



Ministry of Trade, Industry and Fisheries

Strategy

Powered by Nature

Norway as a data centre nation



Foto: Marte Garmann

Norway shall be an attractive country for data centres and data-centric businesses. The crucial importance of data in business and industry will only increase. Norway needs new industries that create jobs and boost economic growth. Data centres are an exciting industry that can help this to occur.

Torbjørn Røe Isaksen (Conservative Party)
Minister of Trade and Industry



Foto: Hans Jørgen Brun

Setting up industrial enterprises and creating jobs in Norway must become easier. We want to see shorter processing times and more predictability for development plans and applications sent to the authorities.

Monica Mæland (Conservative Party)
Minister of Local Government and Modernisation



Foto: Ola Heggø

Good digital infrastructure is very important for businesses and households alike. We are strengthening Norway's attractiveness as a data centre country with robust growth in fibre investments nationally, new government support to install more fibre optic cables to other countries and simplified national trenching and excavation rules. Other industries and the population in general will benefit as well.

Ketil Solvik-Olsen (Progress Party)
Minister for Transport and Communications



Foto: OED/NTBScampix

Norway has a good basis for developing data-centric business enterprises. Our renewable resources and well-functioning energy sector are major competitive advantages. Norway's power supply is renewable, flexible, secure and competitively priced.

Terje Søviknes (Progress Party)
Minister of Petroleum and Energy



Contents

1 SUMMARY	5	7 NORWAY AS A DATA CENTRE NATION	25
2 DATA AS A RESOURCE AND INPUT FACTOR	11	7.1 Norway is a leader in digitisation.	25
3 DATA CENTRES AS A SERVICE	13	7.2 Norway has renewable energy.	27
4 THE NORWEGIAN DATA CENTRE INDUSTRY	16	7.3 A good framework of direct and indirect taxation	30
5 IMPORTANT CRITERIAS FOR THE DATA CENTRE INDUSTRY	18	7.4 The Government's commitment to transport and communications.	34
6 DATA CENTRES – A POTENTIAL NEW NORWEGIAN GROWTH INDUSTRY	21	7.5 Facilitating electronic communications.	34
		7.6 Site development	37
		7.7 Expertise	39
		7.8 The public sector as customer	41
		7.9 Internationalisation and investment.	42



1 Summary

The Government wants Norway to be an attractive nation for data centres and other data-centric industries. As the future unfolds data, will become an increasingly important resource and input for the business community as well as for society in general. This represents a major economic opportunity for Norwegian businesses and society, and will be a key to the Government's policies and priorities going forward. One of the Government's main ICT policy priorities is for the authorities to facilitate digital innovation. The Government seeks to help Norway make the most of data-driven value creation, so the country can reap the benefits and manage the challenges.

The main objective of Norwegian industrial policy is to maximise overall value creation in the Norwegian economy within a sustainable framework. Norway needs new industries that create jobs and economic value. The state's role is to ensure that the general framework conditions for business and industry are sound. There are several reasons why the data centre industry could become a contributor to Norwegian value creation. The data centre industry is relatively new, it is growing, and there is reason to believe its growth will continue as the amount of data produced increases exponentially. Further development of the data centre industry will also help increase business for providers of data centre components and services. The need to maintain and replace data components on a continuous basis contributes to a high level of activity.

The data centre industry has the potential to be an important industry for Norway in future. We therefore need more information about the industry today, such as employment figures, geographical distribution, economic contribution, capacity utilisation and other information. The Government therefore intends to carry out a survey of the data centre industry.

Norway has a solid basis on which to develop data-centric business activities. The country is rich in natural resources and has a stable, cold climate. We have a competent workforce, functioning capital markets and political stability. The Government will continue its efforts to provide a business-friendly regulatory framework, with a simpler, more growth-inducing tax system, better infrastructure and a competent workforce. We also seek to facilitate increased trade and investments to and from Norway. While Norway does face a number of challenges, the Government has won approval for measures to address some of them in the 2018 national budget.

Efficient and renewable power supply

Electricity is one of the most important inputs for data centres. Stable supply of renewable power and competitive prices are important factors when deciding on location strategies for data centres. This is a competitive advantage for Norway.

Norway's power sector has the highest renewable share and the lowest emissions in Europe today. Flexible hydropower is, and will continue to be, the backbone of Norwegian energy supply. Norway accounts for half of Europe's reservoir capacity and more than 75 per cent of the Norwegian production capacity is flexible. Security of supply in Norway is good, due to the large hydro reserve capacity in combination with a well-developed transmission grid both domestically and to other countries.

Access to renewable, flexible and secure hydropower on competitive terms has been important to the development of modern-day Norway. The Government will provide a framework that enables Norway to further develop its renewable energy resources and make use of its competitive advantages.¹

Sound framework conditions

The Government puts a priority on tax reforms that strengthen economic growth potential, ease transformation processes and create new jobs – first and foremost by following through on the tax reform that a broad-based majority of the Storting has endorsed. The tax rate on ordinary income for companies and persons was reduced from 28 per cent to 24 per cent in the 2013–2017 period. In the 2018 national budget that rate has been reduced further, to 23 per cent. In 2017, a 10-per-cent valuation discount was introduced for shares and operating assets and associated debt. These changes soften the negative effects of the net wealth tax and help allow more Norwegian capital to flow towards business activity. In the 2018 national budget, the discount has been increased to 20 per cent.

¹ Ministry of Petroleum and Energy. 2016. Meld. St. 25 (2015–2016) *Kraft til endring – Energipolitikken mot 2030* (white paper on Norway's energy policy: Power for change).

The consumer tax on electricity (*elavgift*) delivered to large data centres was reduced starting 1 January 2016. The purpose was to make Norway attractive as a host to large data centres, including international actors. As it turns out, the data centres established or under development in Norway have not yet become as large as expected when a power draw of 5 MW was set as a condition to receive the reduced rate. In the interest of continued data centre development in Norway, the power draw condition was lowered to 0.5 MW from 1 January 2017.

The data centre industry and interest groups have stated that the possibility of property tax being imposed is an obstacle to establishing data centres. Under the national budget for 2018, industrial property classified as *works and installations* (in Norwegian: «verk og bruk») will be taxed as «other commercial property», without the inclusion of «production equipment and production installations» – a distinction that benefits data centres. In accordance with the budget agreement reached with the Liberal Party and the Christian Democratic Party, the phase-out of the tax will be extended from five to seven years. The changes do not apply to hydropower facilities, wind power facilities, the electrical grid or facilities subject to special petroleum taxation rules.

Electronic communication

The Government wants high-quality electronic communication networks to be a competitive advantage for business and industry across the country. Access to high-quality electronic communications with a high security of supply and multiple transmission routes out of Norway is important to the data centre industry and to Norwegian businesses and society in general.

The Government wants to make it easier and cheaper to install broadband infrastructure around the country. Digging costs generally amount to 70-80 per cent of the cost of extending fibre optic cables. The rules and fees associated with laying fibre under roadways have varied from municipality to municipality. As a result, the extension of broadband, fibre and digital infrastructure has been unnecessarily bureaucratic, time consuming and expensive. The Ministry of Transport and Communications has adopted new rules for cable installation on public road property. The new rules will help make framework conditions more predictable for everyone involved in laying cable, thereby facilitating high-speed broadband service to be extended to more users.

The Government has obtained approval in the national budget for two new initiatives to increase security and robustness; both initiatives will help ensure that the data centre industry's connectivity needs are better addressed. Funding of NOK 40 million was proposed in 2018 for an alternative core network pilot scheme. The aim of the pilot scheme is to establish an operational alternative

core network market to be utilised by enterprises of critical importance to society as well as other users. In addition, the Government has proposed a total of NOK 100 million to facilitate additional fibre optic cables to other countries, with an appropriation of NOK 40 million in 2018 and a commitment authorisation of up to NOK 60 million. At issue is the significant vulnerability resulting from the fact that most outbound electronic communication from Norway goes from the Oslo area through a small number of routes to network hubs in Europe. The proposed funding has been approved by the Storting.

Site development

Developing a property site for a data centre requires considerable effort and can be compared to the preparation needed to establish other major industrial enterprises. Large areas must be regulated, the provision of technical services must be clarified and as many uncertainties as possible must be resolved before a customer will consider putting up a centre. One potential site-development challenge is long processing times for planning and licensing issues. In such processes, the Government seeks to facilitate heightened efficiency, quality and predictability, as well as shorter processing times. The Government will therefore prepare guidance for planning and licensing issues, with relevant parties invited to contribute to the work involved.

For foreign investors thinking of establishing an industrial enterprise in Norway, information about the Norwegian system may be hard to obtain. The Government wants Norway to be an attractive country for investments, and will initiate a project to ensure that information related to the establishment of industrial enterprises is readily available and in both Norwegian and English. It will also create a timeline with an overview of permits required to establish industrial enterprises in Norway.

Expertise

ICT competence and ICT research are basic requirements for the digitisation of Norway and important aspects of the Government's commitment to education and research. The Government aims to ensure that both the public sector and the business community have sufficient access to ICT skills. ICT is undergoing rapid development, both as an academic subject and an enabling technology. Access to advanced ICT skills is of crucial importance. Data centres are an example of a forward-looking industry that needs workers with advanced technological skills, particularly in ICT. There are many indications that the need for advanced ICT skills will increase with time, especially in the private services sector, but also in the public sector and in industry. In the 2018 national budget the Government proposed that the 500 ICT student places already funded in 2017 should be prolonged in the ordinary manner so that institutions can take in a new cohorts of students to meet the needs of the future. Under the budget agreement reached

by the governing parties, the Liberals and the Christian Democrats, an extra 500 ICT student places were added to the Government's proposal, with effect from 2018. With regard to ICT research, the Government funds IKTPLUSS, which is the Research Council of Norway's major large-scale initiative on information technology and digital innovation. The goal is to strengthen quality and increase the boldness and relevance of Norwegian ICT research.

