Finnish modelling experiences regarding NEC and MCP directives

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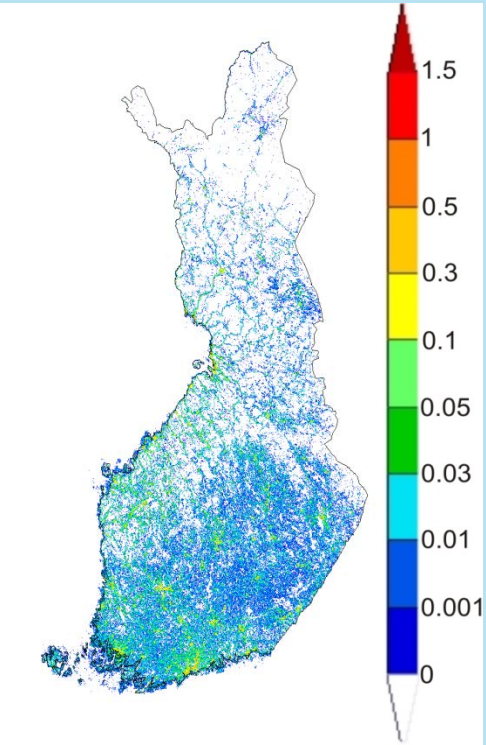
FRES (Finnish Regional Emission Scenarios) model

- Comprehensive and congruent calculation for primary PM and gases
  - primary PM (TSP, $PM_{10\ -\ 2.5\ -\ 1\ -\ 0.1}$, chemical composition, incl. BC/OC/sulfates)
  - SO_2, NO_x, NH_3, NMVOCs
  - GHGs
- Abatement technologies and costs
- Aggregation: 154 sectors, 15 fuels (GAINS compatible)
- **Large point sources (>200),**
  small point sources (> 200),
  area emissions (1 × 1km)
- **RWC emission calculation includes 14 appliance types, emission factors based on measurements by the University of Eastern Finland**
- Dispersion with s-r matrices (10 × 10km^2 and 1 × 1km^2)
- Several emission heights
- Databases of population and critical loads
- LRT from EMEP



