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ENVIRONMENTAL SCIENCE FOR THE EUROPEAN REFINING INDUSTRY

Integrated Assessment Modelling
A Powerful Framework to Account for 'Uncertainties' in AQ Policy Development

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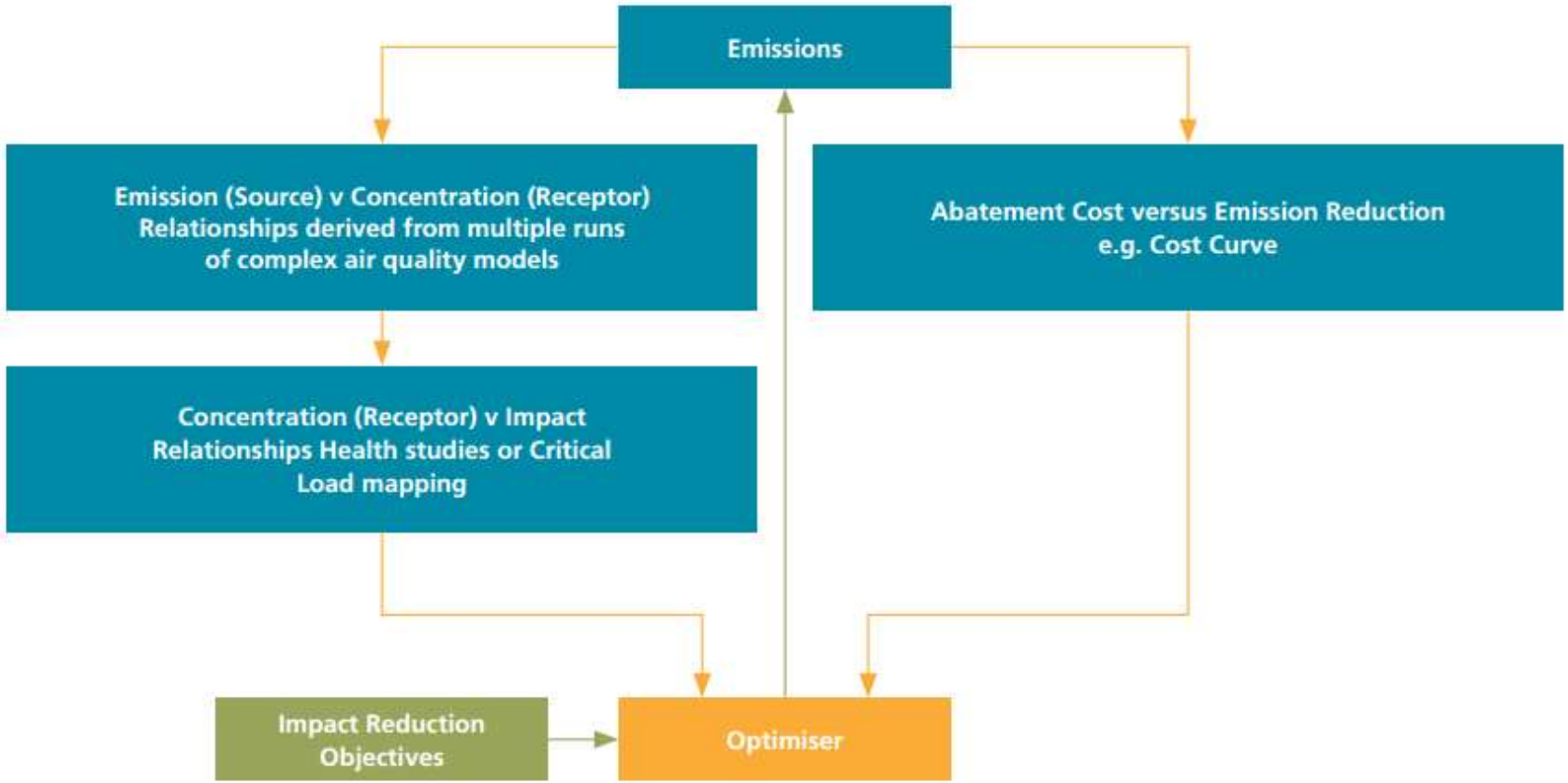
Integrated Assessment Modelling

