Methane emissions from the natural gas supply chain

Paul Balcombe

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Paul Balcombe
Sustainable Gas Institute
p.balcombe@imperial.ac.uk

METHANE vs CARBON DIOXIDE

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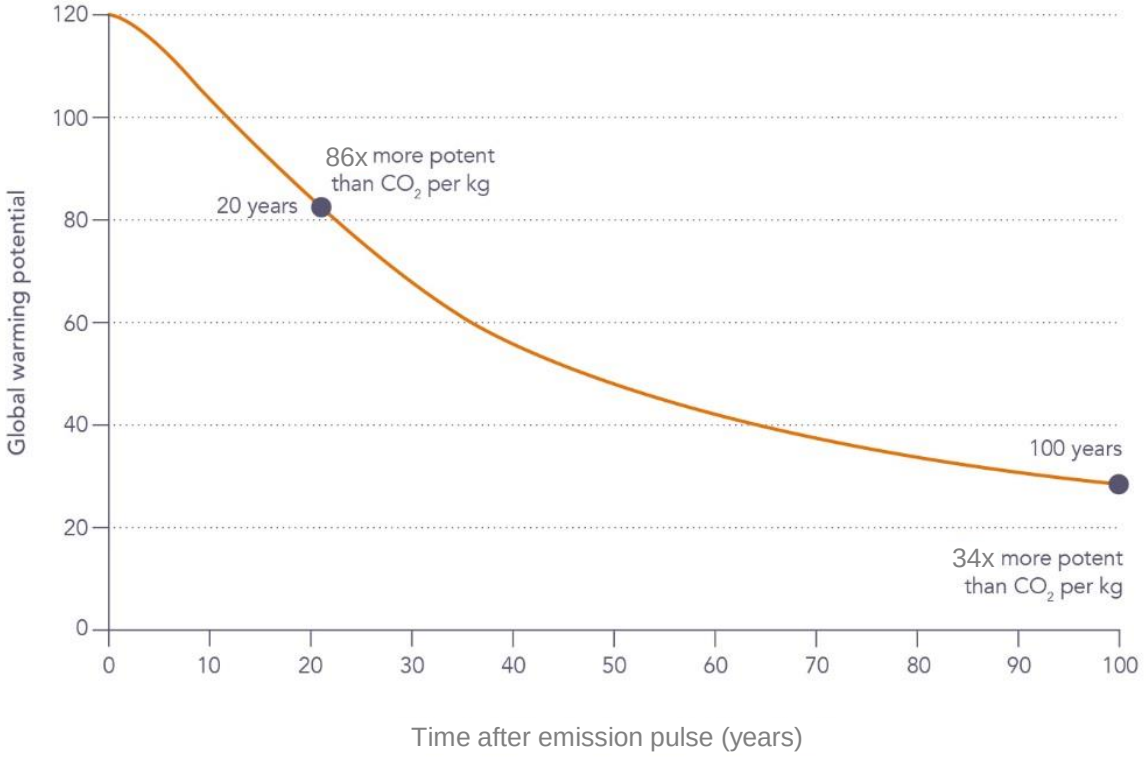
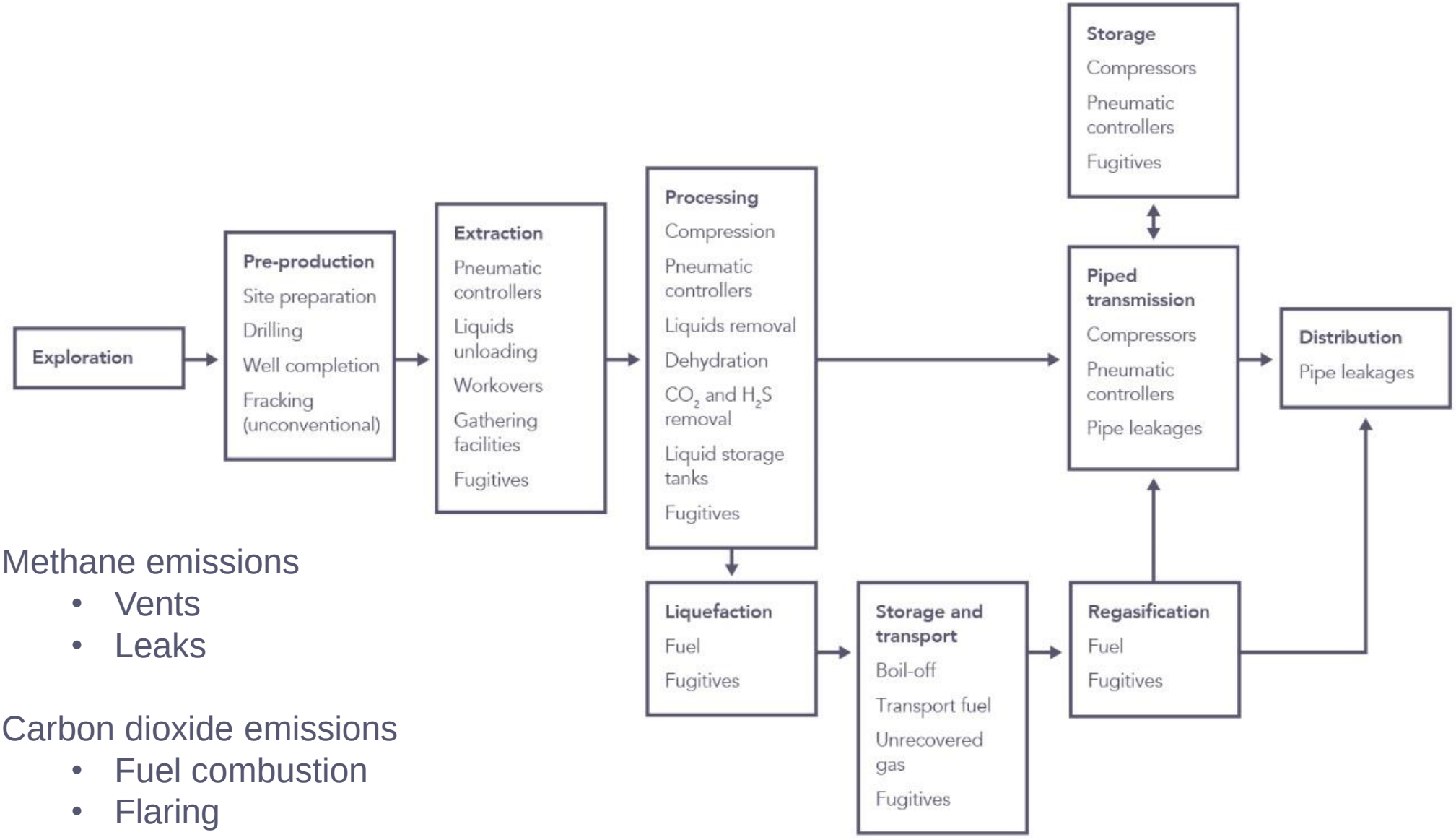
Metric	Methane	Carbon dioxide
Atmospheric lifespan	12 years	100,000s years
Instantaneous climate forcing	120	1
Global Warming Potential (GWP 20 years)	86	1
Global Warming Potential (GWP 100 years)	34	1