The public sector as customer

It is the Government's policy that government should not do what the market can do better and more efficiently. In 2016, the Government put forward a Cloud Computing strategy for Norway.² The strategy states that government agencies must consider cloud services when procuring new ICT solutions. When there are no special obstacles to using cloud computing, and when such services are the most appropriate and cost-effective solution, they should be chosen.

The Government wants all agencies to make a conscious choice about whether or not to outsource IT services. One of the measures contained in the Government's Digital Agenda, is therefore that all public agencies are required to have a sourcing, if relevant. This requirement is communicated to all public agencies through the Ministry of Local Government and Modernisation's circular on digitisation.

The public sector spends about NOK 500 billion a year on procurement. Public agencies can save a great deal by streamlining procurement processes, and they must better utilise opportunities to develop and innovate. The Government will develop a comprehensive procurement policy and pave the way for better, more efficient public procurement. A white paper to the Storting on public procurement is planned for 2018.

In the summer of 2016, the Government assembled an external working group to study and evaluate the competitive conditions under which public and private enterprises operate. The report will be submitted by 1 January 2018. Addressing the report's findings will be a top priority so that private and public actors in the same market can be assured of a level playing field.

Foreign trade and investment

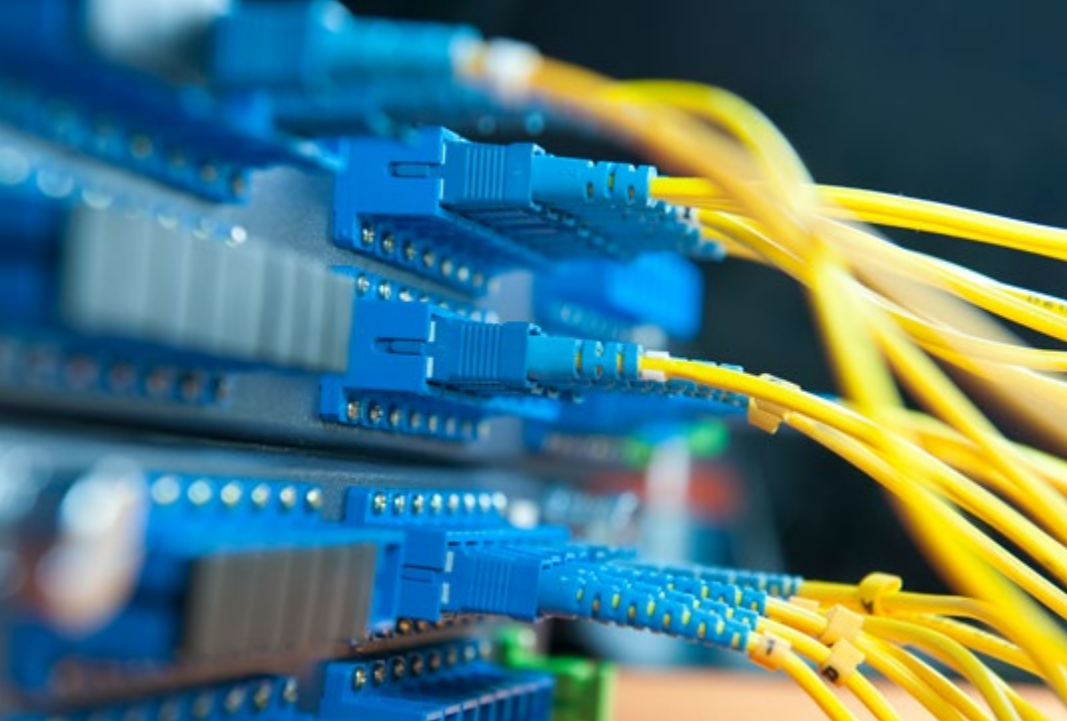
Norway is part of the European Economic Area (EEA), and the European Union (EU) is our most important trading partner. The EEA Agreement is the fundament of Norway's collaboration with the EU, linking Norway to the EU's single market. What the EU does for the digital single market has a direct impact on Norway. One of the Government's key ICT policy priorities is for Norway to be part of Europe's

² Ministry of Local Government and Modernisation. 2016. *Cloud Computing Strategi for Norway*.

digital single market. Removing technical and legal barriers to the flow of data is central to this work. In the autumn of 2017, the European Commission proposed a regulation on the free flow of non-personal data in the EU.³ The proposed regulation introduces the principle of free data flow, proposing that member states are required to remove national regulations that restrict the ability to store data outside their borders, unless the data is restricted on security grounds. The Government supports the EU's efforts on behalf of a digital single market and the removal of unjustified national data-localisation requirements. An open, digital European market gives enterprises in Norway access to a market of more than 500 million people.

Norway shall be an attractive host country for international investors and entrepreneurs. Innovation Norway's Invest in Norway function has proved an effective tool for handling inquiries from international investors that are considering a new venture in Norway. The Government will strengthen Invest in Norway to facilitate foreign investments and make Norway a more attractive country in which to invest. The national budget for 2018 increases funding for this work by NOK 10 million. As part of Invest in Norway's development, a study will be carried out to determine how Norway can become better at attracting foreign investment and expertise.

³ COM(2017) 495 final. Regulation of the European Parliament and of the Council on a framework for the free flow of non-personal data in the European Union.



2 Data as a resource and input factor

Every week, more data is produced than the amount produced in the past 1,000 years.⁴ Images and videos are uploaded from social media; we shop, browse and read newspapers; we communicate online. Sensors on everything from toasters to aircraft engines transmit a continuous flood of information. The value of companies like Tesla are high not only because of the electric sports car, but because of the enormous value of traffic data and the data related to performance and use of the car's self-driving feature.

Data has become a major resource for businesses and social development. Mapping and traffic data, statistics, weather data, research data, energy data, health data and other forms of data are key in developing new and better services for the population. The vast amount of such data changes our approach to everything from research and innovation (of both products and processes), to the interaction and design of business models – data-driven innovation.

The market research company IDC has estimated that the world will produce 180 zettabytes⁵ (ZB) in 2025, up from about 10 ZB in 2015 and 44 ZB in 2020.⁶ Increasingly, private and public enterprises have seen a need for alternatives to investing in, and maintaining, their own processing and storage requirements for such vast amounts of data. They seek flexibility and economies of scale, which has

4 OECD, 2015: *Data-Driven Innovation for Growth and Well-Being: What Implications for Governments and Businesses?*

5 1 zettabyte is equal to 1 trillion gigabytes.

6 IDC; forbes.com

stimulated growth in the data storage and processing market.

According to the IT company Cisco Systems, the number of hyperscale data centres in the world will rise from 259 in 2015 to 485 by 2020, at which time hyperscale data centres will account for 53 per cent of all data traffic in data centres.⁷ The analysis company Gartner expects the global cloud services market to grow 18 per cent in 2017, from USD 209 billion in 2016 to USD 247 billion in 2017. The market is estimated to grow to USD 383 billion in 2020, an increase of 55 per cent over the estimated 2017 figure.⁸

We see similar developments in Norway, where more and more enterprises are using cloud services. In 2017, according to Statistics Norway, 48 per cent of enterprises with at least 10 employees were purchasing cloud services – an increase from 40 per cent in 2016 and 29 per cent in 2014.⁹ Government enterprises use cloud services more than private business does, and large enterprises use cloud services to a greater extent than smaller enterprises do.¹⁰

Going forward, data will become increasingly important as a resource and input factor for the business community and society in general. Faster transfer rates and increased processing power and storage capacity have led to advances in such things as processing massive data sets («big data») and artificial intelligence (AI), which allow data to be understood and exploited in new ways. Development of Internet of Things (IoT), with more and more gadgets connected to the internet, will be a key driver of the rapid growth in data that is expected, and especially the collection of new types of data. The emergence of IoT poses major economic opportunities for Norwegian business and industry, including cloud service providers and data centre actors.

One of the Government's main ICT policy priorities is for the public authorities to facilitate digital innovation. The Government seeks therefore to help us make the most of data-driven value creation, so we can reap the benefits and manage the challenges.¹¹

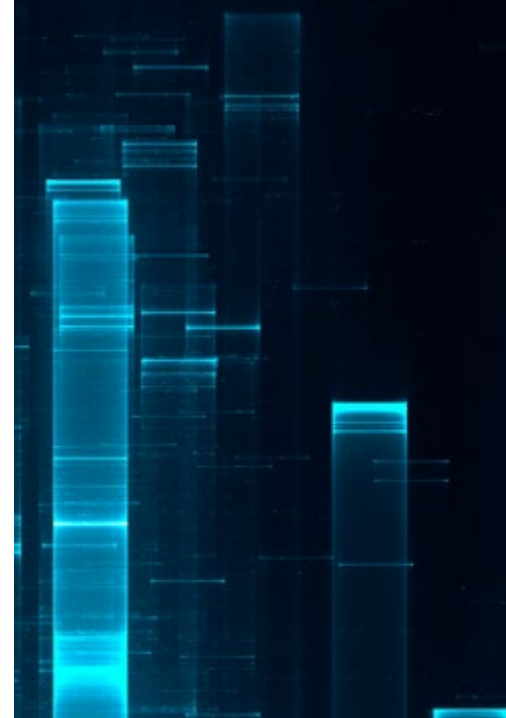
7 Cisco Systems, 2015: *Cisco Global Cloud Index: Forecast and Methodology, 2015–2020*.

8 Gartner, 2017: <https://www.gartner.com/newsroom/id/3616417>

9 Statistics Norway: *ICT usage in enterprises*, updated 29 August 2017.

10 67 per cent of enterprises with more than 100 employees use cloud services, as against 44 per cent of enterprises with 10–19 employees (Statistics Norway, *ICT usage in enterprises*, 2017.)

