



Hafslund

Full-scale CCS on waste incineration, and Carbon removal certificates to help finance carbon capture

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This is Hafslund Celsio

Waste incineration



*Norway's largest waste incineration plant
(350 000 t/å)*

District heating



Norway's largest supplier of district heating

(2,0 TWh i 2023)

Cooling



Norway's largest producer of district cooling

(150 GWh innen 2035)

Electricity



Largest producer of electricity in Oslo

(150 GWh i 2023)

CCS



A key enabler for future waste incineration



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Full-scale CCS on waste-to-energy

- Part of the Norwegian Longship
- Studies and pilot tests completed 2015-2021 (2024)
- 350 000 t CO₂ capture with **90% capture** (SLB Capturi)
- Biogenic CO₂ capture;
 - **50 % Carbon removals** ≈ 150 000 tonnes
- Establishes a CO₂ hub for South-East Norway
- **Restarted project Jan. 2025**, ready 2029
 - Reduced costs and risk (new FEED and EPC)
 - Renegotiated funding/investment agreements
 - Revenues from the **voluntary carbon market**

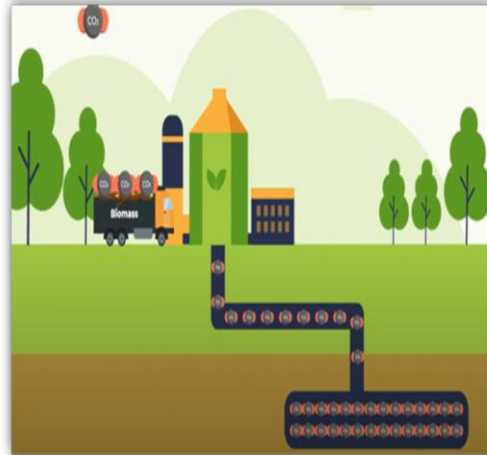


A Public Private Partnership dependent on CDR revenues

OPEX Oslo CCS
27 Mill. Euro

CAPEX Oslo CCS
730 Mill. E (P50)
820 Mill. E (P85)

Revenues



State support



Parliament of Norway
Acc: Stortinget.no

City of Oslo investor in the project



Oslo City Hall

- Voluntary Carbon Market:

- Emerging and immature market
- Legislation lacking
- Before April 1st; No deals on waste incineration

- Other revenues



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1. April; Worlds first carbon removal deal from waste-to-energy

Frontier buyers* will pay 31,6 million USD to remove 100 000 tons in 2029 and 2030

Validating a model that could be replicated throughout Europe and globally to remove millions of tons of CO2

Demonstrating waste-to-energy as a credible and sustainable source of high quality carbon removals

* Frontier founders Google, Stripe, McKinsey, Shopify, and members JP Morgan, H&M, Workday, Salesforce, Autodesk



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EXCLUSIVE SUSTAINABLE BUSINESS

The Next Big Thing in Carbon Capture? Trash.

A group of tech companies is investing in a new method of removing CO2 from the atmosphere by capturing gas emitted when household waste is incinerated

By Yusuf Khan

April 1, 2025 5:30 am ET | WSJ PRO

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Carbon Removal at Google
1t •

Today I'm excited to share that [Google](#), through Frontier, has signed a carbon removal deal with [Hafslund Celsio](#) to build the first ever waste-to-energy plant retrofit for carbon removal. Together, these Frontier offtakes will enable Celsio to remove 100,000 tons of carbon from the atmosphere while providing a blueprint for thousands of other waste-to-energy facilities globally to follow. Read more here: <https://lnkd.in/eXQhJxRj>

Here are a few reasons why we're particularly excited about this deal:

- ✓ Industrial retrofit. This project will retrofit Hafslund Celsio's Klemetsrud plant in Oslo, the largest waste incineration plant in the country. By leveraging existing infrastructure and operations, companies like Celsio can unlock a faster path to scale – and impact – for these innovative solutions.
- ✓ Carbon removal with co-products. By combining waste management with both district heating and carbon removal, this project showcases the real promise of integrated clean energy production and carbon removal to deliver significant impact.
- ✓ Sustainable feedstocks. At this facility, residential and industrial waste streams are pre-sorted, ensuring that only residual waste with no other viable use remains and showcasing best-in-class use of biogenic feedstock.

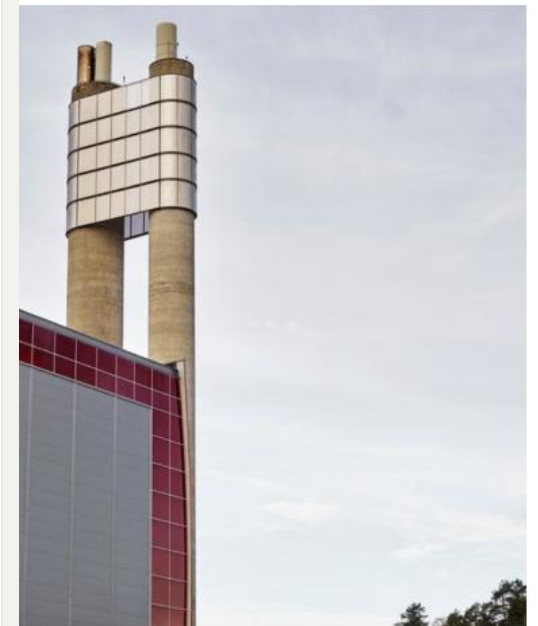
Most of all, we're excited to take this first step to demonstrate the potential of waste-to-energy retrofits to deliver significant scale and help it ramp up to its full potential – 400 million tons of carbon removal per year globally – by 2050.

Congrats to [Martin S. Lundby](#), [Tore Eliassen](#), [Jannicke Gerner Bjerkås](#), and the entire Celsio team!

Vis oversettelse



Frontier and Hafslund Celsio pave the way for first waste-to-energy carbon removal retrofit
frontierclimate.com



y at Klemetsrud, Oslo, Norway. PHOTO: JONAS CARLSEN /

s is investing in a new form of carbon capture

How do we prevent undesirable shifts in waste market dynamics?

1



Market trends and Policy Shifts

2



Customer and WtE (with CCS)
operator behavior



Impact on the waste composition
delivered for incineration



How to prevent plastics from ending
up in landfills or nature?

How to ensure sustainable treatment
of non-recyclable plastics?

How to create value from non-
recyclable plastics?



