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# Pathways to net-zero emissions by 2030 for Norway

TOO AMBITIOUS TO BE TRUE?

# Background

- IPCC's 1.5 °C report (2018): «Net zero by around 2050 necessary»  
→ Countries, companies, industries, cities have made plans
- Norway appears to be a forerunner country:  
*«Net zero by 2030»*
- Too ambitious to be true?



## THE 2030 COMMITMENTS

Nationally Determined  
Contribution, Paris Agreement  
+  
Climate Act

- Pledged a 55% GHG reduction from 1990 levels.

The agreement with the EU  
(under renegotiation)

- (1) **ETS**-covered (EU Emissions Trading System):  
62% cut from 2005 level.
- (2) **ESR**-covered (Effort Sharing Regulation)  
50% cut from 2005 level.
- (3) **LULUCF** (forest and land):  
X % net uptake (to be determined).

Some flexibility across time, borders, pillars.

## THE 2030 TRANSFORMATION AMBITION

The present government

- 55% GHG reduction from 1990 levels.
- Only domestic abatement.

## THE 2030 NET-ZERO AMBITION

The Parliament

- Net-zero GHG emissions by 2030 onwards.



# The non-binding, unspecified net-zero ambition allows for creative interpretations:

## WHAT TO INCLUDE?

Measures that are not internationally approved

e.g. compounds usually not counted (as black carbon, sulphur)

e.g. carbon sinks in oceans, biochar sequestration

e.g. offsets purchased by domestic companies in voluntary markets

## WHAT TO COMPARE WITH?

Choose more favourable references than in regulated commitments

e.g. LULUCF illustrative: reference year with low net uptake

## HOW TO COUNT?

Take credit for others' abatement

e.g. count emissions reductions abroad

NOTE: tempting to selectively count *reductions* but not *increases* indirectly caused

NOTE: risk of doublecounting!



# The non-binding, unspecified net-zero ambition a conservative interpretation:

Only already regulated measures, reference cases and counting principles in UNFCCC and EU

- The territory principle
  - Except offsets regulated in the UNFCCC and EU frameworks
- Kyoto gases, only (CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, fluorides) - measured by CO<sub>2</sub> eqv. (GWP100)
- EU's rules for ETS, ESR and LULUCF
- Only approved measures (or in the process for 2030)



# Simulations of the 2030 targets

## compared with a 2030 BaU projection without new policies

### **Statistics Norway's World model SNOW**

- Standard GTAP-based, global Computable General Equilibrium (CGE) model
- Norway is a separate region
- Relatively aggregate (13 sectors + 1 household)
- Competitive markets, region-specific labour and capital
- CO<sub>2</sub> emissions linked to various energy goods

### **The projection**

- International: IEA (2017) stated policies scenario
- Norwegian: National budget (2020)



# Simulations of the 2030 targets

## (i) THE 2030 COMMITMENTS



Nationally Determined Contribution, Paris Agreement  
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- (1) ETS-covered** (EU Emissions Trading System):  
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Some flexibility across time, borders, pillars.

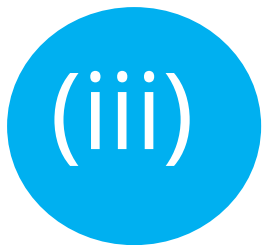
## (ii) THE 2030 TRANSFORMATION AMBITION



The present government

- 55% GHG reduction from 1990 levels.
- Only domestic abatement.

