Global 2°C Scenarios

Norway and the Road Towards the Low Emission Society
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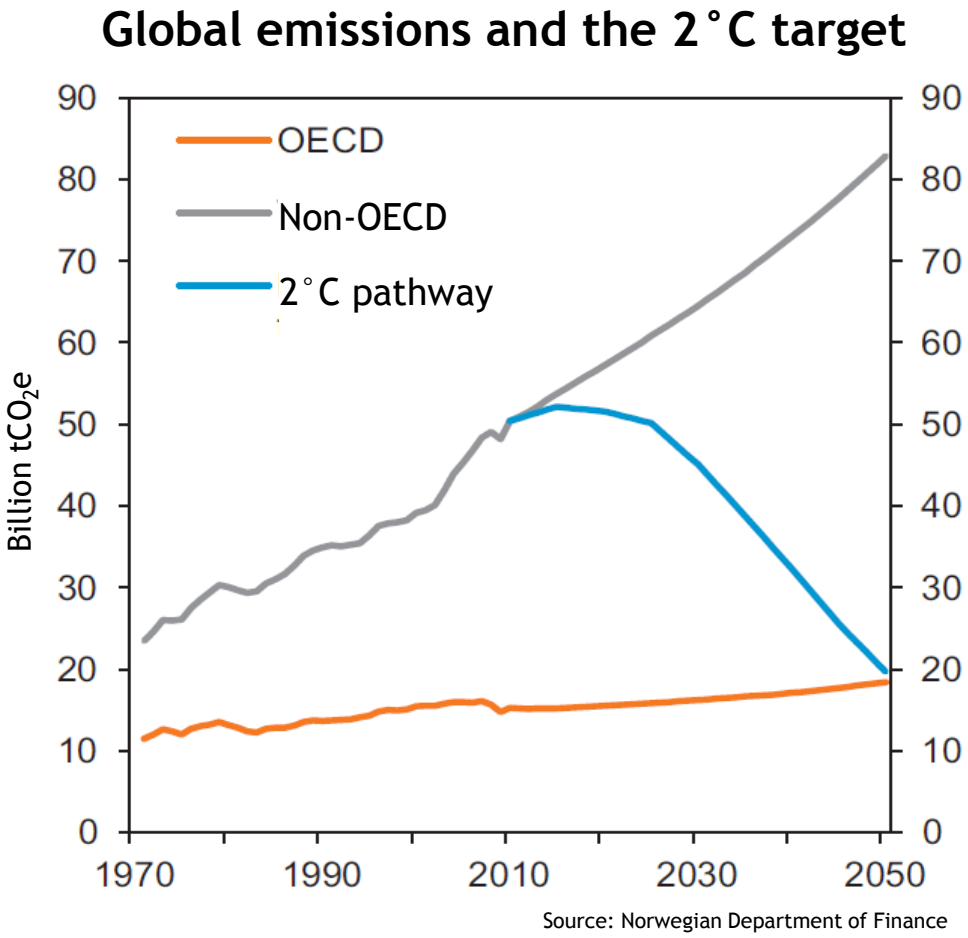
Audun Rosland
Director - Climate Departement
Norwegian Environment Agency

2°C Challenge

- Without new measures emissions will increase to 80 billion tons CO_2e by 2050
- Almost the entire increase is expected outside OECD countries
- A 2°C target represents a sharp departure from the BAU scenario



