

Global forest biomass demand and supply under different climate policies and energy technology paths

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Questions we aim to address

- **Can the future needs for wood biomass be satisfied** in the sustainable and economically feasible manner?
- What will the **competition over resources** be like between the **regions** and **end-use applications**?
- What are the **biggest uncertainties** regarding the **potential shortage** of wood?

Outline

The method

- 3 scenarios considered
- 2 models used to quantify the impacts of scenario assumptions on the global wood demand and supply

Some results for background info: energy and forest industry

Some key results by questions

- Can the future needs for wood biomass be satisfied?
- What will competition over wood biomass be?
- What are the biggest uncertainties?

Three scenarios considered: main characteristics

	Economic growth	Climate policies	Nuclear power	Tehnology development
Crunch	Modest	No priority: +4-5°C <ul style="list-style-type: none"> • EU 2030 – package • Miscallaneous in other regions 	Large increase - doubles by 2035	Conservative, No CCS Higher investment costs for biorefineries
Bio-Inno	Moderate	Global ~ + 2°C <ul style="list-style-type: none"> • EU 2050 -80% 	Free increase	Bio-economy in the focus of European R&D CCS + BECCS 2030 onwards
Bio-Stor	Moderate (emerging economies) Modest (else)	Global ~ + 2°C <ul style="list-style-type: none"> • EU 2050 -80% 	No increase	Boosted for new renewables and storage (Solar PV investment costs 55% lower than in Crunch) CCS more expensive Bio-SNG + LNG

The scenarios were quantified using two models

Energy systems examined with

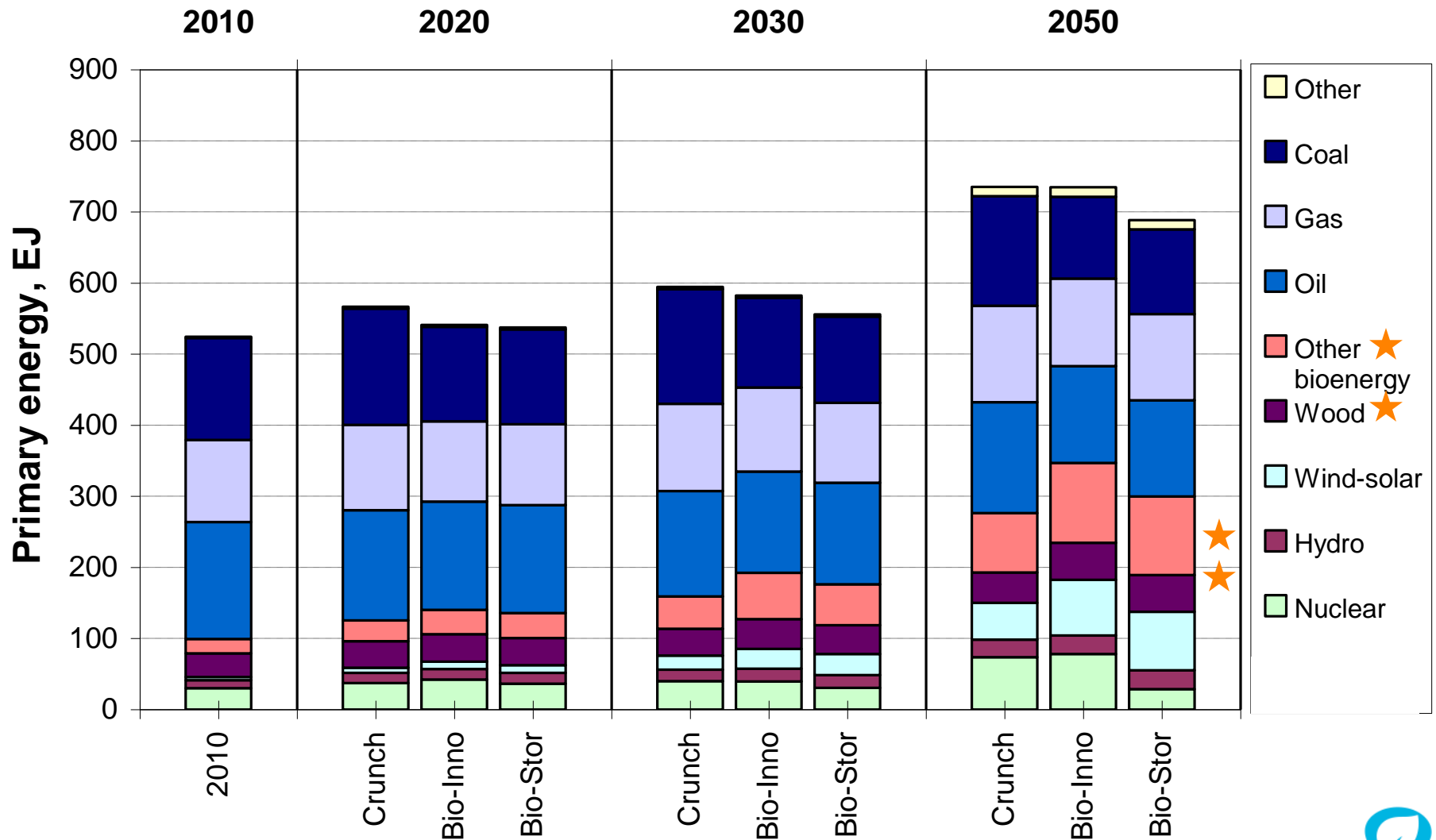
- The global **TIMES-VTT** model of VTT
 - Dynamic partial equilibrium model
 - Technology rich, bottom-up type model of 17 regions
 - Energy supply chain from fuel extraction to end use by various sectors

Forest sector examined with

- The global forest sector model, **EFI-GTM**
 - Technology rich, recursive, partial equilibrium model of 61 regions for over 40 forest related commodities
 - Supply chain from forests to consumed end product

