



**DIFFER**

# **FOM Institute DIFFER**

Science for Future Energy

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# Mission: Science for Future Energy

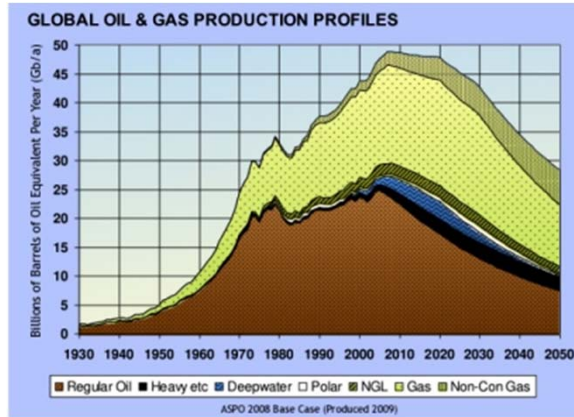
## DIFFER's mission is...

- Fundamental energy research
- Partnering with academia & industry
- Adopting a national coordinating role



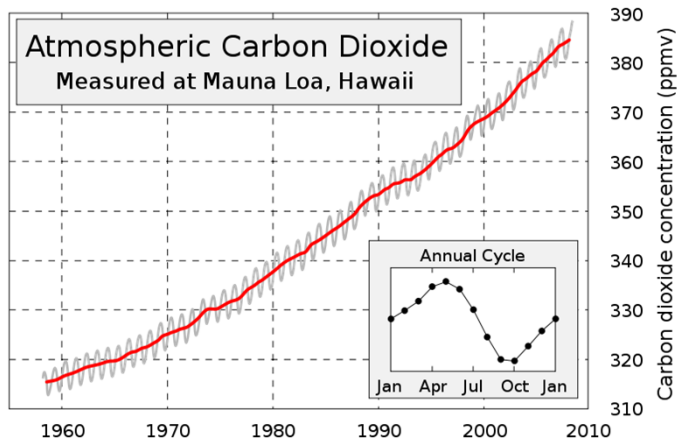


# Energy Research at DIFFER



- Motivation: breakthrough solutions to energy and climate challenges

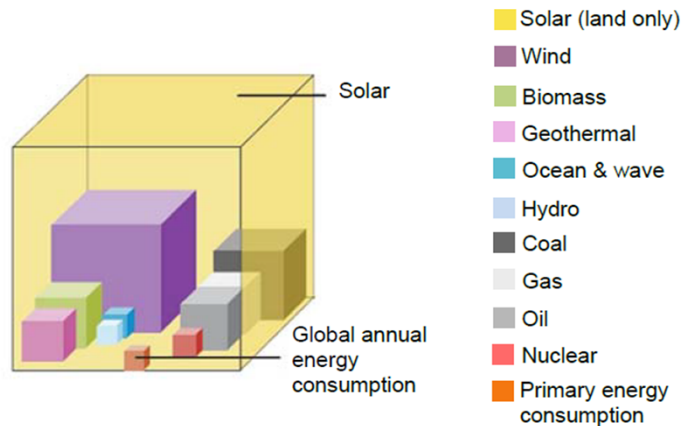
## Limits to fossil fuel production



## Increasing atmospheric CO<sub>2</sub> levels

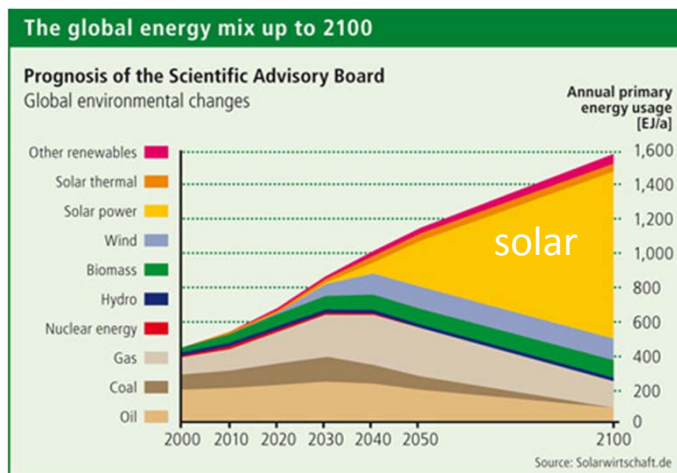


# Energy Research at DIFFER



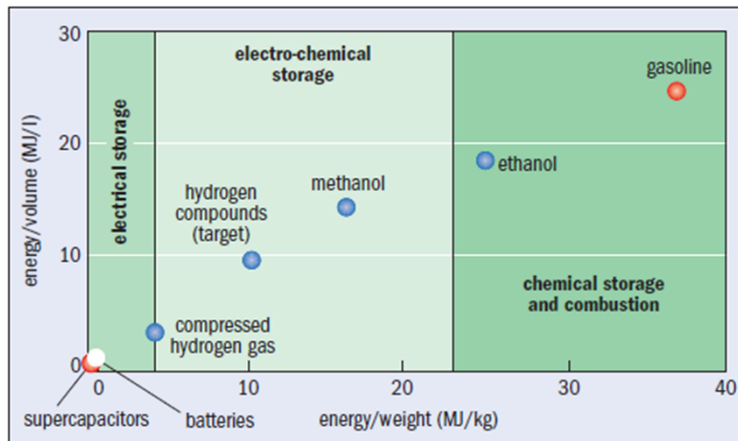
- Motivation: breakthrough solutions to energy and climate challenges
- Short term (until 2050): supply of sustainable energy will depend heavily on wind and sun

