



June 16th – 20th

Study Tour 4: Norway - Sweden

This study tour will take you across the border between Sweden and Norway, visiting several hydropower dams typical for this part of Scandinavia. In Norway we will see the famous hydropower station in Rjukan where heavy water was produced for the Nazi regime during WWII. After visiting Oslo we continue towards Sagnfossen, a run-of-the-river hydropower station along river Trysiløva, that crosses the border to Sweden where it is called Klarälven where we meet again at the Höljes dam and reservoir. In between we stop by Trängslet, Sweden's highest dam that is undergoing major refurbishments as we will be visiting. Continuing south on the Swedish side of the border we will also pass Lettens pumped hydro reservoir, Arvika flood protection and Långeds power station before returning to Gothenburg.

This trip will give you a good feel for the deeply forested central parts of Scandinavia, that has connected the kingdoms of Sweden and Norway since the early Viking age.

Please make sure to be on time on the bus before departure as the schedule is tight! The bus leaves from entrance no. 8 outside the conference venue.

Coordinating from SwedCOLD and the conference will be:



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Schedule - Overview

Friday 16th	From Gothenburg by bus, visiting Rjukan/Såheim
Saturday 17th	Industrial workers museum, bus to Oslo, free time in afternoon
Sunday 18th	Bus to Sagnfossen for visit/lunch, afternoon visit at Trängslet, Night at Sälen outdoor resort
Monday 19th	Visit to Höljes dam and power station, lunch at Letafors at Letten pumped storage reservoir, night in Sunne and Selma Spa
Tuesday 20th	Visit to Arvika flood protection barrier and later Långeds dam and hydropower station before traveling back to Gothenburg

The bus will depart from **Gothia Towers Hotel** at this address: <https://goo.gl/maps/hpzYXPUXJS9PUHmt9>

Day 1: Såheim Rjukan

The main point of interest of the first day is Rjukan, which hydropower plant at Såheim was the target of one of the worlds' best known strikes against the Nazi nuclear weapons program. The sabotage action was vital in delaying the development of the atomic bomb by the Third Reich. Allied leaders in World War II regarded the heavy water plant at Vemork as "on the thin line separating victory and defeat."



Winter at Såheim Hydropower station



From the turbine hall at Såheim

Time schedule for the day 1 – Friday 16th

07.30	Bus boarding outside the conference venue / Svenska Mässan
08.00	Departure from Gothenburg
11.15	Lunch at Kumlegaarden
15.30	Arrival Såheim Hydropower Station, quick snack
16.00	Presentation of Hydro's history and
17.00	Guided tour of the Såheim Hydropower plant
18.00	Bus to Rjukan Hotel
19.30	Dinner at the machine hall and site of the heavy water sabotage. Access to museum.

Read more on the sabotage action at

<https://www.nationalgeographic.com/history/article/winter-fortress-neal-bascomb-heroes-of-telemark-nazi-atomic-bomb-heavy-water>

Day 2: Gaustatoppen & Oslo

Scandinavians love to climb mountains, and Gaustatoppen beckons, rising 1883 m.a.s.l. From here we get to see half of Norway (yes, literally) on a good day. Luckily, there is a shortcut to the top with a lift so that we can make time for breakfast.



View of Gaustatoppen on a summer day.

Following the brief visit to the mountaintop we will travel on to Oslo where we will meet Statkraft for lunch and hear about the 150 years of hydropower development that led to the company today.

Time schedule for the day 2 – Saturday 17th

07.40	Departure for the cable car
08.30	Breakfast at the mountain top
11.30	Bus ride to Oslo
14.15	Arrival at Statkraft HQ in Oslo
16.15	Bus ride to the hotel, the Hub in Oslo
16.45	Arrival and check in at hotel The Hub, thereafter free time in Oslo
20.00	Dinner in Oslo



Day 3: Sagnfossen & Trängslet

After a morning bus-ride we will be served lunch by Hafslund-Eco at Sagnfossen, a run-of-the-river hydropower plant along Trysilälva that was upgraded in 2005, where the dam crest was fitted with air bladder-controlled steel gates for increased head whilst preserving overflow capacity to handle floods.



