“If we want things to stay as they are, things will have to change.”

Why innovation eco-systems are important

Dr. Ir. Jan-jaap Aué, Director of Energy
Professor of Hydrogen Applications
Hanze University of Applied Sciences
Who?

- https://twitter.com/janjaapaue
- https://www.linkedin.com/pub/jan-jaap-au%C3%A9/0/43b/102
- Applied Physics
- PhD Materials Sciences
- KPN Research / TNO ICT (internet) services
- Hanze University of Applied Sciences
  - Life Sciences, Engineering, Centre of Expertise Energy
Now

\[ \begin{align*}
203 &= 62.4 \\
\text{Then a miracle occurs...} \\
\text{A sustainable energy system}
\end{align*} \]

"I think you should be more explicit here in Step Two."

the world.
Hanze University of Applied Sciences Groningen

- Established in 1798
- Professionally oriented higher education
- Applied Research Programmes
- 55+ Bachelor programmes, 18 Master programmes;
- 3 focal areas: Energy, Healthy Ageing, Entrepreneurship (Quality hallmark VNO NCW Entrepreneurship)
- Partner in the Energy Academy Europe
- 3300 Staff members
- 28,500 students choose our university; 10% international, 72 nationalities
Hanze University of Applied Sciences Groningen
Our strategy at work:

- 2,500+ Business partners
- 2,400+ New Jobs 2012-2016
- International Academic- and Business networks
Hanze University of Applied Sciences has been ranked in the top 5 educational institutions in the world in the category Graduate companies and top 3 in the category regional focus U-Multirank 2017.
Bron:
http://www.deltawerken.com/Voor-de-ramp-van-1953/24.html
share your talent. move the world.
October 2015 Opening by King Willem Alexander

EnTranCe is open

EnTranCe
ENERGY TRANSITION CENTRE

share your talent. move the world.
Speeding up Innovation

At the Centre of Expertise Energy, we speed up innovations needed for the transition towards a sustainable energy society. We contribute by applied research and education.

HOW?

- An interdisciplinary and multilevel approach
- The establishment of co-ownership from Society
- Involving young people
- Showing options and their impact
- In dialogue with stakeholders
Applied

Business sector

Government

University

Society

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## Ways of working: inspiration from ICT

<table>
<thead>
<tr>
<th>Home grounds of different development methods</th>
<th>Agile methods</th>
<th>Plan-driven methods</th>
<th>Formal methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low criticality</td>
<td>High criticality</td>
<td>Extreme criticality</td>
<td></td>
</tr>
<tr>
<td>Senior developers</td>
<td>Junior developers(?)</td>
<td>Senior developers</td>
<td></td>
</tr>
<tr>
<td>Requirements change often</td>
<td>Requirements do not change often</td>
<td>Limited requirements, limited features see <a href="https://en.wikipedia.org/wiki/Wirth's_law">Wirth's law</a></td>
<td></td>
</tr>
<tr>
<td>Small number of developers</td>
<td>Large number of developers</td>
<td>Requirements that can modeled</td>
<td></td>
</tr>
<tr>
<td>Culture that responds to change</td>
<td>Culture that demands order</td>
<td>Extreme quality</td>
<td></td>
</tr>
</tbody>
</table>
Our offer

- Extensive network
- Access to knowledge and experience
- Support local communities
- Experimental facilities
- Office- and workspace
- Collective Intelligence
- Energy related events
- Access to launching costumers
- Awareness creation
- Students
Goals 2022

- Together with partners and local communities we develop concepts for (at Least) 5 sustainable (Emission Neutral) communities in our region.

- In 2022 we educated 1500 EAE certified Energy Students

- We realised 25 Energy Startups per year

- We induced 25 million Euros of investments in our region based on our concepts.
Speeding up: challenges

- More than Research only
- Extending and activating Partner network
- Human Capital agenda
- Energy Value Chains
- Trust and understanding
- Learning: “Rapid Protoyping”
Position: Bridging two Worlds

CoE Energy

Decentral when possible, central when necessary
At the Centre of Expertise Energy we focus on **FIVE** main topics

1. Hybrid energy system design & management
2. Alternative gasses & hybrid fuels
3. Energy interventions & behaviour, public support & communication
4. New economic realities, labour market, governance & legal aspects in the energy sector
5. Sustainable communities & local initiatives
Bio-P2G

Research about the technical and economical feasibility of Bio-P2G
Maize → Bulk truck → Digester → Upgrading → Pipeline → Injection

Manure → Tractor → Digester → Upgrading → Pipeline → Injection

Tanker truck → Digester → Upgrading → Pipeline → Injection

Biomass → Digestion → Bio-methanization → Upgrading → CH₄

H₂O, E_λ → Electrolysis → H₂ → Bio-methanization

H₂ → Upgrading → CH₄

O₂ → Bio-methanization

CO₂ → Upgrading

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Waterstofwijk Hoogeveen

Overig Nijstad-Oost
10 vrijstaande woningen
10 bedrijven (o.a. RWZ, NAM)

Nieuwbouw
180 woningen

Recreatiegebied
± 32 permanente woningen
± 105 recreatie woningen

Erflanden
1030 woningen
share your talent. move the world.
GOS
Electrolyser
Opslag/buffer
Fuel Cell system
(at house or district)
Nijstad-Oost (80 woningen)
Nijstad-Oost (80 woningen)

Trafo

Externe aanvoer; Back-up

Onderzoek alternatief

Opschaalbaar

Bestaande RENDO gasinfrastructuur

Opschaalbaar bijmenging

Natural gas
MC

Erflanden 100% (1130 woningen)
Erflanden 20% (1130 woningen)

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Our mission

HydoHub

Largescale electrolysis-based production of sustainable, low cost, hydrogen as a driver for circular industrial chains.
The technology development at the MW test center should lead to a cost prize for the electrolyzer stack of 50-100 €/kW* at an efficiency of >80% (for first 5 years of operation) and a pressure of 30 bara by 2030.

Open Innovation test location where new partners, technology suppliers and system developers are invited to join us in developing the hydrogen technology for 2030.

Source: Google Earth
Identify the Energy Guzzler (Speur de energieslurper)

Stimulate home owners to check how much each appliance uses
We Energy Game

Creating the ideal sustainable energy mix and make villages and towns energy neutral
2. Educational programs

• Energy Routes in 22 schools leading to EAE certification

• Learning Community *(Energy Transition Community EnTranCe)*

• Master (MSc) portfolio
  – European Master Renewable Energy
  – Master Sustainable Energy System Management
  – Master Energy 4 Society
  – Master International Communication (specialisation Energy)
3. Partners

[Image of logos and company names]
4. Society

- Knowledge & Support
- Liberalization & Decentralization of the Energy Market
- People in Power
- Public events
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Position: Dean Centre of Expertise Energy
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