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# Norwegian Waste-to-Energy in 2030

## Challenges & Opportunities

### Focus

Norwegian WtE is at a crossroad. This work is a short discussion on both challenges and opportunities this sector is facing. The reflection axes are:

- What are the **unique advantages** offered by WtE to the Norwegian society?
- What are the **challenges** faced by WtE in Norway?
- What are the **novel aspects** that will be essential for Norwegian WtE to take into account in the coming years?

### Introduction – The big picture

#### Energy mix

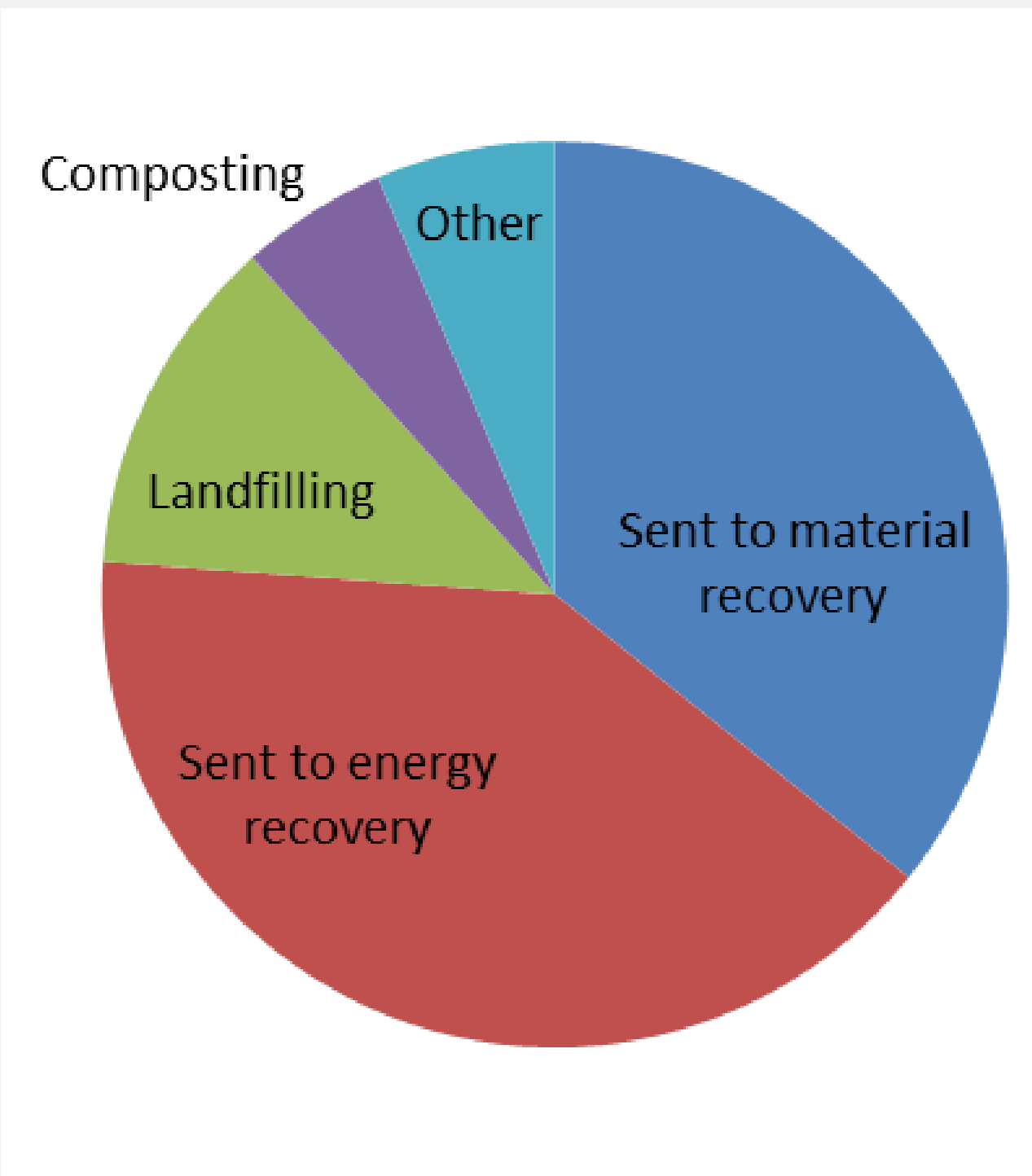
- Total yearly energy use in Norway: about 217 TWh (2013), half of it being electricity
- Electricity is almost exclusively (>95 %) produced by hydropower (127 TWh in 2013)
- Electricity covers the majority of the heat demand, with wood stoves in second place and district heating in third place, covering only a few percent

#### RES & Climate goals

- National goal of 67.5 % RES by 2020 from a 2012 value of about 64.5 %
- The 2008 Norwegian national bioenergy plan sets the goal of doubling bioenergy production to 28 TWh by 2020. The bioenergy production was about 17 TWh in 2013, indicating that the goal appears difficult
- A common Norwegian-Swedish green electricity certificate market is established (not including WtE)

#### Waste management

- High levels of energy & material recovery (SSB, 2013)

