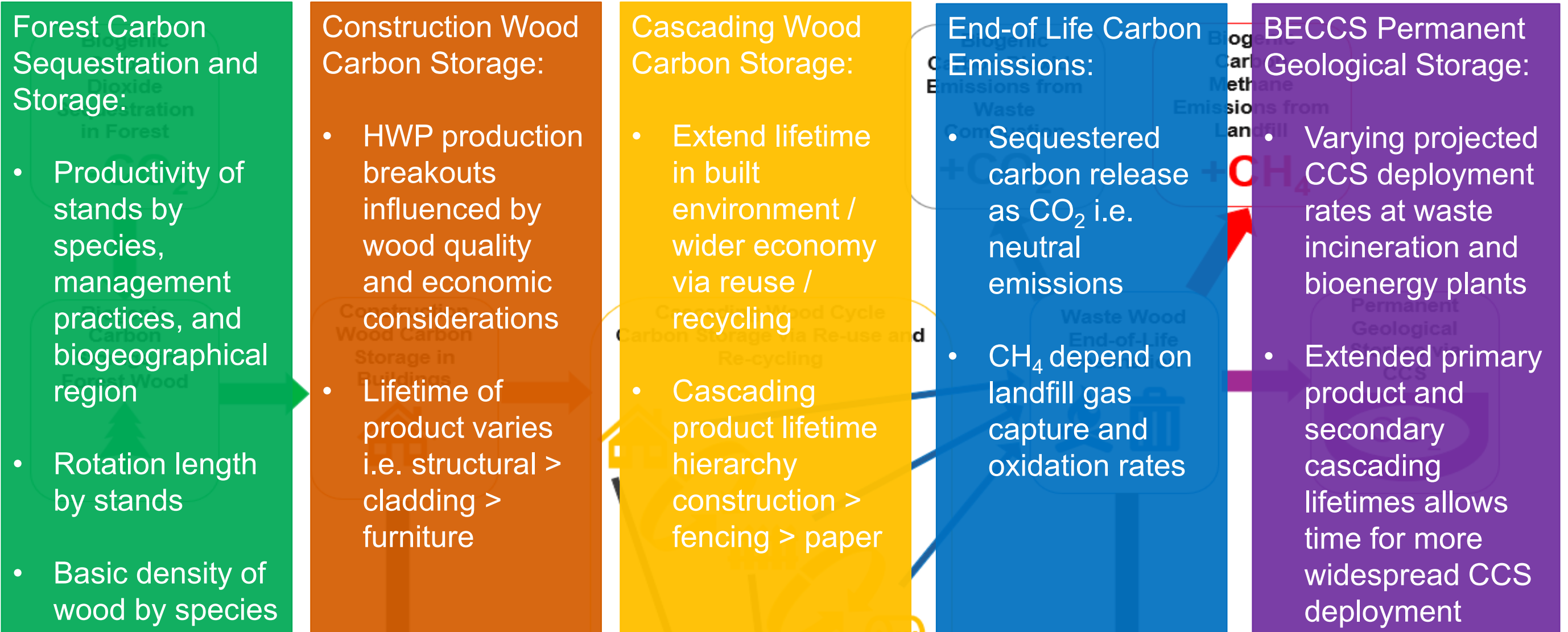


The background of the slide features a close-up, vertical view of a wood grain, showing the natural texture and color variations of the timber. The grain runs vertically, with darker and lighter brown tones creating a sense of depth and texture.

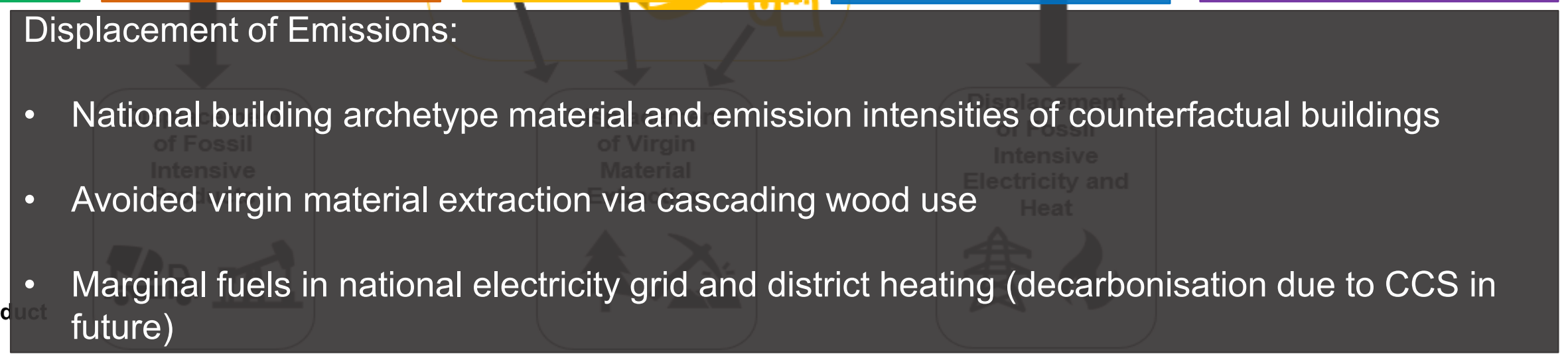
Future GHG mitigation (and land sparing) from cascading use of construction timber for BECCS

William Horan, Michael Quilligan, George Bishop, David Styles

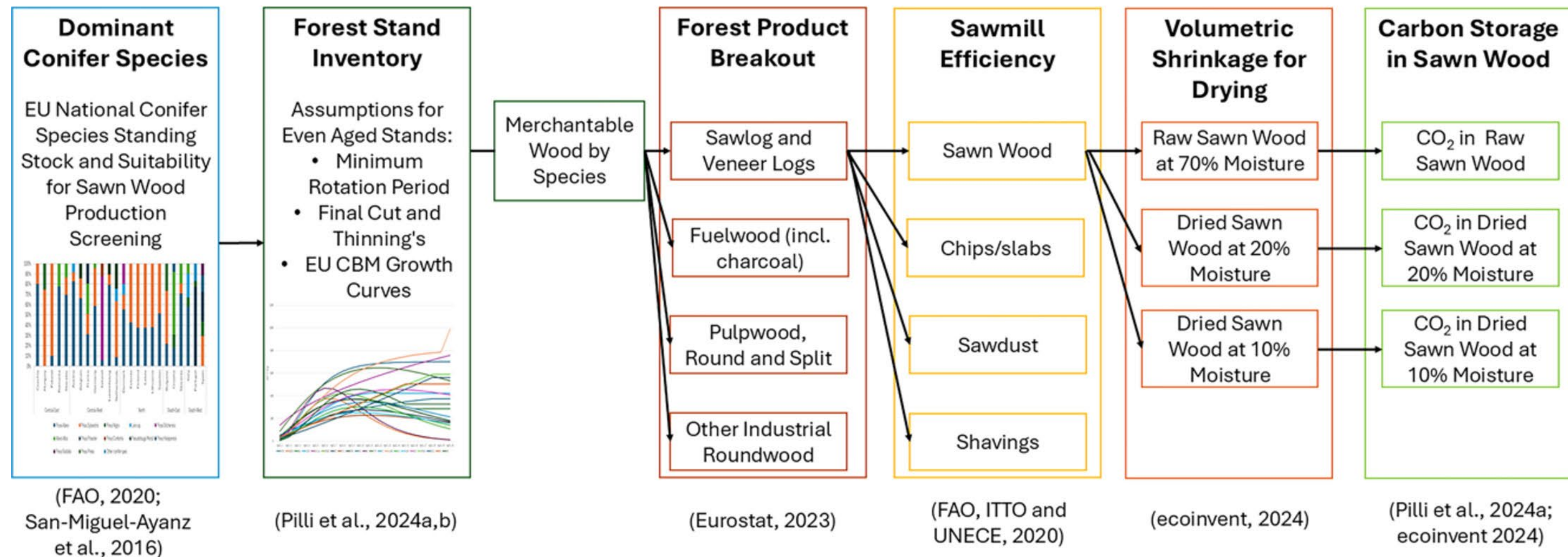
Important Factors for Modelling Cascading Value Chains for Net GHG Mitigation