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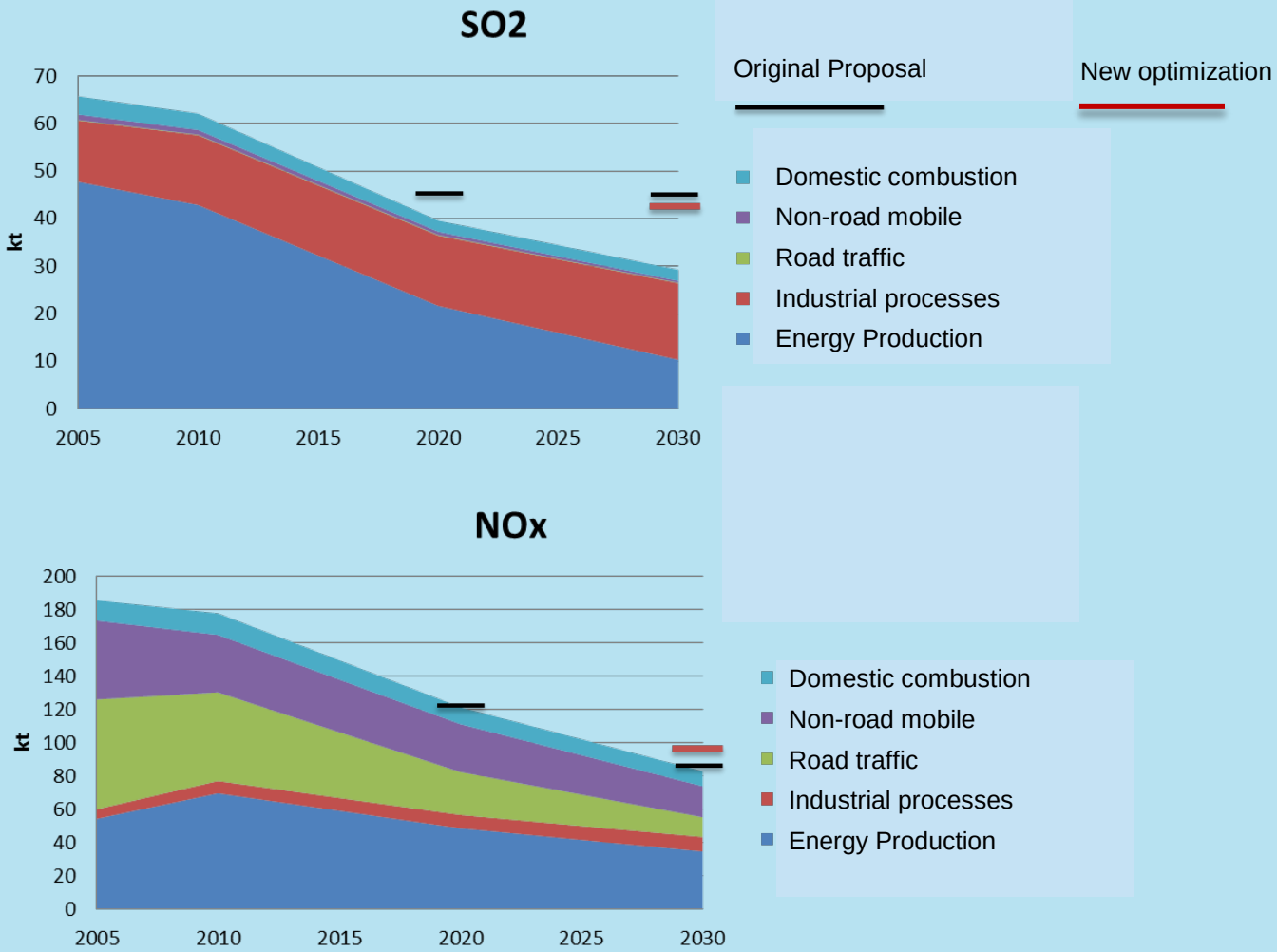
Emissions in CLE



