

1st Nordic ZEB+ Conference 06.11.2019




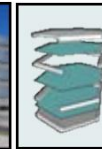






















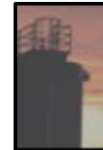







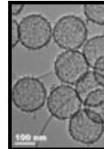








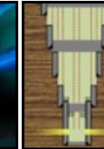




Estimating the aggregated energy savings from large-scale introduction of zero emission buildings the Norwegian building stock

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FME ZEN (NTNU)



Evaluation: Effects of energy research

48 utvalgte prosjekter og case fra norsk energiforskning

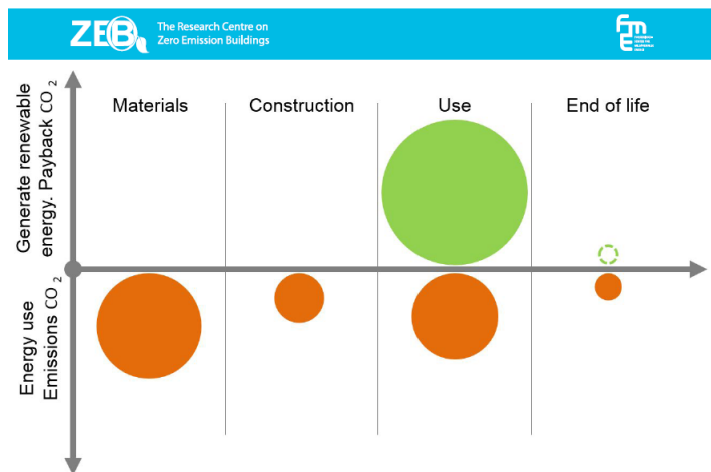
Industri		Bygg og områder		Vannkraft		Energi-systemer		Solenergi og solcellematerialer		Bioenergi		CCS		Nullutslipps-transport	
 CO ₂ som kuldemedium	 Offshore gassturbin	 Ventilasjon i passivhus	 Varmegjenvinner	 Francis-turbiner	 Miljødesign-håndboka	 Transmisjonsnett	 Økt levetid-utnyttelse	 Metallurgisk solcellesilisium	 Sentrifugalreaktor	 Enzymer for bioraffinerier	 Avansert biodrivstoff	 SOLVit CO ₂ -fangst	 Flytende-gjøring av CO ₂	 Silisium til batterier	 Silisium til batterier
 Lavtemperatur spillvarme	 Aluminiums-produksjon	 ZEB GHG Tool	 ZEB Energy Tool	 Plastring på fyllingsdam	 Feildeteksjon og prediksjon	 AMS	 Smarte distribusjonsnett	 Høykvalitets Si-wafere	 Bygnings-integrerte solceller	 Biogass verdikjede	 Bioenergi, klima og bærekraft	 CO ₂ -fangst ved CLC	 Løpende brudd i CO ₂ -rør	 H ₂ fra vann-elektrolyse	 Batterier til elektriske skip
 Kobber-produksjon	 Integrert energisystem	 Nano-isolasjon	 Bygnings-integrert ventilasjon	 Oppgradert sandfang	 SHOP	 Spennings-kvalitet	 Overspennings-beskyttelse	 Drift og vedlikehold av solparker	 Laveffekts vedovn	 Overvåking av CO ₂ -lagring	 Sementering av CO ₂ -brønner	 Hydrogen og brenselceller til tungtransport	 Smart design av CCS-kjeder		
		 ZEB Definition				 Distribuert produksjon i nettet									

A Norwegian ZEB Definition Guideline

ZEB Project report 29 – 2016

Selamawit Mamo Fufa, Reidun Dahl Schlanbusch, Kari Sornes,
Marianne Inman and Inger Andresen