Small release of methane = large impact (at least in the short term)

THE SUPPLY CHAIN



Methane emissions

- Vents
- Leaks

Carbon dioxide emissions

- Fuel combustion
- Flaring

PREVIOUS STUDIES

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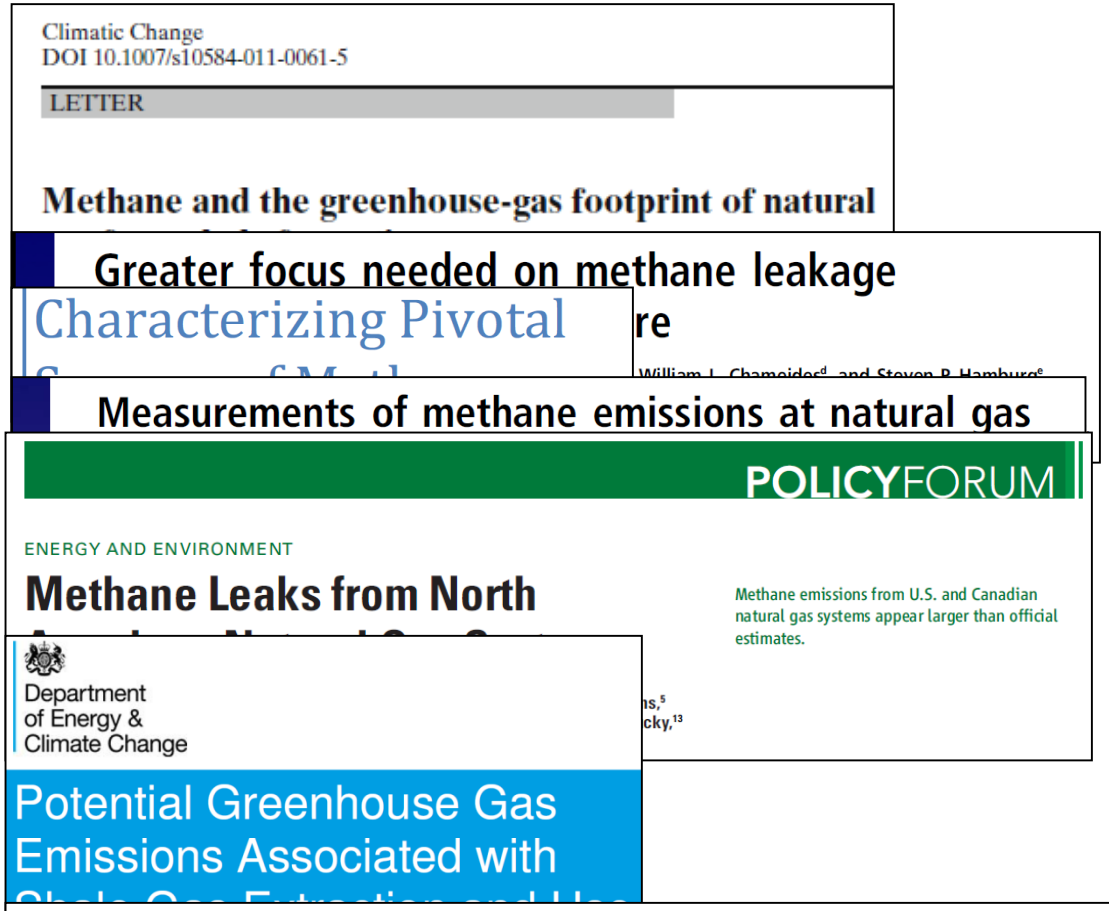

