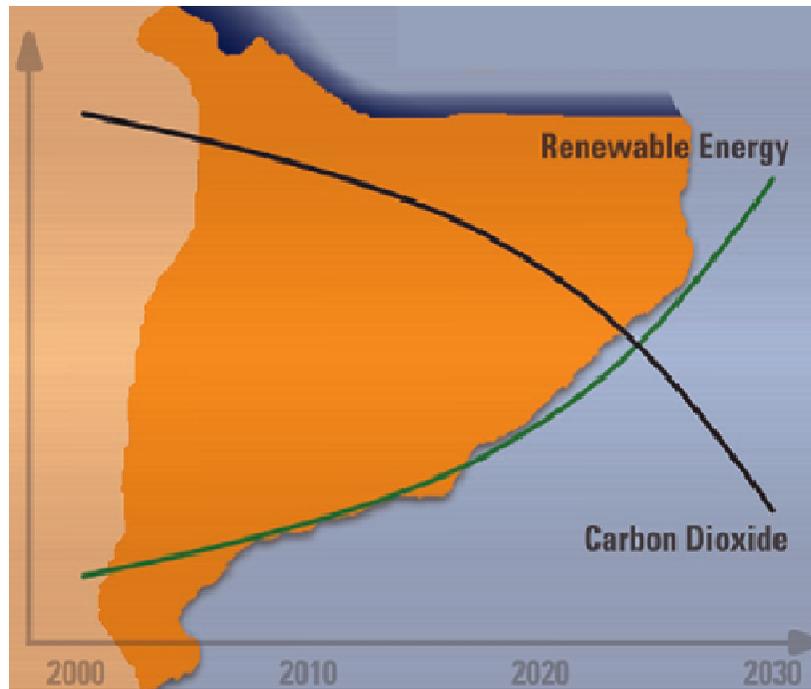


# Catalunya Solar-2

El camí cap a un sistema elèctric 100% renovable a Catalunya.  
Una simulació horària de tot un any amb dades meteorològiques  
i potència demandada reals.



Promotor i coautor:



Coautors:



Coordinador:



Barcelona / Makkleeberg 2009

**Autors:** Anja Doleschek<sup>1</sup>, Harry Lehmann<sup>2</sup>, Stefan Peter<sup>3</sup>, Josep Puig<sup>4</sup>, Marta García<sup>4</sup>

<sup>1</sup> ISuSI - Institute for Sustainable Solutions and Innovations - Gutsstr. 5 - 04116 Markkleeberg/Leipzig - Germany - info@isusi.de

<sup>2</sup> WCRE - World Council for Renewable Energies - Bonn - Germany, www.wcre.de

<sup>3</sup> EuroSolar - European Association for Renewable Energies, www.euro-solar.org

<sup>4</sup> Ecoserveis - Barcelona, Catalunya, www.ecoserveis.net

## XXV Conferència Catalana per un Futur Sense Nuclears i Energèticament Sostenible

La Pedrera, 13/4/2011

**Autors:**

A. Doleschek (ISuSI)

H. Lehmann (WCRE),

J. Puig (EuroSolar)

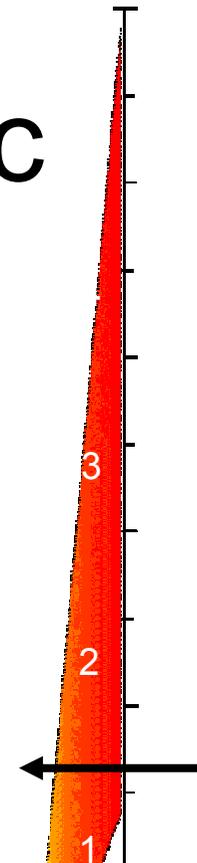
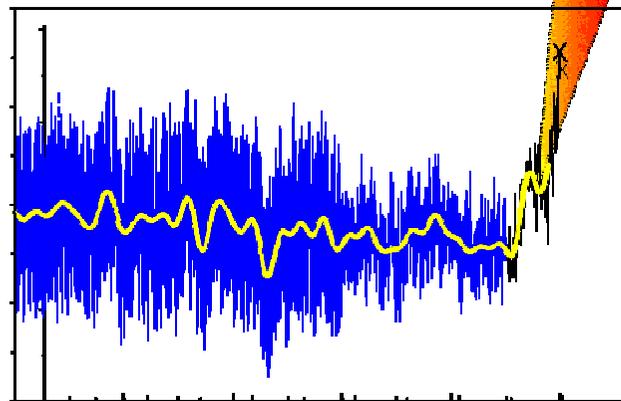
M. García (Ecoserveis)

S. Peter (ISuSI)

# Canvi climàtic



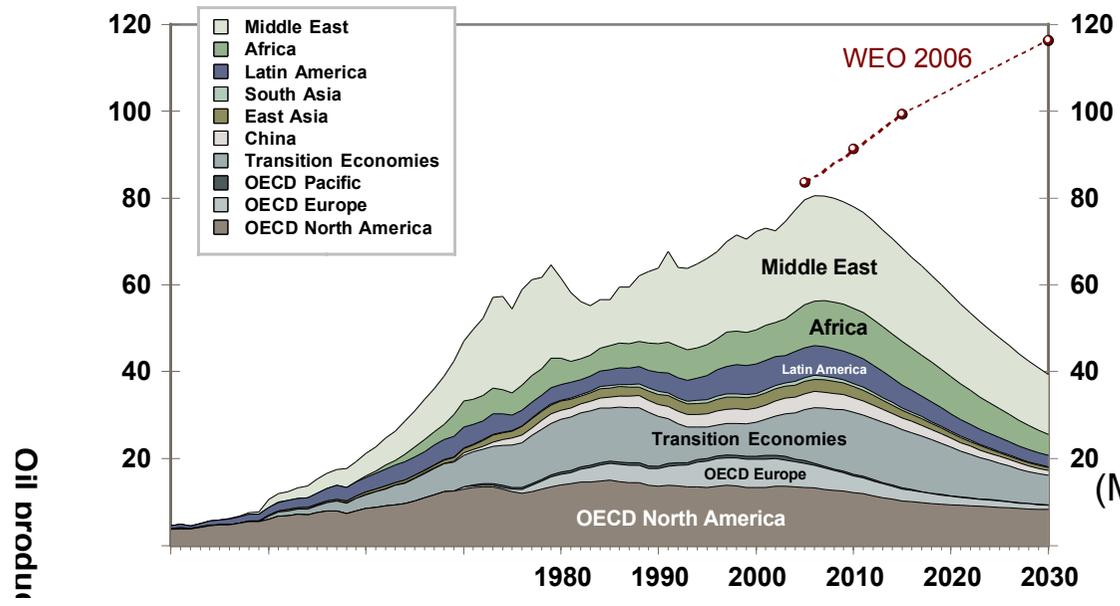
Projeccions de l'IPCC  
Temperatures fins 2100



Adaptació -  
Sostenibilitat

# Escasesa materies primeres

*Reserves-to-production ratio  
(Years)*

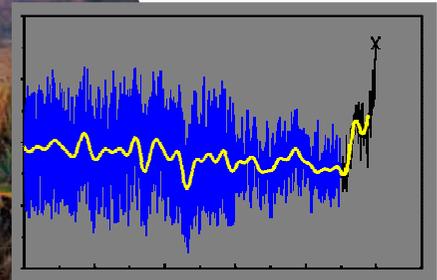
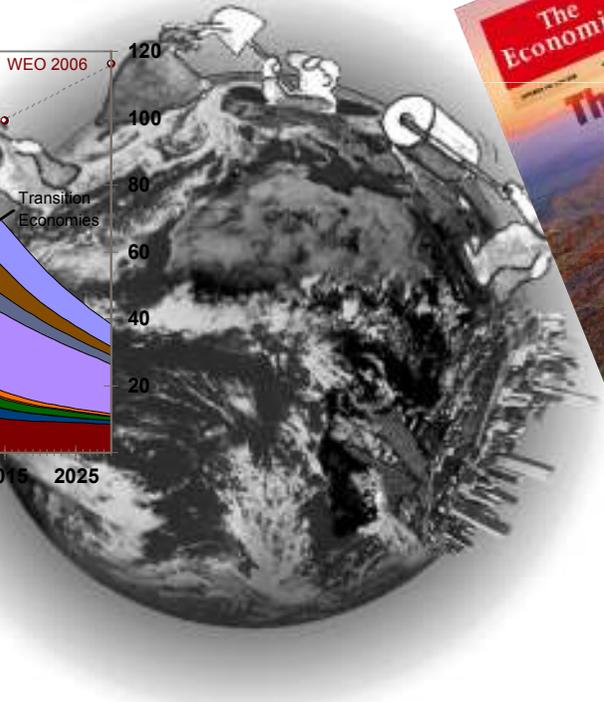
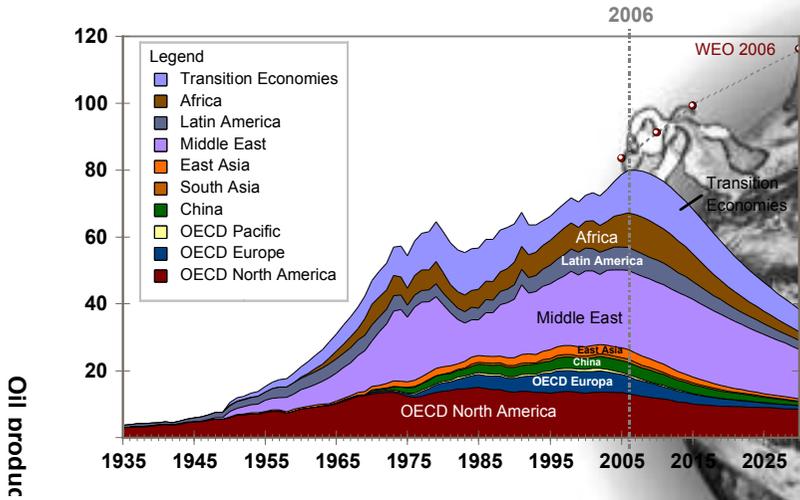


Strontium	11
Silver	13
Arsenic	15
Antimony	16
Gold	17
Zinc	17
Tin	20
Lead	22
Indium	22
Chromium	24
Cadmium	25

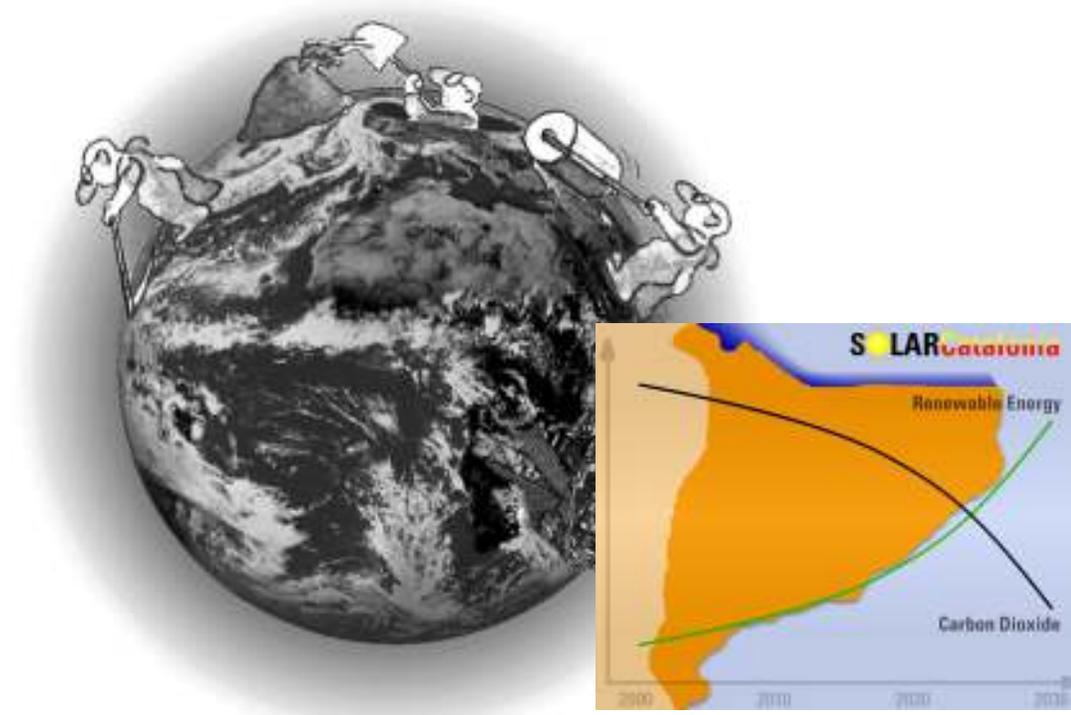
(MaRes 2.1)

A Alemanya:  
Us de recursos (60-80 tons/cap.any)  
Us de sòl (100 ha/day)

# Catalunya ha d'assumir la seva responsabilitat

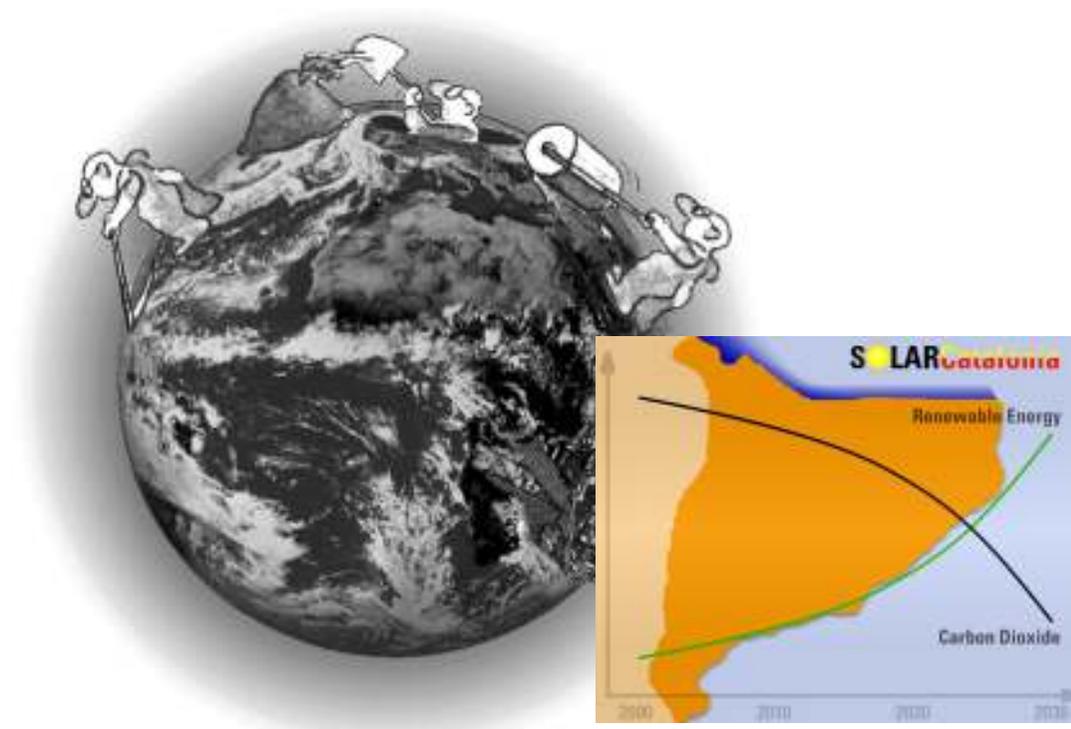


# Catalunya 100% REN

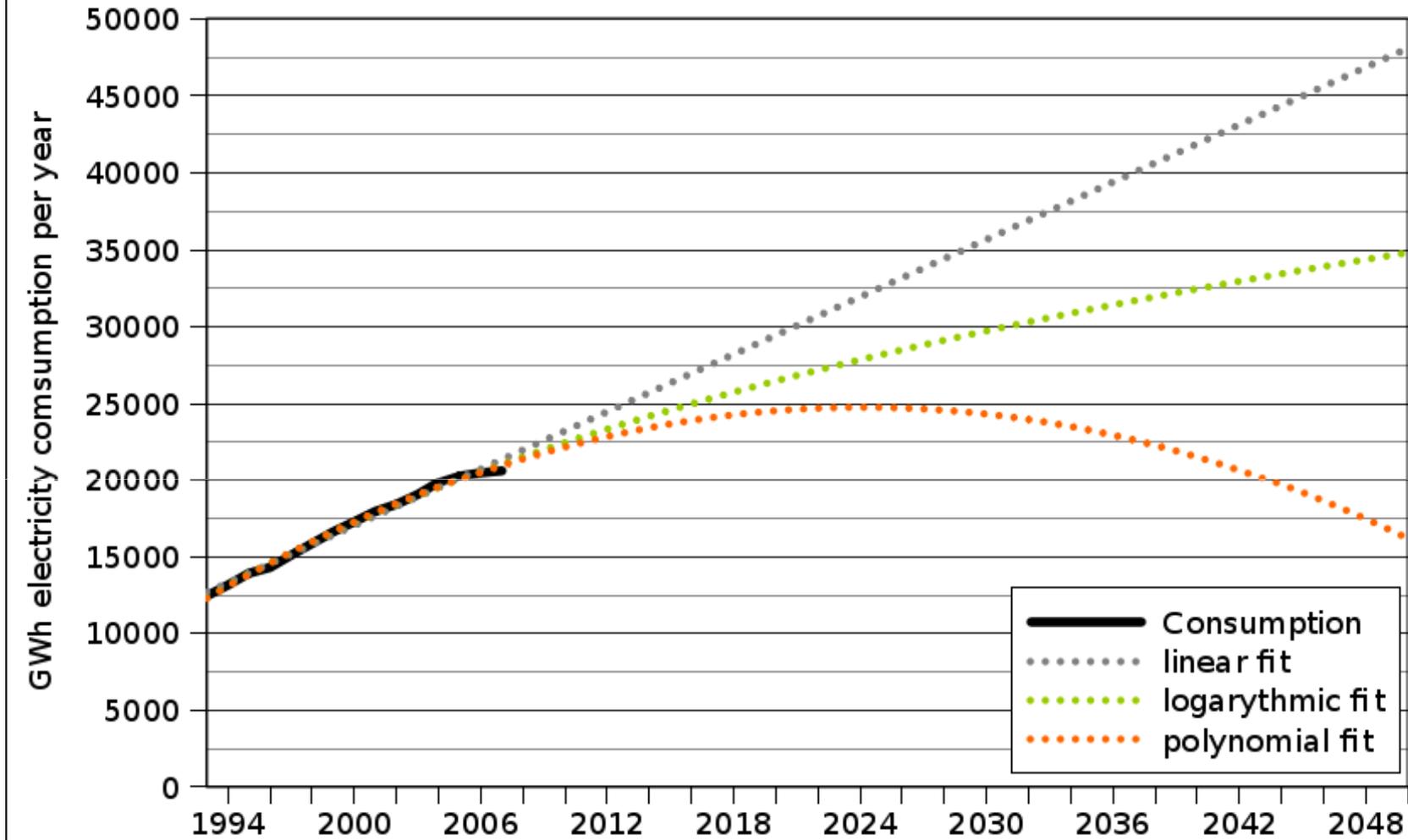


# Catalunya 100% REN

Demanda



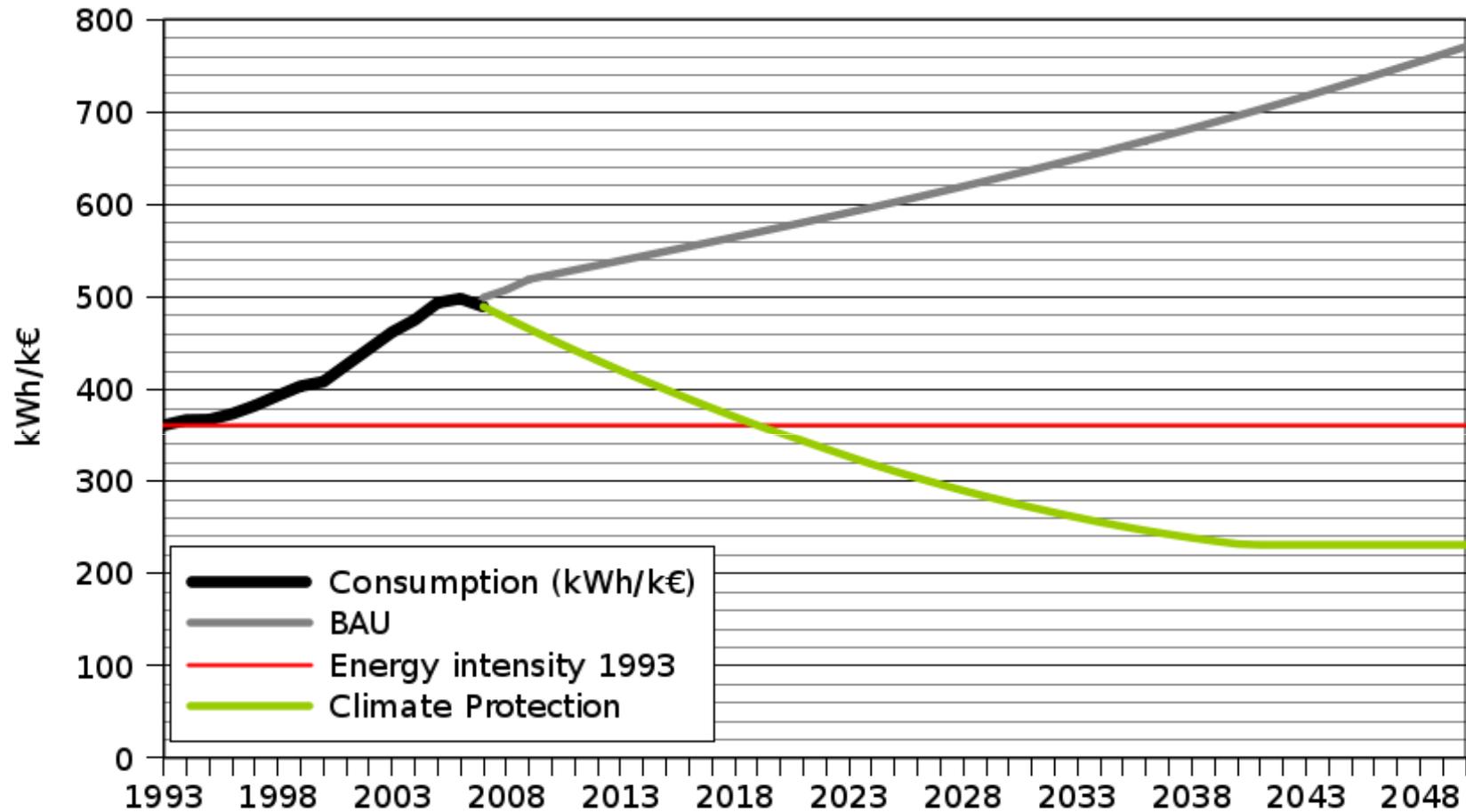
# Industrial Electricity Consumption and Projection



