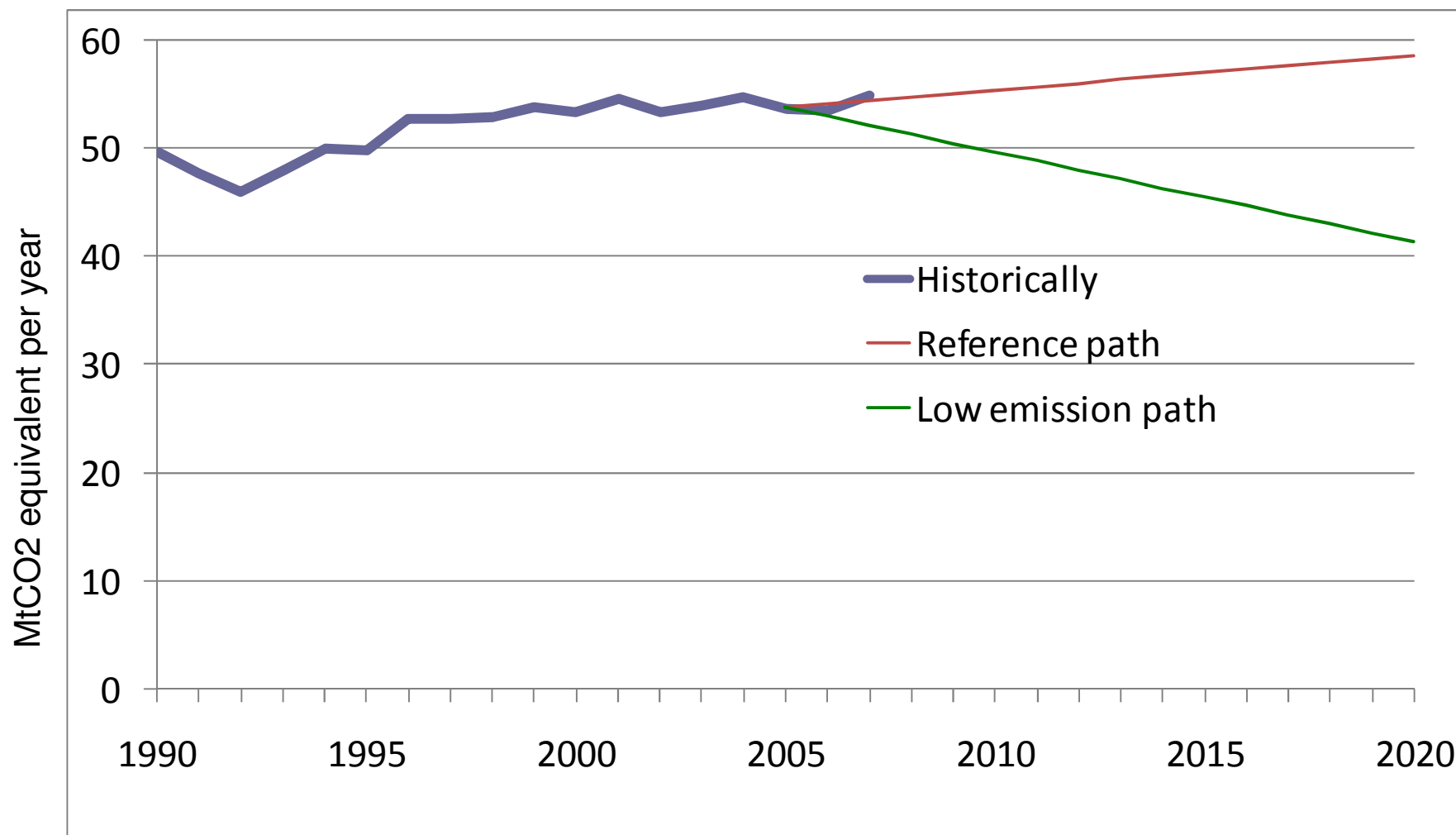


ENCL-plan:
An energy and climate plan for Norway until 2020



Launch
Oslo, March 16 2009
Jørgen Randers, BI
Sverre Aam, SINTEF
Steinar Bysveen, EBL