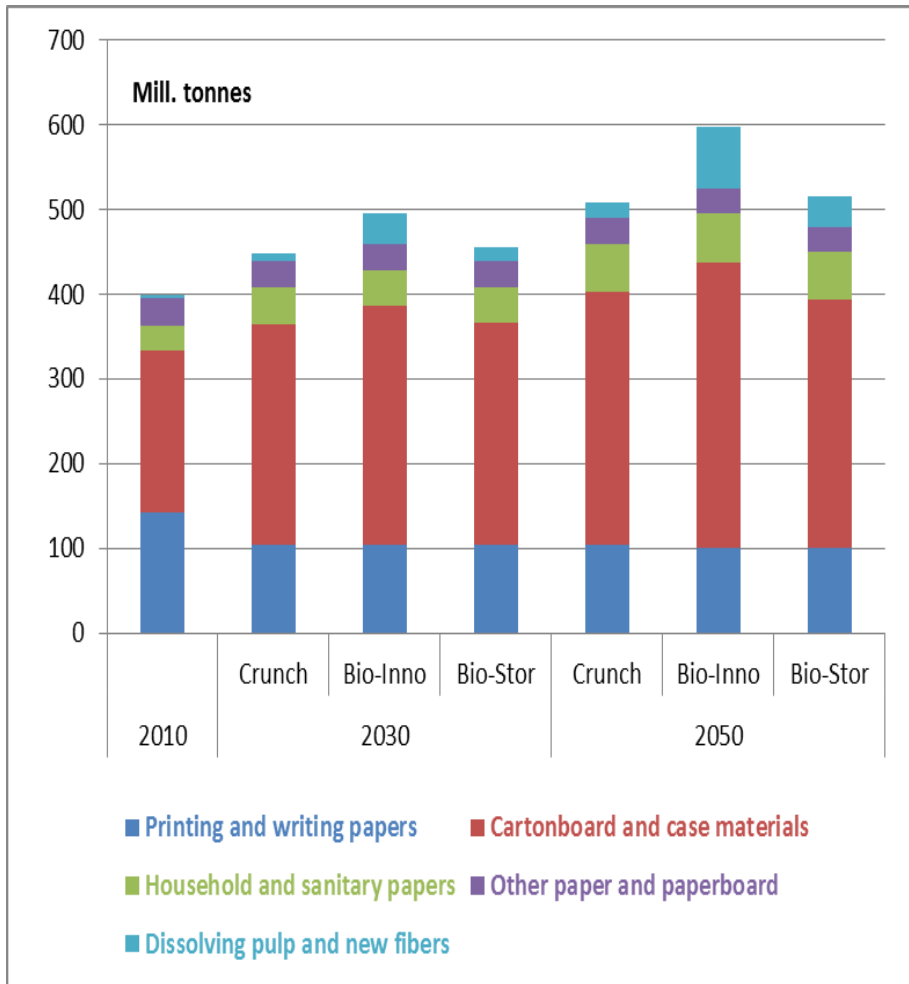
Some results for background

Global primary energy consumption, EJ

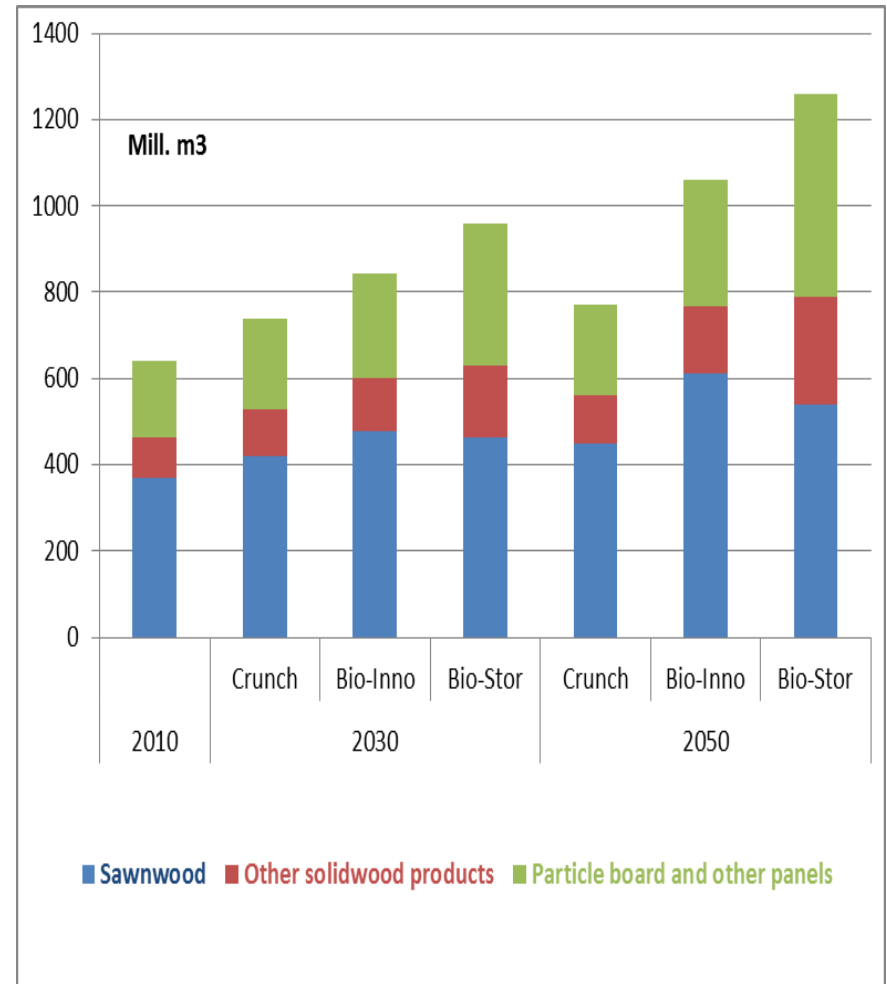


The global forest industry production

- Pulp and paper



- Mechanical forest products



Projected using the EFI-GTM -model

Can the future needs for wood biomass be satisfied in the sustainable and economically feasible manner?

