

Institute for Sustainable Innovations of  
the Netherlands' Technical Universities

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# Regions: Incubators of Sustainable Energy

Yoram Krozer, Leeuwarden, September 2006



# Cartesius Institute

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- Institute for Sustainable Innovations of the Netherlands' Technical Universities
- Research to demonstrate innovations with a large contribution to society
- Work on innovations in energy, water, tourism, space use and culture,
- In 2006 about 30 researchers and 5 professors, several international networks
- Co-operation of Technical Universities Delft, Eindhoven and Twente with SME Association, EU support, location the Frisian province

# Structure of the presentation

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Innovation process

Strategic choices (what?)

Decision making (how?)

Implementation

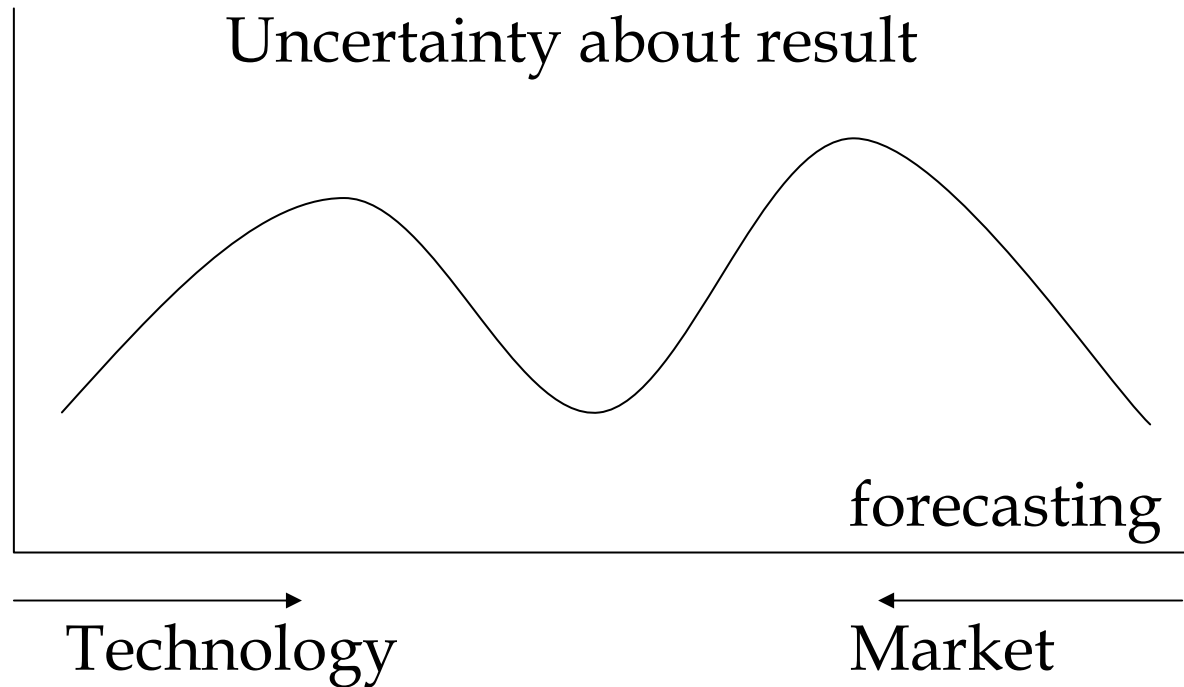
Conclusions

# Innovations for Sustainability

forecasting

backcasting

**Developer**  
interest  
science  
profit



**User**  
need  
desire  
appeal

**Users' attributes of renewable energy**

clean, safe, infinite, free, flexible, spiritual, sexy

# Renewable energy

(based on Daey Ouwens, 2005)

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## **Production (globally 20% of the total 400 EJ)**

- Biomass: crops, residuals
- Water: drop, wave, stream, temperature, salinity
- Climate: wind, solar
- Geo-thermal (earth heat)