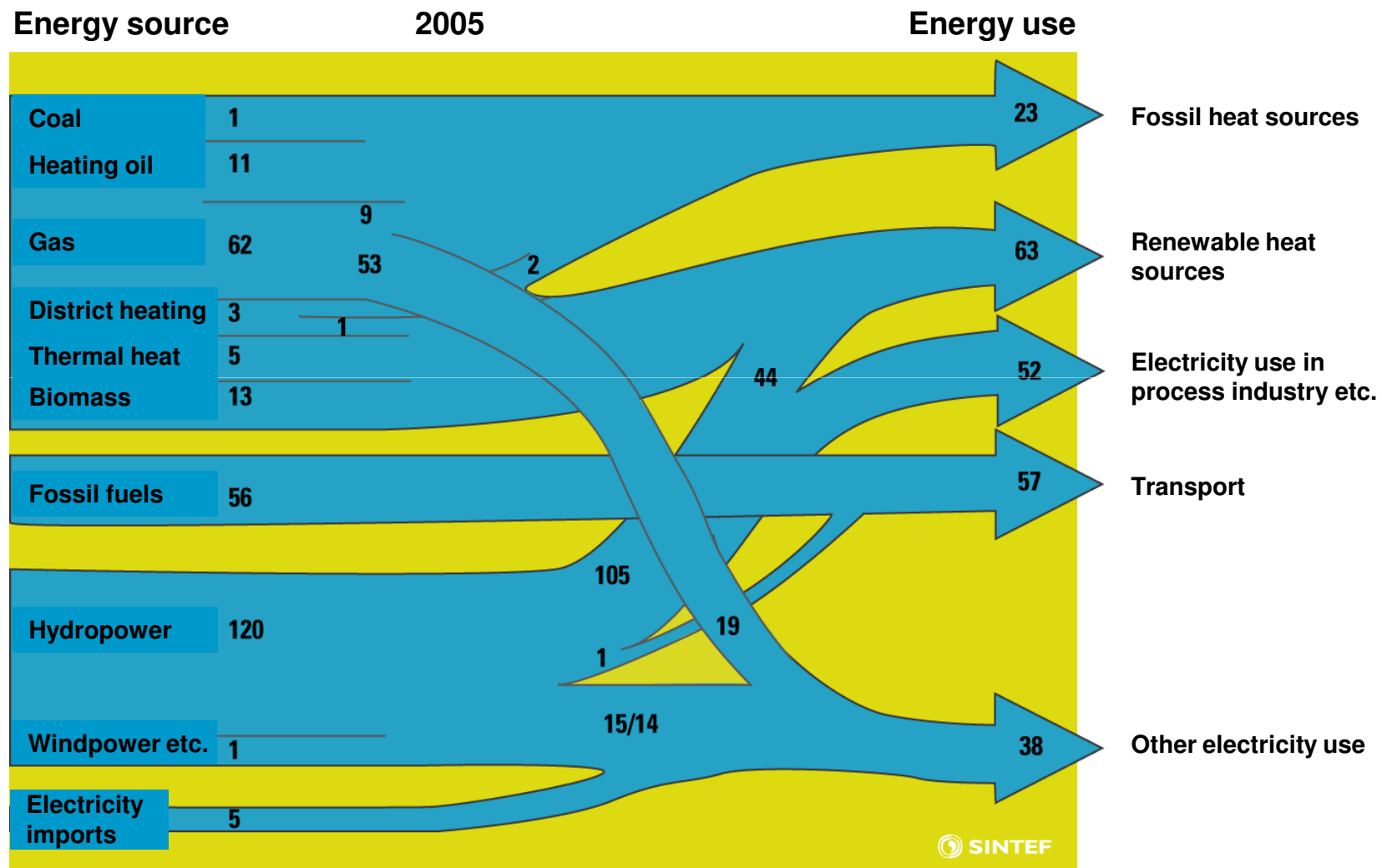
Total greenhouse gas emissions from Norway



The ENCL-plan has to meet the following requirements

<p>Stortinget * Agreement on climate policy January 2008</p>	<p>* Cut 16 MtCO₂e/year (from 59 to 43 MtCO₂e/year excluding forest carbon uptake)</p>
<p>Government * 30% reduction in CO₂ emissions by 2020</p>	<p>* Cut another 8 MtCO₂e/year through buying quotas – from 43 to 35 MtCO₂e/year</p>
<p>EU 20-20-20 * Climate * Energy efficiency * Renewable energy</p>	<p>* 20% lower emissions in 2020 compared to 1990 * 20% better energy efficiency compared to business as usual (“BAU”) * 20% share of renewable energy (of total energy use)</p>
<p>EU * Renewables in transport</p>	<p>. * 10% share of renewables in transport</p>