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Before 2030: despite the pressure: YES in the global level

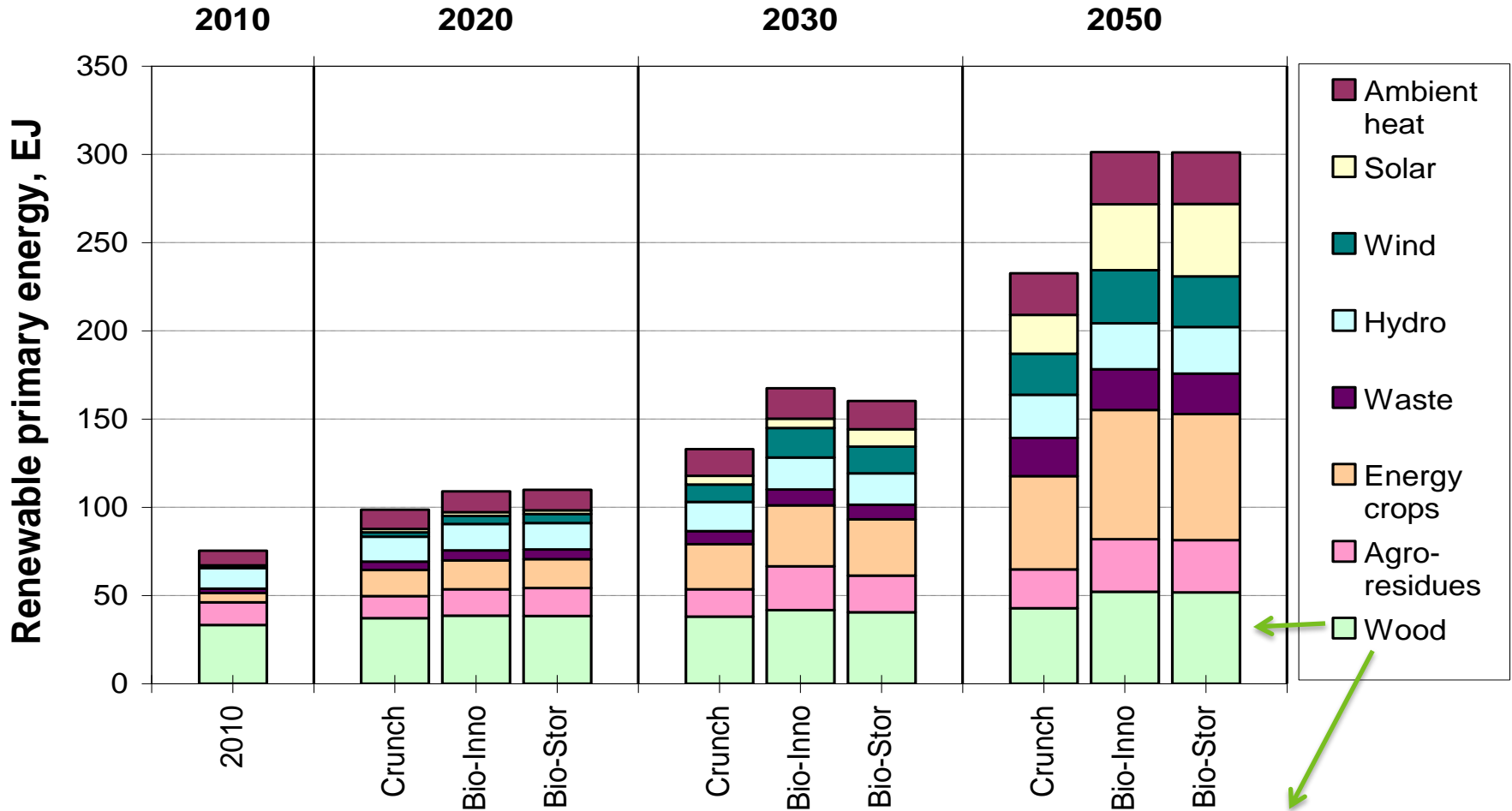
- Demand-supply relationship is still rather "balanced"
- Wood is important for energy, yet growth focused on other renewables
- Forest chips is the most important source for modern wood bioenergy.
- In the forest industry, the increase of 200 – 500 Mm³ of round wood use can be satisfied by intensified use of growing forest resources

By 2050: Could be, but also problems might be anticipated

- 80-90% of the *all biomass* resources that are *currently perceived* to be sustainably available may be taken to use
 - New wood supply
 - Plantations
 - modernization of the use of traditional fuel wood
- will be of crucial importance in Bio-Stor and Bio-Inno

