Vattenfall's Climate Map

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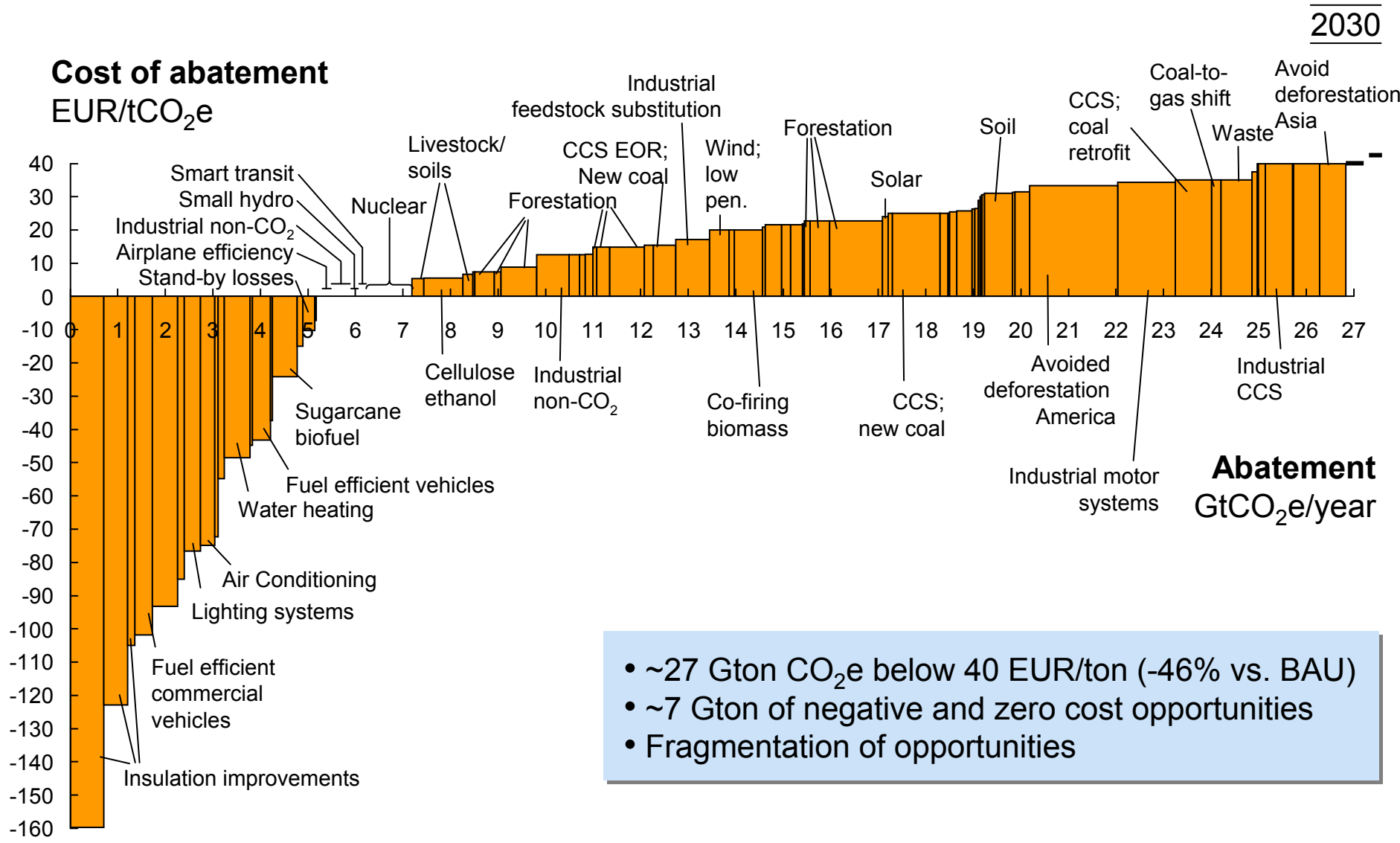
VATTENFALL

Stabilization is possible at limited costs – markets can supply



- ~27 Gton CO_2e below 40 EUR/ton (-46% vs. BAU)
- ~7 Gton of negative and zero cost opportunities
- Fragmentation of opportunities

All sectors and regions will have to contribute to emissions reductions – global cooperation is key to the low carbon economy

$GtCO_2e$, 2030

	Regions						
Sector	**US + Canada**	**OECD Europe**	**Eastern Europe** (incl. Russia)	**Other Industrial***	**China**	**Rest of world****	**Total**
Power	1.3	0.8	0.3	0.7	1.7	1.0	**5.9**
Industrial	0.8	0.6	0.7	0.8	1.5	1.5	**6.0**
Transportation	1.2	0.5	0.1	0.4	0.3	0.4	**2.8**
Buildings	0.8	0.5	0.4	0.5	0.7	0.8	**3.7**
Forestry	0.2	0	0	0	0	6.5	**6.7**
Agriculture	0.2	0.1	0.1	0.1	0.3	0.8	**1.5**
Total	**4.4**	**2.5**	**1.6**	**2.5**	**4.6**	**11.1**	**26.7**

