Bio-energy – current developments and impact on forest product companies

MCKINSEY & COMPANY

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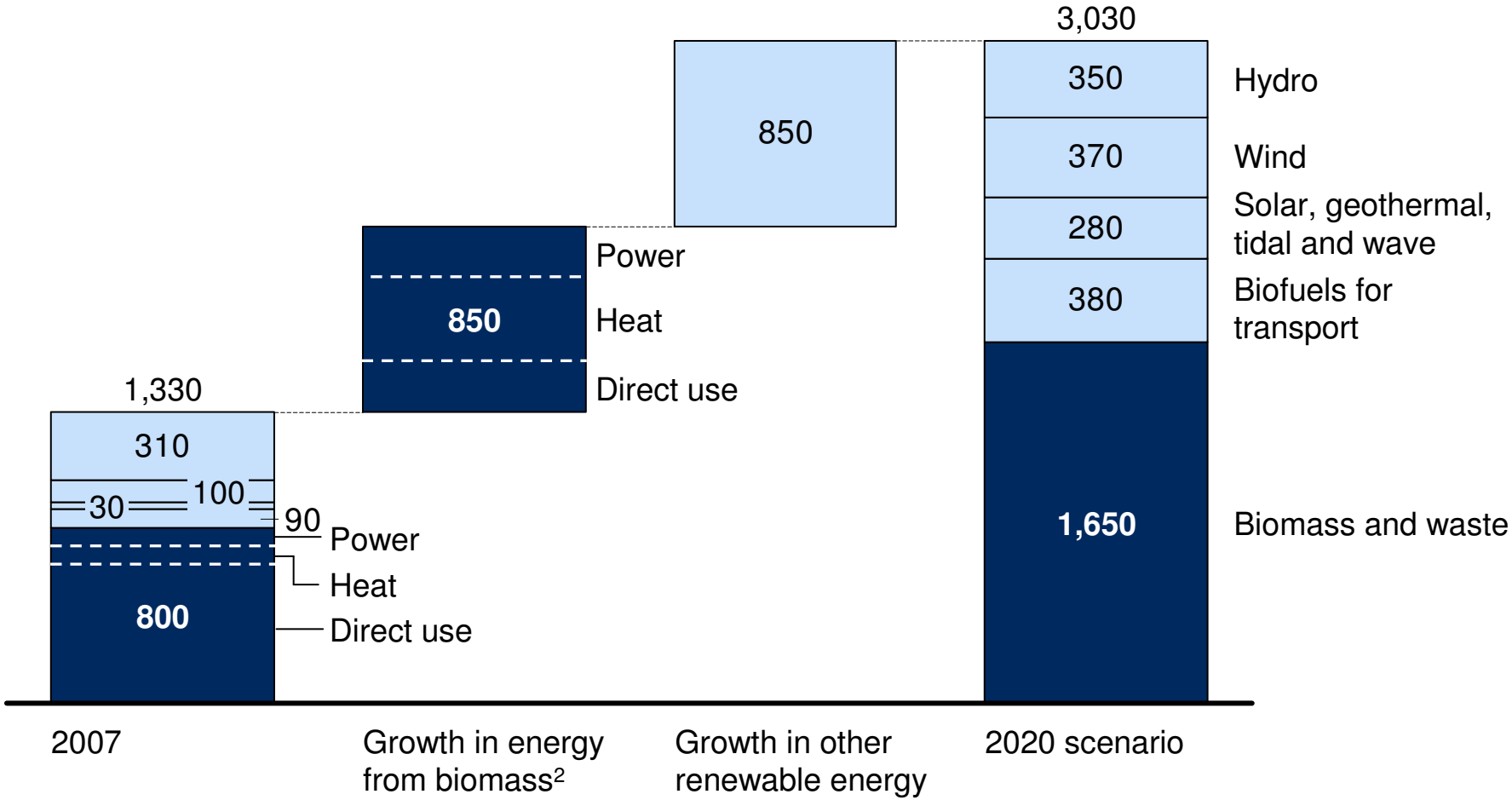
In the European Commission scenarios, biomass plays a significant role in meeting Europe's renewable energy targets

