

Inventories and projections for transboundary air pollution

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Content

- Context
- Inventories (basics / time series)
- Projections (basics / time series)
- NO_x
- NH₃ / Agriculture
- Solvents
- Conclusions

CLRTAP – Convention on Long-Range Transboundary Air Pollution

- CLRTAP 1979
- 1999 Gothenburg Protocol to abate acidification, eutrophication and ground-level ozone
- Establishes national emission ceilings for
- SO_2 , NO_x , VOC, NH_3

NEC Directive (2001/81/EC)

National Emission Ceilings

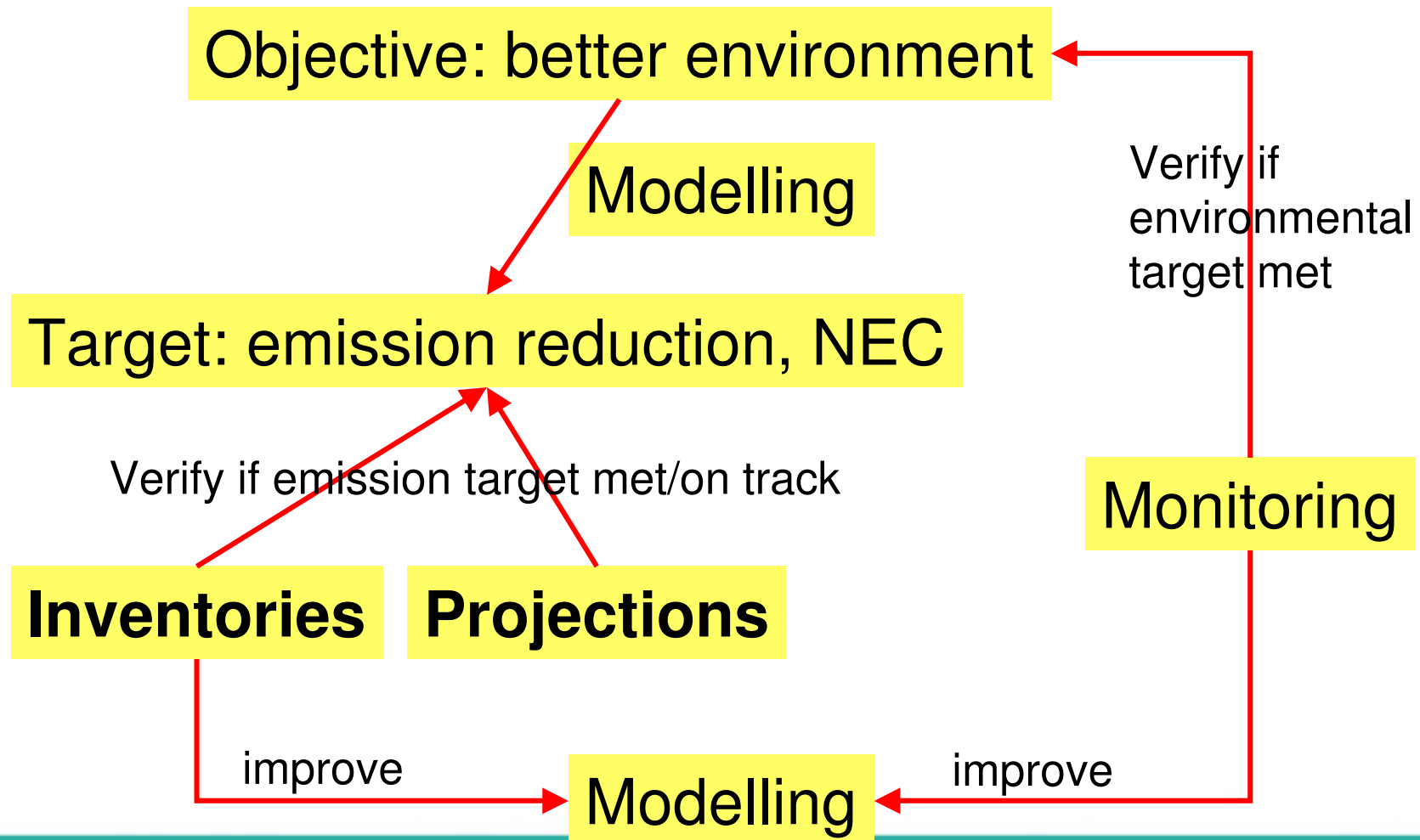
- Limit emissions of acididifying and eutrophying polutants and ozone precursors... to
- Improve protection of environment and human health... by
- Establishing national emission ceilings for SO_2 , NO_x , VOC, NH_3

Emission ceilings

- Emission ceilings to be reached by 2010, in ktonnes

	1990	CLRTAP (Gothenburg protocol)	NEC-Directive	change
SO₂	178	42	42	-76%
NO_x	115	65	65	-43%
VOC	197	55	55	-72%
NH₃	126	116	116	-8%

Inventories/projections in context



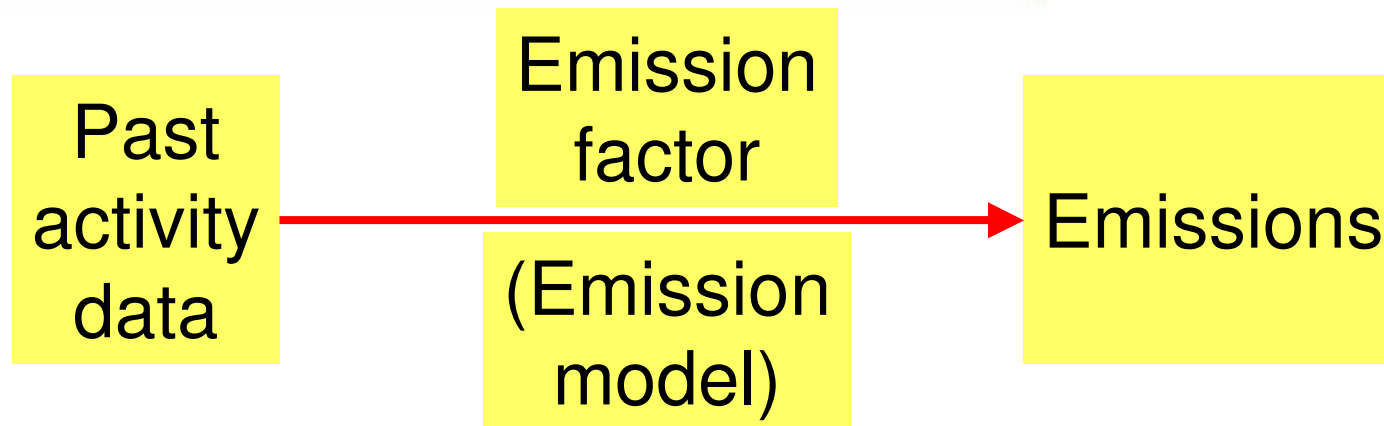
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Inventories - basic approach