- Forest Carbon Flow
- Construction Wood Flow
- Cascading Wood Flow
- Waste Wood Flow
- Permanent Storage Flow
- Waste Carbon Dioxide Emissions
- Waste Methane Emissions
- Displacement of Fossil Intensive Product and Energy Emissions



Better tracking of biogenic carbon needed

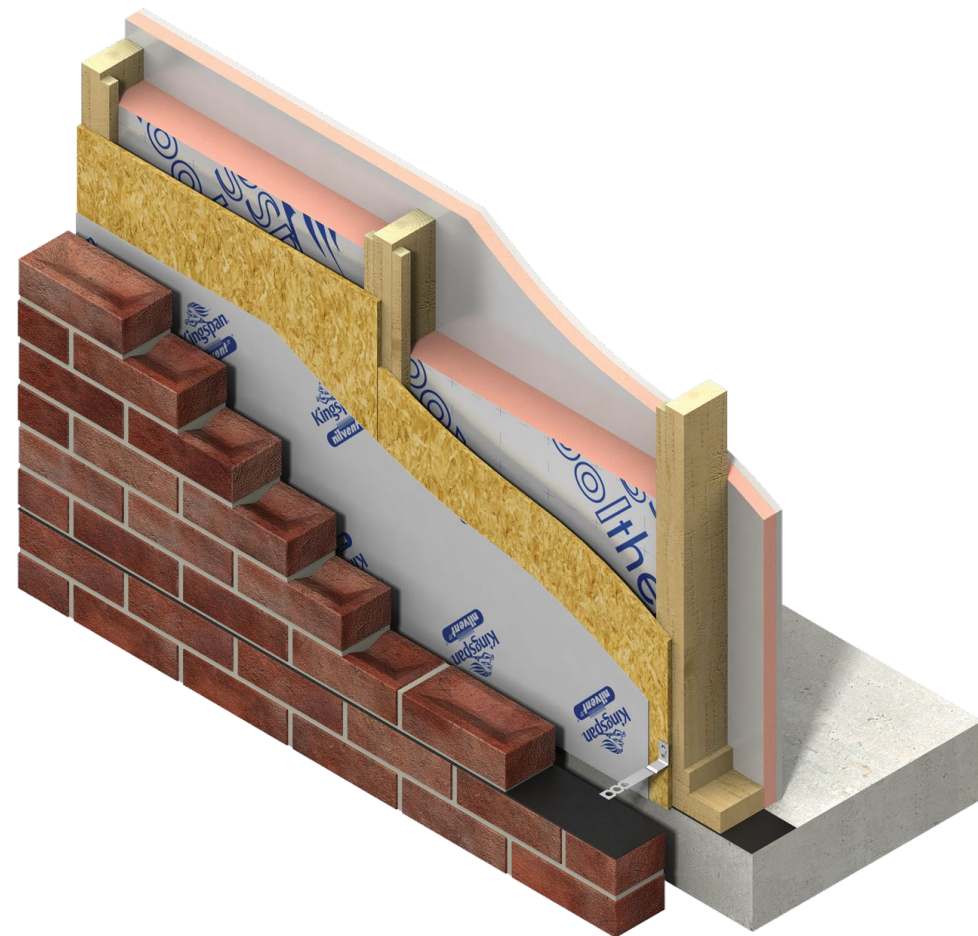


Key Insights:

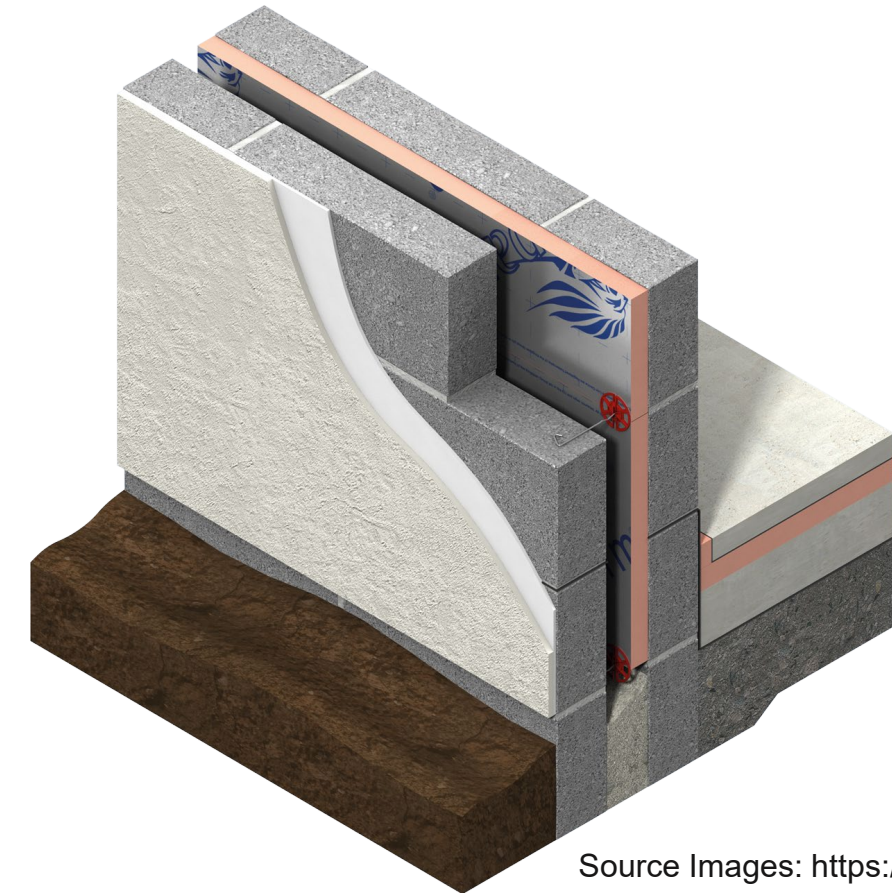
- Biogenic carbon varied from -10% to +47% compared to ecoinvent EwS, and -22% to +38% compared to IPCC Tier 1 default for coniferous sawn wood (exceeding IPCC $\pm 25\%$ uncertainty).
- Land occupation ranged from -65% to +388% relative to ecoinvent EwS-derived values.

