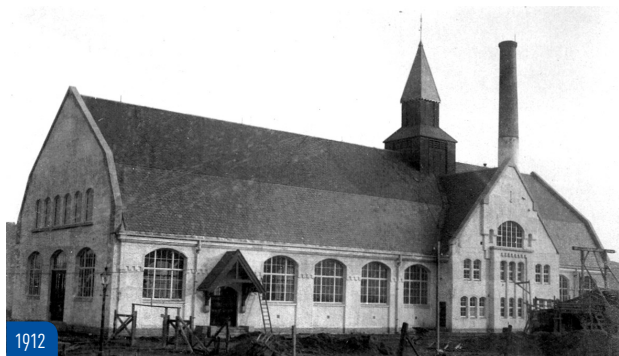


FUTURE-FOCUSED ENERGY LABORATORIES

– Through the Years

A timeline with selected contributions to society, from the start of NTNU via the establishment of SINTEF until today's Department of Energy and Process Engineering at NTNU.





1910

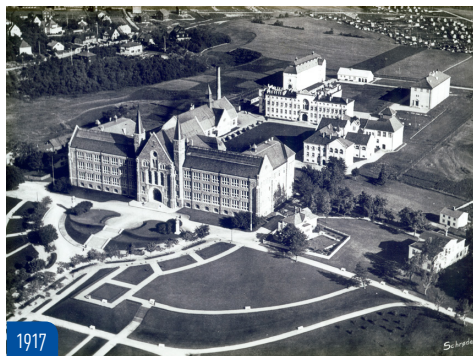
The Norwegian Institute of Technology (NTH), one of NTNU's predecessors, opens in Trondheim: The university was inspired by the German model of higher technical education with a combination of polytechnic basic education and specialized professional education. General education with the common subjects of physics, mechanics, mathematics, technical drawing and chemistry played a key role.

1912

The Thermal Power Laboratory is completed, headed by the university's first professor, Adolf **Watzinger**. This was the forerunner of today's **Thermal Energy Laboratories**.

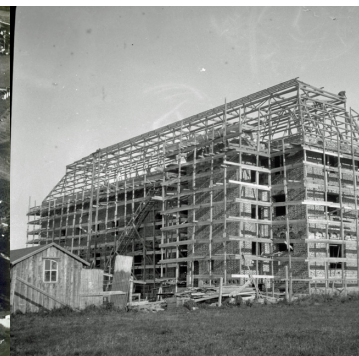
1917

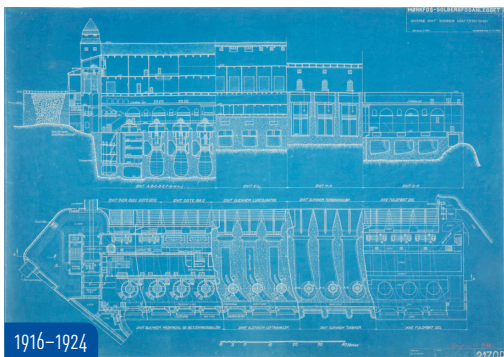
The **Waterpower Laboratory** is completed, with help from the Prime Minister: NTH's first professor of hydropower machinery was Gudmund Sundby. After Sundby's application to build the laboratory was rejected by NTH's leaders, he contacted his old friend, Norway's Prime Minister Gunnar Knutsen from the Liberal Party (Venstre). The first funding for the laboratory was soon in place, and grants continued until it was complete.



1916 – 1924

The construction of the Solbergfoss plant was vital for the development of turbine technology: Hydropower laid the foundation for a major export-focused industry, often developed far from the cities. Much of the work at the Waterpower Laboratory involved resolving urgent issues facing Norwegian industry. The most well-known example is the work on the development of the **Solbergfoss power plant**. With help from his assistants Henrik Christie and Leif Søsnes, Gudmund Sundby achieved a dramatic increase in the efficiency of the Myren and Kværner turbines, which boosted income for Solbergfoss, as well as for later development projects and for the country.





1916–1924



1945 →



1950–1985

1945 →

Cooling technology and freezing plants in the post-war period: After the war, large-scale development of freezing equipment began in connection with the Norwegian fishing industry. The idea was that frozen fish would fetch better prices than dried fish on overseas markets, among other advantages. Gustav Lorentz was a pioneer in refrigeration technology, and after the war he played an important role in developing plans for Norway's fish freezing industry. He later became a professor at NTH, and was responsible for building the refrigeration technology research community at NTNU and SINTEF, now counting more than 100 researchers.