EU-27 final energy consumption[1]; TWh

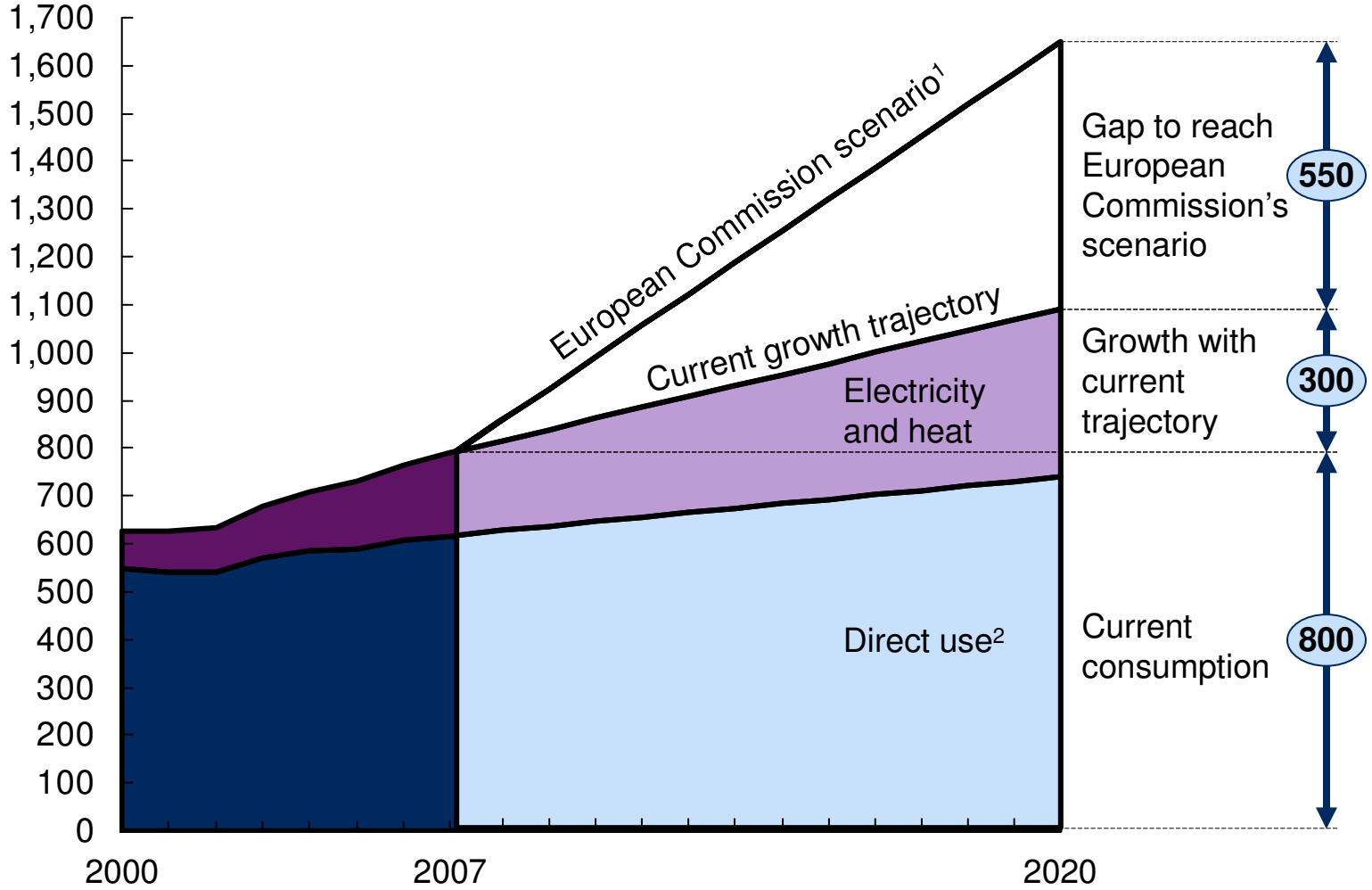


1 Average of the "EC proposal with RES trading" and the "EC proposal with CDM and RES trading" scenarios
2 Varies between 839 and 886 TWh depending on scenario

SOURCE: 2010 report "Biomass for heat and power" by ECF, Södra, Sveaskog, and Vattenfall (Capros et al (2008): *Model-based Analysis of the 2008 EU Policy Package on Climate Change and Renewables*; IEA)

Current biomass energy growth is significant but not enough to reach the European Commission scenario

Final energy consumption from biomass (excluding biofuels); TWh

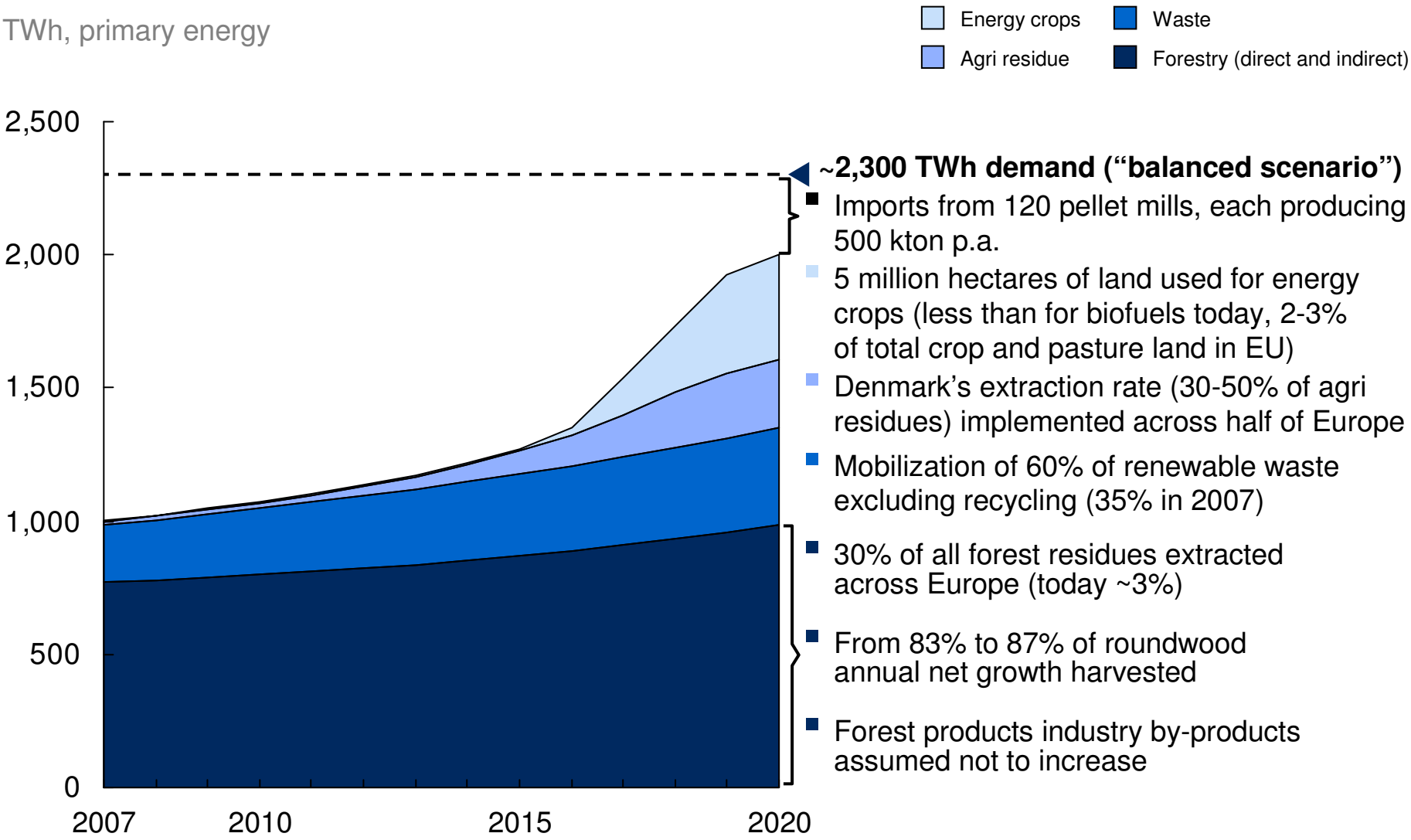


1 Average of the "EC proposal with RES trading" and the "EC proposal with CDM and RES trading" scenarios
2 Consumption in private households or industries producing heat or electricity for their own use, i.e. not for sales