11 Ministry of Local Government and Modernisation, 2016: Meld. St. 27 (2015–2016) *Digital agenda for Norge – IKT for en enklere hverdag og økt produktivitet* (Digital agenda for Norway – ICT for a simpler everyday life and increased productivity). English summary: <https://www.regjeringen.no/en/dokumenter/digital-agenda-for-norway-in-brief/id2499897/>



3 Data centres as a service

A data centre is a facility consisting of servers and other components used to organise, process, store and distribute large amounts of data.¹² Data centres come in many sizes, from a separate room, basement or hall to a multi-storey building equivalent in area to 10 football pitches. A data centre can be part of an enterprise's internal infrastructure, or it can be its actual product, in the form of data centre services provided to external customers. All enterprises send and receive data, so a data centre is a critical component in enterprise operation.

Data centre services are offered in accordance with different business models that provide different levels of service content. The Norwegian Communications Authority (Nkom) divides data centres into four categories:¹³

- 1) *Hyperscale enterprise data centres*: Large dedicated data centres established by international actors for their own use (Facebook, Microsoft, Apple, Google, etc.).
- 2) *Large international co-location centres*¹⁴: Data centres sometimes called carrier hotels that mainly offer rentals to large national and international enterprises.
- 3) *Midsized national co-location centres*: Data centres sometimes called carrier hotels that mainly offer rentals to the small and midsize business (SMB) market and the public sector, with emphasis on regional and national enterprises.
- 4) *Cloud service providers (Infrastructure as a Service, Platform as a Service, Software as a Service)*: Providers of computing power, whether based on their own data centre or one in which they rent capacity.

¹² <http://searchdatacentre.techtarget.com/definition/data-centre>

¹³ Norwegian Communications Authority, 2016: *Kartlegging og vurdering av infrastruktur som kan nyttiggjøres av datasentre* (Surveying and evaluating infrastructure that can be utilised by data centres).

¹⁴ Co-location centres are somewhat simplified data centres that provide computing power and storage on a rental basis, whether by making their own servers available or renting out suitable space, with all necessary infrastructure, where customers can install their own equipment.

Box 3.1. Cloud computing

Cloud services are scalable services provided over the internet. The main difference between cloud services and more traditional outsourcing is the business model, with the customer paying for capacity used. Key features of such services are:

- They are easily accessed from anywhere (via the Internet).
- They are provided on demand.
- They can be elastically provisioned and scaled up or down according to demand. Customers themselves can administer the service, usually without the provider's involvement (self-service).

Cloud computing can be provided as different service models: Infrastructure for both storage and processing (Infrastructure as a Service, (IaaS), platform services such as operating systems and databases (Platform as a Service, (PaaS) and software (Software as a Service, (SaaS). can be provided through cloud services. Purchasing software delivered in the form of cloud services has much in common with purchasing other standard software.

In the spring of 2016, the Government presented a Cloud computing strategy for Norway.¹⁵ The aim of the strategy is to make clear how public and private sector enterprises can benefit from using cloud services and in which cases such services are appropriate for public sector use.

The circular issued on digitisation¹⁶ requires government agencies to consider cloud services in line with other alternatives when new ICT solutions are to be acquired.

Increased use of data centre services/cloud services available in the marketplace may lead to more cost-effective ICT operations in the public sector when such services are employed in appropriate contexts.

Energy Norge distinguishes between the following types of data centre:¹⁷

- *In-house data centres*: A data centre generally located within the premises of a company that uses the data centre for its own operations.
- *Co-location data centres*: Such data centres, sometime called carrier hotels, are often developed by actors including site developers which have them as their core business and which provide a stable power supply, reliable cooling capacity, connectivity and security.
- *Data centre enterprises (DCEs)*: The largest data centres in the world consume more than 100 MW. The companies which buy or rent large land areas for data centres they build and operate themselves are generally large and international. The largest data centres require a great deal of fibre optic infrastructure and electric power, and site selection is an extensive process involving competition between countries and between communities within countries. There are currently no data centres of this size in Norway, while some data centres in Sweden, Denmark and Finland could possibly grow to such size.

¹⁵ Ministry of Local Government and Modernisation, 2016: Cloud computing strategy for Norway. <https://www.regjeringen.no/en/dokumenter/cloud-computing-strategy-for-norway/id2484403/>

¹⁶ Ministry of Local Government and Modernisation, 2017: Circular H-07/17 *Circular on digitisation*.

¹⁷ Energy Norway, 2016: *Locations for data centre enterprises (DCE) in Norway*, written by Asplan Viak AS for Energy Norway.

The Norwegian data centre debate is focused largely on the establishment of large data centres (or hyperscale/DCEs) by global actors such as Google, Facebook, Amazon, Apple and Microsoft. Several Norwegian companies are working actively to attract such data centres to Norway. While the establishment of a large data centre by an international actor may create potential benefits and have a positive symbolic effect, Norway could still develop a strong data centre industry and become an attractive data centre country without having large data centres.

Exactly how one defines and refers to the different types of data centres – whether as DCEs or hyperscale centres, for example – is of no significance to this strategy. This document does seek to cover the industry's full breadth, but when we refer to data centres we generally mean co-location data centres, cloud service providers with their own data centres, and hyperscale data centres – not in-house data centres situated within an enterprise's own locale. In any case this strategy will be relevant to all data centre actors, since framework conditions like taxation and fibre optic infrastructure are important for any kind of data centre.



4 The Norwegian data centre industry

Norway's data centre industry consists mainly of small to medium-sized actors that have developed their centres – co-location centres – with an eye to providing services to external customers, including international customers. To date no large data centres (hyperscale or DCE) have been established in Norway, but several projects presently under development are oriented to this market.

At the moment there exists no comprehensive list of data centre actors or overview of what may be classified as Norway's data centre industry. Some actors are registered under general business classifications such as *data processing, hosting and related activities*, while others are registered under classifications not normally thought of as linked to the data centre industry, such as *buying and selling of own real estate*. How a company's data centre activity fits into its business model is one factor that affects its classification. Some actors rent out physical capacity in a data centre to their customers; others operate cloud services, while still others maintain a data centre as part of their own business infrastructure, without the centre being part of the product they sell. Such variation makes it hard to map the industry or keep statistics on it.

The data centre industry has the potential to become an important industry for Norway in the future, so it would be useful to have an overview of the number of enterprises operating in the industry today, along with employment figures, geographical distribution, economic contribution, capacity utilisation and other information. The Government therefore intends to carry out a mapping of the data centre industry.

Box 4.1. Examples of Norwegian data centre actors

Norway has a number of established players in what is known as the co-location market. These include Green Mountain, Digiplex and Basefarm. Among new actors securing a market position for themselves are Lefdal Mine Datacentre, which opened its data centre in Sogn og Fjordane county in May 2017, and the property company Bulk. Several other data centre initiatives are under development around the country as well. Statkraft plans to develop sites for large data centres in Vestfold and Telemark counties, and Nordavind Data Center Sites is developing sites in Hedmark county.

Beyond data centres themselves, data centre activity as a whole extends to numerous industries and actors, especially on the supplier side. Included are general infrastructure and support functions such as electric power, water, drainage, maintenance and security. Fibre optic capacity is one of the most important factors for a data centre. Transmission speed and capacity are in ever-increasing demand, as is the need for a sufficient number of cabling routes within Norway and to other countries. The fibre industry is therefore of special importance to data centres, just as data centres are important customers of the fibre industry. Data centre customers expect the services to work at all times, and they depend on it, making robust infrastructure a key priority. The fibre situation in Norway is described in more detail in Chapter 7.5.

Other businesses of particular importance to the daily operation of data centres are those providing hardware and software services or support services as well as other IT services. For such businesses, data centres of a certain size will likely be a significant part of the customer base. Growth in the data centre industry could therefore expand the market base of several other industries, leading in turn to product and service scalability with associated economies of scale. It would also mean increased competition, with the most productive enterprises winning market share at the expense of those that are less productive. Increased productivity contributes to increased economic growth overall.



Photo: NTE

5 Important criterias for the data centre industry

There are several types of data centres, as described in Chapter 3. What is to be regarded as an optimal environment for data centres can therefore vary. Some criteria, however, apply to data centres of all types.

Data centres consume large amounts of power. The largest of them draw over 100 MW (on the order of 1 TWh with full utilisation throughout the year, equivalent to what a small aluminium plant consumes). This makes power an important data centre input factor. Predictable, low prices and a stable power supply are therefore among the top criteria. In addition, some major Silicon Valley-based companies aim to reduce the energy consumption of their data centres and to rely mostly on renewable energy. Access to secure and affordable renewable electric power was among Facebook's key criteria when it announced that it would build its first data centre outside of the United States, in Luleå, Sweden, in 2011. Such an approach to site selection gives Norway an advantage over other parts of Europe and the Nordic region, as the country's power production is based largely on flexible, climate-friendly hydropower.

Data centres are also dependent on robust fibre optic capacity (dark fibre, optical channel and other transmission services), low connection delay and a sufficient number of cabling routes within Norway and to other countries. Fibre capacity is therefore very important as an input factor for enterprises considering the establishment of data centre operations in Norway. The Norwegian Communications Authority has mapped and analysed the Norwegian transmission market and existing fibre infrastructure.¹⁸ Today, demand for long-distance dark

¹⁸ Norwegian Communications Authority, 2016: *Kartlegging og vurdering av infrastruktur som kan nyttiggjøres av datasentre* (Surveying and evaluating infrastructure that can be utilised by data centres).

fibre comes from the largest data centres and the largest customers. But many data centres and data centre customers require optical channels in a variety of capacities. Depending on market area and customer needs, data centres vary in their data transfer requirements over short and long distances. Most data centres seek long-distance, end-to-end transmission capacity. This typically means transmission to Oslo or some other central hub where international carriers are present and can ensure linkage onward to central parts of the internet. The largest actors demand two, sometimes three, redundant pathways. In addition to technical access, data centre actors are concerned about commercial availability – the ability to purchase fibre links in a free and open market at competitive prices, and for the customer to choose among multiple suppliers over time.