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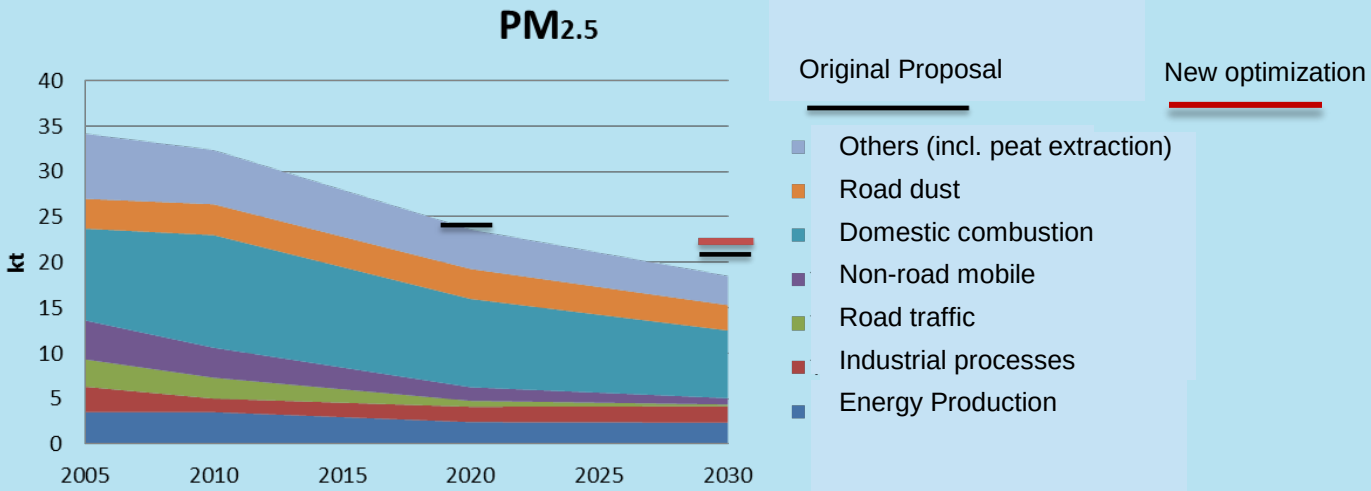
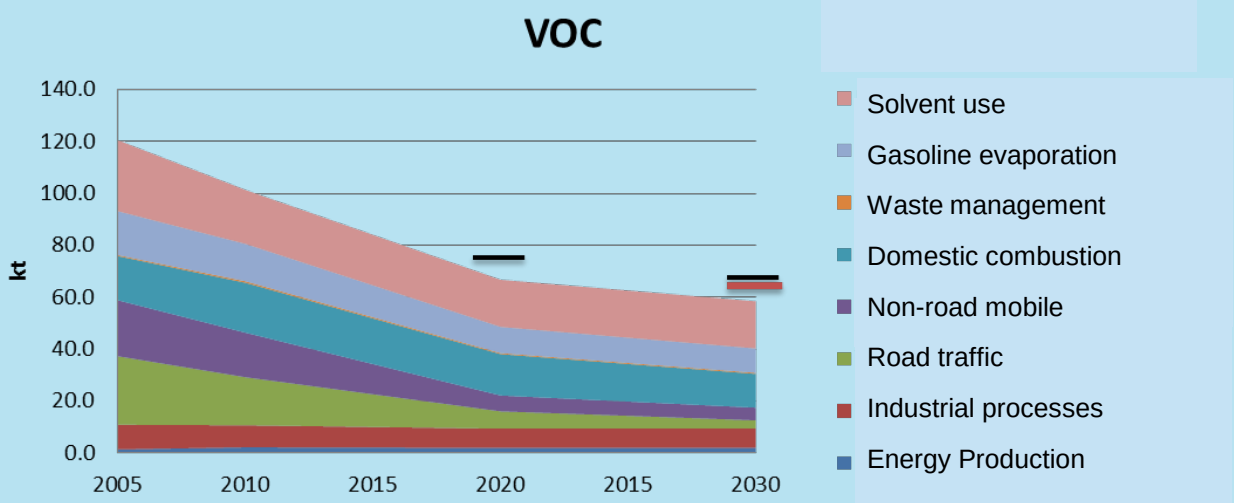
Emissions in CLE





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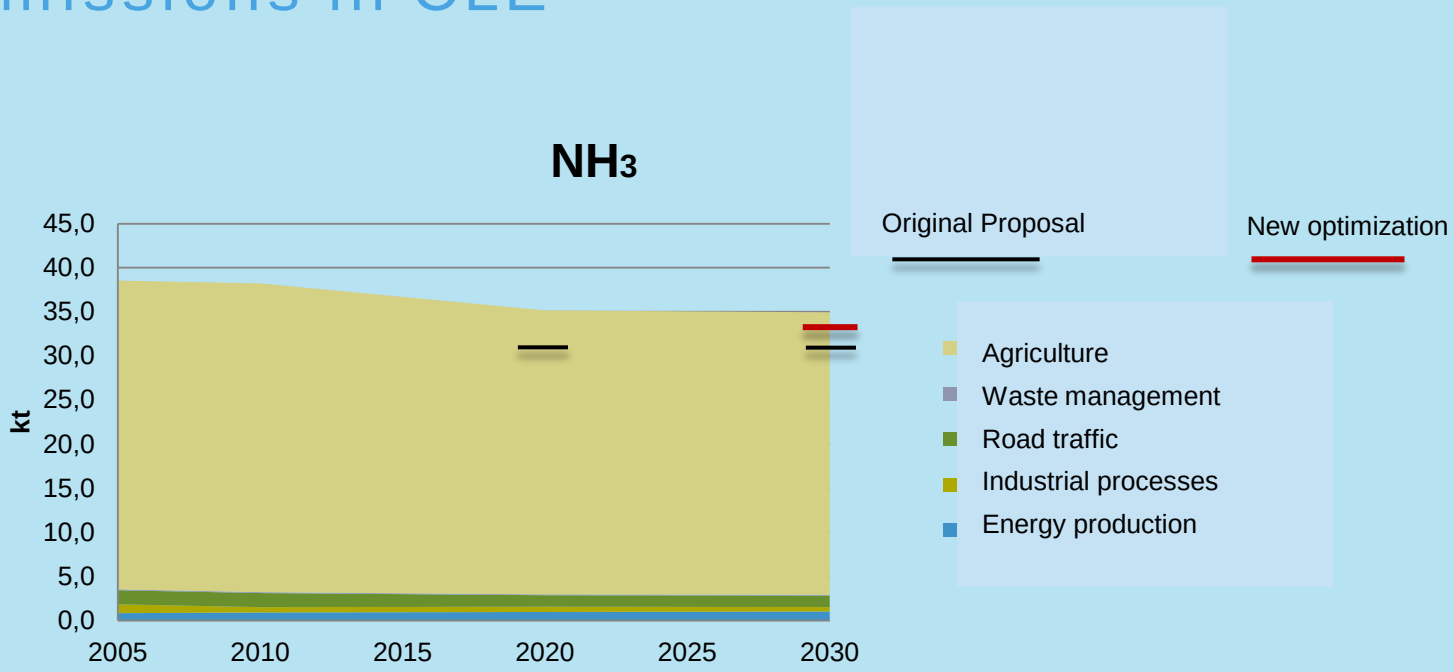
Emissions in CLE