SOURCE: 2010 report "Biomass for heat and power" by ECF, Södra, Sveaskog, and Vattenfall (Capros et al (2008): *Model-based Analysis of the 2008 EU Policy Package on Climate Change and Renewables*; IEA)

Extensive supply mobilization is needed – aggressive EU supply mobilization scenario

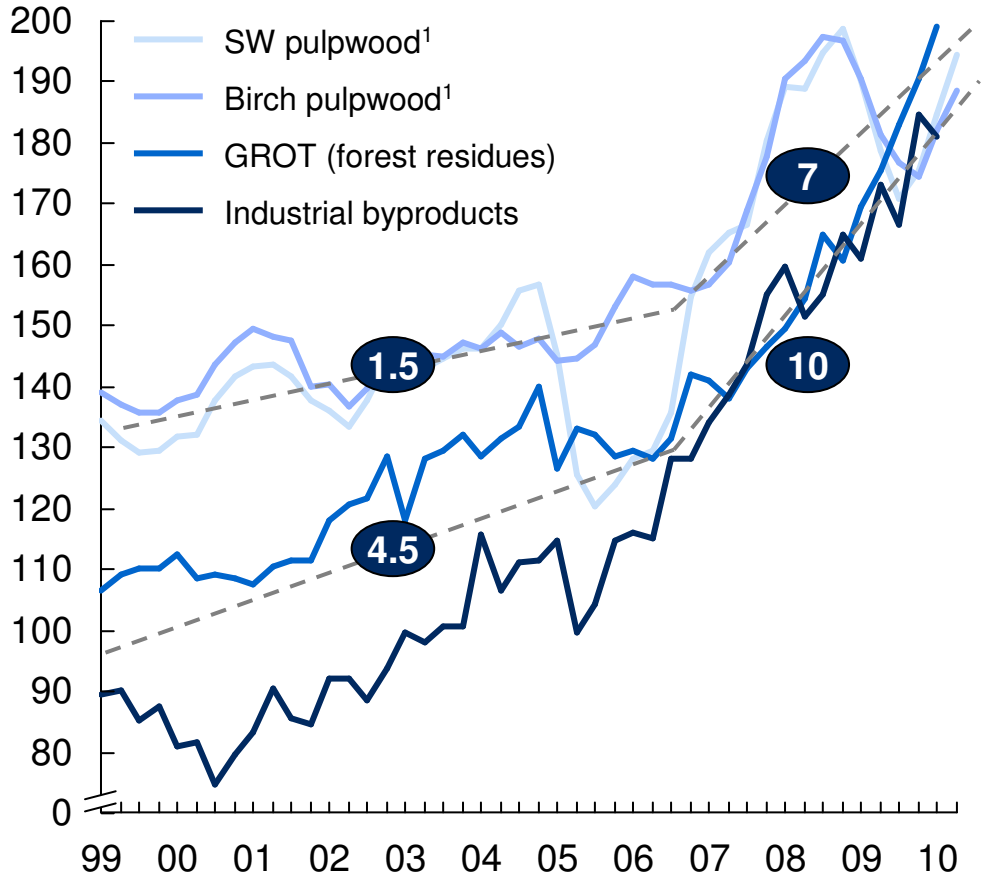
TWh, primary energy



SOURCE: 2010 report "Biomass for heat and power" by ECF, Södra, Sveaskog, and Vattenfall (AEBIOM; EEA (2006); IEA; Capros et al (2008): *Model-based Analysis of the 2008 EU Policy Package on Climate Change and Renewables*; McKinsey biomass model (2009))

Bio-energy competition is likely one of the factors pushing up prices of Swedish pulpwood

Swedish biomass prices, delivered
SEK/MWh



x Percent growth per year

> With the rapid expansion of energy capacity generated from biomass, it is clear that the **wood fiber market in Sweden has forever been transformed to a more competitive market place** with two fiber-consuming sectors…. prices for smaller logs have been driven to new highs the past few years, and **not likely to go back down to the levels seen during the period 1997-2006**.
>
> *- Wood Resources Quarterly, May 2010*