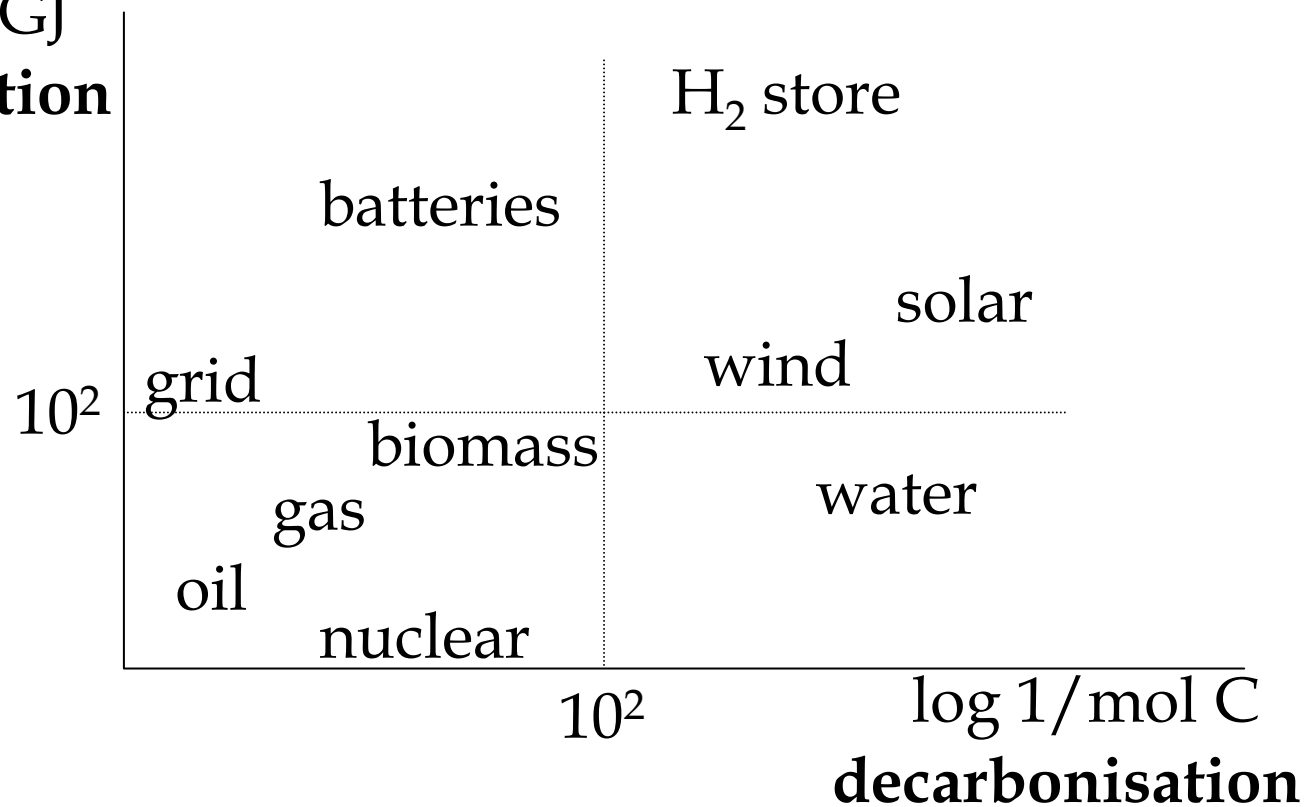
## **Conversion**

- Distribution: co-generators, power exchange,
- Storage: heat/frost, batteries, hydro
- Eco-design: housing, transport, durables
- Saving in use: available \*0.45, best practice \*0.3