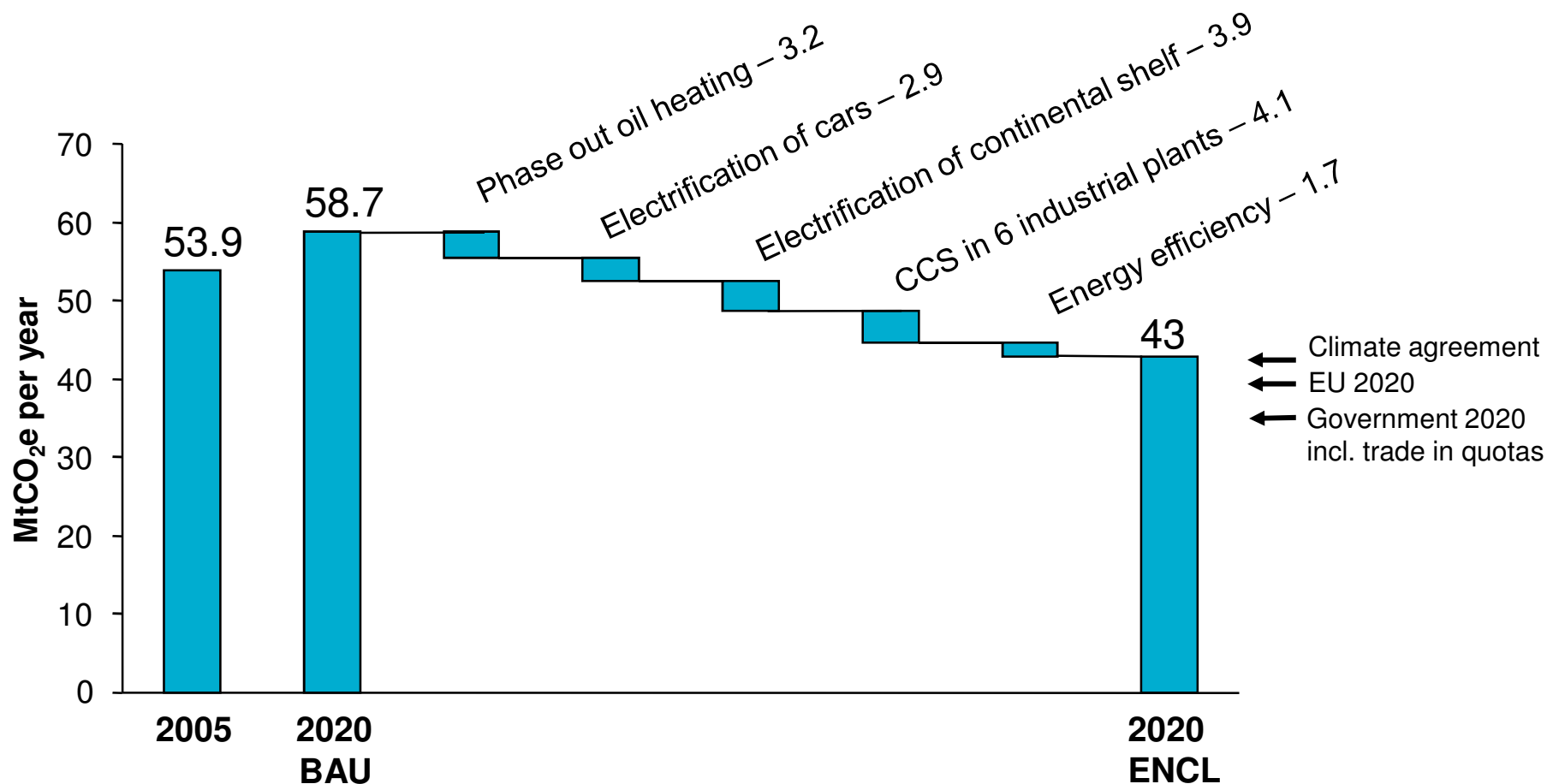
Energy sources and energy use Norway 2005



The 5 climate measures in the ENCL-plan

No.	Measure	Changes in greenhouse gas emissions MtCO ₂ e/year	Changes in the use of renewable electricity TWh-el/year	Changes in the use of renewable heat TWh-heat/year	Changes in the use of biofuels TWh-heat/year
1	Phase out all oil heating	-3	+1	+6	
2	Electrification of one fifth of all passenger cars	-3	+1		+6
3	Electrification of a quarter of all offshore activities	-4	+7		
4	Implement carbon capture and storage in 6 large industrial plants with high emissions	-4	+1		
5	Accelerate development towards energy efficiency in the building and industrial sectors	-2	-8	-3	
SUM	Overall effect of the ENCL-plan in 2020	-16	+2	+3	+6