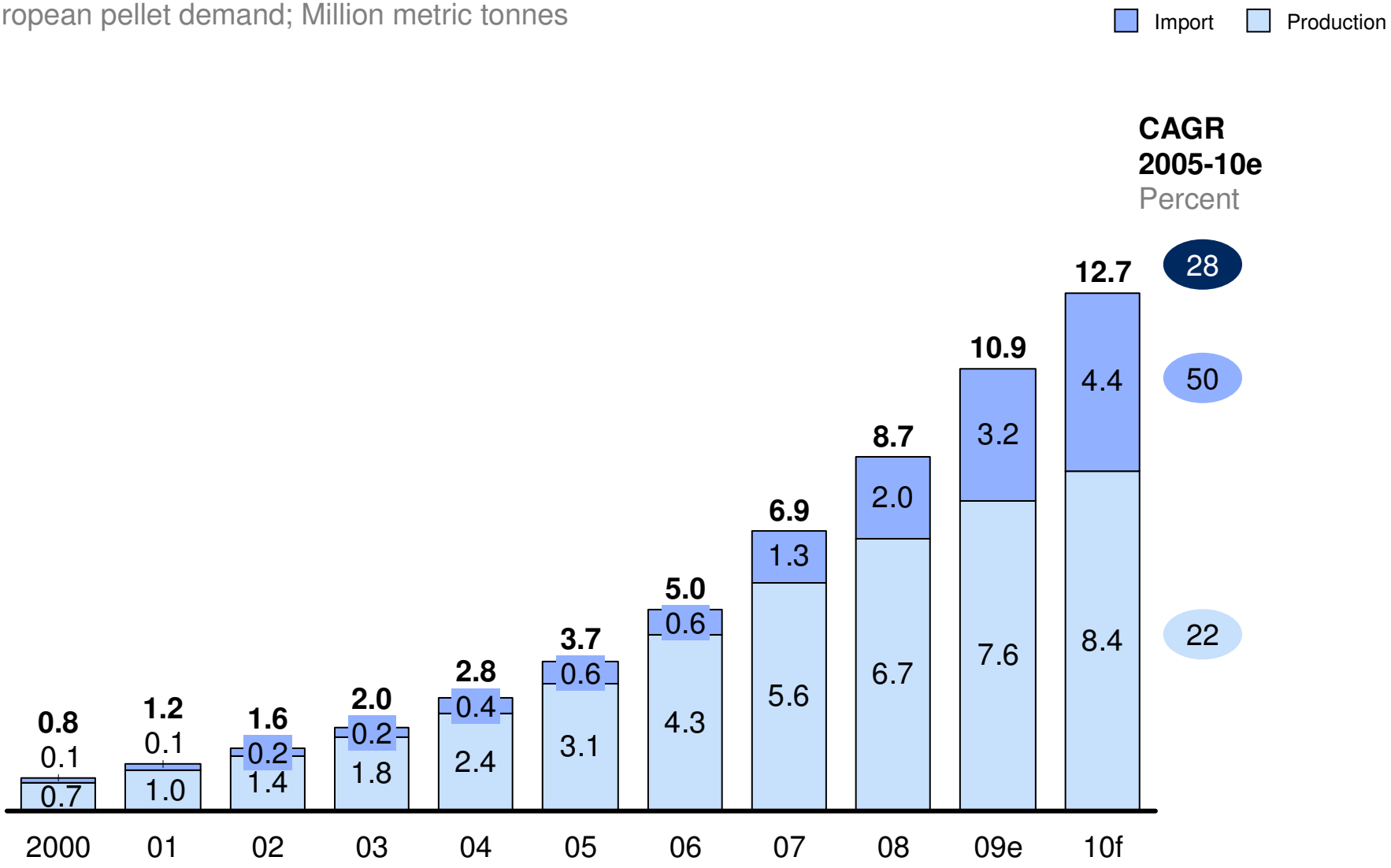
> …after big price falls on pulpwood combined with a cold winter and a smaller supply of sawdust from sawmills, **energy wood is for the first time seriously competing with pulpwood**…That pulpwood is bought in heat plants immediate vicinity is nothing new. The difference today is that **forest fuel is now fully established in the wood market**.
>
> *- Danske Bank, March 2009*