# Innovation strategies

For example

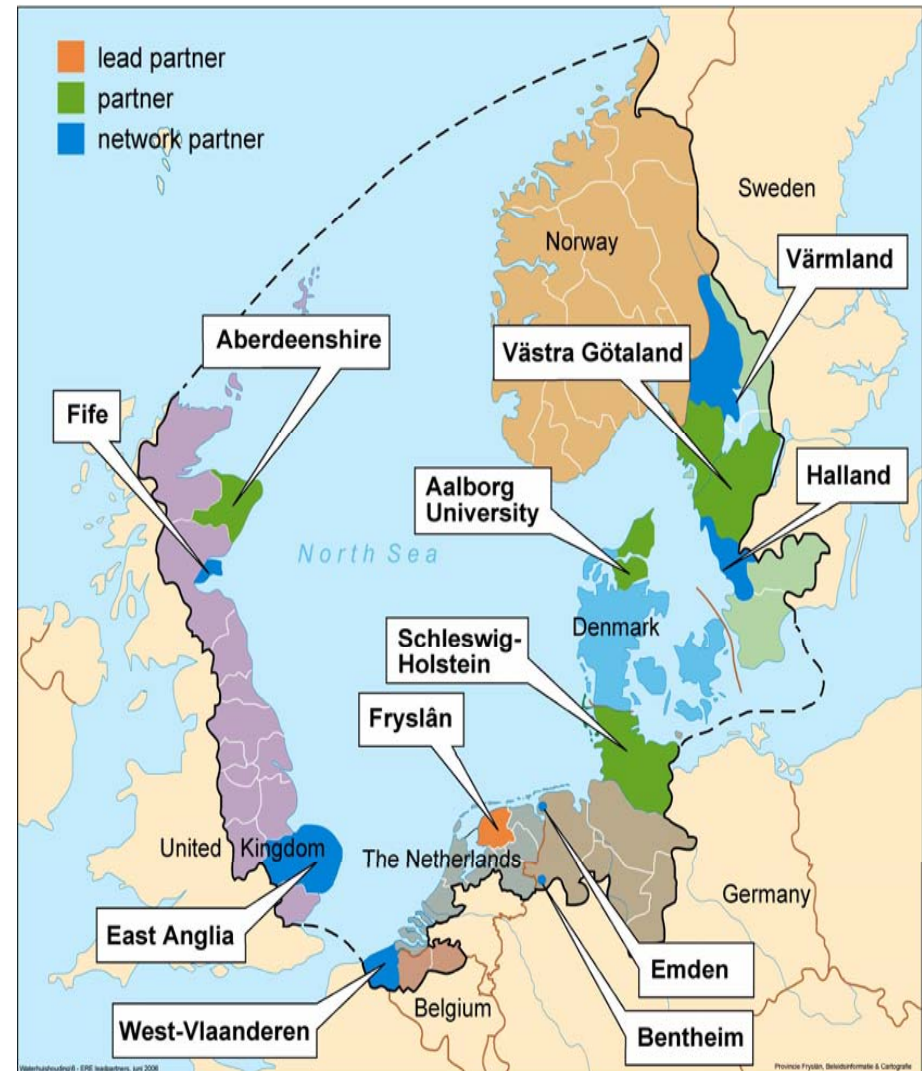
log €/GJ  
valorization



## Inter-regional co-operation on know-how

### Aim

- Regional energy for Lisbon/Goteborg
- Earning with renewables
- Prepare Intereg projects
- 5 core partners
- 7 network partners
- € 820.000
- 2006-2008



# Energy Valley in North Netherlands

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## Regional co-operation on branding

Coordination agency



Supervisory board

Regional  
development  
by energy  
activities

**CONVENTIONAL ENERGY BUSINESS**  
Central position European natural gas grid

Business  
Authorities  
Experts

**KNOWLEDGE AND INNOVATION**  
European energy knowledge centre

**ENERGY TRANSITION**  
North-Netherlands as incubator for  
(innovative) sustainable developments

# Energy Valley actions/results

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Direct Involvement of the Energy Valley

Feasibility    Implementation    Commercial

2006: 2 M€

Aim: 5 M€

2006: 17 M€

Aim: 40 M€

2006: 6,5 M€

Aim: 500 M€



Indirect involved about € 350 – 400 mln

Projects like Sunoil Biodiesel, Solaroil PPO, Biomassa Holding, several decentralized projects (about 50 MW landfill gas), Sonac enz.

