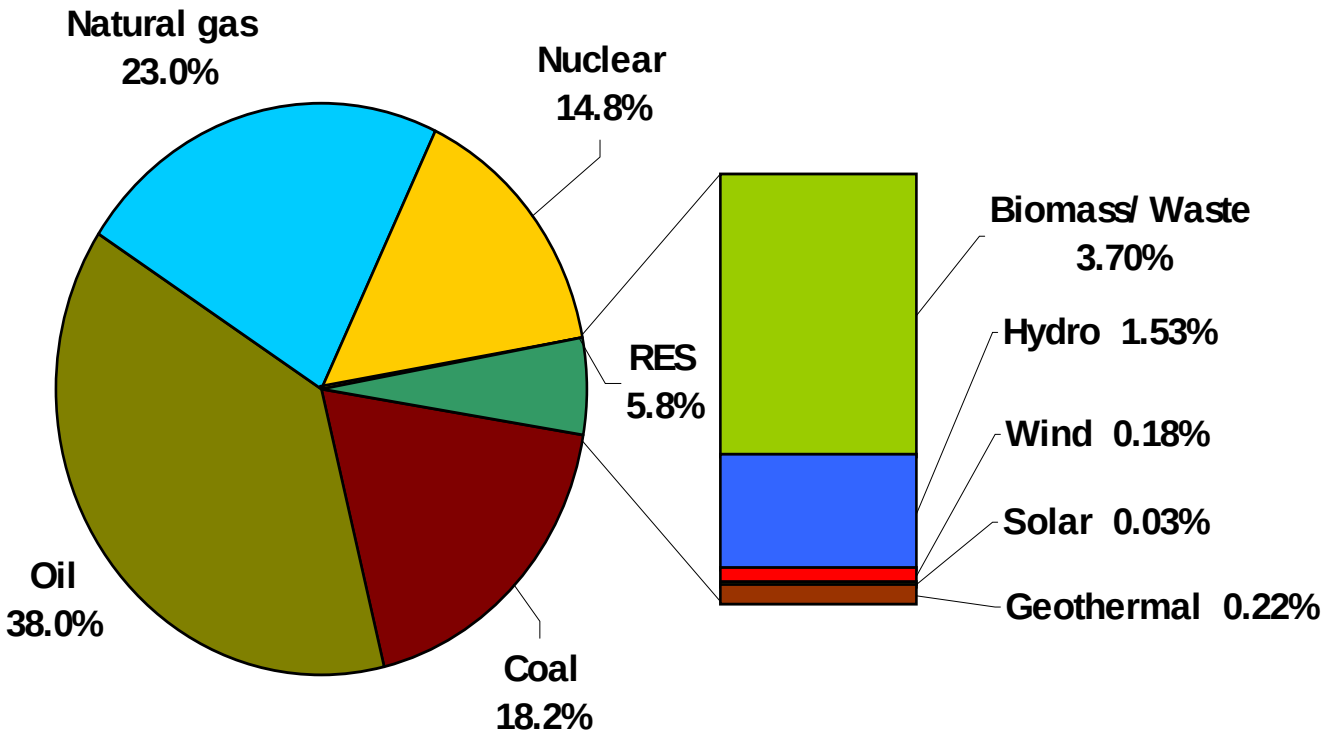
Does the "NextGenBioWaste" project represents any common interest?

Teamleader/Dr.ing. Lars Sørum
SINTEF Energy Research
Norway

Content

- Renewable energy production from biomass and waste within the EU
  - Polish and Norwegian biomass resources and use
- Framework for Renewable energy production from biomass and waste in the EU
  - EU policies
  - EU targets
- Challenges for renewable energy production from biomass and waste
  - Focus on technological challenges
- The “NextGenBioWaste” project

Gross Energy Consumption in 2002



Slide Courtesy of J.Riesgo: EC-DG TREN

Biomass resources in Poland and Norway

- Large unexploited resources
  - Poland: 5-6 times current use
  - Norway: ~3 times current use

Challenges in Polish waste management

- Increasing per capita waste generation due to increased standard of living
- Current waste management: Landfilling
- Greenhouse gas emissions
- Poland as a new member state:
  - Complying to EU directives
  - Transition phase

EU Policies and Targets: Energy (1)