Simplified Integrated Assessment Modelling Framework

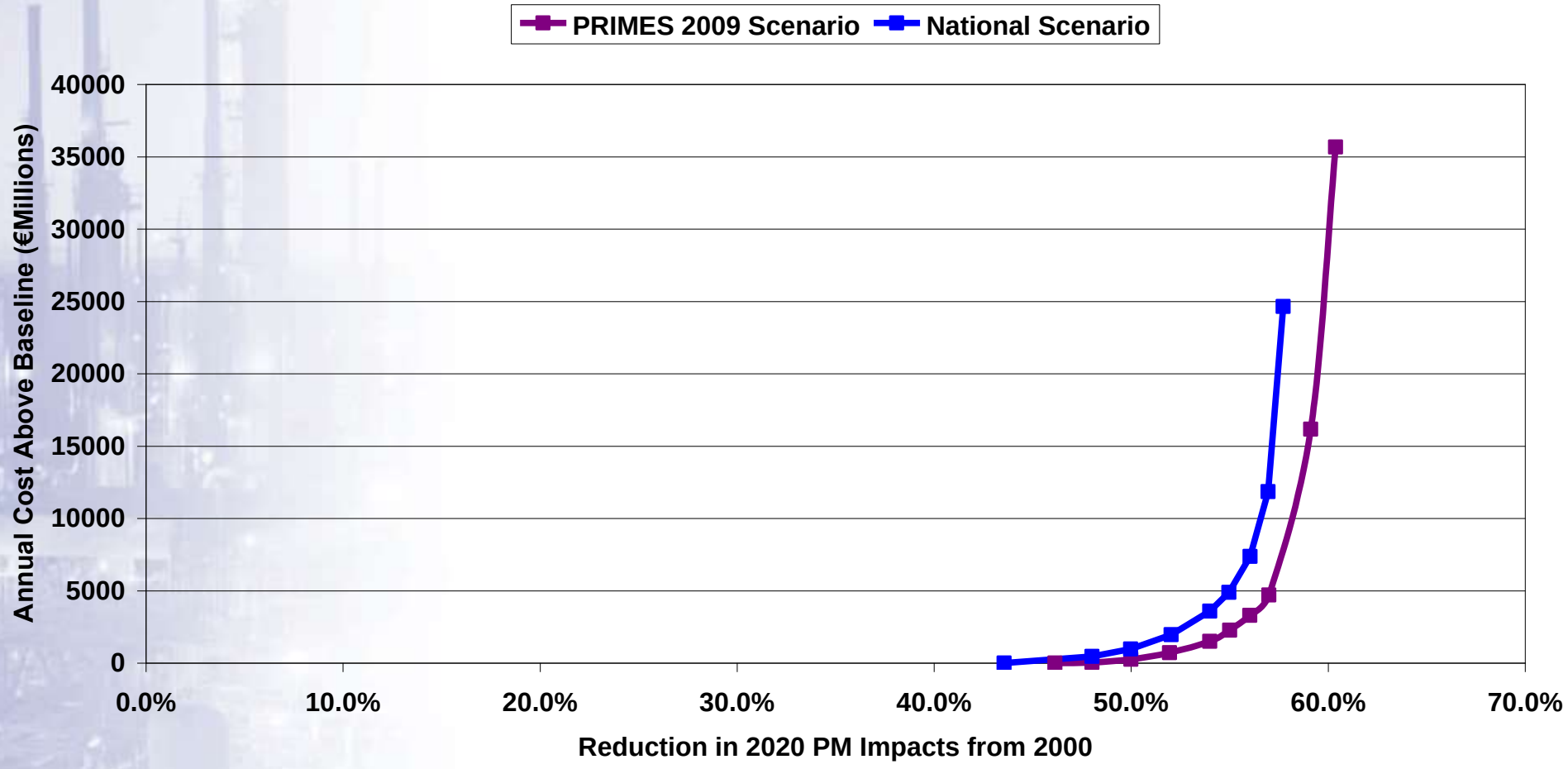


Introduction

- In principle Integrated Assessment Modelling (IAM) provides an ideal framework for designing 'target driven' policies using the principles of sound science and cost-effectiveness
- The approach offers policy makers a means of connecting the increasingly complex science of air quality to practical policy
- Policy making, if it is to be robust, needs to account for 'uncertainties' e.g. in the science or in the structure of the 'future world' it is designed to address
- IAM provides a powerful means of exploring such uncertainties and directly expressing their influence in policy relevant terms
- Want to illustrate this with three examples explored and shared during the recent Air Policy Review process:
  - Policy for a range of possible energy scenarios
  - Policy vulnerability to under-delivery of sector specific measures (e.g. Euro VI)
  - Policy benefit of more fully accounting for short lived climate forcers

1: Policy should account for a range of possible future energy worlds (1)

EU-27 PM Impacts Improvement in 2020 versus Annual Cost Above Baseline: Comparison of National and PRIMES Scenarios Developed for Revision of Gothenburg Protocol



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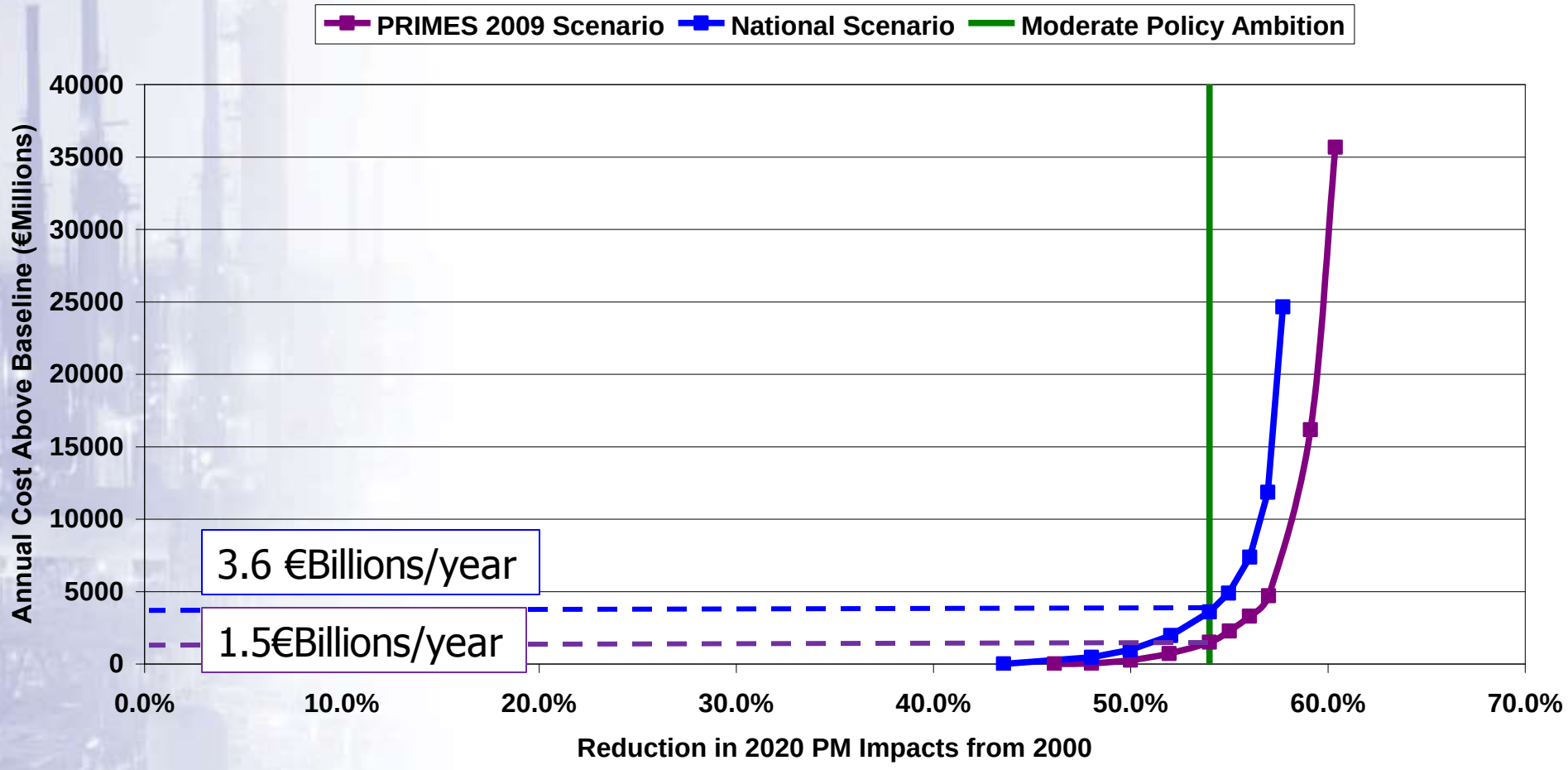