Example:

- Energy use
- National animal herd
- Fuel in road transport /
mileage in road transport
- Population

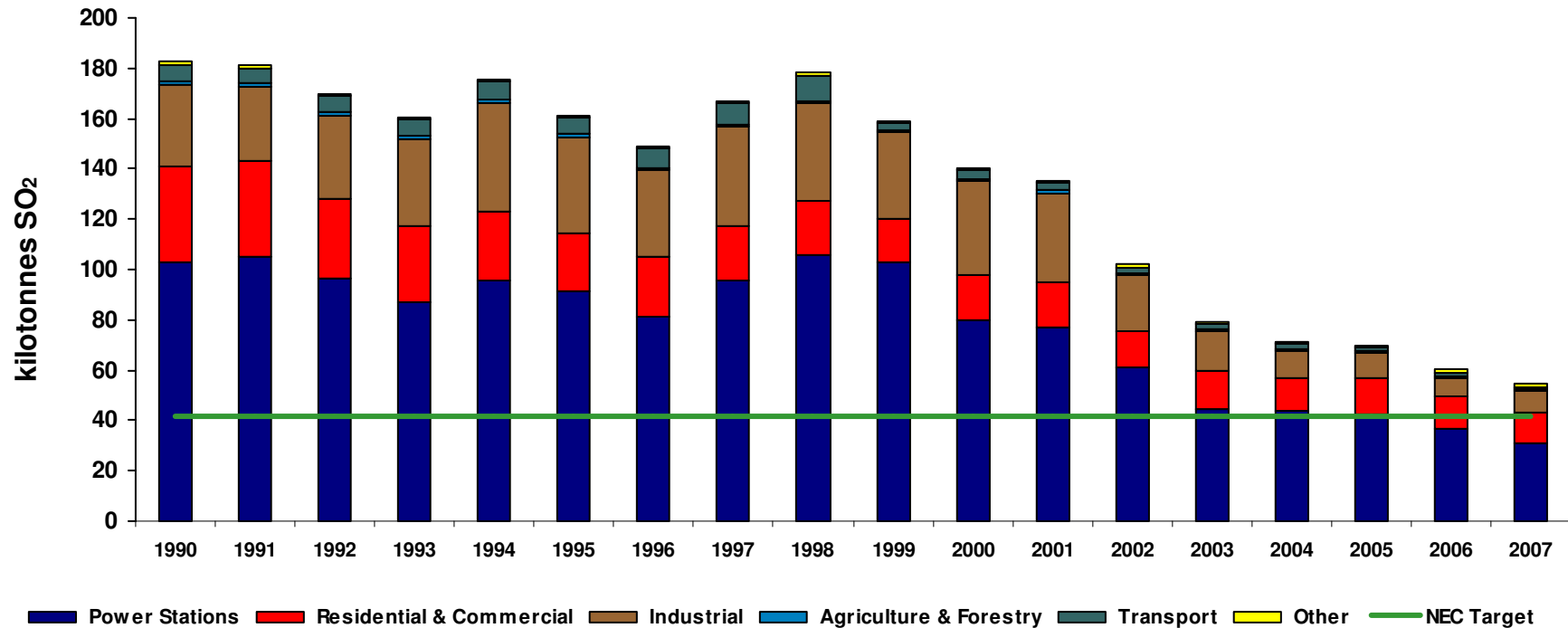
Source categories for emissions



Source category (green: non energy related)	NO _x	SO ₂	NM VOC	NH ₃
<i>Energy Industries</i>				
Power Generation	X	X	X	
Oil Refining	X	X	X	
Peat briquetting	X	X	X	
<i>Industry</i>				
Industrial Combustion	X	X	X	
Solvent and Other Product Use			X	
<i>Transport</i>				
Road Transport	X	X	X	X
Domestic and International Aviation (LTO's)	X	X	X	
Rail Transport	X	X	X	
Navigation	X	X	X	
Other Transport (Pipeline Compressors)	X			
<i>Residential</i>				
	X	X	X	
<i>Commercial and Institutional Services</i>				
	X	X	X	
<i>Agricultural Combustion</i>				
	X	X	X	
<i>Storage and Distribution of Oil Products (Fugitive emissions)</i>				
			X	
<i>Agriculture</i>				
Manure Management				X
Agricultural Soils			X	X

