series of formalised relationships between different stakeholders. These included:

- a number of MoUs between universities in Texas and Norway;
- agreements between universities in Texas and the Petroleum Research School of Norway;
- several agreements detailing research collaborations between universities in Norway and universities in Texas and
- an agreement outlining Statoil’s support of the University of Texas at Austin.

These agreements drew, in part, on existing research collaborations between the University of Bergen, Rice University, Texas A&M and The University of Texas at Austin, which had, to that point, supported 15 individual exchange visits of researchers and students between the US and Norway. This collaboration had already proved of significant value to the partners involved, having been instrumental in developing a proposal for a CO₂ field pilot test for enhanced oil recovery onshore in Texas at significantly less cost than offshore in Norway. The results of this pilot were of great interest to oil companies in Norway and in Texas and the collaboration also identified several individual researchers in the US and in Norway who were keen to spend time in the counterpart country to facilitate joint research between the universities. As such, this proved to be the pilot for what later became NorTex, demonstrating both how a petroleum cluster could coordinate research activities between partners in Norway and Texas and proving that such collaboration could yield significant results for both the academic partners and the industry as a whole. The NorTex Petroleum Cluster could build on this idea and strengthen and expand educational and research collaboration between Norway and Texas.
The concept of the cluster was based around the complementarity of those involved. In this, the blend of partners was critical, as was the depth of their involvement. Industry expertise needed to be brought to the fore. To this end, Statoil was invited to provide the vice president for the Board. Schlumberger was also invited to be part of the Board. Alongside these core partners, other industry representatives were invited to take part on a more informal basis. In future, the ambition is to have industry people teaching at all participating universities. This way, they can expose students to current industry challenges. Although industry partners do have a role in the funding of the initiative, NorTex is not simply a mechanism for generating revenue from commercial partners to fund research—the purpose is to create an integrated forum so that those from industry can direct and guide researchers towards the areas that are of real need and concern.

The concept is also rooted in the varied context for the industry in both partner countries. By involving students in exchange programmes, they are able to draw on the experience and expertise in Norway (which is mostly offshore) and set that against the context in Texas, which is predominantly onshore.

Currently activities are focused on the exchange of PhD students between the two countries. In Norway, there is a pool of around 300 PhD students who are brought together under the umbrella of the Petroleum Research School of Norway.5

5. Figures provided by NorTex.
This is a collaboration between the principle higher education institutions in Norway who are involved in postgraduate petroleum-related scientific disciplines. The approach is to create coordinated, interdisciplinary collaborations between institutions and students, to coordinate lectures offered at different universities and provide intensive courses, seminars and conferences for all PhD students in Norway involved in research projects related to petroleum. The Petroleum Research School of Norway is also involved in establishing discussion groups and offers a meeting place for PhD students and their supervisors.

In Texas, there is estimated to be between 200 and 300 students at a similar stage of educational development (i.e. involved in PhD-level research within petroleum-related fields). NorTex is focused on finding ways to connect these PhD students with learning and research opportunities across the Atlantic and exploring collaboration on future research between Texas and Norway. Part of the challenge is to place these students with the right academic partner. The other challenge is to frame how industry partners can participate.

As the NorTex cluster develops—and new partners and collaborators come on board—the initiative is becoming a network of resources and expertise that combines and connects the best that the research base has to offer with industry thinking, experience and resources. This is a powerful environment within which students can learn and develop. The size of the network and the involvement of industry represent the real value—industry partners and collaborators can give students access to equipment and facilities that are simply not available within the academic world. In addition, students are given the opportunity to interact and work with individuals who have decades of industry experience. Students are also attracted by the opportunity to travel internationally and see a different culture. By making the experience of studying more appealing, participating institutions are increasing the number of home-grown students who are willing to continue their academic studies rather than leave for lucrative employment within the industry.

The NorTex model—in regard to the PhD student exchange programme—is to find oil companies who are willing to sponsor Norwegian students to go and study in the US. This gives the oil companies the opportunity to engage with these students and, so far, the feedback from the oil companies has been very positive.

The role of industry partners can vary according to the specific requirements of the institutions involved. Schlumberger offers significant contributions in kind and bring a great deal to the partnership:

- They are key members of the Advisory Board that influences NorTex strategy.
- They provide adjunct professors who co-teach topics with the university professors.

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6. Figures provided by NorTex.
They provide experts who deliver dedicated lectures on specific industry topics.
They have informed, upon invitation, the development of the curriculum that the participating universities teach to students.

The future for NorTex is promising. There are plans to engage in a variety of activities that further the objectives of the cluster. These include

- Developing academic courses through collaboration with NorTex partners.
- Holding NorTex conferences to bring together key partners to explore ideas, concepts and collaborations in relation to the future of the energy industry—this started in 2013 with a conference dedicated to the challenge of CO₂ in enhanced oil recovery.
- Facilitating industry funding for adjunct and chair positions within partner institutions (as of 2014, several companies have been identified and meetings are planned to explore the possibilities here and take the initiative forward).
- Promote and support important research projects in Texas and Norway and continue to shed light on the key industry challenges to inform the work of the academic science community.
- Continue to improve communication between industry and academia.
- Create and fulfil industry lecture positions at the collaborating universities.