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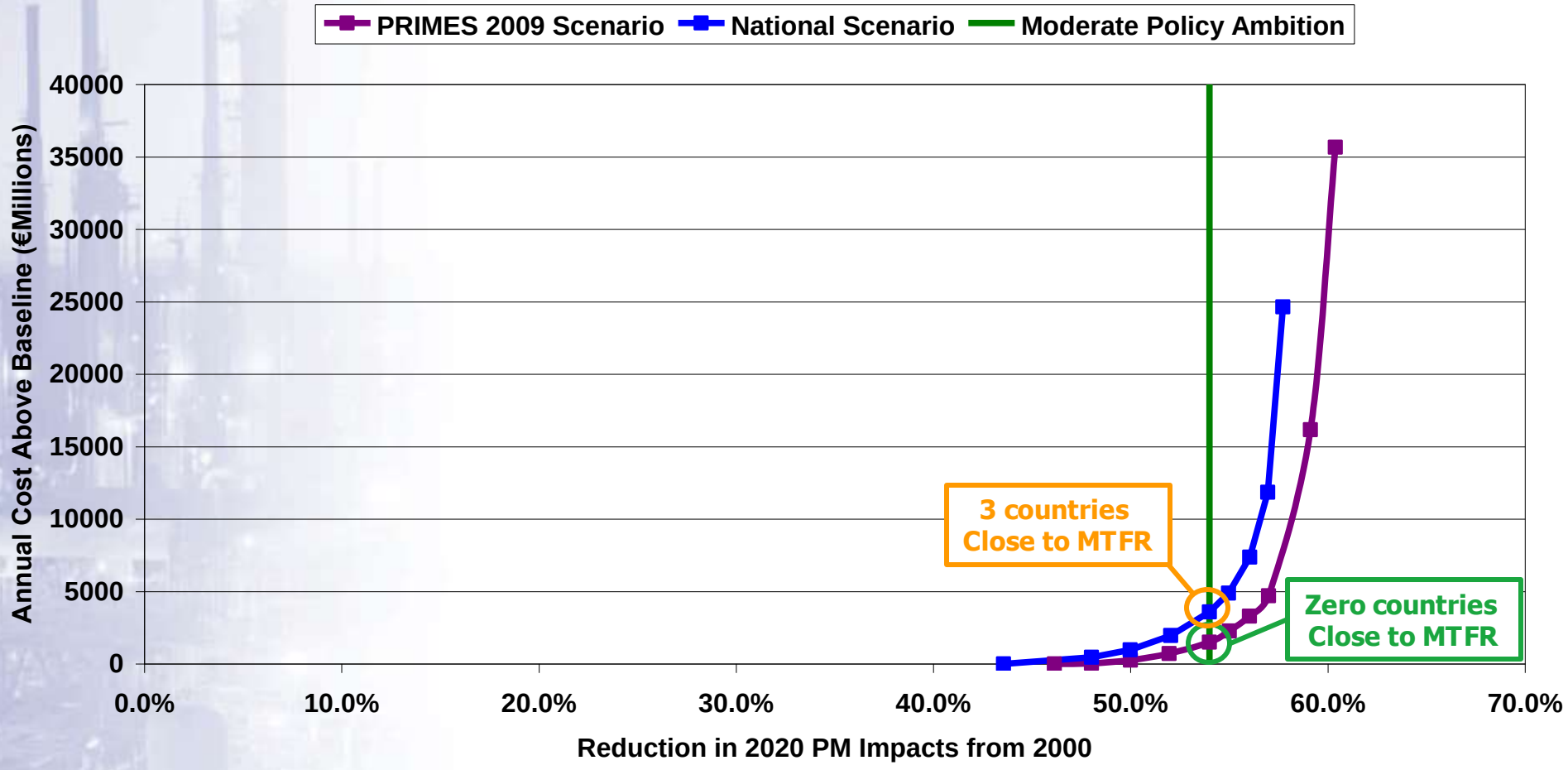

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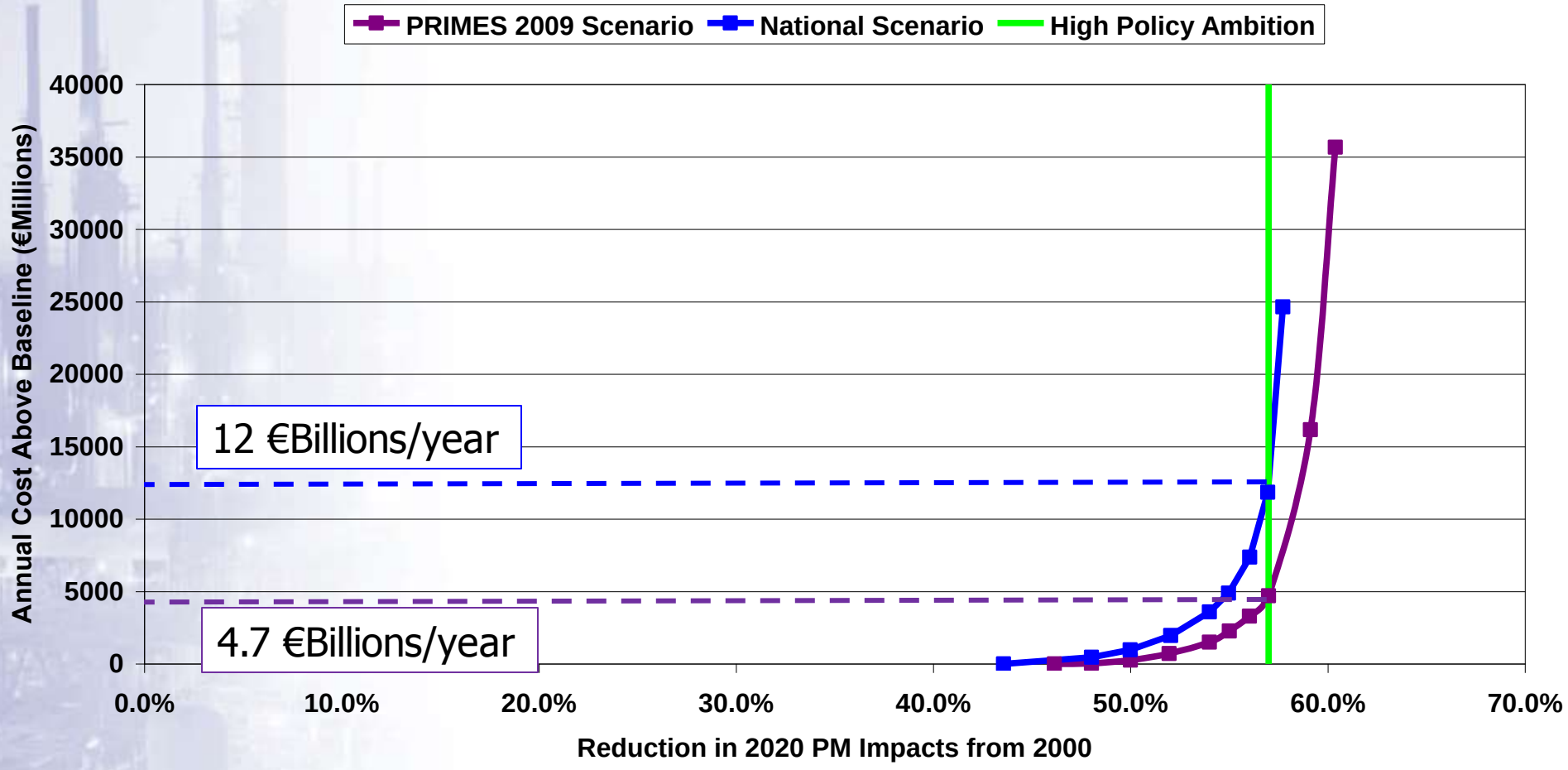