S. Peter, H. Lehmann, J. Puig, , M. García



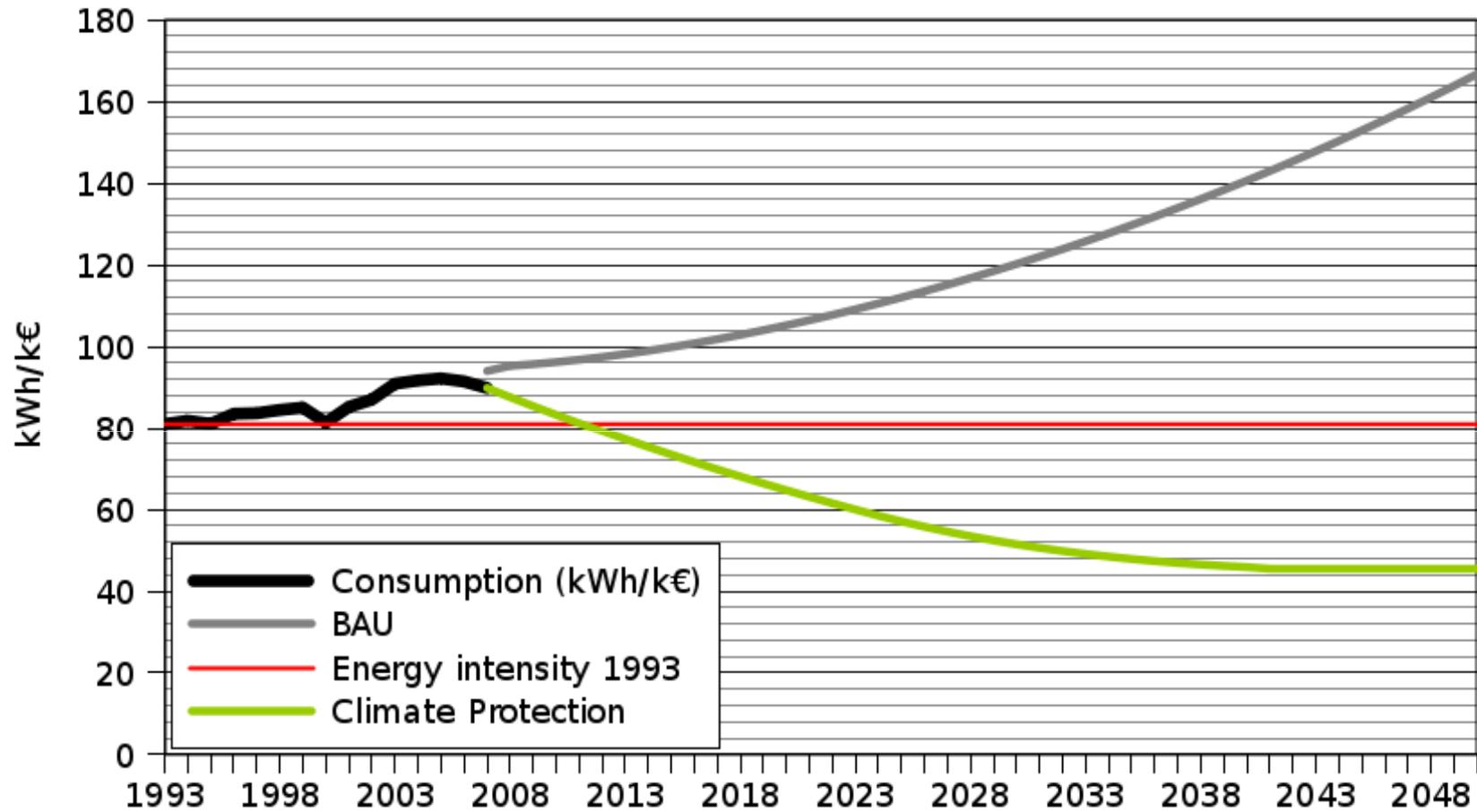
## Development of Energy Intensity in the Industrial Sector - Historical development, BAU case & Climate Protection scenario -



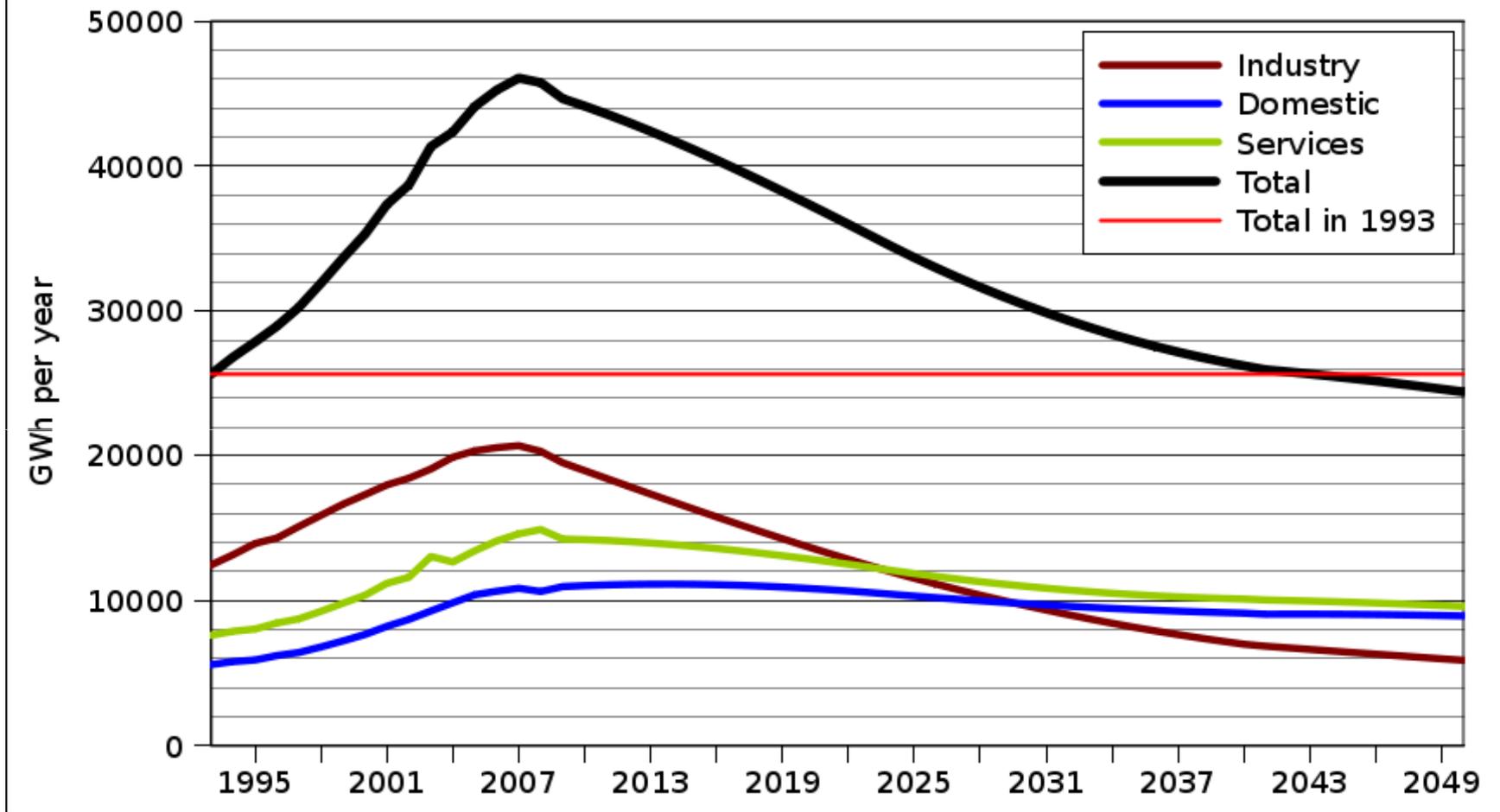
S. Peter, H. Lehmann, J. Puig, , M. García



## Development of Energy Intensity in the Domestic Sector - Historical development, BAU case & Climate Protection scenario -



## Development and Projection of Electricity Demand Climate Protection Scenario

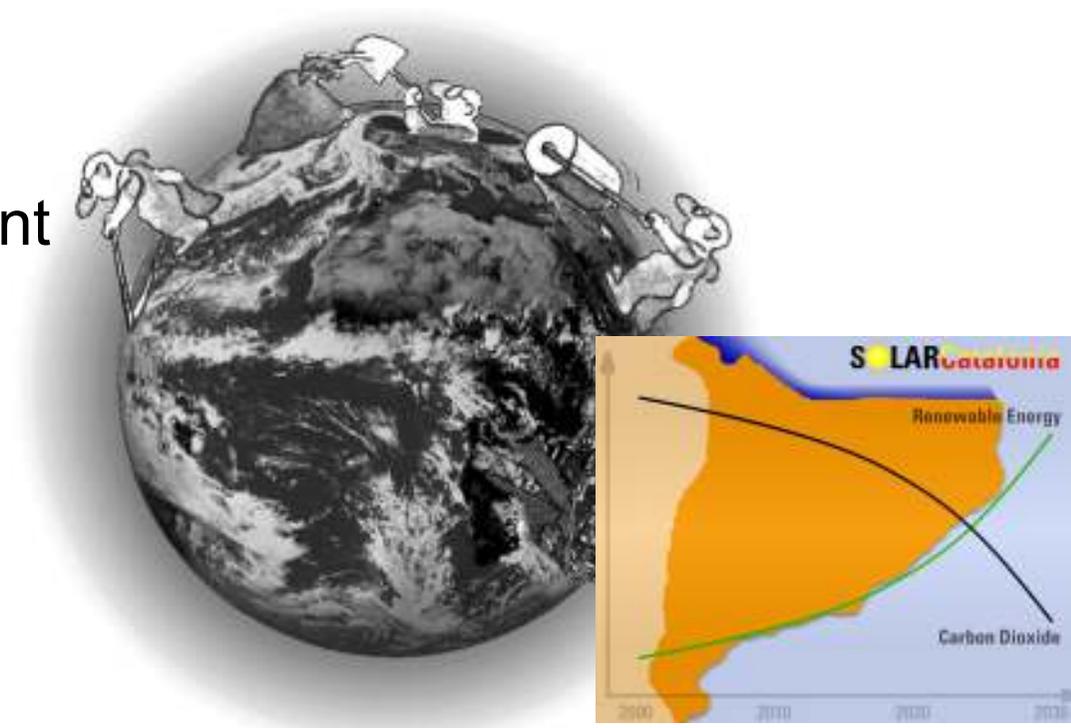


S. Peter, H. Lehmann, J. Puig, , M. García

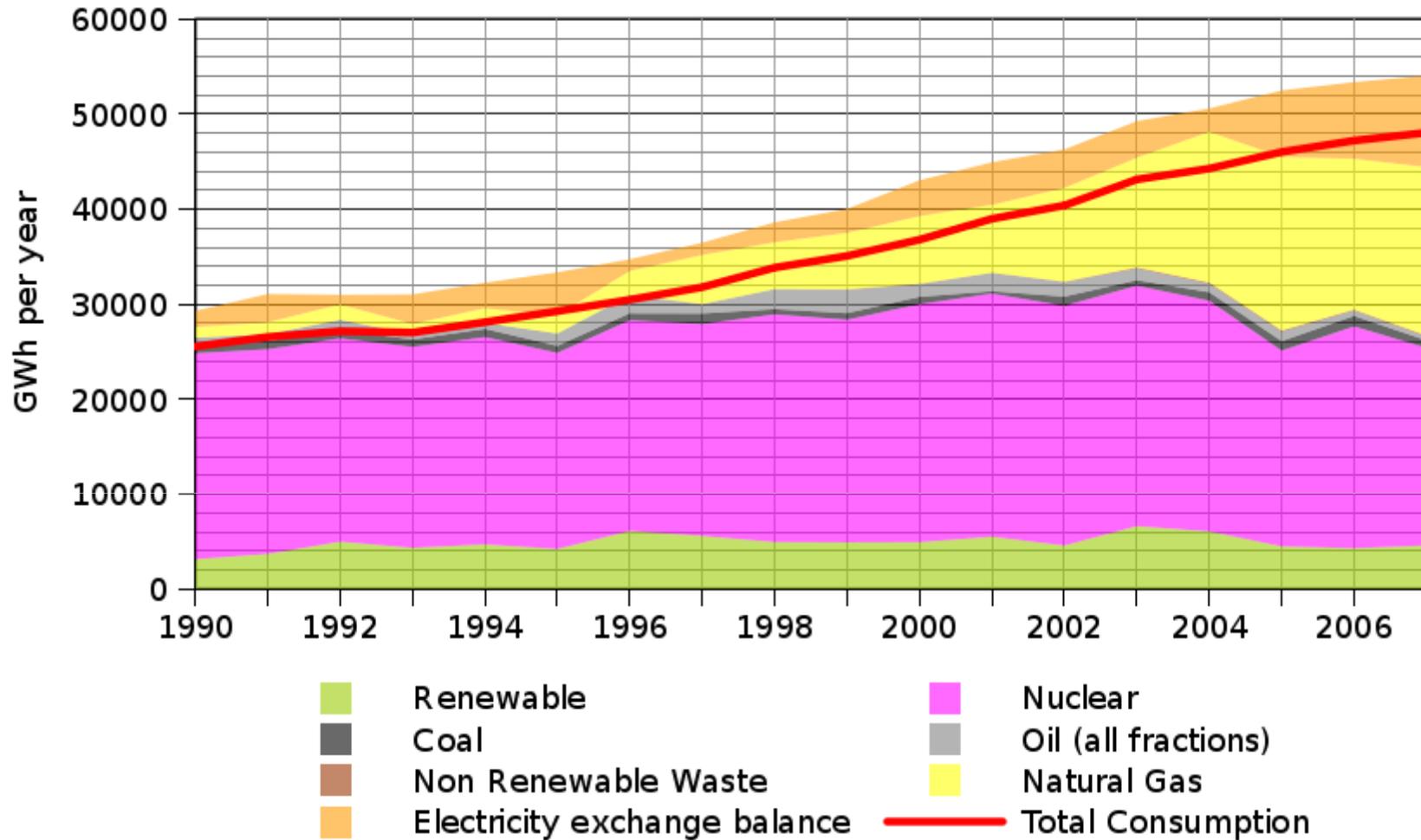


# Catalunya 100% REN

Subministrament  
avui



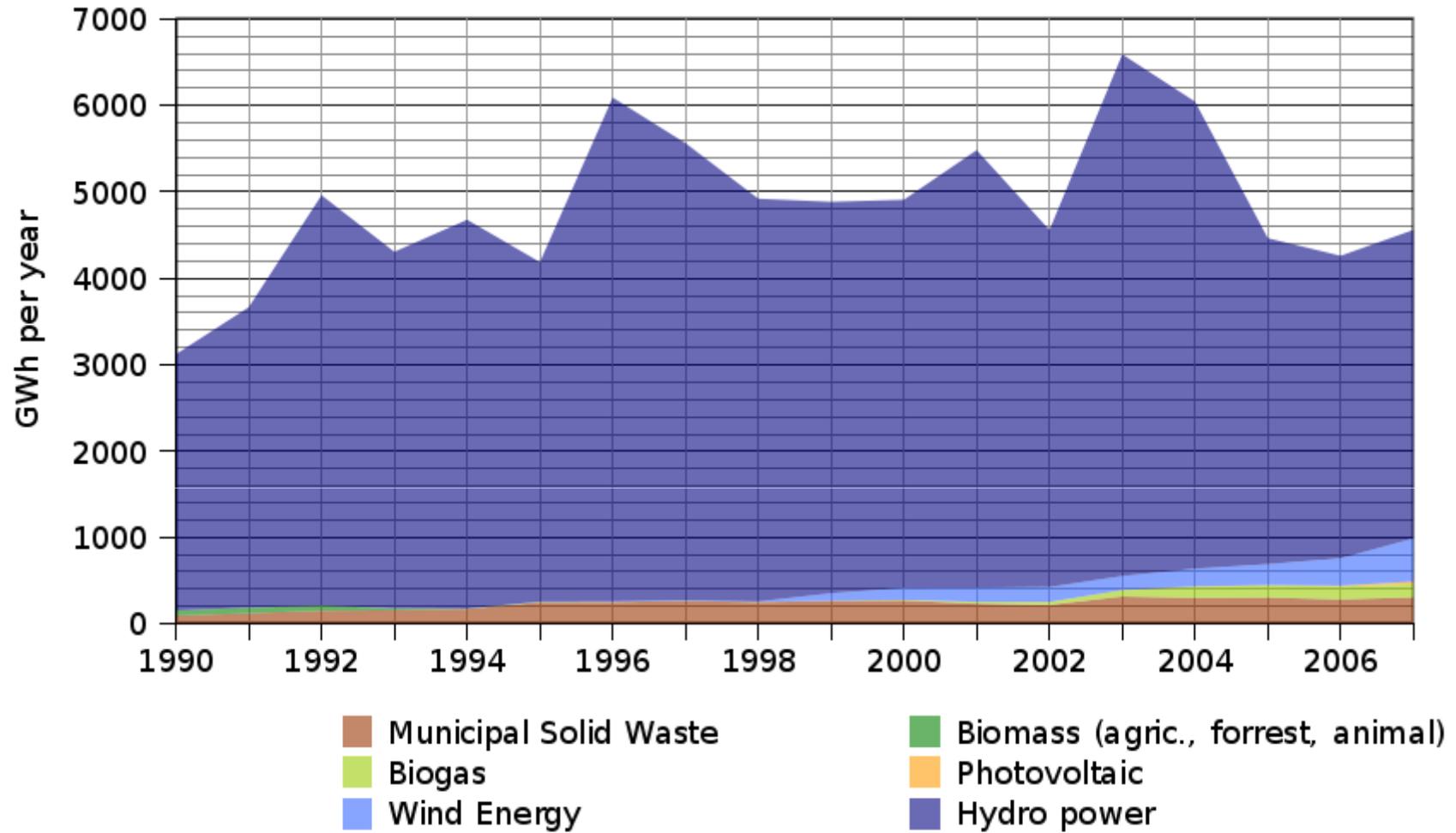
## Electricity Production, Exchange and Consumption



S. Peter, H. Lehmann, J. Puig, , M. García



## Electricity production from Renewable sources

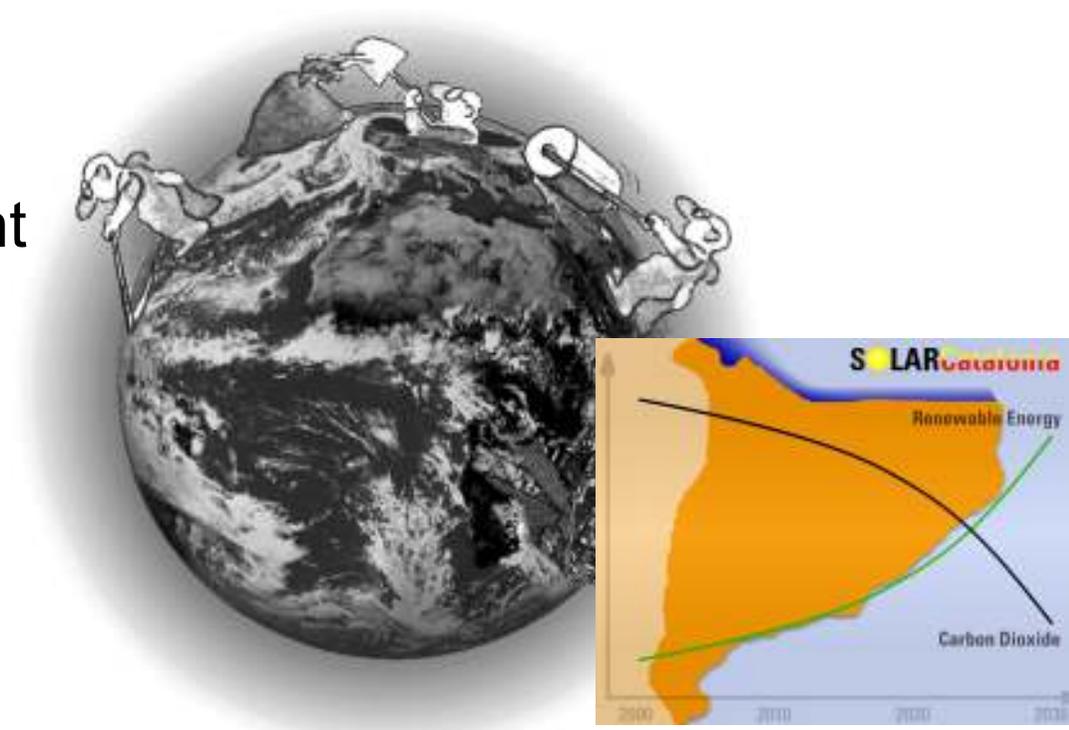


S. Peter, H. Lehmann, J. Puig, , M. García



# Catalunya 100% REN

Subministrament  
futur



# Els escenaris “Catalunya Solar”

Dos escenaris de subministrament elèctric 100% renovable de la demanda d'electricitat

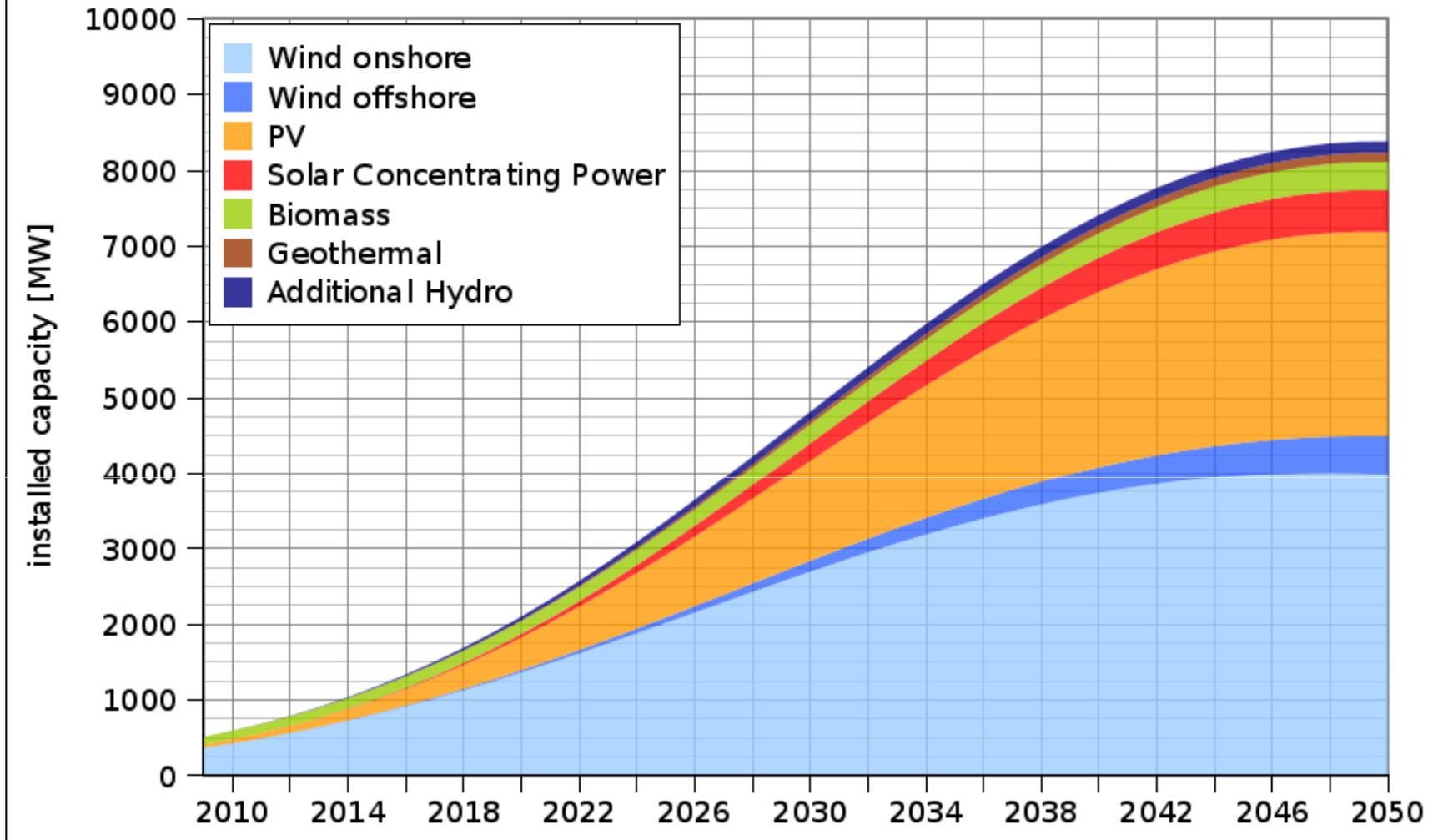
## 1) Escenari de Protecció del Clima

- Objectiu: subministrament 100% per l'any 2050

## 2) Escenari de Sortida Ràpida

- Objectiu: assolir la mateixa potència installada 20 anys abans
- Resultat: 80% del subministrament per l'any 2030