The Executive Board of the NorTex Petroleum Cluster consists of representatives from all principle partners. The current Board will serve for three years and will look to demonstrate, within this time frame, the impact NorTex has had. Although the size of the Board is efficient for the time being, it is possible that additional Board members will be added if required. The number of participating companies below Board level is not set and may increase, but the number of university partners will not increase during the first 3 years.

THE IMPACT

The first NorTex conference (held in 2013) on CO₂ in enhanced oil recovery involved 106 participants from 14 universities and 17 oil companies. There were 43 PhD students in attendance—13 from Norway and 30 from the US—with the students paid for by the Petroleum Research School of Norway.⁷

The academic exchange programme has so far impacted on around 30 PhD students across the two countries with plans to double that number in 2014⁸ (depending on the level of support garnered from industry partners).

⁷ Figures supplied by NorTex.
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The Petroleum Research School of Norway has, since the launch of NorTex, signed five MoUs with institutions in USA, two of which are in Texas, for the exchange of students and faculty and to support research collaborations. NorTex partners are hopeful of achieving the following in terms of impact over the next 3 years:

- Participating universities in Norway and Texas exchange best practice on entrepreneurship and innovative strategies within the industry and gain a deeper understanding of how to accelerate the commercialisation of research and the effective transfer of technology.
- New partnerships and joint ventures are created between industry and academia with the potential that spin off consortia will launch that are successful and self-sustaining.
- These partnerships will lead to joint publications, joint patents and perhaps new ventures (in the form of start-up companies) between partners in Norway and Texas.

As NorTex is only in the start-up phase, it is difficult to gauge the impact so far. The intention of the existing Board is to assess the impact of the Cluster’s activities over the course of 3 years of operation and then, if required, refine the model.

At this stage, the potential is significant as the participants who are contributing are all experts within their fields. The partnership has been built on a sound footing and there is political support for the initiative. On this basis, we should see positive results in the near future.

**WHAT MADE THE PARTNERSHIP SUCCESSFUL?**

NorTex has been ambitious in its attempt to engage with a wide range of partners. The achievements so far suggest that the partnership has been effective and well-managed. Here’s why:

- It was decided early on that for the energy cluster to work, it needed to have geographical boundaries that reflected and built on existing social and economic ties. To this end, the Cluster was established between Texas and Norway (rather than bringing in other US states or other international partners). Strong political ties between the two regions were also critical in this regard.
- More specifically, relationships between the key industry partners and the academic institutions were in many cases, already established. In this way, NorTex was building on existing collaborations rather than trying to forge new partnerships.
- Furthermore, Statoil and Schlumberger—the two principle industry partners with positions on the Board—also had an established relationship. This mitigated any issues of competition between the two partners.
Although NorTex represents a collaboration between a number of individual organisations, the core activities are based on bilateral agreements between institutions and/or industry partners. This has proved easier to handle although there are still challenges around marrying the competing agendas of different universities.

The size of the Cluster has been limited for the initial 3 years of operation. This will ensure that the activities and governance of the Cluster can be fully piloted before any new partners are brought on board.

The progress made so far by the NorTex Cluster has been significantly attributed to the individuals involved. It’s vital that a partnership of this nature is instigated and managed by the right people—those who have a positive and collaborative mindset.

As a way of engaging fully with all partners from the beginning, NorTex established an interim Board. The job of this Board was to guide the establishment of the Cluster and to identify the right people to move things forward until the initiative was up and running.

The Board was responsible for selecting the chair and there were votes held on all key strategic decisions with everyone having the same vote. Getting the governance right has helped keep all partners engaged and supportive.

There was a degree of flexibility in relation to the involvement of industry members. They have to be empowered to decide themselves whether they want to be paying partners (with their annual payment meeting the expenses for visiting professors and for exchange students) or whether they want to play more of an ad hoc role. There also need to be opportunities for industry partners to make in-kind contributions rather than simply providing funds. This flexibility is likely to lead to a greater number and range of industry partners playing a positive role in the Cluster.

The success of the partnership has been based on the fact that the goals of the Cluster are common for all partners. The research agenda that the universities are keen to pursue is of great value and interest to the industry partners (and is driven by industry needs) and, on the workforce development side, the universities are keen to see their graduates move into senior industry positions. For the industry partners, they can see the value of educating the next generation of energy professionals.

**THE CHALLENGES**

Having launched in 2013, the challenges around ongoing collaboration and operation are only now beginning to emerge. However, there were a number of obstacles during the process of establishing NorTex that needed to be overcome:

- There were significant issues around the partnership between different universities. In trying to establish a group of PhD students, you are asking
different institutions to agree on aspects of their operation that they typically define themselves. Questions arise around the nature of the curriculum, what the system of credits will be and so on. Universities are very cautious about protecting their academic reputation and this can be a stumbling block to effective collaboration.

