



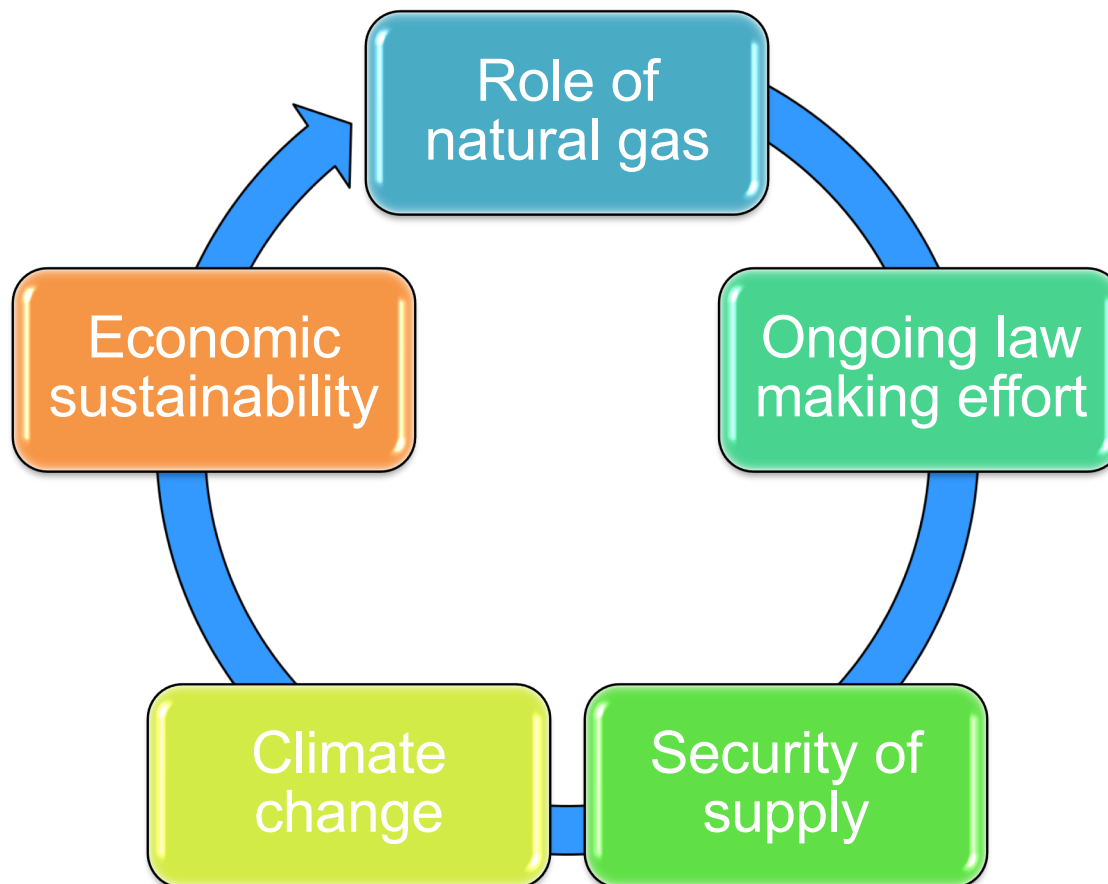
ASSORISORSE

Risorse Naturali ed Energie sostenibili

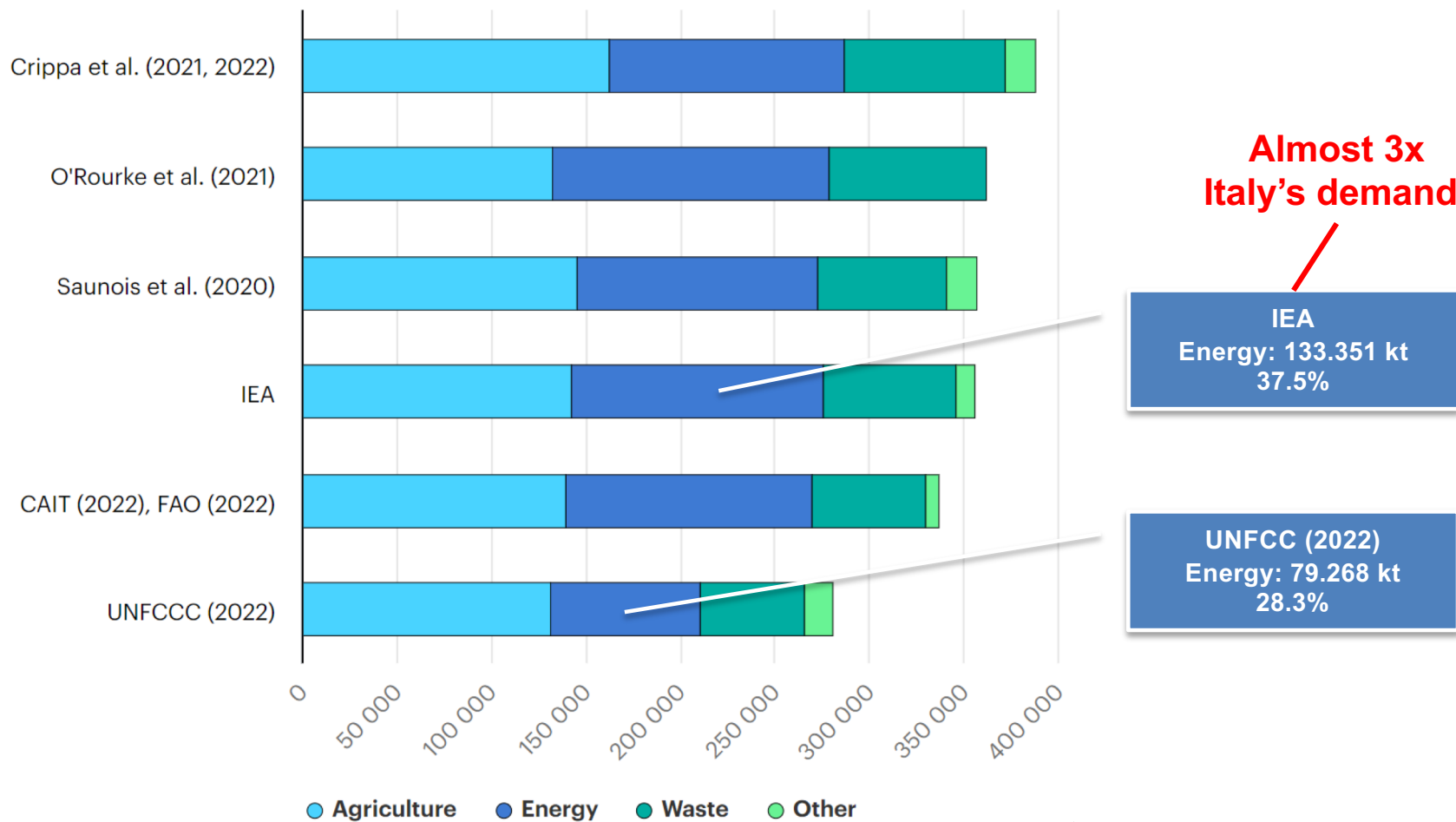
Cutting methane emissions at net zero cost: is it a dream or a real thing?