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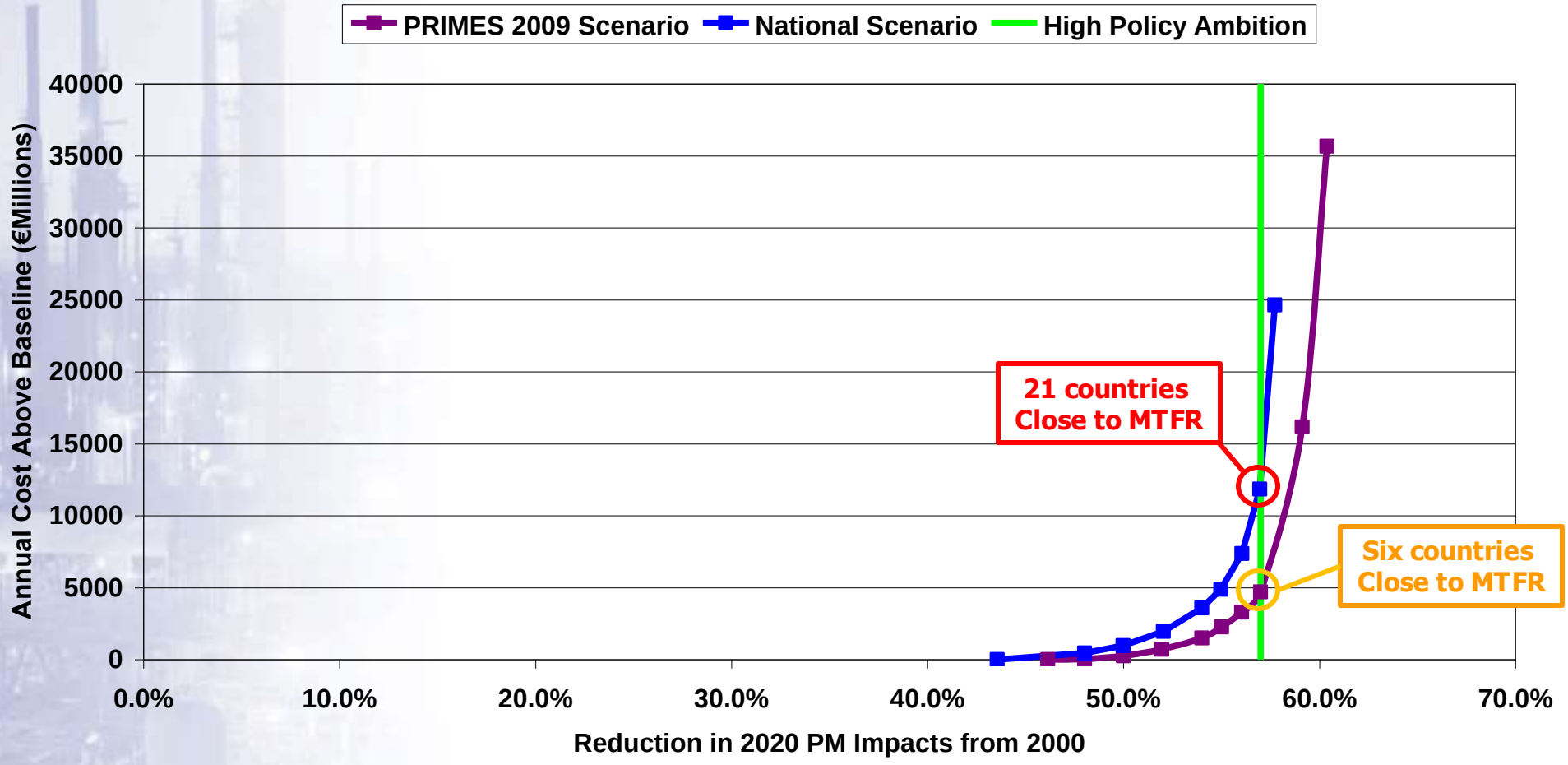
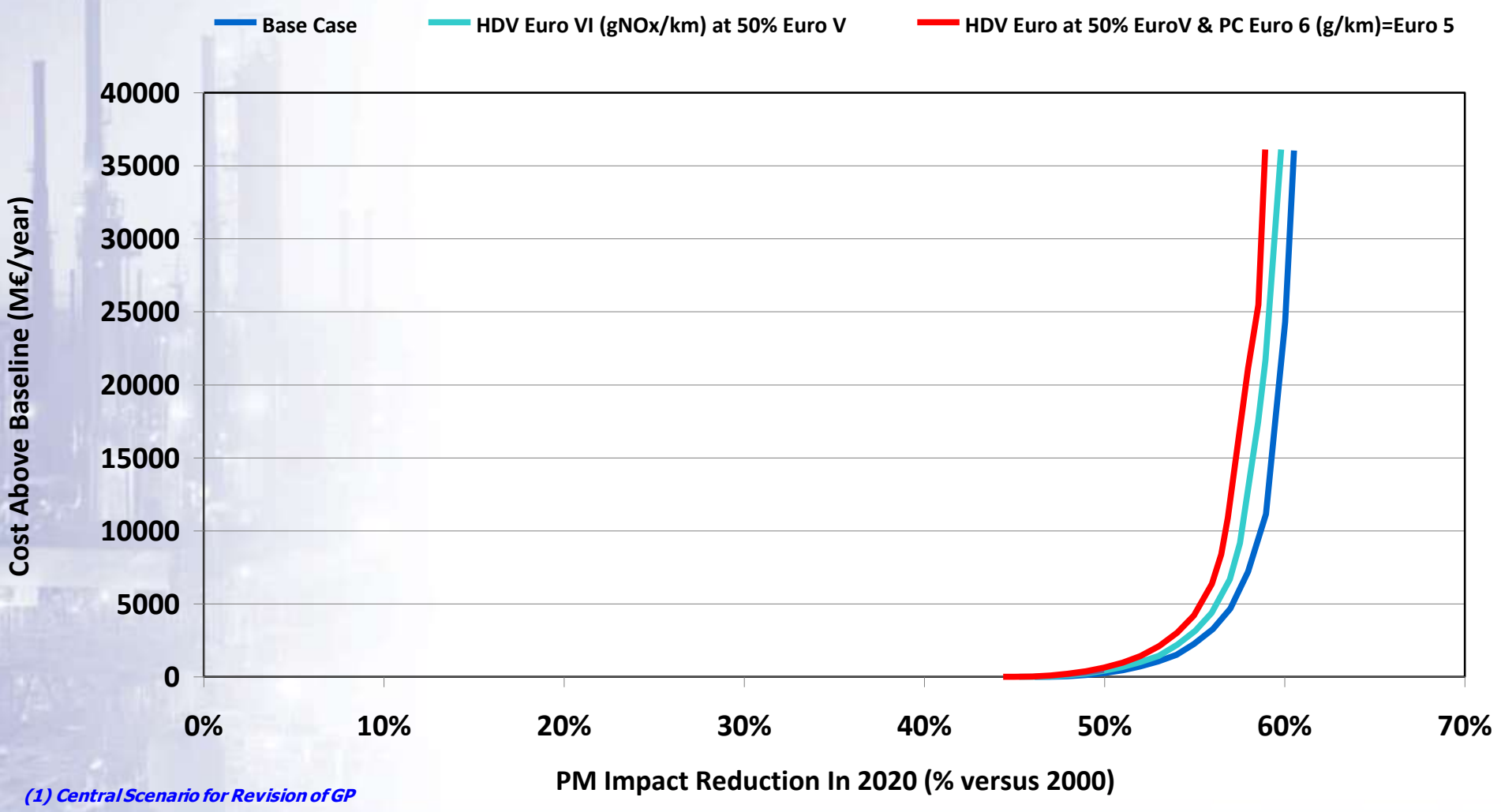