Source: European Photovoltaic Industry Association (EPIA), 2010





# Energy Research at DIFFER



**How to store it** Chemicals like gasoline and ethanol store energy at much higher densities than batteries. With scientific advances, the gap can be filled with electro-chemical storage where chemical energy is converted to electricity in fuel cells.

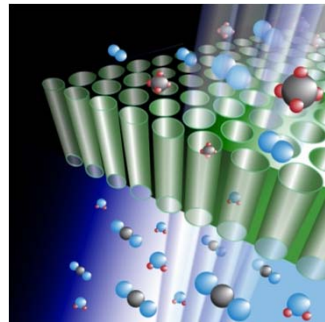
**Storage options: electrical, electro-chemical and chemical**

- Motivation: breakthrough solutions to energy and climate challenges
- Short term (until 2050): supply of sustainable energy will depend heavily on wind and sun
- Storage and transport enable transition to sustainable energy based economy



# Energy Research at DIFFER

## sustainable energy



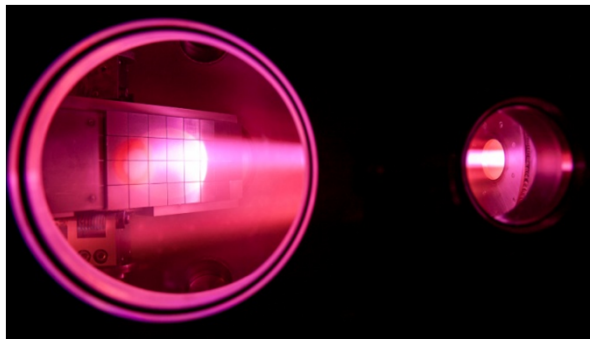
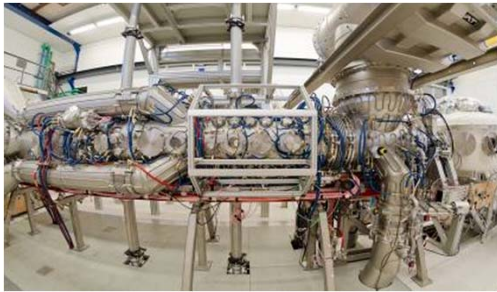
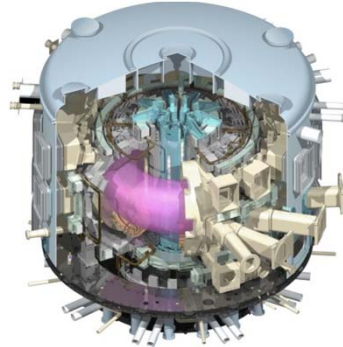
Plasma activation of  $\text{CO}_2$  & (Photo)-electrochemical cells