*OMC 2023 – Lecture Theater B – Operations Optimization
Ravenna (RA) – October 24th, 2023
Angelo Lo Nigro (angelo.lonigro@rina.org)*

Role of natural gas today

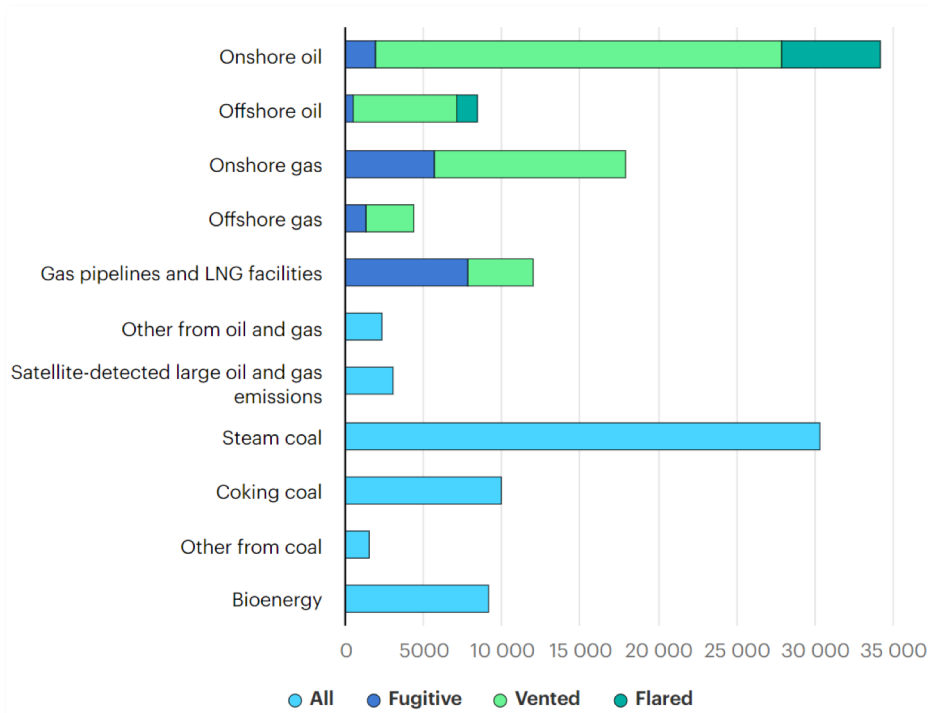


World methane emissions from all sources (kt/y)