A1-A3 Displacement Factors sensitive to building design

Timber Frame

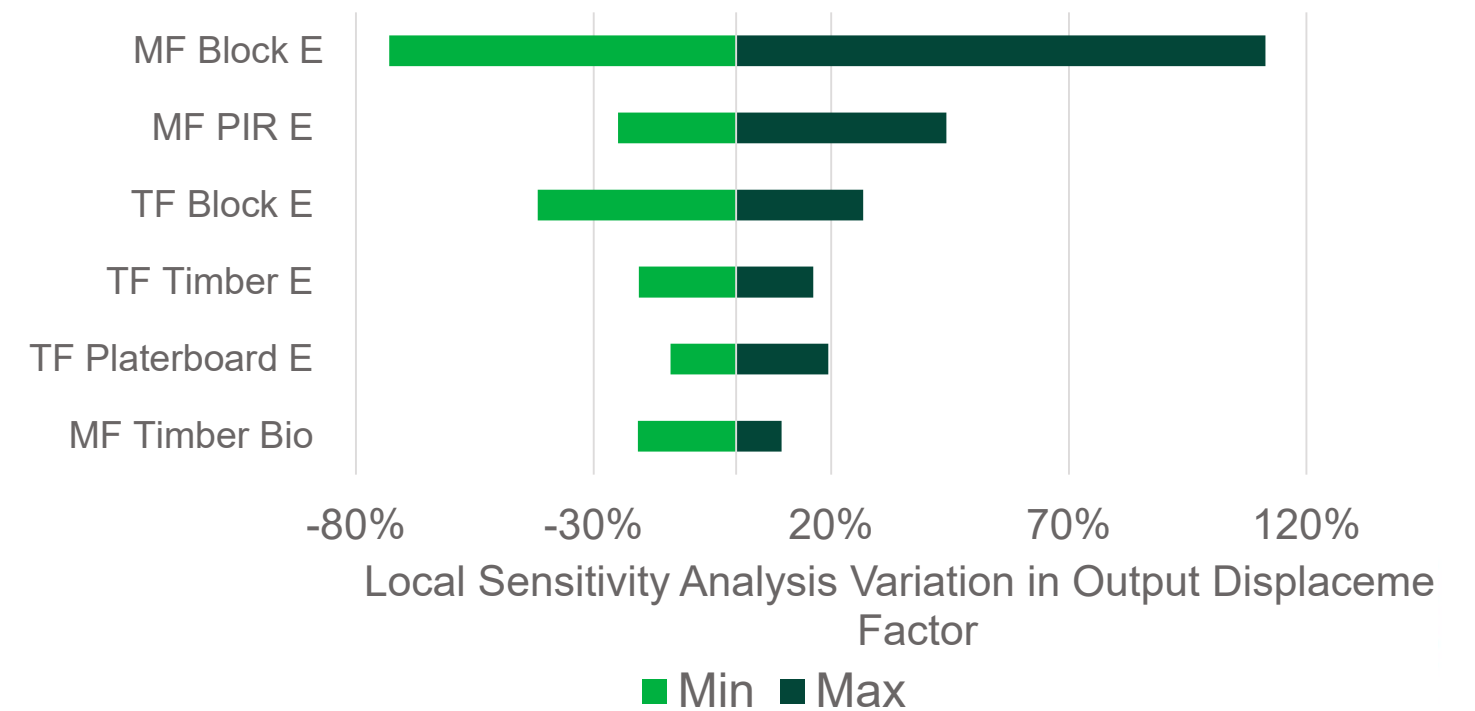
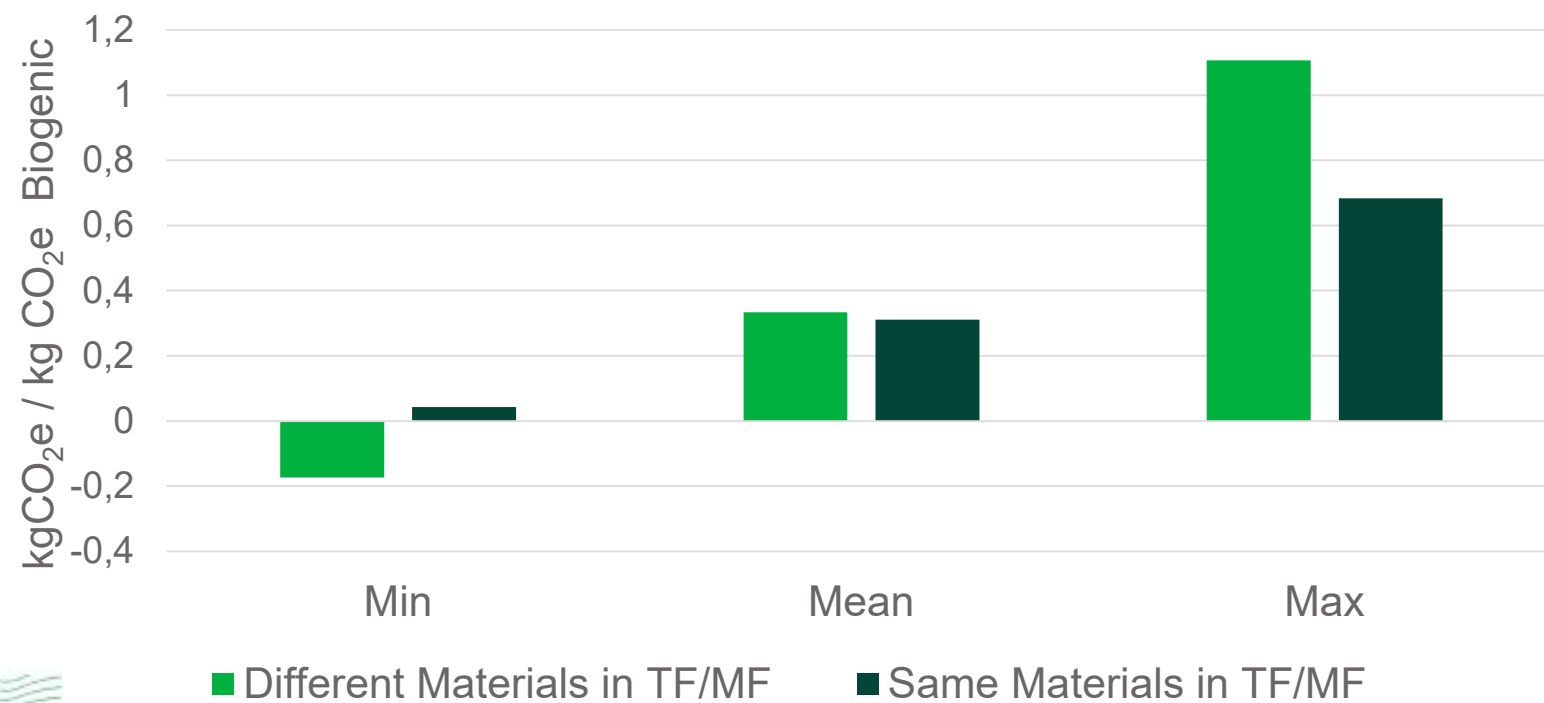