Box 5.1. Dark fibre and optical channels

Dark fibre is a transmission product consisting of fibre optic links to which customers are free to hook their own transmission equipment. Buyers are free to use equipment with the quality and capacity they desire, and no other users share the fibre link. In Norway at present, dark fibre is offered predominantly in urban areas. For example, dark fibre is used to connect a data centre with its communication service provider's network hub in the same city. Dark fibre is priced by distance.

Optical channel (wavelength) service is produced when communication service providers and/or dark fibre customers employ wavelength-division multiplexing (WDM) of multiple optical channels to achieve the desired capacity for a data centre. Purchasing a wavelength gives a customer access to that wavelength's full capacity (typically 10 Gbit/s) without any form of sharing with others, but different wavelengths on the same fibre usually have different applications or customers. Depending on distance, optical channel service is generally priced lower than dark fibre.

Establishing a data centre is an expensive investment. Developing a site for a data centre requires considerable effort and can be compared with the preparation that goes into setting up other major industrial installations. For the largest data centres, enormous amounts of money have to be invested, so it is important – as with any large investment – for the actors involved to know the risks. International actors unfamiliar with local conditions may be especially concerned. This is natural given the size of the investments and the market's need for reliability and regularity in the operation of such facilities. Areas of potential risk include unsettled planning status, property arrangements, taxation, technical issues relating to power supply or digital infrastructure and local ownership of the project in question.

Development of the data centre industry requires good, predictable framework conditions (taxes, indirect taxes, regulations, etc.) and access to skilled labour. Another important factor, particularly for large international data centre actors, is proximity to a major city with an international airport.

Competition to attract large data centres is stiff, and data centre actors can choose among many places. Site selection is a demanding process in which numerous countries and properties are evaluated against one another. Countries across the Nordic region offer many of the same advantages. Norwegian actors compete against Sweden, Denmark, the Netherlands and Finland, among others, on most of siting criteria.

The Swedish Agency for Economic and Regional Growth and the Boston Consulting Group (BCG) have pointed out several factors that caused Facebook to choose to build a data centre in Luleå, Sweden, many of which are common to the Nordic region.^{19;20} Countries across the region have a stable political climate with little corruption and good access to a secure and reasonably priced supply of renewable power. Another factor mentioned, applicable especially to the northernmost parts of the Nordic region, is a cold climate, which reduces cooling costs. In other words the Nordic countries are well situated for continued growth in the data centre industry.

Box 5.2. «Locations for data centre enterprises (DCE) in Norway»

The report *Locations for data centre enterprises (DCE) in Norway* was presented in March 2016.²¹ The report describes a variety of criteria of importance to DCE actors, of which the five most important are:

- access to power with high security of supply – i.e. with input from at least two directions – meaning in practice the 132 kV network.
- access to dark fibre with high security of supply and the option of transmitting out of Norway via multiple pathways – at least three pathways to the data centre.
- completed (or commenced) regulation of an industrial area – minimum 100,000 m².
- good access to infrastructure – roads, airport and proximity to a city, access to skilled labour.
- possible construction start within one year from decision.

19 Swedish Agency for Economic and Regional Growth, 2014: *Etableringen av Facebooks europeiska datacentre i Sverige och Luleå* (Establishment of Facebook's European data centre in Sweden and Luleå).

20 Boston Consulting Group, 2014: *Digital infrastructure and economic development: An impact assessment of Facebook's data centre in northern Sweden*.

21 Energy Norway, 2016: *Locations for data centre enterprises (DCE) in Norway*, written by Asplan Viak AS for Energy Norway.



6 Data centres – a potential new Norwegian growth industry

The main objective of Norwegian industrial policy is to maximise overall value creation in the Norwegian economy within a sustainable framework. The level of value and social welfare we create depends on how we use our combined resources. In an economy with well-functioning markets, society's resources will be allocated to those industries and sectors that generate the highest returns. The state's role is to ensure that the general framework conditions for business and industry are sound. Norway needs new industries that add jobs and value to the economy. Data centres can be a contributor to Norwegian economic growth.

Studies

In recent years, studies have been published that address the economic importance of establishing large, dedicated («hyperscale» or «DCE») data centres, including those of Google and Facebook in Belgium and Sweden respectively.

Facebook in Luleå, Sweden

The consultancy Boston Consulting Group (BCG) has estimated that the construction of Facebook's first data centre in Luleå led to investments of approximately SEK 3.8 billion, of which SEK 1.5 billion was invested nationally.²² During preparation of BCG's report, Facebook began building a second data centre, which will lead directly to national investments of SEK 800 million. BCG estimates that the operation of both data centres will cost Facebook about SEK 316 million

²² Boston Consulting Group, 2014: *Digital infrastructure and economic development: An impact assessment of Facebook's data centre in northern Sweden*.

annually, of which 92 per cent will be spent in the Luleå region. BCG reckons that it took a total of 900 full-time equivalent positions to construct Facebook's first data centre from start to finish. In addition, BCG estimates that daily operation of two data centres will require about 120 full-time equivalent positions annually.

According to the Swedish Agency for Economic and Regional Growth, the first of Facebook's data centres has led to approximately 120 new jobs.²³ The agency estimated in its study that a fully developed facility in Luleå, with three data centre buildings, would result directly in about 200 new jobs. The construction work itself equated to an additional 300 full-time equivalent positions annually in the 2011–2017 period.

Google in St. Ghislain-Mons, Belgium

Copenhagen Economics found similar effects in St. Ghislain-Mons, Belgium, after Google established a data centre.²⁴ Its report shows that Google spent EUR 550 million on construction from 2007 to 2014. Of the total construction costs, only EUR 98 million was spent on imported goods and services. In the 2009–2014 period Google spent EUR 225 million operating the data centre. Many of Google's costs in Belgium are tied to labour, though the report does not say how many full time equivalent positions of work per year can be attributed to permanent operations. A substantial portion is also spent on such needs as water and power supply, security, transport and maintenance of machinery and equipment.

Benefits from a foreign actor's hypothetical establishment of a hyperscale data centre in Norway

Menon Economics has estimated the benefits Norway would stand to gain if a foreign actor were to establish a hyperscale data centre in Norway.²⁵

Menon Economics estimates that the hypothetical establishment of a hyperscale data centre would directly contribute 3,000 full-time equivalent job positions in the 12-year analysis period. When fully up and running the data centre would have direct employment effects of about 225 full-time equivalent positions annually. The direct economic impact for the entire construction period is estimated at approximately NOK 1.3 billion. The direct annual economic effects of data centre operations are seen gradually increasing over the construction period, reaching approximately NOK 160 million per year at full operation.

23 Swedish Agency for Economic and Regional Growth, 2014: *Etableringen av Facebooks europeiska datacentre i Sverige och Luleå* (Establishment of Facebook's European data centre in Sweden and Luleå).

24 Copenhagen Economics, 2015: *The economic impact of Google's data centre in Belgium*.

25 Menon Economics, 2017: *Economic impact of a hyperscale data centre establishment in Norway*, Menon Publication No. 39/2017.



To analyse net local benefits, Menon Economics looked at average housing and labour market regions of three different sizes: small, medium and large. The local employment effect associated with operating the data centre was estimated at 1,222 full-time equivalent positions over the full 12-year period. The impact from data centre operations would be largely the same in the three regions. The total direct employment effect would be somewhat larger in medium-sized or large regions, due to their access to skilled labour and greater involvement by the local business community in the data centre's construction. Likewise, the local economic effects associated with operation and construction would be greatest for a large region, though the impact on smaller regions, relative to their size, would be greater.²⁶ The effects on local employment and economic growth depend on access to competent workers in the region. A region that can provide a large share of employees with the right skills would probably see more economic benefit than the average region.

The studies discussed above give an idea of the value created when technology giants establish large data centres. We must take care, however, to avoid overestimating the effects. The studies look primarily at the impact of the establishment of data centres on employment and economic activity in the economy in general (including indirect and induced effects). What is not discussed is opportunity cost – that is, the value which the best alternative use of the resources would generate. It is not obvious that the data centre industry has more economic impact than, for example, other power-intensive industries.

²⁶ Total (net local) direct economic effects over 12 years: NOK 135 million for a small region, NOK 272 million for a medium-sized region and NOK 371 million for a large region.

No statistics or key figures exist for the data centre industry in particular, so it is hard to make definite statements about value creation and profitability in Norway's data centre industry today in comparison with other industries. One development that suggests the data centre industry could add significant value to the economy in the future, is the exponential increase in generated data that is expected, which in turn suggests a future increase in demand for storage and processing capacity. More and more enterprises are also choosing to lease capacity in data centres or purchase services from the cloud rather than operating their own server rooms or data centres; this, too, contributes to an increased need for data centres.

From the studies discussed above it emerges that most of the value creation associated with data centres occur in their construction. Continued growth of the data centre industry will also help increase business activity for suppliers of data centre components and services. Data centre components, such as servers, have a relatively short service life and need regular maintenance and replacement. This helps keep up the activity level at data centres and creates jobs for operating personnel and service providers.

The establishment of additional data centres could also lead to increased competition for Norwegian resources. Increased demand for labour, real capital and natural resources cause wages and the other resource prices to rise, a development that in isolation creates added value. The arrival of more data centres would also help enlarge the markets for industries that deliver goods and services to the centres. Larger markets mean that production can be scaled and economies of scale can be exploited, resulting in lower unit costs and better resource utilisation.

Internationalisation is another important source of competition in Norway. The presence of international actors in Norway means Norwegian companies will face stronger domestic competition. Increased domestic competition strengthens the incentive of Norwegian companies to develop new products and improve their production processes and business models.