1 Assuming 2.0 MWh/m^3 fub at normal moisture content, adjusting for SEK 50-80 / m^3 fub delivery costs roadside to mill

SOURCE: Skogsstyrelsen; Energimyndigheten; McKinsey

Imports of pellets to Europe have increased significantly

European pellet demand; Million metric tonnes

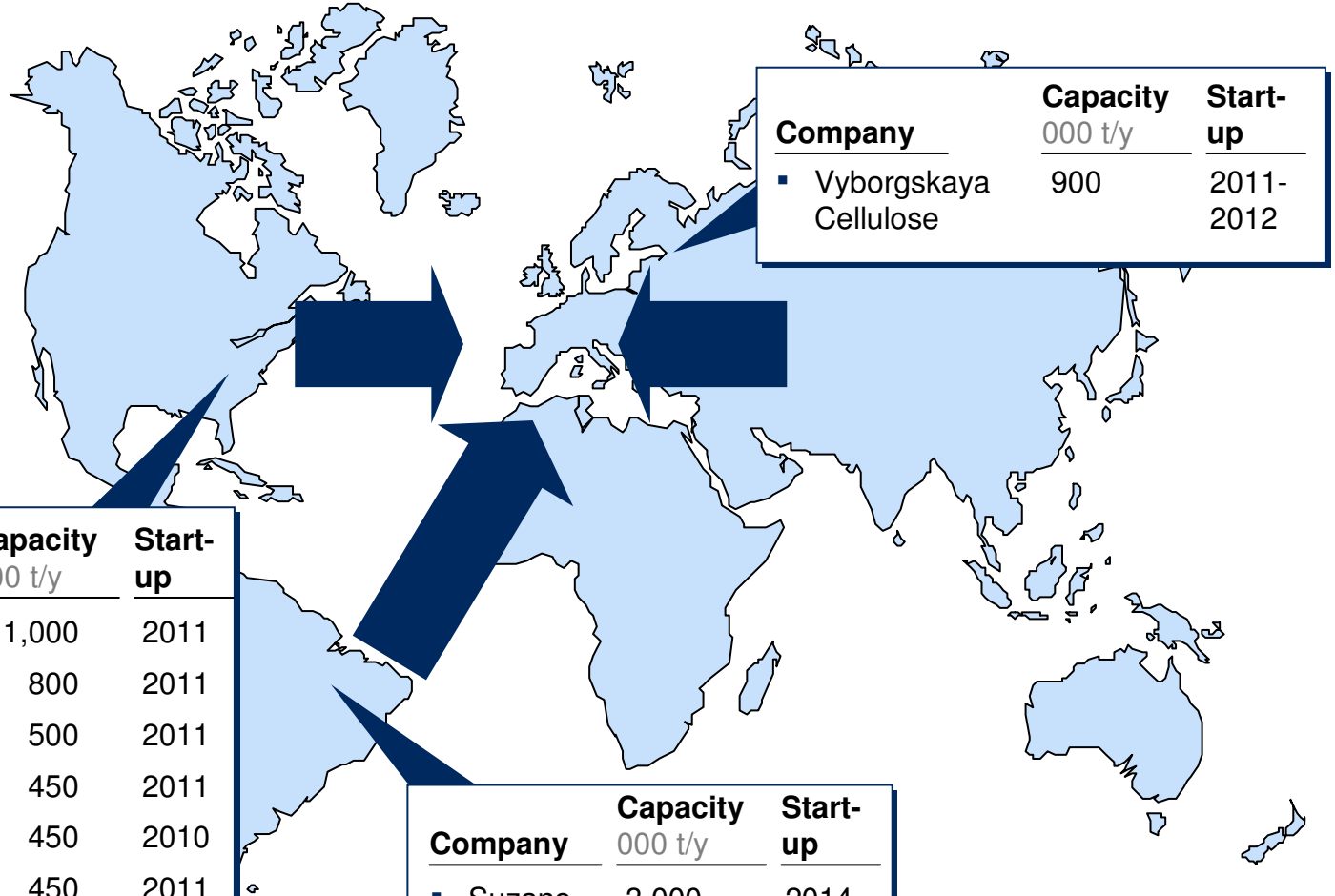


SOURCE: Wood Pellet Association of Canada; McKinsey

7-10 million t/y of new large scale capacity, mostly intended for the EU

Planned new large scale (>350 kt/y) wood pellets mills, announced 2009-2010

EXAMPLES



Company	Capacity 000 t/y	Start-up
▪ Vyborgskaya Cellulose	900	2011-2012

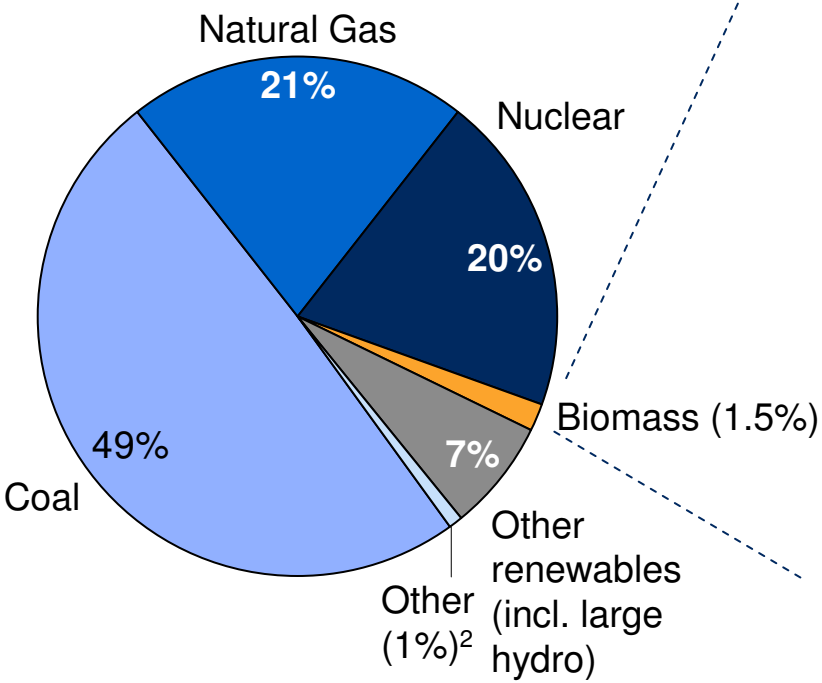
Company	Capacity 000 t/y	Start-up
▪ Magnolia Biopower	1,000	2011
▪ RWE Innogy	800	2011
▪ Green Circle	500	2011
▪ Point Bio Energy	450	2011
▪ NextGen Biomass	450	2010
▪ Can. Bio Pellets	450	2011
▪ Pacific Bioenergy	350	2010
Total NA	**~4,000**	

Company	Capacity 000 t/y	Start-up
▪ Suzano	3,000	2014
	2,000	2019

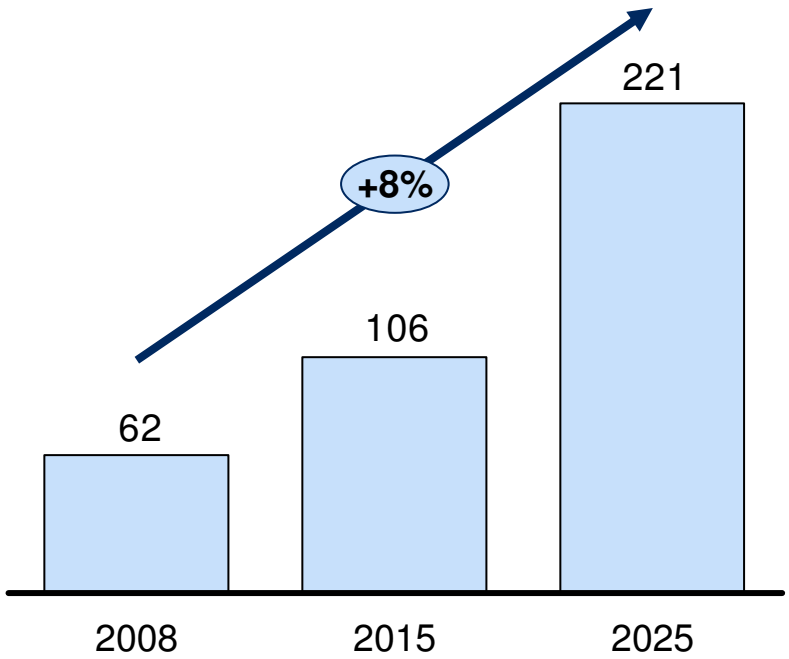
SOURCE: Hawkins Wright; WRQ; RISI; Canadian Biomass Magazine; Press search

In the U.S., biomass currently represents a small fraction of the power generation mix but appears headed towards strong growth

Net electricity generation by fuel type (2008)[1]
100% = 4,115 TWh



Projected U.S. Biomass generation
TWh



Increased generation through 2015 could require 150 new 50MW biomass plants[3]

1 Includes end-use generation
2 Other includes oil and petroleum products; petcoke
3 Assumes 65% capacity factor average for biomass plants

SOURCE: Energy Velocity, EIA – Annual Energy Outlook 2009 update; McKinsey analysis

Several significant U.S. players are becoming active in the biomass sector

- Duke Energy Corp and Areva SA have formed a JV called Adage to develop biomass power plants in the U.S.
- Areva will design and build the plants, while Duke will operate them
- The plants will use wood waste to produce electricity

- Converting its 155-MW Plant Mitchell coal unit near Albany into a 96-MW biomass plant by June 2012 at a cost of $102.8 million
- Additionally, buying 100 MW of wood-waste fired output from Summit Energy & Rollcast Energy