- More broadly, it can be difficult to bring together the sense of value that individual universities attribute to academic activities. This can mean that agreeing on strategic decisions is challenging.
- Internationally, the challenge is more related to the competition that typically exists between institutions, particularly in the US. The concept of multi-university partnerships is still quite difficult for some, particularly those operating within the same industrial sectors.
- The cost of involvement for smaller industry partners can be prohibitive. Furthermore, it is typically the larger firms that are able to take a longer term view of the research agenda. This means that only certain types of industry partner are likely to be attracted to NorTex unless new approaches can be developed to involve smaller companies.
- It has been challenging to keep the size of the Cluster manageable as several universities have been keen to involve other academic partners as this offers them the opportunity to access additional sources of funding.
- It has been necessary to carefully manage issues around intellectual property. To address this, the focus has been on pre-commercial research to avoid any activities that go into the realm of applied and commercial research. The challenge is to keep activities at a level where everyone benefits equally and there are no commercial benefits to specific partners. As the Cluster grows, this could become a greater challenge.

THE COST

No specific figures are available for the costs of establishing the NorTex Petroleum Cluster. Some funding was provided in year one by the contributions from Statoil and this was augmented by public funding in Norway.

In future, the challenge is to find industry funding that can support and promote the expansion of the cluster. This may work either on a workshop/event basis—with an industry partner sponsoring specific activities—or will be on an annual contribution basis as is currently the case with Statoil.

The university partners are not providing direct funding but are committing the time of their staff and of those who sit on the Board. A similar situation is in place for industry partners including Schlumberger who make contributions in-kind rather than financially.
The Getenergy View

The NorTex story is still emerging. What is clear is that partnership and collaboration is at the centre of the initiative and that much has been achieved so far. But what can we learn from NorTex and what makes it unique?

- **NorTex is about moving away from a reliance on oil and gas**
  One of the unique features of the NorTex project is that it is highly futuristic in its thinking. Although the energy professionals of today are undoubtedly benefitting from the experiences they gain through NorTex, the focus is on looking at future energy sources and planning for a day when fossil fuels run out. This is a challenge for every country currently extracting hydrocarbons and, as such, NorTex should be of interest across the world.

- **The cultural connections are key**
  The bilateral and multilateral relationships around which NorTex is built have their roots in a long history of economic and cultural collaboration. The ties between Norway and Texas go back decades and it is upon this history that NorTex builds.

- **Significant political support is key**
  The initial drive to establish NorTex was part of a wider political agenda guided in particular, by the Norwegian government. This support has been vital in ensuring that the initiative can take flight.

- **MoUs need to be meaningful**
  The NorTex Cluster was established, in part, through the signing of a number of MoUs between various parties. The challenge is to ensure that these agreements carry weight and are not merely statements of intention. Without concerted activity, an MoU can mean very little.

- **It is currently only working at PhD level**
  The focus for NorTex is to support the development of PhD students within energy-related fields. In part, this is because a significant emphasis for the initiative is on supporting research activities at the highest level. This means that emergent nations would be unlikely to replicate the model as most do not have PhD students within the field. It would be interesting to explore whether the model would work at bachelors or masters level with a greater focus on the exchange of knowledge and experience and less emphasis on research.

- **It is a relatively loose arrangement which has positives and negatives**
  The model for NorTex is evolving. The nature of industry involvement varies according to the commitment of the partner and what they hope to get from the partnership. This suggests that the initiative faces a certain degree of uncertainty around financial sustainability. That said, such flexibility allows NorTex to react and respond to what emerges. The plan to review after the first three years of operation seems wise in this regard.

- **This is about building a new model of higher education that brings academics closer to industry**
  The evident enthusiasm of all partners (particularly the industry partners) demonstrates that NorTex is breaking new ground in connecting the academic community (and the energy leaders of tomorrow) with the industry. It will be fascinating to see the results emerge as the initiative matures.
A Note on Sustainability

That NorTex is based on existing long-term relationships means that it is likely to be sustainable. The simplicity of the arrangement and the track record so far are also strong indicators of a bright future. That said, the activities of the Cluster are based on a level of industry funding that may not endure as the return is long term and industry typically thinks short term. The model is also less attractive to smaller companies who may not be able to afford to invest.

A Note on Replicability

The success of NorTex so far has clearly relied on specific conditions and externalities—the political backing has been key, as has the existing cultural ties between the two territories. Given the right external conditions where such relationships exists, the model could be replicated. There needs to be a level of interest from participating universities and a degree of academic equivalence between the two countries. The model also has to be based on leveraging existing relationships between industry partners and the academic community.

A Note on Impact

The impact so far is encouraging and the number of universities involved is genuinely impressive (with others expressing an interest to join). Plans are in place to double the number of PhD exchanges in the second year and this is likely to lead to further collaborations. The long-term impact is harder to gauge but could be significant with the sector benefitting from the experience, thinking and knowledge of these graduates.