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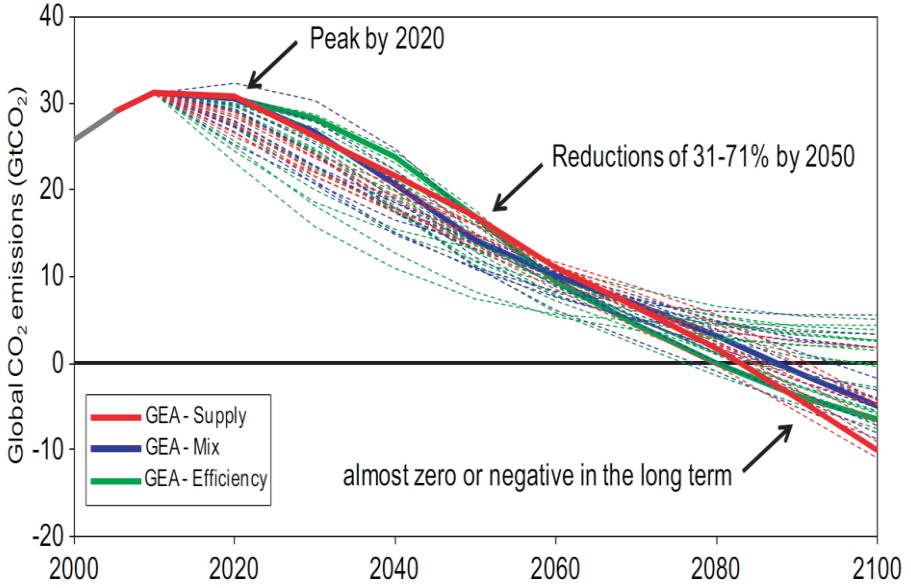
Global Energy Assessment – Pathways to 2°C

- Today's emission levels and policies implies global warming of 3-5°C
- Emissions must peak by 2020 otherwise much higher costs and technology dependency (e.g. CCS)
- Most scenarios temporarily overshoot a 450 ppm level, hence net negative emissions needed in the long term (e.g. BioCCS)



Source: IIASA, 2012

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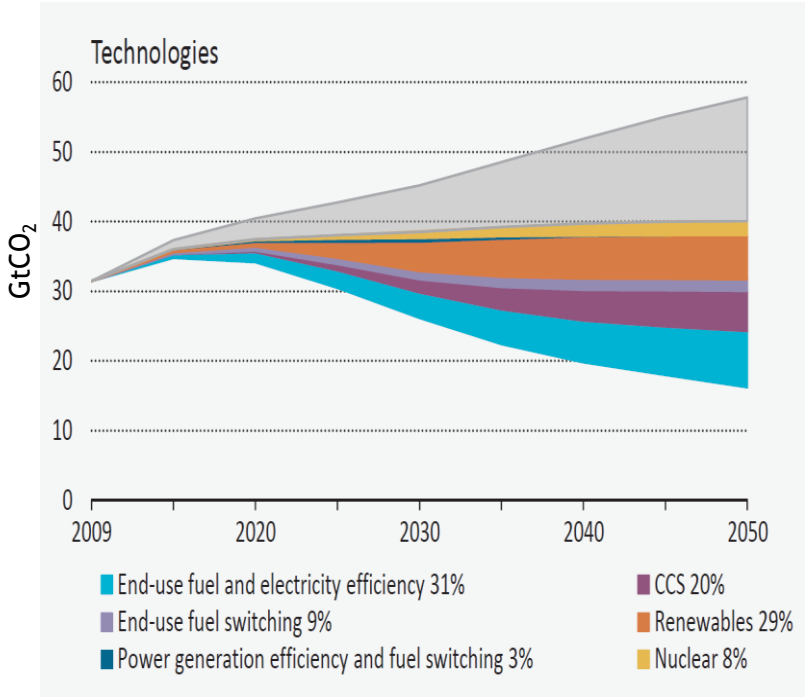
Technologies under a 2°C scenario

- Energy efficiency key to cost-effectively reaching the 2°C target
- Without CCS or nuclear costs will increase
- Globally larger reduction potential in the power sector than in transport
- The cost of wind and solar has already fallen dramatically