Motivation:

- US shale gas production increase
- In 2011, 1st estimate of greenhouse gas of shale: Natural gas may be worse than coal
- Prompted greater investigation
- Different conclusions and estimation methods
- *We need clarity*

… Plus many more

WHITE PAPER 2015

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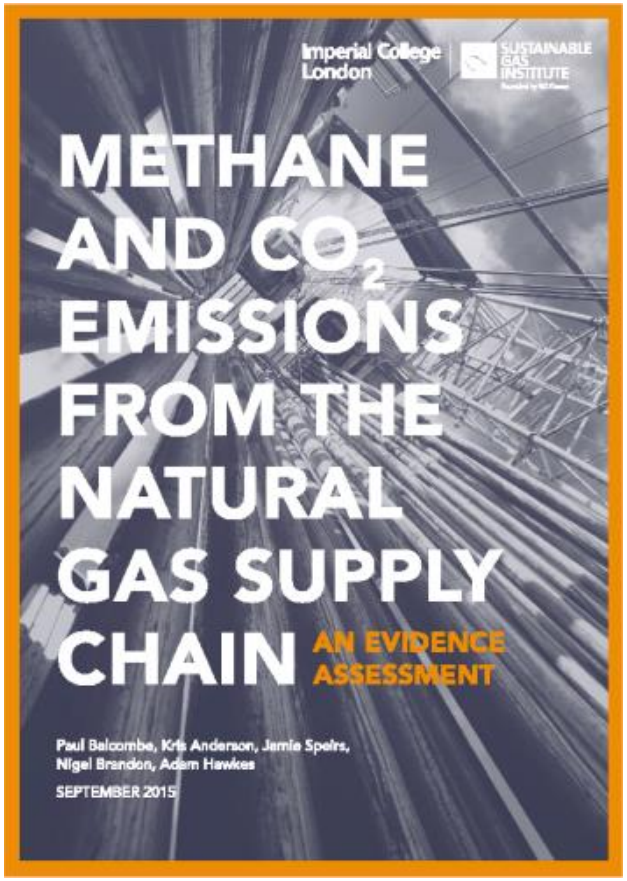
A comprehensive review of studies on methane and CO_2 emissions across the whole natural gas supply chain

1. What is the **range** of estimated CO_2 and methane emissions?
2. What are the **reasons** for the different estimates?

>250 papers analysed

>1400 emissions data



KEY FINDINGS

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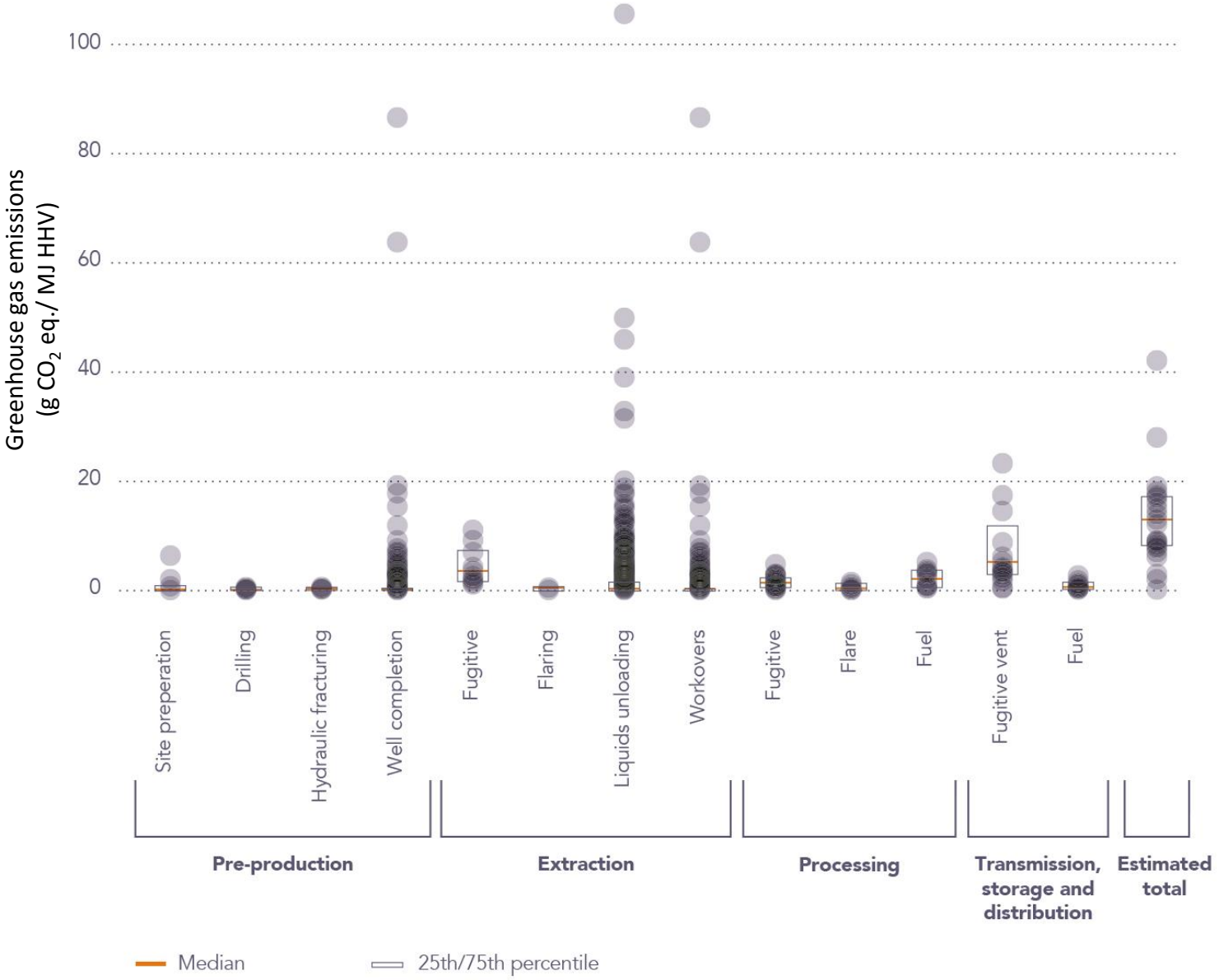
1. The reported **range** of greenhouse gas emissions is vast
2. Evidence of **super emitters** all across the supply chain
3. Key emission **sources**
4. Revised **estimate of emissions** for supply chains using modern equipment and effective operation and maintenance procedures
5. Significant **methodological** differences
6. Lack of **data**
7. Further research needs