The 5 climate measures in the ENCL-plan will reduce emissions by 16 MtCO₂e/year

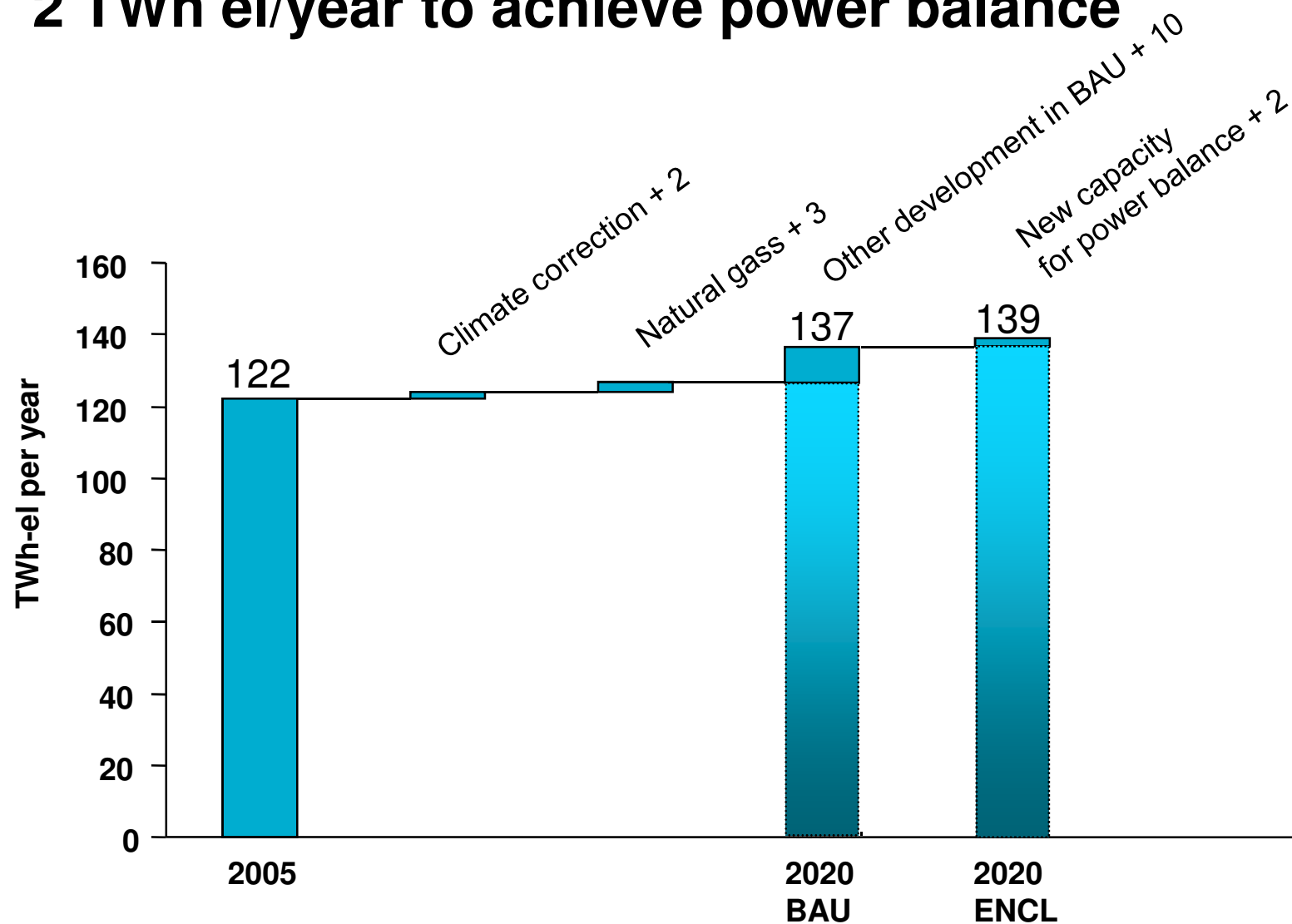


Base: Total emissions from Norwegian territory 2005 = 53.9 MtCO₂e/year

The 4 energy measures in the ENCL-plan

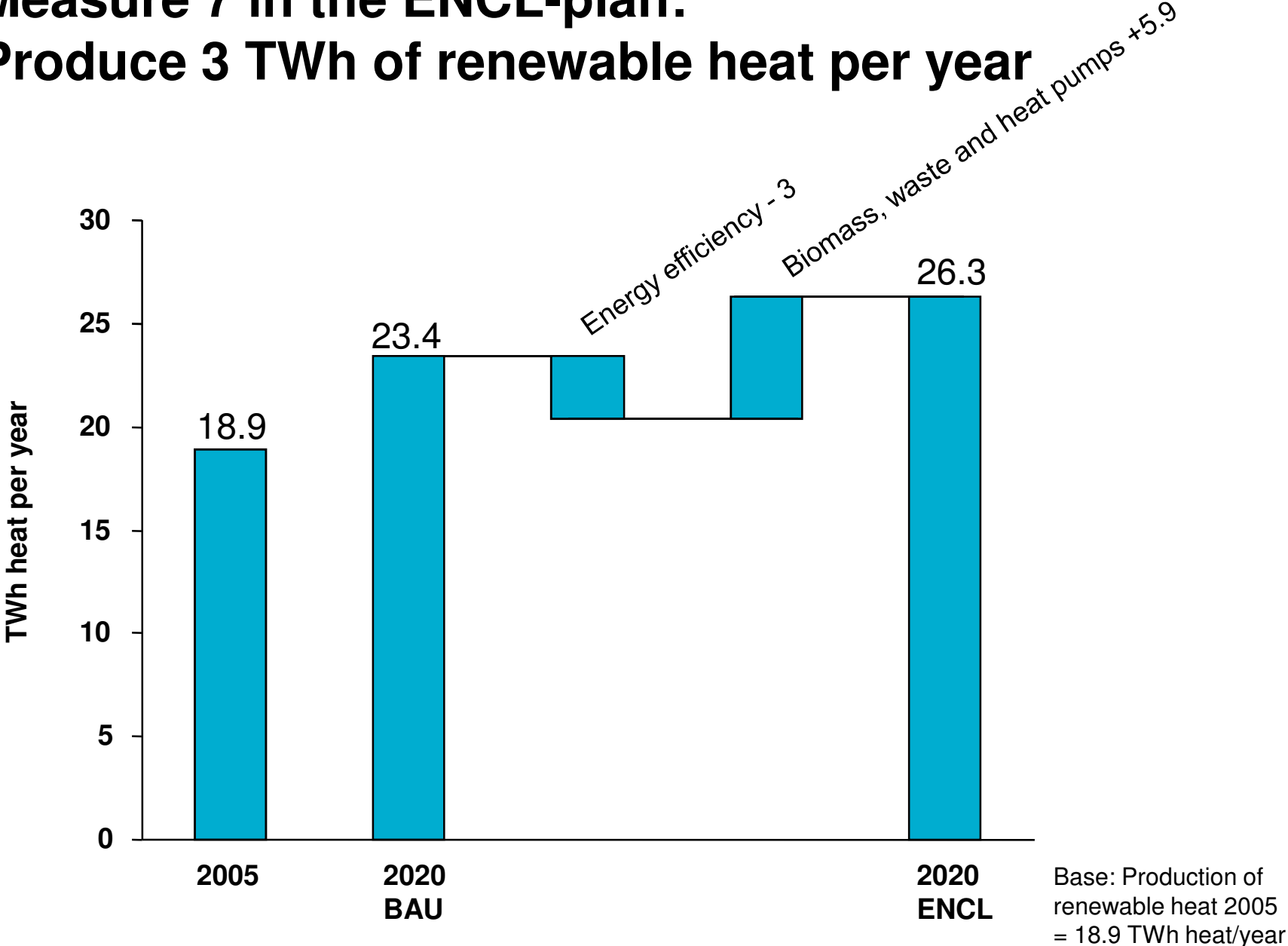
No.	Measure	Changes in the use of renewable electricity TWh el/year	Changes in the use of renewable heat TWh heat/year	Changes in the use of biofuels TWh heat/year
	Changes in BAU from 2005 to 2020	+12	+4	+3
6	Develop 2 TWh el/year of renewable electricity to achieve power balance in Norway in 2020	+ 2		
7	Produce 3 TWh heat/year from heat pumps, biomass and waste		+3	
8	Produce 250 000 tons of certified biofuels per year			+ 3
9	Develop 12 TWh el/year of renewable electricity for export – if the goal is to achieve a 76% share of renewables by 2020. Need for power lines and network/grid	+12		
SUM	Change from 2005 to 2020 with the ENCL-plan	+ 26	+ 7	+ 6