Source: IEA, 2012

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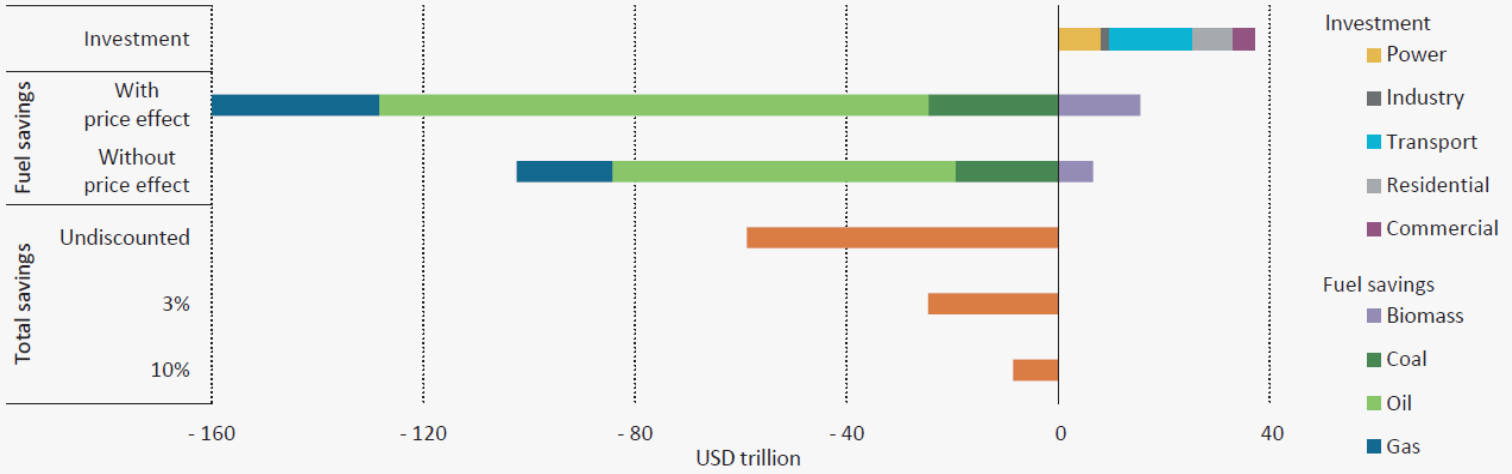
Costs Associated with Reaching the 2°C Scenario

- Fuel savings more than compensates for higher investment needs in the 2°C scenario
- However, investments are needed upfront while savings accumulate over time
- Mainly a financial challenge rather than a socioeconomic one

Figure 4.10 Additional investment and fuel savings in the 2DS compared to 6DS, 2010 to 2050



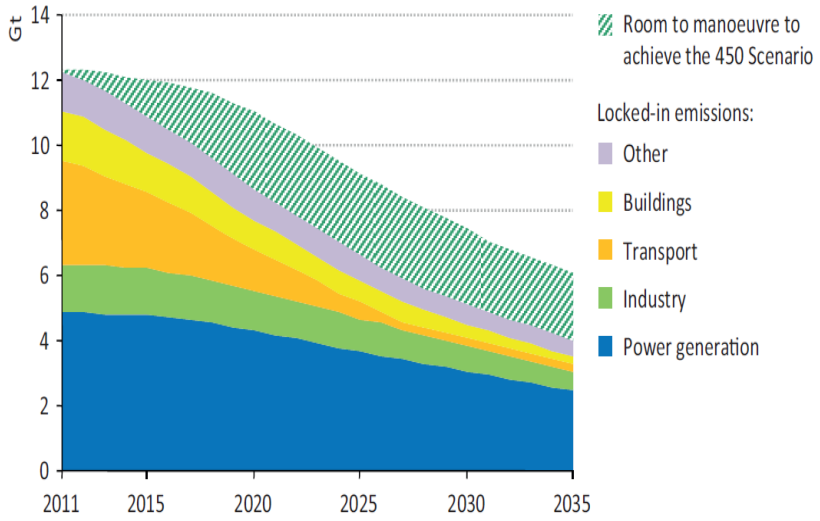
Note: Total is based on fuel savings without price effect.

Source: IEA 2012

Carbon Lock-in

- 4/5 of energy-related CO_2 emissions allowed under a 2°C scenario under are already locked-in in existing infrastructure
- Power generation and industry with long-lived infrastructure are the biggest challenges in this context

Figure 8.13 ▷ Energy-related CO_2 emissions from locked-in infrastructure in 2011 and in the 450 Scenario in OECD countries