7 Norway as a data centre nation

The Government wants Norway to be an attractive nation for data centres and other data-centric industries.

The Norwegian economy has certain advantages that have enabled us to prosper and to have good opportunities of becoming an attractive data centre nation. Norway's natural advantages include a stable and cold geological climate, as well as renewable energy that is affordable and reliable. We benefit from a skilled workforce, functioning capital markets and political stability. The Government will continue to pursue good, predictable framework conditions for business and industry, including a simpler and more growth-inducing tax system, better infrastructure and a skilled workforce, as well as to facilitate increased trade and investment to and from Norway.

7.1 Norway is a leader in digitisation

Norway is one of Europe's most digitised countries.

With a skilled population that tops world rankings in the use of the internet and new technologies, Norway is well equipped for developing data-centric industries. Ninety-six per cent of the population between 16 and 79 years of age have used the internet in the past three months.²⁷ Ninety per cent used the internet on a daily basis, and virtually everyone under 54 does so. Many service industries, such as banking, finance and tourism, have significantly digitised their business processes,

²⁷ Statistics Norway, 2017: *Nine in ten use internet every day*, published 12 September 2017.

becoming much more efficient. Norway has also had success in many areas in its effort to digitise public services. More and more services provided by government agencies and municipalities are available digitally, and use of such digital services is rising significantly.

Internationally, Norway generally scores high on digital development. In 2016, 45 per cent of Norwegians between the ages of 16 and 74 had good general digital skills, as against 29 per cent in the EU.²⁸ In Europe, only Denmark and Luxembourg do better. According to BCG, Norway is among Europe's «digital frontrunners» – countries that have gone the furthest in digitising various aspects of their societies.²⁹

According to the Digital Economy and Society Index (DESI) 2017, only Denmark is more digitally advanced than Norway.³⁰ Most indicators show Norway on the rise, and compared with the prior year's index it scored higher on public sector digitisation.

The index also shows that Norwegian companies apply new technology to a greater extent than the rest of Europe. Their use of electronic invoicing and cloud services, for example, is 29 and 19 percentage points respectively above the EU average. Norwegian companies also trade online more than their counterparts in Europe.

Norway has seen a significant increase in distribution and use of fixed and mobile broadband in recent years. Several surveys show Norway far ahead of other countries in this area.

Norway also has challenges with regard to digitisation. Norwegian companies view digitisation as important but say they lack the skills and capacity to realise its potential.³¹ As a result, seven of ten companies lack adequate digitisation plans and strategies.

28 <http://www.ssb.no/teknologi-og-innovasjon/artikler-og-publikasjoner/norge-i-europatoppen-pa-digitale-ferdigheter>

29 Boston Consulting Group, 2016: *Digitizing Europe – Why northern European frontrunners must drive digitization of the EU economy.*

30 Digital Economy and Society Index, 2017: <https://ec.europa.eu/digital-single-market/en/scoreboard/norway>

31 Siemens and Norsk Industri, 2016: *Er norske bedrifter klare for den digitale fremtiden? En studie om norske bedrifters syn på digitalisering* (Are Norwegian companies ready for the digital future? A study of how Norwegian companies view digitisation).



Box 7.1.1. The Digital Economy and Society Index

DESI (the Digital Economy and Society Index) measures the performance level of EU countries in the following areas:

- connectivity
- integration of digital technology by businesses
- digital public services
- human capital/digital skills
- use of Internet by citizens

7.2 Norway has renewable energy

Looking towards 2030, one of the Government's energy policy priorities is industrial development and value creation through efficient utilisation of lucrative renewable resources.³²

Norway's renewable resources and well-functioning energy sector are competitive advantages. The Norwegian power supply is renewable, flexible, secure and competitively priced. However, connecting new large power consumers may require additional grid investments. With a suitable location, a new data centre can be connected to the grid quickly and also make efficient use of existing grid capacity. It is therefore important that developers inform the relevant grid company early in the process.

³² Meld. St. 25 (2015–2016) *Kraft til endring – Energipolitikken mot 2030*, a Ministry of Petroleum and Energy white paper on energy policy through 2030.

Power

Norwegian electricity generation is based largely on flexible, climate-friendly hydropower and has a major competitive edge compared to power generation in other parts of Europe and the Nordic region. Not only is water, the main input factor, cost-free, but the generating process itself is emission free and more flexible than in coal and gas fired power plants.

European power markets are undergoing large-scale conversion from fossil energy carriers to renewables, and mostly intermittent forms of power generation. Norway is a net exporter of renewable power.³³ For Norway, using renewable power in new sectors does not require the replacing of fossil-based power production systems. Due to the flexibility of its hydropower plants, Norway is better equipped than other countries in responding to the power system changes stemming from European restructuring.

Norway was an early adopter of market-based power trading. Today, all the Nordic countries are closely integrated in a common physical and financial power market. The interplay between flexible hydropower and other power sources in the Nordic region helps to secure the supply at relatively low costs. This is also why energy costs for Norwegian businesses and industries are low compared to other countries.³⁴

Today, Norway is constructing more renewable power generation capacity than the preceding 25 years, and is already a net exporter of renewable energy in most years. This is expected to be the case for many years to come, contributing to a situation in which Norwegian power prices may at times be markedly below European levels.

Energy policy for mainland Norway from the present through 2030 has been reviewed in a white paper by the Ministry of Petroleum and Energy, *Kraft til endring* (Meld. St. 25 (2015–2016)). The Government will facilitate profitable production of renewable energy in Norway. This should as far as possible take place within the framework of a power market where production is developed on the basis of profitability. This approach makes it possible to use Norway's renewable energy resources in a way that creates the maximum value for society at the lowest possible cost.

Connecting data centres to the power grid

Data centres' connections may occur at different voltage levels in the grid. The size of the data centres will decide the voltage level to which it will be connected.

³³ The Norwegian electric power balance is highly dependent on precipitation amounts, but in a normal year Norway generates a renewable energy surplus.

³⁴ Fraunhofer-ISI and Ecofys, 2015: *Electricity Costs of Energy Intensive Industries: An International Comparison*.



In many cases, smaller data centres in the distribution grid can be connected quickly. Large data centres, especially if built with a load exceeding 100 MW, may require new grid investments, whether at regional or transmission level, depending on location and existing grid capacity.

The grid companies have a duty to provide grid connection for consumption. In the transmission network, the responsibility is Statnett's, while the responsibility at lower grid levels belong to the relevant grid company in the area. Grid companies must analyse, apply for necessary licences and build without undue delay so that the consumer can be connected in an operationally sound manner as soon as possible.

However, the necessary grid investments may take more time to realise than the construction of the data centre. At the point in time when the grid company must begin analysing a potential grid investment, it is often uncertain whether the proposed projects will be realised. Moreover, the actual size of the consumption is often uncertain. Many data centres are planned with a load of 5–50 MW in the beginning, but with the option of subsequent expansion. Given enough customers, a single data centre can end up consuming more than 100 MW at full load. For necessary grid investments to be considered and implemented in time, the grid companies must be kept well informed about large consumption increases. Binding agreements between the relevant grid company and the enterprise seeking connection can help improve coordination and reduce the risk

of unnecessary planning and misguided investments on both sides.

Location

Since grid investments are costly and time consuming, it is helpful if the actors receive relevant information enabling them to select a location where there is available grid capacity.

The grid capacity is signalled to actors in several ways. Power system studies are produced for 17 regional areas in Norway. In addition, Statnett creates a network development plan for the transmission grid. These studies are updated biannually. Together they provide a valuable overview of development aspects and planned grid investments, and they also provide actors with information on how the location of production and consumption facilities will affect the power system.

In addition, the marginal loss component in the grid tariff and the different power price areas both provide locational signals for new enterprises. Grid companies may also impose connection charges to cover the direct costs of connecting consumption and production at lower grid levels. In the transmission grid and the meshed regional grid, connection charges are not currently permitted, except in exceptional cases. So far no exceptions have been made. The Norwegian Water Resources and Energy Directorate (NVE) is evaluating potential measures to more effectively signal the costs of establishing an enterprise at various locations in the grid; one possibility under consideration is increased use of construction charges at higher grid levels.³⁵

7.3 A good framework of direct and indirect taxation

The Government has reduced the consumer tax on electricity supplied to large data centres in order to make Norway an attractive data centre nation.

The Government has won approval to exempt production equipment and production installations from property tax, starting in 2019.

The Government uses tax policy as an instrument to increase value creation and improve the environment. The white paper on taxation³⁶ emphasised continued reliance on the principles of equal treatment, broad tax bases and low tax rates. It is important to facilitate economic growth in the best ways possible. The Government has adopted direct and indirect tax reductions totalling about NOK 23 billion through

35 Ministry of Petroleum and Energy. 2016. Meld. St. 25 (2015–2016) *Kraft til endring – Energipolitikken mot 2030* (white paper on Norway's energy policy: Power for change)

36 Meld. St. 4 (2015–2016) *Better Taxation – A Tax Reform for Transformation and Growth*, a Ministry of Finance white paper.

2017. The corporate tax, the net wealth tax, the consumer tax on electricity and the property tax are of particular relevance to the data centre industry.

Tax on ordinary income

The Government puts a priority on reforms in direct and indirect taxation that strengthen economic growth potential, ease transformation processes and create new jobs, first and foremost by following through on the tax reform that a broad-based majority of the Storting has endorsed. The tax rate on ordinary income for companies and persons has been reduced from 28 per cent to 24 per cent in the 2013–2017 period. In the national budget for 2018, the rate is reduced further, to 23 per cent. The rate reduction will benefit all sectors of the business community and other taxpayers. By comparison, the corporate tax rate in Sweden and Denmark is 22 per cent, while in Finland and Iceland it is 20 per cent.