2: Policy is more vulnerable to under-delivery of sector specific measures at high ambition levels (1)

EU-27 PM Impacts Improvement in 2020 versus Annual Cost Above Baseline: Euro VI/6 Sensitivity Scenarios Around PRIMES 09(1) Base Case)



(1) Central Scenario for Revision of GP

2: Policy is more vulnerable to under-delivery of sector specific measures at high ambition levels (2)

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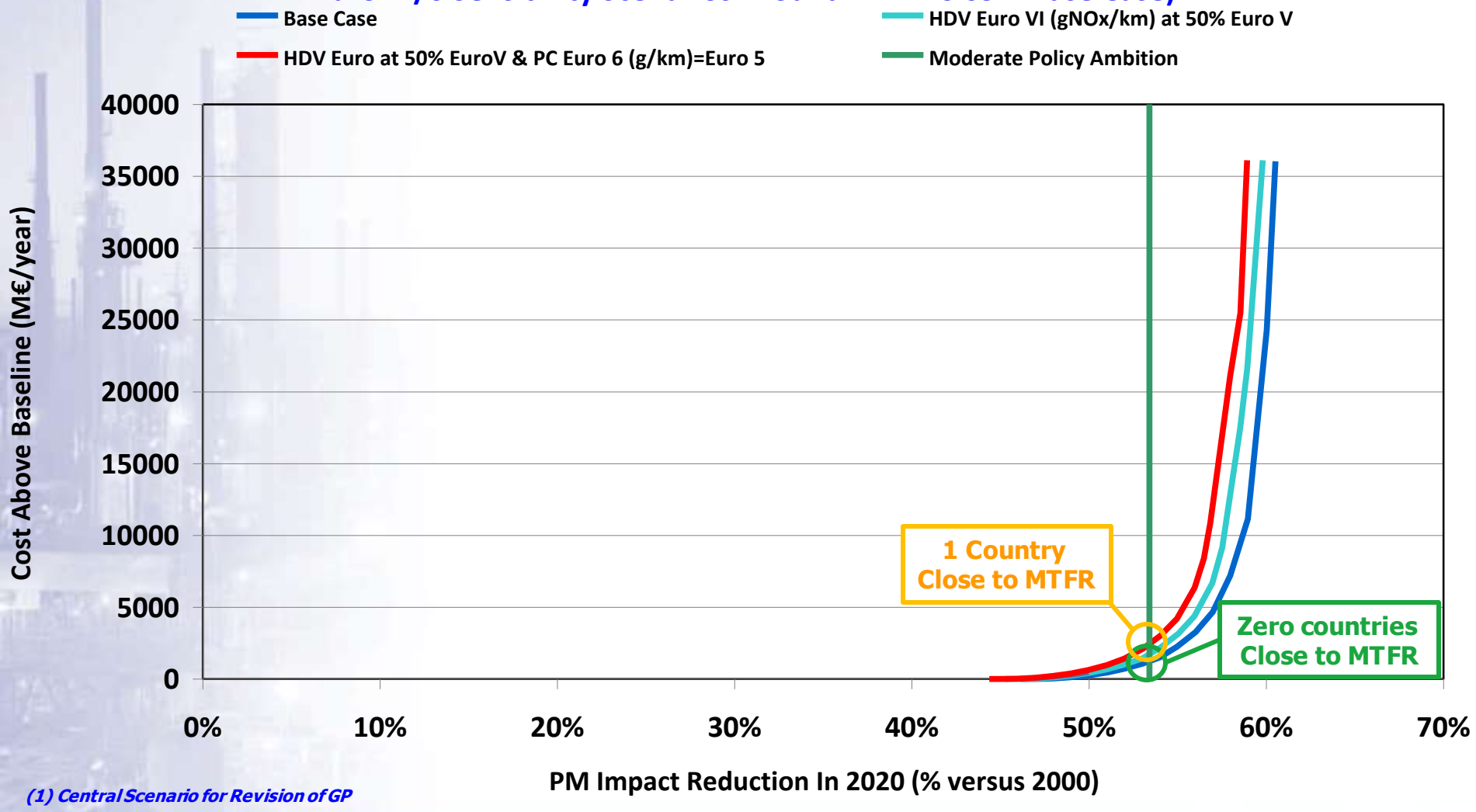