## (iii) THE 2030 NET-ZERO AMBITION



The Parliament

- Net-zero GHG emissions by 2030 onwards.
- As much as feasible domestically



# Simulations of the 2030 targets

## (i) All countries meet their NDCs (+ Fit for 55) in EU and Norway

Input: COMMITMENTS

Assume:

- Met by equal marginal abatement costs in each sector (cost minimisation)
- No flex. in ESR, but trade in ETS

Norway's targets	% from benchmark
ETS sector	-49%
ESR sector	-32%
LULUCF sector	0 %

Output:

Norway's macroeconomic results	(% from benchmark)
ESR-sector emissions	-32 %
ETS-sector emissions	-39 %
ETS-sector purchases*	-10 %
LULUCF-sector emissions	0 %
ETS output	-2 %
Petroleum output	-10%
Petroleum prices	-10%
ESR output	-1 %
GDP	-2 %
Welfare	-5 %

\* Other international offsets banned by EU!





# Simulations of the 2030 targets

## (i) All countries meet their NDCs (+ Fit for 55) in EU and Norway

### ABATEMENT COSTS

	Marginal \$/tCO <sub>2</sub>	Total mill \$	Shares of total %
ETS-sector abatement	170	700	34 %
ESR-sector abatement	340	980	48 %
LULUCF-sector uptake	0	0	0 %
ETS-sector purchases	170	380	18 %
SUM COMMITMENTS		<b>2060</b>	



# Simulations of the 2030 targets

## (ii) Norway adds the transformation ambition

### ABATEMENT COSTS

	Marginal \$/tCO <sub>2</sub>	Total mill \$	Shares of total %	Marginal \$/tCO <sub>2</sub>	Total mill \$	Shares of total %
	THE COMMITMENTS, ONLY			COMMITMENTS WITH TRANSFORMATION GOAL		
ETS-sector abatement	170	700	34 %	340	1750	64 %
ESR-sector abatement	340	980	48 %	340	980	36 %
LULUCF-sector uptake	0	0	0 %	0	0	0 %
ETS-sector purchases	170	380	18 %	-	-	0 %
SUM COMMITMENTS		<b>2060</b>			<b>2730</b>	

2060

2730

+ 33%



# Simulations of the 2030 targets

## (iii) Norway adds the net-zero ambition

### ABATEMENT COSTS

	Marginal \$/tCO <sub>2</sub>	Total mill \$	Shares of total %
THE COMMITMENTS, ONLY			
ETS-sector abatement	170	700	34 %
ESR-sector abatement	340	980	48 %
LULUCF-sector uptake	0	0	0 %
ETS-sector purchases	170	380	18 %
SUM COMMITMENTS		<b>2060</b>	



# Simulations of the 2030 targets

## (i) Norway adds the net-zero ambition

### ABATEMENT COSTS

	Marginal \$/tCO <sub>2</sub>	Total mill \$	Shares of total %
THE COMMITMENTS, ONLY			
ETS-sector abatement	170	700	34 %
ESR-sector abatement	340	980	48 %
LULUCF-sector uptake	0	0	0 %
ETS-sector purchases	170	380	18 %
<b>SUM COMMITMENTS</b>		<b>2060</b>	<b>46 %</b>
THE ADDITIONAL ROAD TO NET ZERO			
added ETS-sector abatement	340	1050	47 %
added ESR-sector abatement	420	560	17 %
added LULUCF uptake	150	40	2 %
other CO <sub>2</sub> removal	560	560	25 %
added ETS purchases	0	0	0 %
other offsets	10	200	9 %
<b>SUM ADDED NET ZERO</b>		<b>2410</b>	<b>54 %</b>
<b>SUM TOTAL</b>		<b>4470</b>	

Many possible combinations

We have simulated some

I present only one:

- as much domestic abatement
- and CO<sub>2</sub> removal as feasible.

NOTE: Potential is limited;

- the residual: offsets,

NOTE: international ok, but not ETS!

buy&delete is infeasible!