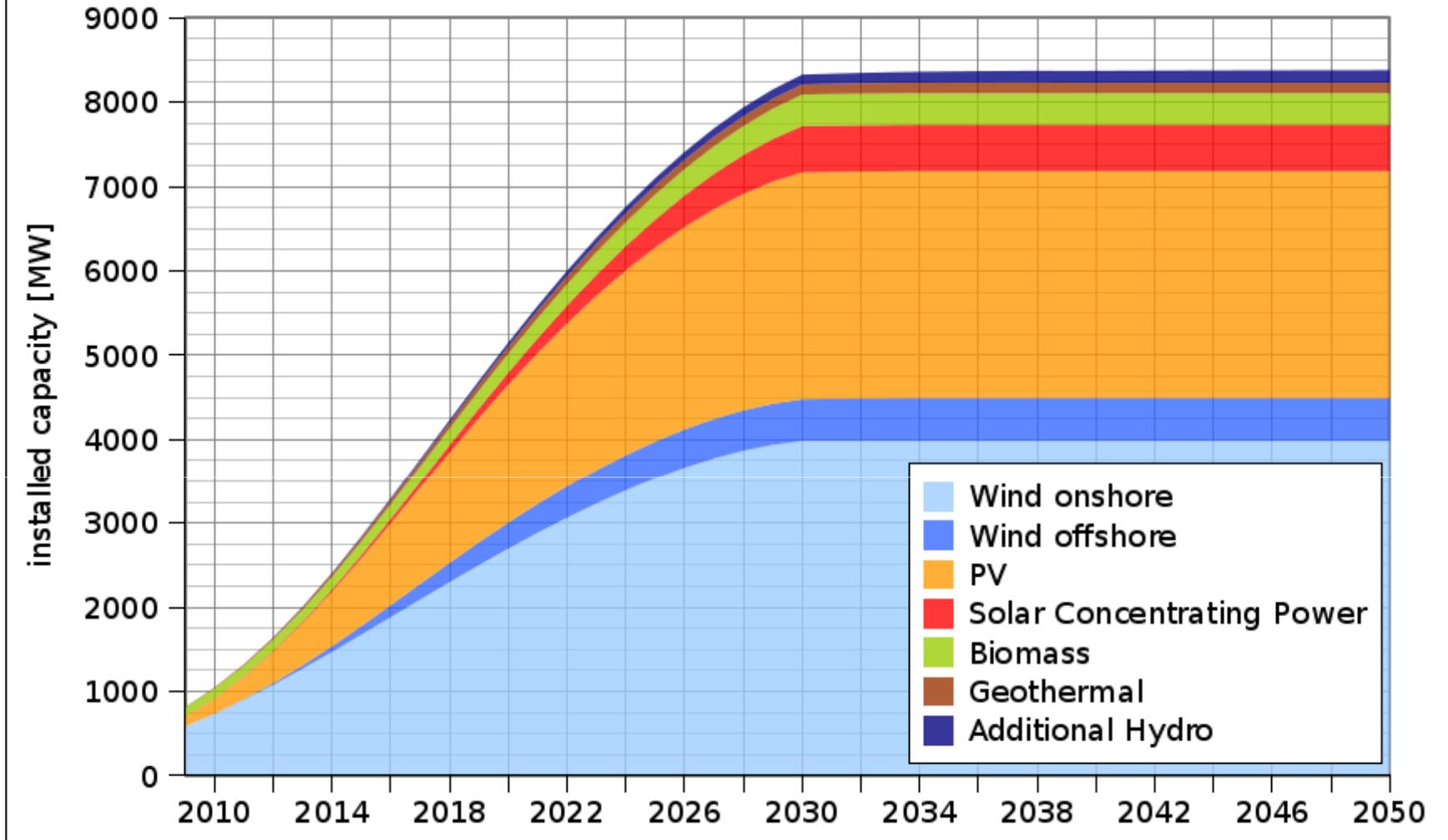
## Installed Capacities up to 2050, CPS Scenario



S. Peter, H. Lehmann, J. Puig, , M. García



## Installed Capacities up to 2050, FE Scenario



S. Peter, H. Lehmann, J. Puig, , M. García



## Simulació: potències installades per tecnologia

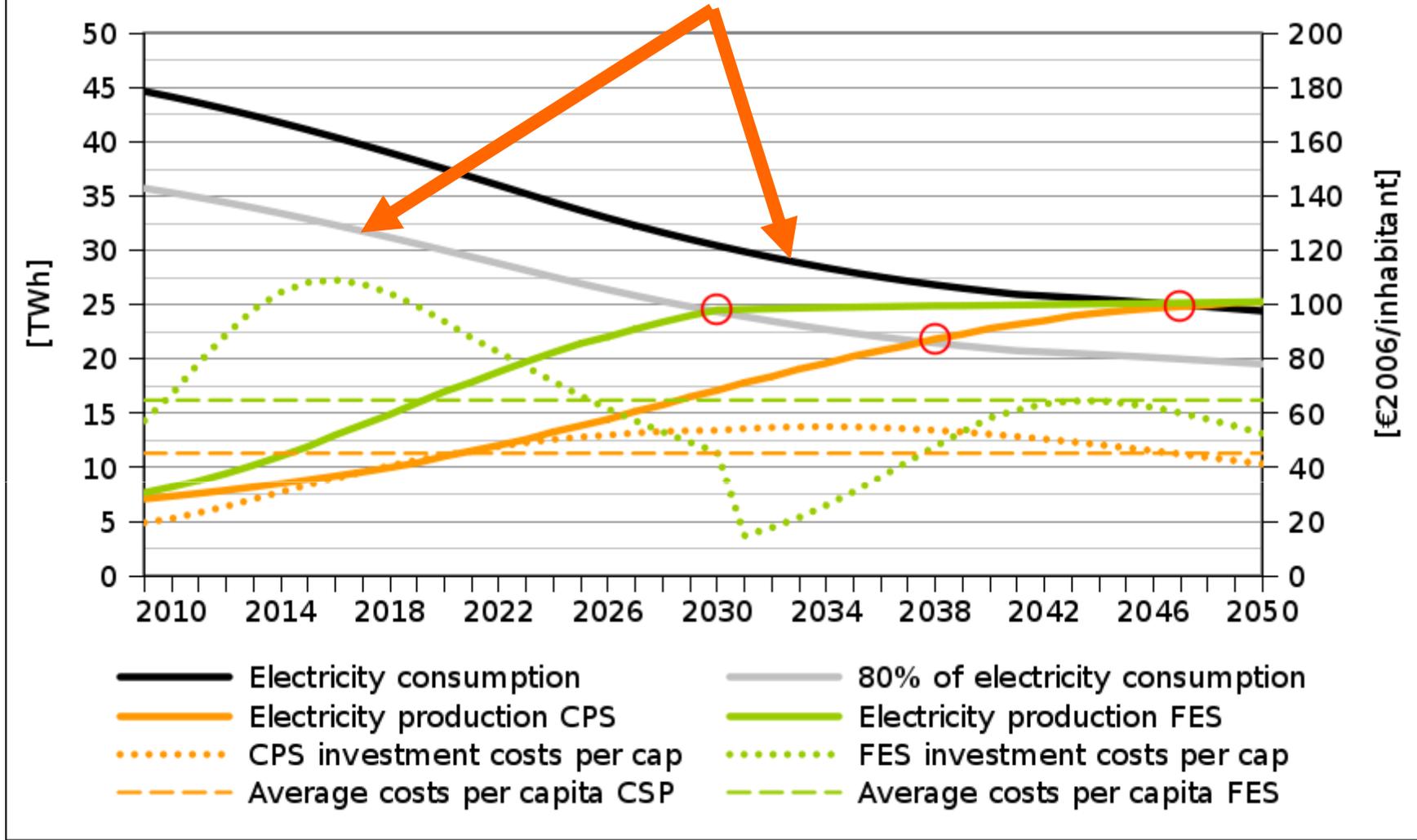
Tecnologia	Potència [MW]	Fracció [%]
Fotovoltaica	2,691.2	22.6%
Electricitat Termosolar	550.0	4.6%
Eòlica terra ferma	3,986.0	33.4%
Eòlica mar endins	497.5	4.2%
Biomassa & Residus	373.0	3.1%
Geotèrmia	120.0	1.0%
Hidràulica	2,477.0	20.8%
Bombeig hidràulic	495.4	4.2%
Importació (pic)	735.0	6.2%
<b>Total</b>	<b>11,925.1</b>	<b>100.0%</b>

# Costos d'inversió específics avui a a l'any 2050

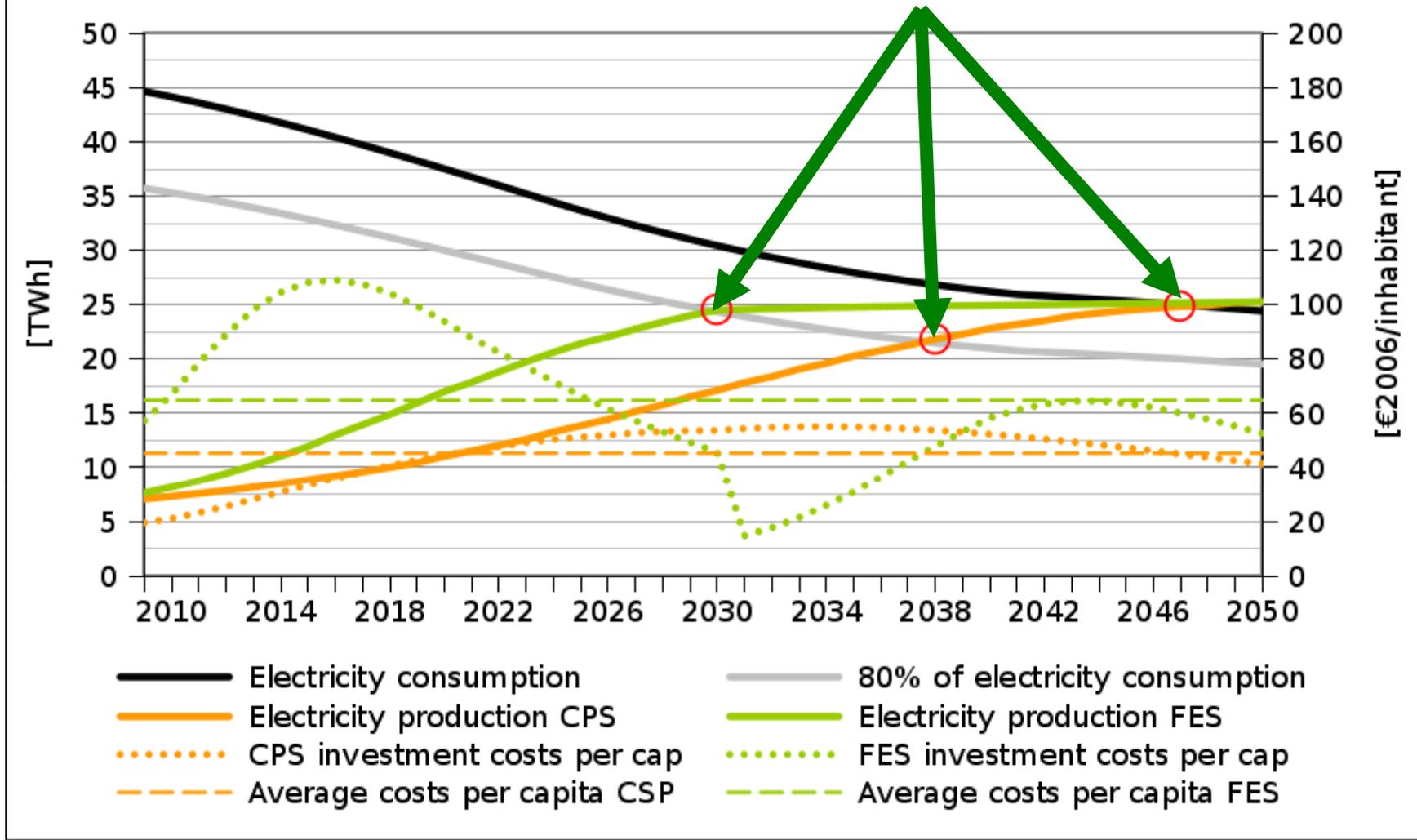
Technologia	Costos inversió avui [€ <sub>2006</sub> /kW <sub>el</sub> ]		Costos inversió 2050 [€ <sub>2006</sub> /kW <sub>el</sub> ]	
Biomassa&Residus	4,325	(4,400)	3,595	(2,200)
Eòlica terra ferma	1,120	(1,200)	779	(600)
Eòlica mar endins	1,669	(1,800)	962	(900)
Fotovoltaica	4,288	(5,000)	1,504	(1,667)
Electr. Termosolar	3,750	(4,000)	2,315	(2,000)
Geotèrmia	4,682	(8,000)	4,124	(4,000)
Hidràulica	5,000	(6,350)	5,000	(6,350)

En parentesi els valors emprats a "Catalunya Solar I", SolCat II, 2009, en base a dades de "Renewable Energy Outlook 2030" i [Kruck/Eltrop; 2004].

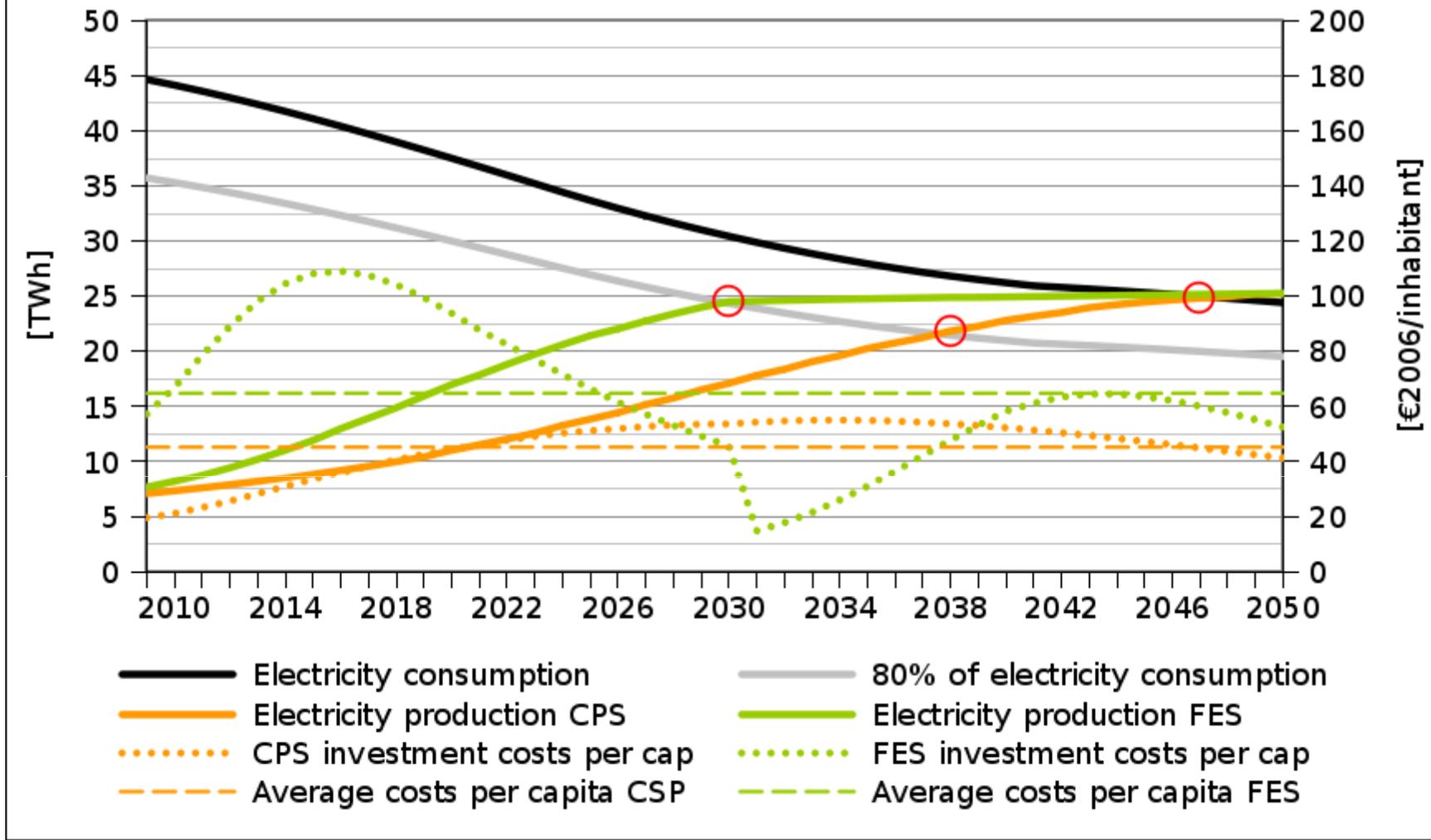
# Electricity: Demand & Supply



# Electricity: Demand & Supply



# Electricity: Demand & Supply



# Simulació del subministrament elèctric

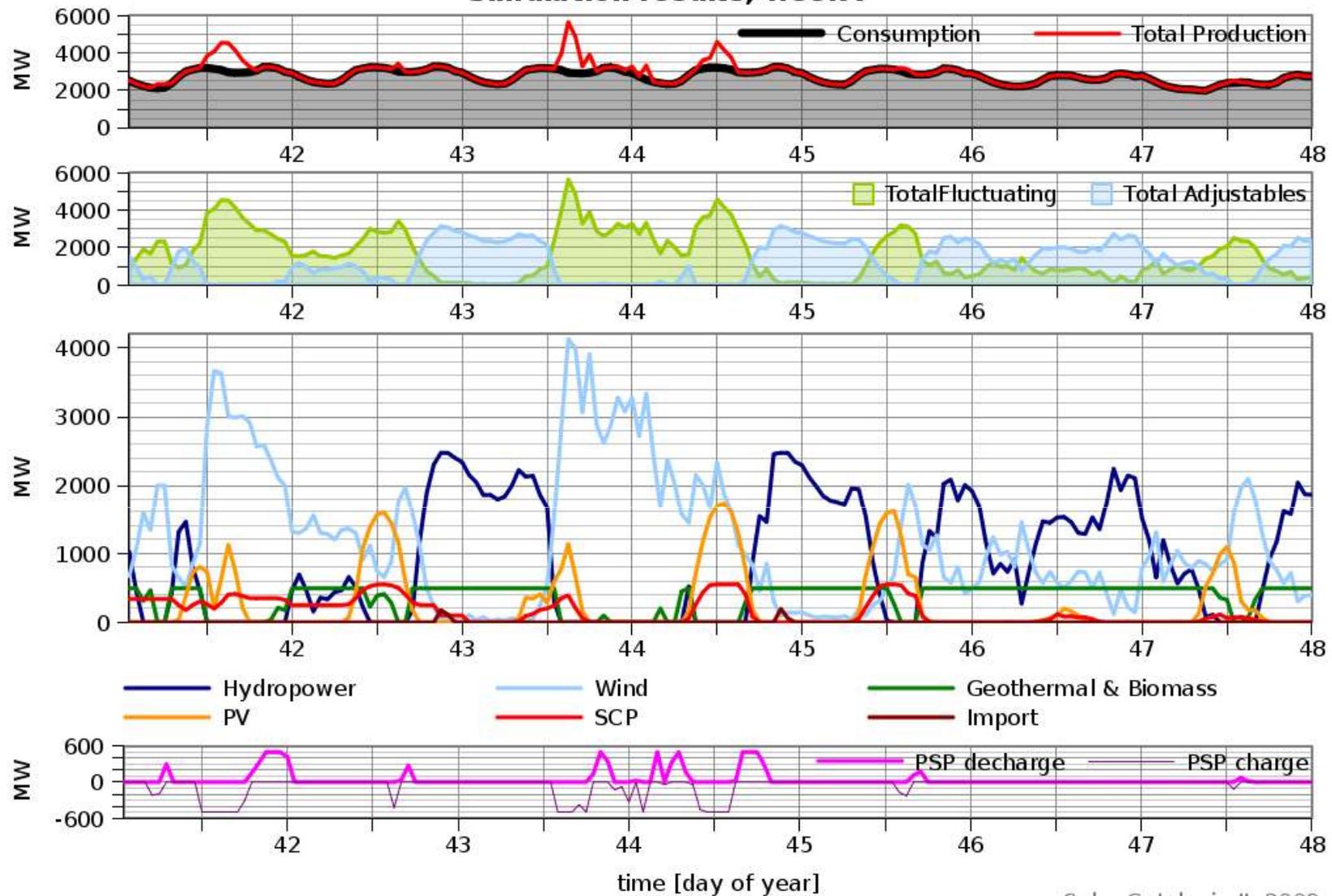
L'Escenari Sortida Ràpida va ser simulat amb SimREN

SimREN permet la simulació dinàmica de sistemes de subministrament amb una elevada proporció de fonts d'energia renovable

S'han emprat dades meteorològiques reals de Catalunya per avaluar l'energia eòlica i la solar

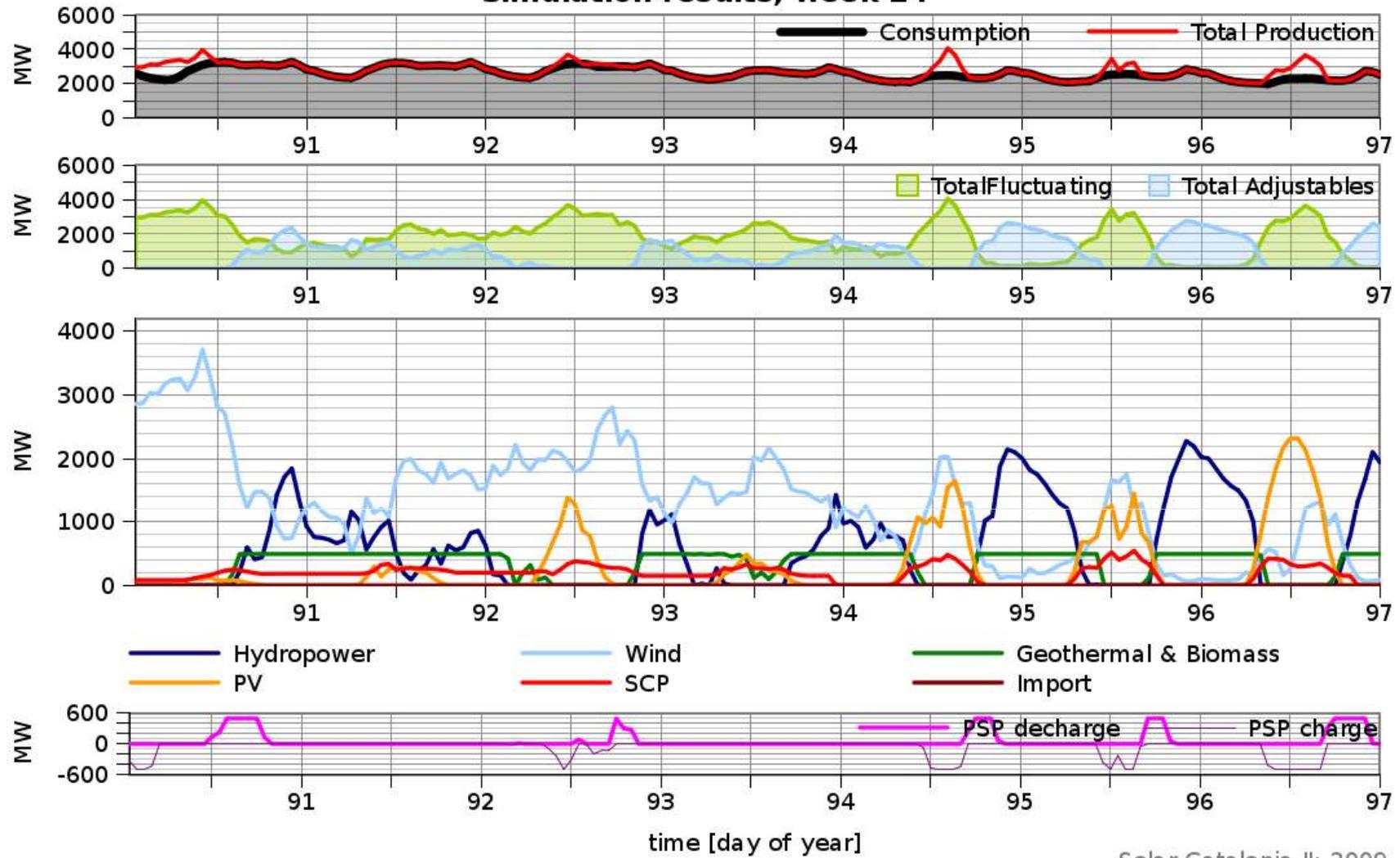
S'han emprat els perfils de la demanda d'electricitat a Espanya per modelar la dinàmica de la demanda a Catalunya