Net wealth tax

Since 2013, the Government has reduced the net wealth tax by about NOK 5.4 billion. In 2017 a 10-per-cent valuation discount was introduced for shares and operating assets and associated debt. These changes dampen the negative effects of the net wealth tax and facilitate an increased flow of Norwegian capital towards business activity. In line with the compromise settlement on tax reform, this discount is being further increased, to 20 per cent, in the 2018 national budget.

Tax on electric power

For power delivered to large data centres, the consumer tax on electricity (*elavgift*) was reduced starting 1 January 2016. The purpose of the tax rate reduction was to improve Norway's attractiveness as a host to large data centres, including international actors. A condition set for receiving the reduced rate was to have a power draw exceeding 5 MW, a provision modelled on one that Finland introduced with effect from 1 April 2014.

It turns out that data centres established or under development in Norway have not yet reached the size that was expected when the power draw condition was set at 5 MW. In the interest of continued data centre development in Norway, the power draw condition was lowered to 0.5 MW from 1 January 2017.

In 2017 the ordinary rate was 16.32 øre per kWh and the reduced rate was 0.48 øre per kWh. That represents about NOK 7 million per year in savings for a 5 MW data centre, and about NOK 700,000 a year for a data centre drawing 0.5 MW. Reduced rates for large data centres are seen as being compatible with the EEA Agreement.

Denmark, Finland and Sweden have also lowered power consumption tax rates for large data centres – though with varying delimitations and rates:

- Denmark extended its reduced rate for production processes (about 0.5 øre per kWh) to all fields of business as of 1 January 2014 (previously it had applied mainly to industry), thereby including data centres among beneficiaries of the reduced rate.
- Finland included data centres with a power draw of at least 5 MW among installations charged a reduced rate (about 6.5 øre per kWh, available otherwise mainly to industry), starting 1 April 2014.
- Sweden included data halls with installed capacity exceeding 0.5 MW (not including cooling and fan systems) among recipients of its reduced rate (about 0.5 øre per kWh, available otherwise mainly to industry), starting 1 January 2017. For the 2018 budget, the Swedish Government proposes to reduce the tax for smaller data centres as well by lowering the installed capacity requirement to 0.1 MW.

Property tax

An important factor in determining whether to establish a data centre is the possibility of property tax being imposed.

Property tax is a municipal tax. The municipal council of each municipality decides whether property tax is to be levied in that municipality. Under current law municipalities may exercise a degree of discretion in the design of the tax, with such authority justified in part by the possibility it affords to adjust the tax to local conditions. Within the strictures of the law municipalities are able to determine such aspects of the tax as the types of property included, the rate charged, and any rate differentiations to be applied. The tax basis of a property is its market value, but in making their assessments municipalities are permitted to apply a percentage-based reduction (reduction factor).

A municipality may choose to levy property tax on all real estate in the municipality. A levy specifically on commercial property is another alternative. *Works and installations* is both a category under commercial property and a stand-alone levying alternative. Property tax is a tax on real property. A distinctive feature of industrial property classifiable as *works and installations* is that, when assessing it, machinery and accessories are to be included when «the thing is a part of the enterprise». Power plants are considered *works and installations*, but are assessed according to separate rules.

In 2017, 366 of 428 municipalities exercise the opportunity to levy property tax in all or part of their jurisdictions. 348 municipalities employ a levying alternative that includes properties categorised as *works and installations*.

In the context of property taxation, just what constitutes a data centre is not defined. The term appears generally applicable to everything from a dedicated room in a company's own locale to large buildings designed exclusively to house

computer equipment. Examples of the latter would undoubtedly be seen as commercial property when levying property tax. The law does not directly indicate whether such facilities are also to be categorised as *works and installations*. Nor does case law clarify this particular difficulty. Whether to count machinery, etc., in determining a property's tax basis hinges on an overall discretionary assessment with multiple factors to be considered. Legal precedent requires special emphasis on the degree to which the machines, servers etc., are integrated, the potential cost of moving them and the possibility for alternative use of the buildings.

The Supreme Court has issued decisions in which property tax has been imposed on cable TV, fixed telephony and broadband facilities. The decisions indicate that facilities for, and consisting of, electronic equipment may be regarded as *works and installations*, and thus be subject to property tax.

The property tax has contributed uncertainty and heightened risk to new data centre ventures, whose backers seek long-term, predictable framework conditions. The equipment inside data centres has great value, and any taxation of it would entail significant economic consequences. Removing the so-called «machinery tax» has therefore emerged as one of the data centre industry's top policy priorities.

According to the Sundvolden Declaration political platform, the Government will «exempt fixed, non-integrated machines from property tax in industrial facilities (not including power plants)». In June 2015, the Ministry of Finance circulated for hearing a proposal to remove property tax on machinery and accessories in *works and installations*.³⁷

In its draft national budget for 2018, the Government proposed that *works and installations* be taxed as «other commercial property» starting in 2019, without including «production equipment and production installations». Subsection 7.1.4 of the Government's 2018 budget proposal (Prop. 1 LS (2017–2018)) states: *The term «production equipment» is intended to include assets that perform a function in the production process, such as machine processing of raw materials. The term includes all production equipment without regard to the degree of physical integration. It states furthermore: Computers and servers will be considered as production equipment and production installations when they are part of the production process. The same will apply to cables, shelving and columns for storage of computer equipment, to facilities for emergency power supply, cooling and stable humidity, and to fire extinguishing equipment when such equipment is installed directly on account of the computer equipment. This means that production equipment and production installations in, for example, data centres will be exempt from property tax.*

³⁷ <https://www.regjeringen.no/no/dokumenter/horing-om-eiendombeskatning-av-arbeidsmaskiner-mv.-i-verk-og-bruk/id2423331/>

Under the budget agreement entered into by the governing parties, the Liberal Party and the Christian Democratic Party on 22 November 2017, the Government's proposal to amend the property tax is included in the national budget agreement for 2018, except that the phase-out of the tax is to be extended from five to seven years. The budget agreement further states that property tax will continue to be levied on the power grid. The amendments to the property tax rules help improve conditions for business sectors that have invested in this type of equipment. They also encourage more job creation, including in the data centre industry.

7.4 The Government's commitment to transport and communications

Opportunities for growth and new jobs in the data centre industry and in business as a whole depend on the effectiveness of communications solutions. For the data centre industry and other data-centric industries, physical proximity to markets and customers is no longer a prerequisite. Data can be transmitted quickly over long distances and at low cost. Where enterprises choose to site their data centres, therefore, is often a function of other factors, including energy costs. In principle, data centres can be established anywhere in the country, including the more rural areas, though some data centre actors specify that they require a nearby major city and an international airport. Railways, roads, ports, airports and digital infrastructure are necessary if the entire country is to be used. Being competitive in business requires modern, high-quality infrastructure and safe, efficient transport systems. Reduced transport costs improve business competitiveness and help allow labour markets across the country to function well. The Government's transport policy is described in Meld. St. 33 (2016–2017), a white paper titled *National Transport Plan 2018–2029*. Better infrastructure will result in easier and safer everyday travel, with shorter travel times, more mobility and increased competitiveness. The white paper sets out funding frameworks for roads, railways and coastal affairs in the 2018–2029 period. It proposes a budgetary framework of NOK 933 billion and assumes NOK 131 billion in road toll proceeds (2017 price level) for the planning period.

7.5 Facilitating electronic communications

The Government wants high-quality electronic communications networks to be a competitive advantage for business and industry across the country.³⁸

³⁸ Ministry of Local Government and Modernisation, 2016: Meld. St. 27 (2015–2016) *Digital agenda for Norge – IKT for en enklere hverdag og økt produktivitet* (Digital agenda for Norway – ICT for a simpler everyday life and increased productivity).

Access to good electronic communications with high supply security and multiple routes out of the country, as well as good digital infrastructure in general, is important for the data centre industry and for the rest of Norway's business community.

The data centre industry focuses on several specific aspects of electronic communications access when decision-making about new facilities: low latency (time delay) in the lines, access to fibre optic capacity (dark fibre, optical channel and other transmission services) and multiple independent lines to minimise the risk of downtime.

Norway's fibre infrastructure has been developed by a large number of actors and can appear fragmented. The electronic communications sector is characterised by competition and private ownership, including the core network infrastructure (i.e. «central fibre networks»). Broadnet and Telenor each have their own national transport network. Statnett and the Norwegian National Rail Administration each own and dispose networks – Statnett in the high-voltage grid, and the rail administration along railway lines. These networks cover large parts of the country. Altibox, with its partnership model, has a comprehensive fibre network covering all counties in the country. The other actors have local or regional fibre networks, which in some cases are linked.

Availability of dark fibre, including pathways exiting country

Dark fibre is available between most of Norway's regional centres and geographical regions, except for the Bergen area and western Norway, where the availability of contiguous dark fibre is limited. Over the mountains between Bergen and eastern Norway, no dark fibre is available.

Long-distance dark fibre connections are usually achieved using fibre from multiple network owners. Data centre actors may therefore find it challenging to establish practical point-to-point dark fibre connections in Norway without contracting with a number of network owners. In much of the country, moreover, there are few providers, and outside of the greater Oslo region pricing must be regarded as relatively high.

Installing new fibre optic cables to other countries takes large investments. Today there are a handful of international carriers providing data traffic in a relatively competitive environment from the Oslo area to network hubs in Europe via Sweden. At a higher price, some carriers serving the oil and finance industries also provide traffic with especially high-speed requirements from Oslo via the UK and Denmark. The strong competition from Oslo via Sweden means that prices for regular traffic over this route are significantly lower, giving the actors little

incentive to invest in new fibre or to make use of existing subsea cables. As a result most data traffic out of Norway today goes through Sweden. There are several physical route between Norway and Sweden, but in practice most traffic is routed via a few network hubs in the greater Oslo region and onward to Sweden using a small number of transmission routes. Traffic passing through Sweden is routed mainly to network hubs in Copenhagen and onward to key hubs in other European countries.