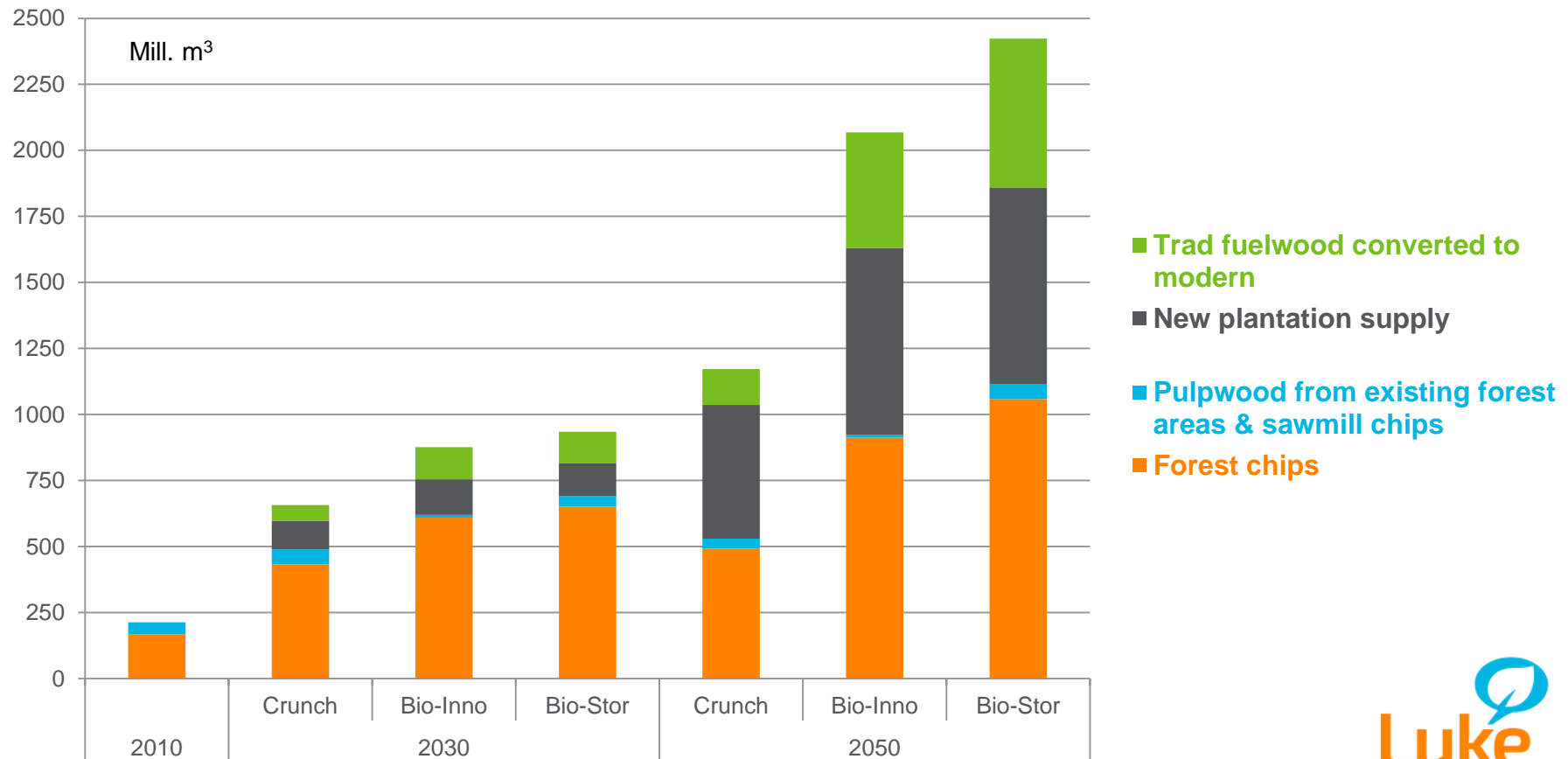
Global use of renewable primary energy, EJ

- Renewables other than wood grow most
- Growth in wood biomass use somewhat moderate to 2030
- By 2050, up to 50 EJ of wood may be used for energy! (1 EJ \approx 138 Mm³)



Use of roundwood & forest chips for *modern energy*

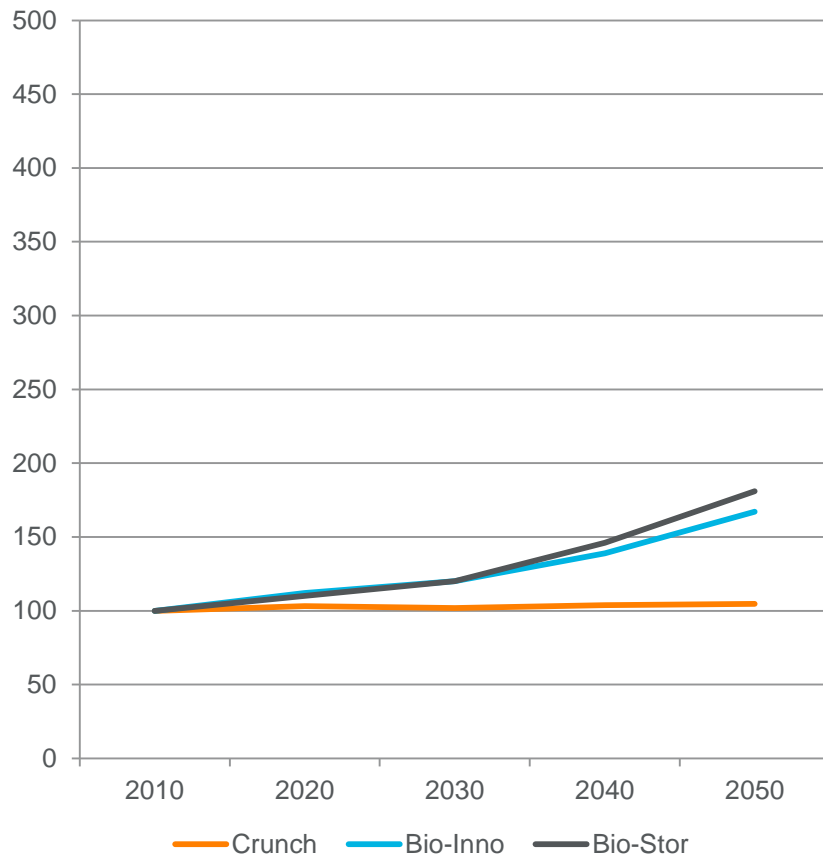
- **Forest chips** most important supply source up to 2030.
- New wood supply (**plantations** and **traditional firewood put to more efficient use**) of crucial importance later on in scenarios Bio-Stor and Bio-Inno.
- By 2050, over half of use from these latter sources.