Measure 6 in the ENCL-plan: Develop an additional 2 TWh el/year to achieve power balance

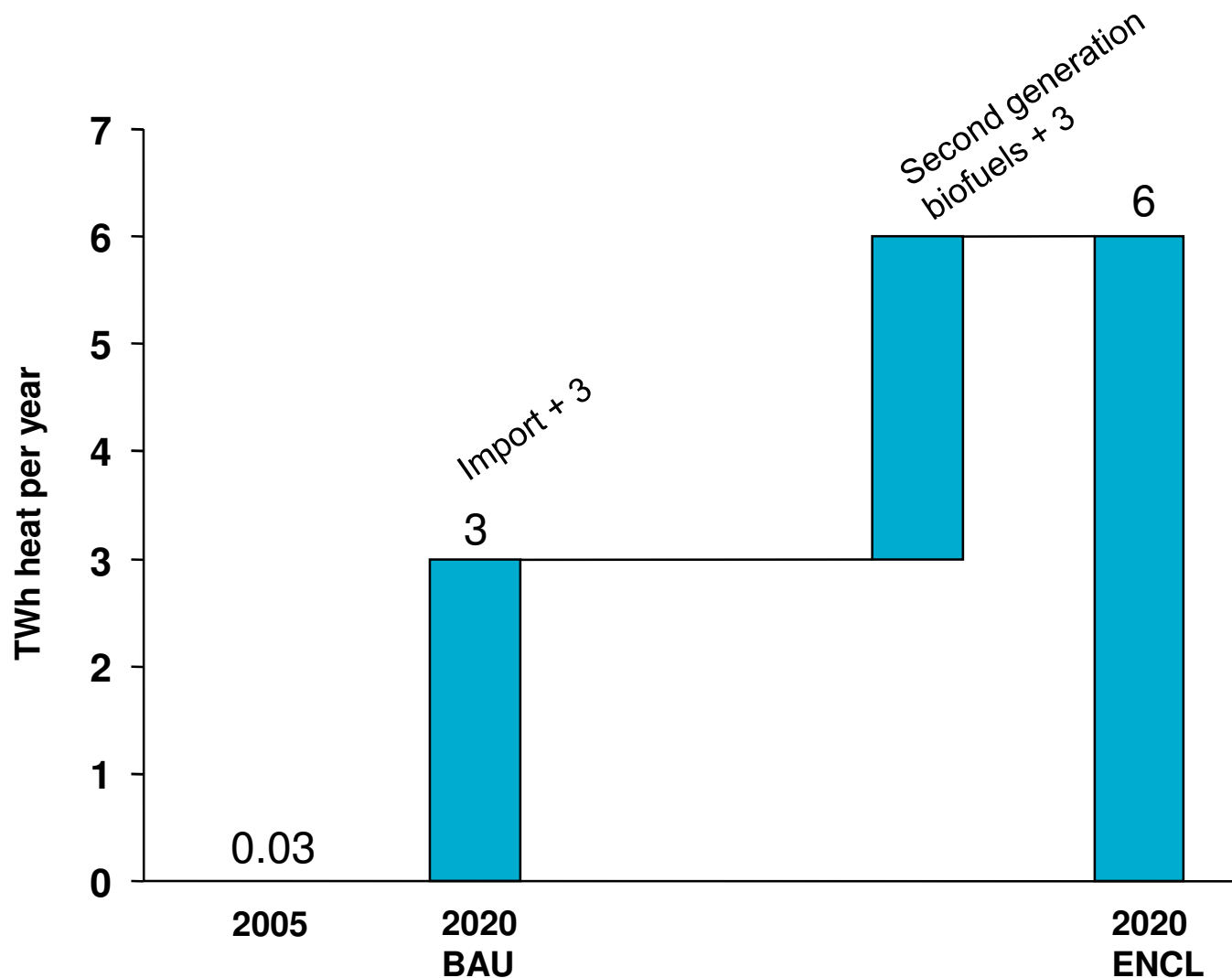


Base: Average production 2005 = 122 TWh-el/year

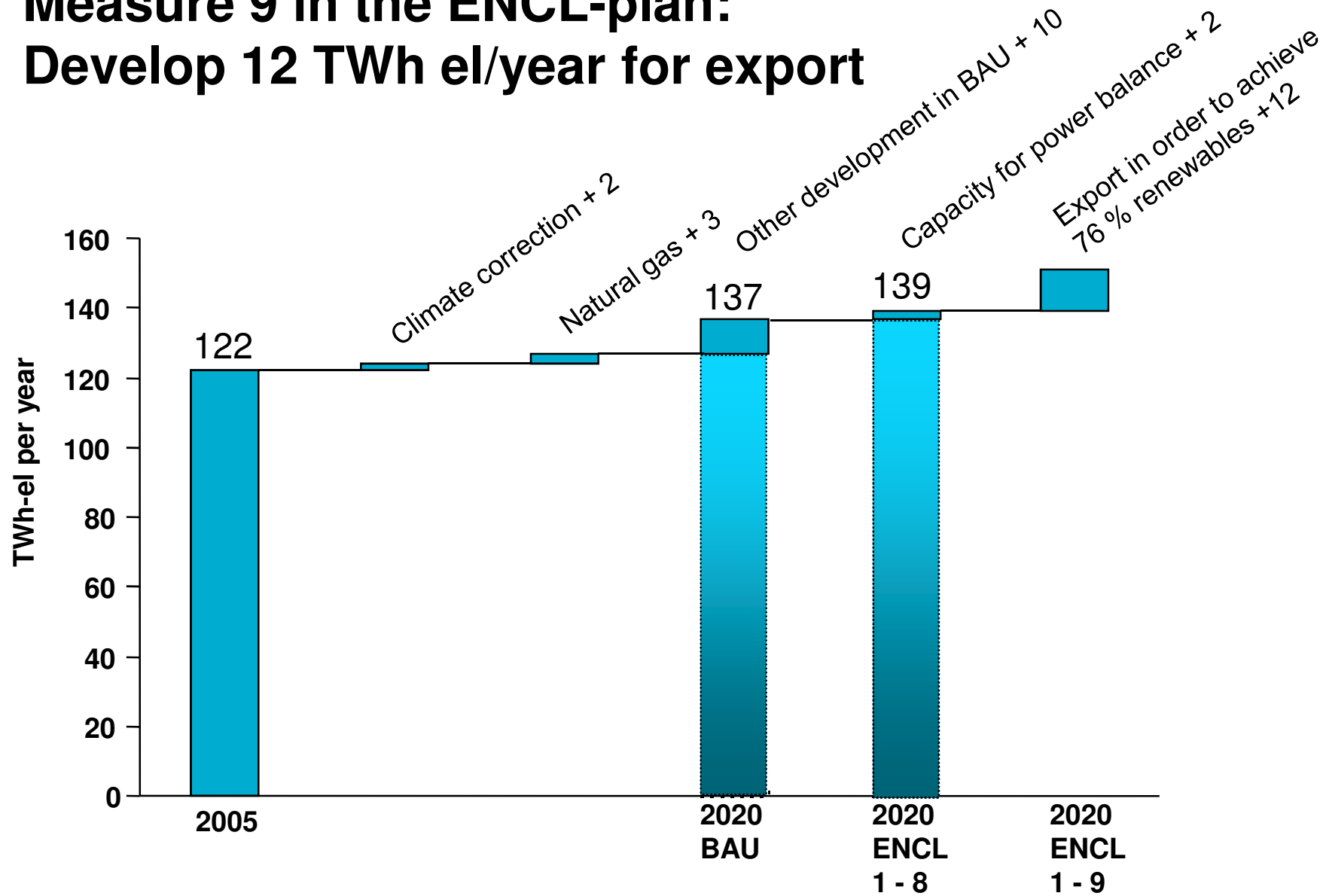
Measure 7 in the ENCL-plan: Produce 3 TWh of renewable heat per year



Measure 8 in the ENCL-plan: Produce 250 000 tons of certified biofuels per year



Measure 9 in the ENCL-plan: Develop 12 TWh el/year for export



Base: Average production 2005 = 122 TWh-el/year

The 4 energy measures in the ENCL-plan

No.	Measure	Changes in the use of renewable electricity TWh el/year	Changes in the use of renewable heat TWh heat/year	Changes in the use of biofuels TWh heat/year
	Changes in BAU from 2005 to 2020	+12	+4	+3
6	Develop 2 TWh el/year of renewable electricity to achieve power balance in Norway in 2020	+ 2		
7	Produce 3 TWh heat/year from heat pumps, biomass and waste		+3	
8	Produce 250 000 tons of certified biofuels per year			+ 3
9	Develop 12 TWh el/year of renewable electricity for export – if the goal is to achieve a 76% share of renewables by 2020. Need for power lines and network/grid	+12		
SUM	Change from 2005 to 2020 with the ENCL-plan	+ 26	+ 7	+ 6

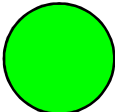
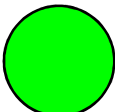
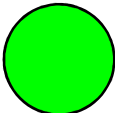
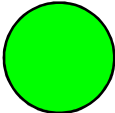
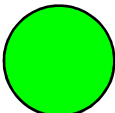
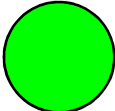
Climate measures: Tools and yearly costs for ENCL – in addition to BAU – in the state budget

	Measure	Suggested tool	Estimated cost for the state NOK mill/year
1	Phase out all oil heating	Vehicle scrap deposit	200
2	Electrification of one fifth of passenger cars	Subsidy for purchase	1 200
3	Electrification of a quarter of all offshore activities	Regulation Subsidy	1 900
4	Implement carbon capture and storage in 6 large industrial plants with high emissions	Regulation Subsidy	2 400
5	Accelerate the development towards energy efficiency in the construction and industrial sectors	Regulation	0
	Sum for ENCL's 5 measures		~ 6 000