OVERALL GHG EMISSIONS



1. The range of reported estimates is vast

White paper: Section 3.1, page 19

1. OVERALL GHG EMISSIONS

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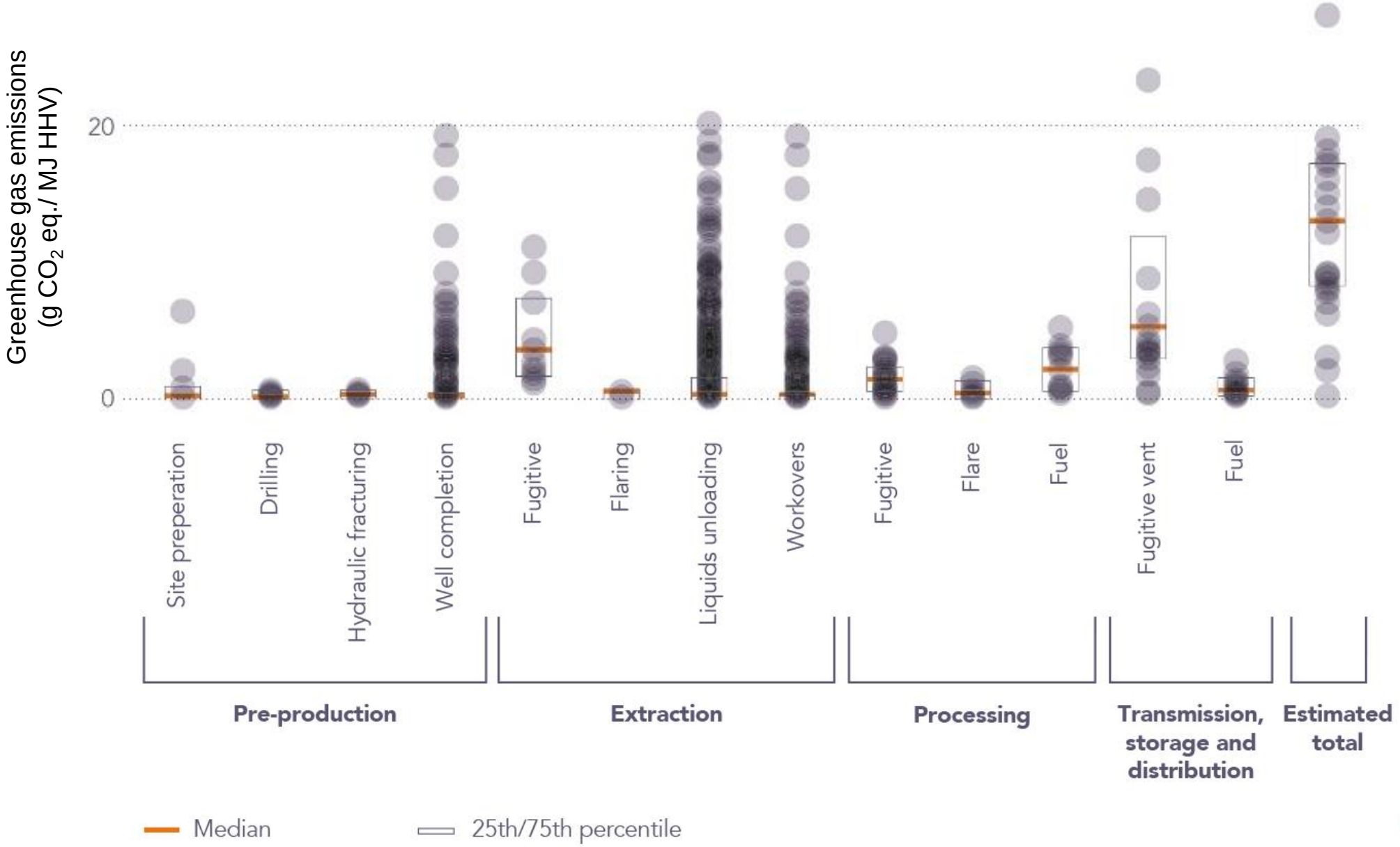
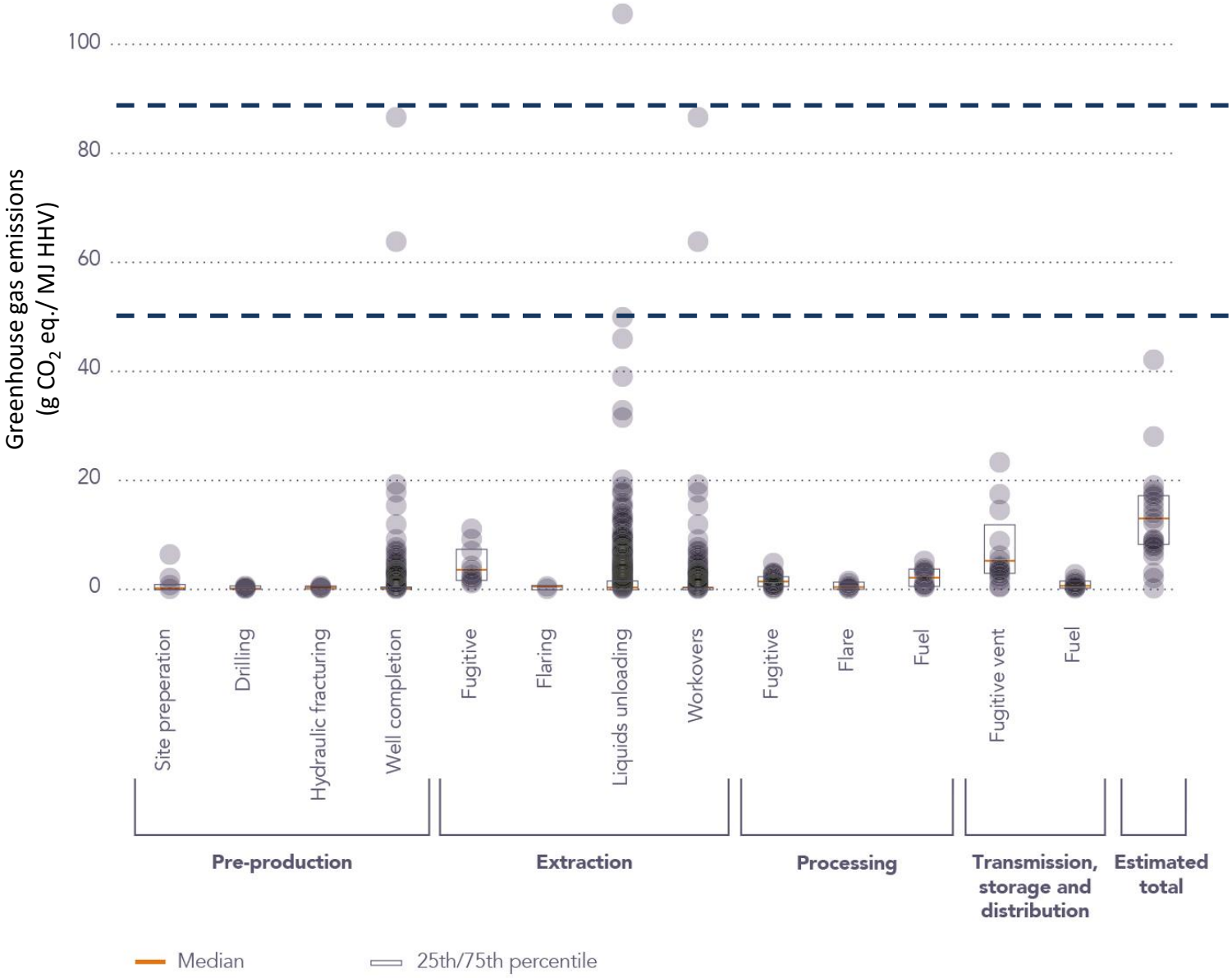


