

# Bioenergi i ett internationellt perspektiv!

**IEA – International Energy Agency  
Task 32 Biomass Combustion and Co-firing**

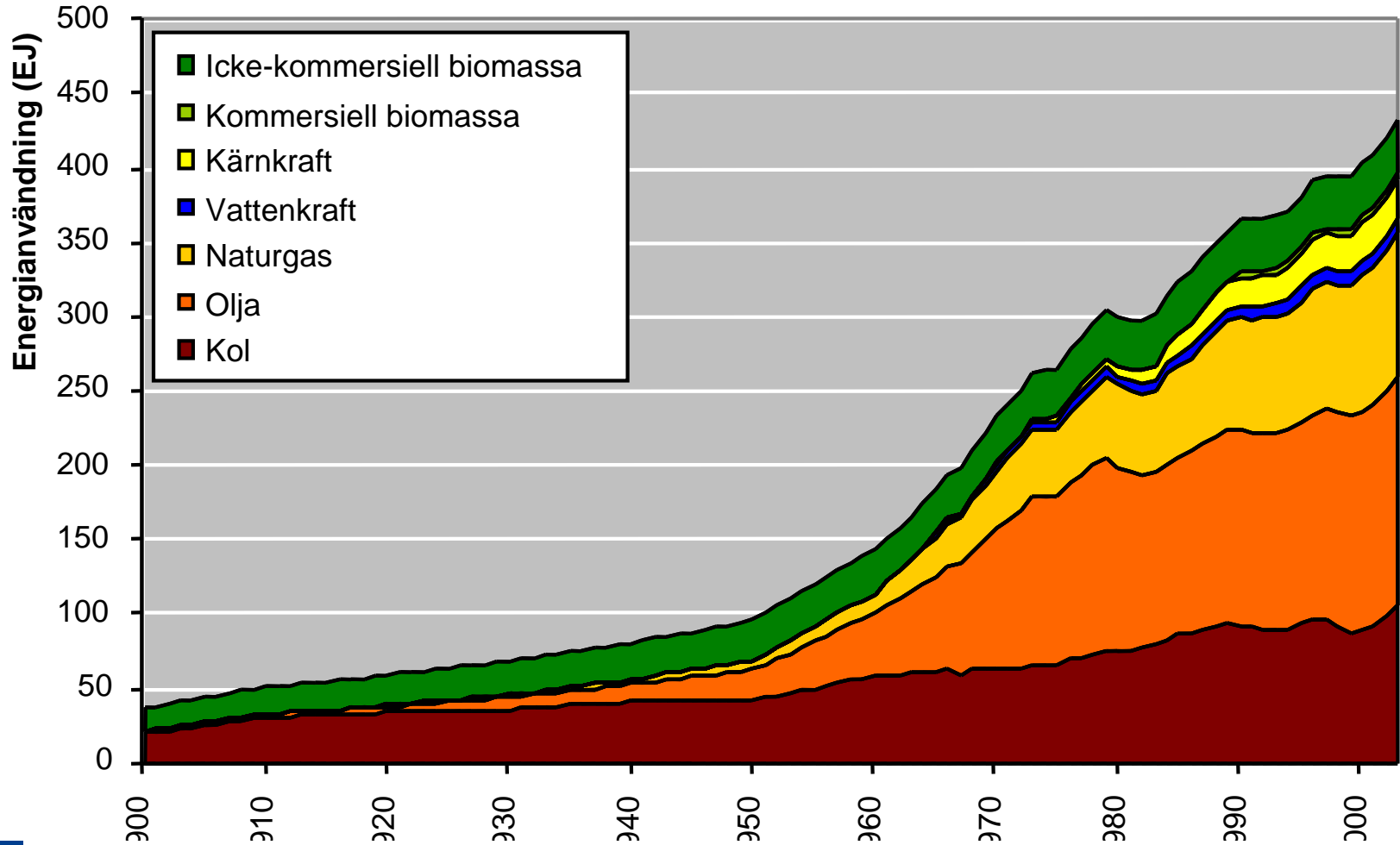
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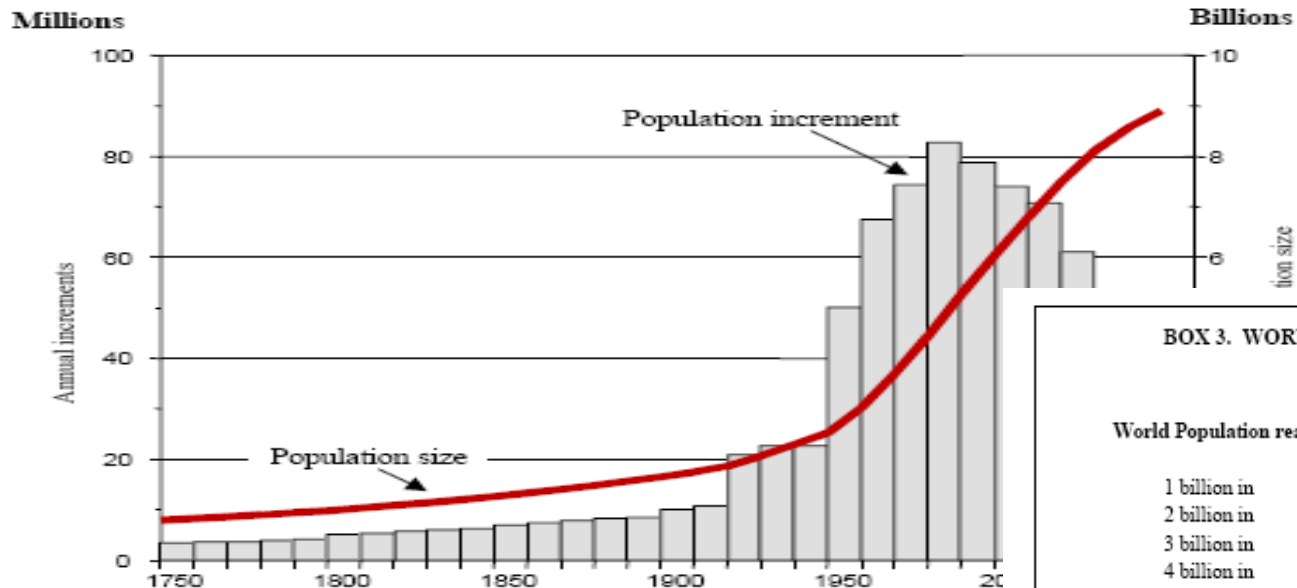