Masonry Frame



Vs

Source Images: <https://www.kingspan.com/gb/en/>

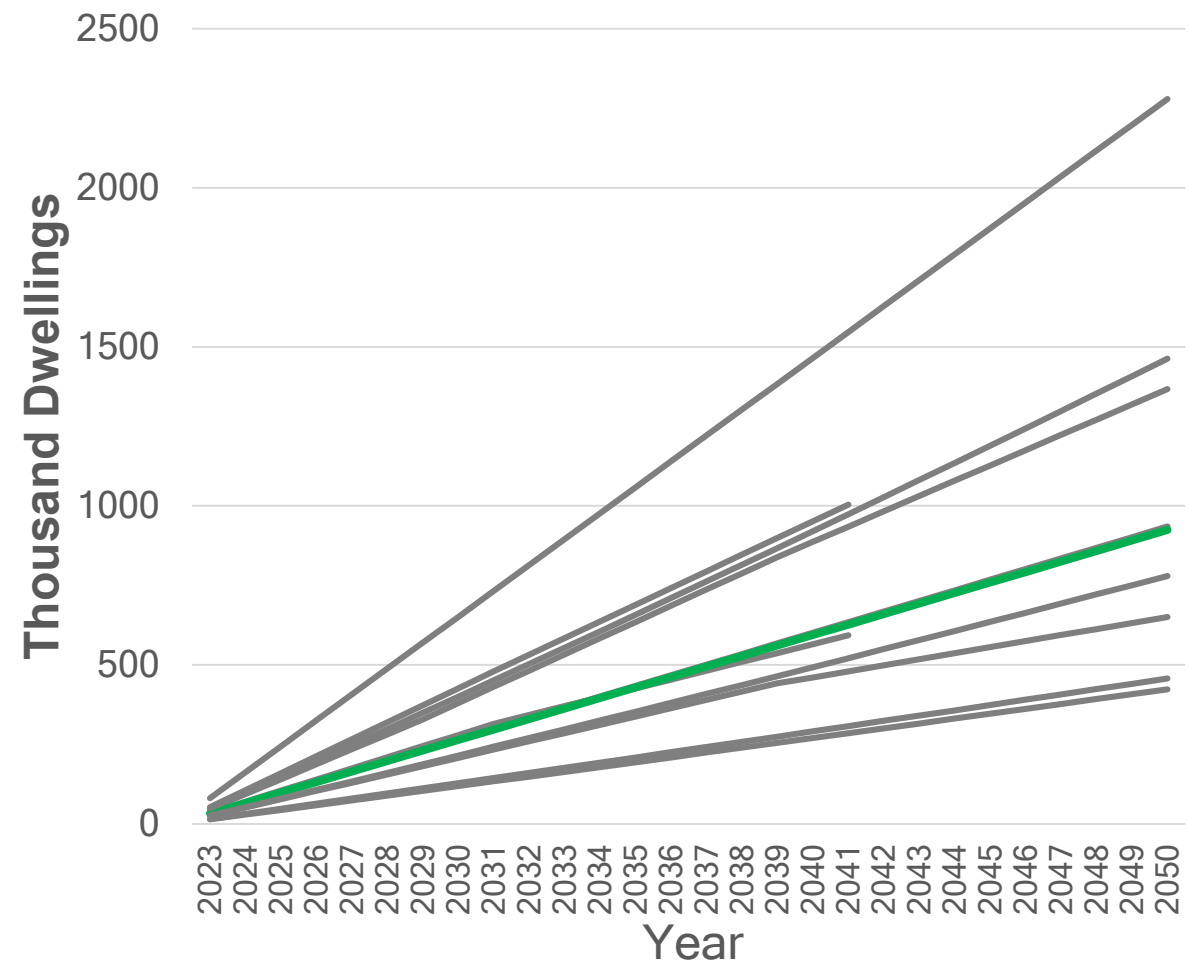


Possible climate and land benefits of cascading construction timber into BECCS

28/01/2026

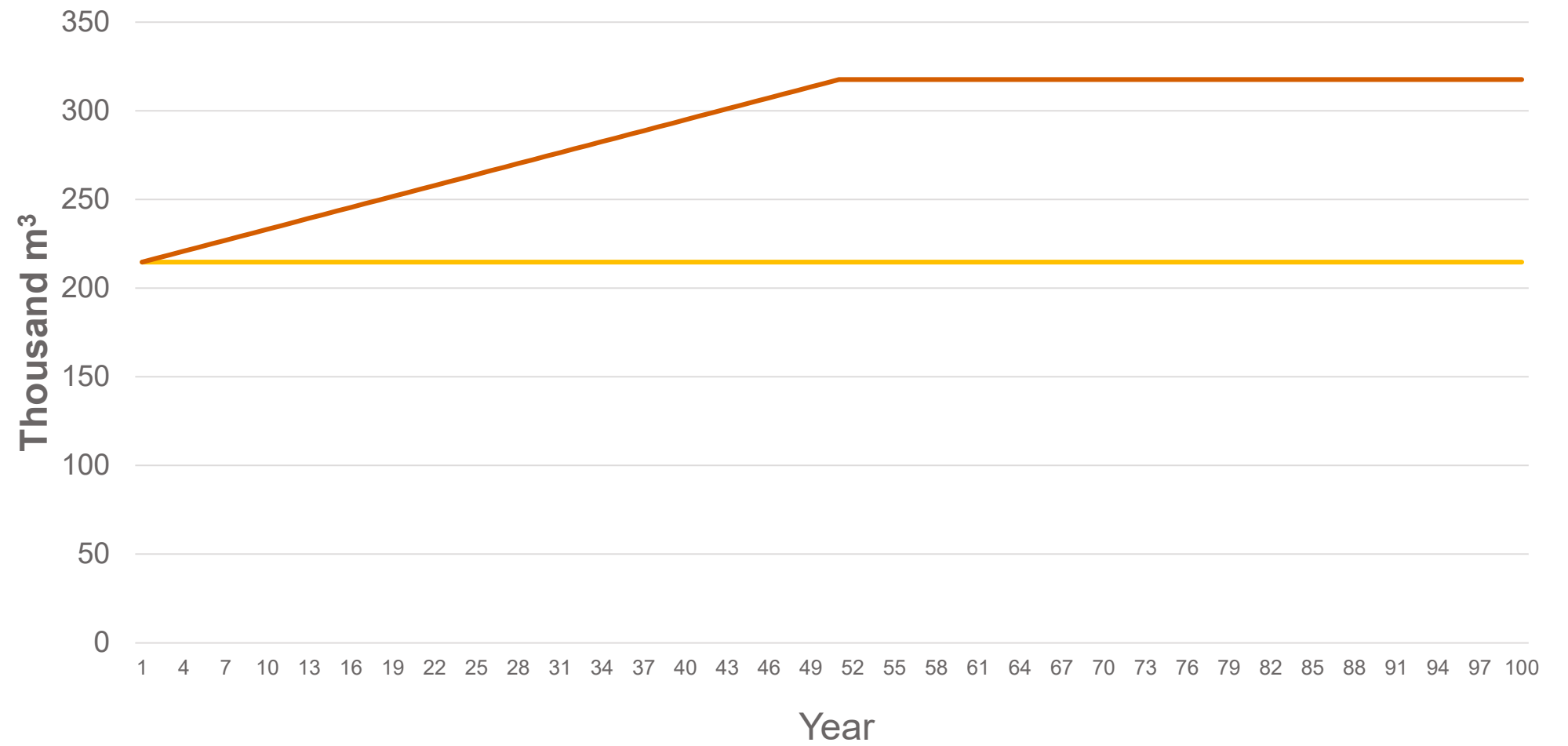
Housing Demand Wood Projections in Ireland

