



IEAGHG 8th Post Combustion Capture Conference

16th to 18th September 2025, Marseille, France

Navigating permitting for amine-based CO₂ capture: Lessons from first-of-a-kind projects

Laurent Thomas^a, Isabel Conradus^b, Paul-Emmanuel Just^c

^aShell Catalysts & Technologies, Montreal, Canada

^bShell Catalysts & Technologies, Amsterdam, Netherlands

^cShell Projects & Technology, Amsterdam, Netherlands

Keywords: air emissions; air permit; amine-based CO₂ capture; amine emissions; emission limits; environmental permit

Navigating air permits for amine-based CO₂ capture

As commercial-scale post-combustion CO₂-capture projects using amine-based solvents move through front-end engineering and reach final investment decision, securing an environmental permit has become a critical step – and, in many jurisdictions, a first-of-a-kind challenge. This is true not only for project developers but also for environmental regulators who may be assessing this technology for the first time.

Air emissions are a particular focus. Alongside well-understood industrial pollutants such as ammonia, aldehydes and other volatile organic compounds (VOC), regulators must also consider substances specific to amine-based capture systems – including solvent amines and degradation products such as nitrosamines and nitramines, which carry particular concerns around toxicity and carcinogenicity. Regulatory approaches vary widely, and there is limited precedent to draw on.

Shell Catalysts & Technologies and Technip Energies have established a global alliance to support carbon capture projects, combining Shell's CANSOLV* CO₂ Capture System with Technip Energies' expertise in project design and execution. This presentation draws on the experience of the alliance, which has supported environmental permit applications for amine-based CO₂ capture in five countries: Norway, Denmark, UK, the United States and Canada. The alliance has worked with both developers and regulators in these jurisdictions, providing a rare comparative perspective on the regulatory, technical and practical considerations involved.

The presentation will explore:

- how different jurisdictions are approaching air permitting for amine-based capture – and how their approaches are converging or diverging
- the differences between retrofit and greenfield projects in terms of regulatory constraints
- how ammonia limits in nitrogen-sensitive areas are becoming a critical factor in project design
- how emission limits for amines and degradation products are being derived and modelled in real projects
- how licensors can support projects with performance guarantees for air emissions, underpinned by comprehensive design and modelling, ad-hoc solvent formulation and operating conditions selection, and pilot plant testing; but also with the relevant input on atmospheric chemistry, toxicology and solvent science.

By sharing these practical insights, this presentation aims to help project teams and regulators navigate the permitting process more effectively – and ultimately accelerate the deployment of amine-based CO₂ capture.

*CANSOLV is a Shell trademark.