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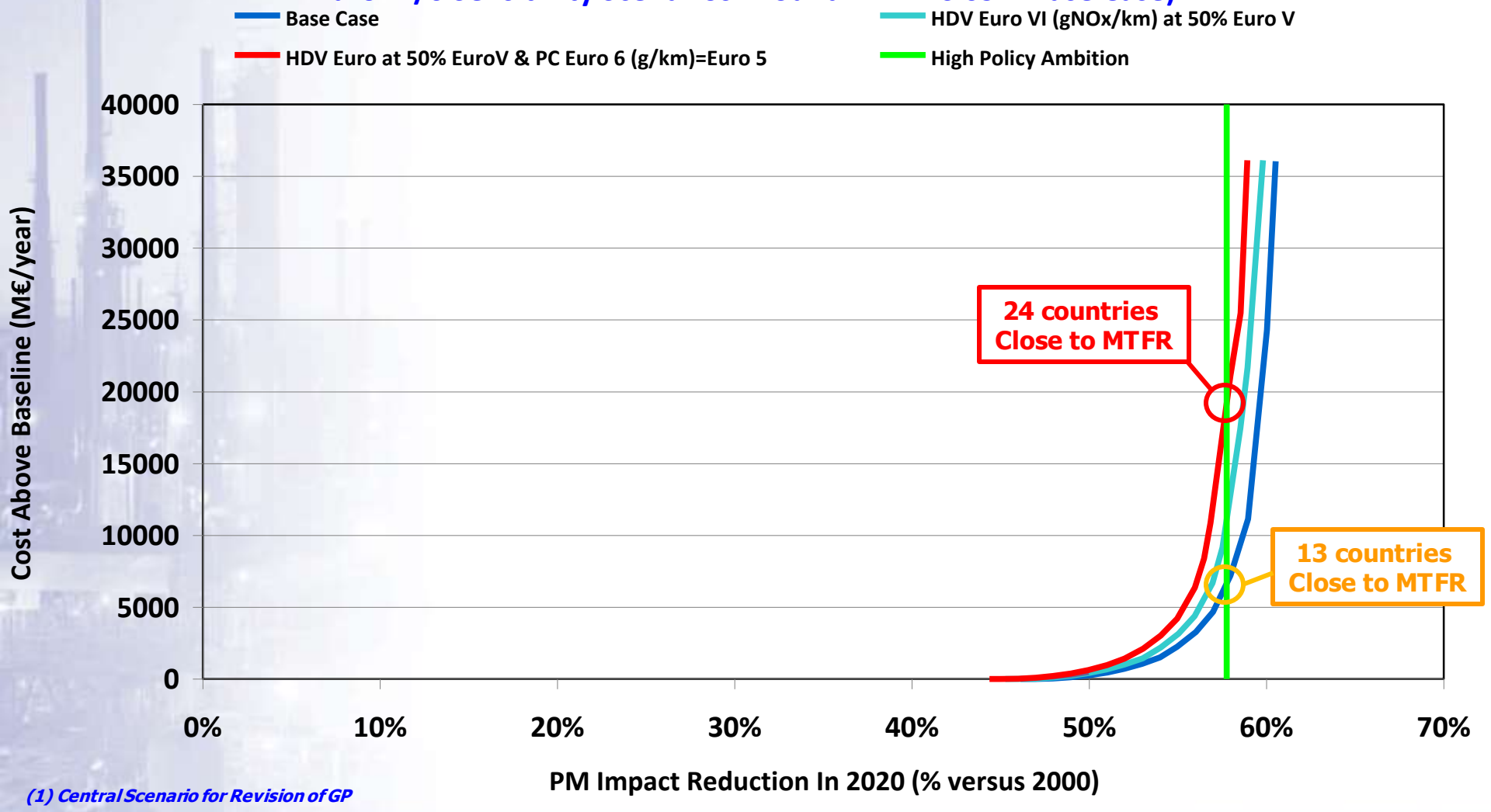


(1) Central Scenario for Revision of GP

Short Lived Climate Forcers (SLCF) in IAM

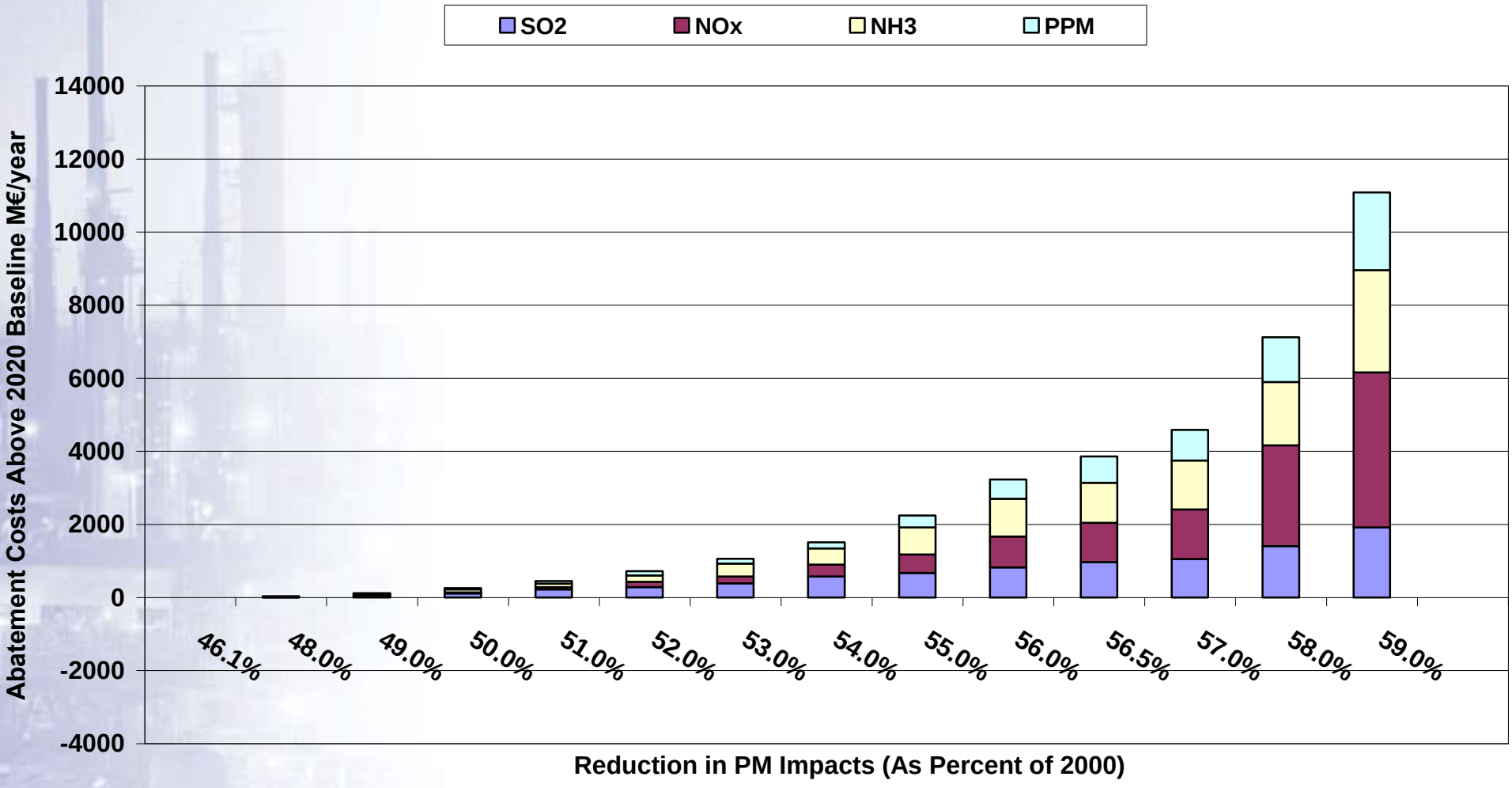
- SO_2 emissions are transformed to sulphates in the atmosphere and **sulphates** are a powerful **short lived climate cooler**.
  - If SO_2 emissions are reduced the loss of the associated cooling influence would need to be compensated by additional CO_2 reductions to remain at status quo in global warming potential terms.
- **Black Carbon** is a powerful **short lived climate warmer**.
  - If black carbon rich Primary PM emissions are reduced, savings in CO_2 emissions reduction costs could be made to remain at status quo.

