VoltaChem Annual Event 2017: Energized for action

(Detailed version)

From the opening speech until the drinks and informal discussions, the VoltaChem Annual Event 2017 was buzzing with electricity. The prospect of massive amounts of offshore wind power enabling electrification and decarbonization of the chemical industry had brought an unanticipated large audience to the Vlaardingen Delta Hotel on Thursday 9 November.

At the border of the Nieuwe Maas and just across the Pernis and Botlek chemical plants, the Delta Hotel was a very fitting location for the event, hosted jointly with Deltalinqs and SmartPort in close collaboration with the Port of Rotterdam. Over 140 participants had registered for the day focusing on the contribution of industrial electrification to large scale fossil decarbonization, providing ample opportunity to discuss both the latest progress in the field and the opportunities to accelerate business and technology development. As presenter Bob Wind put it, the day "is all about connections. Of industry and research. But also among the participants of today."

After the joint opening by Alice Krekt, programme director at Deltalinqs Energy Forum and Michiel Jak, director at SmartPort, the stage was for Ruud Melieste, Corporate Strategist at the Port of Rotterdam. He considered deep decarbonization of the traditionally carbon-intensive chemical industry as an encouragement for the future development of the Port. Melieste showed faith in technological progress: "The transition towards renewable and sustainable industry can be done, no question about that." The opportunities were plentiful, according to Melieste, even in a competitive international environment. When offshore wind power production really takes off "the Doggersbank may be our next Saudi Arabia".

A growing VoltaChem community

In the following presentation VoltaChem's Business Development Manager Martijn de Graaff was happy to report a growing interest of industry reflected in a growing number of contributing community members which more than doubled from 7 to 15 in just one year. The number of VoltaChem projects grew from 11 to 21 in which a total of 38 collaboration partners were involved (2016: 22). The success of technology development was reflected in 5 patent applications that could be filed in the framework of the innovation program. De Graaff reported how the ongoing discussion on the focus of the VoltaChem program led to an emphasis on the fertilizer and polyolefins sectors. The four electrification approaches are consistently *power-2-heat, power-2-hydrogen and power-2-chemicals*, now completed with a *power-2-integrate* focus where multiple approaches are combined - for instance in the use of wind energy in processes to generate both hydrogen and chemicals.

De Graaff was followed by Reinier Gerrits, Head of the Energy and Climate unit at the Association of the Dutch Chemical Industry (VNCI). He provided a sneak preview of VNCI's roadmap for the chemistry towards 2050 that is currently being developed together with Ecofys and Berenschot. The roadmap identifies six pathways including the use of alternative feedstocks and renewable energy. Gerrits emphasized the complexity and heterogeneity of the chemical industry and the huge challenges lying ahead. According to Gerrits "there is no crystal ball. We reach out to our stakeholders to provide them an overview of directions and choices. That being said it does become

clear that potent mission driven innovation programs as well as regional implementation agendas are essential to be able to deliver in time for 2050".

Renewable hydrogen and Carbon2Chem

In the next presentation an interesting example of industrial decarbonization was provided by Muhammad Zubair, Project Manager Business Development at energy company Uniper. He presented a case study regarding the generation of renewable hydrogen for a refinery through electrolysis. The results indicate this could provide a feasible route to CO_2 abatement in mobility fuels chain. Electrolyzer technology is already available and the business case shows the outlook of competitive CO_2-abatement costs in comparison to the use of biofuels. According to Zubair in the long run the green hydrogen can even be competitive with grey hydrogen when capital expenditures for electrolyzers are further reduced. All this does, however, require a favorable regulatory framework regarding, amongst others, the adequate pricing of CO_2 emissions. And according to Zubair the bottom line is that "the cost of electricity will determine whether Power-2-Gas will fly, or die".