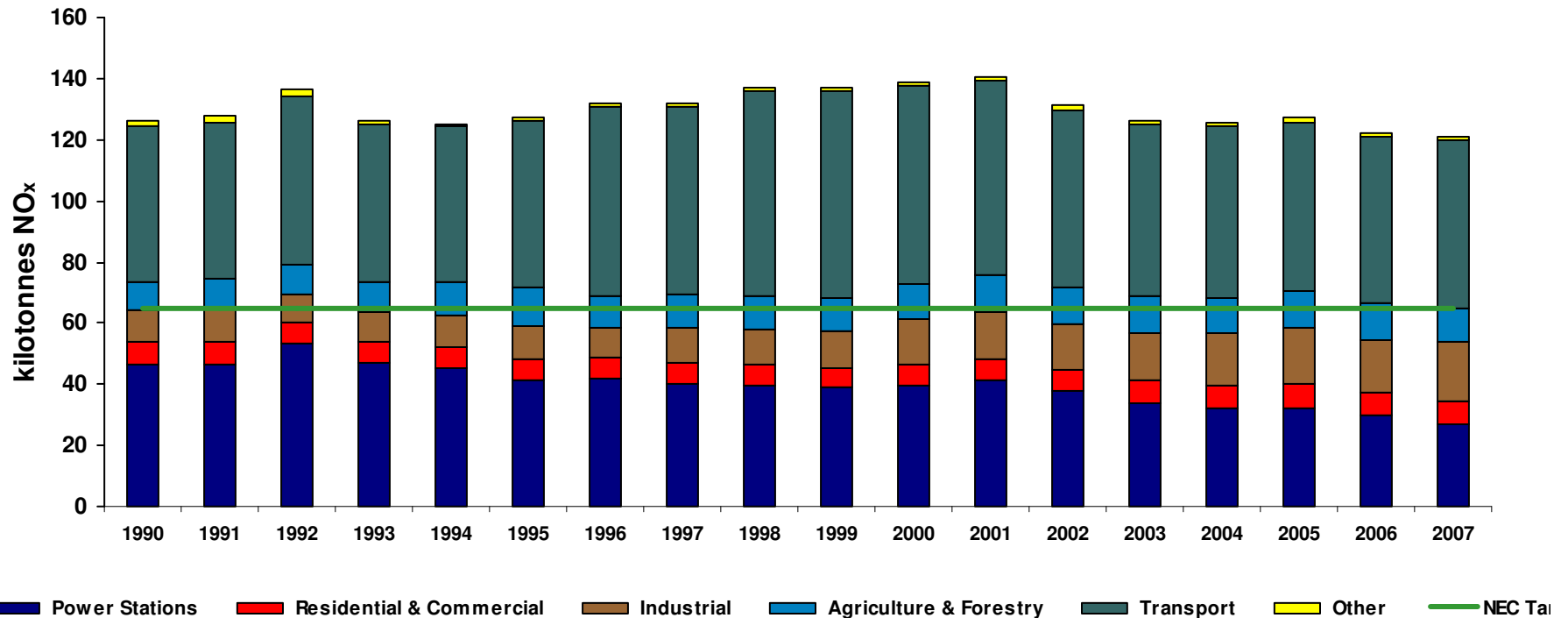
Sulphur dioxide 1990-2007 NEC

Trends in SO₂ emissions



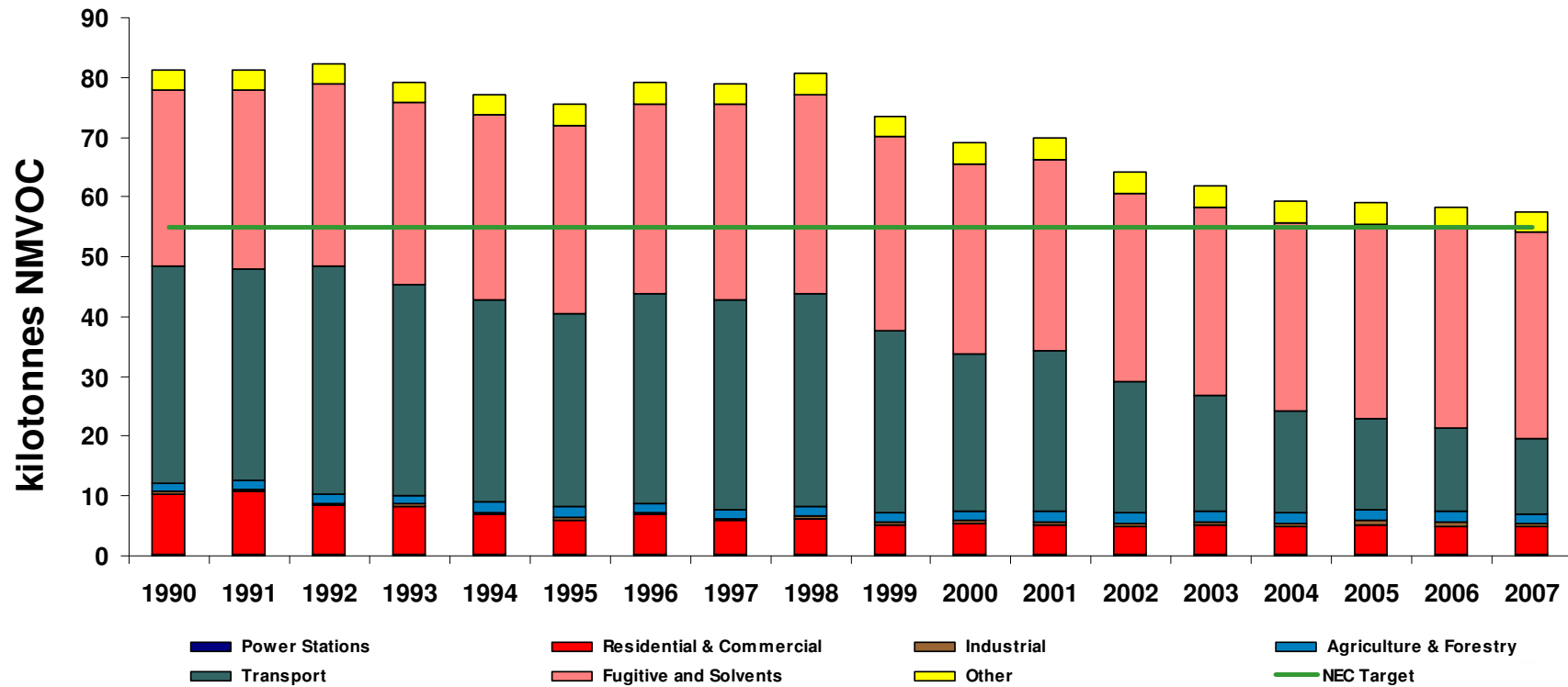
Nitrogen oxides 1990-2007 NEC

Trends in NO_x emissions



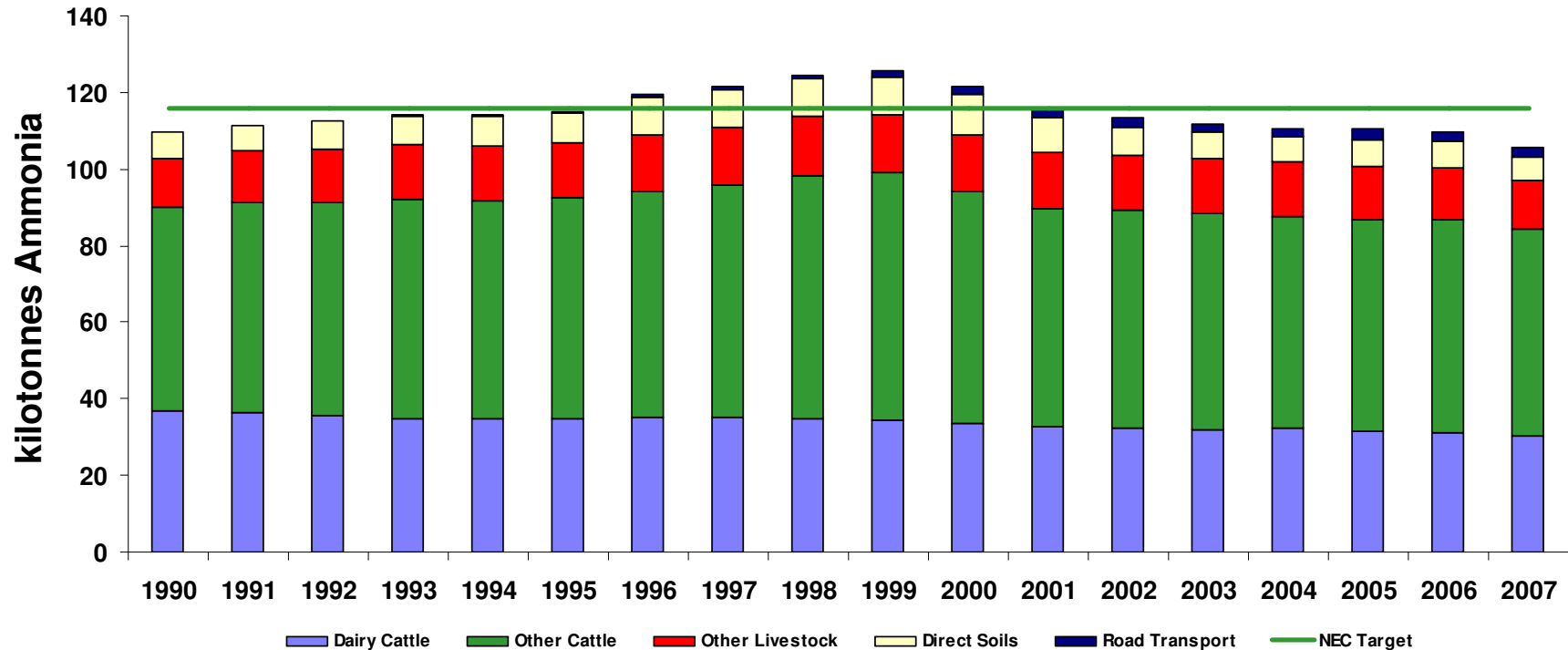
NMVOG 1990-2007 NEC

Trends in NMVOG emissions