A Norwegian ZEB Definition Guideline



System Boundary NS-EN 15978:2011																
A1-3 Product Stage			A4-5 Construction Process Stage		B1-7 Use Stage							C1-4 End of Life				D Benefits and loads
A1: Raw Material Supply	A2: Transport to Manufacturer	A3: Manufacturing	A4: Transport to building site	A5: Installation into building	B1: Use	B2: Maintenance (incl. transport)	B3: Repair (incl. transport)	B4: Replacement (incl. transport)	B5: Refurbishment (incl. transport)	B6: Operational energy use	B7: Operational water use	C1: Deconstruction / demolition	C2: Transport to end of life	C3: Waste Processing	C4: Disposal	D: Reuse, recovery, recycling
ZEB - O/EQ										*						
ZEB - O																
ZEB - OM							**									
ZEB - COM							***									
ZEB - COME																
ZEB - COMPLETE																

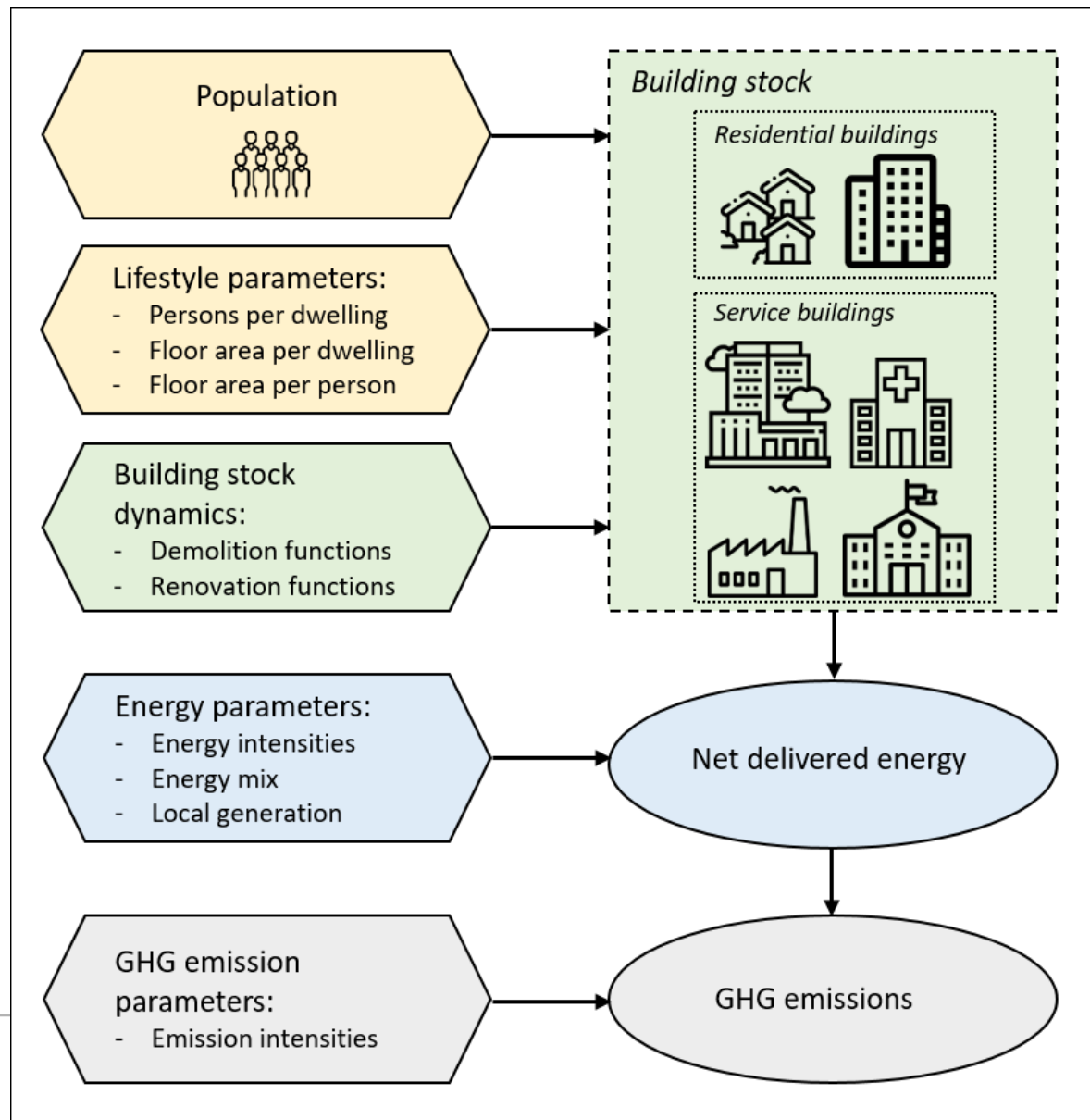
* Does not include operational energy of electrical equipment