The fact that almost all traffic out of the country is funnelled through infrastructure based in the Oslo region and onward to Sweden and then Copenhagen represents a vulnerability. Wider distribution of foreign-bound traffic, using direct fibre connections to a larger number of countries, would reduce the vulnerabilities associated with being unilaterally dependent on a single country and having a physical concentration of fibre connections and network nodes.

Initiatives are under consideration to establish new subsea cables to the United States, the United Kingdom and Germany as well as to Asia via the Northeast Passage. These would help remedy the vulnerabilities identified. In a long-term perspective, linking Norway directly to the United States, the United Kingdom, Germany and Asia could make Norway an alternative hub for intercontinental data traffic and thus more attractive as a data centre nation. One thing these initiatives have in common, however, is that for now there seems to be inadequate market basis for realising them without incentives. This is due in part to the high residual capacity and relatively low prices for transmission services to other countries through the existing links from Oslo to Sweden.

In the 2018 national budget the Government has won approval for two new initiatives to increase security and robustness in electronic communications, both of which should ensure that the data centre industry's need for connectivity is better served. Communications network suppliers are currently dependent on key aspects of Telenor's core network to provide their services. The core network designation refers to transport networks and control systems necessary for the functioning of electronic communications networks like those for mobile telephone service and broadband. Substantial faults in this network could disable electronic communications across the country with serious consequences for a wide variety of activities considered critical to society. The Government therefore proposed funding of NOK 40 million in 2018 for a pilot alternative core network scheme. The aim is to establish an operational alternative core network market to be utilised by enterprises of critical national importance as well as by other users.

The Government also proposed a total of NOK 100 million to facilitate investments in additional fibre cables to other countries, with a NOK 40 million appropriation

in 2018 and a commitment authorisation of up to NOK 60 million. At issue is the significant vulnerability resulting from the fact that most outbound electronic communication from Norway goes from the Oslo area via a small number of pathways to Sweden and onward to network hubs in Europe. The appropriation first and foremost will help to alleviate the vulnerabilities associated with having a single route through Sweden, but it will also help accommodate data based business activities, including the data centre industry, and improve connections along the coast and to North Norway. The Norwegian Communications Authority will be responsible, in close consultation with the Ministry of Transport and Communications, for practical implementation of both the pilot scheme and the funding to facilitate investments in fibre optic cable to other countries.

New trenching and excavation rules

The Government wants to make it easier and cheaper to install broadband across the country. Digging costs generally account for 70-80 per cent of the cost of extending fibre. The rules and fees associated with laying fibre optic cable under roadways have varied from municipality to municipality. As a result, the extension of broadband, fibre and digital infrastructure has been unnecessarily bureaucratic, time consuming and expensive.

The Ministry of Transport and Communications has adopted new rules for cable installation on public road property, including bridges and tunnels (cabling regulations). The new rules will help make framework conditions more predictable for those involved in laying cable. Sensible trenching and excavation rules will make it possible to extend high-speed broadband service to more users. Good network access is important for residents and businesses around the country.

The new regulations include backfilling rules applicable nationwide. In addition, the use of modern excavating methods such as microtrenching is to be permitted where circumstances permit. The new rules take effect on 1 January 2018.

7.6 Site development

The Government will prepare guidance for planning and licensing issues to facilitate efficiency, quality, reduced processing times and increased predictability in these processes.

The Government will initiate a project to ensure that information related to setting up industrial enterprises is readily available and translated into English, and that a timeline is created with an overview of permits needed to establish an industrial enterprise in Norway.

Developing a property site for a data centre requires considerable effort and can be compared to the preparation needed to establish other major industrial enterprises. Large areas must be regulated, the provision of technical services must be clarified and as many uncertainties as possible must be resolved before a customer will consider putting up a centre. In some cases, licensing is required for power installations and geotechnical feasibility studies. Environmental impacts must be studied and neighbours and local communities must be afforded the opportunity to comment.

Site development challenges may include a lengthy processing time for planning and licensing issues. Clarifications may be required in connection with land use rezoning, cabling (electrical and fibre optic), personnel recruitment, etc. In these processes the Government seeks to facilitate efficiency, quality, reduced processing time and increased predictability. The Government therefore wants to see guidance prepared on planning and licensing issues, with relevant parties invited to contribute to the work involved.

For foreign investors thinking about establishing an industrial enterprise in Norway, information about the Norwegian system may be hard to obtain. Very little information in English is available on regulations pertaining to planning and building, energy supply, policy measures and other topics. For foreign actors, this can make it hard to set up an industrial enterprise in Norway. The Government will initiate a project to ensure that information related to the establishment of industrial enterprises is readily available in both Norwegian and English. It will also create a timeline with an overview of permits required to establish an industrial enterprise in Norway.

Data centre actors and interest organisations consider it problematic that access may be requested to documents they send to the authorities in connection with establishing a data centre; their concern is that such documents often contain sensitive information about business affairs or strategy. Section 3 of the Freedom of Information Act stipulates that all case documents, records and similar files contained in public administration registries are in principle open to inspection, and that anyone may demand access to them.

As regards the duty of confidentiality of business information, it is the Public Administration Act that establishes the key rule. Section 13, first paragraph, number 2 of the Act states that anyone performing services to, or working for, an administrative agency is obliged to prevent others from obtaining knowledge of what the service provider or worker learns regarding *«technical devices and procedures, as well as operational or business matters which for competition reasons it is important to keep secret in the interests of the person whom the information*



concerns». In other words a government agency, such as a municipality, has a duty to prevent others becoming aware of information that it would be important for the party concerned to keep secret for competitive reasons. The purpose of the provision is to prevent the spread of information that could lead to a risk of financial loss for the company, person or party in question as a result, for example, of competitors exploiting the information in their business activities. This means that when the public administration receives a request for access to information containing a commercial actor's business analyses, calculations or other trade secrets, the administration has a duty to prevent others becoming aware of such information. Section 13, first paragraph, number 2 of the Public Administration Act thus provides clear grounds for an exemption from the general provision on freedom of information contained in section 3 of the Freedom of Information Act (see also section 13, first paragraph). The duty of confidentiality pertaining to business information is therefore conducive of mutual trust between companies and the public sector, and provides the security needed to prevent unauthorised access to business-sensitive information.

7.7 Expertise

The Government aims to ensure that the public sector and the business community have good access to ICT skills.

ICT expertise and ICT research are basic requirements for Norway's digitisation as well as important aspects of the Government's commitment to education and research. The ability to develop and apply technology, and to be able to adapt to an increasingly demanding and changeable landscape, will be crucial to Norway's development and wellbeing.

The Government aims to ensure that both the public sector and the business community have good access to ICT skills. ICT is undergoing rapid development, both as an academic subject and an enabling technology. Access to advanced ICT skills is of crucial importance.

Productivity growth in the Norwegian economy has been weak in recent years. Good access to advanced ICT skills in business and the public sector can make us better able to apply ICT effectively, as well as contributing to increased productivity in the process. That is why a key focus of Norway's broader policy on ICT is to invest in digital competence in schools as well as in higher education and research.

Universities, colleges and other research organisations are more important than ever to making the knowledge society a reality and helping transform Norway's economy. If Norway were to experience a shortage of job candidates with advanced ICT skills, the country's future productivity and wellbeing could be impaired.

Data centres are an example of a forward-looking industry that needs workers with ICT skills and other advanced technology expertise. That is the case not only for data centres, but for large parts of the value chain associated with them.

Box 7.7.1. Advanced ICT skills

Advanced ICT skills are those possessed by people with a bachelor-level ICT education or higher, they be themselves computer scientists, engineers or graduates of other educational programmes and disciplines with a large ICT component, such as health or business informatics.

It appears likely that the need for advanced ICT skills will increase in future. The need is growing with special urgency in the private services sector, but the public sector and the industrial sector are strongly influenced, too. According to one study, in 2030 the public and business sectors may face a shortfall estimated at more than 10,000 people possessing advanced ICT skills.³⁹ In 2015 six per cent of Norwegian enterprises recruited or attempted to recruit ICT specialists.⁴⁰ Of these enterprises, 21 per cent experienced difficulty in filling vacancies requiring ICT specialists. That

39 DAMVAD and Economics Norway, 2014: *Dimensjonering av avansert IKT-kompetanse* (Dimensioning advanced ICT expertise).

40 Statistics Norway, 2015: *IKT-kompetanse i norske foretak: Hvert femte norske foretak har ansatt egne IKT-spesialister* (ICT skills in Norwegian enterprises: Every fifth Norwegian enterprise has hired its own ICT specialists), published 12 May 2017.

share was down from 32 per cent in 2014 and 37 per cent in 2013, a decline that may indicate it became easier to recruit ICT specialists during those years.

To address the situation the Government – in its 2018 national budget – proposed that the 500 ICT study places funded in the 2017 budget should be increased in the ordinary manner so that the institutions can take in new cohorts of students. In total this would result in 2,000 new study places, including the 500 from 2017, when the increase is fully realised in 2021. In the budget agreement reached by the governing parties, the Liberals and the Christian Democrats on 22 November 2017, an extra 500 ICT student places were added to the Government's proposal, with effect from 2018.

7.8 The public sector as customer

Strategic choices regarding which services to outsource and which to perform in-house are based on a sourcing strategy. Enterprises outsource services to external parties for a variety of reasons. Some wish to achieve economies of scale or to focus on their core business, while others outsource because they lack the capacity or expertise to maintain service levels internally.

Competitive tendering of services is discussed in the Productivity Commission's first report.⁴¹ Among potential benefits from exposure to competition, the commission highlights «cost reductions and increased attention given to core tasks, increased flexibility, improved service quality and access to specialised expertise».