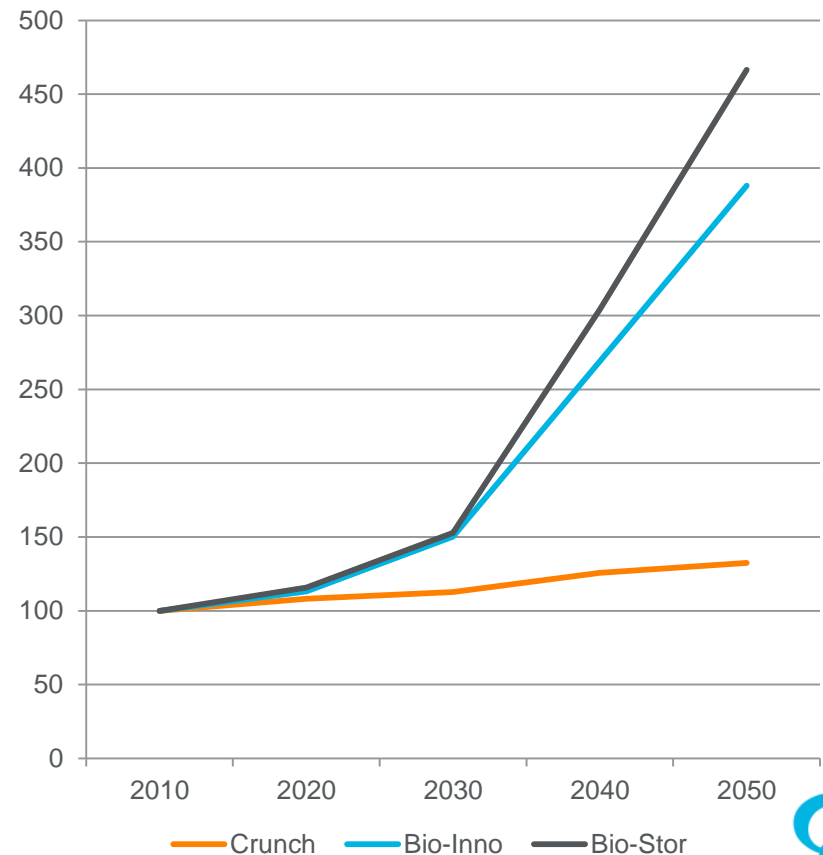
Projected using the EFI-GTM model.

Development of the average mill price for softwood pulpwood in the EU + 2 region (2010=100)

As projected in the scenarios



If **no** additional plantation area or shift from traditional to modern firewood

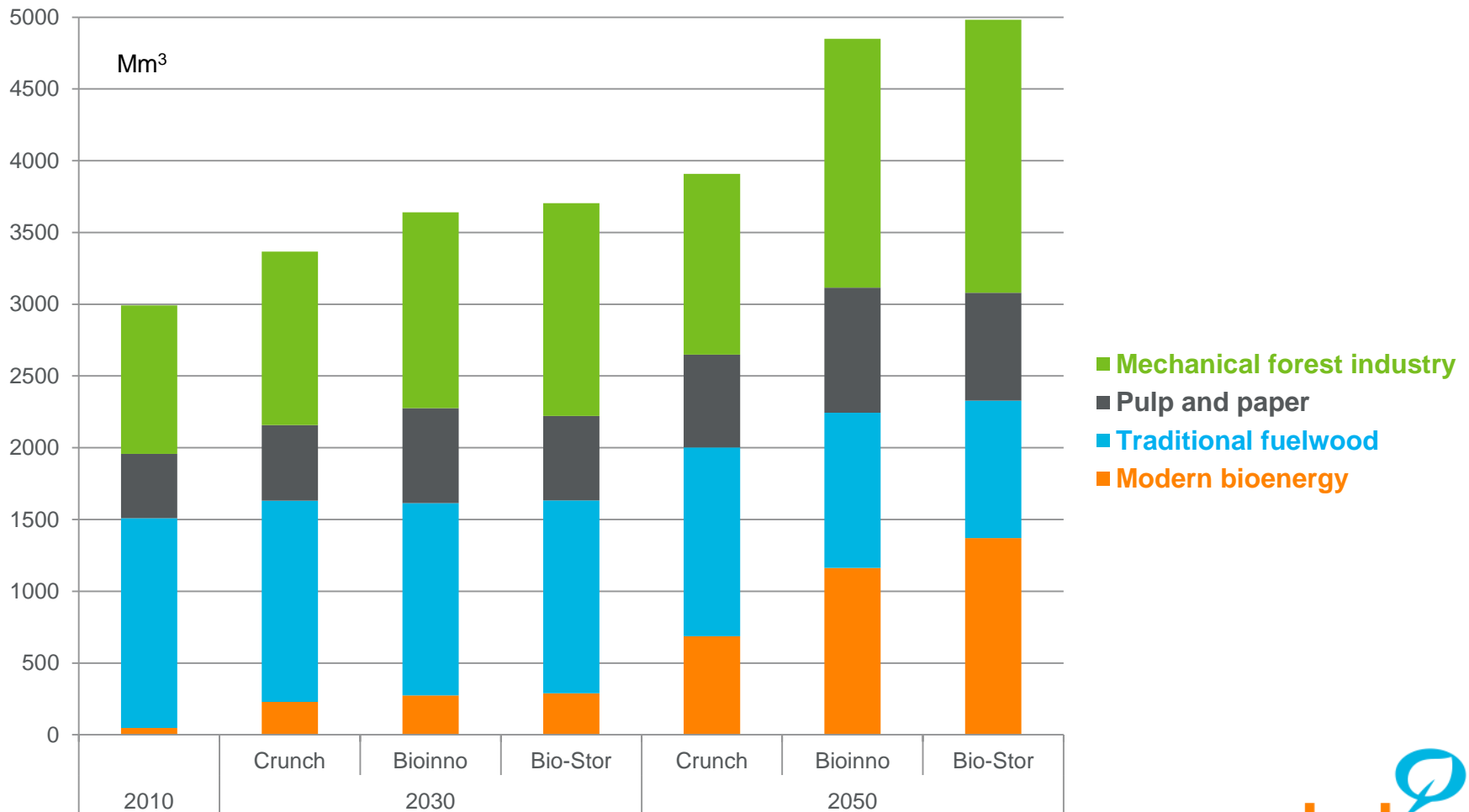


Projected using the EFI-GTM model.