** Does not include transport to building site (A4), installation into building (A5) or end of life treatment of the replaced materials

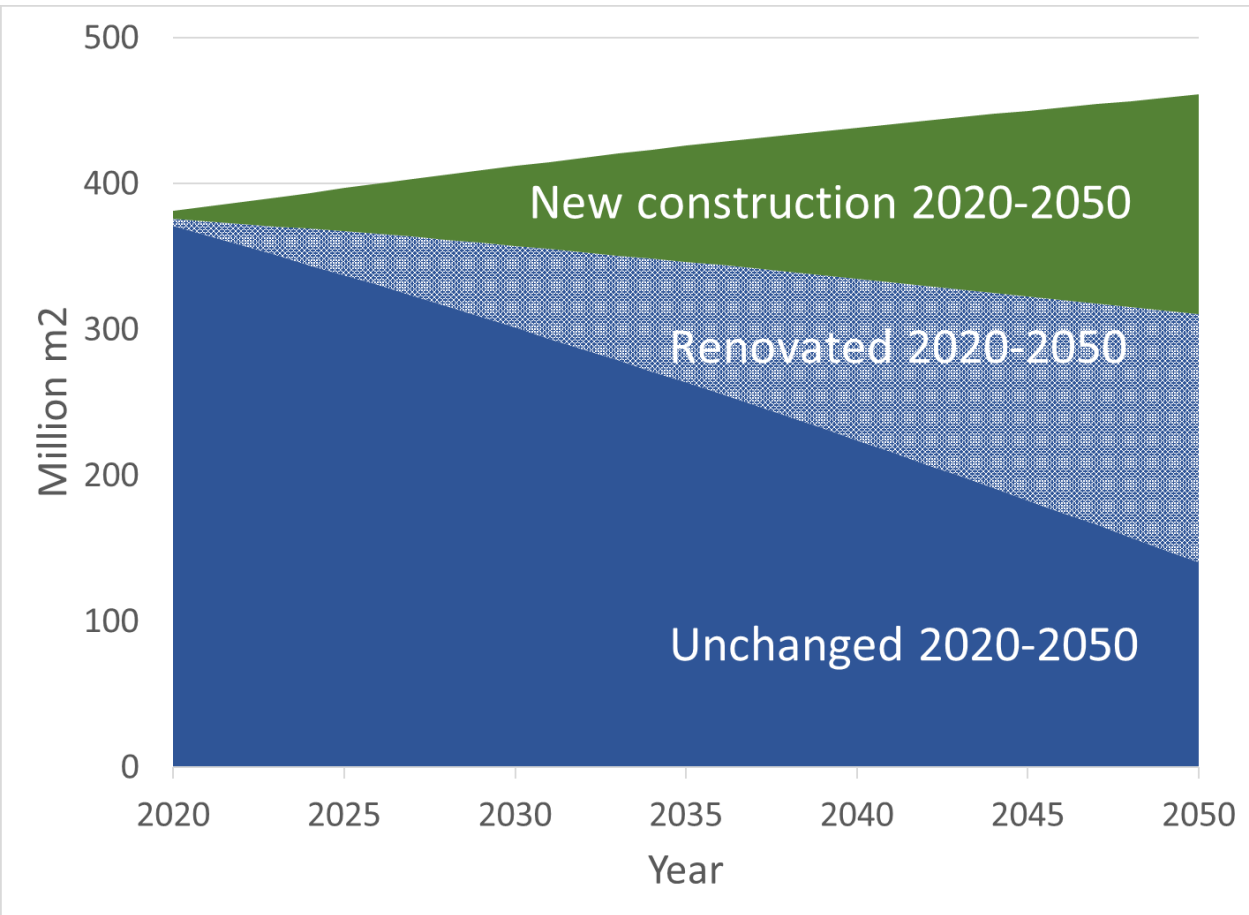
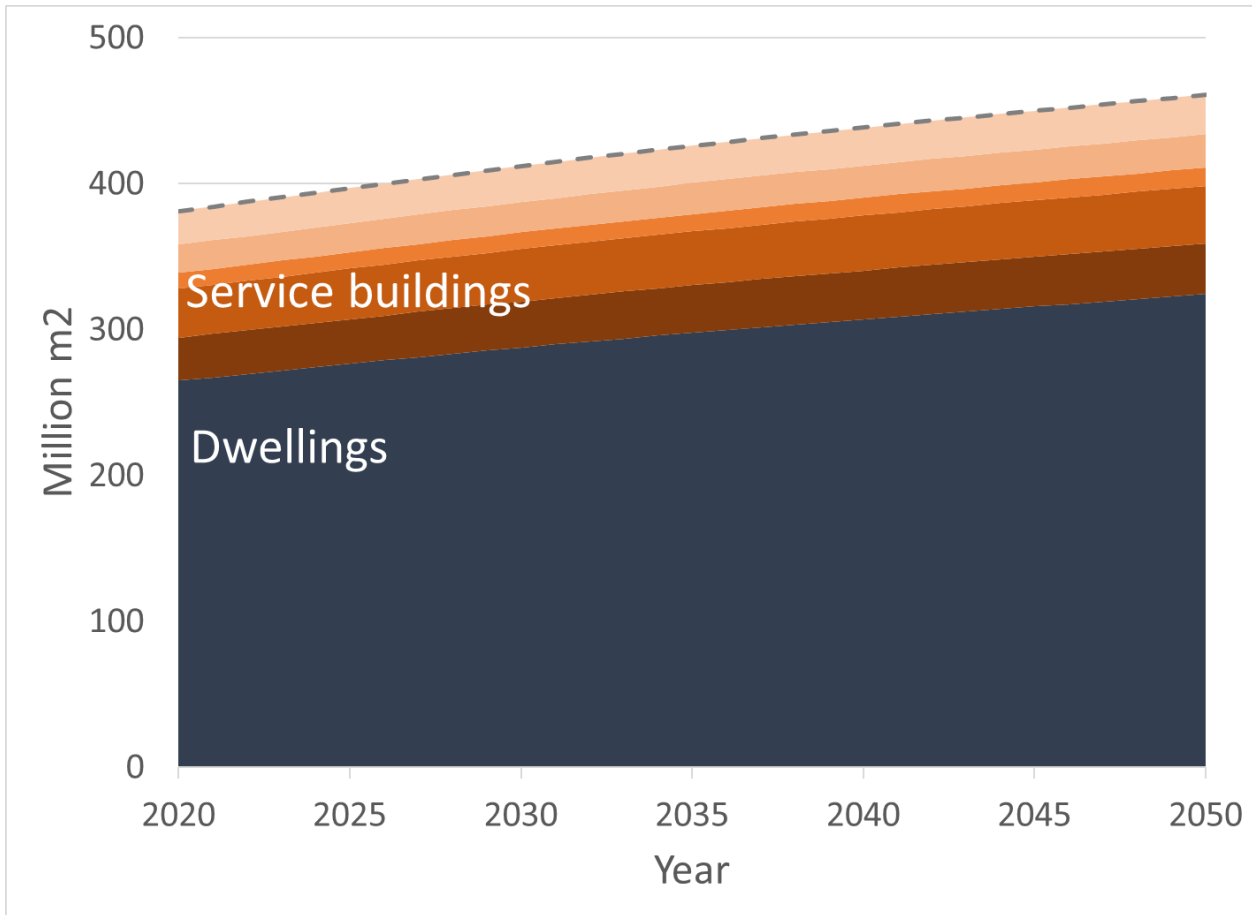
*** Does not include end of life treatment of the replaced materials