- Investing $70M to convert a 73-MW power plant that burns a mix of coal and wood to a plant that burns only biomass
- Investment aligned with the company's goal to cut CO_2 emissions by 22% from 2005 levels on its generation system by 2020

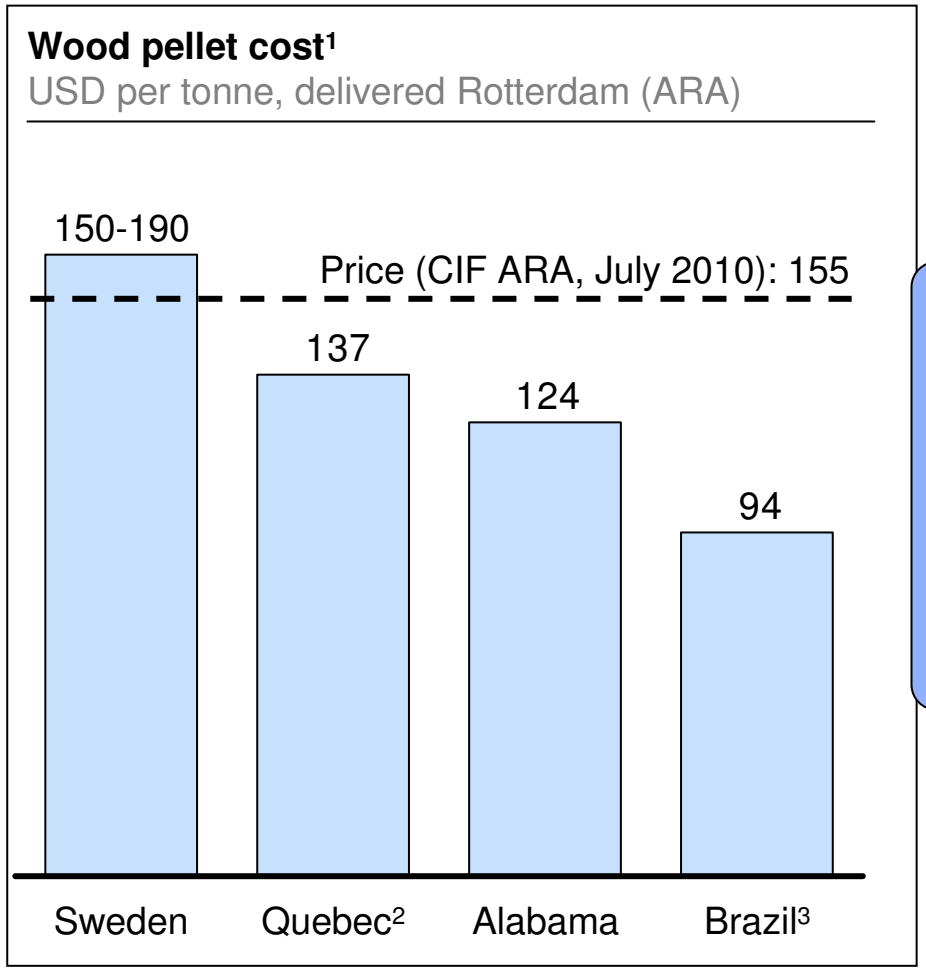
- Enhancing Montville Generating Station in Uncasville, CT to use biomass as a fuel source for 30 MW of the unit's 82-MW generating capacity
- The biomass will replace oil and natural gas, lowering the facility's net carbon footprint

- Buying the entire output of a 100-MW, waste-wood-fired power project planned near Nacogdoches, Texas
- The company has a self-imposed requirement to meet 30% of electricity needs in 2020 with renewable sources

SOURCE: Platts, companies websites, McKinsey analysis

Going forward, it is not clear that Sweden will be cost competitive for pellet supplies to Europe

ROUGH ESTIMATES



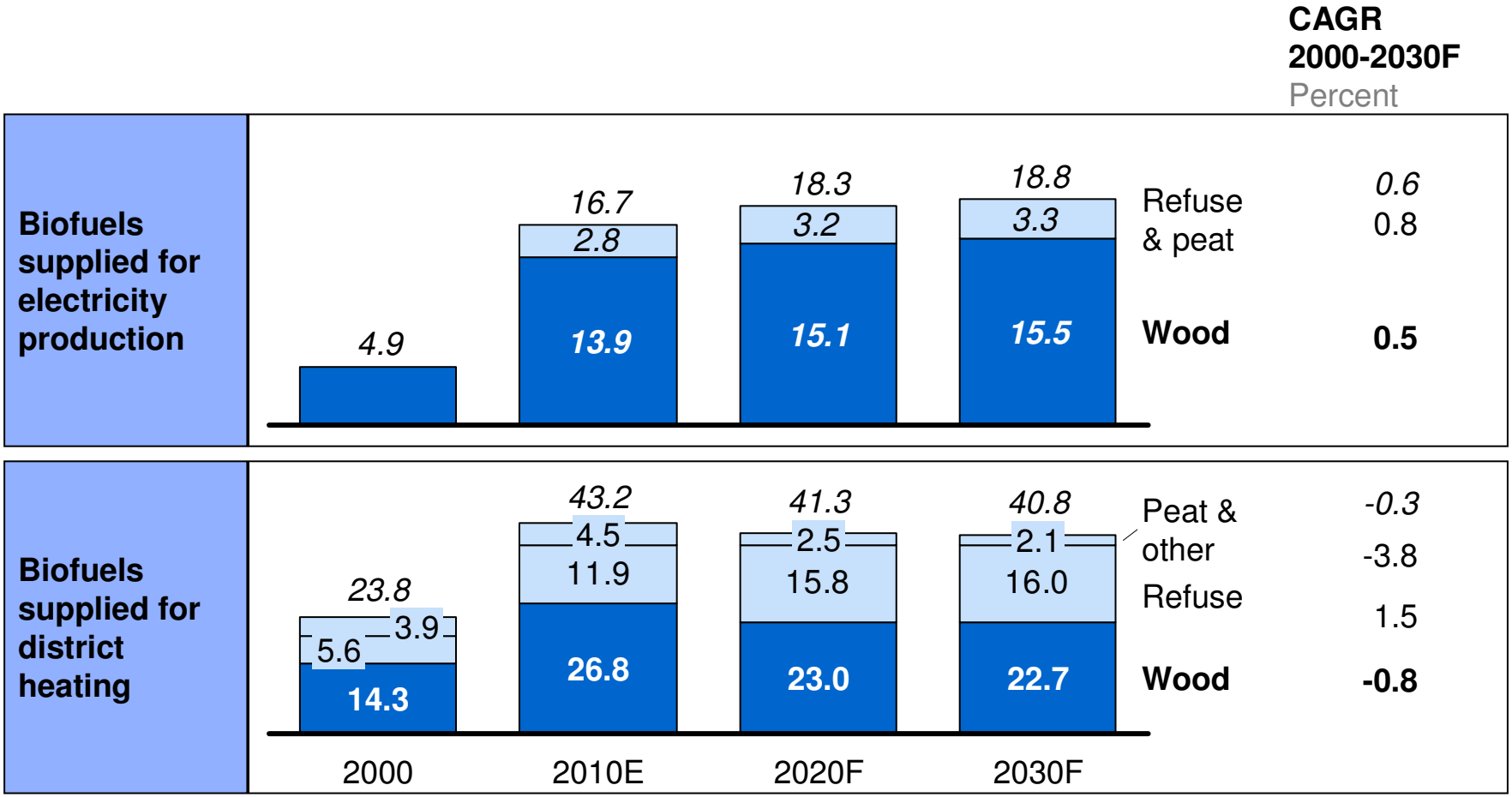
- Sweden is likely producing at a higher cost than the bulk of European imports which is coming from West Canada
- Primary market for Swedish biomass may therefore be Sweden