Another innovative example was provided by Markus Oles, Head of Innovation Strategy at ThyssenKrupp. He presented the efforts of his company to use the emissions of its largest steel plant in Duisburg as raw material for chemicals, using surplus energy from renewable sources in the process. This *Carbon2Chem* project aims at using the emitted carbon monoxide, carbon dioxide and hydrogen for methanol synthesis - a project that is carried out in cooperation with AkzoNobel. At the same time, the emitted nitrogen and hydrogen can be used to make ammonia which in turn can be used to make nitrogen containing fertilizers. The Carbon2Chem pilot plant in Duisburg is expected to be fully operational mid 2018. According to Oles the cooperation with the chemical industry was more or less obvious since "we're talking really large scale production here and this aspect of scale is shared with the chemical industry. To make this project work it was crucial to bring the steel, chemistry and energy sectors together."

Interactive discussion

The following panel discussion featuring all prior speakers was held in close interaction with the audience. Through the use of an interactive web application all could provide input, by choosing one of multiple responses to nine thought-provoking statements. It turned out the participants were in general rather united in their replies. In the first statement, cost reduction and regulation were considered crucial for the implementation of electrification, of which fuels and energy storage were seen as the most benefitting value chain.

Considering the most significant barrier for industrial electrification the majority of the audience choose for economy. Here the panel expressed a different opinion. Not that aspects of economy were considered unimportant, but as Alice Krekt put it, “there's a prisoner's dilemma here since costs always come before earnings”. For Markus Oles the lack of available infrastructure posed the most important barrier for electrification.

Asked whether there will be enough renewable energy available for industrial electrification towards 2050, half of the audience reacted quite confident whereas the other half choose the 'inconclusive' option, depending on regulation and the right 'sticks and carrots'. In the next statements the

unanimity returned as the majority of the audience decided that the focus of shared innovation programs should be with piloting and demonstration of existing technologies, and that public-private investments in hydrogen infrastructure are crucial for large scale implementation. Here again Marcus Oles dared to differ. In his view a positive business case should always be the main driver for investment. Oles also was in favor of large scale centralized developments like the ThyssenKrupp Carbon-2-Chem project, whereas the majority of the audience chose for developing decentralized smaller projects in the short term and scaling up in a later phase. In the final statement everybody agreed that existing business models and market mechanisms currently discourage investments in Power-2-X projects.

Open attitude

After a short coffee break with informal networking and a project poster session it was time for two rounds of nine parallel break-out sessions. Here projects from VoltaChem's Power-2-X routes were discussed (with X being hydrogen, chemical, fuels, fertilizers and plastics) as well as topics such as hybrid energy supply, regulations and infrastructure, and future disruptive technologies. The great variety in background of the participants led to lively discussions. Whether from companies, research institutes or governmental organizations, all contributors kept an open attitude, were genuinely interested and willing to share information. Many participants felt inspired by the break-out sessions and indicated to have gained ideas.

In the final presentation Kees-Jan Rameau, Executive Board Member at Eneco, took the stage to describe the huge future opportunities for the chemical industry provided by offshore electricity generation. According to Rameau "wind is the new gas". Not yet today, but when all plans for offshore wind parks become reality the total amount of energy generated will surplus the current production of the Groningen gas field. The rapid reduction of wind energy cost made him confident that the offshore wind power ambitions, potentially adding up to a total of 30 GW for The Netherlands, indeed could be met.

Rameau underpinned that this enormous supply of electricity poses more than just an opportunity for industry. The transition of industry towards electrification also is imperative as a service to society, providing peak shaving and creating a stable energy system. He announced that Eneco is already developing an approach towards chemical companies to jointly invest in systems such as hybrid boilers and electrolyzers. Rameau stood up for the concept of cross sectoral partnering and proposed a joint initiative of power companies and chemical industry to establish the new energy era in close consultation with governments.

Build momentum

In the wrap-up of the day Alice Krekt concluded that the VoltaChem event had seen a "coalition of the willing" and that the challenge now was to turn this into a "coalition of the doing". According to Krekt, "we need to talk more and share experiences" to build momentum. Michiel Jak added that the cases presented by Uniper and ThyssenKrupp were perfect examples of what can already be achieved. In his view "we should first show what is possible and then approach governments and regulating bodies. I think that is a more effective strategy than vice versa." All agreed that developing a bidbook where the Port of Rotterdam would present itself as "the perfect place to handle the green power" should be the next step.