## Historisk mänsklig energianvändning



# Utmaning 1: Befolkningstillväxten!

Figure 1. Long-term world population growth, 1750 to 2050



Source: United Nations Population Division.

## BOX 3. WORLD POPULATION MILESTONES

### World Population reached:

1 billion in	1804
2 billion in	1927 (123 years later)
3 billion in	1960 (33 years later)
4 billion in	1974 (14 years later)
5 billion in	1987 (13 years later)
6 billion in	1999 (12 years later)

### World Population may reach:

7 billion in	2013 (14 years later)
8 billion in	2028 (15 years later)
9 billion in	2054 (26 years later)
10 billion in	2183 (129 years later)

Source: United Nations Population Division.

Figure 6. Estimated world population: 1950-2000, and projections: 2000-2300

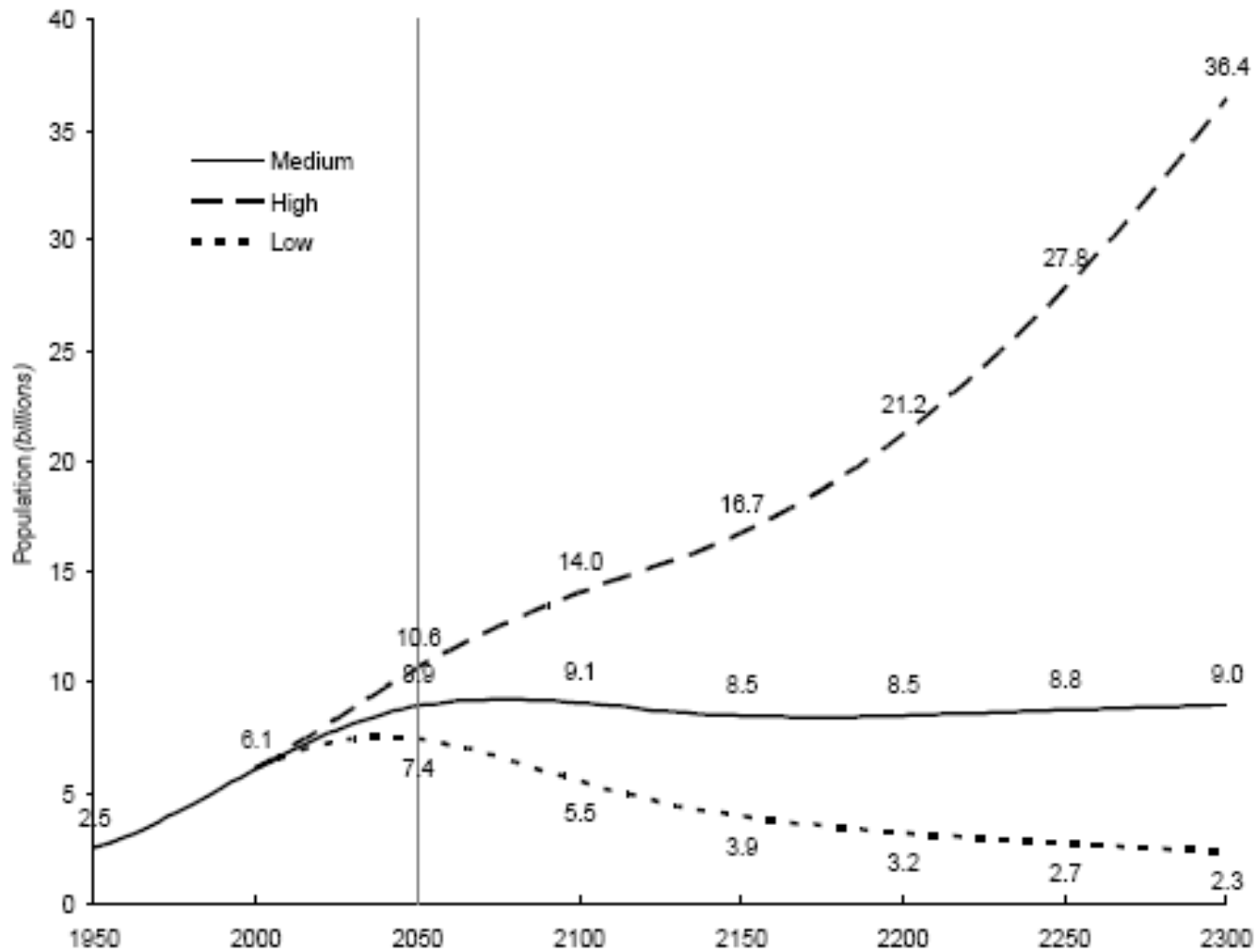


Figure 7. Change in world population over 50-year periods, estimates and three scenarios: 1950-2300



# Utmaning 2: Ekonomisk tillväxt vs begränsade resurser/ekologiska ramar!

- **2050**
  - 9 miljarder människor
  - Global BNP 5 ggr större än 1990
  - Redan 2030 behöver vi en extra planet