NB: Biogenic carbon should only be included at a ZEB-COME or ZEB-COMPLETE level

Model



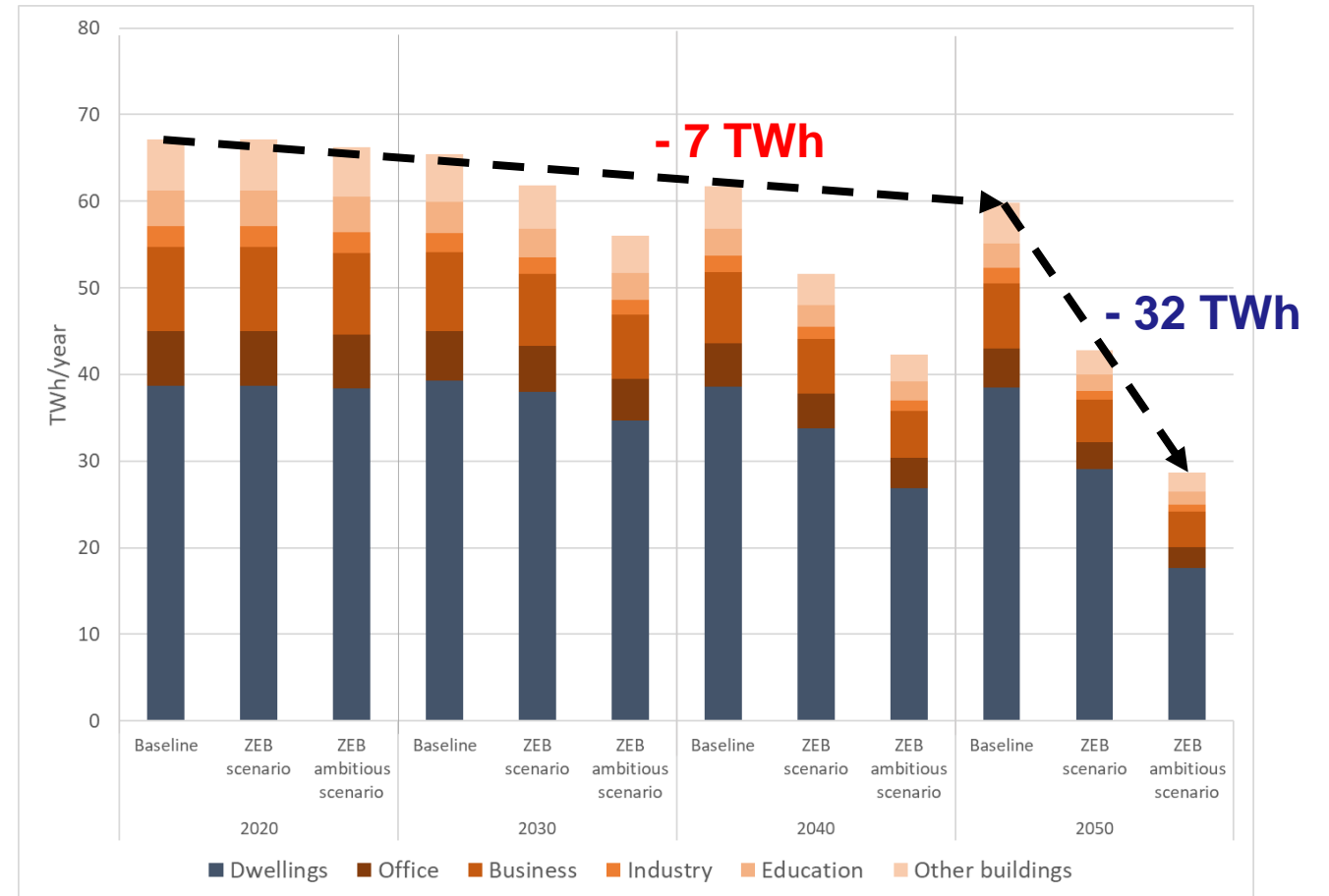
Norway's building stock towards 2050



Scenario results

Energy saving potential 2020-2050