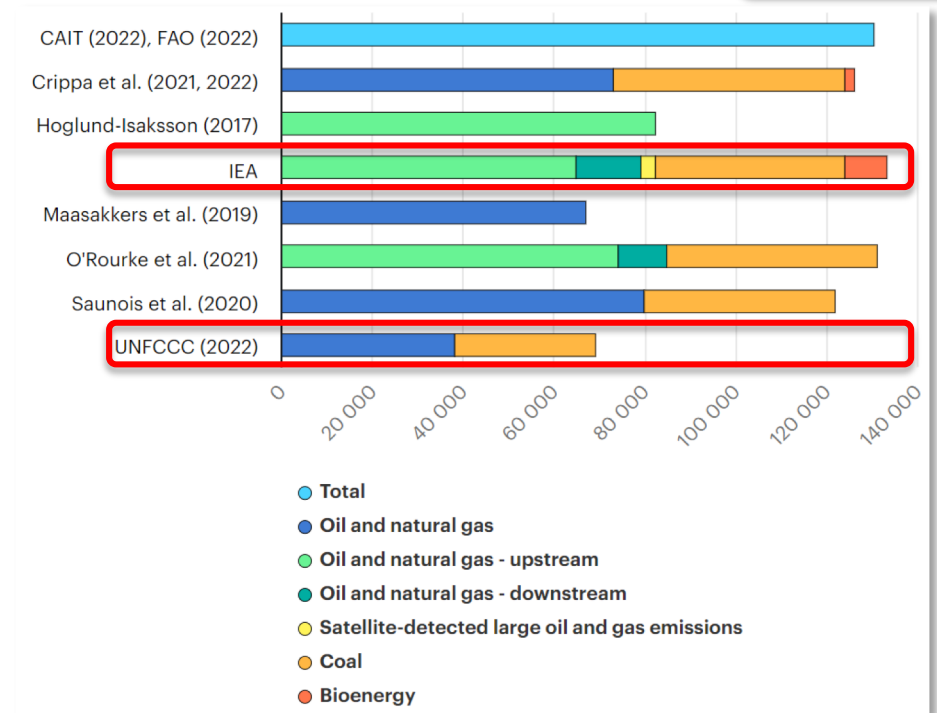


World methane emissions from energy sources

Worldwide

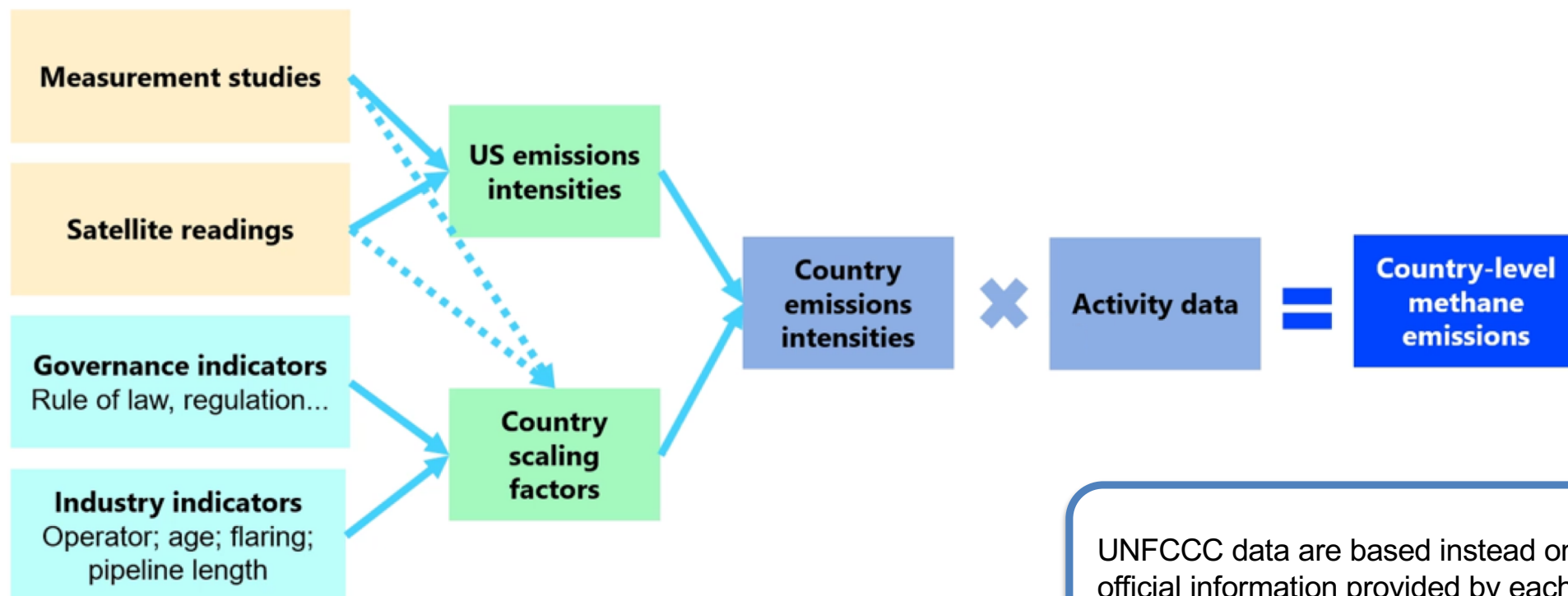


Details of IEA estimate, per industry segment, kt/y



Comparison with UNFCCC and other estimates, kt/y

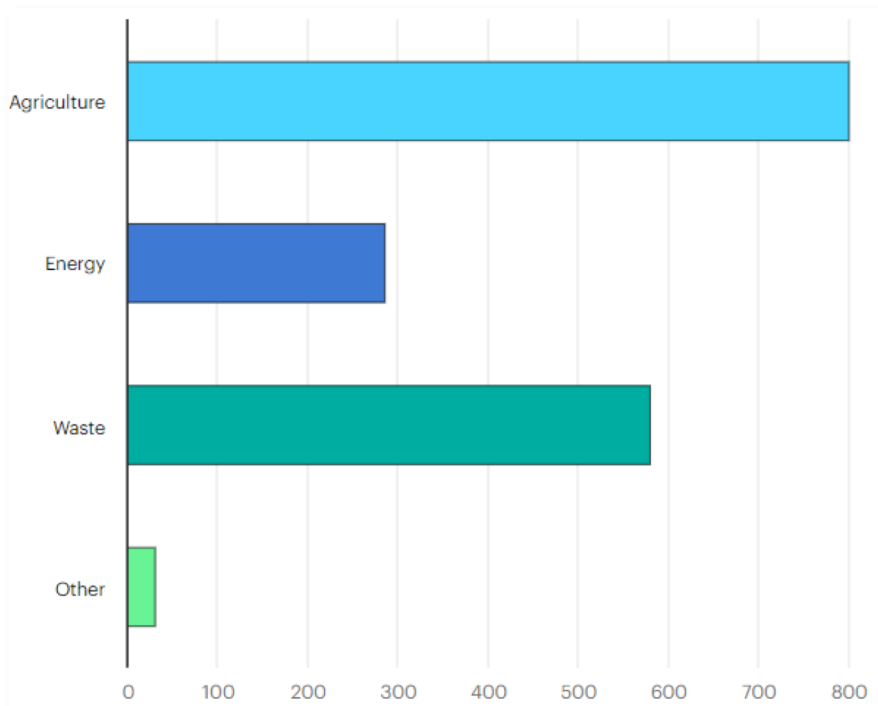
IEA approach for oil & gas methane (top-down)