**Irish Cumulative Housing Demand Projections
2023-2050**



— National Agency Projection
— NDP 2030 Extrapolation

**Scheme Housing Wood Volumes Aligned to National
Development Plan 2025-2125**

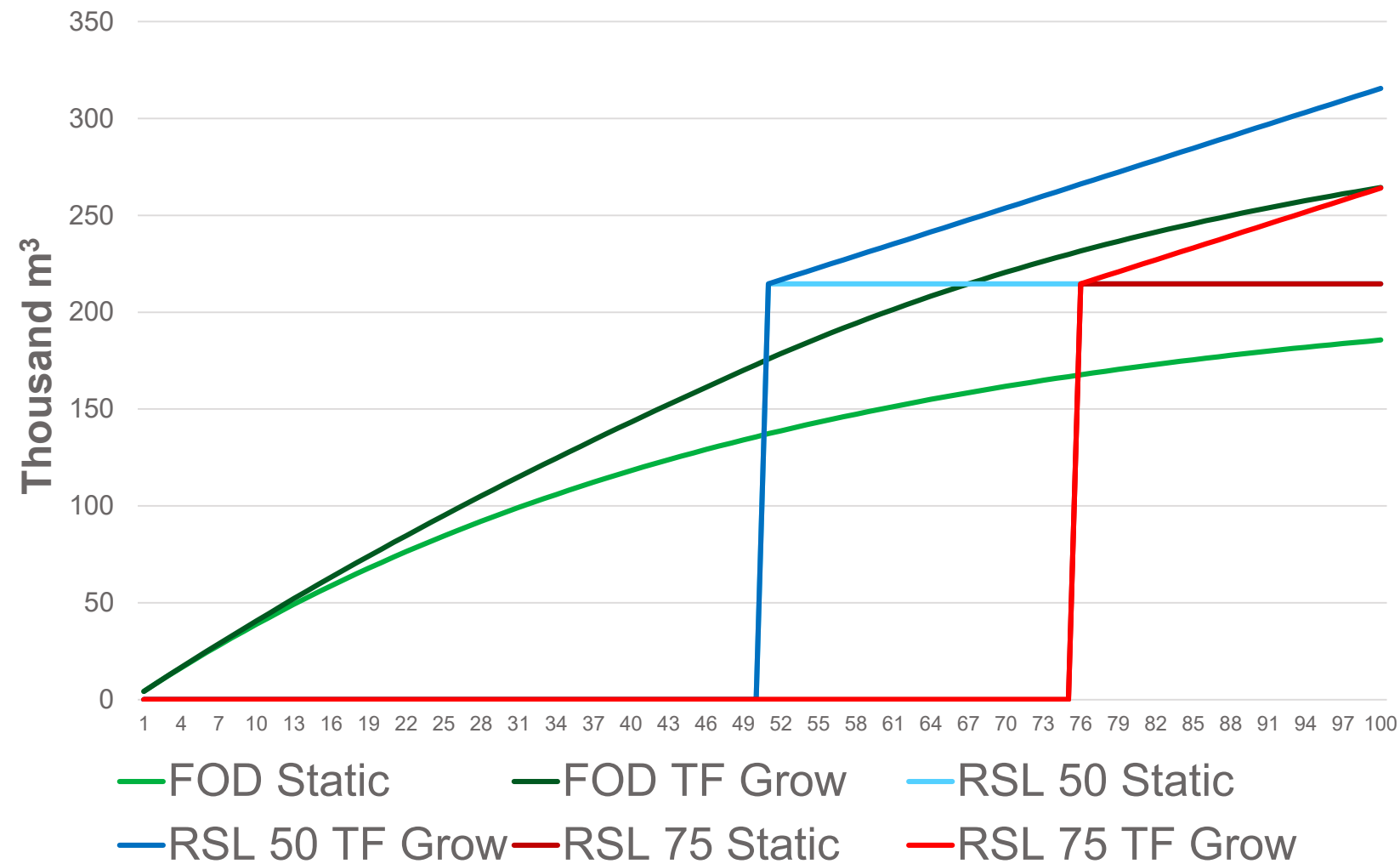


— Static — TF Growth

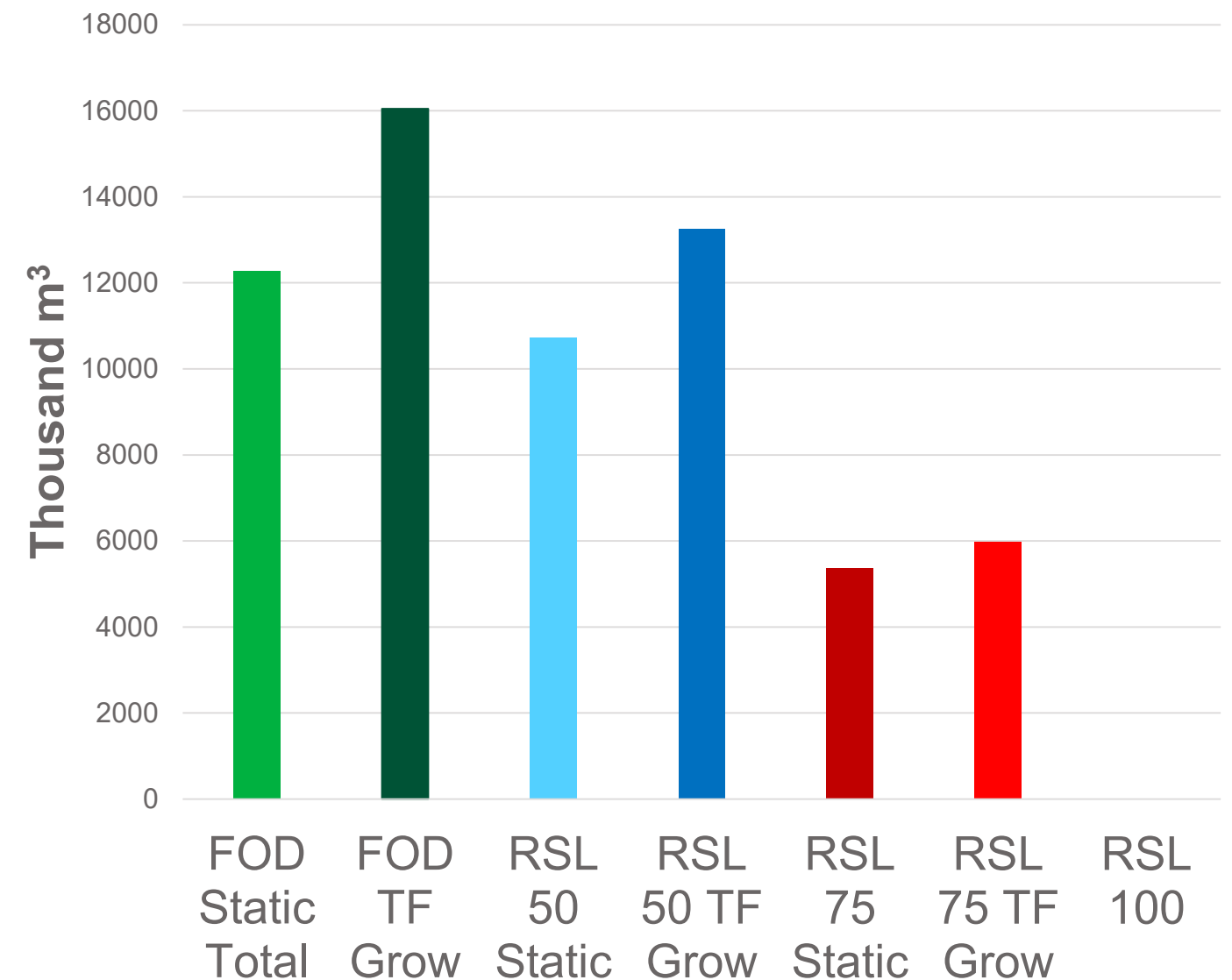
- Static Scenario is 50% TF for 100 years
- TF Growth Scenario is 1% growth in TF per annum until saturation of scheme market

Construction Wood Leaving Building Stock as Waste

Waste Wood From Scheme Units Based On First Order Decay (FOD) or Reference Service Live (RSL)



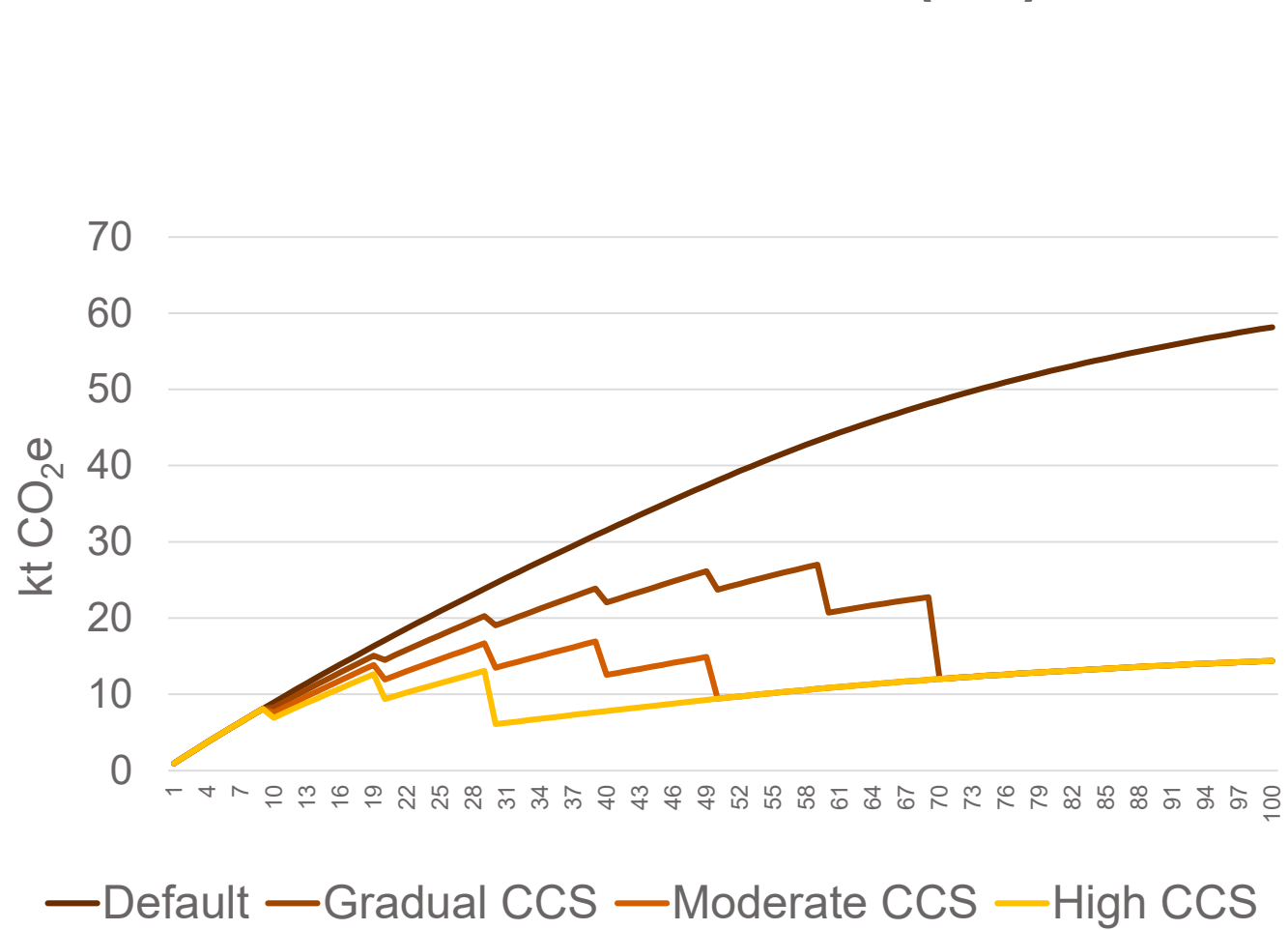
Cumulative Wood Waste Volume Over 100 Years