### Simulation results, week 7



Solar Catalonia II: 2009

### Simulation results, week 14

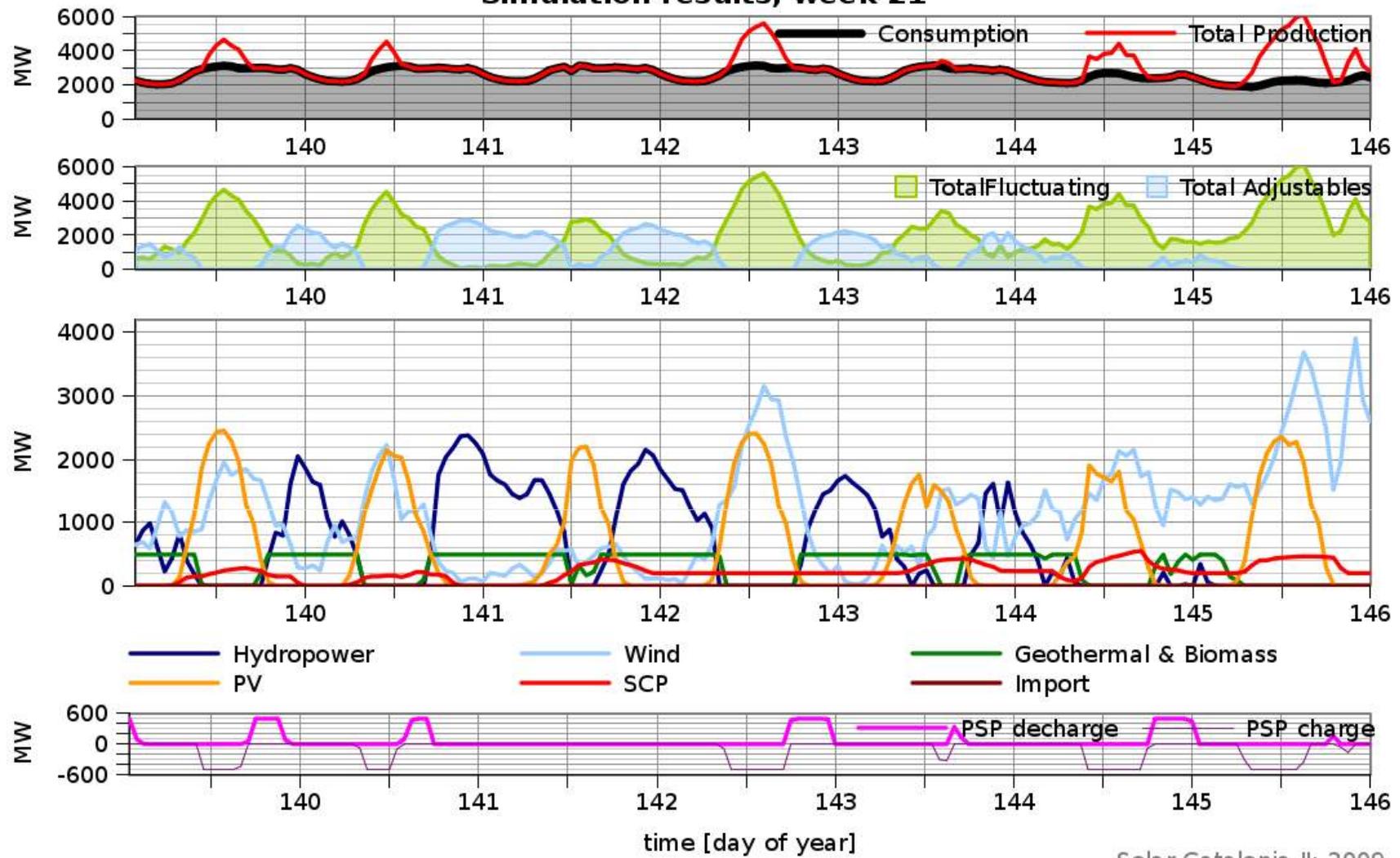


Solar Catalonia II: 2009

S. Peter, H. Lehmann, J. Puig, , M. García



### Simulation results, week 21

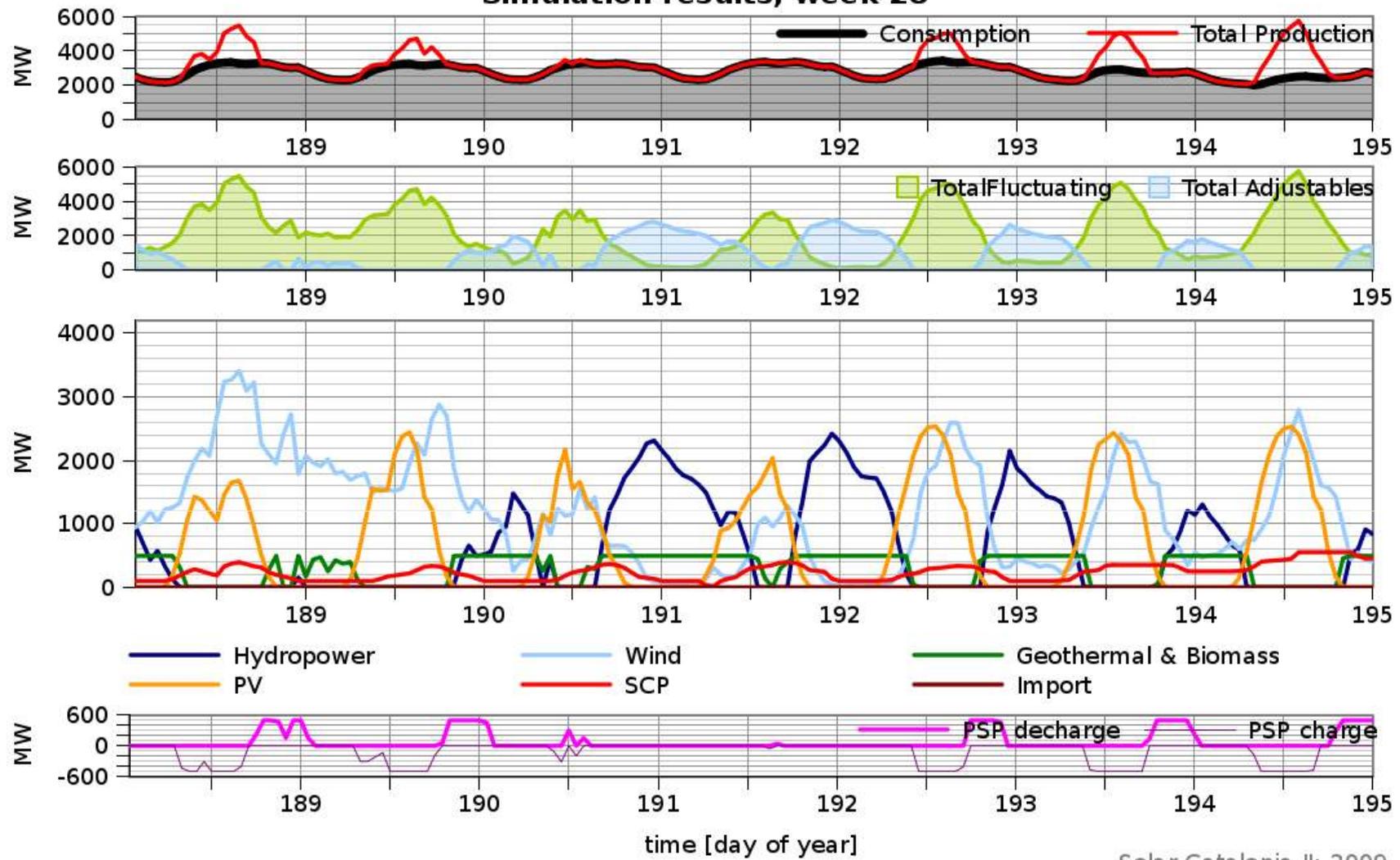


Solar Catalonia II: 2009

S. Peter, H. Lehmann, J. Puig, , M. García



### Simulation results, week 28

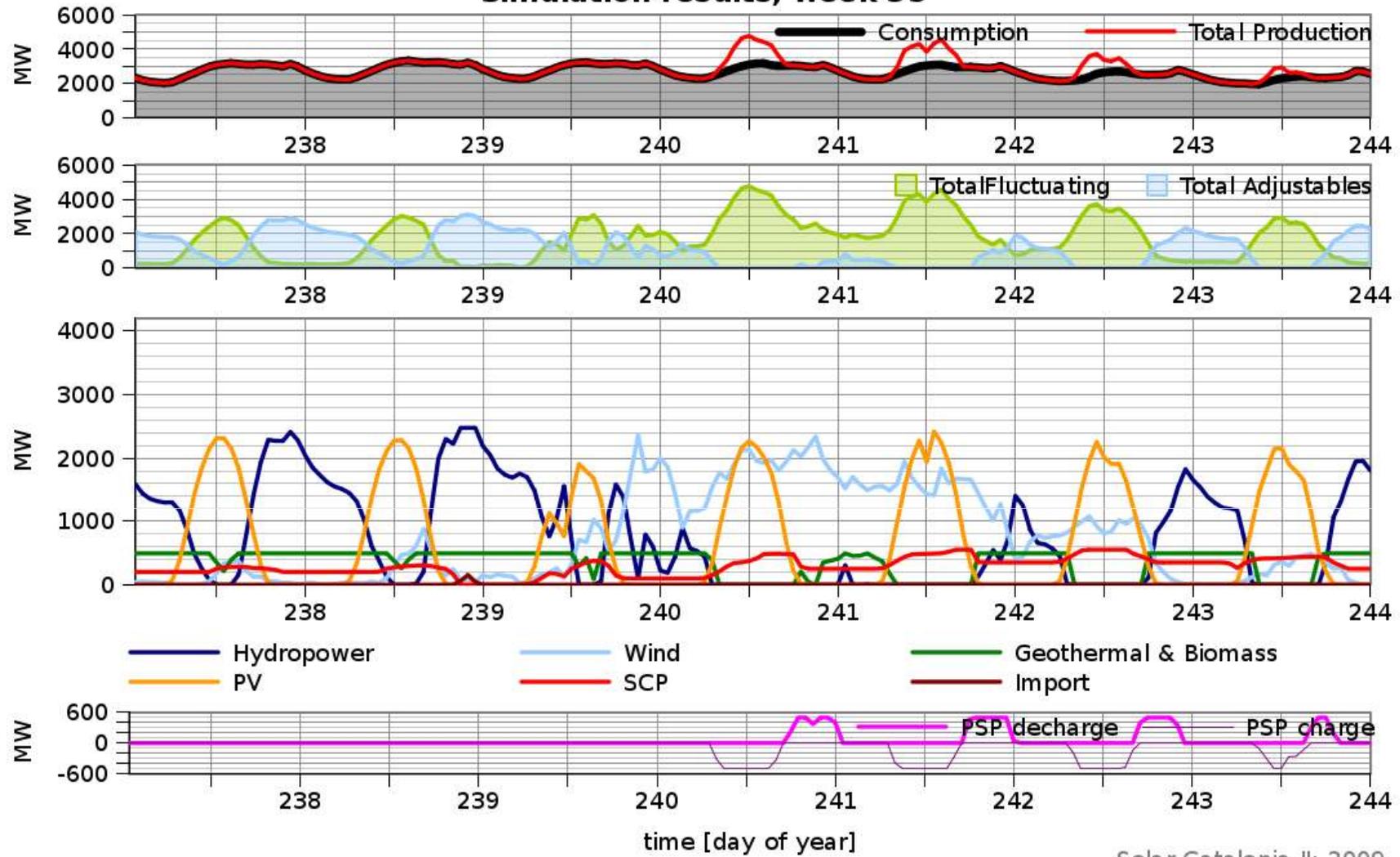


Solar Catalonia II: 2009

S. Peter, H. Lehmann, J. Puig, , M. García



### Simulation results, week 35

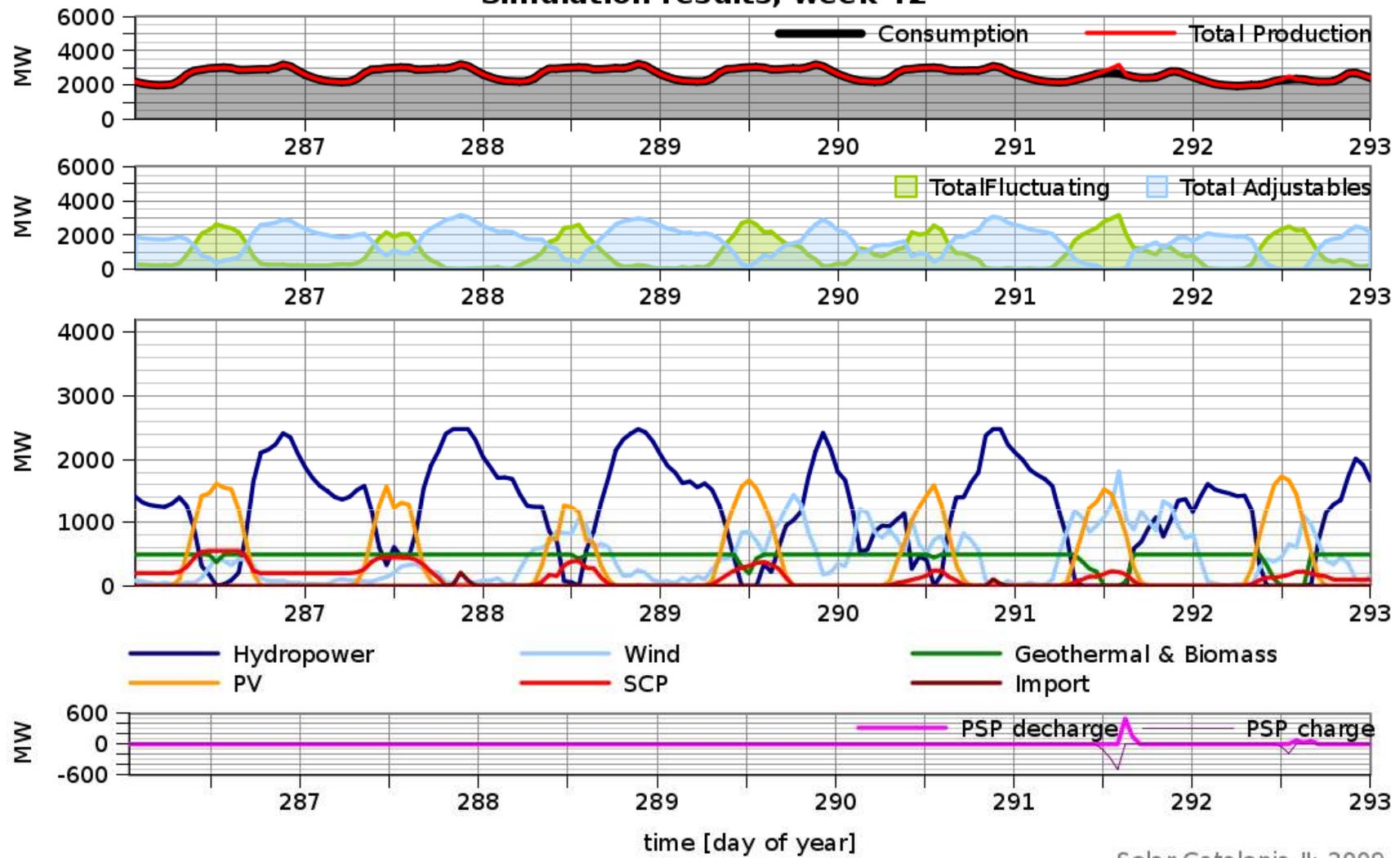


Solar Catalonia II: 2009

S. Peter, H. Lehmann, J. Puig, , M. García



### Simulation results, week 42

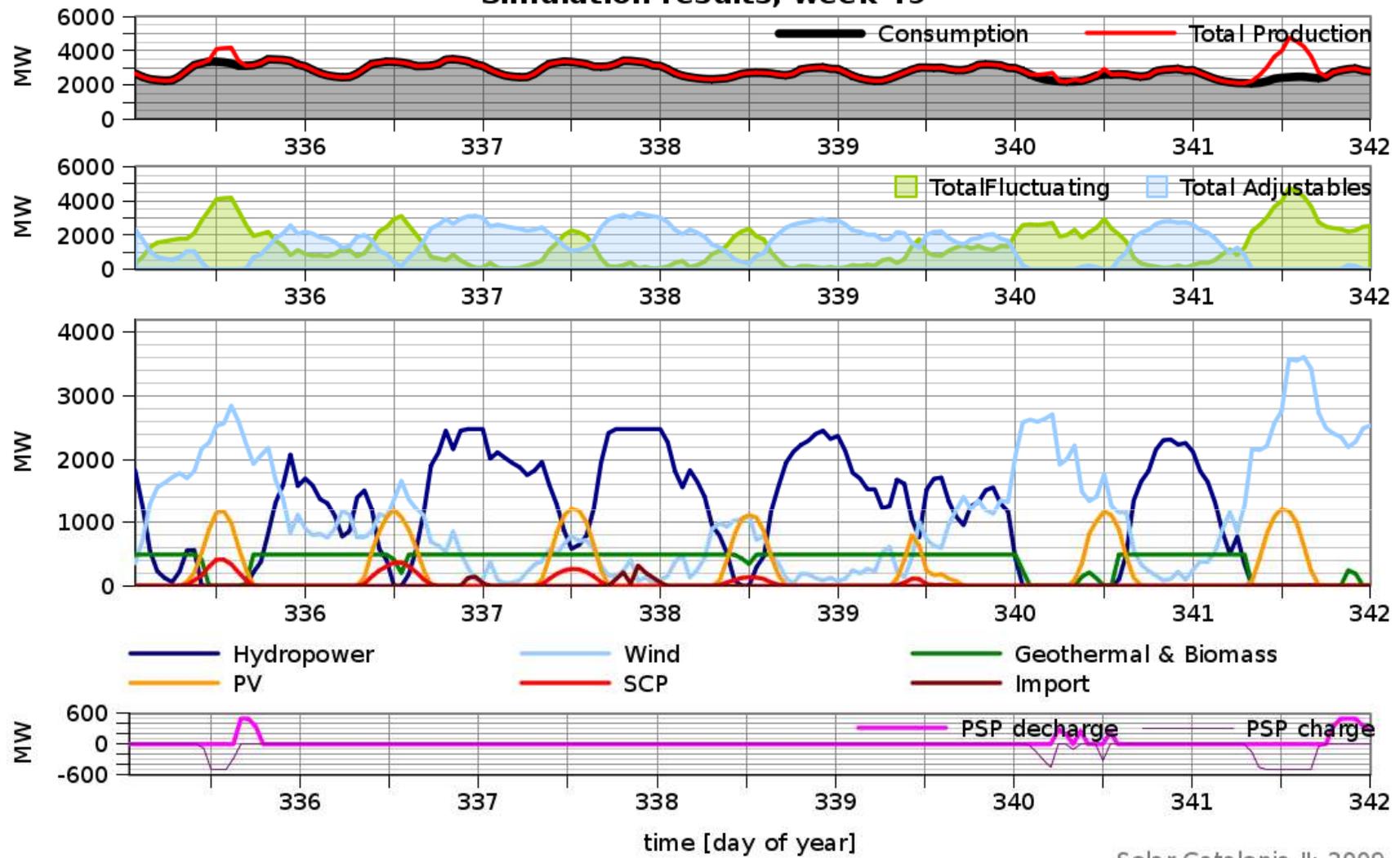


Solar Catalonia II: 2009

S. Peter, H. Lehmann, J. Puig, , M. García



### Simulation results, week 49

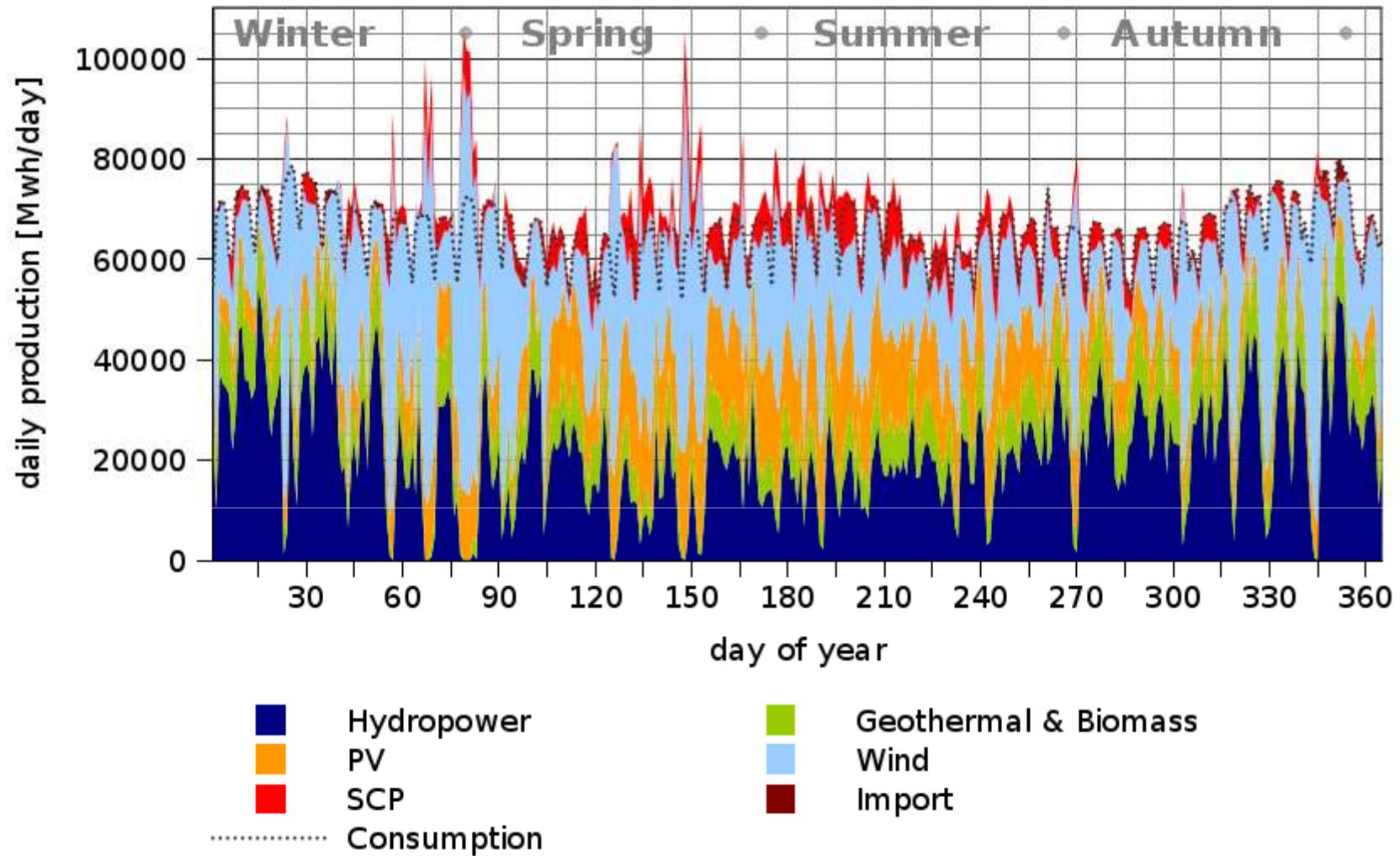


Solar Catalonia II: 2009

S. Peter, H. Lehmann, J. Puig, , M. García



# Annual variations of the Supply System

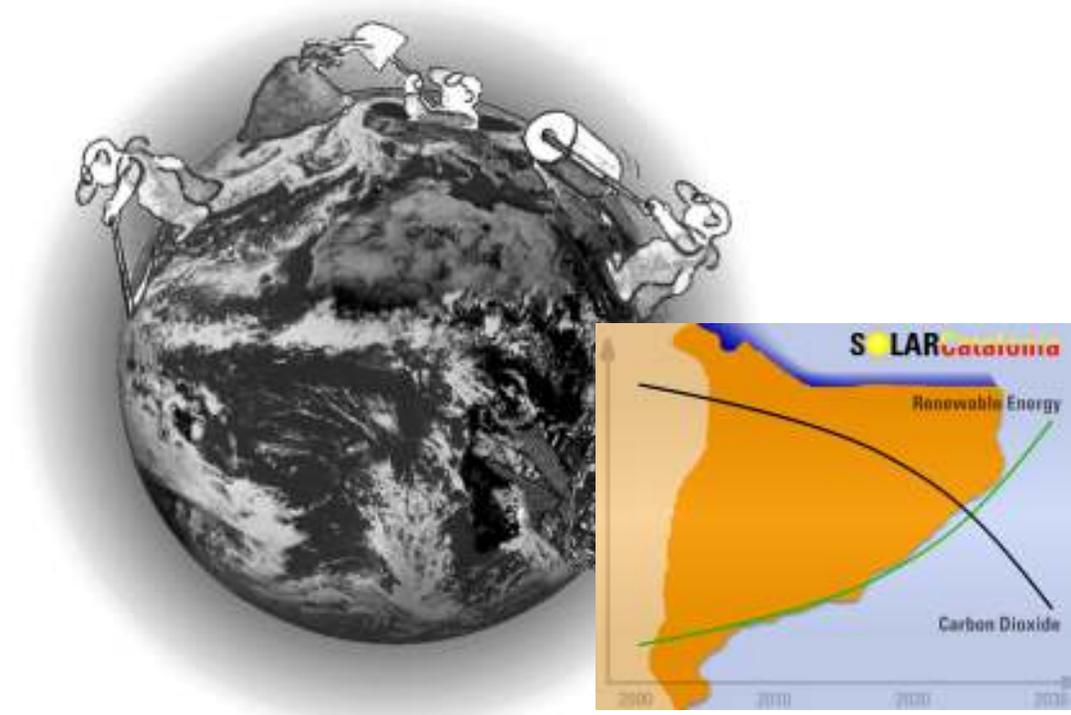


S. Peter, H. Lehmann, J. Puig, , M. García



# Catalunya 100% REN

Món



# L'altre via

Foreign Affairs, Fall  
1976



## Energy Strategy: The Road Not Taken?

By Amory B. Lovins



## A Plan for a Sustainable Future

Wind, water and solar power of the world

By Mark Z. Jacobson

Share Email Print



Urban Visions: The Future of...  
What will population centers look like in the future?  
energy production and transportation