White paper: Section 3.1, page 19

OVERALL GHG EMISSIONS



1. The range of reported estimates is vast
2. Some secondary data less robust
3. Potential super emitters

White paper: Section 3.1, page 19

DISTRIBUTION OF EMISSIONS

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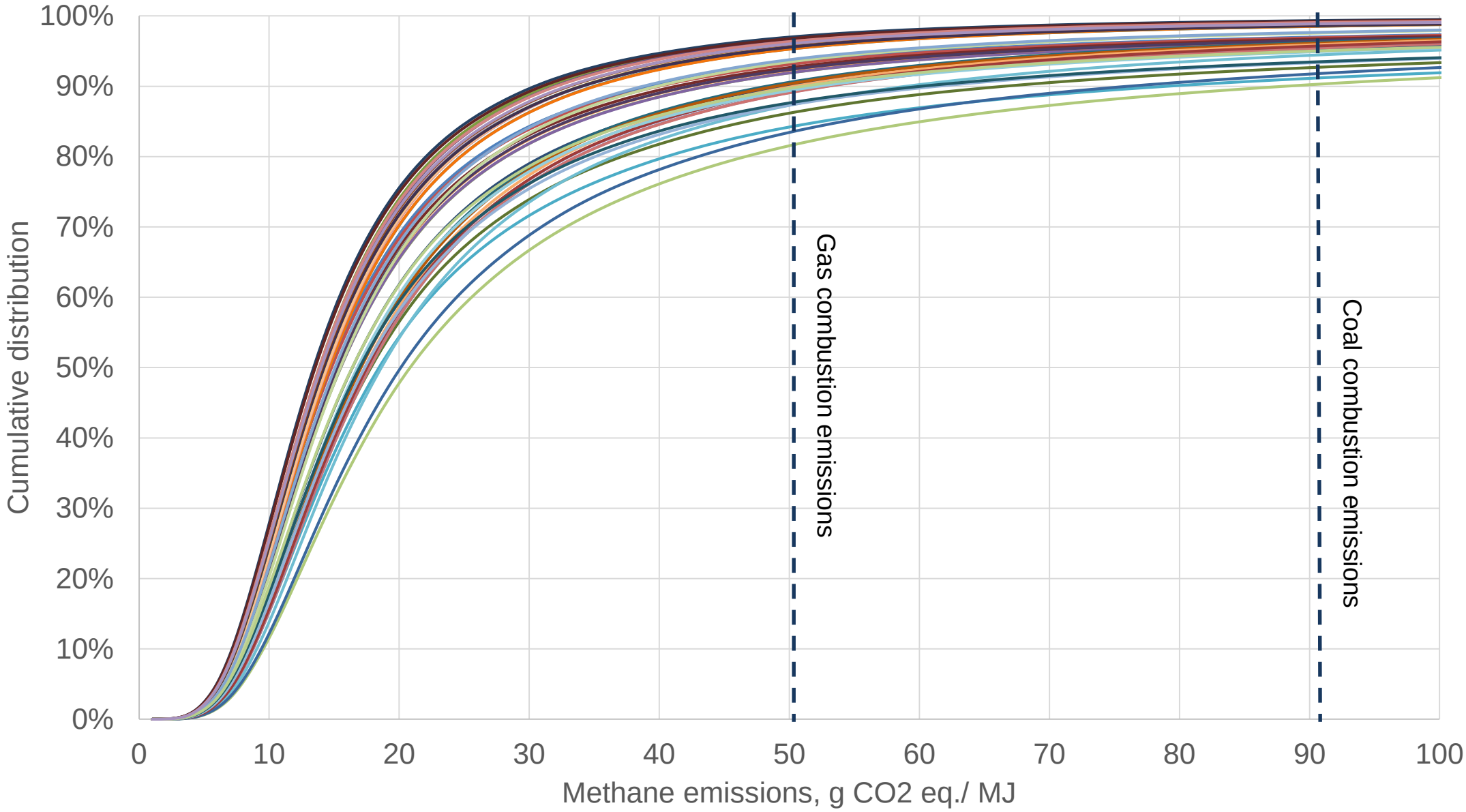