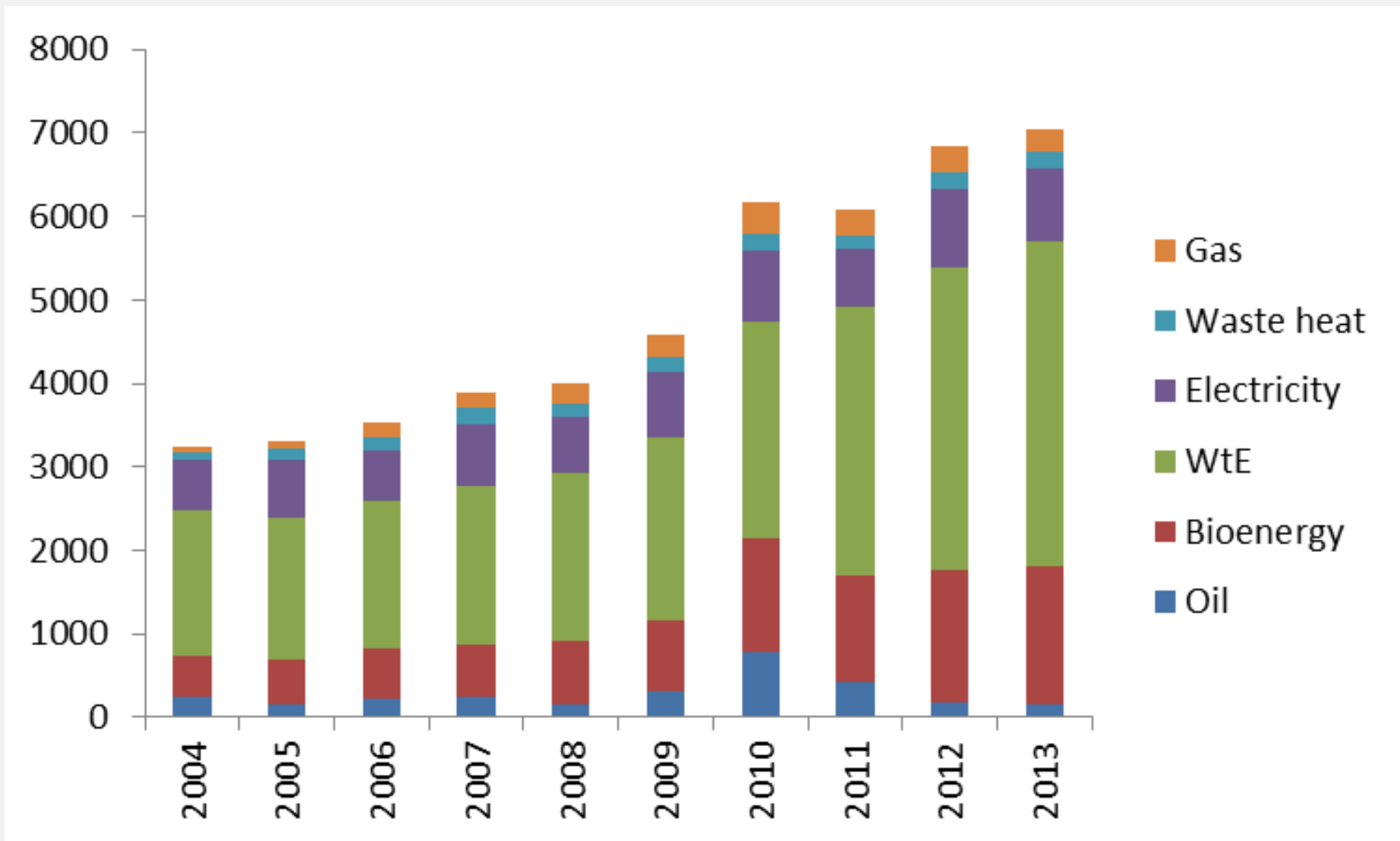


### The WtE sector today

- 17 WtE plants processing about 1.70 million tons MSW (2013, approx. 60 % from households)
- Produces 4 TWh for district heating networks, as well as some processed steam and electricity
- Smallest national average plant capacity in Europe
- 52 % biogenic fraction (on energy basis). Is the remaining renewable?
- The ash problematic: disposal in landfills
- Total capacity went from 1.25 Mt/y in 2010 to 1.70 today – average throughput of 90 % of nominal capacity
- Landfill ban for organic waste (July 2009)
- Important MSW export to Sweden
- A significant fraction of the energy (heat) produced is not delivered to any customer (summer)
- Oslo has newly implemented source sorting of food waste (in addition to paper, plastic, glass and metal)

### The unique advantages

- New energy program (2001) with a twofold goal: (1) increased energy flexibility based on local, renewable energy sources; (2) reduced dependency on electricity for heating
- Further emphasised by Climate Agreement which included promotion of WtE to replace fossil energy
- After material recycling, WtE plants produce energy from the remaining waste fraction that is contaminated and has a complex and heterogeneous composition
- WtE increase material recycling by sorting out elements from bottom ash such as ferrous and non-ferrous metals



Gross district heat production by energy sources in GWh (SSB, 2014)

### The challenges

- Low profitability due to excess capacity in Scandinavia. Solutions? Reduce capacity/increase demand
- Lack of good project opportunities that can secure a long-term, strong and stable revenue stream from energy: limited national market

### The novel aspects

- Circular economy - Waste refinery
- Traditional service still important (volume and weight reduction, destruction of contaminated materials)
- Total use of energy & smart thermal grids: heat, electricity from heat, heat/electricity to other energy carriers, energy storage
- More involvement in sorting out specific fractions (food waste, etc.) before energy production
- By-products (ash) to marketable products (minerals, metals, raw material)

**The WtE sector's future? New products, new markets, boost of energy sales & a stronger role in material recycling**

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