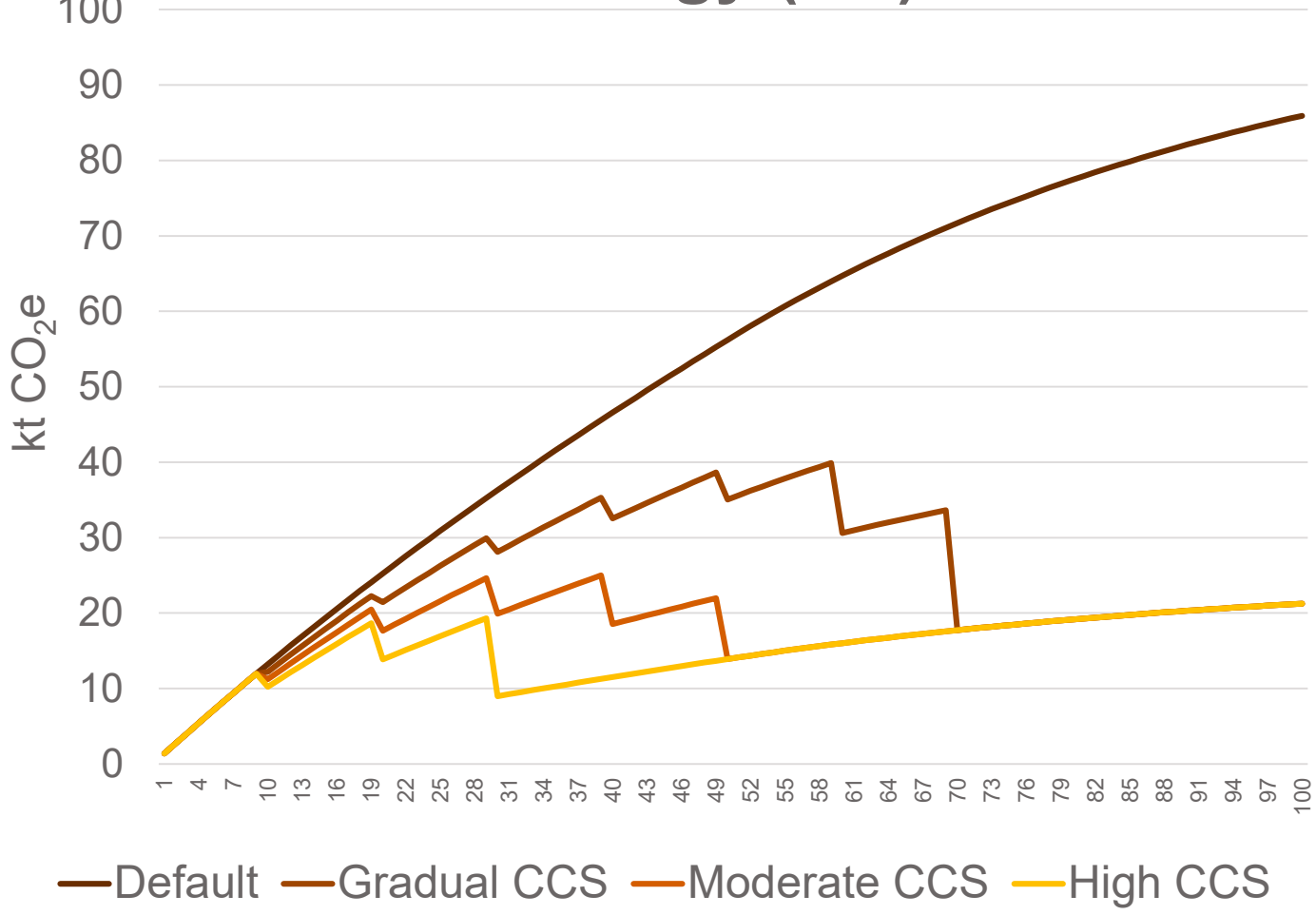
- **First Order Decay (FOD)** Based on IPCC HWP Default Half Life of 35 Years for Sawnwood
- **Reference Service Life (RSL)** of buildings of 50, 75, 100 years (studies aligned to EN 15978 and EN 15804).

First Order Deacy Waste Electricity Displacement of NG Combined Cycle for Varying Levels of CCS

Waste Incineration (WI)



Bioenergy (BE)



NG CCS Deployment Scenario (Year 1= 2025)