* Australia, New Zealand, Japan, Singapore, South Korea, Taiwan, UAE, Saudi Arabia, Qatar, Oman, Kuwait, Israel, Bahrain, Mexico
** Africa, South and Central America excl. Mexico, Asia excl. China and countries included in “Other industrialized” (see previous note)

Split of opportunities according to abatement cost

$GtCO_2e$, 2030

Abatement cost EUR/t CO_2e	Regions: US + Canada	OECD Europe	Other Industrial*	Eastern Europe (incl. Russia)	China	Rest of World**	Total
≤0	1.5	1.1	1.0	0.7	1.0	1.8	**7.1**
0–20	1.2	0.5	0.5	0.3	1.2	3.4	**7.1**
20–40	1.6	0.9	1.1	0.6	2.4	5.9	**12.5**
Total	**4.3**	**2.5**	**2.6**	**1.6**	**4.6**	**11.1**	**26.7**

- ~50% of negative cost opportunities are in industrialized world (buildings, transportation)
- ~40 % of 20–40 EUR/ton opportunities are in Rest of the World, largely driven by forestry opportunities

* Australia, New Zealand, Japan, Singapore, South Korea, Taiwan, UAE, Saudi Arabia, Qatar, Oman, Kuwait, Israel, Bahrain, Mexico
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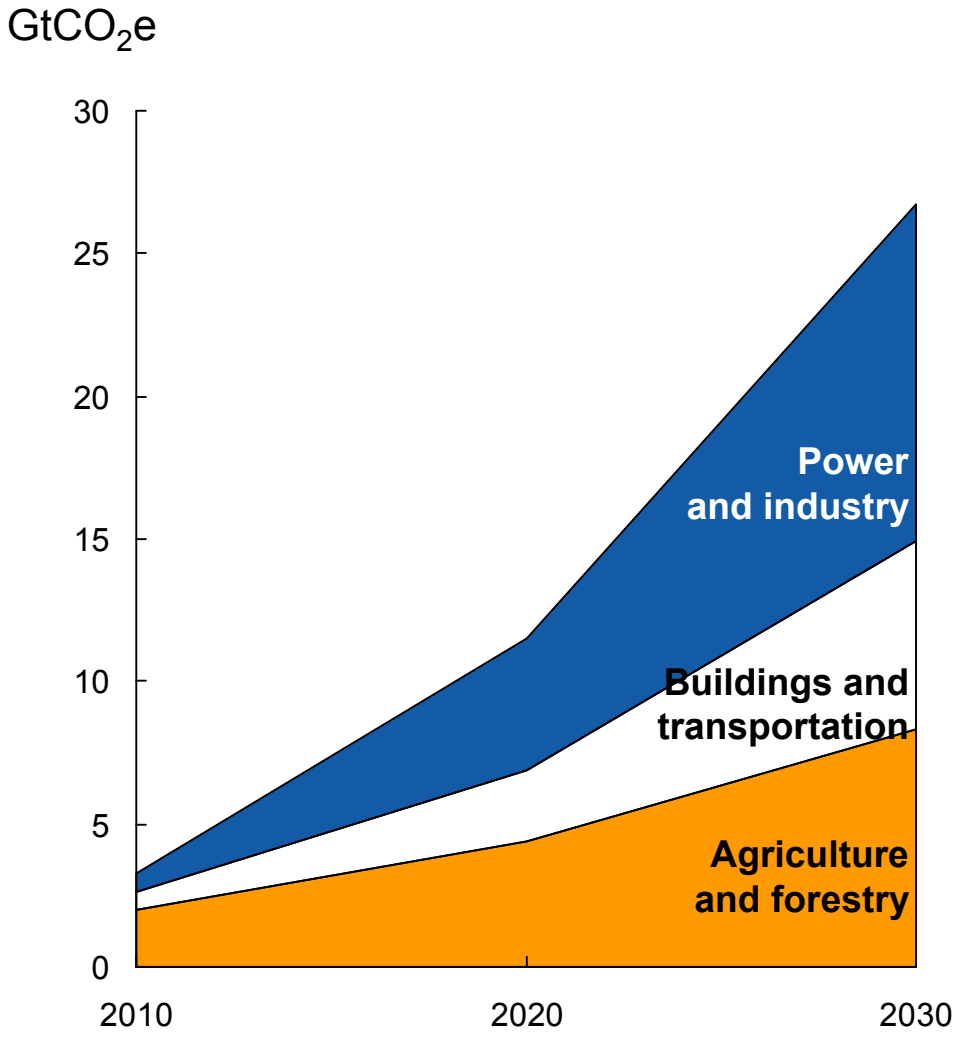
Development of abatement potential over time