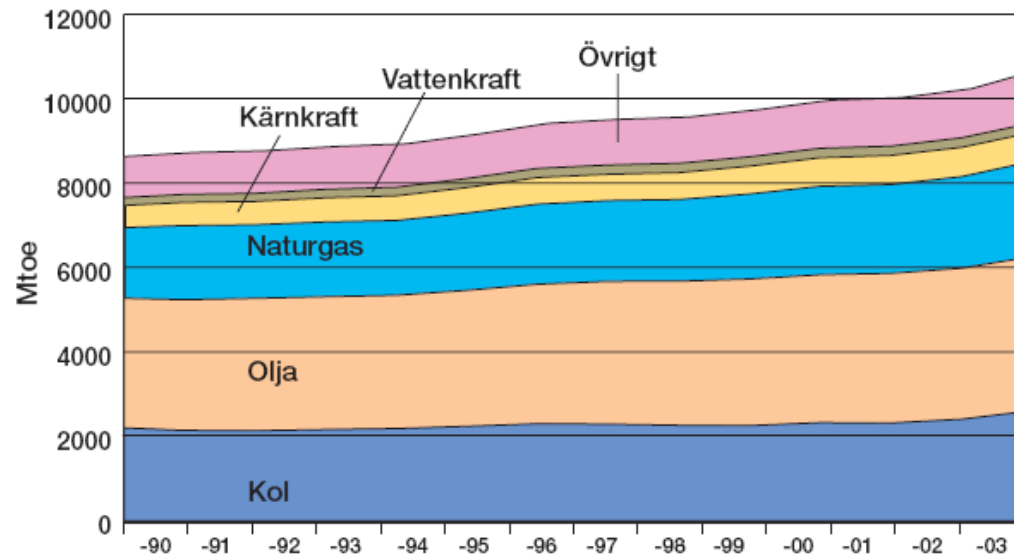


Category	CO <sub>2</sub> concentration at stabilization (2005 = 379 ppm) <sup>(a)</sup>	CO <sub>2</sub> -equivalent Concentration at stabilization including GHGs and aerosols (2005 = 375 ppm) <sup>(a)</sup>	Peaking year for CO <sub>2</sub> emissions <sup>(b),(c)</sup>	Change in global CO <sub>2</sub> emissions in 2050 (% of 2000 emissions) <sup>(b),(c)</sup>	Global average temperature increase above pre-industrial at equilibrium, using "best estimate" climate sensitivity <sup>(d),(e)</sup>	Global average sea level rise above pre-industrial at equilibrium from thermal expansion only <sup>(f)</sup>	Number of assessed scenarios
	ppm	ppm	Year	Percent	°C	metres	
I	350 – 400	445 – 490	2000 – 2015	-85 to -50	2.0 – 2.4	0.4 – 1.4	6
II	400 – 440	490 – 535	2000 – 2020	-60 to -30	2.4 – 2.8	0.5 – 1.7	18
III	440 – 485	535 – 590	2010 – 2030	-30 to +5	2.8 – 3.2	0.6 – 1.9	21