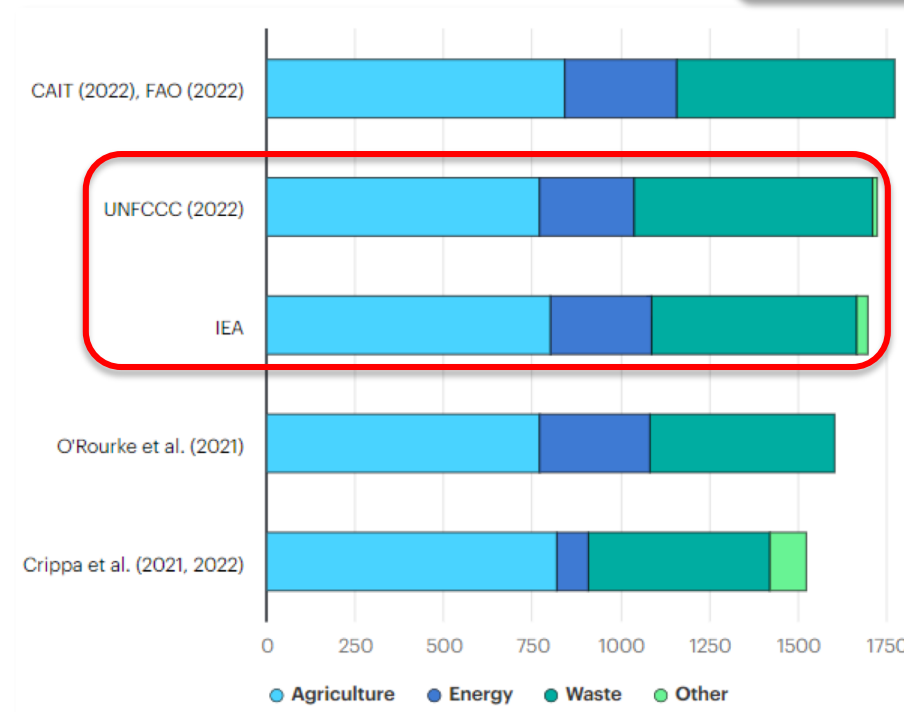
UNFCCC data are based instead on the official information provided by each country (bottom-up)

World methane emissions from energy sources

Italy



Details of IEA estimate, per industry segment, kt/y



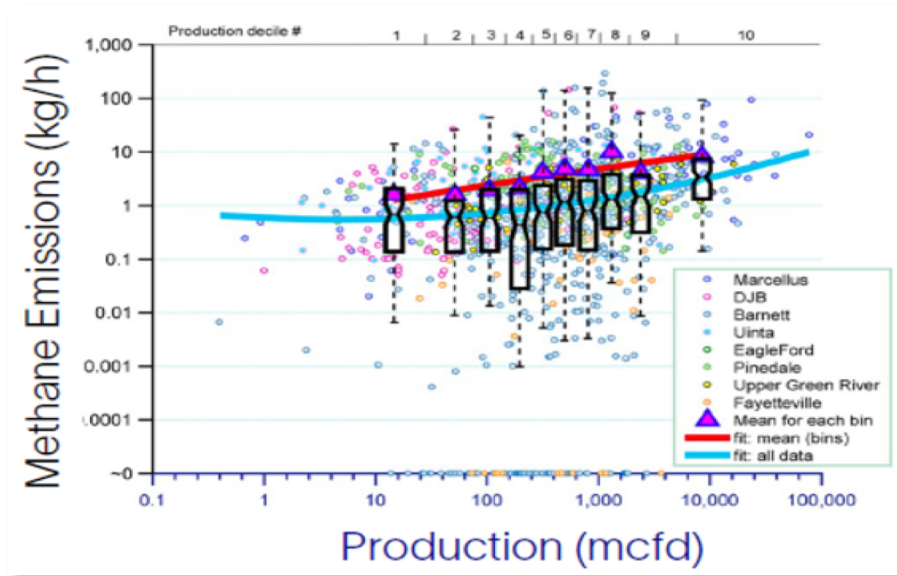
Comparison with UNFCCC and other estimates, kt/y