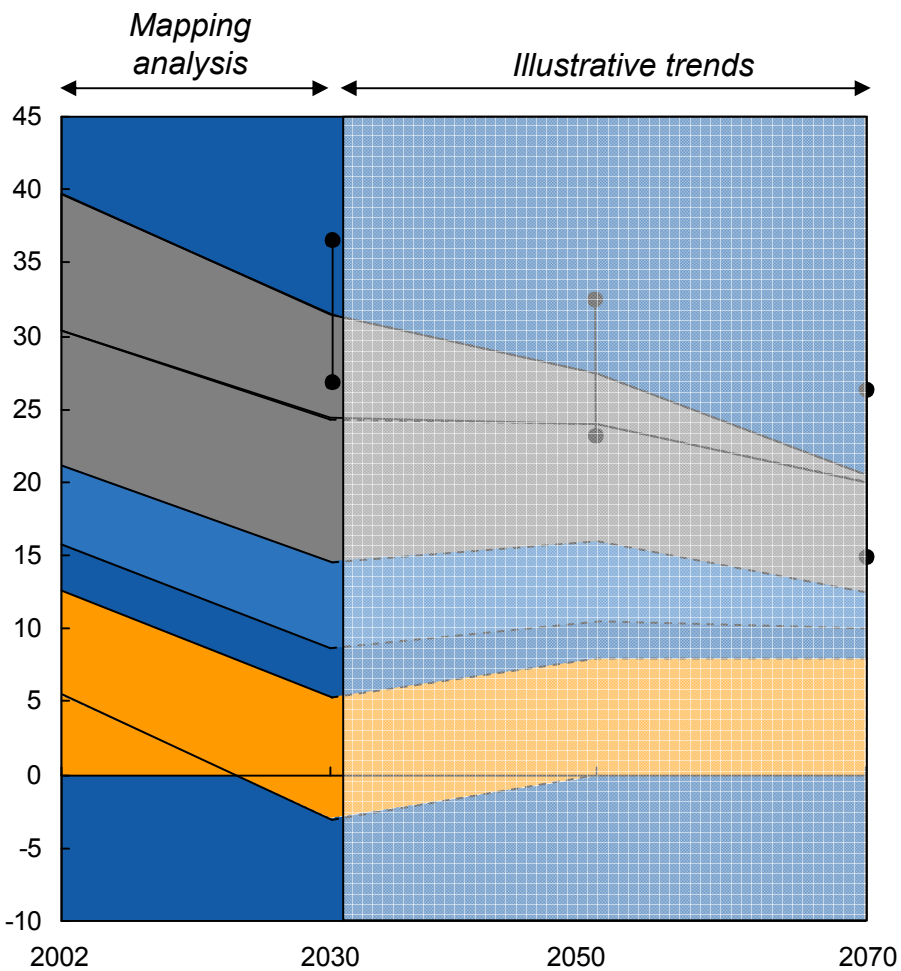
- Smallest relative potential in 2010, largest 2030
- Lead-time driven by stock turnover and technological development
- Annual growth rate 20% in 2010–20 and 10% in 2020–30

- 20–25% of total potential from 2010 to 2030
- Lead time driven by stock turnover
- Annual growth rate 15% in 2010–20 and 10% in 2020–2030

- Large initial potential from forestry – no stock turnover required
- Low growth rate, in particular in agriculture
- Annual growth rate of 6-8% in 2010–30

Possible long-term development of emissions per sector – illustrative trends

$GtCO_2e$ per year



Emissions to maintain 450 ppm CO_2, Gt CO_2e

Potential long term trends

- **Power: Zero;** long term if all fossil fuel plants are equipped with CCS
- **Industry: stable;** reduction at large emitters (e.g., via CCS) balanced by new, small emitters
- **Transport: stable/decreasing;** more bio fuels, hybrids and plug-ins balance increased transportation need
- **Buildings: stable;** efficiency improvements balance population growth, further reduction through electrification
- **Agriculture/Waste: stable;** improvements in carbon efficiency balance population increase
- **Forestry: zero;** deforestation and forestation reaches equilibrium

Conclusions

- Emissions can be reduced substantially
- The abatement potential is well distributed over sectors and regions
- Global cooperation needed to realize potentials
- Price signals are of crucial importance
- “Lubricating measures” needed in some sectors
- Total cost limited
- Speed up learning curves

Implementation - Leadership is key