IV	485 – 570	590 – 710	2020 – 2080	+10 to +60	3.2 – 4.0	0.6 – 2.4	118
V	570 – 660	710 – 855	2050 – 2080	+25 to +85	4.0 – 4.9	0.8 – 2.9	9
VI	660 – 790	855 – 1130	2080 – 2090	+90 to +140	4.9 – 6.1	1.0 – 3.7	5

- Sea level rise under warming is inevitable
- Long time scales of thermal expansion & ice sheet response to warming imply that stabilisation of GHG concentrations at or above present levels will not stabilise sea level for many centuries

# I världen dominerar fossil energi! 2-gradersmålet kräver att utsläppen minskas med upp till 95% till år 2050!!

Figur 41: Global tillförsel av primär energi



# Utmaning 3: Snabb introduktion av förnyelsebar energi!

- **RES-direktivet och 20-20-20-målen**
  - 20% CO<sub>2</sub>-reduktion
  - 20 % Förnyelsebart
  - 20 % Energieffektivisering
- **Biobaserade drivmedel (samt el)**

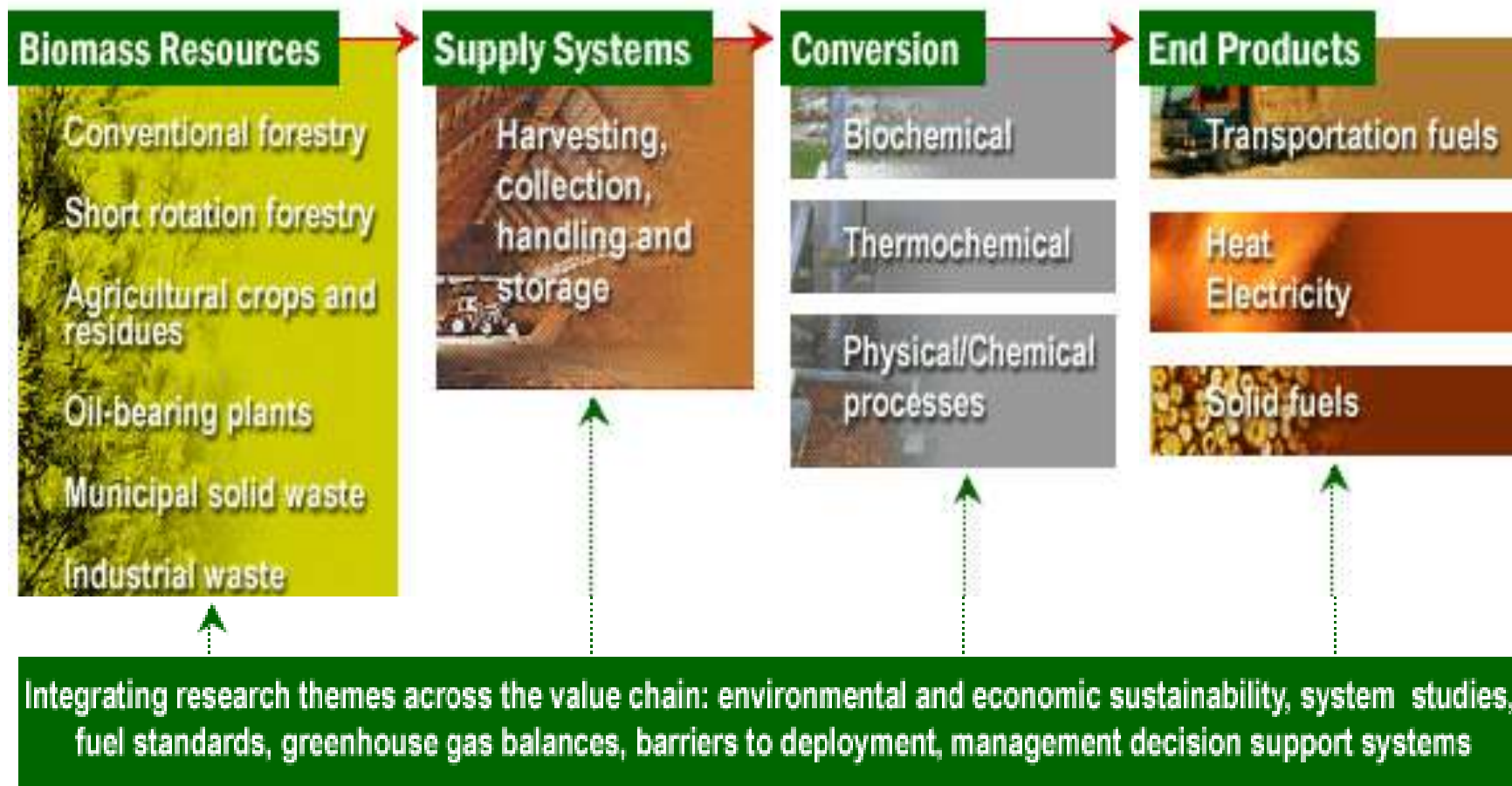
**=> Mycket stort internationellt sug efter bioenergi**