It is the Government's policy that the public sector should not do what the market can do better and more efficiently.⁴² In 2016, the Government put forward a Cloud computing strategy which states that public agencies must consider cloud services when procuring new ICT solutions. When there are no special obstacles to using cloud services, and when such services are the most appropriate and cost-effective solution, they should be chosen.⁴³

Because public enterprises differ, the efficiency of using the market will vary from enterprise to enterprise, so it is important for them to develop a strategy that reflects their own situation and their own needs.

The Government wants all public enterprises to make a conscious choice about whether or not to outsource IT services. One of the measures contained in

41 NOU 2015: 1 *Productivity – Underpinning Growth and Welfare*, the Productivity Commission's first report.

42 Ministry of Local Government and Modernisation, 2016: Meld. St. 27 (2015–2016) *Digital agenda for Norge – IKT for en enklere hverdag og økt produktivitet* (Digital agenda for Norway – ICT for a simpler everyday life and increased productivity).

43 Ministry of Local Government and Modernisation, 2016: *Cloud computing strategy for Norway*.

the Government's Digital Agenda is therefore that all government agencies be required to have a strategy in areas where it would be relevant to have one.⁴⁴ The requirement is communicated to all government agencies through the circular on digitisation issued by the Ministry of Local Government and Modernisation.⁴⁵ This circular further states that «*agencies that establish new or upgraded existing technical systems or digital services, or change or renew agreements related to operations, must consider cloud services in line with other solutions*».

The public sector spends more than NOK 500 billion a year on procurement. Public enterprises can save a great deal by streamlining, and they must better utilise opportunities to develop and innovate. The Government will develop a comprehensive procurement policy and pave the way for better, more efficient public procurement. A white paper on public procurement is planned for 2018.

The procurement regulations have undergone a revision and entered into force on 1 January 2017. The new rules are more flexible and they reduce legal ambiguities and administrative burdens. Effective enforcement of the procurement rules is important. Enforcement in cases of serious violations of the regulations has been strengthened by reauthorising the Norwegian Complaints Board for Public Procurement to impose fines for illegal direct procurement, as from 1 January 2017.

In the summer of 2016, the Government assembled an external working group to study and evaluate the competitive conditions under which public and private enterprises operate, and to consider measures to ensure a level playing field between private and public actors in the same market. The working group submitted its report 23 January 2018. Addressing the report's findings will be a top priority for the Government in 2018, ensuring that private and public actors in the same market enjoy a level playing field and enabling public agencies to perform their duties well and efficiently.

7.9 Internationalisation and investment

One of the Government's key ICT policy priorities is for Norway to be part of Europe's digital single market.

The Government will strengthen the promotion of Norway as a country for investment.

Norway has a small, open economy that benefits greatly from trading abroad. Its domestic market is small compared with that of many other countries, and foreign

⁴⁴ Ministry of Local Government and Modernisation, 2016: Meld. St. 27 (2015–2016) *Digital agenda for Norge – IKT for en enklere hverdag og økt produktivitet* (Digital agenda for Norway – ICT for a simpler everyday life and increased productivity).

⁴⁵ Ministry of Local Government and Modernisation, 2017: Circular H-07/17 *Circular on digitisation*.

trade and investment are important for Norwegian business and industry. Norway could not have achieved its current level of prosperity without international trade and investment. The Government has presented a Strategy for Export and Internationalisation with the goal of facilitating an increase in trade and investment to and from Norway.

The EU's digital single market

Norway is part of the European Economic Area (EEA). The EEA Agreement is the fundament of Norway's cooperation with the European Union (EU), linking Norway to the EU's single market. The EU is Norway's most important trading partner, and Norway collaborates with the EU in a variety of important policy areas. What the EU does for the digital single market has a direct impact on Norway. One of the Government's key ICT policy priorities is for Norway to be part of Europe's digital single market.

In May 2015, the European Commission presented its strategy for development of the Digital Single Market (DSM).⁴⁶ The goal is to enable businesses and private individuals to interact by digital means easily and effectively across national borders. According to the commission, that could open up a digital market of more than 500 million people, triggering large benefits.

An important element of the DSM strategy is to better facilitate digital infrastructure and digital services. This includes revising regulatory frameworks for electronic communications, security and trust, consumer protection and personal privacy.

It is very important to ensure that service providers experience equal terms and conditions across the single market. Different requirements, such as for privacy protection, could mean different competitive conditions. A harmonised privacy policy throughout the EU/EEA is needed for a well-functioning digital single market. The EU's Data Protection Directive was replaced in 2016 by the General Data Protection Regulation (GDPR)⁴⁷, harmonizing privacy laws in Europe. This regulation will be incorporated into Norwegian law in 2018.

Free movement of data in the EEA

The data centre industry is one where Norway can gain a solid position in Europe and the rest of the world. For this to happen it is important that public and private enterprises in other countries have the opportunity to store and process data beyond their own national borders, so that Norwegian data centres can compete to provide services to those enterprises. While energy costs, area development

⁴⁶ Communication From The Commission To The European Parliament, The Council, The European Economic And Social Committee And The Committee Of The Regions A Digital Single Market Strategy for Europe {SWD(2015) 100 final}

⁴⁷ <https://www.eugdpr.org/>

plans and tax rules are important factors when data centre actors consider where to build, market size is also a deciding factor. The European Commission believes that differing national data-localisation requirements are an important reason why only four per cent of the world's data is stored in Europe.⁴⁸

In order to ensure predictability for suppliers and customers alike, it is important to have uniform requirements throughout the EEA. If actors wishing to establish a data centre in an EEA country must provide solutions that can only process certain types of data depending on the country where the customer is located, the result will be complex business models and costly services. When regulations differ for different types of data, customer uncertainty arises in both the private and public sectors. If Europe is to compete with the United States and Asia in cloud services, there must be a uniform and clearly communicated regulatory framework describing what is allowed and what is not allowed when transmitting data across national borders. Only then can the entire EEA be seen as *one* market, including for data services.

The European Commission wants therefore to remove technical and legal barriers that exist today, including inadequate standardisation and national regulations that hinder the free flow of data. It is especially important to avoid unjustified national constraints on where data can be stored within the EEA.

In practice, the implementation of common European rules on personal data protection means that privacy may no longer be used as an argument for national storage requirements. It will make the European data market more predictable and will probably have synergies for other types of data as well.

In the autumn of 2017, the European Commission also proposed a regulation on the free flow of non-personal data in the EU.⁴⁹ This proposed regulation introduces the principle of free data flow and suggests requiring member states to remove national regulations that restrict the ability to store data outside their borders unless the data is restricted on security grounds.

The Government supports the EU's work towards a digital single market and the removal of unwarranted national data-localisation requirements.

48 COMMISSION STAFF WORKING DOCUMENT on the free flow of data and emerging issues of the European data economy. Accompanying the document Communication Building a European data economy {COM(2017) 9 final}

49 COM(2017) 495 final. Regulation of the European Parliament and of the Council on a framework for the free flow of non-personal data in the European Union.

Marketing Norway as a country for investment

Invest in Norway (IIN)⁵⁰ is a part of Innovation Norway⁵¹. IIN promotes Norway as a country for investment and handles inquiries from companies seeking to establish themselves here. It does so in cooperation with Innovation Norway's district offices when appropriate as well as with external offices in the markets from which interest originates.


In 2015 and 2016, Invest in Norway received expressions of considerable interest in Norway as a host country for large data centres, and spent about half of its available resources attending to this interest. The work consisted of finding sites that satisfy the technical specifications of customers; facilitating communication with property owners, municipalities, power companies and fibre actors; and gathering and conveying information on general technical and regulatory affairs in Norway as host country. Tailored to customer preferences, programmes were made and site visits carried out, with supplementary meetings on particular topics held both centrally and locally.

In the course of this work Invest in Norway has learned by experience what international actors are seeking. On that basis, Invest in Norway has developed tools to assist Norwegian site developers and it participates annually in about 20 different conferences and meetings focused on this industry around the country. Invest in Norway has also marketed Norway's offerings at international data centre conferences.

Norway shall be an attractive host country for international investors and entrepreneurs. Innovation Norway's Invest in Norway function has proved an effective tool for handling inquiries from international investors that are considering establishment in Norway. The Government will strengthen its funding to Invest in Norway to facilitate foreign investment and make Norway a more attractive country in which to invest. The national budget for 2018 increases the funding for this effort by NOK 10 million. As part of Invest in Norway's development, a study will be carried out to determine how Norway can become better at attracting foreign investment and expertise

50 <http://www.innovasjon Norge.no/en/start-page/invest-in-norway/>

51 <http://www.innovasjon Norge.no/en/start-page>



The Government's goal is for Norway to become an attractive nation for data centres and other data-centric enterprises.

Therefore, the Government will:

- remove property tax from production equipment and production installations in industrial property classified as works and installations
- facilitate installation of fibre optic cables to other countries
- establish a pilot alternative core network scheme
- introduce new rules for cable installation on public road property
- strengthen Innovation Norway's Invest in Norway function
- prepare guidance for planning and licensing issues
- ensure that relevant information on establishing an industrial enterprise is easily available and translated into English
- create a timeline with an overview of permits required to establish an industrial enterprise in Norway
- carry out a mapping of the data centre industry in Norway



Utgitt av:
Nærings- og fiskeridepartementet

Offentlige institusjoner kan bestille flere
eksemplarer fra:
Departementenes sikkerhets- og serviceorganisasjon
Internett: www.publikasjoner.dep.no
E-post: publikasjonsbestilling@dss.dep.no
Telefon: 222 40 000

Publikasjonskode: W-0021 B
Design og ombrekking: Melkeveien Designkontor
Foto: AdobeStock (der ikke annet er angitt)
Trykk: Departementenes sikkerhets- og serviceorganisasjon
02/2018 – opplag 50