June 15, 2010

In December leaders from around the world will meet in Copenhagen to discuss cutting back greenhouse gas

emissions over the next decades to come. The most effective step to implement that goal would be a massive shift away from [fossil fuels](#) to clean, renewable energy sources. If leaders can

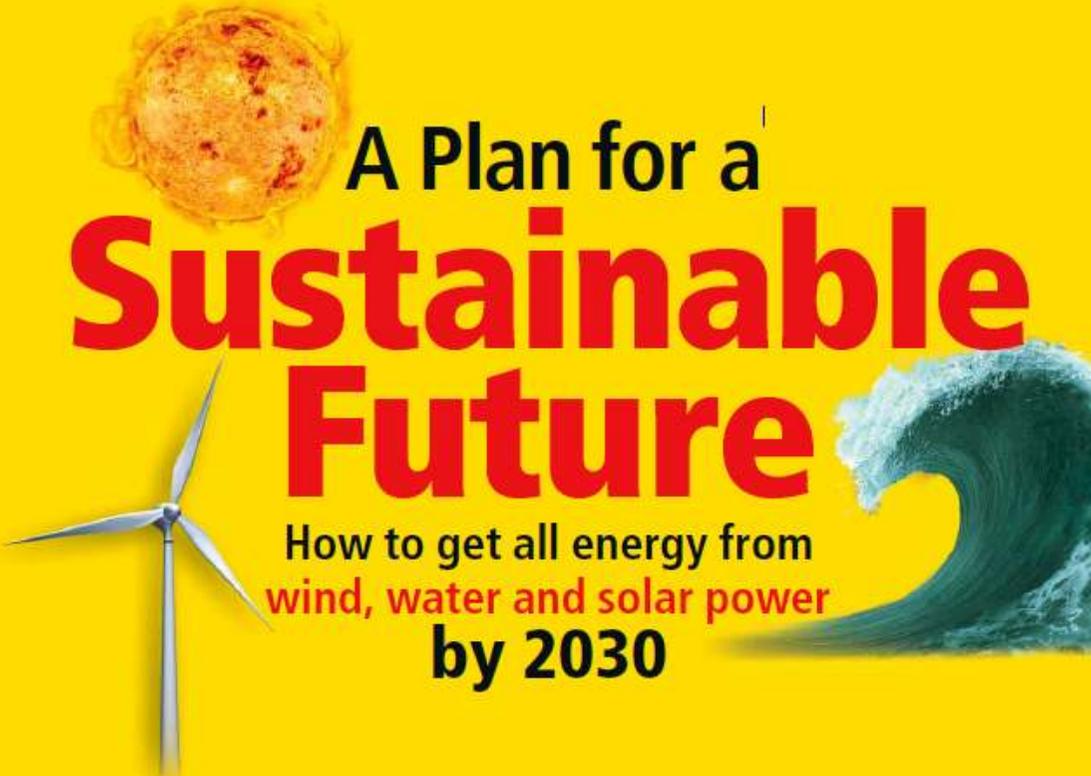
# SCIENTIFIC AMERICAN

November 2009

www.ScientificAmerican.com

The Long-Lost Siblings of OUR SUN

page 40



## A Plan for a Sustainable Future

How to get all energy from wind, water and solar power by 2030





for a living

Home

WWF?

What's

- Home
- What We Do
- Reducing Impacts
- Carbon, Energy & Climate
- Smart Energy
- Renewable Energies

**Sustainable by 2050?**

- Key Decisions
- Critical Choices
- How We Get There
- Consequences of Inaction
- 10 Recommendations
- The Debate
- Questions & Answers
- Ambassadors
- Clean Energy Facts
- Energy & Development
- Electricity Grids
- Deserts & Oceans
- Geothermal Hotspots



THIS REPORT HAS BEEN PRODUCED IN COLLABORATION WITH:

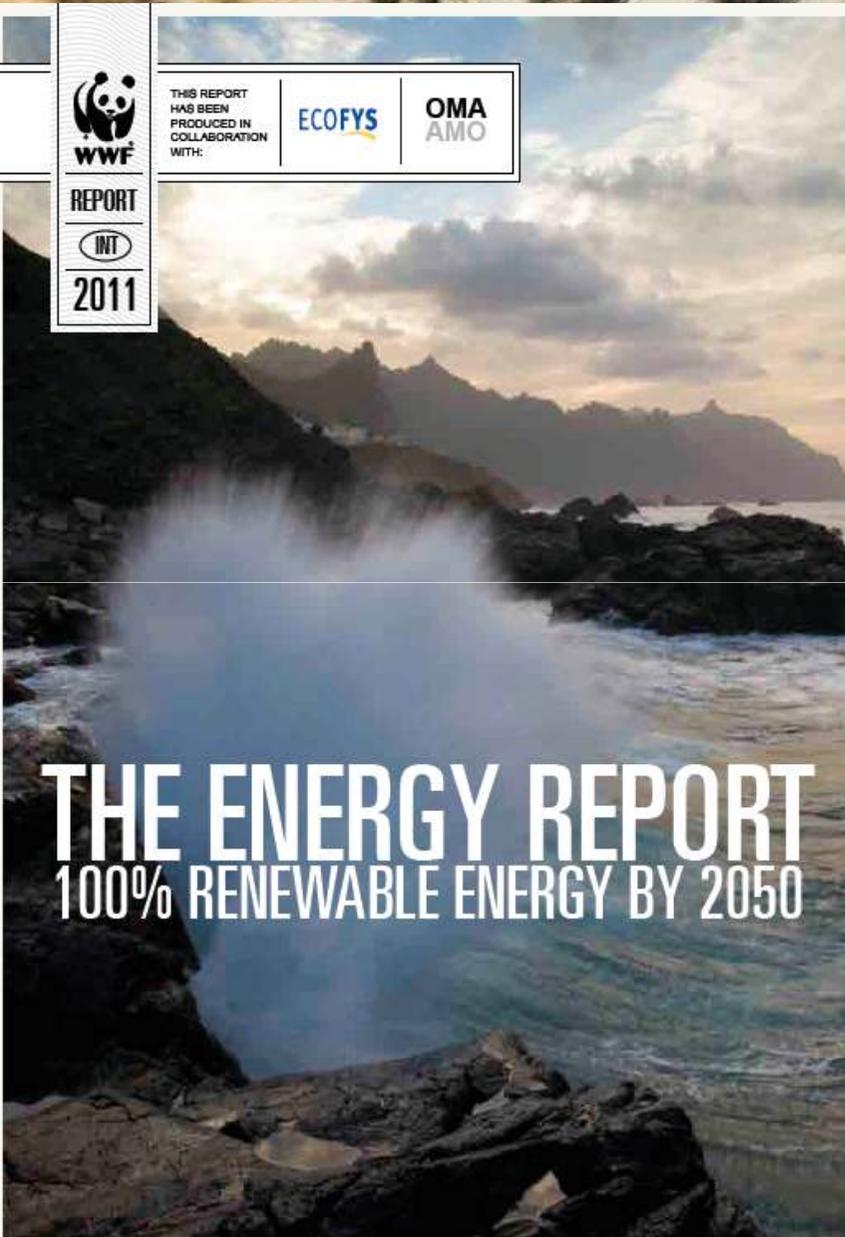
ECOFYS

OMA  
AMO

REPORT



2011



# THE ENERGY REPORT

## 100% RENEWABLE ENERGY BY 2050

*dwindling fossil fuel resources.*



Hour

f M'agrada 3 mil

Tweet 709

St 36

**"BY 2050, WE  
SAVE NEARLY  
€4 TRILLION  
PER YEAR  
THROUGH**

### Navigation

- [Home](#)
- [Scenarios](#)
  - [World](#)
  - [Europe](#)
  - [Japan](#)
  - [Catalunya](#)
  - [Germany](#)
- [Data & graphs](#)
- [Historical studies](#)
- [Downloads](#)
- [Contact](#)
- [Links](#)
- [Imprint](#)

### Log in

- [Log in](#)

## World

### **Renewable Energy Outlook 2030**

a report to the Energy Watch Group

Authors: Stefan Peter, Harry Lehmann

Downloads: ([English: Executive Summary, Short Version, Full Text](#) / [German: Executive Summary](#))

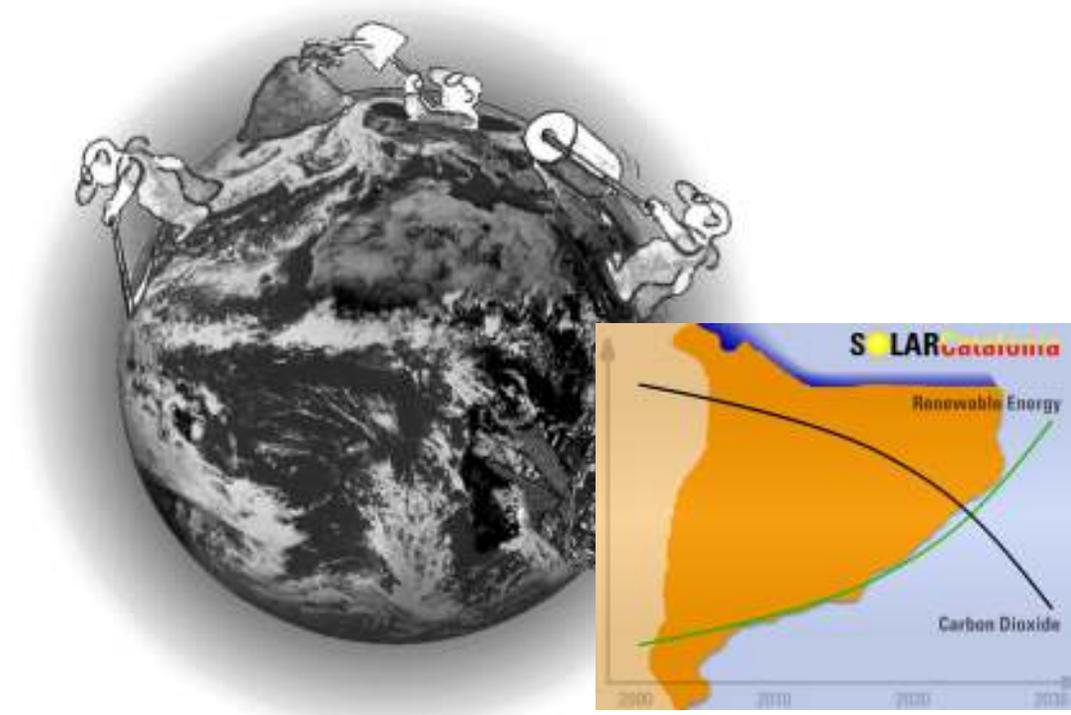
#### **Executive Summary**

The objective of this study is to present an alternative and - from our point of view - more realistic view of the chances of the future uses of renewable energies in the global energy supply. The scenarios in this study are based on the analysis of the development and market penetration of renewable energy technologies in different regions in the last few decades. The scenarios address the question of how fast renewable technologies might be implemented on a worldwide scale and project the costs this would incur. Many factors, such as technology costs and cost-reduction ratios, investments and varying economic conditions in the world's regions, available potentials, and characteristics of growth have been incorporated in order to fulfil this task.

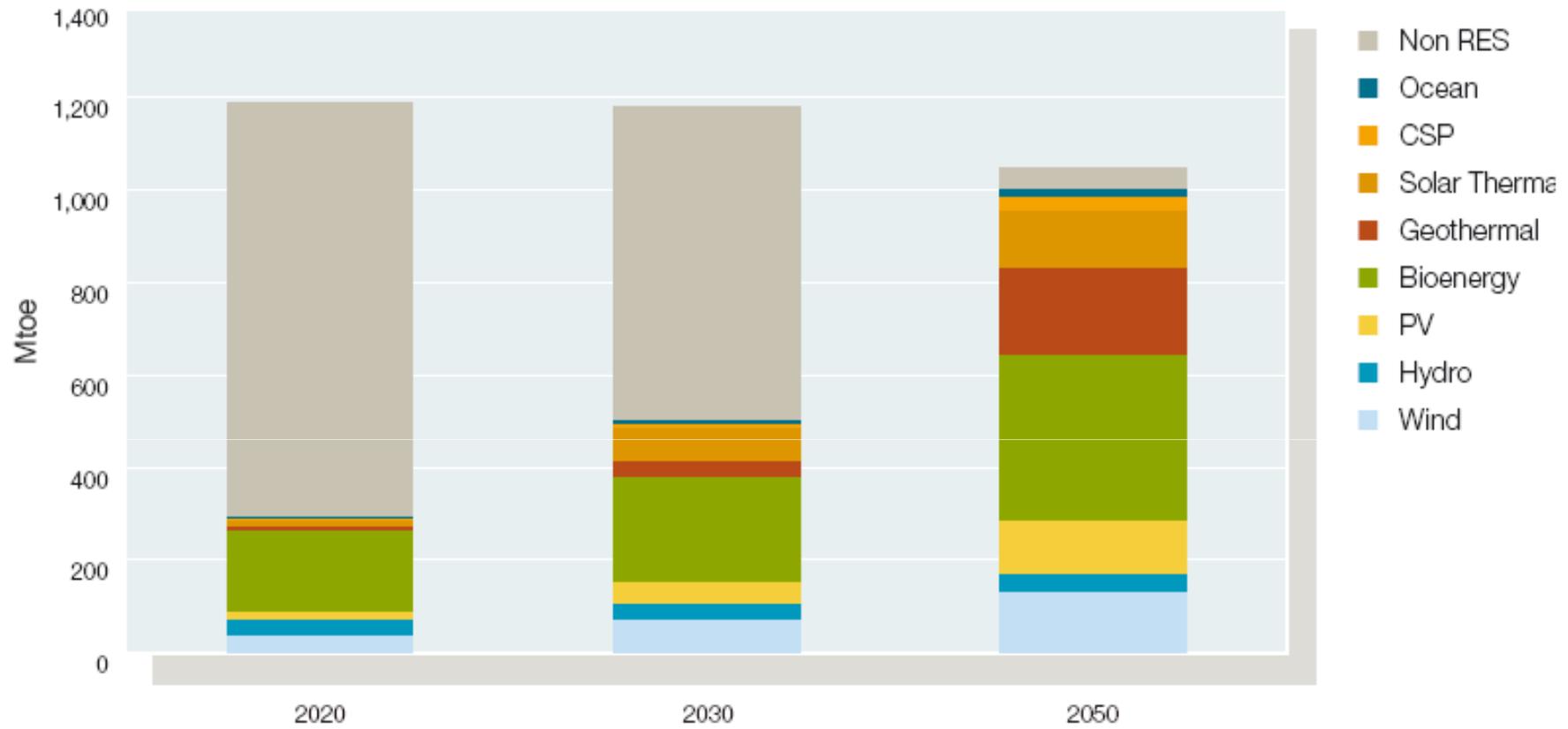
Off course the scenarios describe two possible developments among other possibilities, but they represent realistic possibilities that give reason for optimism. The results of both scenarios show that - until 2030 - renewable capacities can be extended by a far greater amount and that it is much cheaper than most scientist and people actually think. The scenarios do explicitly not describe a maximum possible development from the technological perspective but show that much can be achieved with even moderate investments. The scenarios do not pay attention to the further development of Hydropower, except for incorporating the extensions that are planned actually. This is not done to express our disbelief in the existence of additional potentials or to ignore Hydropower, but due to the fact that reliable data about sustainable Hydropower potentials were not available. Consequently, the figures in this study show how much can be achieved, even if Hydropower remains on today's levels more or less. Higher investments into single technologies, e.g. Hydropower or Biomass, or in general than assumed in the "REO 2030" scenarios will result in higher generating capacities by 2030.

# Catalunya 100% REN

Europa



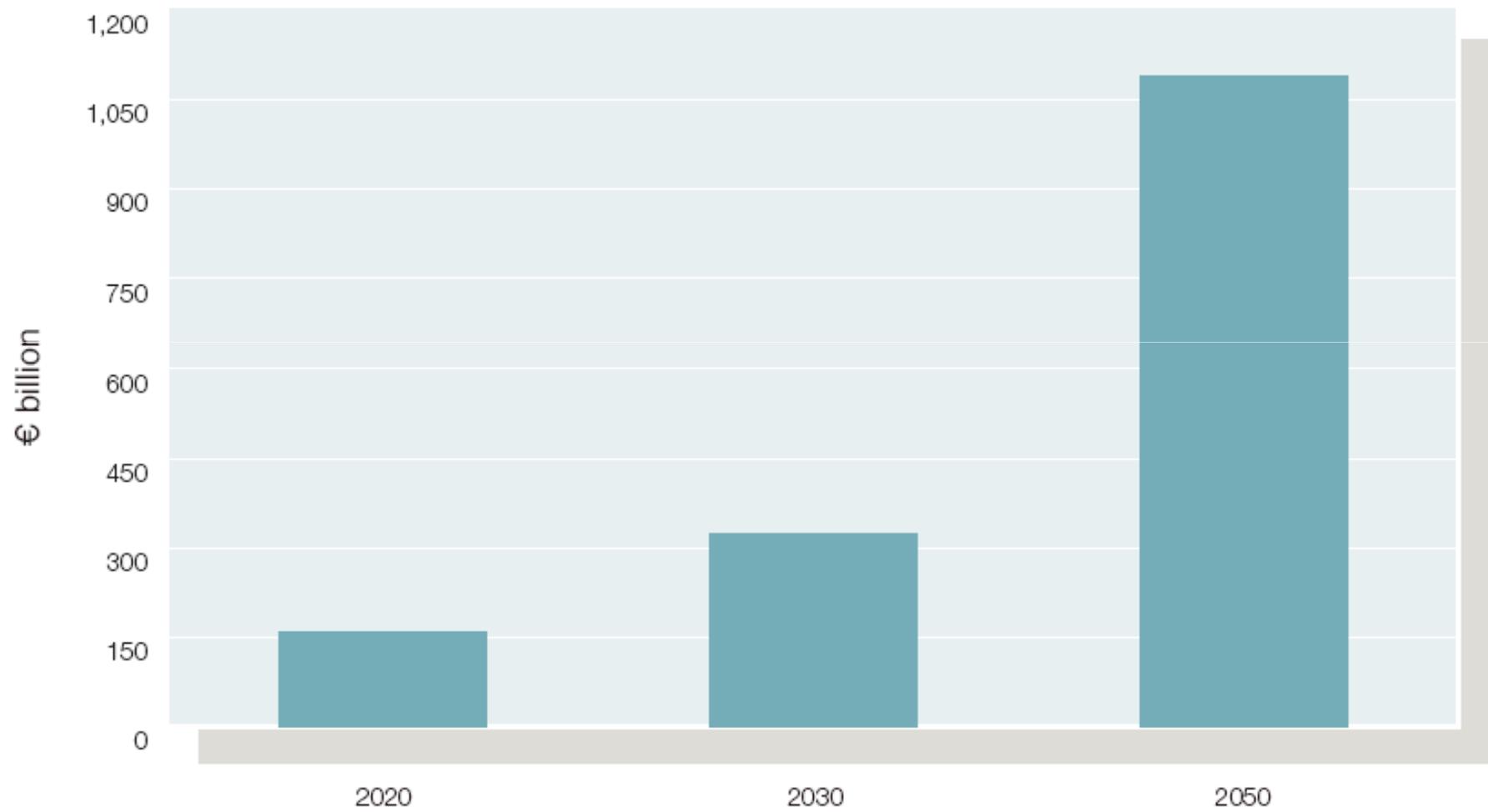
**Figure 1** Contribution of Renewable Energy Technologies to Final Energy Consumption