# Regional decision making

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	Aim	Volume	Diversity
Drivers			
Policymakers		<b>Preaching:</b> to reach co-operation	<b>Demonstrating:</b> to find alternatives
Businesses		<b>Branding:</b> to catch market	<b>Challenging:</b> to become a winner

## Various ways in North Netherlands

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### **Groningen province (0.9 mln inh.) by Preaching**

- Focused actions for large scale investments, e.g. bio-methanol plant for 1.2 mln m<sup>3</sup>/year

### **Texel island (0.05 mln inh) by Demonstrating**

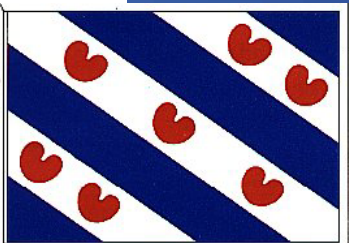
- Partnerships between businesses and authorities for 'energetically sustainable self-reliance'

### **Frisian province (0.6 mln inh.) by Challenging**

- Support of innovators by various actions to foster small and medium size businesses

# Worlds most famous Frisians

I am the best producer of biofuel



## Frisian renewables (2% of all use)

Source	Specific	Realized (MW)	Planning
Waste	farms	1 gasifer (0.25) 6 digesters (0.54)	12 digesters (2-3 MW)
Waste	houses	-	electric plant (100 MW)
Crops	PPO	-	60.000 t
Wind	-	125 MW	20MW
Solar	boats	3 tour boats	hydro boats
Solar	houses	10,000m <sup>2</sup>	
ideas: salinity, tide, CO <sub>2</sub> injection plant			

# Frisian Solar challenging strategy

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- 1994, 1<sup>st</sup> solar panel on a flat, country's primer
- 1998, 1<sup>st</sup> 0-energy house, country's primer
- 2000, 1<sup>st</sup> solar boat for tours, world primer
- 2002, aim 10.000 m<sup>2</sup> solar roofs, EU top
- 2006, solar boat challenge, world primer

## Results:

- Four times energy awards, political support
- Top solar energy businesses in the region
- Upcoming: solar energy design centre

# Implementation

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Several stand-alone Solar Energy examples:

- Electronics
- Tourism
- People movers
- Boats: for a few persons
- Ships: for cruises
- Frisian Nuon Solar Challenge

# Solar power for electronics

You can work all the time



One big PV Cell

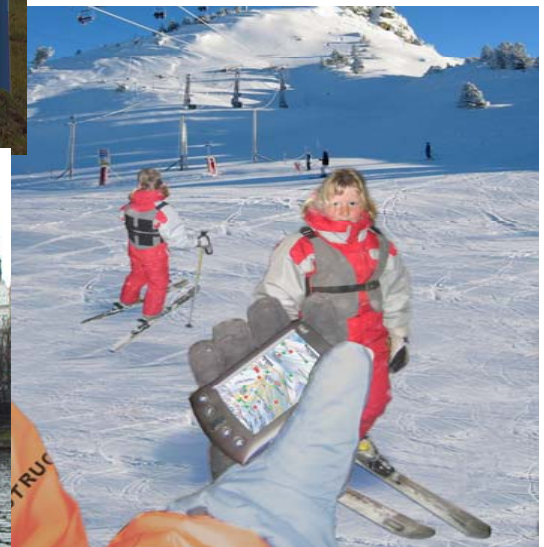


3 PV cells elongated





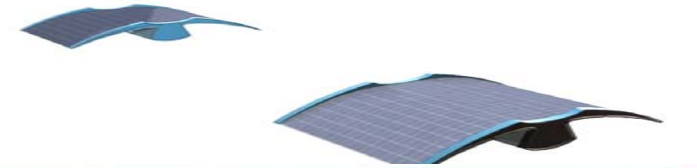
## New landscapes



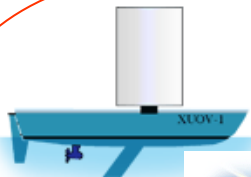
# Solar power for people movers



No  
more  
noise



# Solar ships prototypes & reality



- **Pedaling boats**
- **Small boats (up to 7,5m)**
- **Medium boats (7,5 – 13m)**
- **Big boats (> 14m)**
- **Unmanned and hybrid ships**

## Infinite sailing

# Solar power for boats: examples

## Boat for Fun



# Solar power for transport: examples

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## Cruises



# Frisian Nuon Solar Challenge

Study team



# Conclusions

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## Towards Regions as the **Incubators of Sustainable Energy Innovations**

- Many options for sustainable energy innovations
- Diversity strategy can be more attractive than upscale
- Co-operation can be more effective than competition

### **Postulate:**

**three musketeers that use regional qualities  
roll out renewable energy**



**Thank you!**