# IEA- Bakgrund

- **IEA- International Energy Agency**
  - Bildades 1974 (oljekrisen)
    - Oljeförsörjning
    - Energipolitiskt samarbete
- **IEA-Bioenergy**
  - 1978
  - Syfte: Förbättra internationellt samarbete och informationsutbyte mellan nationella FoU-program på området.

# IEA- Bioenergy: Samverkan mellan experter inom industri, myndigheter och forskning



# Aktuella arbetsgrupper (tasks) 2007 - 2009

- The ongoing Tasks and the recently discontinued Task are as follows:
- Task 29 : Socio-Economic Drivers in Implementing Bioenergy Projects
- Task 30 : Short Rotation Crops for Bioenergy Systems
- Task 31 : Biomass Production for Energy from Sustainable Forestry
- Task 32 : Biomass Combustion and Co-firing
- Task 33 : Thermal Gasification of Biomass
- Task 34 : Pyrolysis of Biomass
- Task 36 : Integrating Energy Recovery into Solid Waste Management
- Task 37 : Energy from Biogas and Landfill Gas
- Task 38 : Greenhouse Gas Balances of Biomass and Bioenergy Systems
- Task 39 : Commercialising 1st and 2nd Generation Liquid Biofuels from Biomass
- Task 40 : Sustainable International Bioenergy Trade - Securing Supply and Demand
- Task 41 : Bioenergy Systems Analysis
- Task 42 : Biorefineries: Co-production of Fuels, Chemicals, Power and Materials from Biomass

# IEA Task 32 Biomass Combustion and Co-firing 2007-2009

- Experts from 13 countries:  
Austria, Belgium, Canada, Denmark, European Commission, Finland,  
Germany, Italy, Netherlands, Norway, Sweden, Switzerland,  
United Kingdom
- Working together in:
  - **Cooperative projects**
  - **Meetings, Workshops, Conferences, Excursions**
  - **Cooperation with other Networks**
- Reports etc. can be found on our website:  
[www.ieabioenergytask32.com](http://www.ieabioenergytask32.com)
- Infospridning Sverige:
  - via mail och personliga kontakter



## Expert meetings - workshops

- **Workshop on fuel storage, handling and preparation and system analysis**
- **Workshop on formation mechanisms, reduction measures and health impact of aerosols from biomass combustion**
- **Biomass co-firing opportunities in China**
- **Workshop on Next Generation Small Scale Biomass Combustion**
- **Workshop on Increasing Biomass Co-firing percentages in existing power Plants**
- **Workshop on High co-firing percentages in new coal fired power plants**



# Projects

- **Handbook on pellet production and utilisation**
- **Updated database on biomass co-firing**
- **Report on corrosion and slagging and fouling experiences with co-firing**
- **Report on increasing co-firing percentages in current plants**
- **Inventory report on aerosols from biomass combustion**



- **Handbook of Biomass Combustion and Cofiring in Chinese!**
- The [Handbook of Biomass Combustion and Cofiring](#) has been translated into Chinese by the [Chinese Center of Energy and Environmental Protection, Ministry of Agriculture](#). During the recent Task meeting, held in Beijing, the book was presented to members of Task 32.