Source: EREC

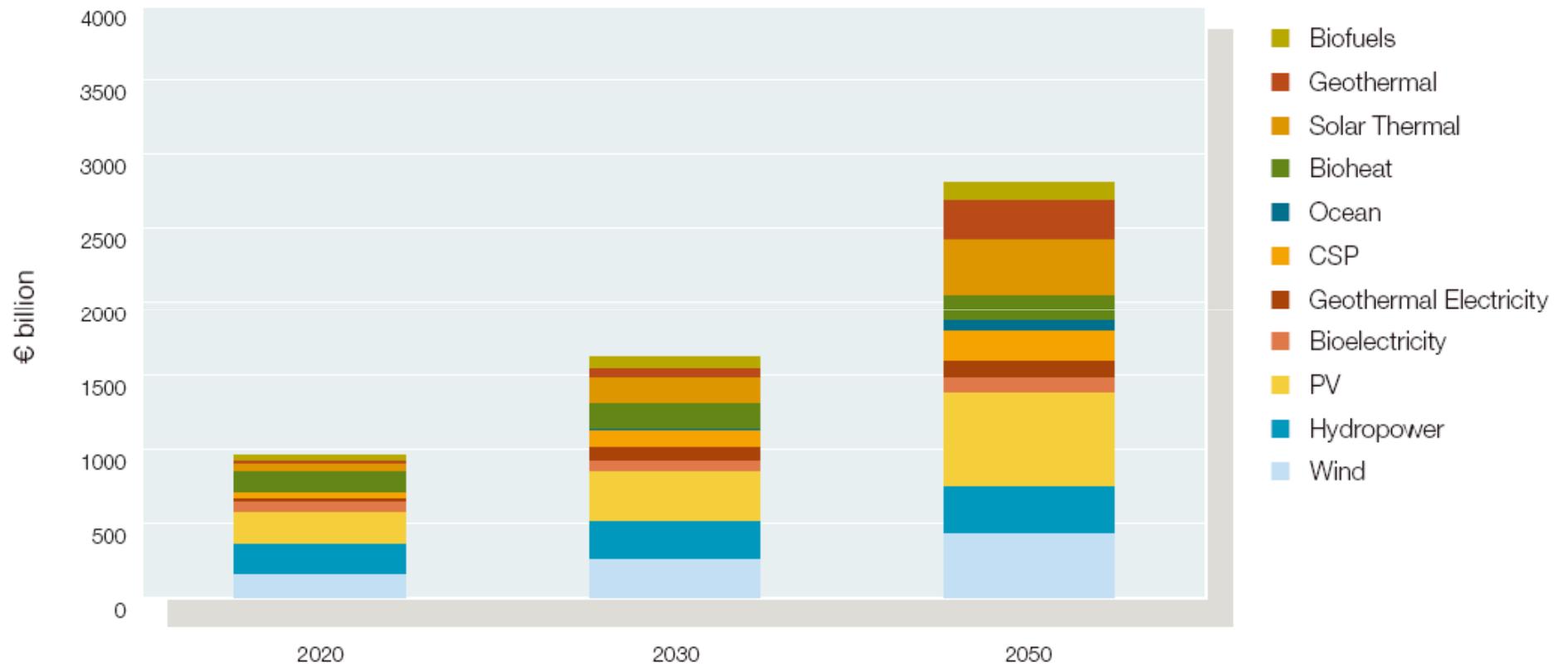
Font: RE-thinking 2050: A 100% Renewable Energy Vision for the EU

**Figure 2** Avoided Fuel Costs from RES Deployment (2020-2030-2050)



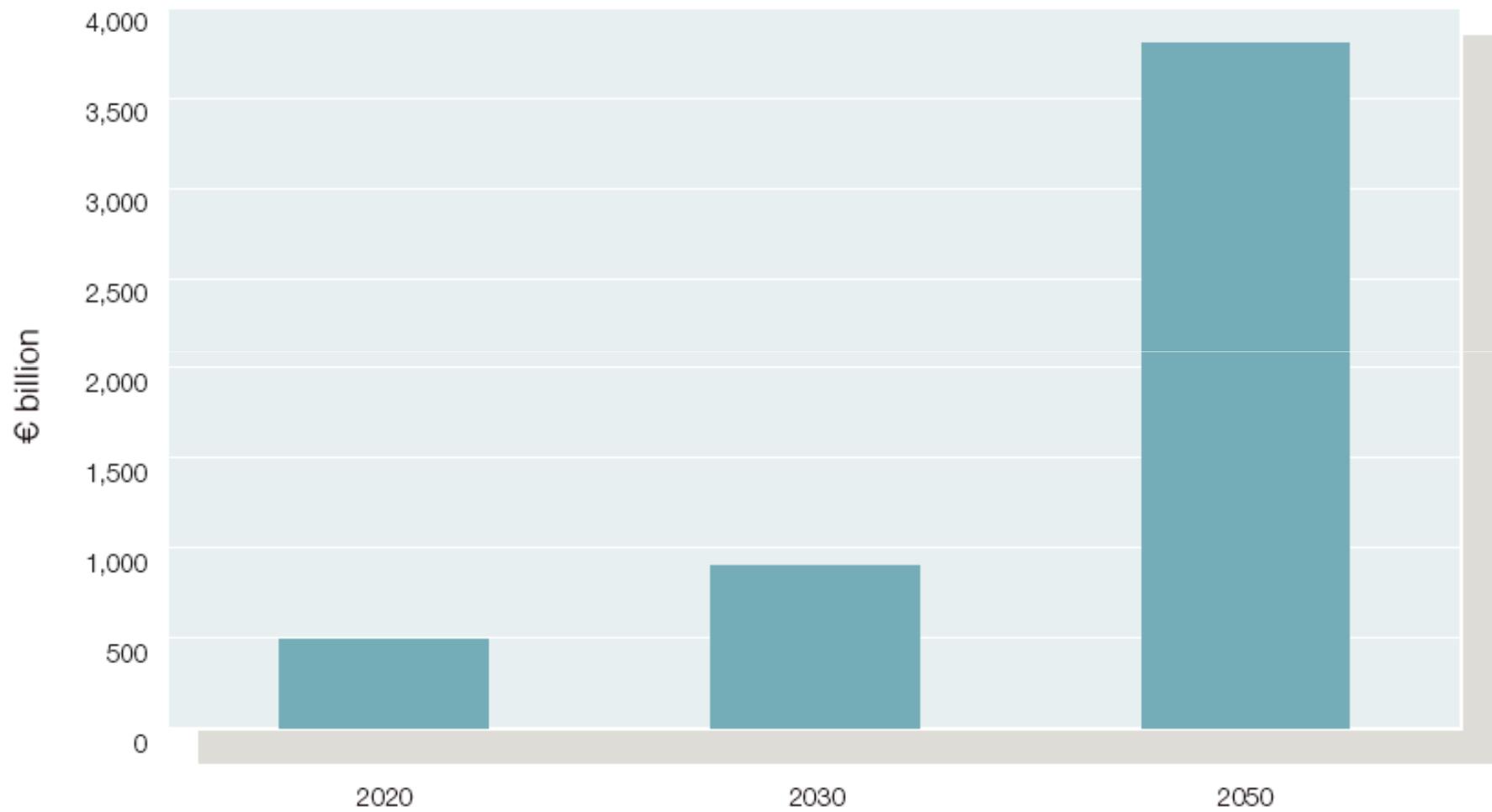
Source: EREC

**Figure 3 Total Cumulative Investments (2020-2030-2050)**



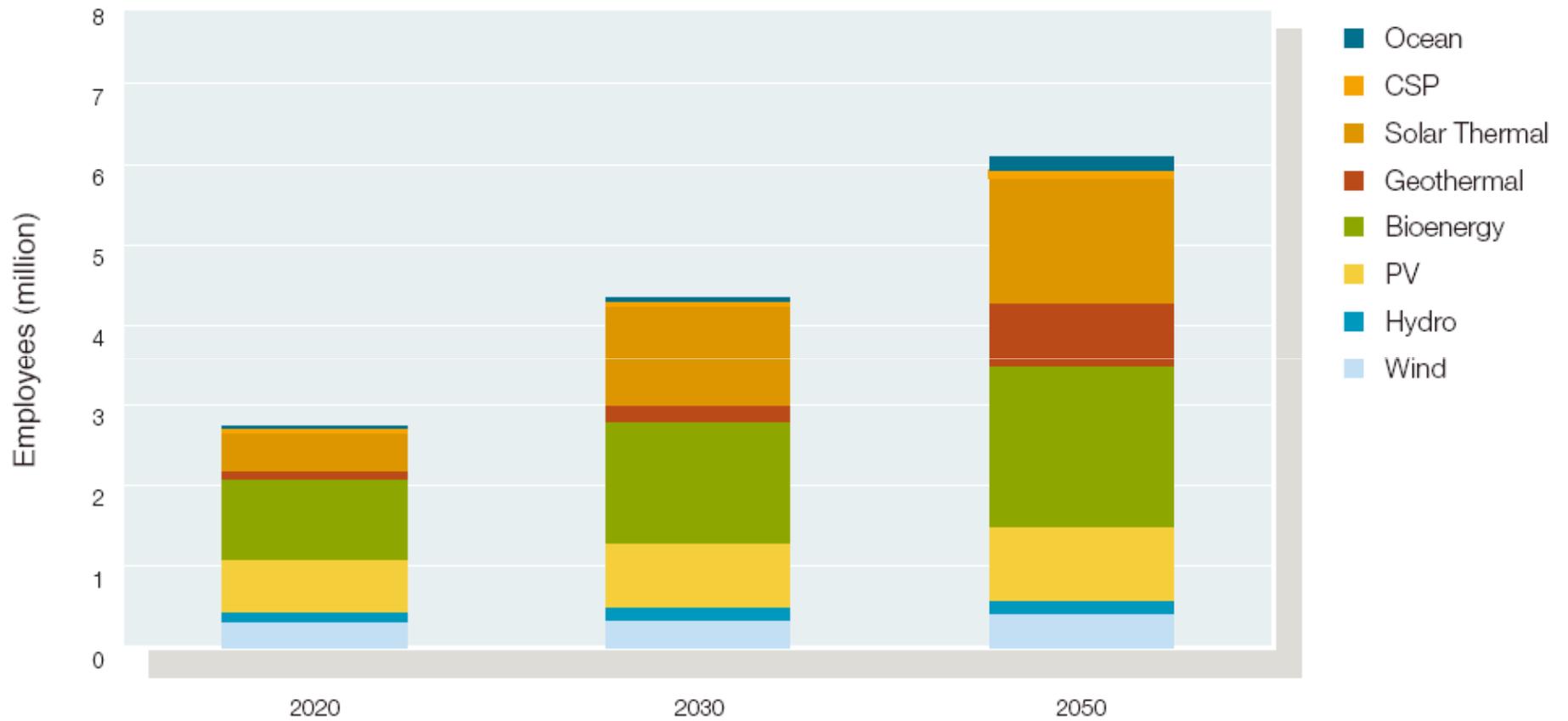
Source: EREC

**Figure 4 CO<sub>2</sub> Costs Avoided (2020-2030-2050)**

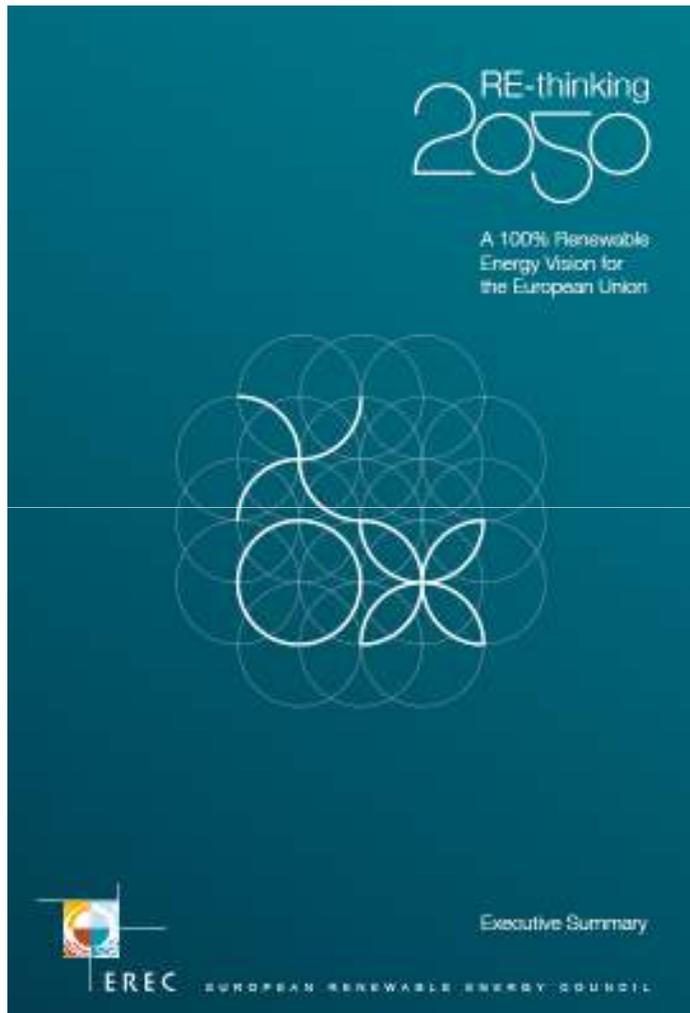


Source: EREC

**Figure 5** Gross Employment in the Renewable Energy Sector (2020-2030-2050)



Source: EREC



## Policy Recommendations – Inventing Tomorrow Today

Continuing on today's energy path without any change in policies would not only mean that the pressing issue of climate change is not addressed, but also that our dependency on fossil fuels is set to increase, and fast, and that we would be bound to unpredictable energy prices, all of which would result in detrimental impacts on Europe's economy and in energy insecurity.

The only way to avoid the ever increasing energy dependence of the European Union is to develop the abundant renewable energy potential of all EU Member States. Europe should lead the way with a clear commitment to a 100% renewable energy future by 2050.

As *RE-thinking 2050* clearly outlines, it is not a matter of availability of technologies. It is a matter of political will and of setting the course today for a sustainable energy future tomorrow. A 100% renewable energy supply for Europe will require paramount changes both in terms of energy production and consumption as well as concerted efforts at all levels – local, regional, national and European.

In order to achieve a 100 % renewable energy supply, a clear-cut and consistent mix of measures must be put in place along the following lines:

- Supporting the transition towards a 100% renewable energy economy through all EU policy areas
- Less is more – an ambitious energy efficiency and energy savings framework
- Effective and full implementation of the new RES Directive (2009) in all EU-27 Member States
- Binding renewable energy targets for 2030
- Full liberalisation of the energy market
- Phasing out all subsidies for fossil and nuclear energy and introducing an EU-wide carbon tax
- Electricity infrastructure – moving towards SuperSmartGrids
- Hybrid energy solutions and virtual power plants
- Heating and cooling – measures to awaken the sleeping giant
- New transport solutions
- Smart-Energy Cities 2050
- Smart-Energy Buildings 2050 – constructing a better climate

Be part of a sustainable energy future –  
download the full report of *RE-thinking 2050* & declare your support at:

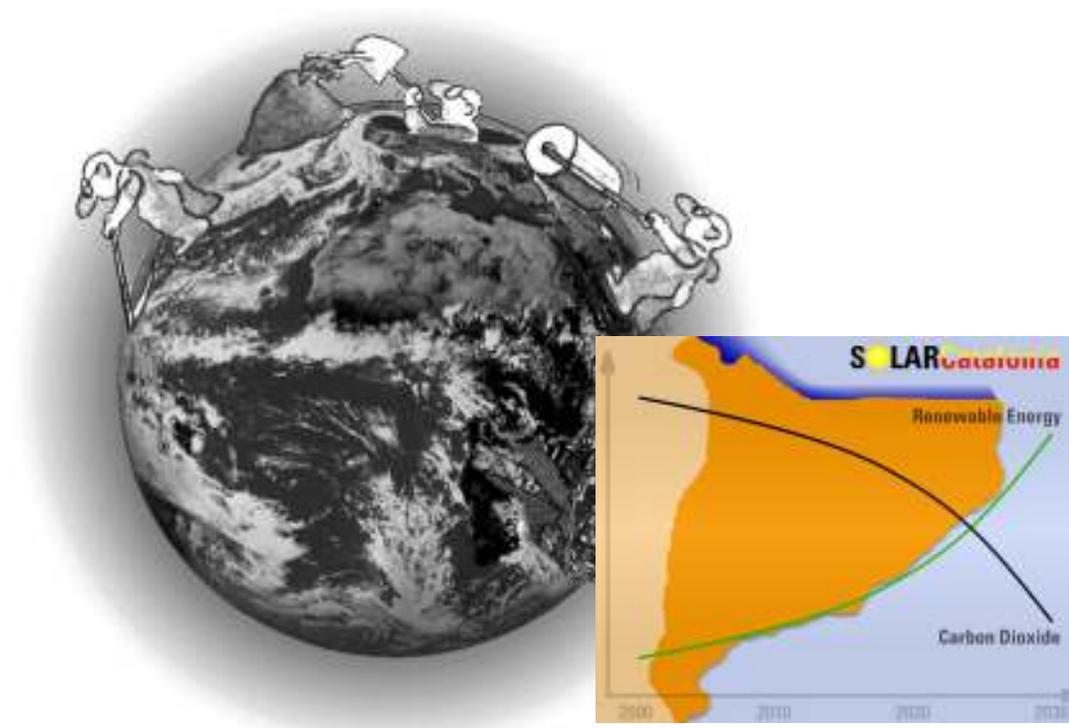
[www.rethinking2050.eu](http://www.rethinking2050.eu)

EREC, the European Renewable Energy Council, is the umbrella organisation of the major European renewable energy industry, trade and research associations active in the field of photovoltaics, small hydropower, solar thermal, bioenergy, ocean & marine, geothermal, wind energy, and solar thermal electricity. It represents an industry with an annual turnover of more than €70 billion and more than 550,000 employees.