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Use of round wood in the forest industry and in traditional and modern energy production

Forest industry uses 200 – 500 Mm³ more roundwood in 2030 than in 2010.



Projected using the EFI-GTM model.

What will **competition over wood** be like between **regions and various end-use applications**?

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Despite increased demand for wood, **no major conflicts between end uses by 2030**

14 Mt of sulfate pulp is "freed" from declining printing and writing paper sector between 2010-2030 easing the pulpwood demand by over 50 Mm³

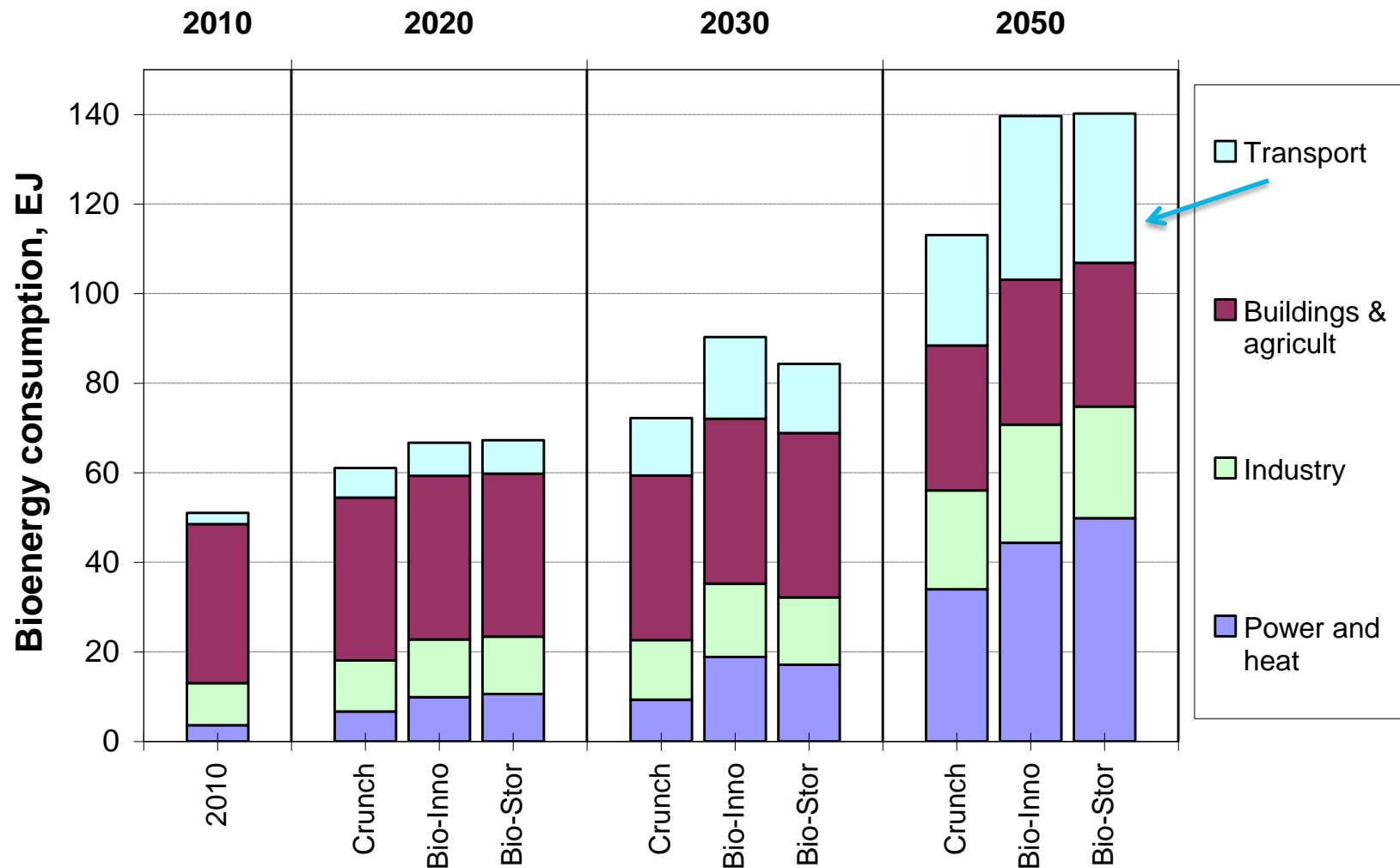
2nd generation biofuels need increasing amounts of biomass and compete for energy feedstock with heat and power production.

Competition to become severe closer to 2050 in scenarios Bio-inno and Bio-Stor without new supply sources

Important to eg start using traditional fuel wood more efficiently. Will that be possible without conflicts?