- **RES White paper 1997:** increase share of RES from 6% to 12% of gross consumption by 2010
- **To reduce greenhouse gas emissions** (meet the commitments made by the EU under the 1997 Kyoto Protocol)
- **To contribute to Security of Supply** [COM(2000)769 – C5-0145/2001]
- **Directive 2001/77/EC of 27.09.01 on RES-e :** to establish a framework to increase the share of green electricity from 14% to 21% of gross electricity consumption by 2010
- **Directive 2004/8/EC on cogeneration of heat and power.** target: 18% by 2010

Slide Courtesy of J.Riesgo: EC-DG TREN

EU Policies and Targets: Energy (2)

- **Landfill (1999/31/EC)**
  Reduced landfilling of biodegradable component of waste by 65% by 2016

- **Waste Incineration (2000/76/EC)**
  Limits on emissions from thermal treatment of Waste materials (effective 12/2005)

- **Directive 2003/30/EC of 08.05.2003 on the promotion of liquid and gaseous biofuels for transport:** targets: 2% by 2005; 5.75% by 2010

Slide Courtesy of J.Riesgo: EC-DG TREN

Estimated Investment Costs/Benefits by Sector

TYPE OF ENERGY	ADDITIONAL CAPACITY 1997-2010	UNIT COST 1997 ECU	UNIT COST 2010 ECU	AVERAGE UNIT COST ECU	TOTAL INVESTMENT 1997-2010 billion ECU	ADDITIONAL ANNUAL BUSINESS 2010 billion ECU	BENEFIT OF ANNUAL AVOIDED FUEL COSTS 2010 billion ECU	TOTAL BENEFIT OF AVOIDED FUEL COSTS 1997-2010 billion ECU	CO_2 REDUCTION milliom tn/year IN 2010
1. Wind	36 GW	1,000/KW	700/KW	800/KW	28.8	4	1.43	10	72
2. Hydro	13 GW	1,200/KW	1,000/KW	1,100/KW	14.3	2	0.91	6.4	48
3. Photovoltaics	3 GWp	5,000/KWp	2,500/KWp	3,000/KWp	9	1.5	0.06	0.4	3
4. Biomass	90Mtoe				84	24.1	-	-	255
5.Geothermal (+ heat pumps)	2.5 GW	2,500/KW	1,500/KW	2,000/KW	5	0.5	-	-	5
6.Solar Collectors	94 Mio m^2	400/m^2	200/m^2	250/m^2	24	4.5	0.6	4.2	19
Total for EU market					165.1	36.6	3	21	402

Major Challenges

- Infrastructure
  - District heating systems
- Fuel (Biomass)
  - Cost efficient and sustainable fuel production
- Economic incentives promoting RES
  - Feed-in tariffs
    - Norway:
      - Power production from biomass: 1,2 eurocents/kWh in addition to market price
    - Germany:
      - Power production biomass: 21,5 eurocents/kWh
      - Power production solar cells (up to 30 kW): 62,4 eurocents/kWh

Major Technological Challenges

- Environmental issues
  - Ash upgrading/valorisation
  - Particulate emissions
  - NOx emissions
  - Clean biomass vs wood waste
- Electrical efficiency
  - Natural gas: ~60%
  - Coal: ~40%
  - Biomass: ~30%
  - Waste: ~20%
- Costs
  - Investment costs
  - Operating costs

NextGenBioWaste

EUs largest project within energy from waste and biomass

Homepage: www.nextgenbiowaste.com

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SIXTH FRAMEWORK PROGRAMME

NextGenBioWaste

- Title: "***Innovative demonstrations for the next generation of biomass and waste combustion plants for energy recovery and renewable electricity production***"

- Funded by the European Commission (6FP)
- Contract no.: 019809
- Project duration:2006-2010 (48 months)
- Budget: 29 017 555 €
- Co-ordinator: SINTEF Energiforskning AS, Norway

