Building a sustainable and circular industry through partnerships

Innovation for Cool Earth Forum
6th Annual Meeting

Marcel Galjee
Tokyo, October 9th 2019
Building our economy 2050, CO2 reductions not as the ultimate goal but as an effect

Creating economic perspective 2030/2050
- Economic growth
- Jobs

Leverage existing infrastructure and clusters
- Transition existing Industry
- Development new Industries

Utilizing world class knowledge institutes

Investments in low/no carbon technologies

Building future proof Industry

Reduction carbon emission
Electrolysis is in the heart of our global business, the basis for green electrochemistry

<table>
<thead>
<tr>
<th>Nouryon</th>
<th>Chlor-alkali</th>
<th>Sodium chlorate</th>
<th>Water electrolysis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Installed capacity: 380 MW</td>
<td>Installed capacity: 620 MW</td>
<td>Installed capacity: 10 MW</td>
</tr>
<tr>
<td></td>
<td>$H_2$ production: 38 kta</td>
<td>$H_2$ production: 62 kta</td>
<td>$H_2$ production: 1.5 kta</td>
</tr>
</tbody>
</table>

Nouryon operates 1000 MW of electrolysis capacity
Together we can initiate, build and develop the sustainable solutions for our future economy

We are looking for and invite partners, along the value chains, to build location specific industrial scale solutions for zero emission materials and fuels.
Through partnerships building the circular economy, a strong need for scale-up and innovation

Our development pipeline of green hydrogen projects

<table>
<thead>
<tr>
<th>Capacity</th>
<th>Hydrogen</th>
<th>Location</th>
<th>Partners</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 MW</td>
<td>Carbon2Chem</td>
<td>Duisburg (DE)</td>
<td>thyssenkrupp, Nouryon, BioMCN</td>
</tr>
<tr>
<td>20 MW</td>
<td>3kt H2</td>
<td>Delfzijl (NL)</td>
<td>Nouryon, GasUnie</td>
</tr>
<tr>
<td>40 MW</td>
<td>6kt H2</td>
<td>Delfzijl (NL)</td>
<td>Nouryon, GasUnie, SHV ENERGY, SkyNRG</td>
</tr>
<tr>
<td>100 MW</td>
<td>15kt H2</td>
<td>IJmuiden (NL)</td>
<td>TATA STEEL, Port of Amsterdam, bp</td>
</tr>
<tr>
<td>250 MW</td>
<td>45kt H2</td>
<td>Rotterdam (NL)</td>
<td>Nouryon</td>
</tr>
</tbody>
</table>

Research & enablers

<table>
<thead>
<tr>
<th>Project</th>
<th>Partners</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bus pilot Delfzijl (NL)</td>
<td>Nouryon</td>
</tr>
<tr>
<td>Certification of green hydrogen (EU)</td>
<td>CertifHy, Hydrogen Europe, Nouryon</td>
</tr>
<tr>
<td>H2 for biofuels Sweden</td>
<td>Swedish Energy Agency, Nouryon, RISE</td>
</tr>
<tr>
<td>HydroHub (NL)</td>
<td>Nouryon</td>
</tr>
<tr>
<td>Hypos Germany</td>
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</tbody>
</table>
Waste to Chemicals Rotterdam: Building a circular value chain with a strong industrial consortium

Production in 2022:
- 220,000 tons of methanol from 309,000 tons of waste
- CO₂ reduction: 300,000 ton
- Est. Investment: > €240 million

Partners:
- Enerkem
- Port of Rotterdam
- Air Liquide
- Nouryon

Nouryon customers use raw materials to produce everyday products
Shell delivers bio-fuels for transportation
Nouryon uses the methanol to produce essential chemicals
Waste is converted to syngas and methanol using Enerkem technology

Nouryon and Air Liquide supply hydrogen and oxygen
The Port of Rotterdam provides infrastructure

Nouryon
Air Liquide
Enerkem
The full transition should benefit all, only through cooperation we can secure our future

Create jobs and economic development
- Build future-proof industry
- Development of renewable energy
- New infrastructure

Build greener industries
- Low-carbon
- Circular
- Bio-based

Develop sustainable materials and fuels

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