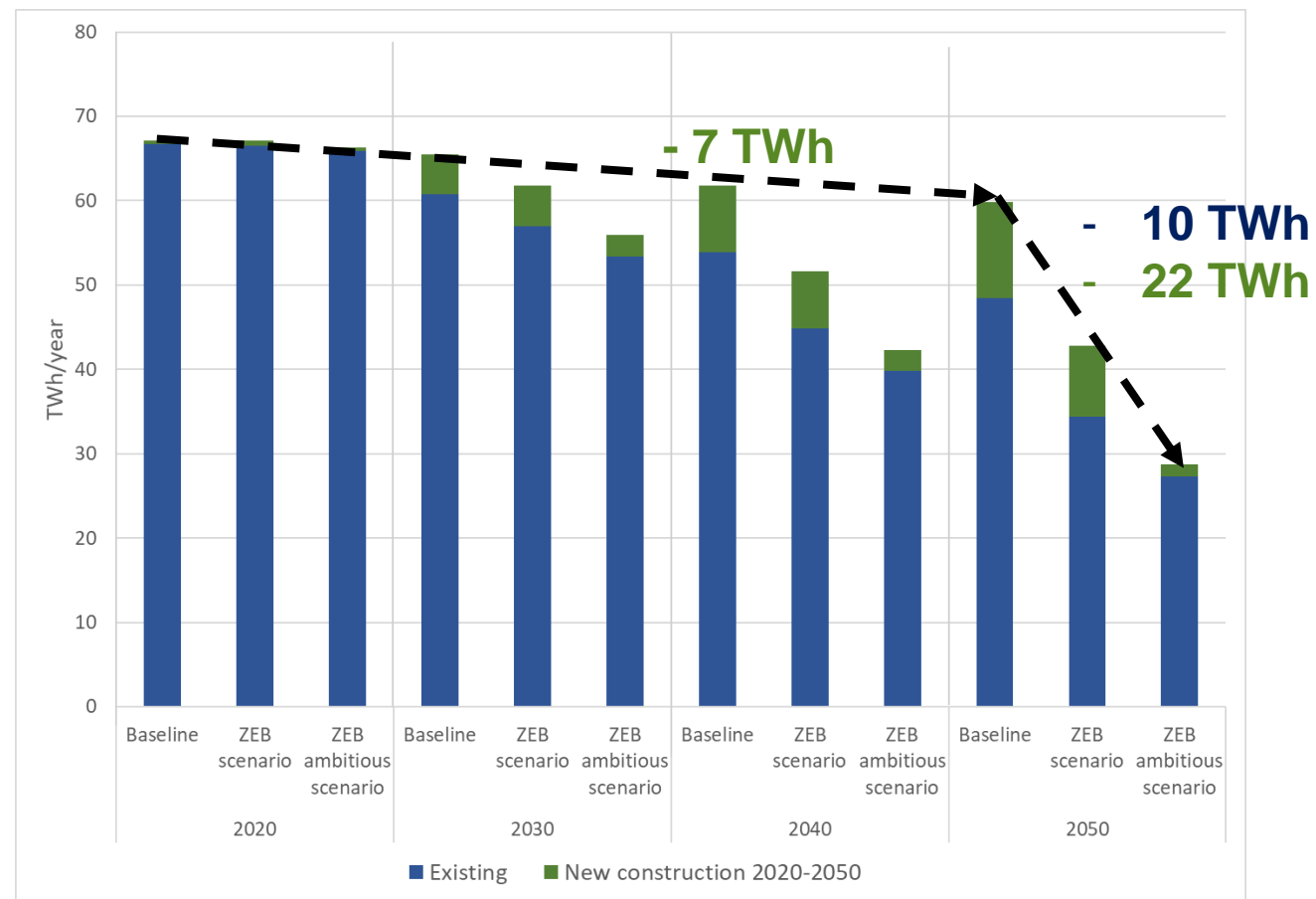
- Baseline: **7 TWh**
- ZEB 1: **25 TWh**
- ZEB 2: **39 TWh (7+32)**



Scenario results: New and existing buildings

Energy saving potential in renovated and new buildings 2020-2050:

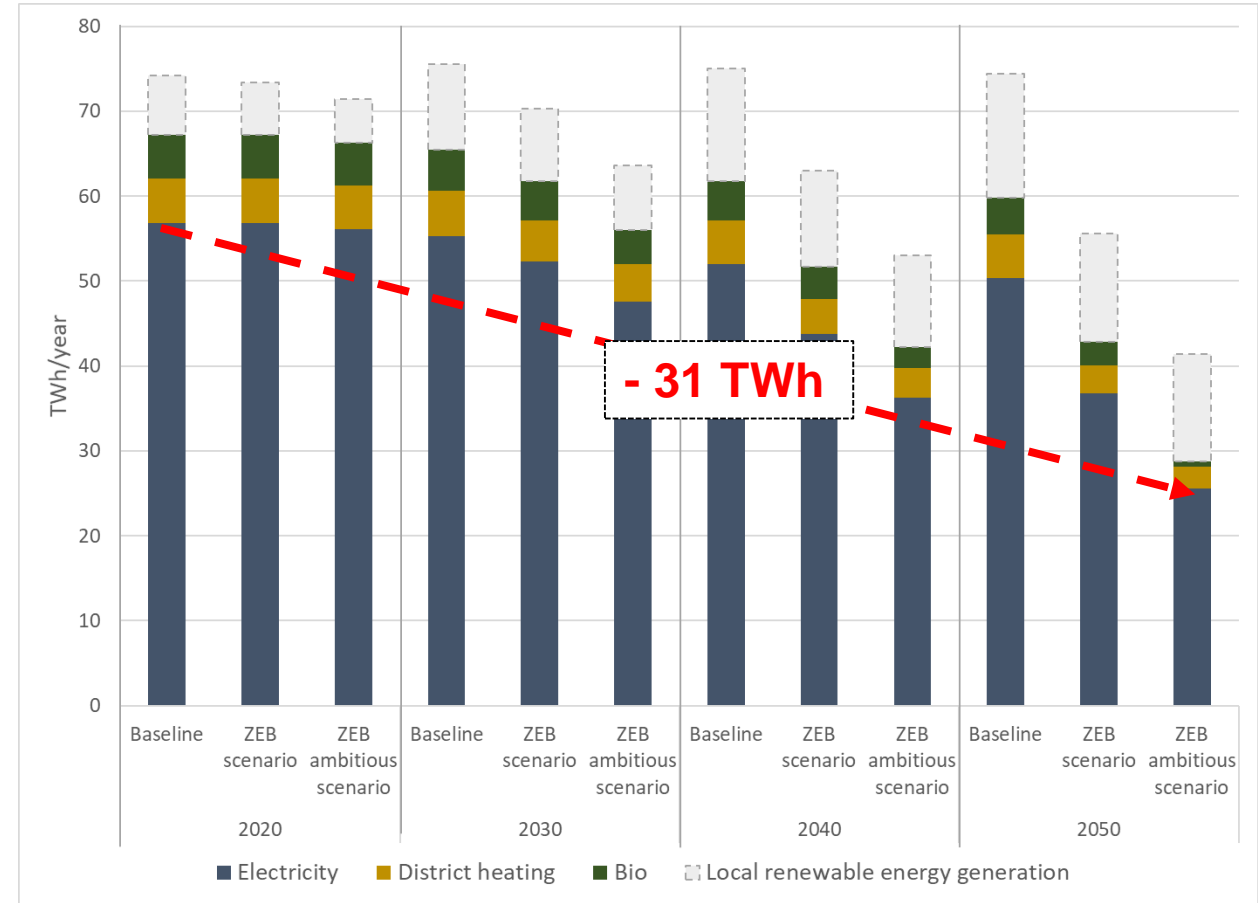
- Existing building stock: **29 TWh** (7+22)
- New construction after 2020: **10 TWh**



Scenario results: Energy mix

Saving potential electricity:

- Baseline: 7 TWh
- ZEB 1: 20 TWh
- ZEB 2: **31 TWh**



Future electricity demand in Norway

Recent report:

- Mainland Norway needs 23 TWh more electricity in 2040 than in 2018

Potential electricity savings in the building stock are of the same scale as the increase in demand!



The future Norwegian energy system

- Development in all sectors should be planned together
- The building stock must be included!
 - Zero emission buildings and technology exist, but are not used in large-scale
 - Large potential for making energy available by large-scale introduction and advanced renovation
 - Energy efficiency of the existing building stock has a large potential

Questions?

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