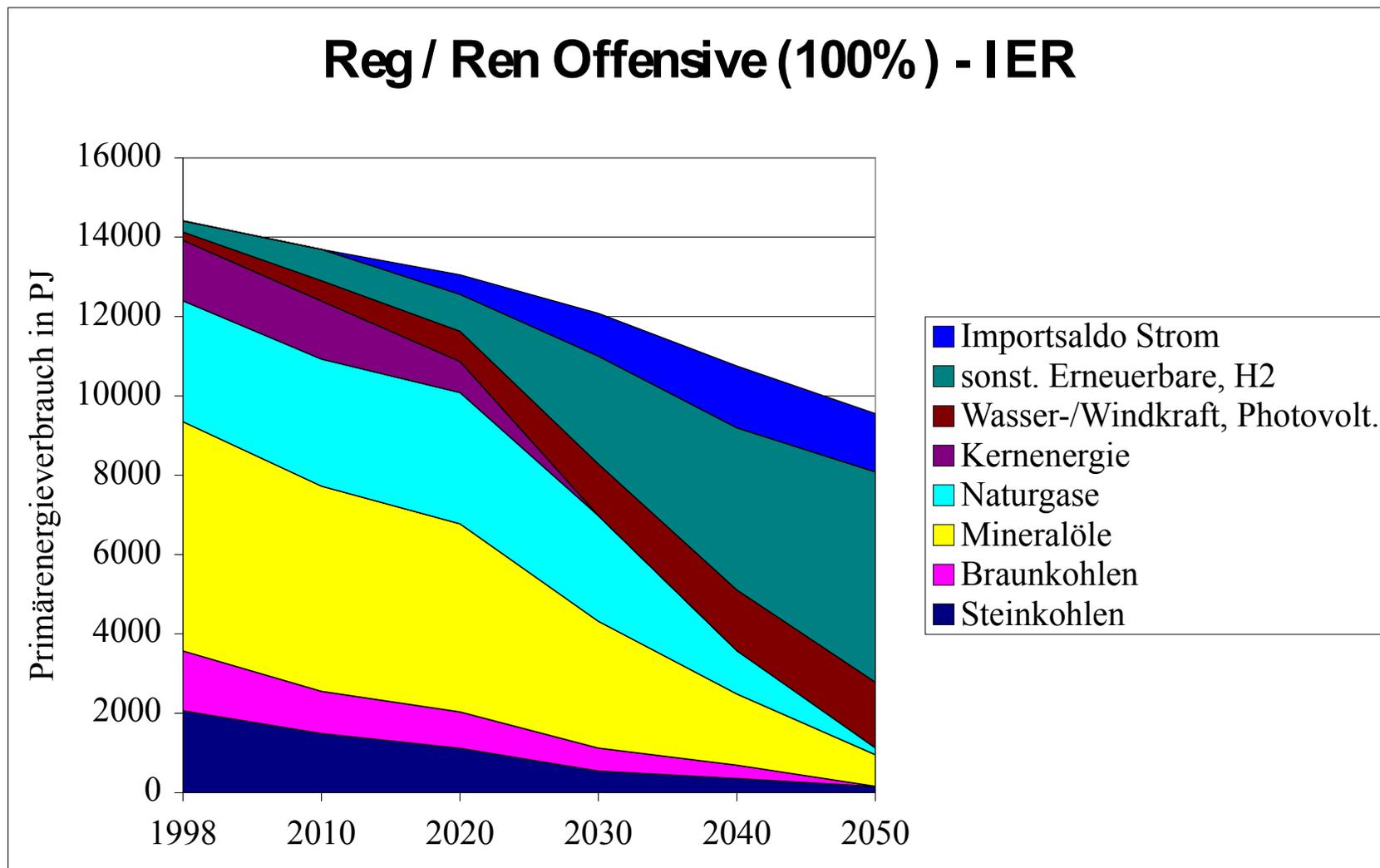


# Catalunya 100% REN

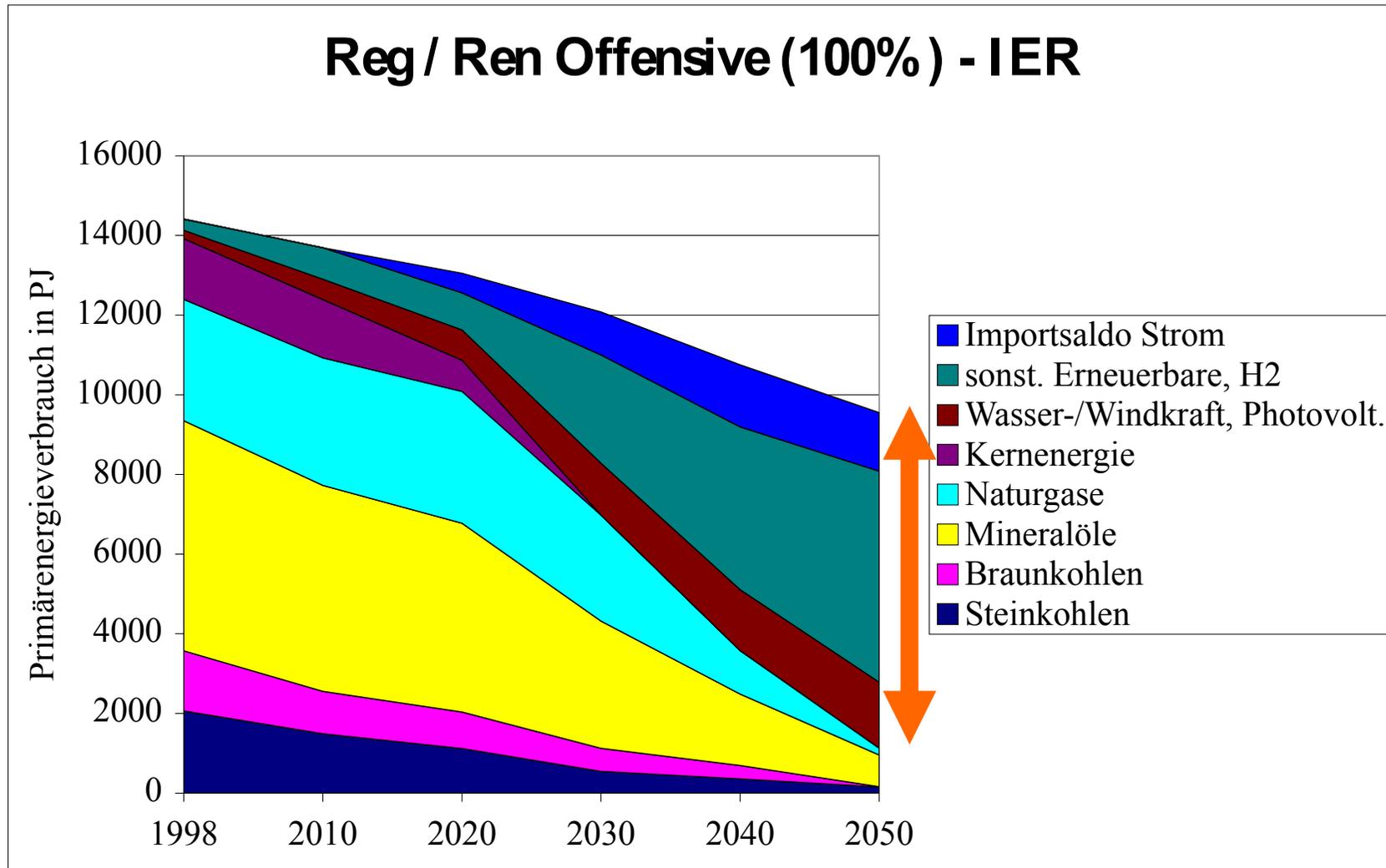
Alemanya



# German Bundestag Enquete - LT Scenarios - 2050

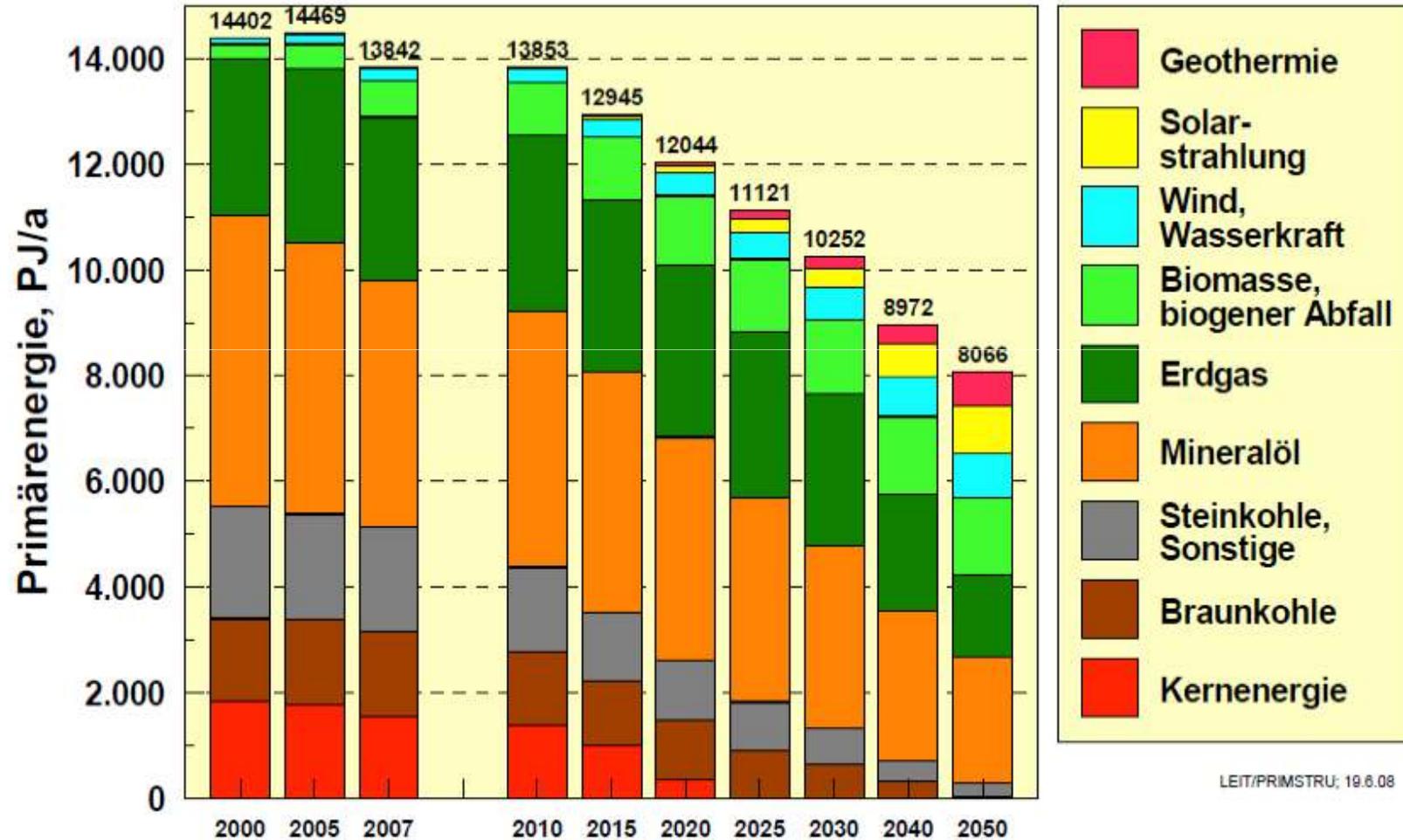


# German Bundestag Enquete - LT Scenarios - 2050



# Lead Study 2008

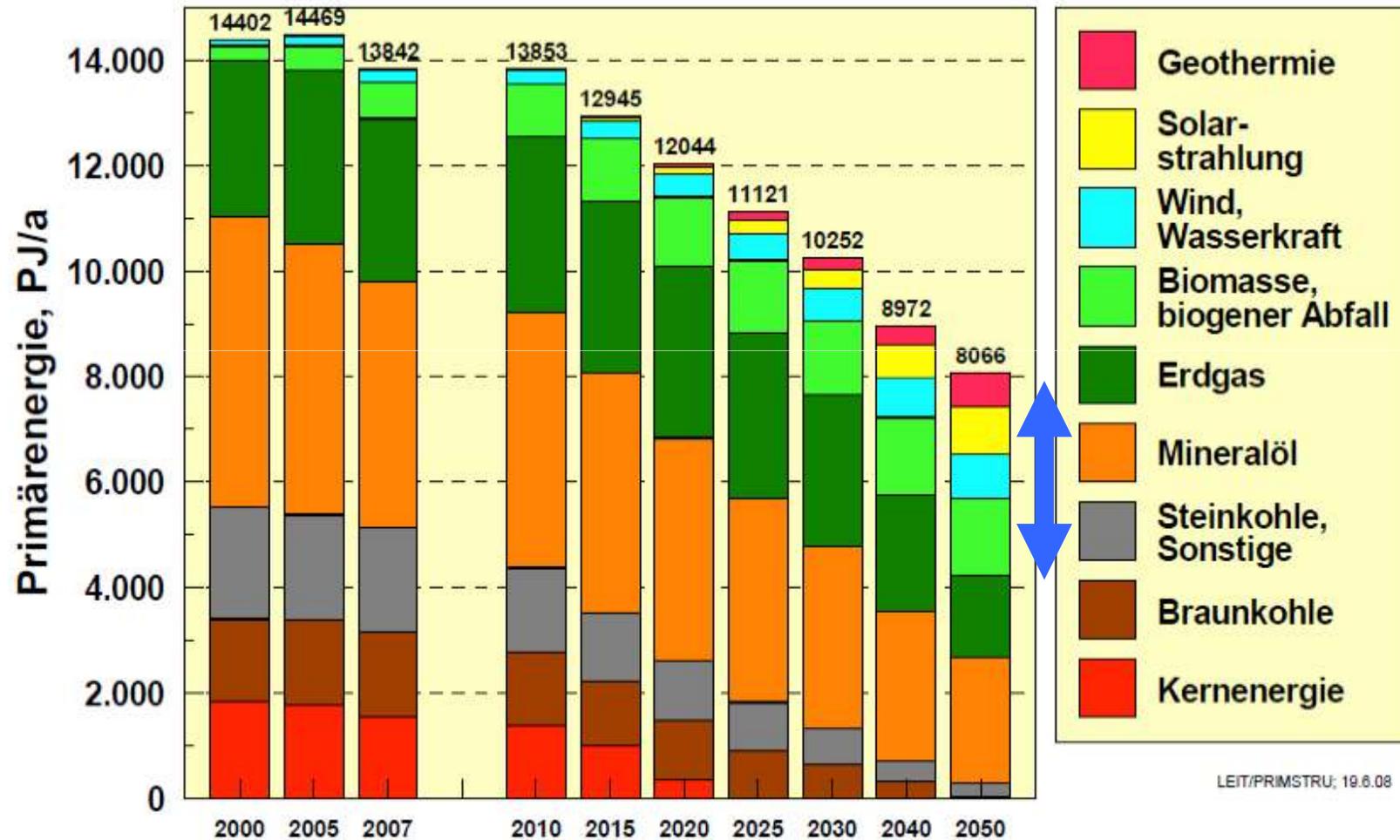
- LEITSZENARIO 2008 -



Quelle: Nitsch 2008

# Lead Study 2008

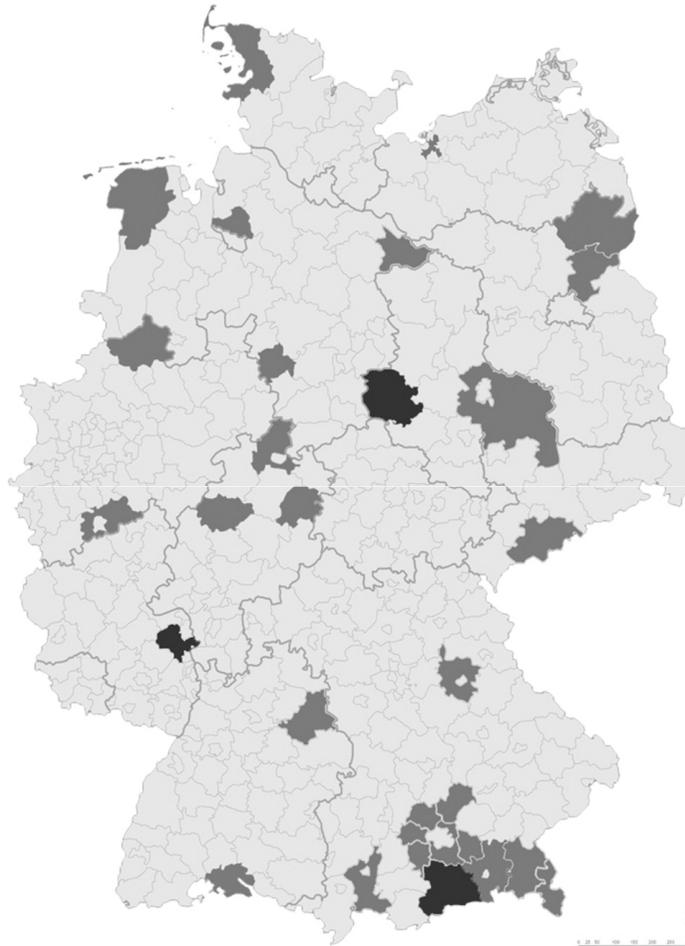
- LEITSZENARIO 2008 -



LEIT/PRIMSTRU; 19.6.08

Quelle: Nitsch 2008

# 100 % Regions in Germany

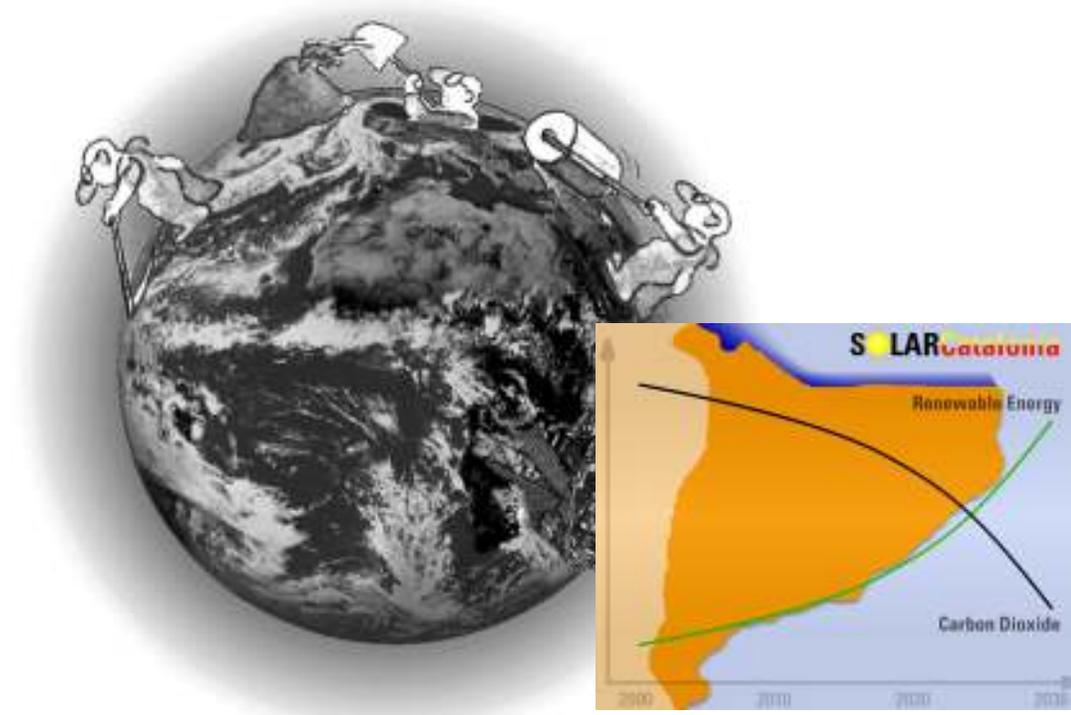


Datenquelle: deNetz GmbH & Universität Kassel (2008): Schriftliche Befragung zu Beschäftigten und Zukunftsprognosen im Projekt "Energiekonzepte für 100% Erneuerbare Energie-Regionen in Deutschland". Kartographie: Bundesamt für Kartographie und Geodäsie, Frankfurt am Main, 2008.

100 % renewable energy regions

# Catalunya 100% REN

Japó





# エネルギー・リッチ・ジャパン

## ENERGY RICH JAPAN



### Main

### Welcome

### Animation

### Download

### Contributors

### Links

### Contact

Dear Visitor,  
The "Energy Rich Japan"

The "Energy Rich Japan" sustainable energy system. This is shown utilising a

For more detailed information

We hope to provide you

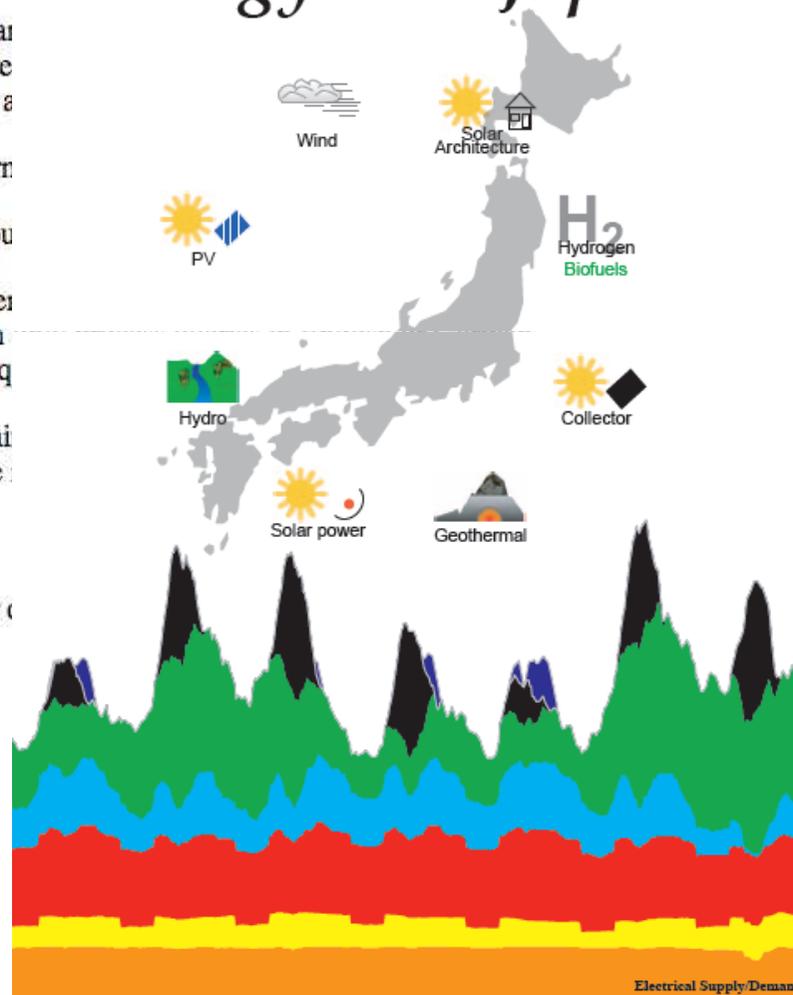
Should you have further questions, please note that we can provide answers. Click here to ask your question.

How to achieve a sustainable energy system is the desire and will to make it happen.

Thank you,  
Harry Lehmann  
(Scientific Coordinator)

### Abstract

# エネルギー・リッチ・ジャパン Energy Rich Japan



and ultimately be covered by a sustainable energy system.

Information is available in English/ Japanese/ German.

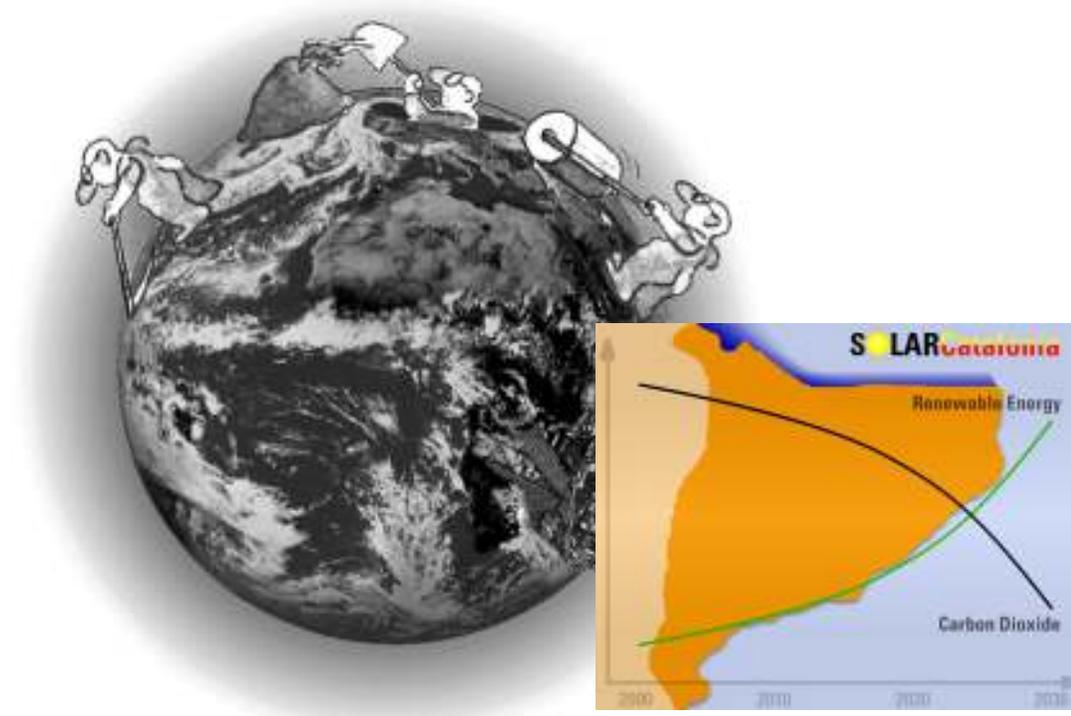
(including diagrams).

Information in this study. What we need now is the

### Short Report

# Catalunya 100% REN

EUA



*Carbon-Free and Nuclear-Free:  
A Roadmap for U.S. Energy Policy*

**CARBON-FREE  
and  
NUCLEAR-FREE**

**A Roadmap for  
U.S. Energy Policy**

Arjun Makhijani

**Download is FREE, but  
donations are Appreciated!  
MAKE A DONATION TODAY!**

[Download the book](#) [Large file, PDF 4.4 MB]

[Purchase the paperback](#) (\$19.95, or \$27.95 to

Sign on to the [Statement of Principles  
Free U.S. Energy System by 2050](#)

**Summaries:**

[Executive Summary](#) [PDF 450 kB]

**Executive Summary:** [Special issue of](#)  
[39](#), in [Chinese](#), [French](#), [Russian](#), and [Sp](#)

[Summary in four pages](#) [PDF 200kB], upd

[Summary in Slides](#) (January 2008) [PDF 1.7MB] & [a May 2009 Slide Presentation](#) [PDF 3.5MB]

al newsletter, [Energy and Security, No.](#)

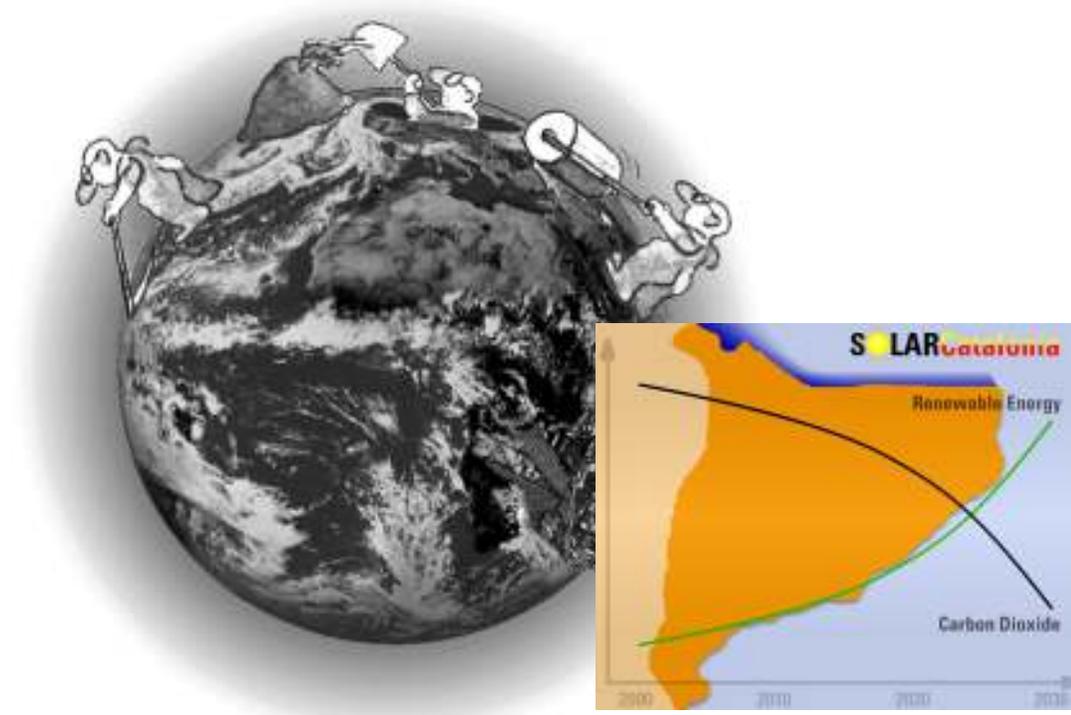
# Catalunya 100% REN



Més info d'escenaris 100% RE a:  
[www.energiasostenible.org](http://www.energiasostenible.org)

Catalunya pot ser 100% REN.

Si hi ha voluntat politica/social !