1950 – 1985

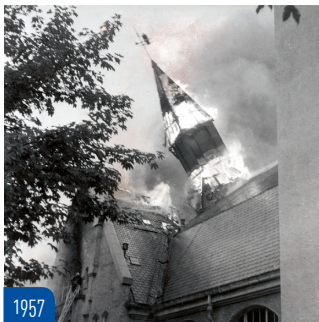
A new era for hydropower started after the war. This period saw the development of most of the exploitable hydropower in Norway. Today, hydropower accounts for about 96% of Norway's generation capacity.

1950

SINTEF is founded, originally as the Foundation for Scientific and Industrial Research at the Norwegian Institute of Technology. Today it is operated as a non-commercial research foundation, where profits are invested in laboratories, scientific equipment and new research.

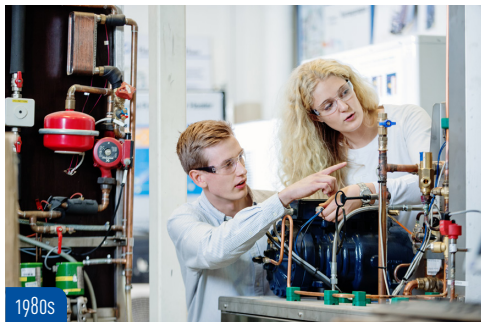
1950

The Department of Steam Technology is founded, with Professor Dag Gotskalk **Johnson** at the helm. A discipline that Johnson started and developed was **combustion technology**, a knowledge base for one of the largest energy consumers in industry and society.



1957

The Thermal Power Laboratory burned down to the ground: The main part of the new building for the Thermal Energy Laboratories was completed in 1962.



1980s

1958

The Laboratory for Heating and Sanitation Engineering was founded and headed by Professor Johan Grønningstøer. Stricter requirements for indoor air quality in workplaces with many employees put **HVAC research** on the agenda.

1980s

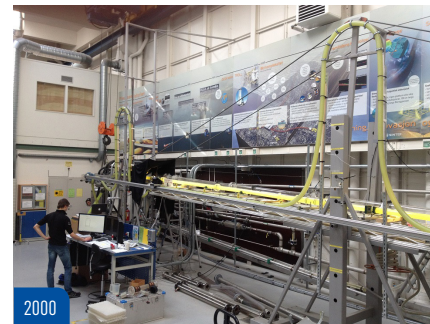
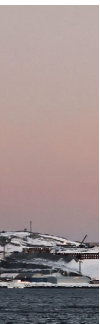
Cooling technology solves environmental problems: The World Commission on Environment and Development, chaired by former Norwegian Prime Minister Gro Harlem Brundtland, launched the new field of "Sustainable Development" in 1987. The academic communities at NTH and SINTEF contributed to the campaign against CFC gases and the hole in the ozone layer through initiatives such as the use of **natural refrigerants** in heat pump technology, which we find in refrigerators and freezers.



1980s

1980s

Profitable **LNG technology** for cooling gas: When the Snøhvit field was discovered, an American company had a near monopoly on the LNG technology that was needed. The NTH and SINTEF environment set out to develop new heat exchangers that could break the monopoly. That would make development of the Snøhvit field profitable. Professor Einar **Brendeng** was later appointed a Knight First Class of the Royal Norwegian Order of St. Olav for his research contribution to LNG technology. Former Statoil Director Olav Fjell has commented that it is unlikely that the Snøhvit development would have taken place without Brendeng's foresight and research.



1982

The large **wind tunnel** in NTH's fluid mechanics laboratories is complete. Today the tunnel is used for experiments ranging from wind turbines to ski suits. The Norwegian Olympic Sports Centre has used the tunnel for testing since the 1990s. Norway's first doctorate in sport aerodynamics was earned in 2010 by Luca Oggiano.

1996

The Norwegian University of Science and Technology is established after the merger of six institutions for research and higher education in Trondheim. The university is given the main responsibility for technology education in Norway.

2000

NTNU's laboratory for multiphase flow is operational. For students and visiting researchers, the laboratory offers teaching and test facilities for pipeline transport of gas-liquid mixtures, and it is an EU Marie Curie Training Site. The laboratory complements the industrial laboratories at SINTEF and at the Institute for Energy Technology (IFE) in Kjeller. Joint SINTEF-IFE projects from the early 80s paved the way for multiphase transport solutions from subsea oil and gas wells.