In practice:

- Bio-CCS from waste incineration
- Direct Air Capture (DACSS)

→ ABATEMENT COSTS more than doubles

# Simulations of the 2030 targets

## (i) Norway adds the net-zero ambition

### ABATEMENT COSTS

	Marginal \$/tCO2	Total mill \$	Shares of total %	Marginal \$/tCO2	Total mill \$	Shares of total %	
	THE COMMITMENTS, ONLY			COMMITMENTS WITH TRANSFORMATION GOAL			
ETS-sector abatement	170	700	34 %	340	1750	64 %	+1050
ESR-sector abatement	340	980	48 %	340	980	36 %	
LULUCF-sector uptake	0	0	0 %	0	0	0 %	
ETS-sector purchases	170	380	18 %	-	-	0 %	-380
<b>SUM COMMITMENTS</b>		<b>2060</b>	<b>46 %</b>		<b>2730</b>	<b>67 %</b>	
	THE ADDITIONAL ROAD TO NET ZERO						
added ETS-sector abatement	340	1050	44 %	0	0	0 %	-1050
added ESR-sector abatement	420	560	23 %	420	560	32 %	
added LULUCF uptake	150	40	2 %	150	40	3 %	
other CO <sub>2</sub> removal	560	560	23 %	560	560	47 %	
added ETS purchases	0	0	0 %	0	0	0 %	
other offsets	10	178	7 %	10	200	17 %	+22
<b>SUM ADDED NET ZERO</b>		<b>2388</b>	<b>54 %</b>		<b>1360</b>	<b>33 %</b>	
<b>SUM TOTAL</b>		<b>4448</b>			<b>4090</b>		<b>-358</b>



# Conclusions

## How realistic is this suggestion from our simulations?

- «Go straight to the transformation if net zero is soon to be implemented anyway. Refrain from EU allowances.»

Illustrates a way to go around the EU ban on international offsets.

→ Too simple: too insignificant effect

- Studying order of measures and timing needs complex model that allows for time-dynamics, inertia, technological change ...

## What our study *does* illustrate

- Without net zero ambition: Minimising abatement costs imply: exploit ETS trading → save 1/3.
- With net zero:
  - Potential for domestic measures small (only 12%).
  - These measures are expensive → net zero more or less doubles abatement costs.

→ Yes, too ambitious to be true!

- Using offsets, only, would save costs; if reliable, marginal costs low.

→ No, this can come true!



# Policy implications in light of 2050

## **Beyond 2030, the cost difference will shrink between offsets and domestic abatement projects:**

- Technological change reduce cost and increase domestic abatement and CO<sub>2</sub> removal potential.
- In spite, prices of international offsets will expectedly rise towards 2050, as demand+quality increase.
- In LULUCF, trade-off between 2030 uptake and 2050 uptake due to biological cycles.

## **Policy-implication:**

Transformation and net-zero ambitions should be formulated less in terms of short-run mitigation and more in terms of preparing for a future competitive, sustainable, decarbonised economy.

## **Where should/could Norway head-start?**

- Shifting to land use/forestry practices that can prepare for increased uptake in the longer run.
- Research on immature abatement and removal technologies – international fund avoid pick winners
- Work internationally for rules and accounting principles for carbon removal and offsets markets.
- Develop transformation indicators beyond emission indicators to monitor transformation, e.g.
  - investments in R&D,
  - land use shifts
  - sectoral resource reallocation.....



# Thank you for the attention!

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**Statistisk sentralbyrå**  
Statistics Norway



# The non-binding, unspecified net-zero ambition

## Options assessed in our study:

### Buy offsets abroad

- Not ETS allowances: will not count as Norwegian but EU abatement
- Quality-checked offsets (UN and maybe voluntary markets)

### Overfulfill the abatement commitments

- if domestic measures still feasible in ETS and ESR

### CO<sub>2</sub> removal

- Natural (according to EU's LULUCF rules)
- Technological (bio-CCS in waste incineration and Direct Air Capture)



# Simulations of the 2030 targets compared to a benchmark

Three scenarios (selected):

- i) All countries meet their NDCs (+ Fit for 55) in EU and Norway
- ii) Norway adds the transformation ambition (domestic)
- iii) Norway adds net zero ambition into (i) and (ii)