DISTRIBUTION OF EMISSIONS

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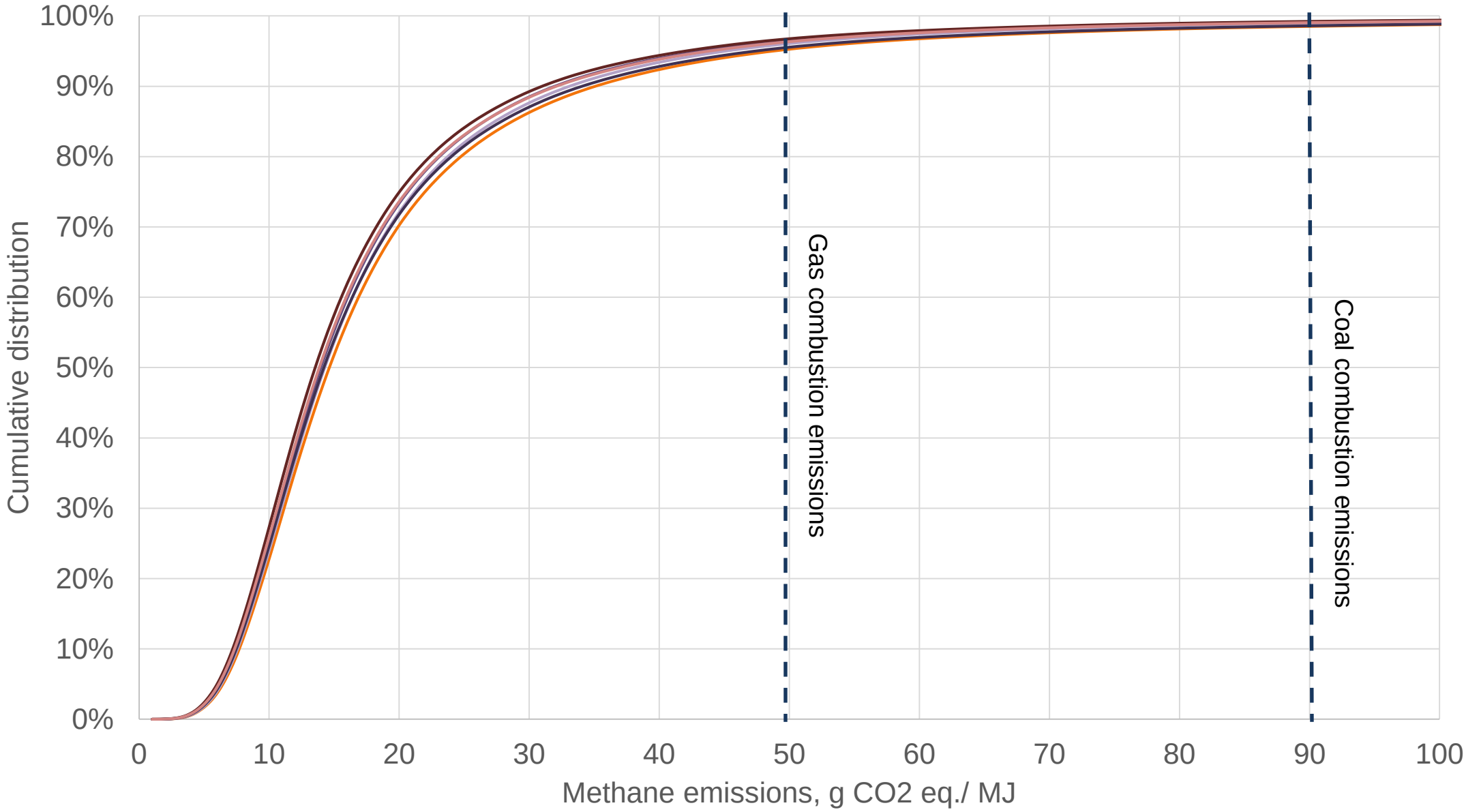