Sources of methane emissions in oil & gas

Incident emissions	unplanned events
Incomplete combustion emissions	unburned methane in the exhaust gases from combustion devices
Operational emission	normal or planned operating activities
Permeation	penetration of a permeate through a solid
Pneumatic emission	gas operated valves, continuous as well as intermittent emissions
Vented emissions	gas released intentionally from processes or activities that are designed to do it
Unintentional venting	equipment malfunctions or non-normal operations

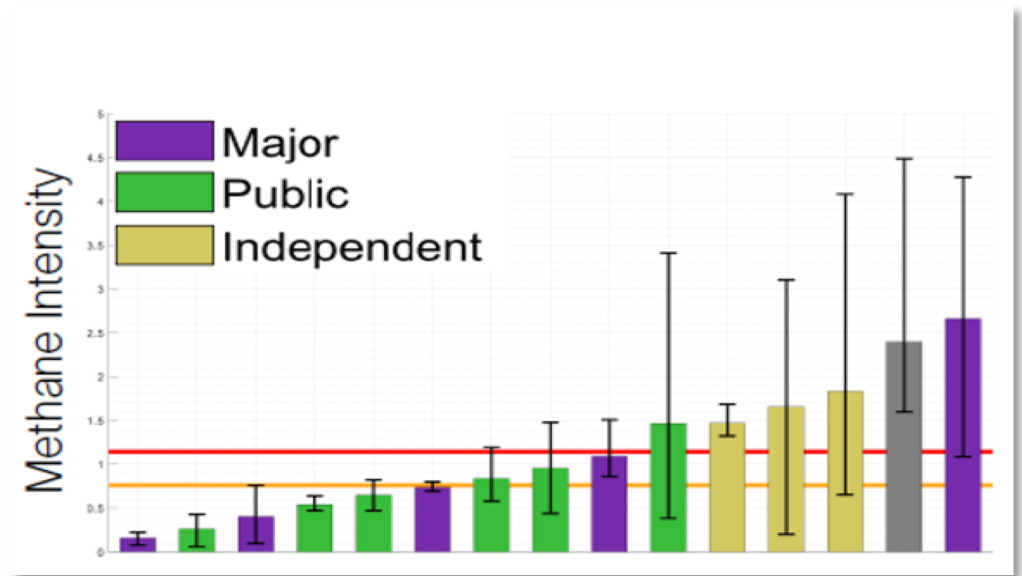
Sources of methane emissions in oil & gas