Table 1
Global Warming Potentials relative to CO_2 (GWP CO_2=1) (a negative value represents a net cooling effect)

	20 year GWP	100 year GWP
SO_2	-140	-40
Black Carbon	2200	680
Organic Carbon	-240	-75

3: Policy would benefit from more fully exploiting Short Lived Climate Forcers (SLCF) synergies (1)

PRIMES-09 Scenario: Without SLCF[(1)] in Optimisation



(1) Black Carbon, Organic Carbon and Sulphates

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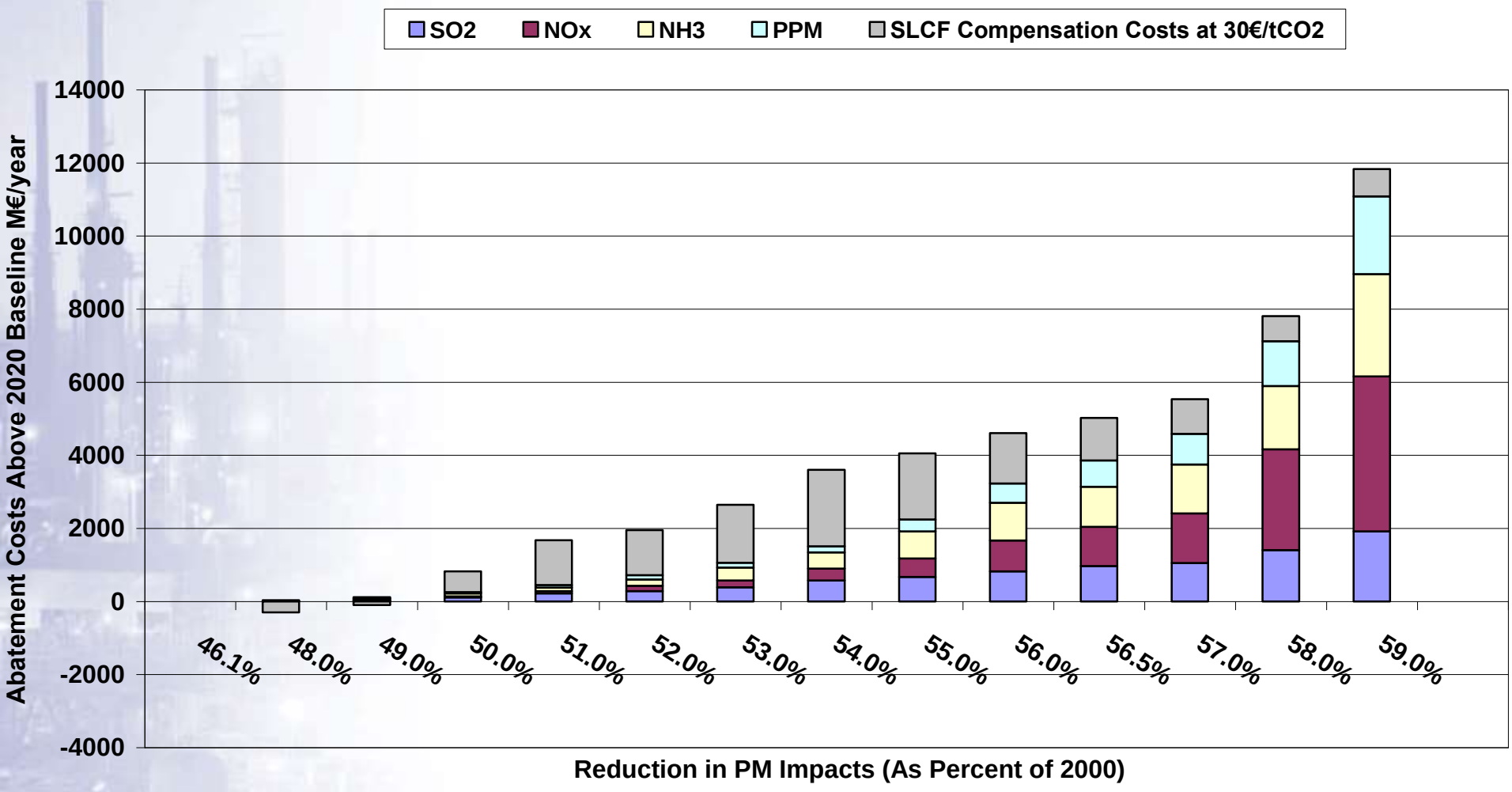

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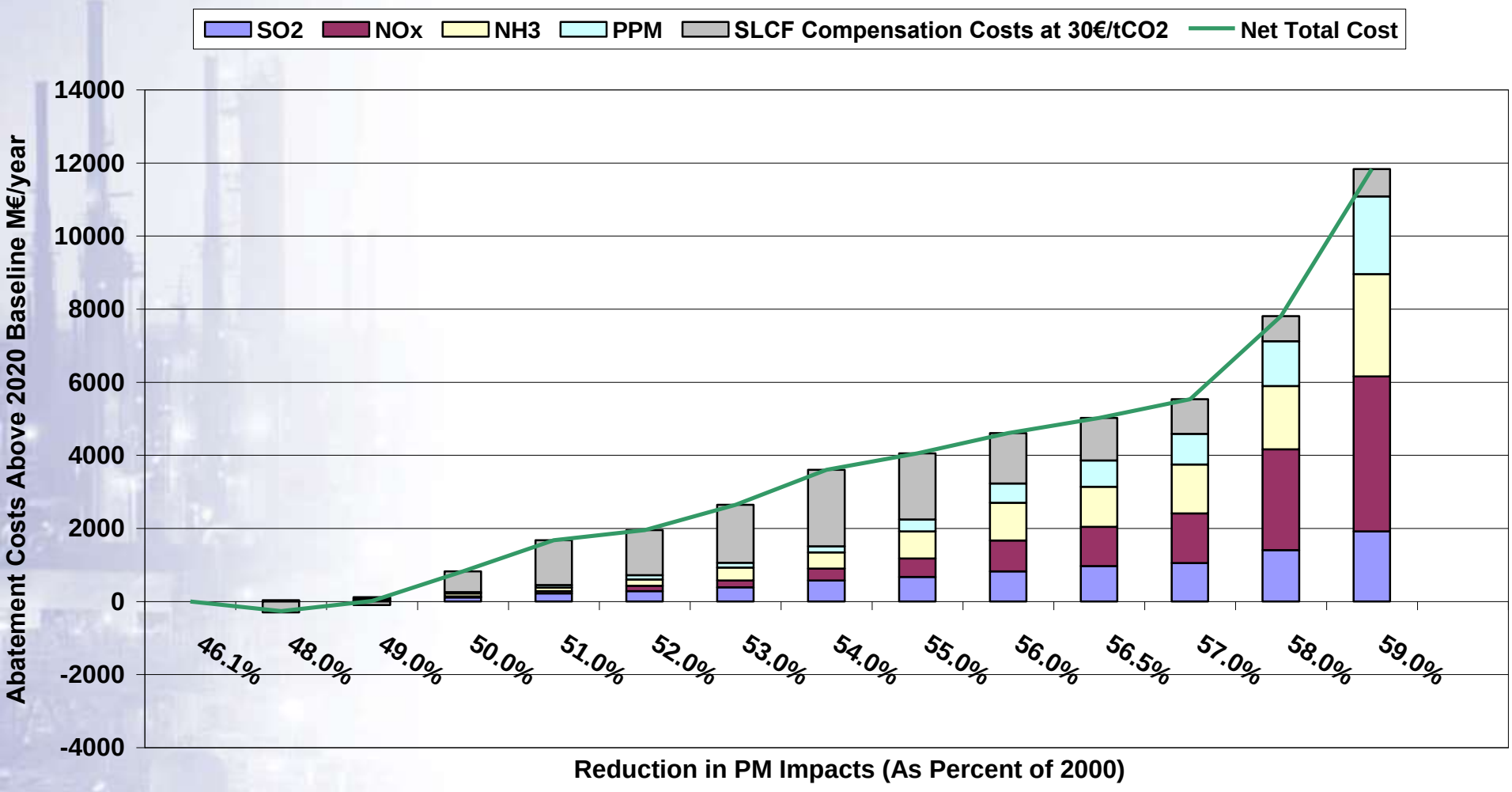