Source: World Energy Outlook, 2012

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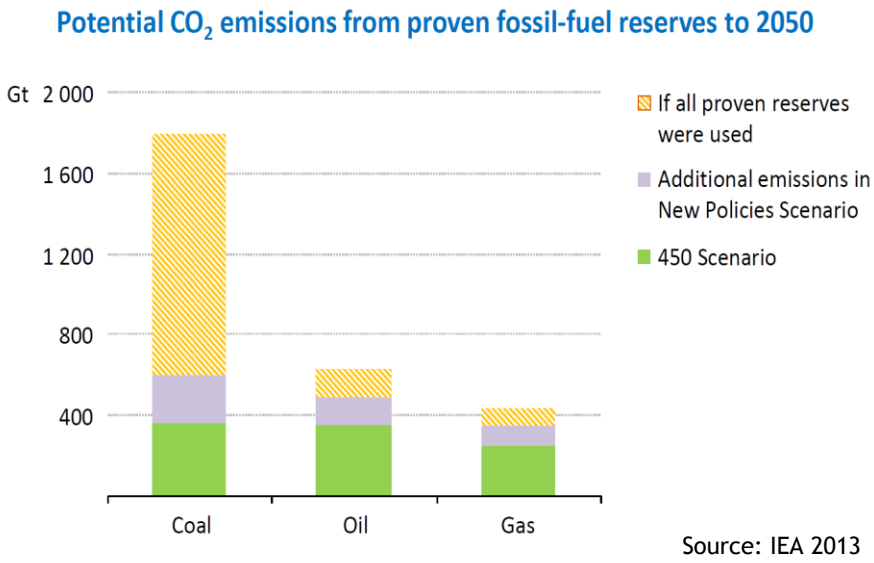
Fossil-fuel Reserves

- 2°C target implies that 2/3 of proven fossil-fuel reserves cannot be commercialised (without the use of CCS)
- Applies mainly to coal reserves, but close to 50 % of proven oil reserves also need to stay in the ground



Source: IEA 2013

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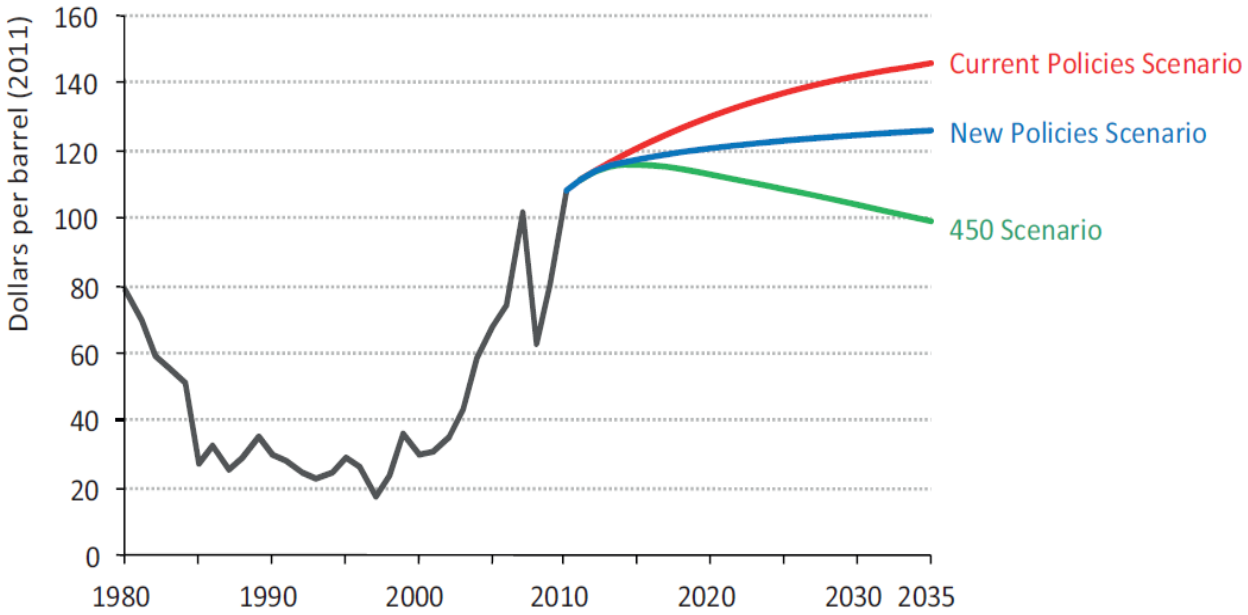
Lower Oil Prices