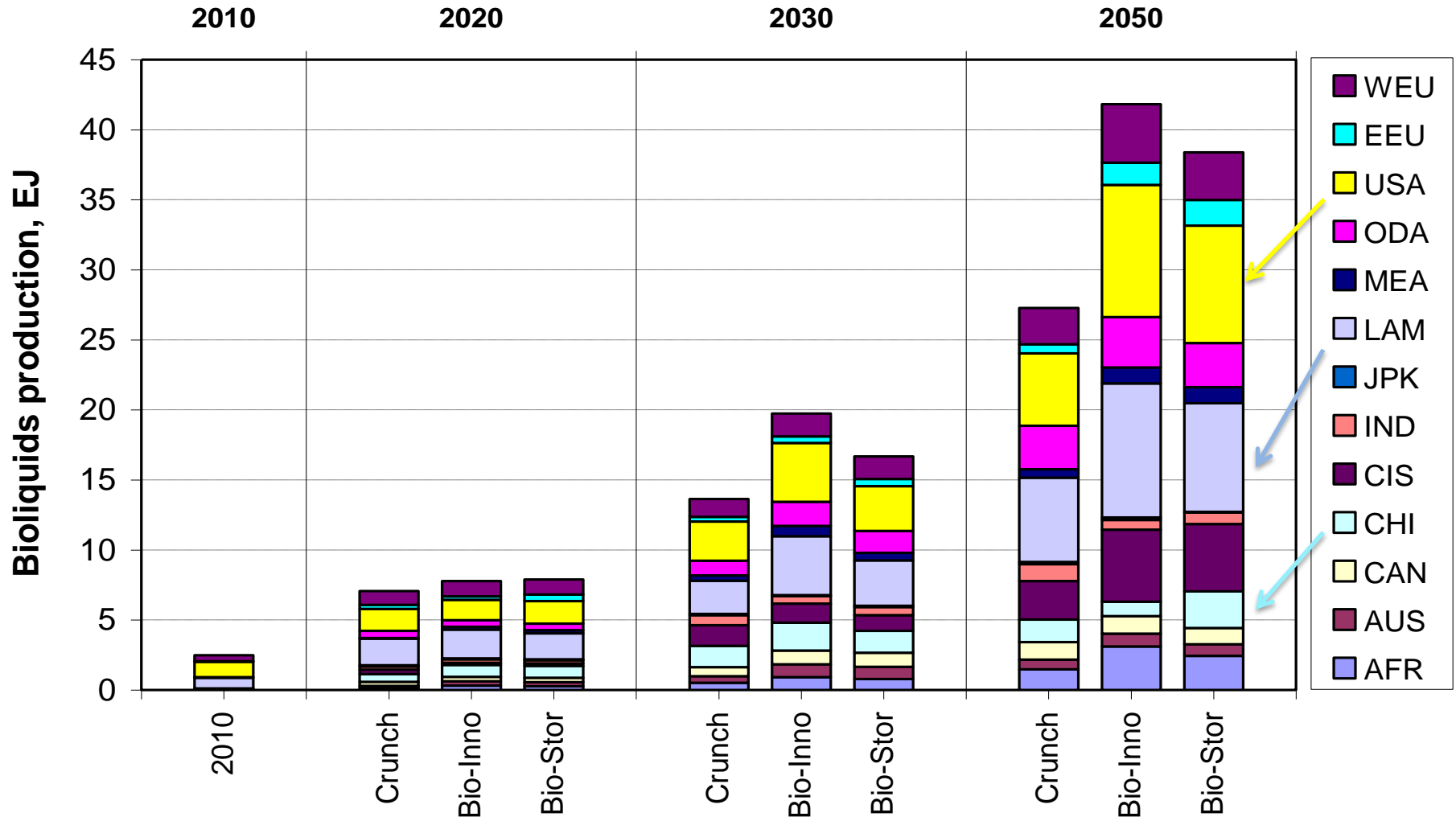
Global use of *all* biomass for energy by end use

- 2nd generation biofuels mostly for transports compete for biomass with heat and power production.



Regional use of *all* biomass in making liquid fuels

- USA, Latin America, China.... Many important producer regions.
- Remembering that 1 EJ is almost 140 Mm³ this business could become huge



What are **the biggest uncertainties** regarding the potential shortage of wood

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- **Factors affecting pressure from demand side**
 - Climate policies:
 - Less ambition > less biomass demand
 - Wood remains to be considered carbon neutral ?
 - Speed of technological development of alternative energy sources and *novel* energy storage. The more rapid > the less demand
 - New wood products? To what extent will wood replace plastic, cotton, metals, concrete...
- **Factors affecting pressure from the supply side**
 - Forest plantation area: if not increased the price of wood biomass might sky-rocket by 2050. Spots to follow incl. LAM, China... the US
 - Shift from traditional to modern fuel wood takes place: India, Africa...
- **Additional factors (demand or supply) not modelled**
 - *Climate change affecting the yields*
 - *Future diets/meat consumption: availability of (competing) agribiomass and land*

More detailed information also in the regional level will be available in the pdf-report to be published soon.

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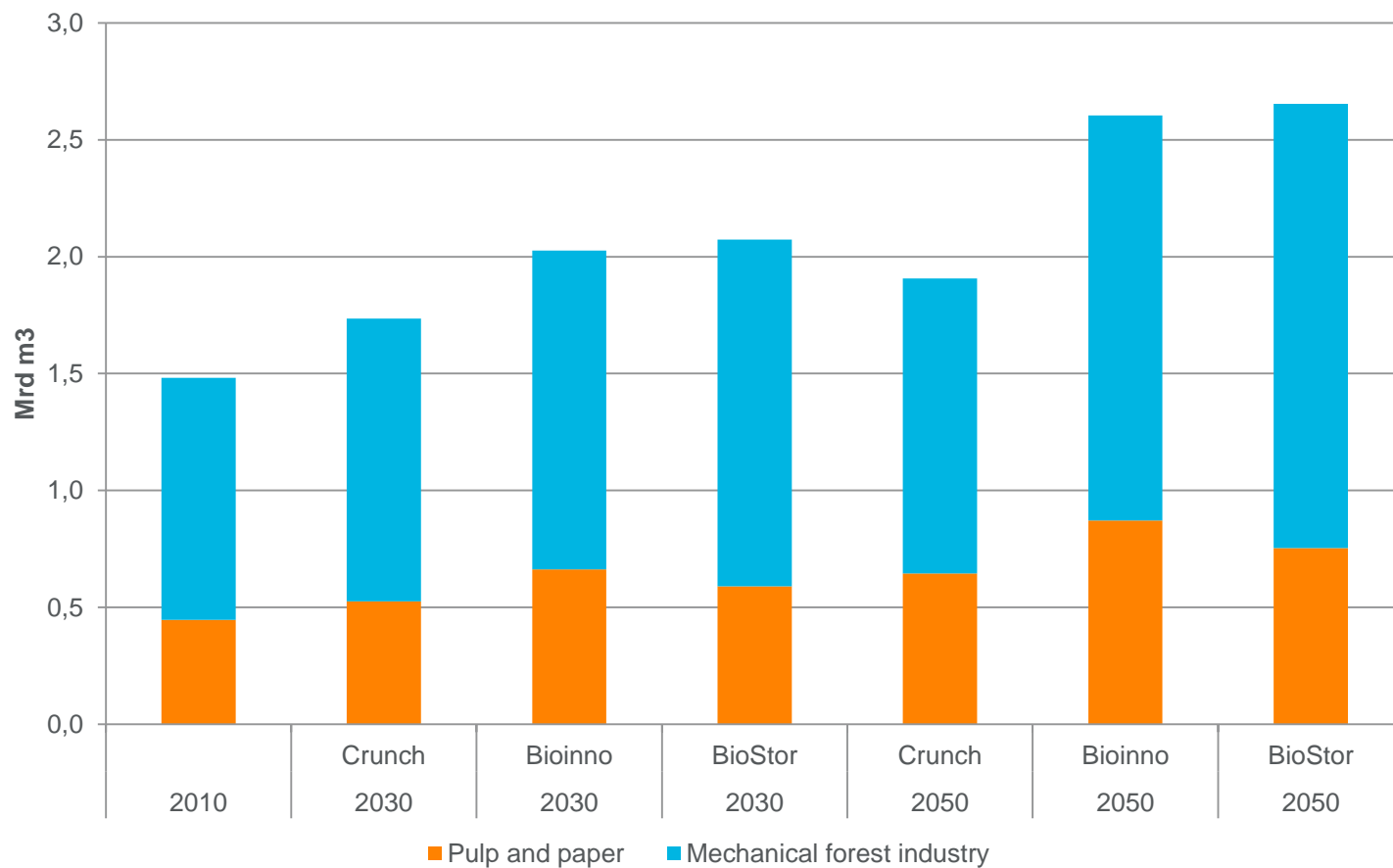