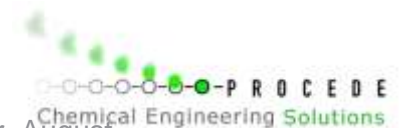


# Nästa programperiod 2010 - 2012

- Challenges and trends in combustion technologies
  - **Residential heating**
  - **Industrial scale combustion**
  - **Co-firing**
- Activities of Task 32



IEA Bioenergy Conference, Vancouver, August  
2009



# Aerosol emissions from small scale combustion

- How are they formed and what can be done about it?
- To what degree does improved furnace design help?
- How can aerosols be reduced through end-of-pipe technologies?



## **Actions of Task 32 in 2010-2012:**

- **Workshop on formation mechanisms, reduction measures and health impact of aerosols from biomass combustion**
- **Workshop on low emission woodstoves (Ecodesign)**
- **Review on technical performance and cost effectiveness of new particle removal technologies, incl an assessment of different measurement techniques**

# CHP concepts for small scale applications



- For medium scale, novel CHP concepts are being demonstrated and implemented. The scale of biomass CHP is going down.
- Steam cycle usually only feasible above 1 MWe/5 MWth
- Several R&D efforts for small scale CHP technologies
- Financial aspects and reliability yet uncertain

## Action of Task 32 in 2010-2012:

- Workshop on small scale CHP technologies to provide better insight in latest developments

Biomass Combustion and Cofiring



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# Challenging biomass fuels



- Nox emissions, ash melting, corrosion, aerosols , SCR deactivation
- Outlook for new boiler materials and limits in steam temperature

## Action of Task 32 in 2010-2012:

- Workshop on use of challenging fuels in domestic and industrial scale combustion devices

# Biomass cofiring

- The largest contributor to bio-electricity in several countries
- Largest and easy potential is in existing PC boilers because of size and public opinion
- Relevance of different technical issues however varies per power plant and biofuel considered



## Action of task 32 in 2010-2012:

- Workshop with VGB Powertech on high percentages co-firing and increased fuel flexibility
- Update of existing cofiring database

Biomass Combustion and Cofiring



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# Pretreatment, storage, handling and sustainability of biomass resources



- Biomass logistics for large scale cofiring are very complex
- Self ignition of fuels has caused problems in practise
- Very large interest in torrefaction

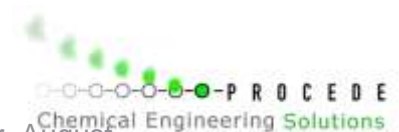
## Actions of Task 32 in 2010-2012:

- Technical evaluation of suitability of torrefied fuels for different appliances (both small scale and cofiring)
- Technical review on safety issues in fuel storage, handling and preparation
- Workshop with T40 on large scale fuel supply

Biomass Combustion and Cofiring



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# Utilization of ash

- As fertilizer, in road construction, or cement
- EN450 and ASTM set limitations on use of flyash in cement, which may hinder high percentage cofiring



## Action of task 32 in 2010-2012:

- Technical paper on
  - characteristics of different ash fractions from various biomass/technology combinations,
  - how the ashes are currently utilized and
  - what can be done to improve ash utilisation.
- The paper will contain a guideline for utilisation of various types of ash, which could be used to improve national policies on ash utilisation

Biomass Combustion and Cofiring



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# Hur kan vi utnyttja IEA Bioenergy för att kommersialisera svensk kompetens?

- Påverka politiska processer och ta tillvara nationella intressen som världens främsta bioenergination!
  - Synliggöra svensk kompetens och skapa tillväxt på hemmaplan
  - Ta del av den internationella kunskapsbyggnaden inom bioenergi för att skapa svenska produkter och tjänster
- 
- Samtidigt drar vi vårt strå till stacken för att lösa den globala klimatutmaningen!



# Any 'burning' questions?