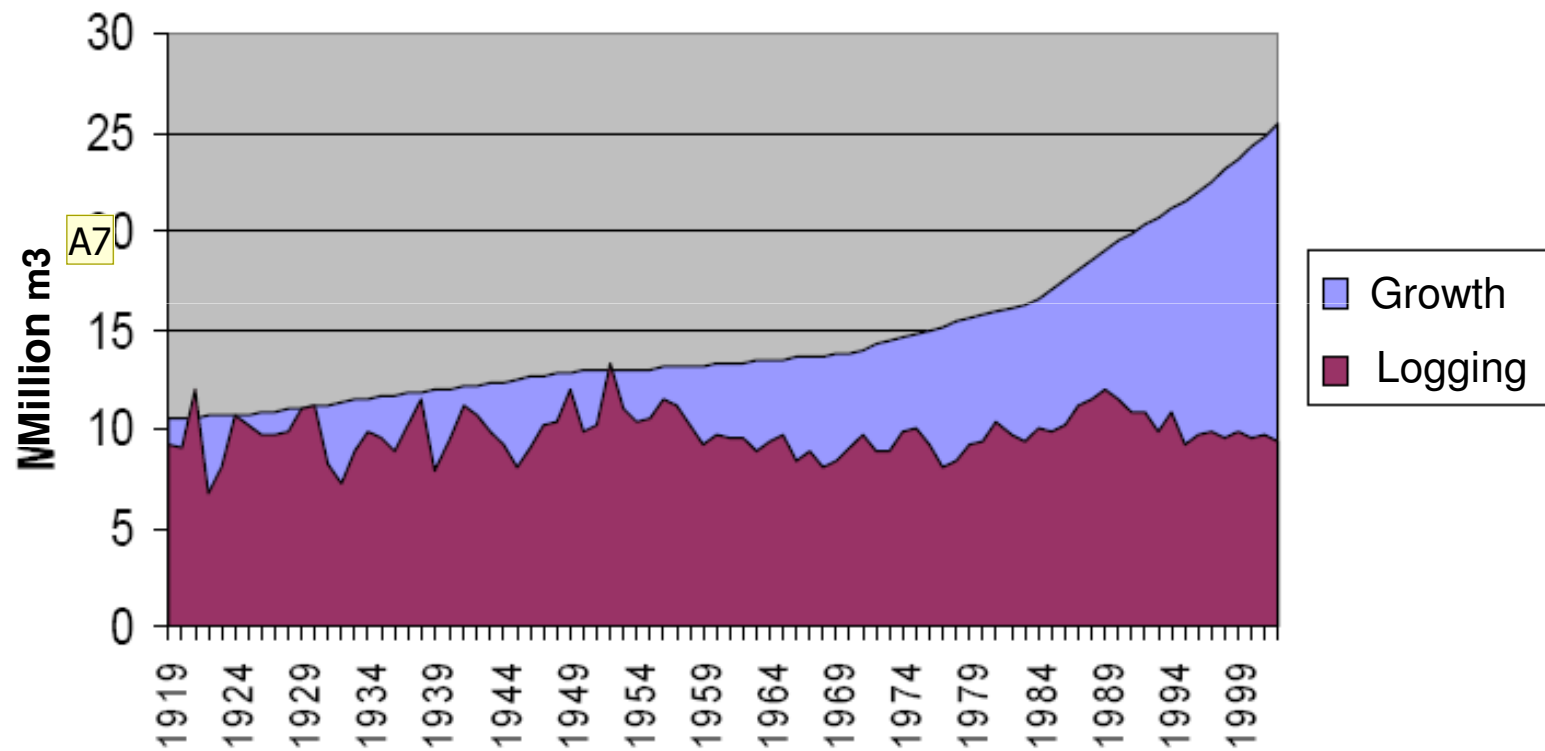
Energy measures: Tools and yearly costs for ENCL – in addition to BAU – in the state budget

Measure	Suggested tool	Estimated cost for the state NOK mill/year
Develop 2 TWh el/year renewable electricity – in order to achieve power balance in Norway by 2020	Certificate system Increased network charges (actual cost 450)	
Produce 3 TWh heat/year from heat pumps, biomass and waste	Subsidy	600
Produce 250 000 tons of certified biofuels per year	Subsidy	400
Develop 12 TWh el/year of renewable energy for export – if the goal is to achieve a 76% share of renewables by 2020. Requires power lines and network	Agreement with importing country (potential export subsidy ~ 3 000)	0
Sum for ENCL's 4 energy measures		~ 1 000
SUM for ENCL's measures 1-9		~ 7 000

ENCL's measures 1-9 meet all requirements

<p>Stortinget *Climate agreement</p>		<p>OK, reduction from 59 to 43 MtCO₂e/year, excl. forest carbon uptake</p>
<p>Regjeringen *30% reduction in CO₂ by 2020</p>		<p>OK, further reduction from 43 to 35 MtCO₂e/year through purchase of quotas for 8 MtCO₂e/year</p>
<p>EU 20-20-20 * Climate * Energy efficiency * Renewable energy</p>	  	<p>OK, reduces 16 MtCO₂e/year at home plus 3 MtCO₂e/year through quotas</p> <p>OK, as Norway's energy consumption is expected to grow 20% less than Norway's GDP</p> <p>OK, even though achieving this goal depends on negotiation with the EU . Maximum level of 76% can be reached through more hydro and wind power</p>
<p>EU * Renewable transport</p>		<p>OK, through plug-in cars and biofuels – of which approx. half need to be imported</p>

