

# Socio-economic effects of options for further regulation of HFCs

Mikkel Aaman Sørensen

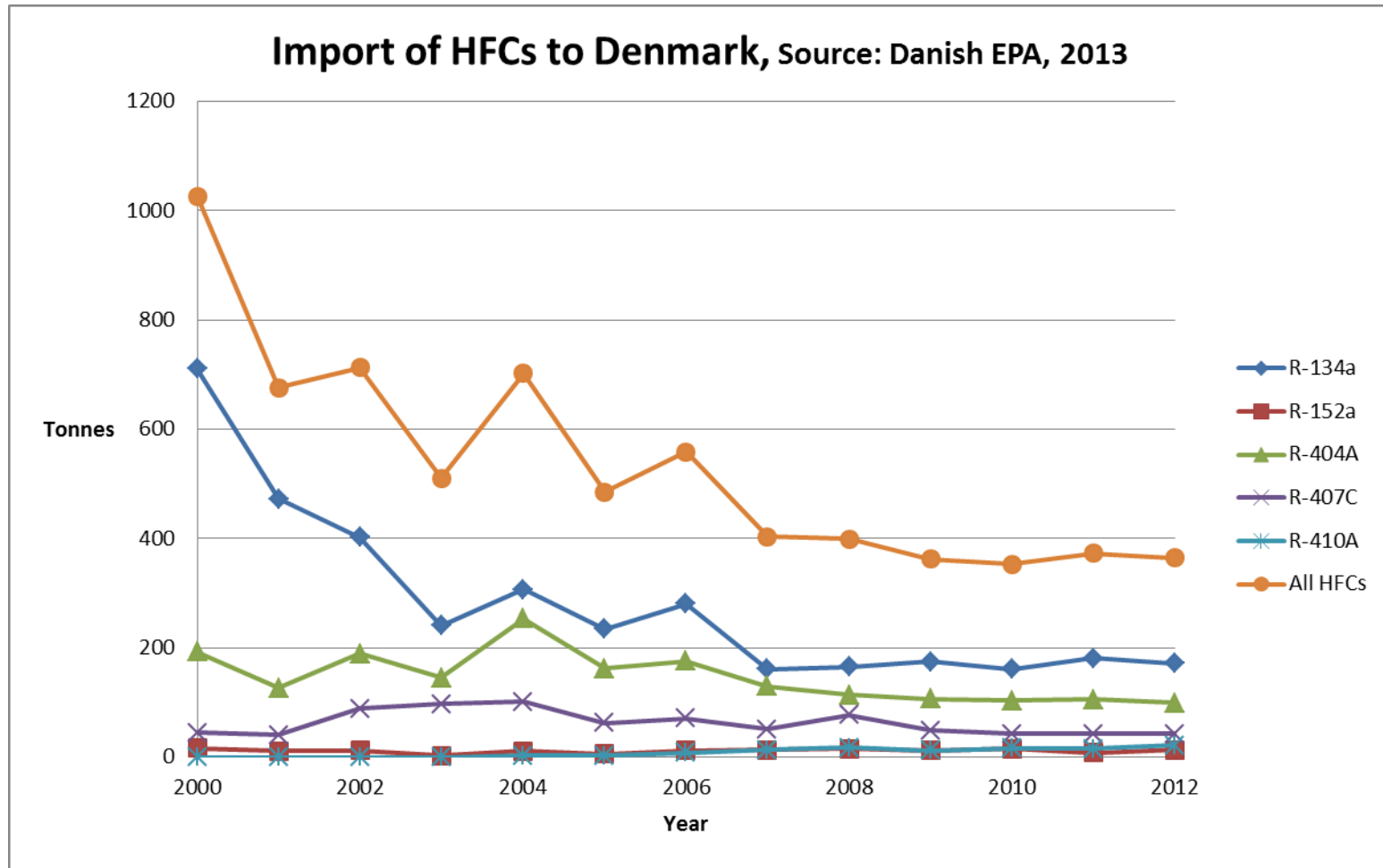
Danish EPA

---



Danish Ministry of the Environment  
Environmental Protection Agency

# Background



# Options for supplementary rules

- Size of legal equipment defined by charge size expressed in CO<sub>2</sub> EQ
- Service ban
- Low GWP refrigerants allowed



# Changing the 10 kgs rule

- Ban on equipment above 5 t CO<sub>2</sub> eq  $\approx$  1,3 kg R404 A
- Assumptions:
  - Effect especially on CDU'er and smal chillers
  - App. 5355 pieces of equipment installed each year
  - Twice as expensive for 5 years there after 10-30 %
  - Higher energy efficiency



# Socio-economic consequences

		2017	2018	2019	2020	2021	2022-2026	2027-2031	2032-2036	2037-2041	2042-2046
<b>Extra investments</b>	mio €	28	24	19	15	11	31	40	53	53	53
<b>savings</b>	mio €	-1	-3	-5	-6	-7	-59	-93	-152	-196	-202
<b>taxes</b>	mio €	-3	-3	-4	-4	-5	-32	-40	-51	-61	-62
<b>sum</b>	mio €	24	17	11	4	-1	-60	-93	-150	-204	-211

- Reduction in CO<sub>2</sub> equivalents: 3,95 mill t in 30 years
- Shadow price: -91 €/t CO<sub>2</sub>
- Lost tax revenue: 130 mill €.



# Service ban for refrigerants >2500 from 2024

- Assumptions:
  - 1.337 € additional cost for 1. service
  - R 407 app. 2 €/kg more expensive than R 404 (before tax)
  - No difference in energy efficiency
  - Recycled R 404 can be sold in Denmark



# Socio-economic consequences

		2024	2025	2026	2027	2028	2029
Extra investment	mill €	3,5	0	0	0	0	0
Running expenses	mill €	-0,4	0	0	0	0	0
Tax	mill €	-6,8	0	-0,5	0	0	0
Sum	mill €	-3,7	0	-0,5	0	0	0

- Reduction i CO<sub>2</sub> equivalents: 92.923 t (30 years)
- Shadowprice: app. 50 €/t CO<sub>2</sub>



# Allowing refrigerants with $GWP < 25$

- No negative economic consequences
- Maybe a problem because of formation of TFA





# Price of refrigerants

Year	R407	R404 A
	€/kg	€/kg
2016	31,2	45,5
2018	33,6	50,6
2020	36,4	56,5
2022	39,7	63,5
2024	43,5	71,6
2026	47,9	81,1
2028	53,1	92,1
2030	59,2	105,0

refrigerant	units	Tax
R404A	€/kg	78,6
R407	€/kg	36,6