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SIXTH FRAMEWORK PROGRAMME

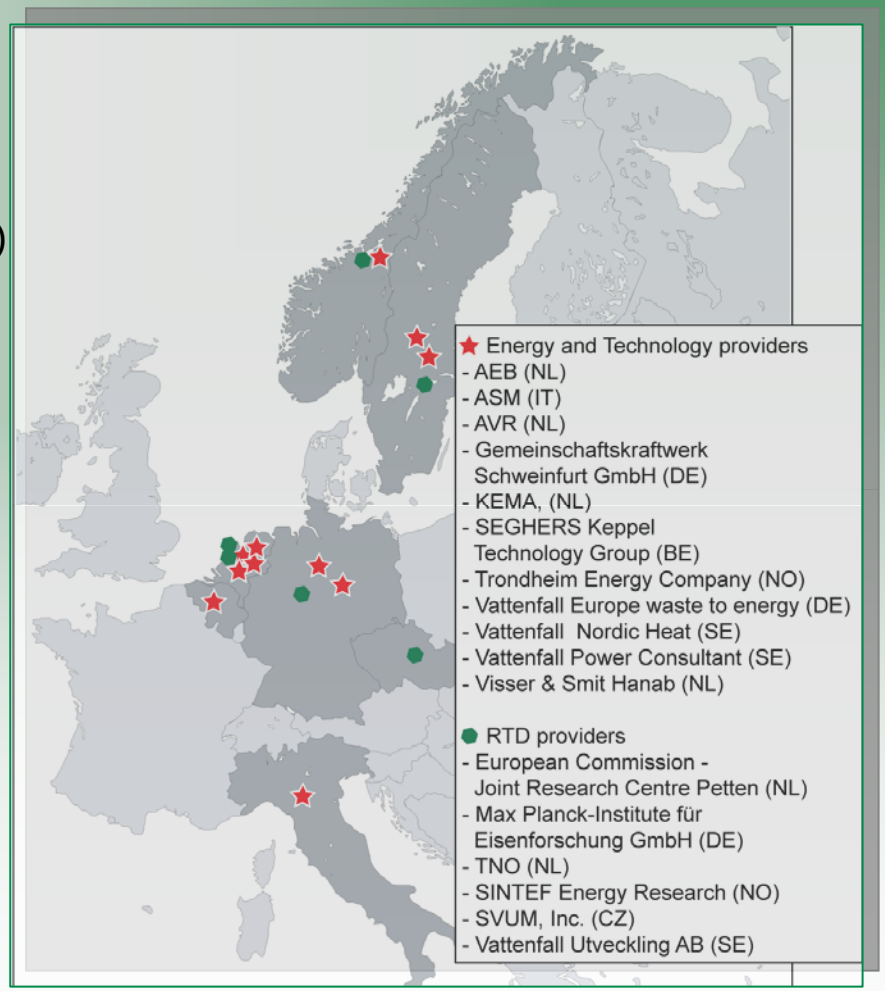
Consortium - 17 partners from 7 countries

Co-ordinator:

SINTEF Energiforskning AS (NO)

Partners:

- Afval Energie Bedrijf, Amsterdam (NL)
- ASM BRESCIA SPA (IT)
- Gemeinschaftskraftwerk Schweinfurt GmbH (DE)
- Joint Research Centre of the EC (NL)
- KEMA (NL)
- Max-Planck-Institute (DE)
- N.V. Afvalverwerking Rijnmond (NL)
- SEGHERS Keppel Technology Group (BE)
- SINTEF Energiforskning AS (NO)
- SVUM, a.s., Prague (CZ)
- TNO (NL)
- Trondheim Energiverk Fjernvarme AS (NO)
- Vattenfall AB Business unit Nordic Heat (SE)
- Vattenfall Europe Waste to Energy GmbH (DE)
- Vattenfall Power Consultant AB (SE)
- Vattenfall Utveckling AB (SE)
- Visser & Smit Hanab (NL)