Super-emitters: 50% emissions / 5% facilities



Omara et al., 2018

Operators: large and small



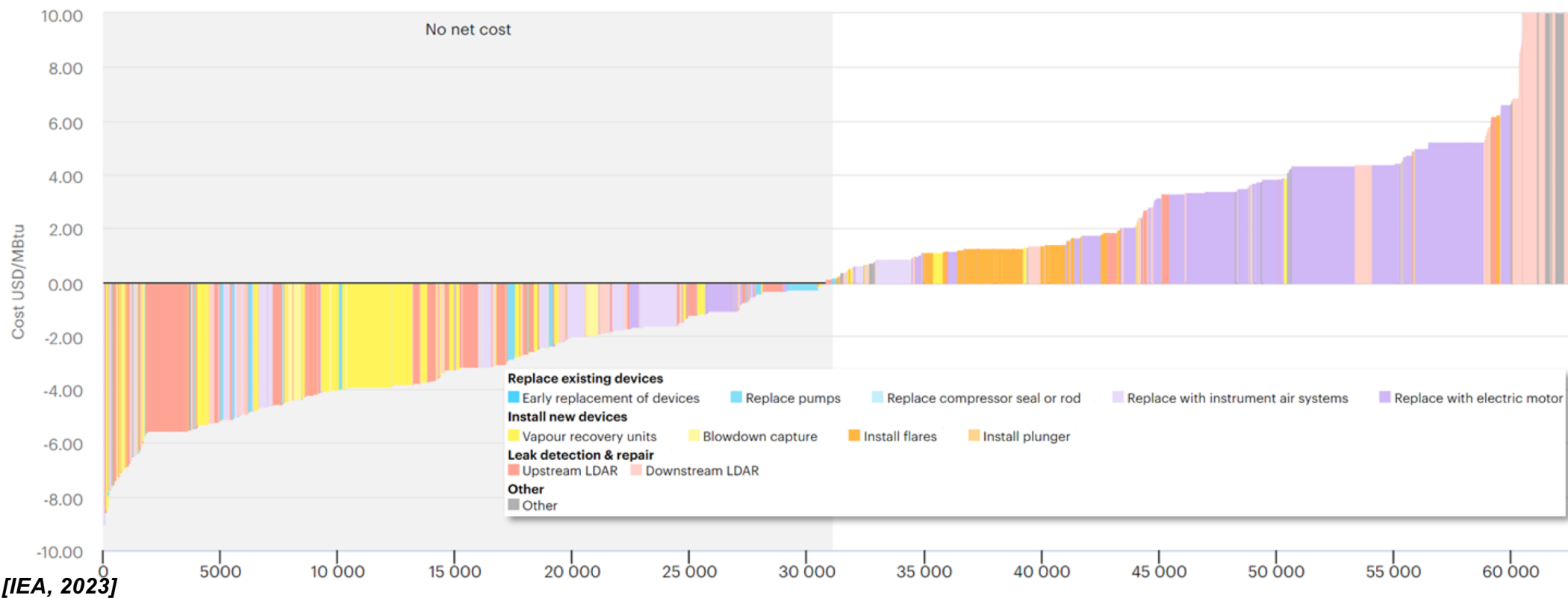
Hmiel et al., 2023



Methane abatement potential in oil & gas

- Estimated emissions in oil & gas (2022, IEA): 80,219 tons
- Share of abatement possible: 78%
- Share that could be avoided at no net cost: 39%