Ammonia 1990-2007 NEC

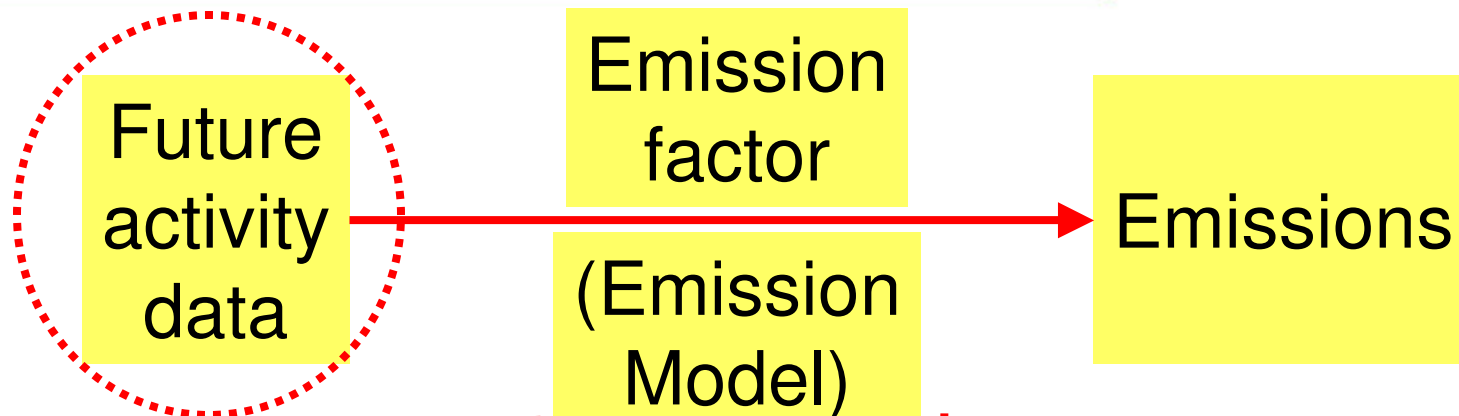
Trends in NH3 emissions



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Projections - basic approach



- E.g. model

Consistency with

- Inventory
- GHG projections
- Energy forecast

as inventory

Emissions

Energy related:

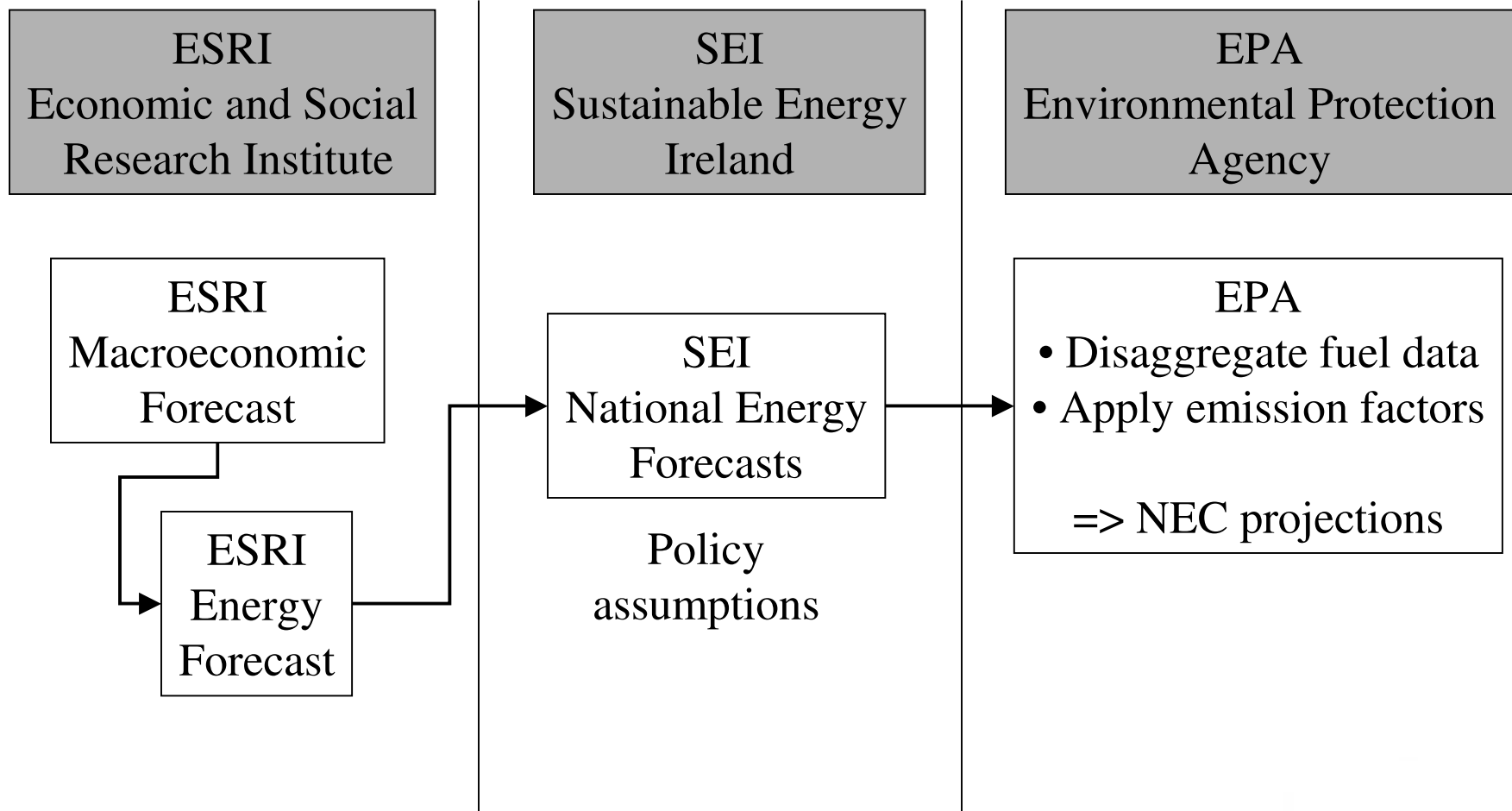
- Power generation
- Road transport
- Industrial combustion
- Residential
- Commercial & Institutional Services
- Fuel use in agriculture

Non-energy related:

- Agriculture (NH_3)
- Agriculture (NMVOC)
- Solvent emissions

- Storage and distribution of oil products

Energy Forecast - Institutional/ procedural arrangements

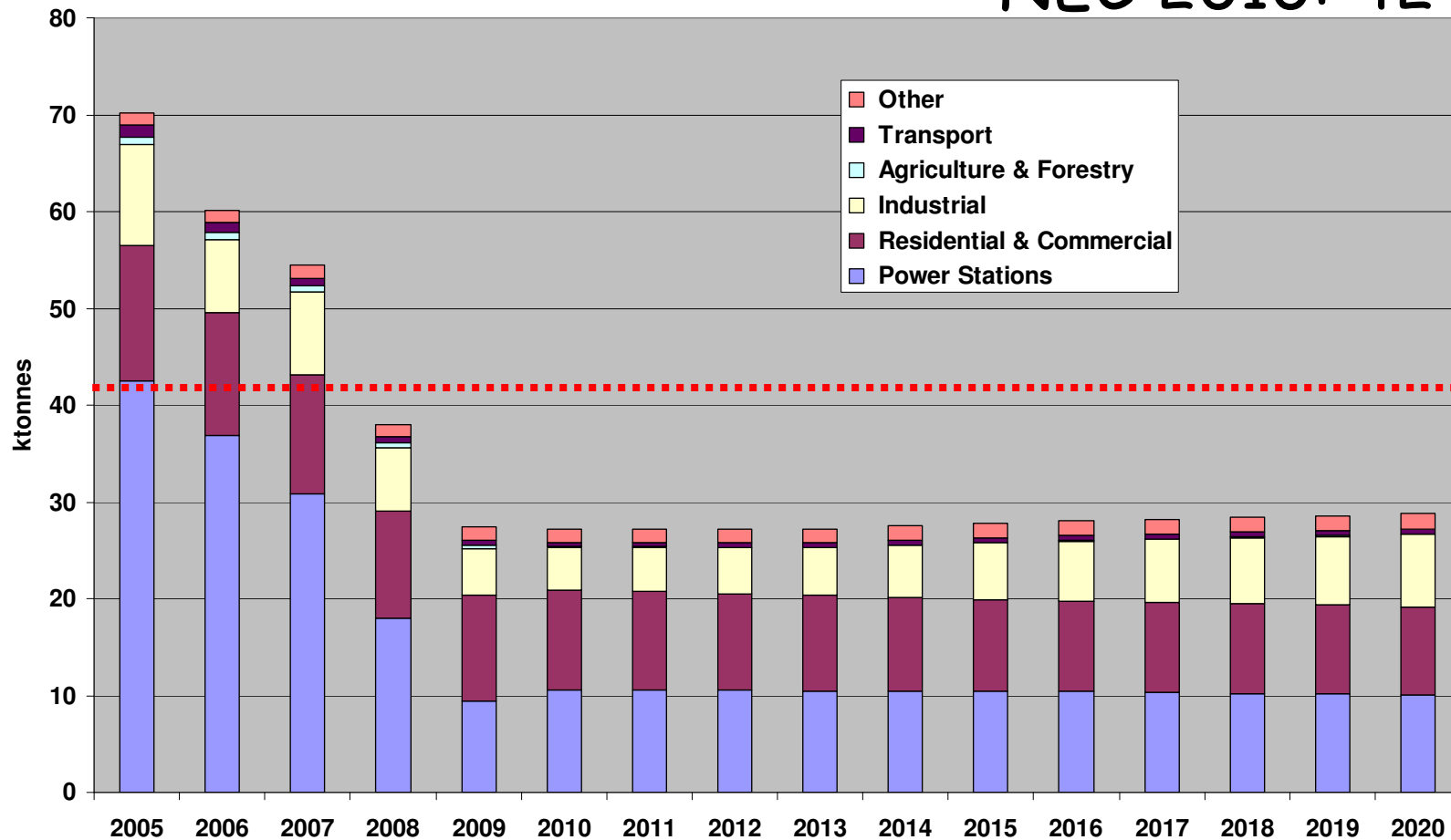


SO₂ projections, 2005-2020

(April 2009, unpublished)

SO₂ emissions, Economic Shock

NEC 2010: 42 kt SO₂

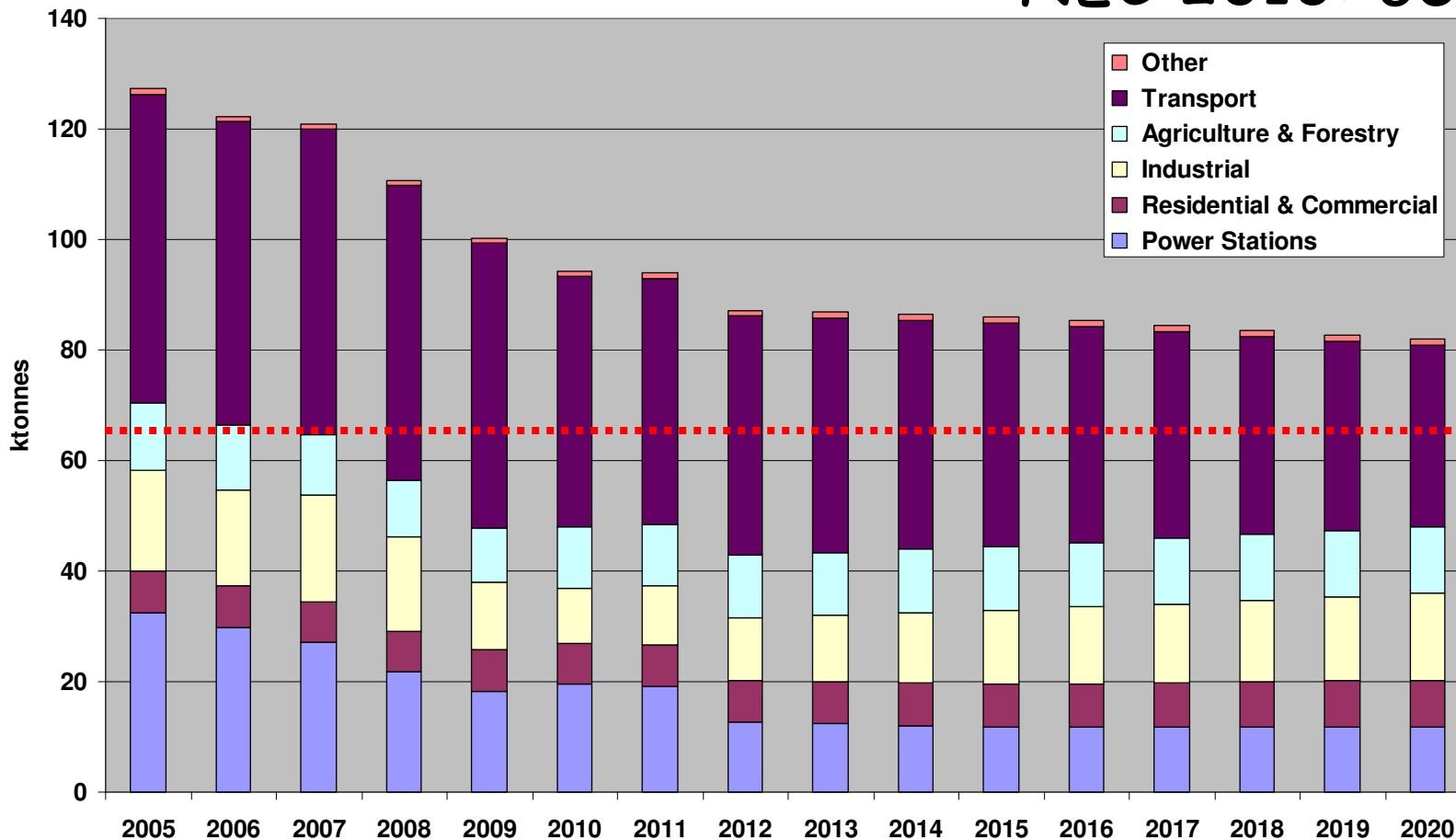


NO_x projections, 2005-2020

(April 2009, unpublished)