1 Pellet mill assumed capacity: 450 000 odmt/yr in all countries but Sweden (~100 000 admt/yr)
2 In Québec, model assumes pellet plant is supplied by 60% S&S, 30% chips & 10% pulplogs at S&S and wood chips market price
3 Assuming wood fiber is coming from nearby plantations in Brazil. Assumed plantation of ~23,000 ha at 3,000 USD/ha

SOURCE : RISI (Analytical Cornerstone); WRQ; UBC (2006); WPAC (2008); CIFQ & PwC (2008); CSX (2009); Clarkson Research Services (2009); Brazil Agrianual (2007); Oanda.com; Hawkins-Wright; McKinsey analysis

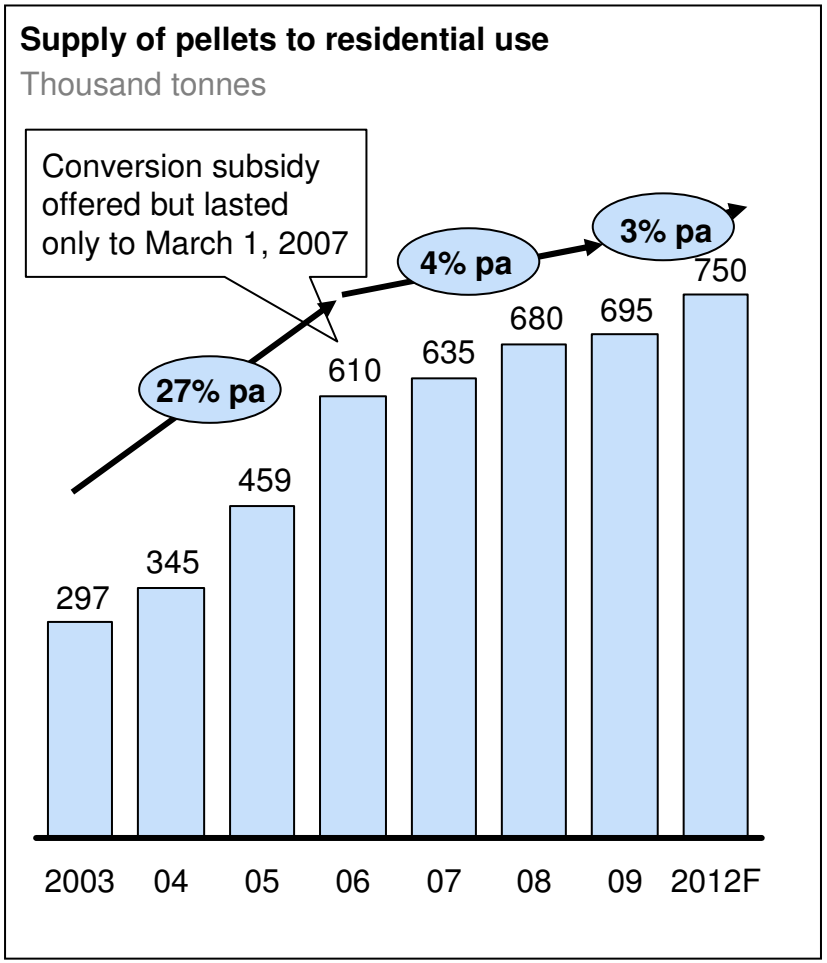
In Sweden, the demand for woody biomass for power generation and district heating is not expected to grow significantly beyond 2010