Worldwide

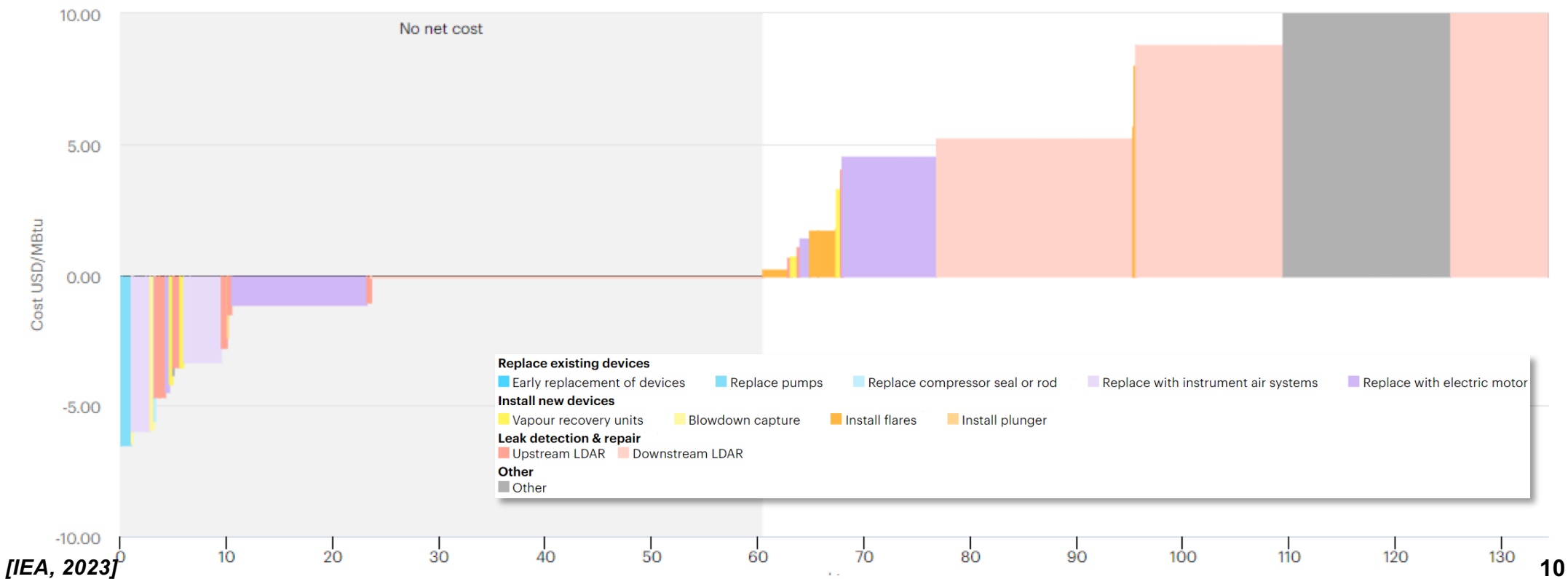




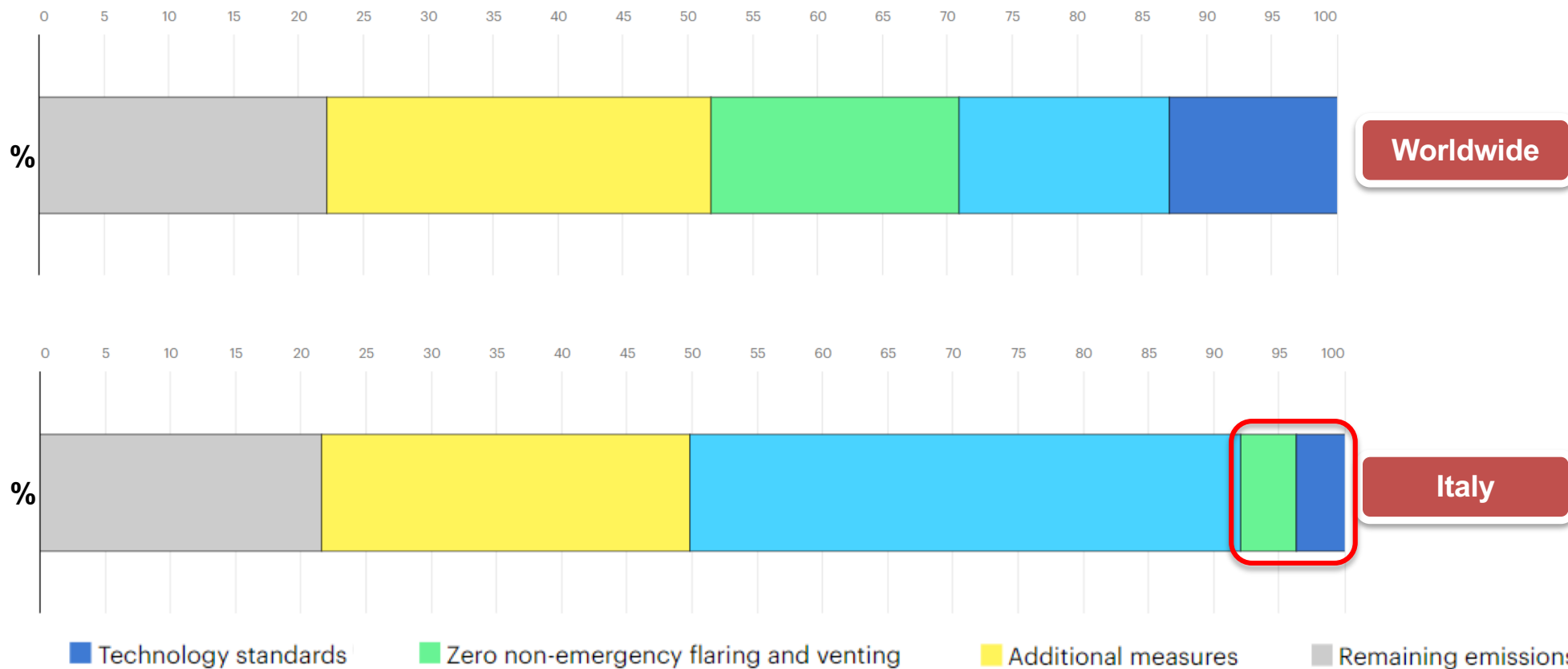
Methane abatement potential in oil & gas

- Estimated emissions in oil & gas (2022, IEA): 171 tons
- Share of abatement possible: 78%
- Share that could be avoided at no net cost: 35%

Italy



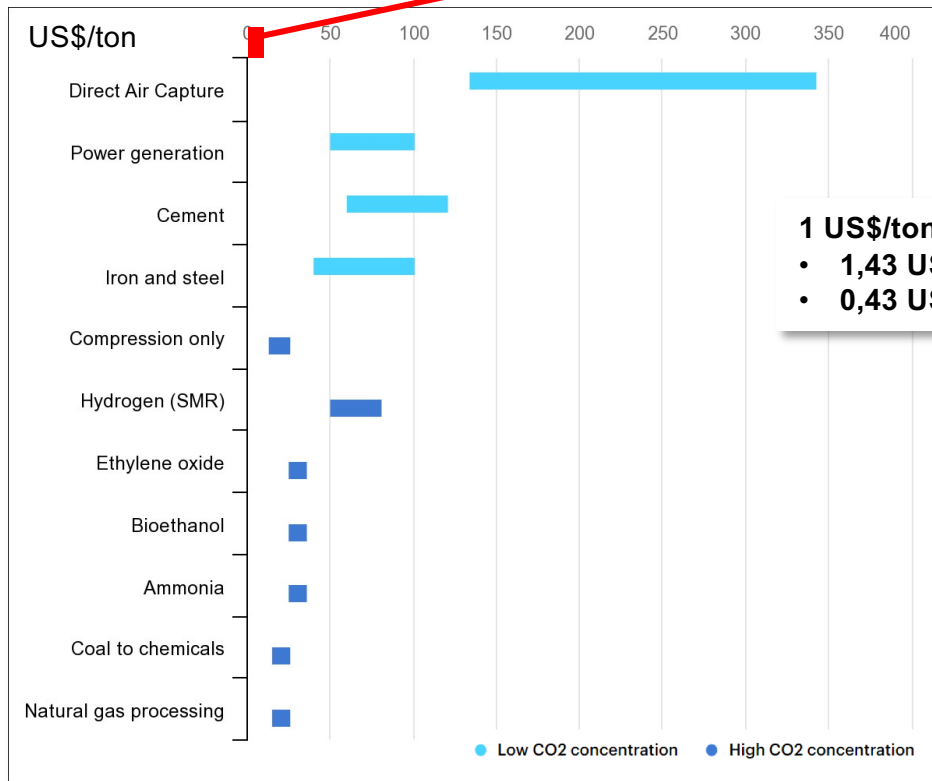
Potential methane reduction by policy options