NO_x emissions, Economic Shock

NEC 2010: 65 kt NO_x

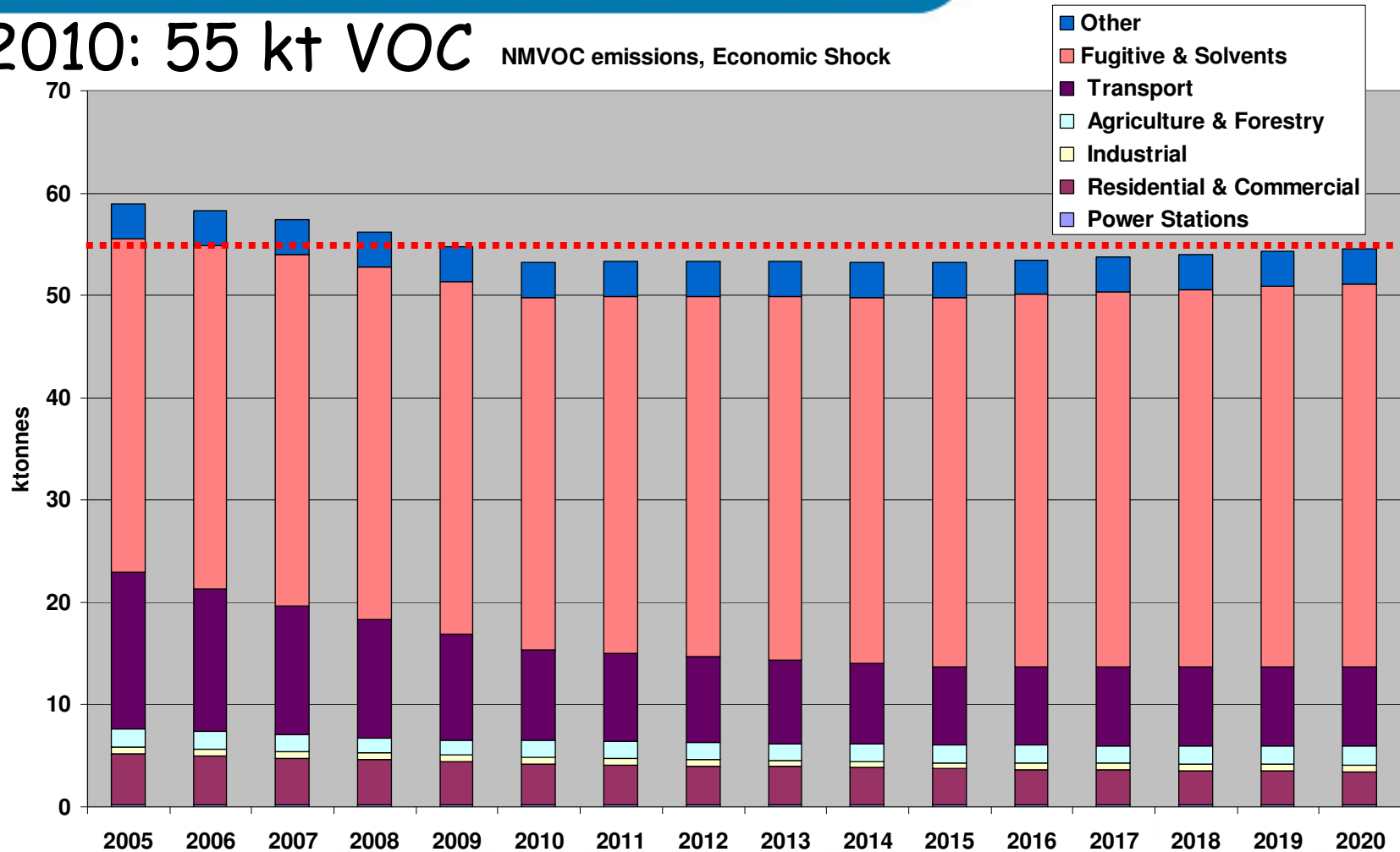


VOC projections, 2005-2020

(April 2009, unpublished)