Time schedule for the day 3 – Sunday 18th

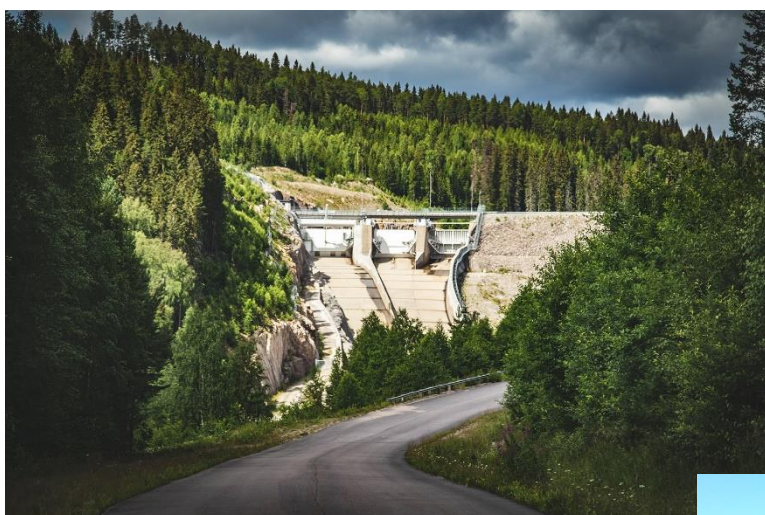
09.00	Bus departs from Oslo
12.00	Lunch and visit to Sagnfossen hydropower plant along Trysilälva
13.45	Bus departs from Sagnfossen
15.30	Arrival to Trängslet dam and hydropower reservoir, visit at dam and construction site
18.00	Bus departs from Trängslet
19.30	Arrival and check in at hotel Gammelgården
20.00	Dinner

In the afternoon we continue to Trängslet, Sweden's highest dam that was commissioned in the 1950's and is currently undergoing a thorough refurbishment by its owner Fortum. Spillway capacity is increased, a bottom outlet is retrofitted, and energy dissipation improved along the spillway chute. Dinner is served and the night is spent at Gammelgården, accommodation in a traditional setting with several buildings dating back as long as to the 17th century.



Day 4: Höljes & Letten

After spending the night in Gammelgården and Sälen, a popular outdoor resort for people from northern Europe, we are invited to visit another of the Finnish power company Fortums important hydropower plants, Höljes. The dam and reservoir is located along the same river as Sagnfossen, but on the Swedish side of the border it is called Klarälven.



The Höljes dam was refurbished from 2012 to 2017. Works included adding a third radial gate and greatly increasing the capacity of the energy dissipation basin downstream, while also rising the dam core and strengthening the upstream rip-rap. The bottom outlet was also refurbished in order to be able to divert water during construction of the main flood gates.

After visiting Höljes we continue downstream Klarälven to the nearby Letten pumped storage plant, reservoir and dams. Letten was originally constructed by the regional Steel, logging and paper industries to secure energy demand during dry periods, but its use has changed with an evolving energy system and it is now a valuable asset able to help balance the electrical grid. During our visit the one of its' two long earthfill dams is being reinforced with a toe berm and fitted with a modern seepage monitoring system to ensure safe operations.



After these technical visits we round off the day at Selma Spa, where you will have time to relax before dinner in the environments of famous writer and storyteller Selma Lagerlöf who was born and lived most of her life in the region. Selma Lagerlöf was the first woman praised with the Nobel prize in literature.



Time schedule for the day 4 – Monday 19th

08.30	Bus departs from Hotel Gammelgården
09.40	Visit to Höljes dam and reservoir
12.30	Bus departs from Höljes
13.10	Lunch in Letafors and visit to the construction site at Letaforsdammen and Lettens pumped storage reservoir
16.00	Bus departs from Letafors
18.00	Arrival and check in at Selma Spa - time to spend in the Spa
20.00	Dinner in hotel restaurant

Day 5

Arvika flood protection & Långed

We hope you made good use of last evenings free time at the Spa since the last day on the trip starts early. After a short bus trip, we will visit Arvika and its recently built flood protection system. Its construction was suggested after a severe flooding event hit the region in year 2000.



Time schedule for the day 4 – Tuesday 20th

08.00	Bus departs from Selma Spa - <u>Early start!</u>
09.00	Arrival and visit to Arvika flood protection barriers and pumping station
11.00	Bus departs from site
13.00	Lunch at Dalslands aktiviteter – Moose park
14.00	Bus departs
14.10	Arrival and visit to Långed hydropower dam
15.40	Bus departs from Långed
18.00	Return back to Gothenburg, bus stops at Hotel Gothia Tower / Conference Venue



The flood protection system consists of two saddle dams and one main dam. The main dam is usually open for boats to pass, but in flooding situations the dam is closed of and integrated pumps are started with the capacity to lower water levels affecting the city of Arvika and much of its infrastructure.

As the last stop on our journey in the borderlands of Norway and Sweden we are visiting Vattenfall's hydropower plant Långed. The dams and evolving use of hydropower at this site has changed through history, resulting in the current dam, spillway, fish ladder and powerhouse. We will hear the interesting story of how the then almost new spillway was close to failing after being undermined from backwater erosion after its first year of operation in 1909.

The bus will finally take us back to Gothenburg and the journey ends where it started outside the conference venue.