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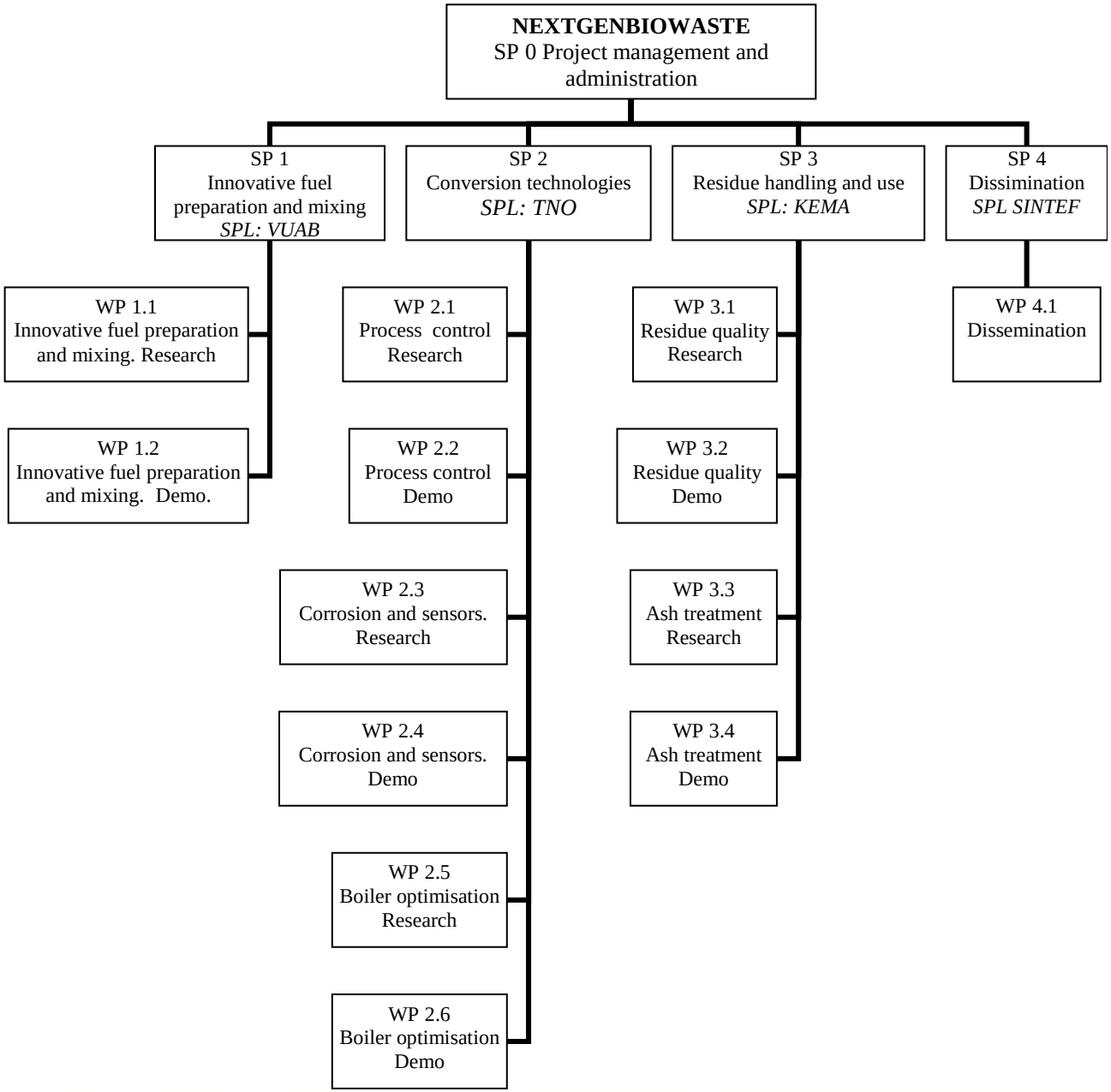
NextGenBioWaste's Targets

1. Increase the electric efficiency for waste to energy plants from 22% to 30% (gross generated).
2. Double the lifetime of heat exchange components at existing steam temperatures
3. Increase the electric efficiency for biomass combustion plants from 33% to 35%, while making the systems more cost-effective by the use of more low-grade fuels
4. Lower the fuel cost at least 1 mill.€/year for a 100 MW_{th} biomass combustion plant while maintain the two former sub targets (2 and 3).
5. Enable technologies for upgrading of bottom ash, thus, enabling the utility companies to valorise from 70% of their bottom ashes for civil engineering purposes