NEC 2010: 55 kt VOC

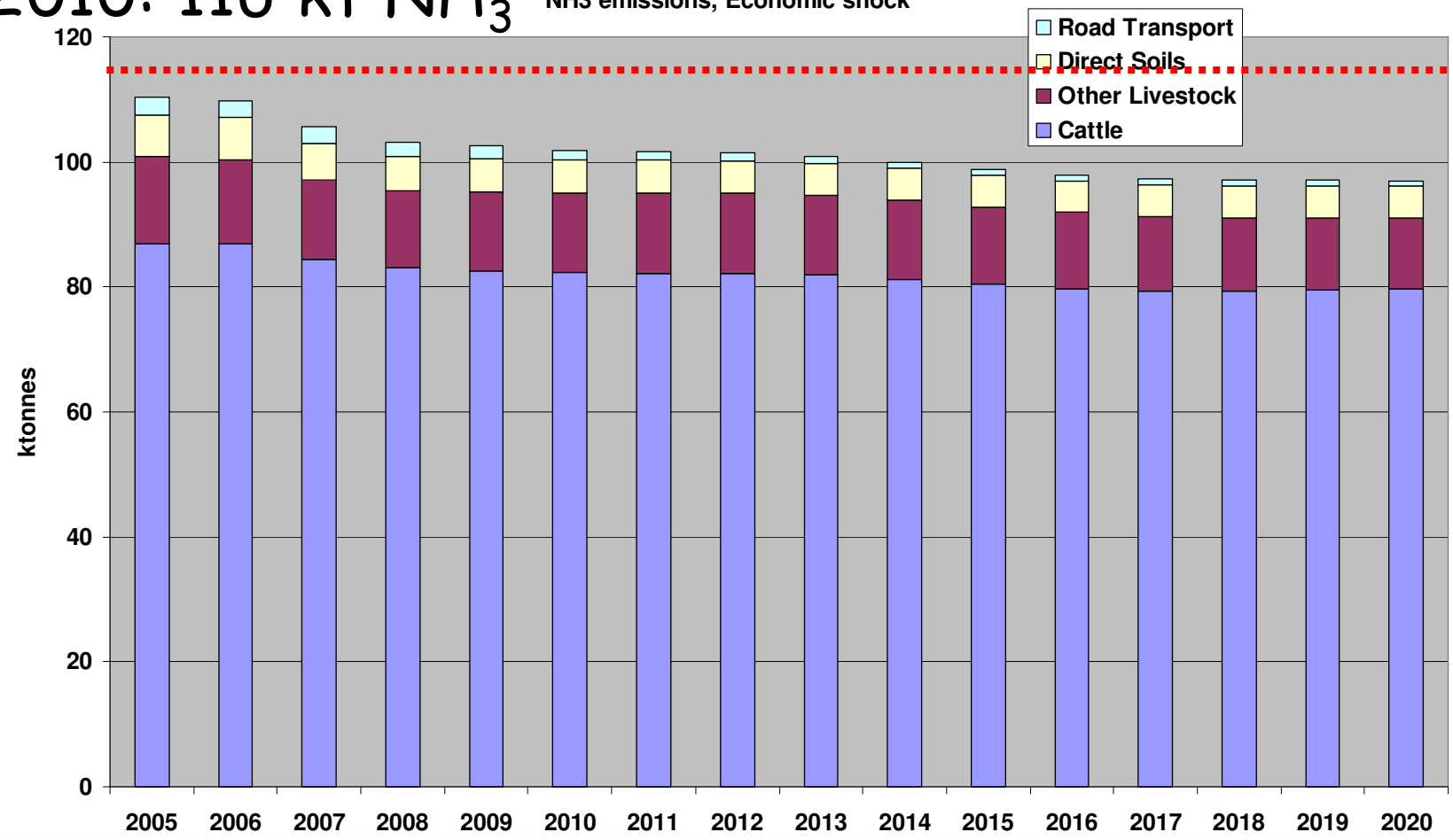
NM VOC emissions, Economic Shock



NH₃ projections, 2005-2020

(April 2009, unpublished)

NEC 2010: 116 kt NH₃ NH₃ emissions, Economic shock

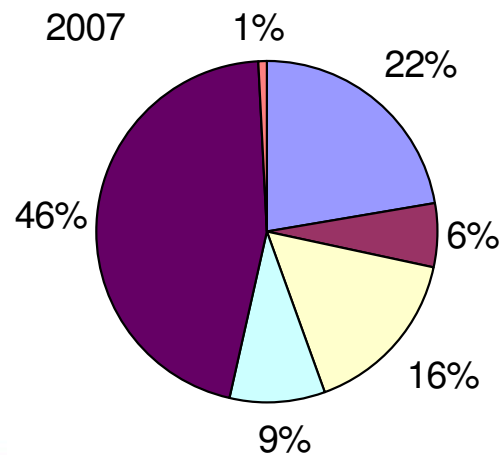
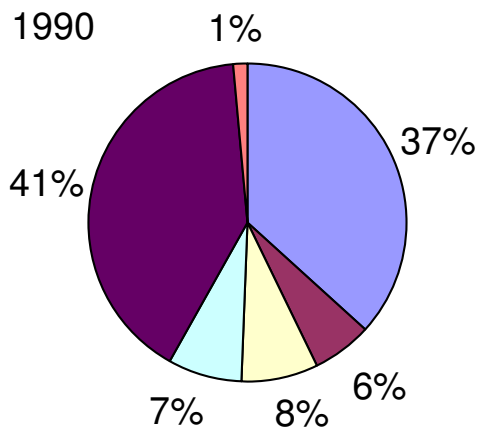


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NO_x inventories and projections

NEC 2010: 65 kt NO_x



NO _x / kt	1990	2007	
Power Generation	46.37	27.03	-42%
Residential & Commercial	7.78	7.33	-6%
Industrial	9.79	19.37	98%
Agriculture & Forestry	9.37	10.99	17%
Transport	51.28	55.21	8%
Other	1.61	0.98	-39%
Total	126.22	120.91	-4%

Agriculture / NH₃

“There are a lot of sheep in Ireland...”

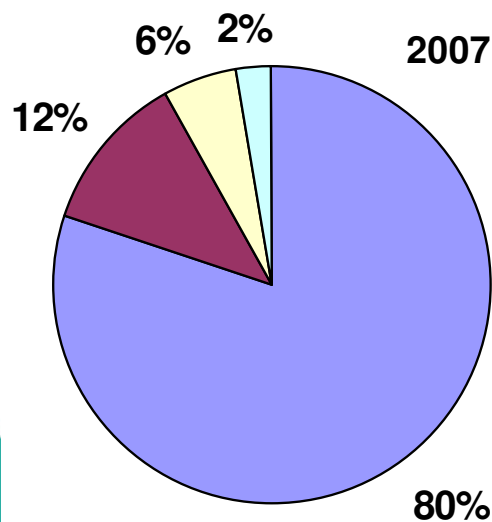
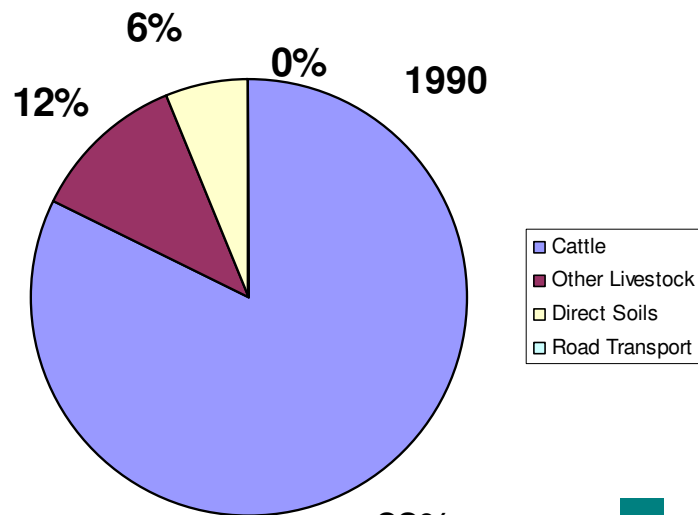


Agriculture / NH₃

"There are a lot of sheep in Ireland..."

Reality is that cattle outnumber sheep - and NH₃ emissions associated with cattle make up about 80% of NH₃ emissions.

NH₃ - Agriculture contribution



NEC 2010: 116 kt NH₃

NH ₃ / kt	1990	1999	2007
Cattle	90	100	84
Total	110	125	106

- Almost all NH₃ from agriculture
- 80% from cattle, very stable
- Further decrease for total NH₃ emissions projected

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Solvents and other product use

- i. Paint application
- ii. Degreasing and Dry Cleaning

Per capita emissions are assumed constant, thus growth in line with population growth.

- iii. Chemical Products
- iv. Other Solvent Uses

Per capita emissions were declining since 1990 - trend assumed to go forward.

Conclusions

- Consistency of inventories and projections
 - Emission factors
 - Same model (e.g. NH₃ agriculture, road traffic/COPERT)
- Consistency of projections with
 - National energy forecast
 - GHG projections
- NO_x target major challenge

Thank you