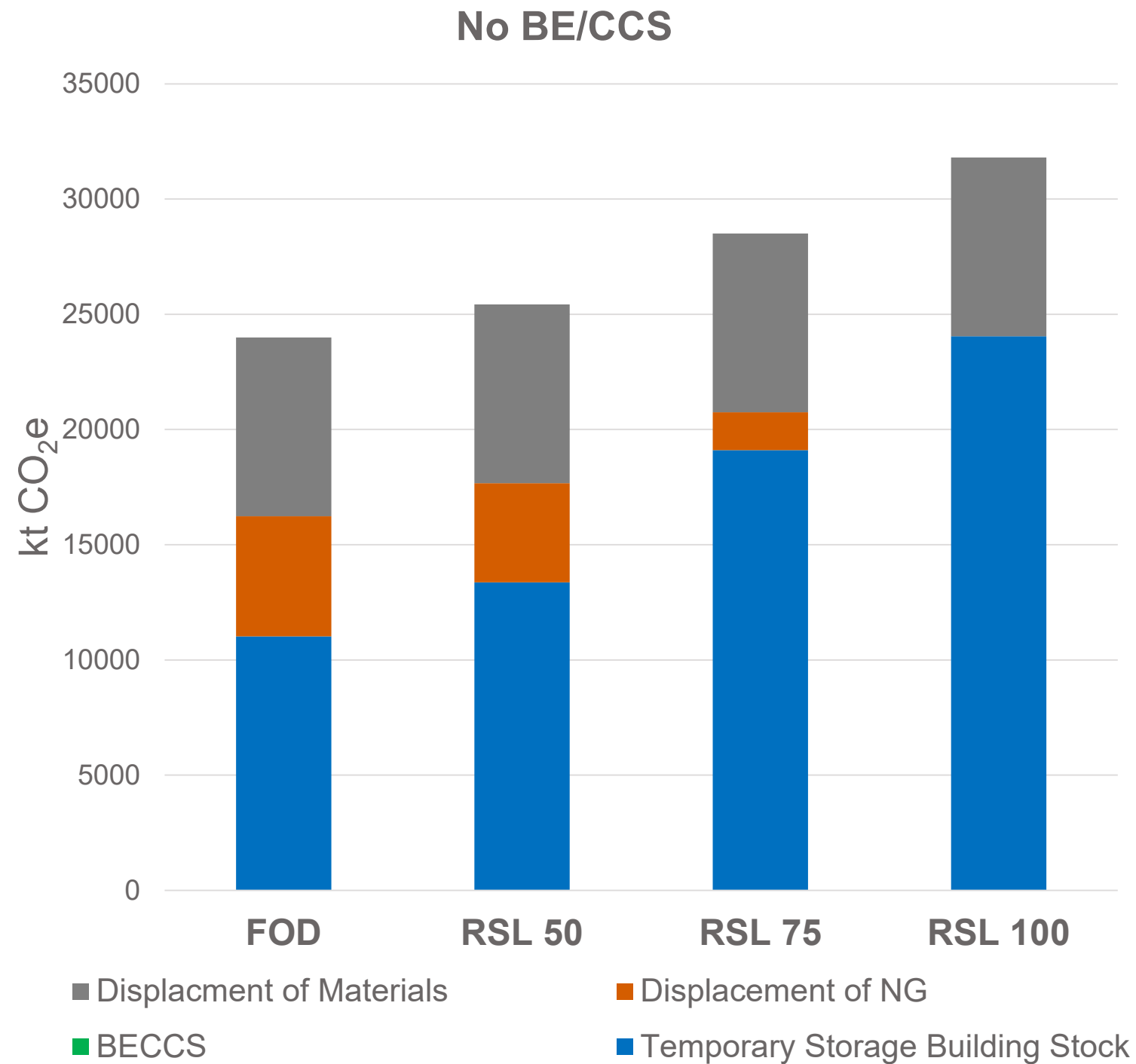
Gradual
Moderate

Decade x (% direct carbon capture)
 Decade 1 (0%), 2 (10%), 3 (20%), 4 (30%), 5 (40%), 6 (50%), 7 (70%), 8 (90%), 9 (90%),
 Decade 1 (0%), 2 (20%), 3 (40%), 4 (60%), 5 (80%), 6 (90%), 7 (90%), 8 (90%), 9 (90%),
 (90%), 8 (90%), 9 (90%), 10 (90%)
 Decade 1 (0%), 2 (30%), 3 (60%), 4 (90%), 5 (90%), 6 (90%), 7 (90%), 8 (90%), 9 (90%),
 10 (90%)

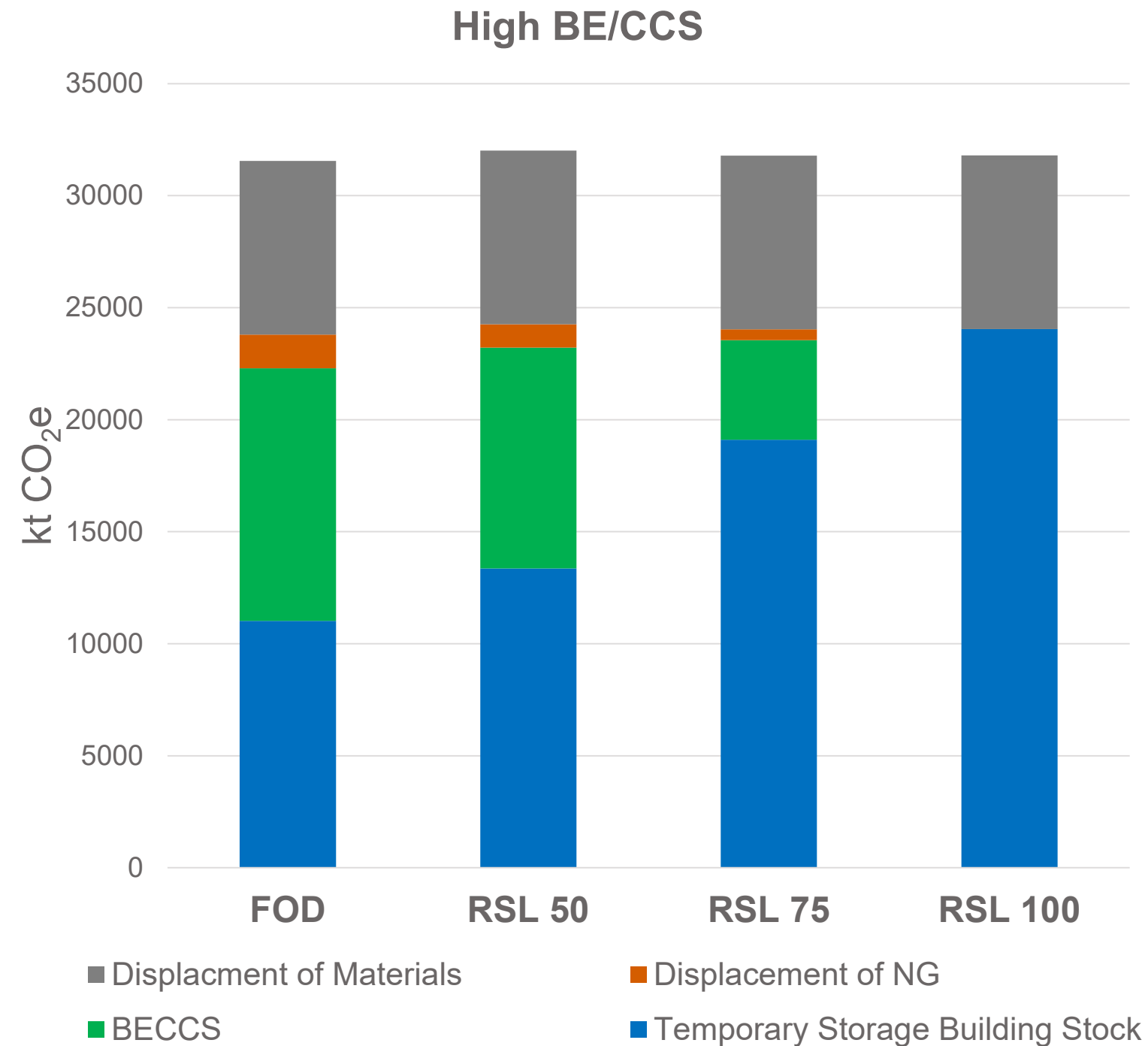
Cumulative Displaced Emissions GWP100 (Orange) and Permanent Biogenic Storage (Green) by BE/CCS Deployment Rate for TF Growth Scenario



Accounting for Temporary Storage in Building Stock and Displacement of Materials- TF Growth



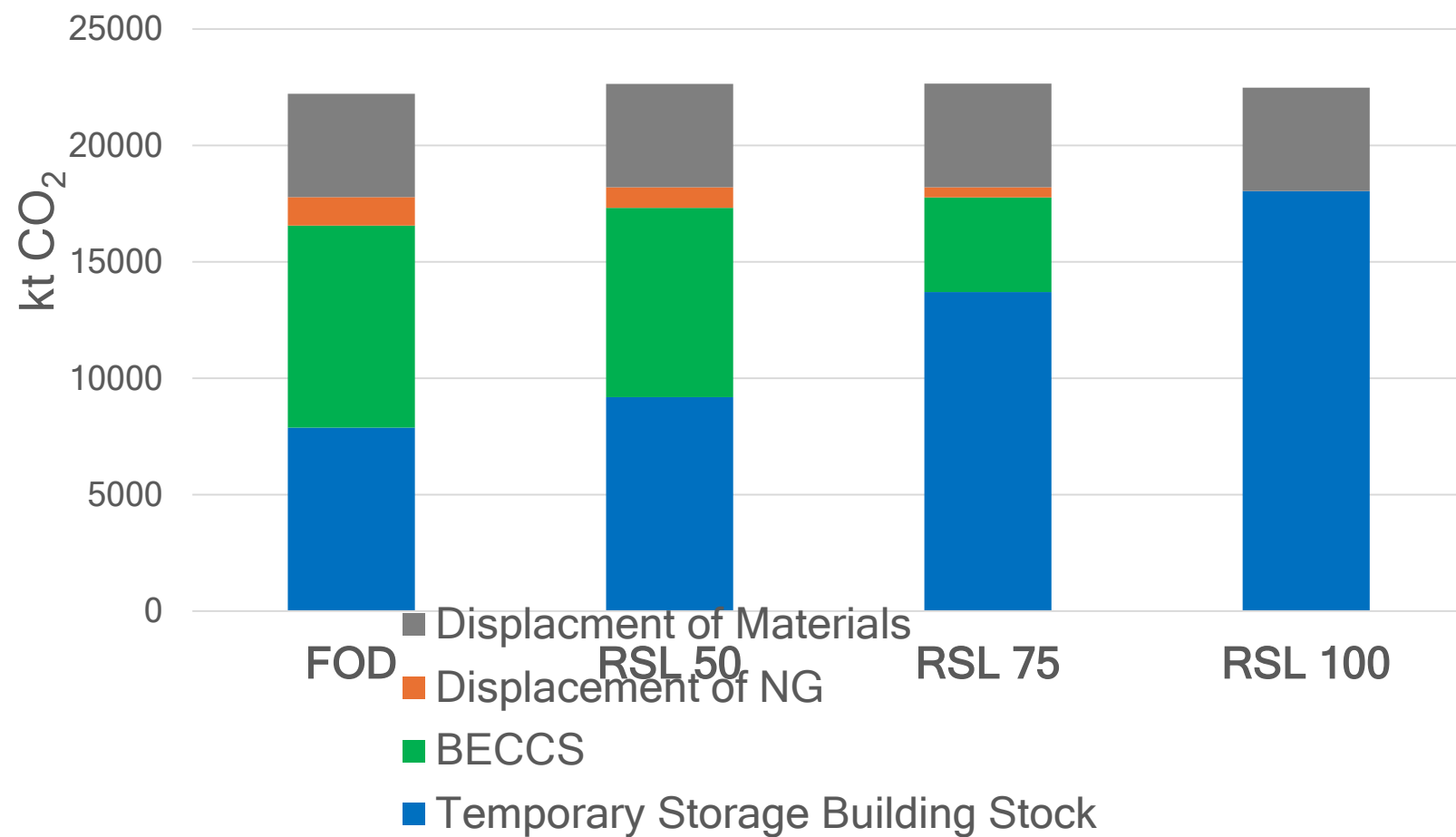
25 % lower climate mitigation for FOD vs RSL 100