Development of growth and logging



Source: Slettbak, Viken Skog, 2008

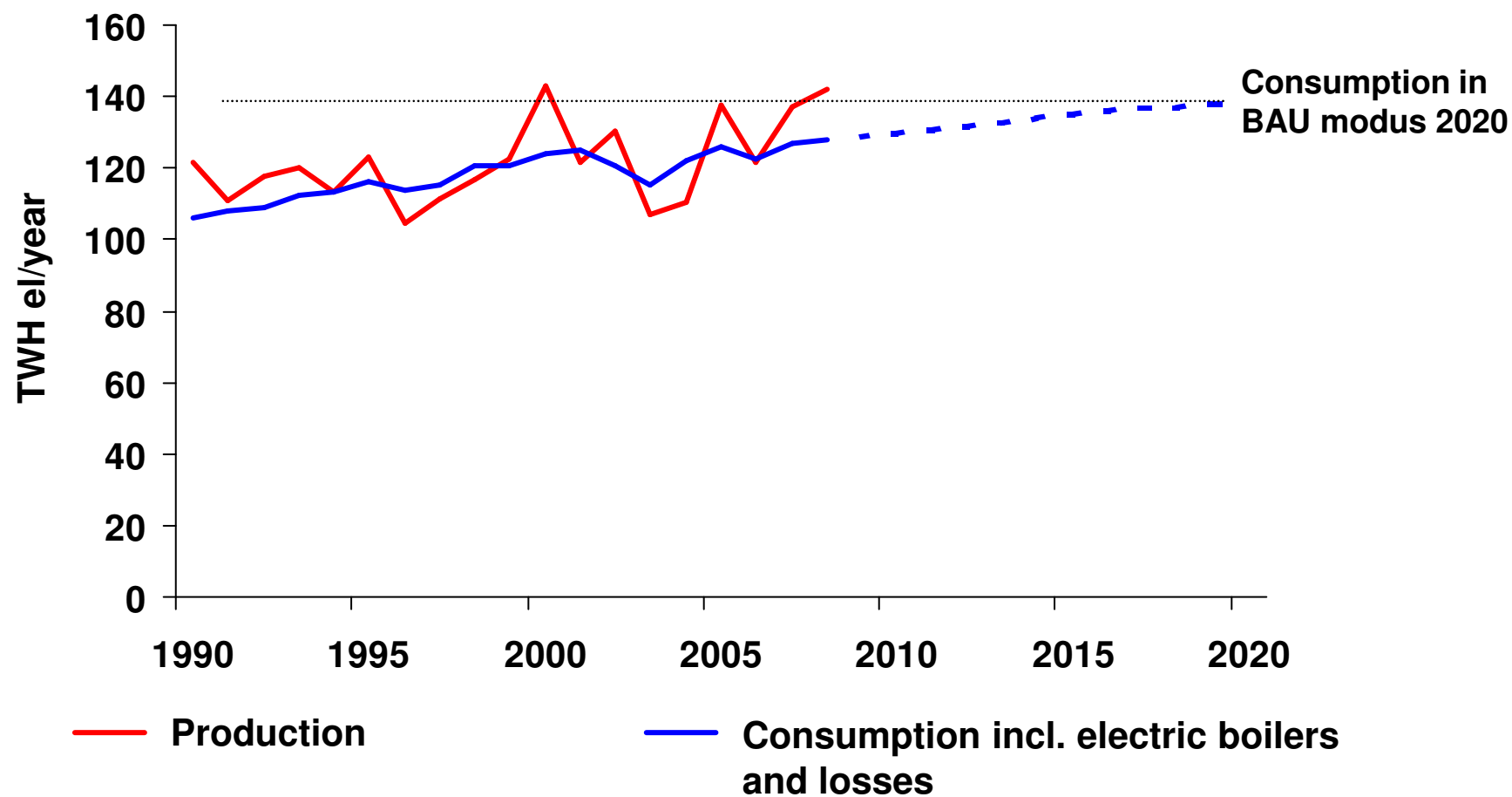
Lysbilde 16

A7

Hva står u.b. for i denne tabellen?

Anna; 07.04.2009

Production and consumption of electricity in Norway historically 1990-2008 and BAU until 2020



ENCL-plan: The core message

- Norway and the EU have established a set of goals for greenhouse gas emissions and the energy system in Norway in 2020.
- All of these goals can be achieved via the 9 measures in the ENCL-plan.
- The 5 climate measures of the ENCL-plan are 1) phasing out all oil-based heating, 2) electrification of 20% of all passenger cars, 3) electrification of 25% of the activities on the continental shelf, 4) installing CCS in 6 industrial plants with especially high emissions, and 5) intensifying the drive towards better energy efficiency.
- The 4 climate measures of the ENCL-plan are 1) increasing the production of hydro and wind power by 2 TWh el/year in order to achieve power balance, 2) increasing the production of renewable heat by 3 TWh heat/year, mainly by means of heat pumps, biomass and waste, 3) producing 250 000 tons/year of biofuels in Norway and importing an equal amount, and 4) increasing the production of hydro and wind power by another 12 TWh el/year, mainly for export.
- The easiest way to implement the ENCL-plan will be by means of government directives and subsidies; the plan should be seen as a supplementary measure in addition to the expected future effect of emission quota prices.
- The total cost via the state budget will be approximately NOK 7 billion per year, i.e. approximately 1% of the total state budget and NOK 1,500 per inhabitant.