- Motivation: breakthrough solutions to energy and climate challenges
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- Challenge: buffer sustainable energy by creating **Solar Fuels** from  $\text{CO}_2$  and  $\text{H}_2\text{O}$



# Energy Research at DIFFER

Control of  
burning fusion  
plasma

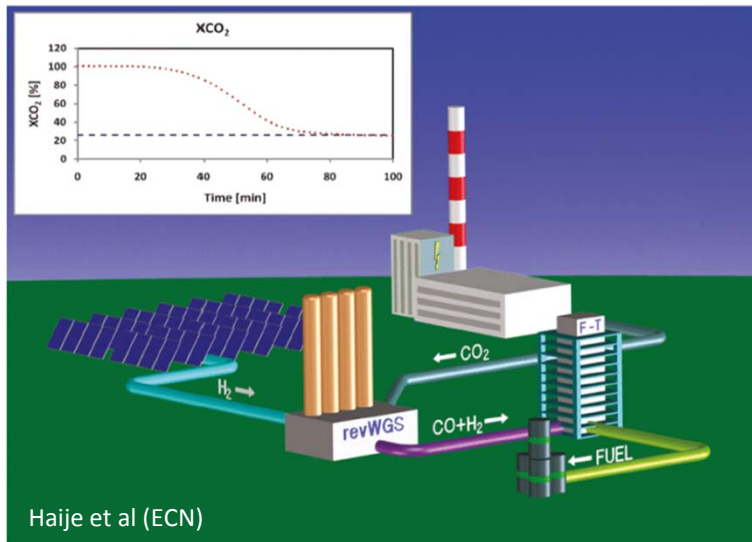


MAGNUM-PSI for plasma-  
surface interaction studies

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- Longer run: **Fusion** – control burning fusion plasmas and plasma-facing materials for extreme conditions



# Energy Research at DIFFER



## CO<sub>2</sub> neutral energy infrastructure

- Motivation: breakthrough solutions to energy and climate challenges
- Short term (until 2050): supply of sustainable energy will depend heavily on wind and sun
- Storage and transport enable transition to sustainable energy based economy
- Challenge: buffer sustainable energy by creating **Solar Fuels** from CO<sub>2</sub> and H<sub>2</sub>O
- Longer run: **Fusion** – control burning fusion plasmas and plasma-facing materials for extreme conditions





# Changing research organisation

## Start up of research groups for Solar Fuels

attracting high potentials

one in-house group from Eindhoven University of Technology

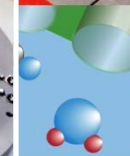
## Spin-out of succesful research

user facility FELIX -

infrared free electron laser

multilayer optics for

Extreme UV lithography





# Relocation to Eindhoven campus

DIFFER will relocate to Eindhoven University of Technology campus in 2015

Optimum use –inspired research environment

Intensify collaboration with Dutch academia and technological institutes

Attract top students for research programmes

Exchange of DIFFER staff



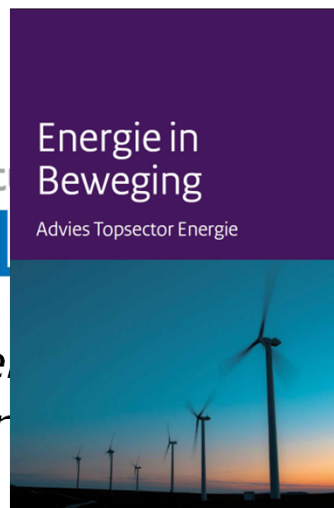


# National coordinating role

## Creating a fundamental energy research network

- Council of Energy Research
- Top-sectors Energy and High Tech Systems & Materials
- FOM energy focus groups
- YES!-fellowships: Young Energy Scientists

FOM Institute  
AMOLF  
Light management  
insolar



Creating the  
next-generation  
of organic PV

university of  
 groningen



# The road ahead – strategic actions

Fundamental energy research: Fusion and Solar Fuels

Changing research organisation DIFFER

- starting up new research groups in Solar Fuels

- spin-out of successful non-energy research

Create a fundamental energy research network

Relocation to campus of Eindhoven University of Technology



# FOM Institute DIFFER