- Fossil fuel prices: the 2°C scenario implies a lower oil price as a result of lower demand for oil

- Lower demand for fossil fuels can be policy driven by either a price on CO_2 emissions or subsidies on renewable energy sources (increasing the relative price of fossil fuels)

Figure 1.1 ▷ Average IEA crude oil price



Source: World Energy Outlook, 2012

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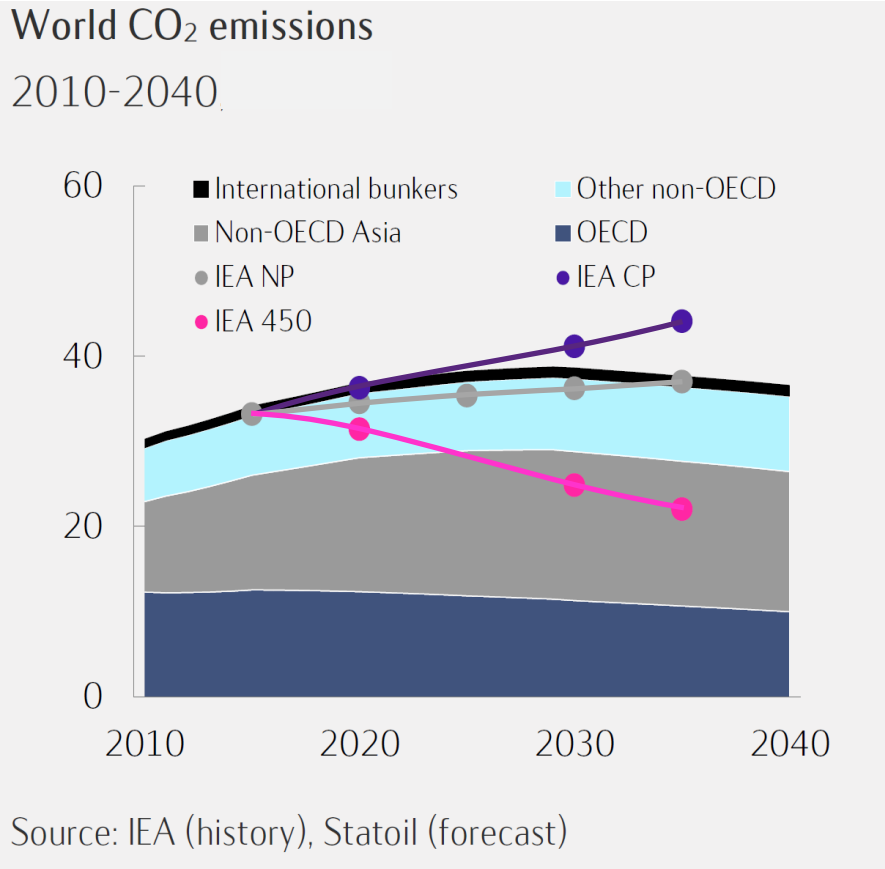
Statoil's Energy Perspectives 2013

- Statoil's Energy Perspectives is in line with IEA's New Policies Scenario
- This corresponds to a 3,6°C scenario
- Potentially overvaluing assets and proven reserves given lower oil/gas demand under a 2°C scenario