METHODOLOGICAL DIFFERENCES

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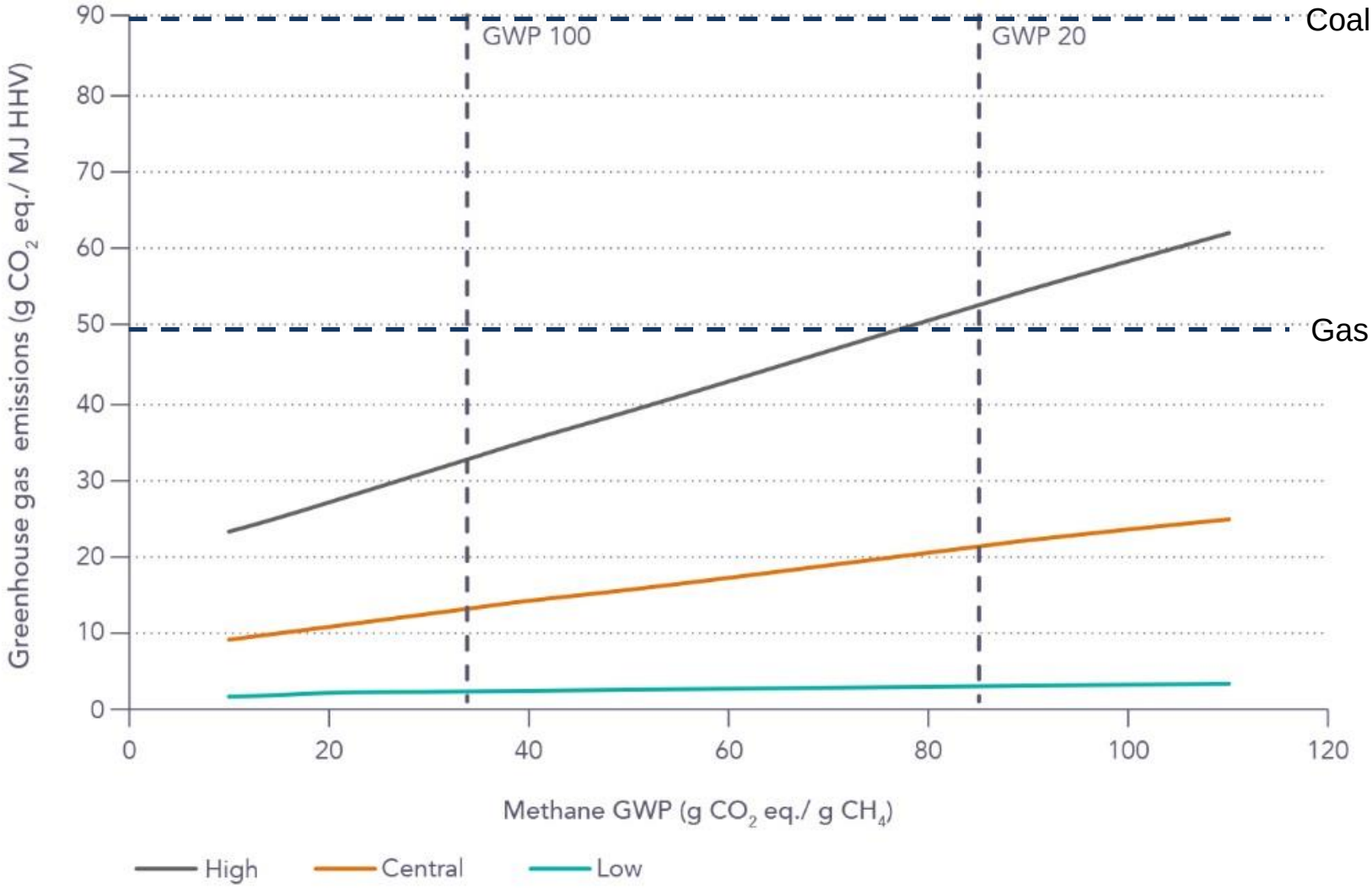
Global Warming Potential