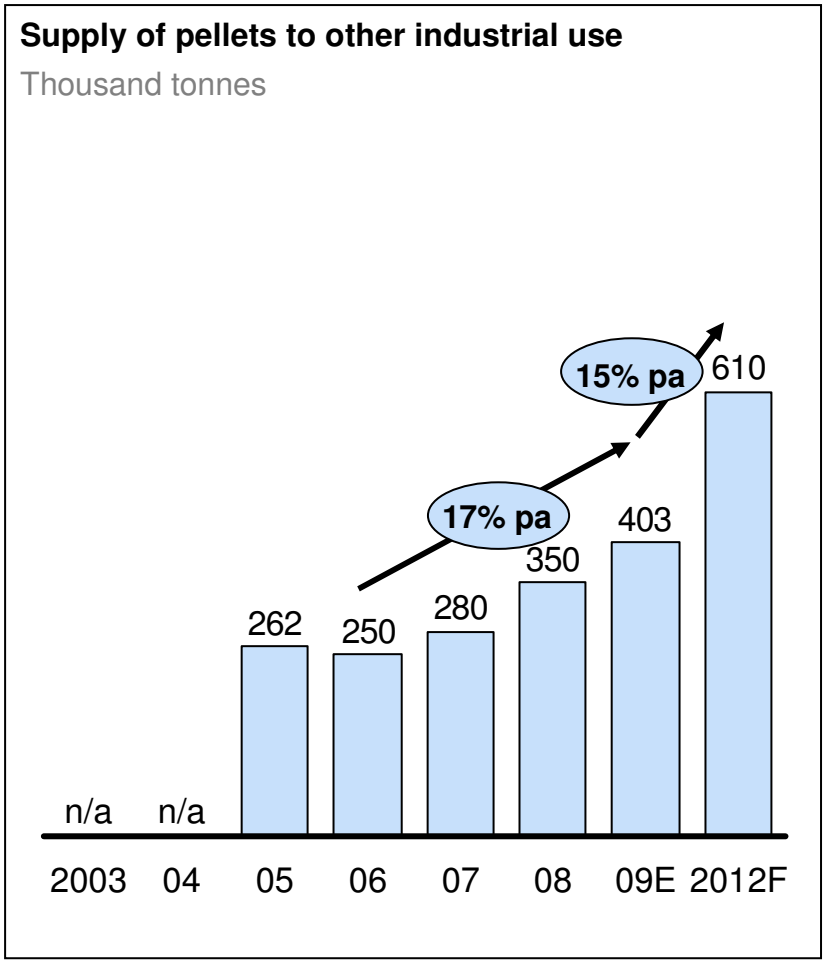
Swedish biofuel demand, base scenario; TWh



SOURCE: Energimyndigheten; McKinsey

Residential growth is also stagnating; it is only pellets for other industrial use (medium size plants) that is expected to see strong growth in Sweden





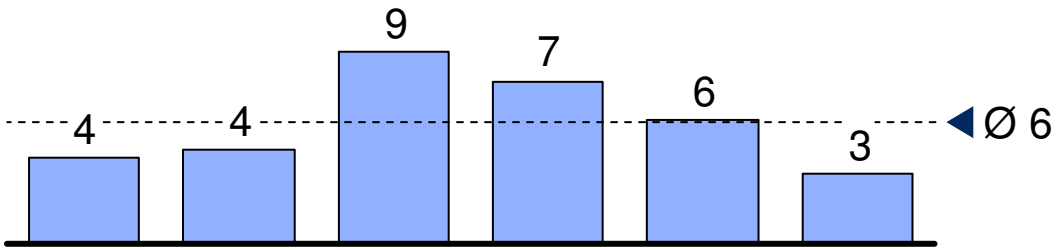
NOTE: PiR estimates somewhat higher than McKinsey's

SOURCE: PiR; Energimyndigheten; Press search; Expert Interviews; McKinsey Analysis

Pressure on pellet producers has affected their profit margins

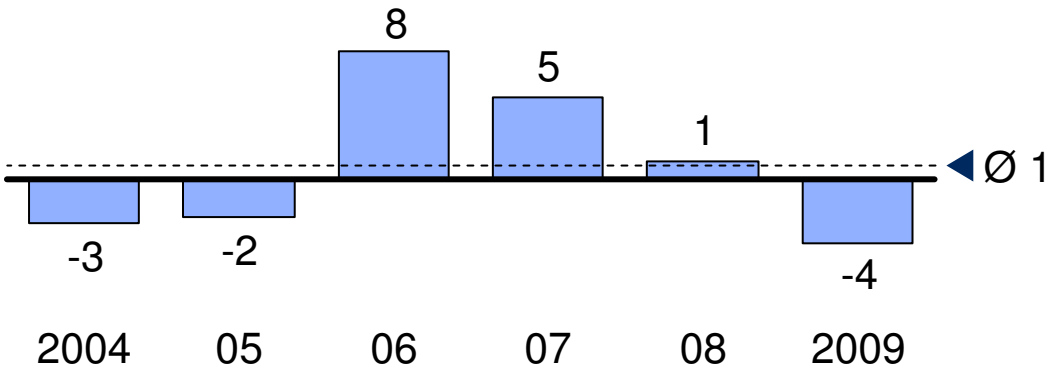
EBITDA margins[1] (Rörelsemarginal)

%



ROCE[1] (Avkastning på sysselsatt kapital)

%



Expected trend 2010–2012

- Margins and ROCE have historically been volatile
- Little future margin upside with an expected volume demand slow down in combination with increased upstream and downstream pressure
- Going forward, margins and returns will likely remain at historical median margins, at the best

1 Weighted average estimate based on reported and nonadjusted numbers for SCA Bionorr, Neova, Laxå Pellets, Lantmännen Agroenergi, Vida Energi, Bioenergi I Luleå, Hällefors Ekobriketter and Härjedalen Miljöbränsle

Sources: Odin; company reports; McKinsey analysis

Biomass has a cost improvement potential of 25-50%, and could be cost competitive with coal and CO_2@20 EUR/ton – three main levers identified

3 main levers for cost competitiveness…

1	**Increased scale and standardization in plants** – proven in other energy equipment	▪ Other project-based industries show standardization potential of up to 70%, equaling cost saving of 20% ▪ Scale benefits when moving to 100 MW and larger
2	**Efficiency revolution** – already technically feasible	▪ State-of-the-art technology and optimized feedstock allow for efficiencies of ~40% compared to today's average of 25-30%
3	**A professional supply chain** – pulp and paper already did it	▪ Economies of scale and improved harvesting practices could reduce fuel cost by 20-25%

… supported and speeded up by

4	Innovation and technology breakthroughs – torrefaction easing transport and storage	▪ Higher energy density and "coal-like" properties

In summary – today's main messages

Great challenge to reach ambitious energy targets could create stress in the wood supply system; but demand is not on track

Sweden may not be fully affected by the European situation – for good or bad

- **Imports from other regions expected to be larger than previously thought (but things may still change)**
- **Swedish biomass may not be highly cost-competitive in Continental European markets**
- **The jury is still out as to how much domestic demand Sweden will have**

Continued development of technology, infrastructure, and value chain will be necessary to fully develop the opportunities of Swedish biomass