- 20% reductions needed by 2020, baseline gives 8%
- 90% of emissions from agriculture
- Reduction measures available (SYKE study, Juha Grönroos)
  - Decreasing or stopping additional protein feed to young cattle and dairy cows
  - Improved methods in spreading the manure on fields
  - Covering slurry storages with floating covers at minimum and urine tanks with tight roofs
- Possible to achieve 24% reductions by 2020 at the cost of 4.2 M€/a

Will be higher after update

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Sensitivity study on energy sector

- 3 scenarios in addition to baseline
  - PRIMES
    - More coal, less gas
  - Low carbon
    - -80 % CO2 2005-2050
    - Similar to baseline but less total energy use (mostly from gas)
  - Max carbon
    - More coal, peat and oil, less gas and nuclear

	2030
	SO_2
NEC Goal	**-34 %**
Baseline	-56 %
PRIMES	-48 %
Low carbon	-52 %
Max carbon	-35 %

- Conclusions
  - Activity pathway for energy sector influences SO2 emissions, but the goal is not very ambitious
  - NOx emission less sensitive to activity changes, implementation of IED is key
  - Changes in PM2.5 mostly from peat production

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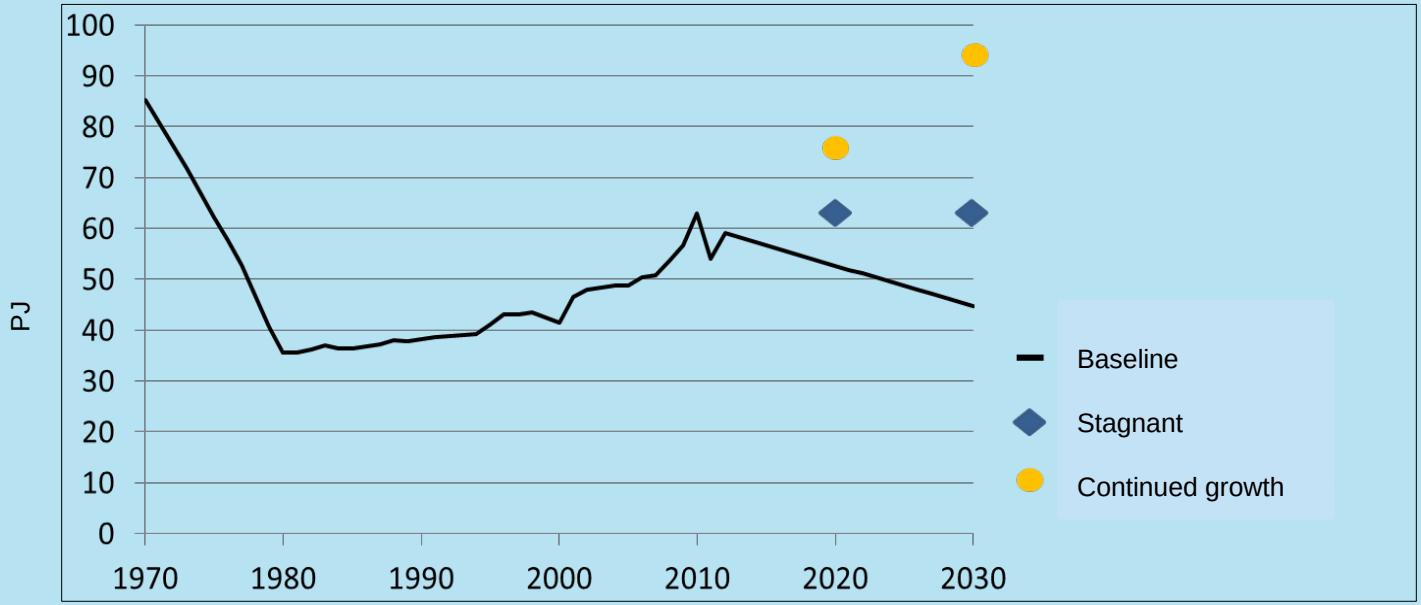
Sensitivity study on residential wood combustion 1/2

- Decreasing activity in national and PRIMES projections
- Statistics disagree
- Two scenarios in addition to baseline



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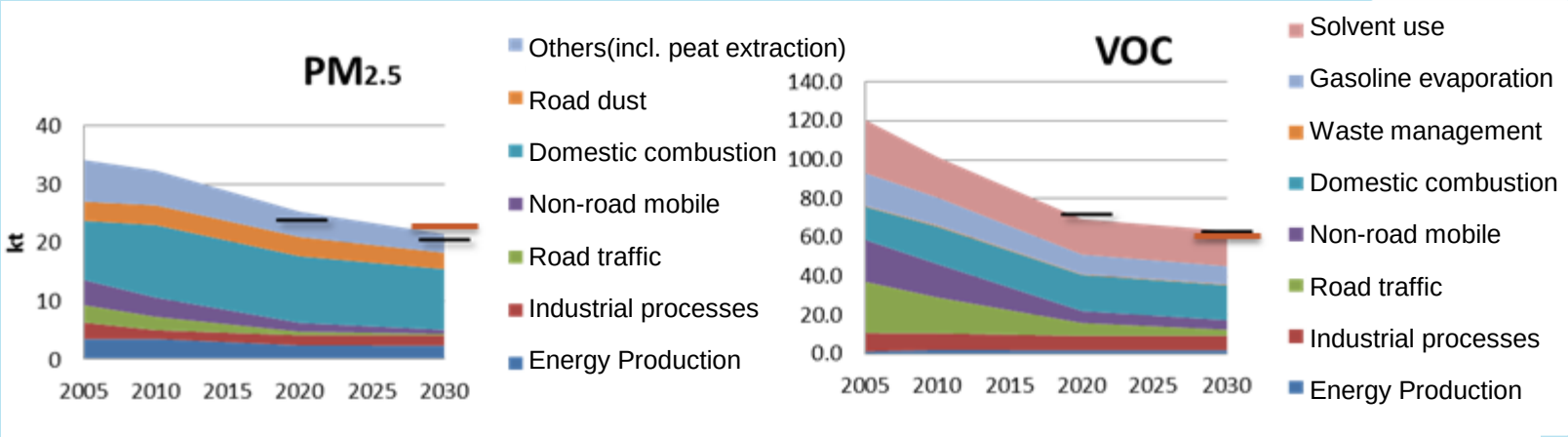
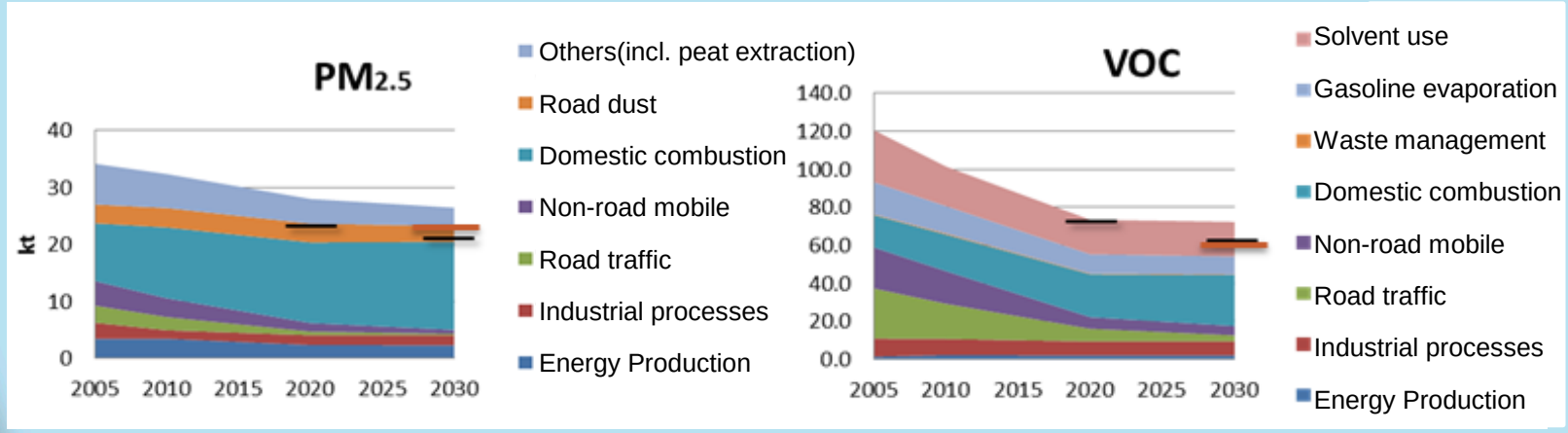
Sensitivity study on residential wood combustion 2/2

