



VoltaChem is a business-driven Shared Innovation Program that connects the electricity sector to the chemical industry. New technologies are developed and implemented that focus on the conversion of renewable energy to heat, hydrogen and chemicals.

The growing availability of sustainable electricity might be exactly what the chemical industry needs to enhance its competitive position.



COST SAVINGS, INNOVATIVE TECHNOLOGIES & SUSTAINABILITY

With more solar and wind energy being produced, sustainable electricity supply in North West Europe is constantly increasing. This source of energy might be exactly what the chemical industry needs to enhance its competitive position. The supply of sustainable energy can bring reductions in energy costs, offers numerous opportunities to develop new, high-value products and lowers the carbon footprint of production.

Also the energy sector will benefit by overcoming the issues caused by fluctuating electricity supply. This creates great potential to establish a frontrunner position, especially in areas where the chemical industry and the electricity sector

come together, as new capacity is planned at locations where extensive industrial process infrastructure is present, such as the Delta Areas.



LINKING SUSTAINABLE ELECTRICITY SUPPLY TO ENERGY DEMAND IN CHEMICAL SECTOR

Applied knowledge institutes TNO and ECN, together with industrial and academic partners, founded Shared Innovation Program VoltaChem to initiate and facilitate collaborative development of technology and business models. The aim: moving innovation faster towards commercial implementation. The program incorporates the entire value chain and addresses both the indirect and direct use of electricity within the chemical industry.

We work closely with the industry on:

- Developing business-cases for industrial electrification in the short- and long-term.
- Performing collaborative applied R&D.
- Bringing technologies into industrial practice by pilot/demo activities.
- Work on fundamental research questions together with top academic players.



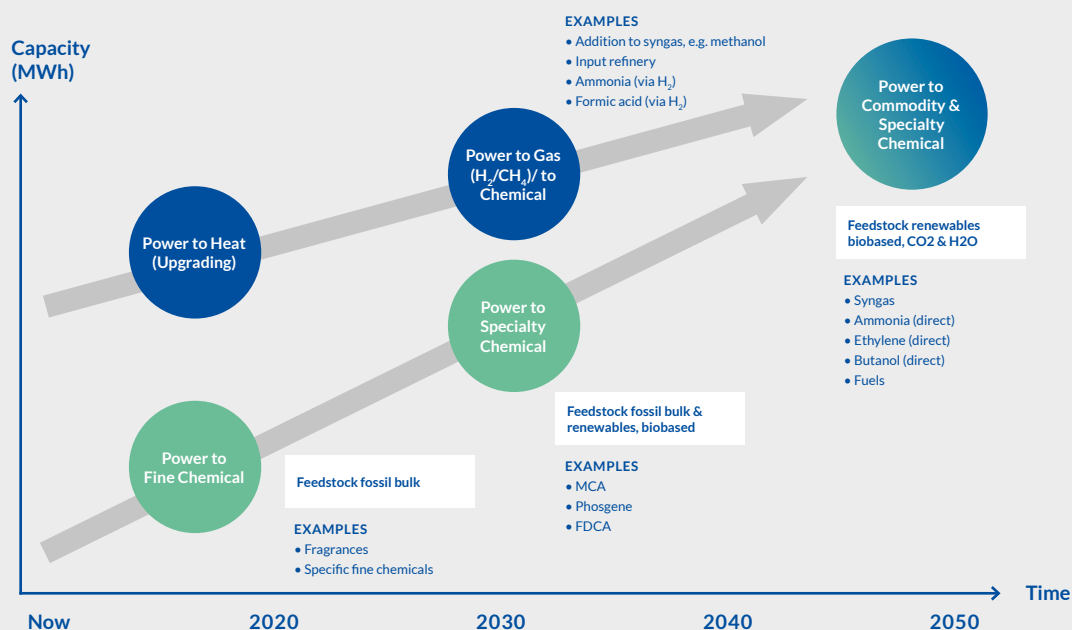
VOLTACHEM: THREE PROGRAM LINES AND A COMMUNITY

VoltaChem's activities span across three program lines:

1 Power-2-Heat: Use of electricity to generate or upgrade heat and steam for flexible use in chemical processes. Specific challenges are load-following at intermittent electricity supply,



High level Road Map of Electrification



the feasibility of retrofitting, process integration and the development of sound business cases.

2 Power-2-Hydrogen: Use of electricity for direct chemical transformations via hydrogen. This line looks at the production of hydrogen as well as further reactions (e.g. methanol, ammonia, formic acid). Main challenges that will be addressed are the development of low-cost electrolyzers and the selection of financially attractive follow-up conversions.

3 Power-2-Chemicals: The direct synthesis of intermediates and higher value products using conventional and sustainable feedstock (e.g. CO₂, biomass-derived). The main challenges that will be addressed are the development of electrochemical routes, reducing capital costs for electrochemical cells, increasing energy density and selectivity, choosing & using catalysts and downstream processing.

Additionally VoltaChem invites the chemical industry and electricity sector to join **VoltaChem's Power-2-Integrate Community**. Community members get the exclusive opportunity to participate in one or more program lines and to influence the roadmap. Furthermore members get access

to dedicated workshops and (inter)national events and are kept up to date on current developments and the latest results from VoltaChem's program lines. To conclude, the community is an excellent opportunity to meet relevant stakeholders across the entire value chain, exchange knowledge and explore business opportunities together.



HOW TO PARTICIPATE

There are five ways in which you can participate in VoltaChem:

- 1 Community participation:** Exclusive discussion group, roadmap updates, high-level results and (inter)national events.
- 2 Shared R&D project:** Pre-competitive R&D within collaborative program with a duration of a minimum of 2-3 years. Participants get rights to the results and can influence the scope of the program along the way.
- 3 Sponsored project:** Pre-competitive linear development; small projects with predefined scope/time/budget. Participants get rights to the results and determine the scope upfront.
- 4 Commissioned project:** Exclusive

bilateral project with pre-defined scope/time/ budget.

5 Indirect participation: The program participates in publicly funded consortium projects. The funding rules of that program determine the rights to the results.



CONTACT

Do you want to find out more about VoltaChem and how your company can participate and benefit? Please contact us! We are more than happy to discuss your needs and interest in the program and find out how we can work together.

Martijn de Graaff
Business Development Manager
+31 6 222 608 71
martijn.degraaff@tno.nl

Yvonne van Delft
Innovation Manager
+31 6 124 105 83
vandelft@ecn.nl

www.voltachem.com
@VoltaChem_