Which GWP should we use?

White paper: Section 4.4, page 57

METHANE vs CARBON DIOXIDE… AGAIN

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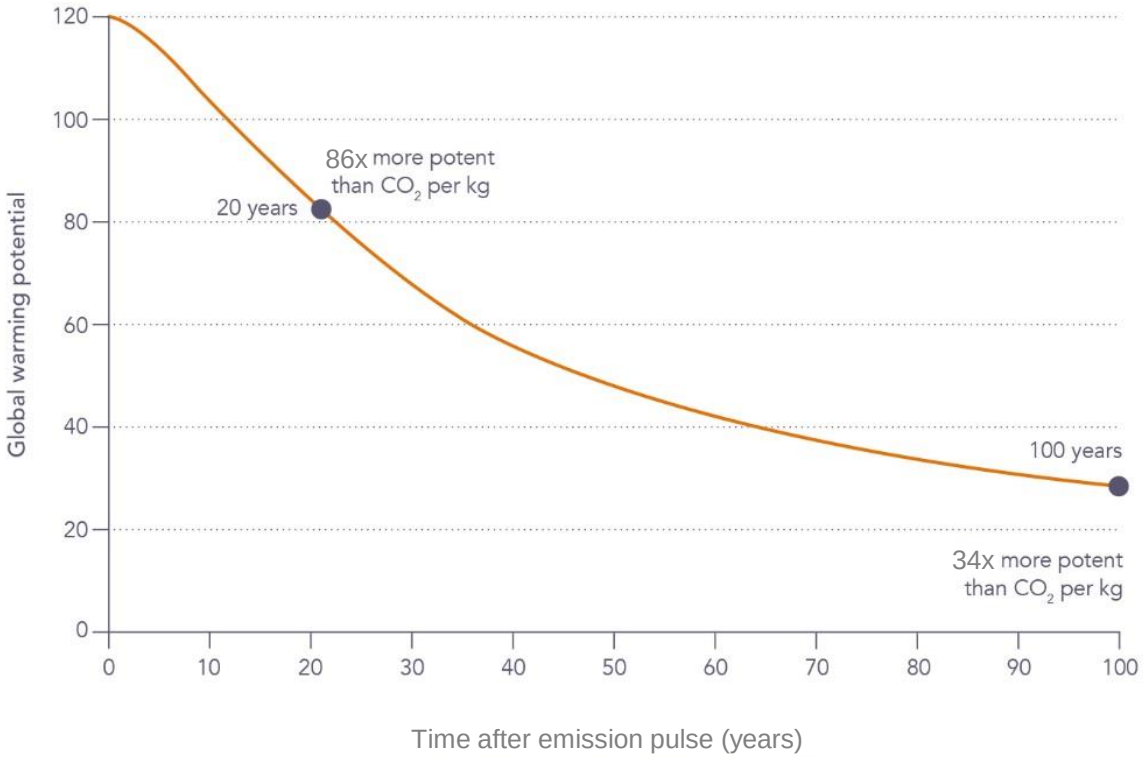

Short term and long term climate impacts are very different

We need to be careful not to replace one problem with another

Tackling both CO_2 and CH_4 emissions is the only way to reduce total warming and peak temperatures

CONCLUSIONS

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- Extremely large range methane emissions
- Key emission sources from the literature are
  - Well completions (unconventional) ; liquids unloading; pneumatics; compressors
- The presence of a few ‘super emitters’ skew average emissions significantly
- With ‘best available techniques’ and effective maintenance, emissions are far lower
- There remains a lack of representative data with respect to
  - Different regions other than the US
  - Some key emission sources, in particular liquids unloading