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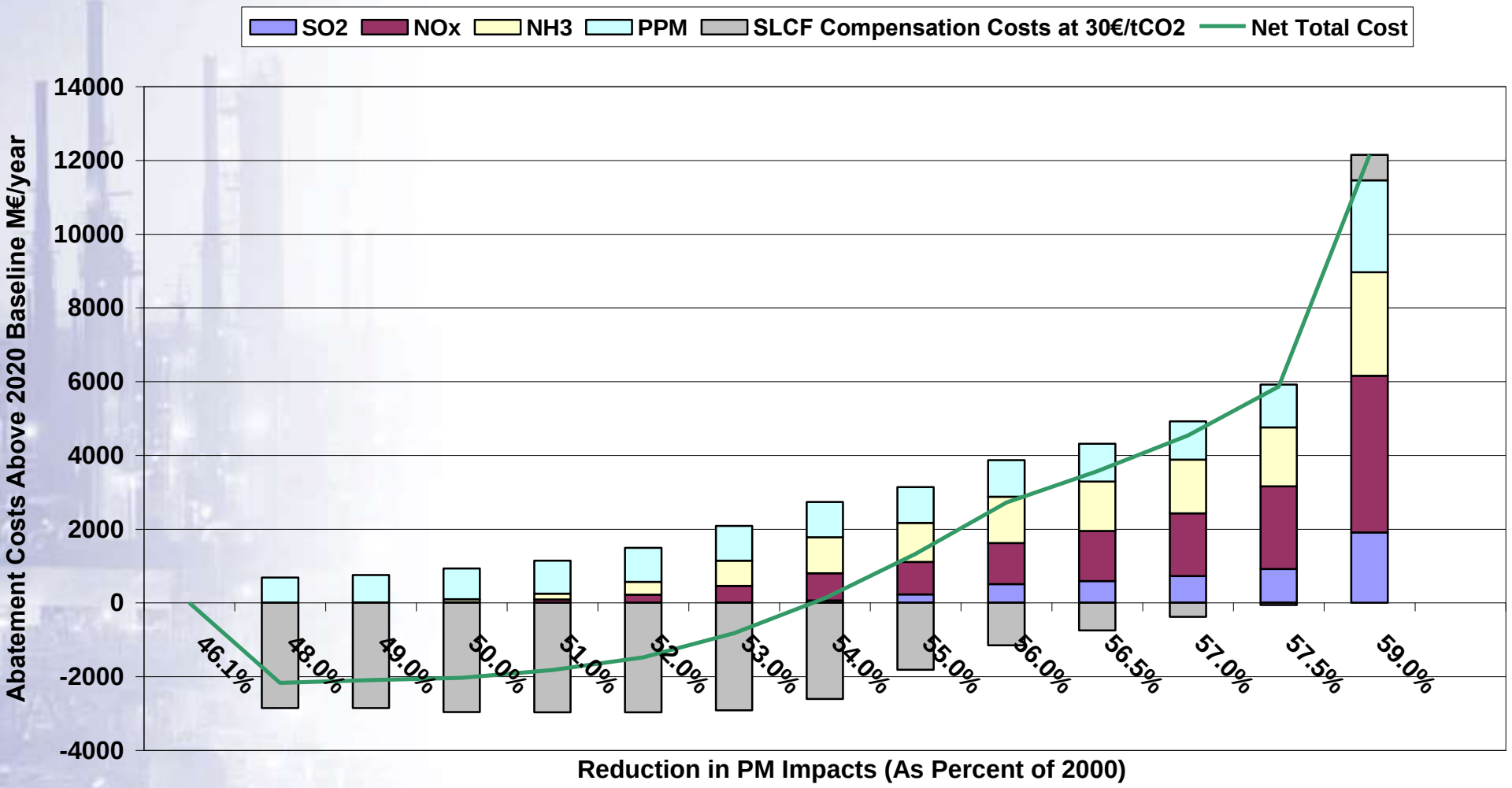
3: Policy would benefit from more fully exploiting Short Lived Climate Forcers (SLCF) synergies (4)

PRIMES-09 Scenario: With SLCF(1) in Optimisation



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Some Concluding Remarks

- Properly accounting for 'Uncertainties' is as important to 'robust policy making' as it is to 'successful business life'
- The availability of powerful IAM tools has enabled AQ policy makers to make significant progress in this area but more needs to be done e.g.,
  - Need to undertake optimisation which accounts for policy relevant uncertainties rather than just testing the central policy outcome in 'other worlds'
- Need to explore the implications of uncertainties earlier in the policy process rather than do it at the end
- Need to maintain an 'evergreen' approach to IAM data bases (e.g. Costs) and internal algorithms (e.g. source-receptor relationships)
- This should be positive for all stakeholders!

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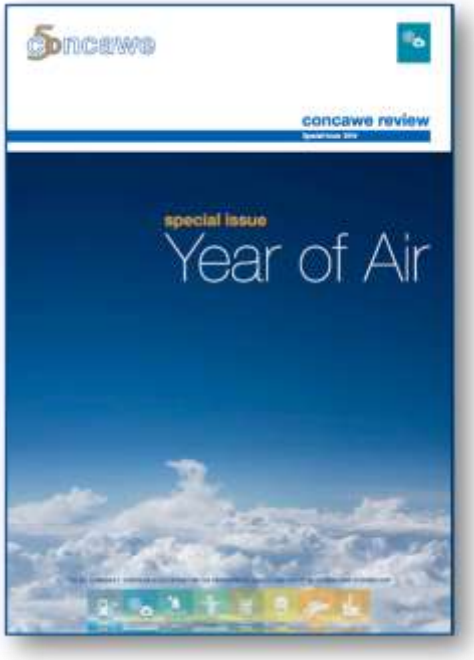
Thank you for your Attention



Technical reports are available

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www.concawe.org