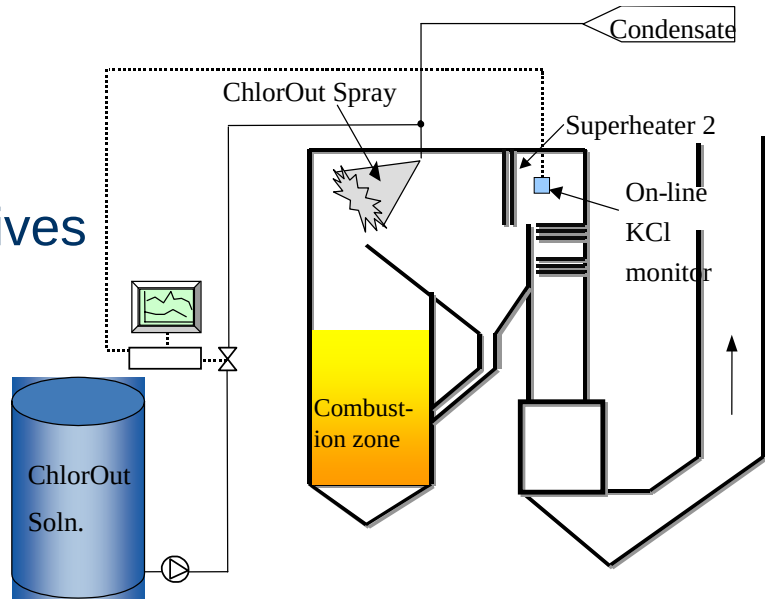
Demonstrations on 8 plants in Europe

1. A full-scale demonstration of a retrofit fluidised bed bottom design for combustion of 100% of waste wood fuel in a 100 MWth biomass boiler
2. Large-scale demonstration of advanced control systems enabling plant operators to obtain more stable conditions and improved electrical efficiency
3. Large-scale tests of advanced boiler materials and cladding of superheater surfaces to reduce maintenance costs
4. Large-scale demonstration of advanced combustion techniques using low excess air enabling more compact and cost-effective systems with higher electrical efficiency
5. Full-scale demonstration of high-dust selective catalytic reduction (SCR) of NOx for improved electrical efficiency and environmental performance
6. Full-scale demonstrations on the use of additives in order to reduce operation costs because of decreased fouling and to reduce maintenance costs via an increased lifetime
7. Demonstration of novel design and retrofitting of boilers for improved efficiency
8. Full-scale demonstration of artificial aging of bottom ashes for improved leaching properties giving added value products


NEXTGENBIOWASTE
SP 0 Project management and administration
SP 1
Innovative fuel preparation and mixing
SPL: VUAB
SP 2
Conversion technologies
SPL: TNO
SP 3
Residue handling and use
SPL: KEMA
SP 4
Dissimination
SPL SINTEF
WP 1.1
Innovative fuel preparation and mixing. Research
WP 1.2
Innovative fuel preparation and mixing. Demo.
WP 2.1
Process control Research
WP 2.2
Process control Demo
WP 2.3
Corrosion and sensors. Research
WP 2.4
Corrosion and sensors. Demo
WP 2.5
Boiler optimisation Research
WP 2.6
Boiler optimisation Demo
WP 3.1
Residue quality Research
WP 3.2
Residue quality Demo
WP 3.3
Ash treatment Research
WP 3.4
Ash treatment Demo
WP 4.1
Dissemination

Examples of large-scale demonstrations

- Vattenfall Europe Waste to Energy, Hamburg Germany
  - A few details:
    - WtE plant, MSW 320 000tons waste/year
    - Grate fired. 2 lines. 380C steam
    - 100 MW. A present heat.
    - Possible to convert to heat and power
  - Corrosion reduction by use of additives
  - First time trial in a WtE plant
  - Both short-term and long term tests to be performed
  - The level of KCl will be monitored on-line



VATTENFALL

Examples of large-scale demonstrations

- ASM SPA, Brescia Italy

  - A few details:
    - Fuel: MSW / biomass
    - 3 lines; 552 000 t/a (137.000 t biomass)
    - 361GWh electric and 292 GWh thermal
  - Reducing NOx emissions while improving the electrical efficiency
  - Presently SNCR system is installed
  - Installation of high-dust SCR system in existing boiler
  - Risks: material performance and energy recovery potential

Examples of large-scale demonstrations

- Vattenfall Nordic Heat, Nyköping, Sweden
  - A few details:
    - BFB plant, 100MWth
    - 1 line, CHP, 540^{o}C steam
    - Fires about 50/50 forest wood residue/waste wood
  - Reconstruction of the bed bottom design, enabling the plant to burn 100% waste wood
  - Assess the impact of corrosion and fouling due to increased use of low-grade fuels
  - Demonstrate the use of additives to reduce corrosion and fouling
  - Potential to reduce fuel costs with 1 mill. €/year

SINTEF activities in ”NextGenBioWaste”

- Fuel testing
  - Fuel mixtures
  - Additives
  - Impact on:
    - Flue gas quality
    - Particle formation
    - Corrosion and fouling
- Corrosion and fouling
  - Equilibrium calculations on combustion chemistry
- Boiler design
  - CFD
  - Particle transport in boiler
  - Detailed combustion mechanisms

Is there a potential for collaboration?

- Based on similar challenges on:
  - Increased utilisation of biomass and waste
  - Increased power production from biomass and waste (electrical efficiency)
  - Infrastructure

Yes

Thank You For Your Attention!