Stagnant



Continued growth



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Emission reductions in RWC

- Study by SYKE

Measures, PM2.5 reduction potentials and costs in 2030

Measure	Reduction potential (total RWC emissions)	Cost M€/a	Cost efficiency (reduced emissions)	Cost efficiency (reduced health impacts)
Ecodesign	- 6 %	14		
Legislation for sauna stoves	- 20 %	22		
Informational campaign	< - 8 %	0.3		
ESPs to boilers and banning the use of log boilers without an accumulator tank	- 17 %	44		

- Legislation on new appliances slow to effect, but it's a step into the right direction

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MCP directive

- EC estimates for Finland
  - Number of plants: 409
  - Compliance costs: 3 M€/a (SO2), 2.3 M€/a (NOx), 1.3 M€/a (PM)
- National database was improved with inquiries to municipalites
  - Results show that the number of plants is 1400
  - Mostly biomass, HFO and gas
  - Mostly 1-5 MW
- Impact assessment by SYKE (on General approach)
  - 1117 plants included
  - PM limits in small plants the biggest change to CLE
  - ~600 new installations required, of which 2/3 in solid fuel plants
  - Reduction potentials: ~0.4 kt (SO2), 0.5-1 kt (NOx), 0.7 kt (PM2.5)
  - Compliance costs: ? (SO2), <2.3 M€/a (NOx), 14 M€/a (PM)
- Resistance expected

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Conclusions

- Agriculture, traffic and residential wood combustion in key role
- Additional measures needed for agricultural NH3 emissions and likely for RWC
- Impact of Ecodesign relatively small by 2030, other measures available for RWC
  - Informational campaigns seem to be very cost-efficient and worth doing in any case
  - Biggest reduction potential in sauna stoves
- Implications of MCP bigger than estimated by the commission

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Thank you

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