<1.5% climate mitigation between RSLs

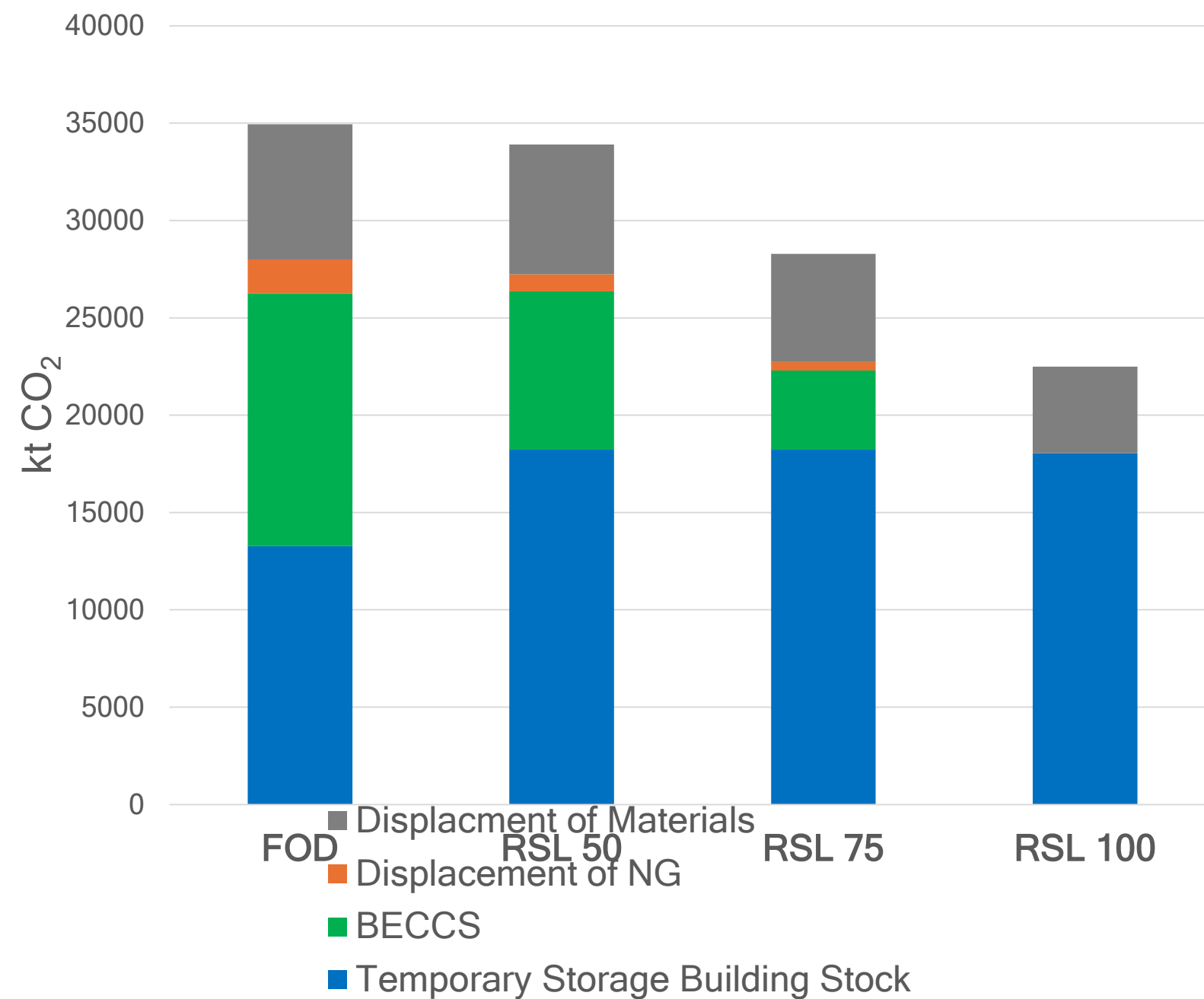
Accounting for Building Stock Replacement Based on RSL- TF Static

No Replacement High BE/CCS



1.2 % lower climate mitigation for FOD vs RSL 100

Replacement High BE/CCS



55% more climate mitigation for FOD vs RSL 100

Land Sparing



- Wood waste for max BE scenario equivalent to **4,179 ha** of SRC willow in 2050, and **11,227 ha** in 2125
- Land sparing, or use of willow for other purposes / additional BE(CCS)
- Equivalent to 170%/464% increase in current SRC willow output in IE
- Useful contribution to net zero goals

Image source: Agriland.ie

Summary

- Difficulty in consistently modelling biogenic C based on existing LCA databases.
- Displacement factors -0.173 to 1.11 kgCO₂e /kgCO₂e biogenic (mean 0.33), based on Irish material intensities and EPD LCA dataset variation.
- Waste wood has the potential to displace up to 3,530 kt CO₂e from NG electricity via incineration energy recovery, or 5,216 kt CO₂e via bioenergy plant (without CCS), over 100 yr scenario.
- NG emission displacement reduced 53-71% for gradual to high CCS deployment over 100 yr time horizon. Biogenic C storage potential up to 11,273 kt CO₂e for high BECCS exceeds all credits from NG displacement.
- At whole system level (i.e. including temporary storage and material emission displacement), total climate mitigation potential is sensitive to BECCS deployment rate, building reference service life, and building stock replacement assumptions (FOD vs RSL 100 can vary -25% to +55%).
- Land sparing up to 4,179 ha in 2050, and 11,227 ha in 2125 freeing up land and/or bioenergy crops for net zero goals.

Next Steps

- Development of reference systems to compare to our wood scenarios (e.g. storage and land use impacts of unharvested forest stand over 100 year period).
- Investigate impact of cascading construction wood use scenarios on improving temporary storage potentials.
- Investigate wood material intensity of other building archetypes in an Irish context (e.g. one off single family homes, apartments, commercial buildings).
- Investigate impact of CCS deployment and decarbonisation of industrial processes on material displacement factors over time.
- Recommend improved national data collection efforts to characterise wood waste composition and EoL destination for more robust LCA calculations and scenario modelling.

**Thank You and Any
Questions?**



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