Sustainable Bioenergy
Solutions for Tomorrow

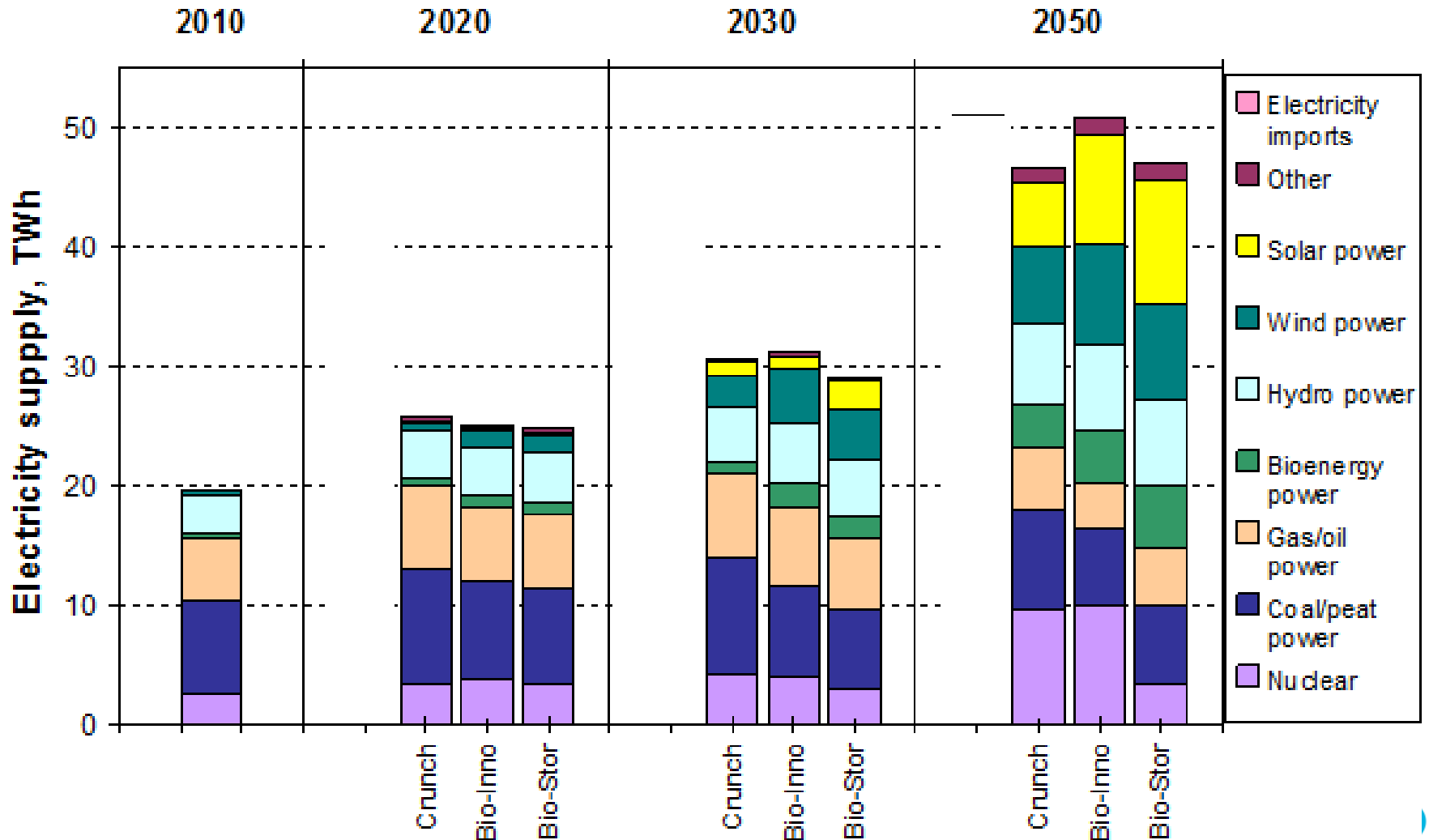


Thank you!

Use of roundwood in the forest industry



Global supply of renewable electricity by source



Increase in demand for forest chips and roundwood for modern heat, power and liquid biofuels production from 2010 to 2050 in selected regions