2002

NTNU's Department of Energy and Process Engineering (EPT) emerges as the result of a merger of several academic environments at the university



1998 Professor John Ehrenfeld, MIT, Ingvild Malvik, who was IndEcol Coordinator at that time, and Professor Helge Brattébo, head of the IndEcol programme, at the NIVA (Norges Tekniske Vitenskapsakademi) Industrial Ecology seminar in June 2001.



2005



2009

2003 – 2005:

First higher education in industrial ecology worldwide: In 1998, NTNU launched the world's first programme in industrial ecology at master's level. Three years later, NTNU offered the first doctoral programme in industrial ecology in the world. A strong focus has been dedicated to improving NTNU's capacity in various methods of environmental systems analysis and its application to technical systems, especially systems related to energy supply, production of materials, waste management, product design and technology management.

2005

District heating became an important factor in energy and energy-saving issues. During this year, the Gemini Centre for energy supply and indoor environments opened a demonstration facility for district heating systems. This provided a tool for learning that could be used for students' practical work and demonstrations.

2007

The idea of a pan-European laboratory infrastructure for carbon capture and storage: The idea of ECCSEL was launched in 2007. In 2015, Norway became the host of a pan-European laboratory infrastructure for carbon capture and storage. And with NTNU as the host institution, and SINTEF as strategic partner, the ECCSEL's headquarters were located in Trondheim. The Research Council of Norway is involved in ECCSEL as well.

2009

The Research Council of Norway (NFR) granted funding to several Centres for Environment-friendly Energy Research (FME), and energy researchers at NTNU and SINTEF have had considerable activity in the following FME's: BIGCCS, Cedren, CenBio, CENSES, Solar United NOWITECH and ZEB.



2016

NFR granted funding for new FME's, and SINTEF and NTNU is a host or partner in the following centres: ZEN, NCCS, CINELDI, HighEFF, Bio4fuels, HydroCen, SUSOLTECH and MoZEES.

2017

15-year jubilee of NTNU's Department of Energy and Process Engineering

2017

100-year jubilee of the Waterpower Laboratory

2017

Opening of the new Thermal Energy Laboratories, which have been rebuilt and modernized connection with the pan-European carbon dioxide capture and storage laboratory infrastructure ECCSEL.



The text in this brochure was written by communications consultant Maren Agdestein, in cooperation with the historians Terje Finstad and Per Ostby (2017).

Photo credits:

1. The Thermal Power Laboratory 1912. Photographer: unknown
2. Waterpower Laboratory under construction. Photographer: unknown. Source: Department of Energy and Process Engineering, NTNU.
3. Aerial view of NTH photographed in about 1933. (for use as a postcard for F. Bruns bookshop in Trondheim) Photo: The Schröder Archives, Sverresborg Trøndelag Folkemuseum (FTTF.SCH.K.003709.02)
4. Drawings of the Mørkfoss-Solbergfoss plant. Various sections through the power station. Source: Waterpower Laboratory NTH, the Norwegian Institute of Technology (1925)
5. Salmon in the laboratory at NTNU. Photo: NTNU/Ignat Tolstorebrov
6. The poster was drawn by Willi Midelfart for the parliamentary elections in 1945. Photo: The Norwegian Labour Movement Archives and Library (Arbark).
7. Fire in the Thermal Power Laboratory, October 1957. Photo: Adresseavisen
8. Heat pump model with students in the modern Thermal Energy Laboratories. Photo: Geir Mogen/NTNU.
9. LNG Export Terminal, Melkøya. Photo: Janter CC BY-SA 3.0
10. Espen Bredesen in the wind tunnel, about 1994. Photo: NTNU
11. Wind turbines in NTNU's wind tunnel. Photo: Geir Mogen, NTNU
12. Multiphase Flow Laboratory in the Thermal Energy Laboratories. Photo: NTNU
13. Photo: Trond Oldertroen
14. Associate Professor Natasa Nord demonstrates the district heating system. Photo: Geir Mogen, NTNU
15. The Waterpower Laboratory 2016. Photo: NTNU/Chirag Trivedi
16. Photo: Jørgen Hjelmsøy, Ufo2 AS