# Bullir aigua amb el Sol

	Nombre	Localidad	Potencia MW	Fase
<b>OPERATIVAS</b>	PS10	San Lúcar la Mayor	11	Fase 1
	ANZASOL 1	Achéne	50	Fase 1
	PS20	San Lúcar la Mayor	50	Fase 1
	PUERTO LLANO IBERSOL	Puerto Llano	50	Fase 1
	PUERTO ERRADÓ 1	Cazorra	14	Fase 1
	LARISOL	Alcañes	50	Fase 1
	ANZASOL 2	Achéne	50	Fase 1
	EXTRESOL 1	Torre de San Miguel, Seville	50	Fase 1
	SOLnova 1	San Lúcar la Mayor	50	Fase 1
	SOLnova 3	San Lúcar la Mayor	50	Fase 1
<b>CONSTRUCCIÓN AVANZADA</b>	ANZASOL - 3	Achéne	50	Fase 2
	PL. TERMOSOLÉTRICA DE MALAGAS	Malaga	50	Fase 1
	PL. TERMOSOLÉTRICA DE PALMA DEL TERTI	Palma del Rio	50	Fase 1
	PL. TERMOSOLÉTRICA DE PALMA DEL TERTI	Palma del Rio	50	Fase 1
	CENTRAL SOLAR TERMOSOLÉTRICA LA FLORES	Alcañes	50	Fase 1
	CENTRAL SOLAR TERMOSOLÉTRICA LA GEBISA	La Gomería	50	Fase 1
	MARSAFOL 1	Alcañes de San Juan	50	Fase 2
	PLANTA TERMOSOLAR EXTRESOL 2	Torre de San Miguel, Seville	50	Fase 2
	SOLnova 10E	Torre de San Miguel	11	Fase 2
	SOLNOVA 5	San Lúcar la Mayor	50	Fase 2
	HELIOENERGY 1	Esca	50	Fase 2
	HELIOENERGY 2	Esca	50	Fase 2
	LEPUSOL 1	Lepe	50	Fase 2
	TERMSOL 30	San José del Valle	50	Fase 2
	ADSOLO 30	San José del Valle	50	Fase 2
PL. TERMOSOLAR BARRIO CASAS DE LOS PINOS	Villanueva	1	Fase 2	
<b>PREASIGNADAS</b>	PL. SOLAR TERMOSOLÉTRICA	Espejo	50	Fase 1
	C. TERMOSOLAR "LA ALHURRANA"	Fuente Palmera	50	Fase 1
	PL. TERMOSOLÉTRICA DE CONSOL ORELLANA	Orellana	50	Fase 1
	PUERTO ERRADÓ 2	Puerto Erradó	50	Fase 1
	HELIO 1	Puerto López	50	Fase 1
	HELIO 2	Puerto López	50	Fase 1
	C. SOLAR TERMOSOLÉTRICA "ARTE-SK"	Alcañes de San Juan	50	Fase 2
	C. SOLAR TERMOSOLÉTRICA "ARTE-3P"	Alcañes de San Juan	50	Fase 2
	SOLACOR 1	El Campío	50	Fase 2
	SOLACOR 2	El Campío	50	Fase 2
	PL. TERMOSOLAR DE MORDÉN	Morón de la Frontera	50	Fase 2
	MANCHASOL 2	Alcañes	50	Fase 3
	PL. TERMOSOLAR DE OLIVENA 1	Olivena	50	Fase 3
	PL. TERMOSOLAR EXTRESOL - 3	Torre de San Miguel, Seville	50	Fase 3
	C. SOLAR TERMOSOLÉTRICA "ARTEL-2"	Balneario	50	Fase 3
	SOLAREN 1	Logroño	50	Fase 3
	SOLAREN 2	Logroño	50	Fase 3
	SOLAREN 3	Logroño	50	Fase 3
	TERMSOL 1	Navacerrada de Tala	50	Fase 4
	TERMSOL 2	Navacerrada de Tala	50	Fase 4
	TERMSOLAR BARRIO S.L.	Agüera Marzábal	22	Fase 4
	EXTRESOL 1	Villanueva de la Serena	50	Fase 4
	SOLAREN 4	Logroño	50	Fase 4
	C. SOLAR TERMOSOLÉTRICA CÁDIZES	Cádiz	50	Fase 4
	CASARILLOCA	Castellón	50	Fase 4
	C. SOLAR TERMOSOLÉTRICA ENERSTAR VILLERA	Alcañes	50	Fase 4
	PL. TERMOSOLAR 8MW PUERTO LLANO	Puerto Llano	8	Fase 4
	PL. TERMOSOLAR 10MW PUERTO LLANO	Puerto Llano	10	Fase 4
	PL. TERMOSOLAR 10MW PUERTO LLANO	Puerto Llano	10	Fase 4
	PL. TERMOSOLAR 10MW PUERTO LLANO	Puerto Llano	10	Fase 4
PL. TERMOSOLAR 10MW PUERTO LLANO	Puerto Llano	10	Fase 4	
PL. TERMOSOLAR 10MW PUERTO LLANO	Puerto Llano	10	Fase 4	
PL. TERMOSOLAR 14 MW PUERTO LLANO	Puerto Llano	14	Fase 4	
ARENALES	Morón de la Frontera	50	Fase 4	

Total de Plantas 60

## LOCALIZACIÓN DE CENTRALES TERMOSOLARES EN ESPAÑA

PROTERMO  
SOLAR



● Operativas

● Construcción avanzada

● Preasignadas

# Bullir aigua amb el Sol



Andasol 1  
Aldeire, Granada



# Generar electricitat amb el vent

Valldevià, Vilopriu, Girona  
10 març 1984  
Aerogenerador Ecotècnia 12/15



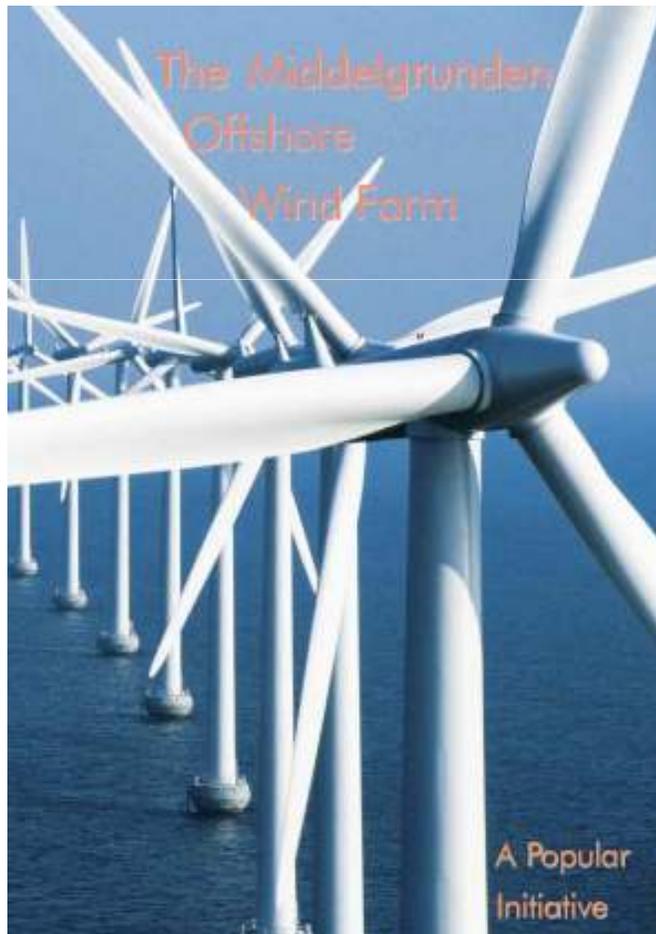
# Generar electricitat amb el vent



El Perelló, Tarragona  
25 juliol 2009  
Eco-100 Alstom-ECOTÈCNIA

# Generar electricitat amb el vent

## Projectes eòlics comunitaris



Middelgrunden Wind Turbine Co-operative - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://www.middelgrunden.dk/MG\_UK/ukindex.htm

Getting Started Latest Headlines

### MIDDELGRUNDEN WIND TURBINE CO-OPERATIVE

Cooperative Economy Production News Articles Project info Photo Contact/visit Links/sitemap

The English section of this website will not be updated in general after 1. January 2004. Please go to [Danish section](#) or contact [the Cooperative](#). See [production figures](#).

NEW [Cracks in Siemens Geafol transformers report](#) NEW

You are visitor nr.: **184420** since 01.03.03

This screenshot shows a web browser window displaying the website for the Middelgrunden Wind Turbine Co-operative. The browser is Mozilla Firefox. The website has a blue header with the title 'MIDDELGRUNDEN WIND TURBINE CO-OPERATIVE' and a navigation menu. The main content area features a large image of the wind farm and a message about the English section being discontinued after January 2004. There are also smaller images of wind turbines and a visitor counter at the bottom.

# Generar electricitat amb el vent

## Projectes eòlics comunitaris



Home About Us Community Ownership Projects Scotland News Links Contact Us

Projects

Baywind **Projects**

Baywind movie Click on a wind turbine to learn more about that project.

Westhill Wind Farms Co-op

Freedom

Ferland Green Power Co-operative

Bayshore Co-operative

Baydon Windless

Airfield Wind Farms

Scotland Partials

Revere Hill Wind Farms

Isle of Gogo Renewables Co-operative

Garbrae Wind Power Co-operative

Mapa Satelit Híbrid

La Imatge és: ©2000 TerraMétrica - Copyleft DM



http://www.trec.on.ca/ A Non-Profit Environmental Organisation

NEW! ONLINE TREC FORUM | Contact Us | FAQ

About Us Project Development Renewable Energy Education

History of TREC | Mission | Partners WindShare | LakeWind | SolarShare Education | Resources | Tours

The Toronto Renewable Energy Cooperative

About Us Education What's New

The Toronto Renewable Energy Co-operative (TREC) is a non-profit, co-operative, environmental organization.

[TREC's mission](#)

[TREC's history](#)

[TREC's partners](#)

A Major component of TREC's mandate is education related to renewable energy.

[Green City Cycle Tours \(Starting June 1st\)](#)

[Solar Neighborhood Tours \(June 14th\)](#)

[Kid's World of Energy Festival](#)

[Exhibition Place Turbine Tours](#)

[EcoSchools](#)

[Solar Share Final Report Recently Completed](#)

[WISE Solar Success Story](#)

[World Wind Energy Conference 2008](#)

[Standard Offer Contracts: Program Rules announced November 8th, 2008](#)

TREC has an [ONLINE FORUM](#), for visitors to post news on renewable energy projects around the GTA.

Quick Links

[WindShare](#)

[The Ontario Sustainable Energy Association](#)

[World Wind Energy Conference 2008](#)

[Toronto Atmospheric Fund](#)

[Toronto Hydro](#)

THE ONTARIO FOUNDATION LA FONDATION EN L'ONTARIO

© Toronto Renewable Energy Co-operative 2008

# Generar electricitat amb el Sol

## Projectes de propietat compartida

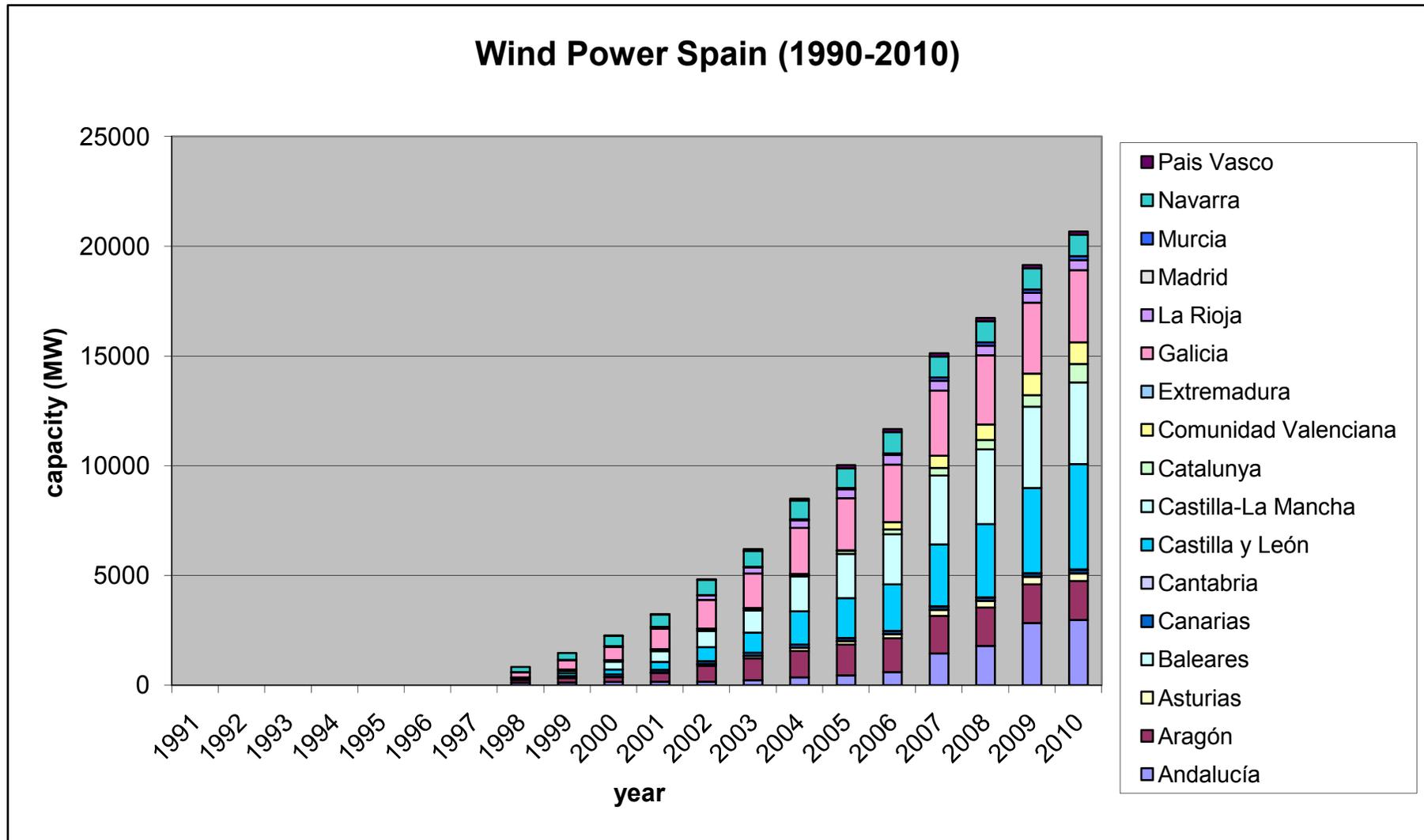


Ona solar  
40 kW, 100 co-propietaris  
Barri del Carmel, Barcelona

Huerto Solar Milagro  
9,55 MW, 753 co-propietaris  
Milagro, Navarra



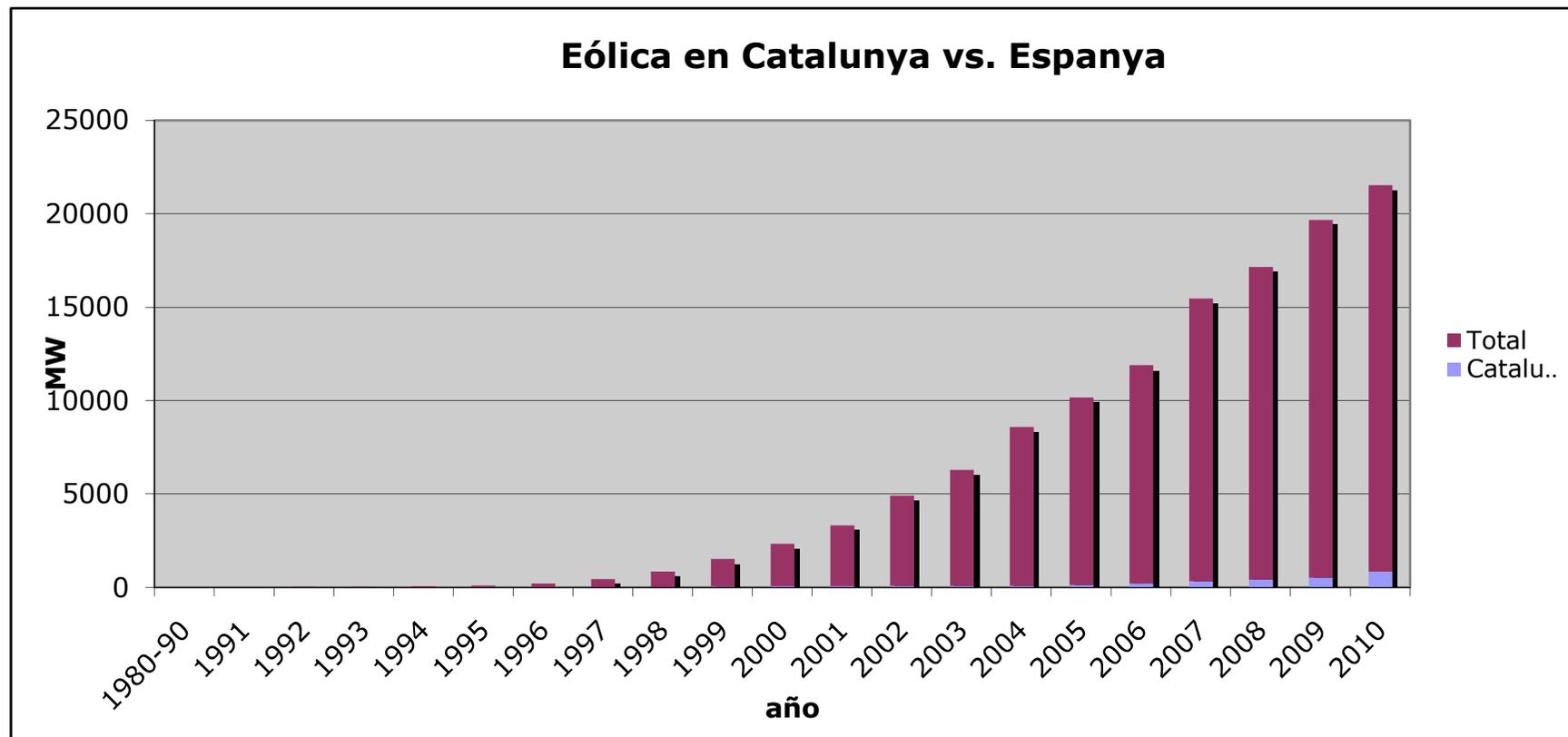
# Eòlica a Espanya



# Eòlica a Espanya

La generació d'electricitat mitjançant el vent es va consolidar l'any 2010 com una tecnologia important en el sistema elèctric, assolint una producció de 42.656 GWh, al darrera de les CTCC de gas i les nuclears i pel davant de la hidràulica.

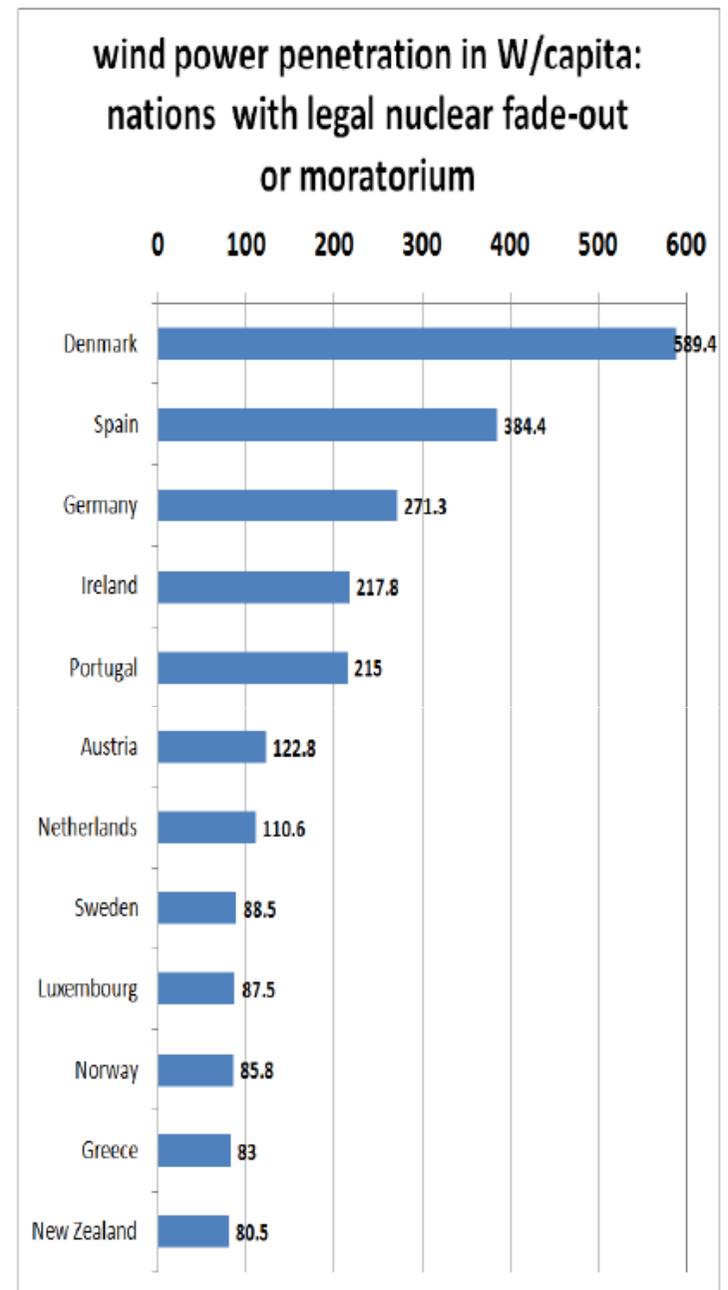
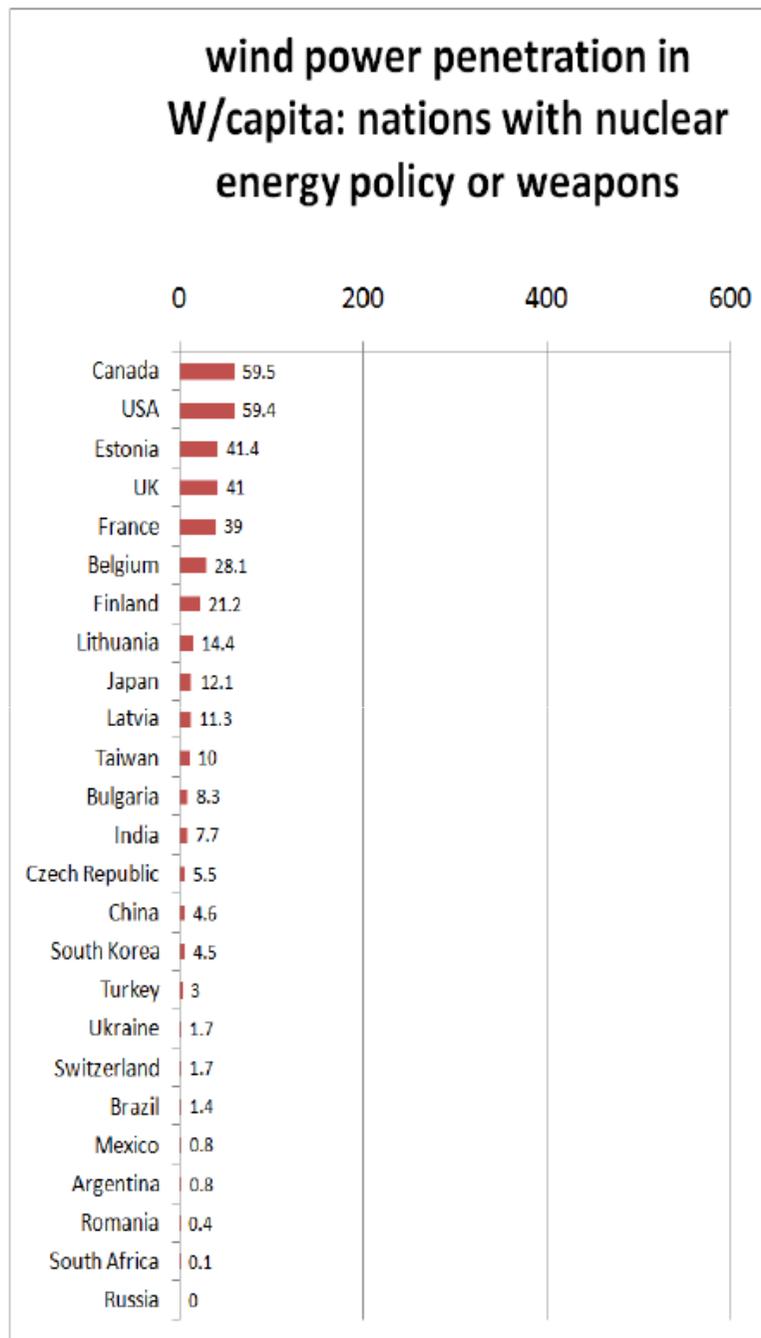
# Eòlica a Catalunya



# Per pensar . . . .

## Catalunya vs. Espanya

	Cat	Es	
Pot.inst.nuclear:	3.142	7.716 MW	40,7%
Emissions rad.:	1.679	4.564 Ci	36,8%
Pot.inst.eòlica:	851	20.676 MW	4,1%
26,5 kW/km <sup>2</sup>		(111 kW/km <sup>2</sup> : Galicia)	
<b>116,8 W/habitant</b>		(1.913 W/habitant: Castella-Lleó)	



**Figure 24 Wind penetrations per capita in nations with and without nuclear ambitions**