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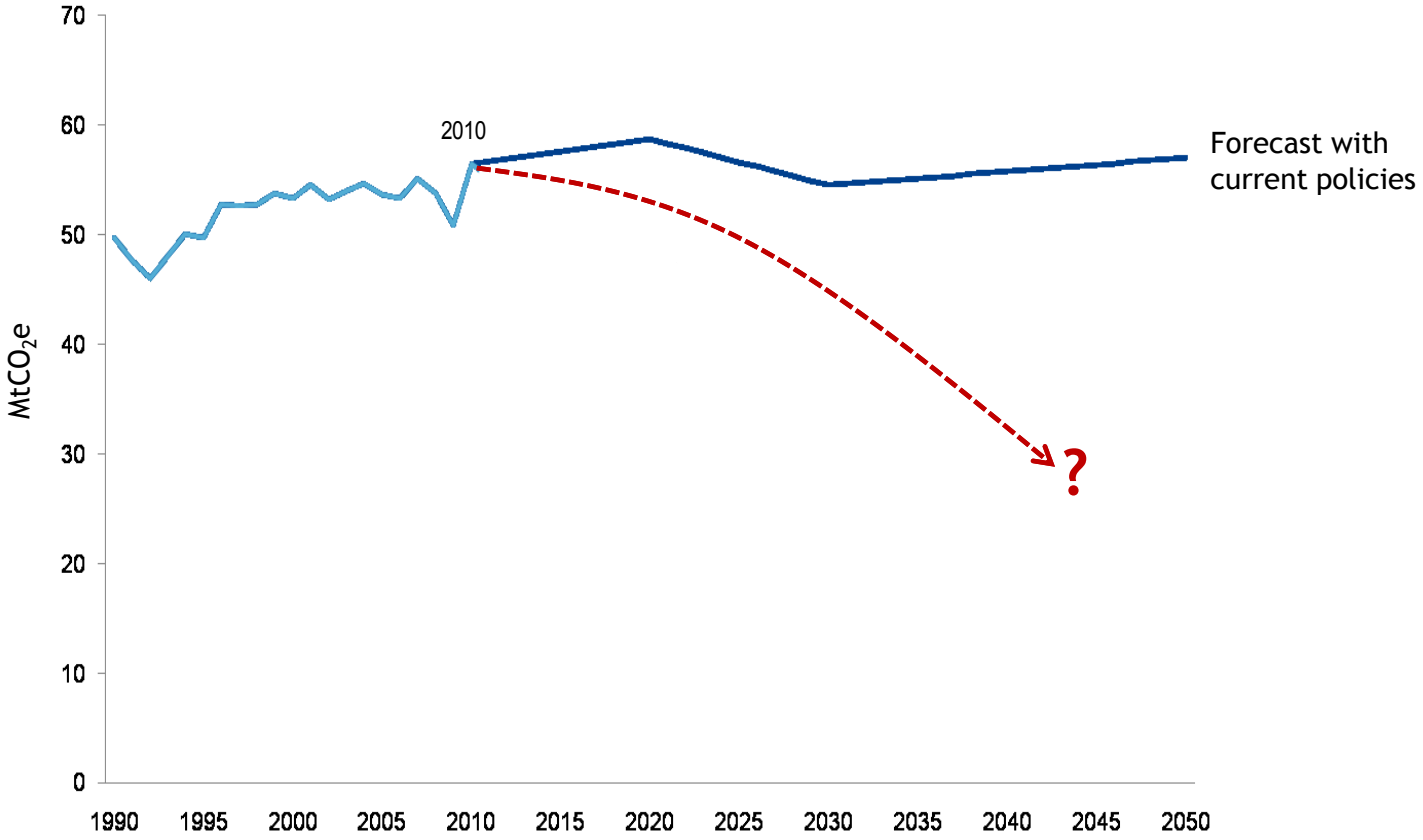
Historical and Projected Emissions in Norway



Kilde: Klimakur 2020, SSB, Econ Pöyry

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Norway in 2050 (1)

- Minimal consumption of fossil fuels:
  - A high global carbon price or other policies to limit the use of fossil fuels (without CCS)
  - No longer many small points of emissions (cars, oil furnaces, etc.)
  - Oil and gas no longer the dominant industry
- Substantially lower energy intensity in all sectors
- Norway no longer the only European country with a clean electricity production
  - Smart-grid introduced throughout Europe
  - EU has solved the power balancing issue in an energy system dominated by renewables

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Norway in 2050 (2)

- Close to zero emissions in the transport sector
  - More public transportation and different city planning; passenger vehicles on electricity, biofuels in freight vehicles?
- Bio-energy a large energy source, access to bio-energy may be a challenge
- Prepare for negative emissions (biomass plus CCS)?
- Energy intensive industry
  - Can Norway continue to be in the forefront on energy use and emissions per unit of output?
  - CCS in industry to tackle remaining emissions

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