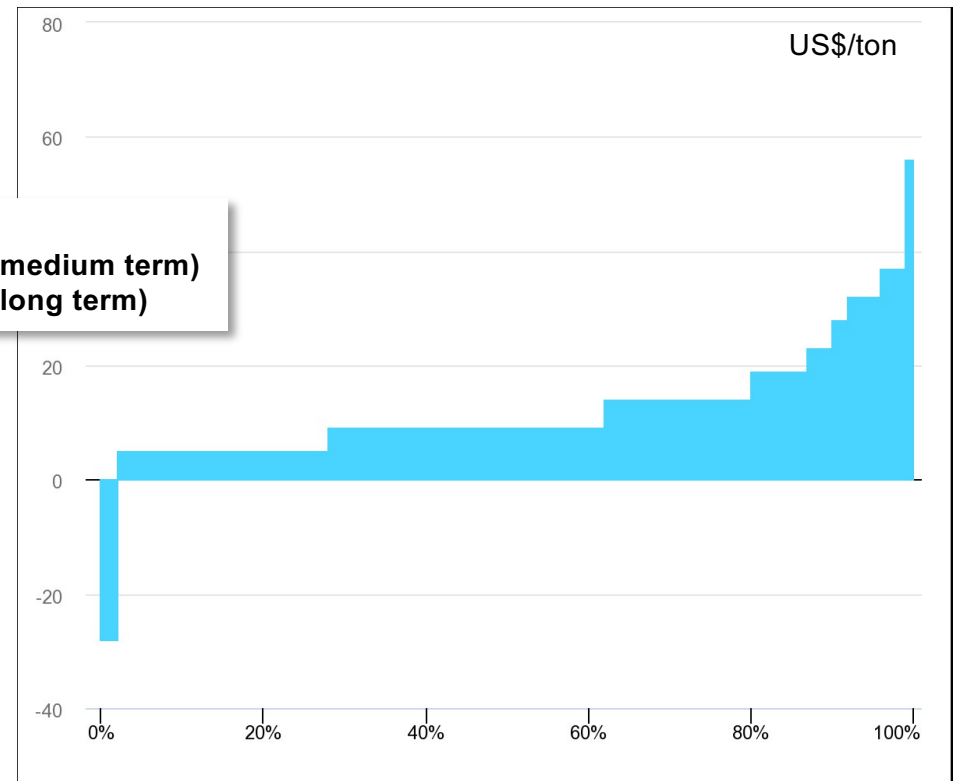
[IEA, 2023]

CCS typical costs

Marginal abatement cost for CH4 emission options range (<10 \$/Mbtu)



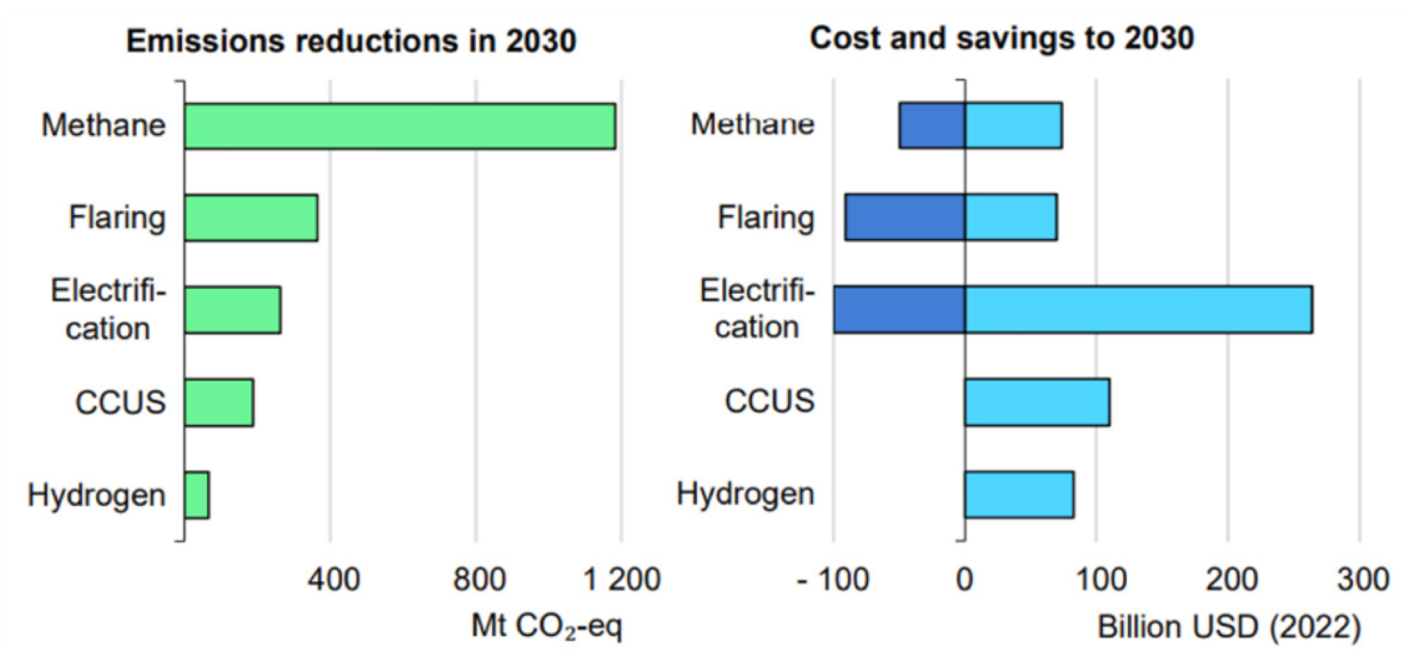
1 US\$/ton CO2e =
 • 1,43 US\$/mbtu (medium term)
 • 0,43 US\$/mbtu (long term)



Levelised cost of CO2 capture by sector & initial concentration, 2019

Indicative CO2 storage cost curve for the United States, onshore

NZE Scenario @2030: emissions reductions & cost and savings from 2022 to 2030



Large emission source

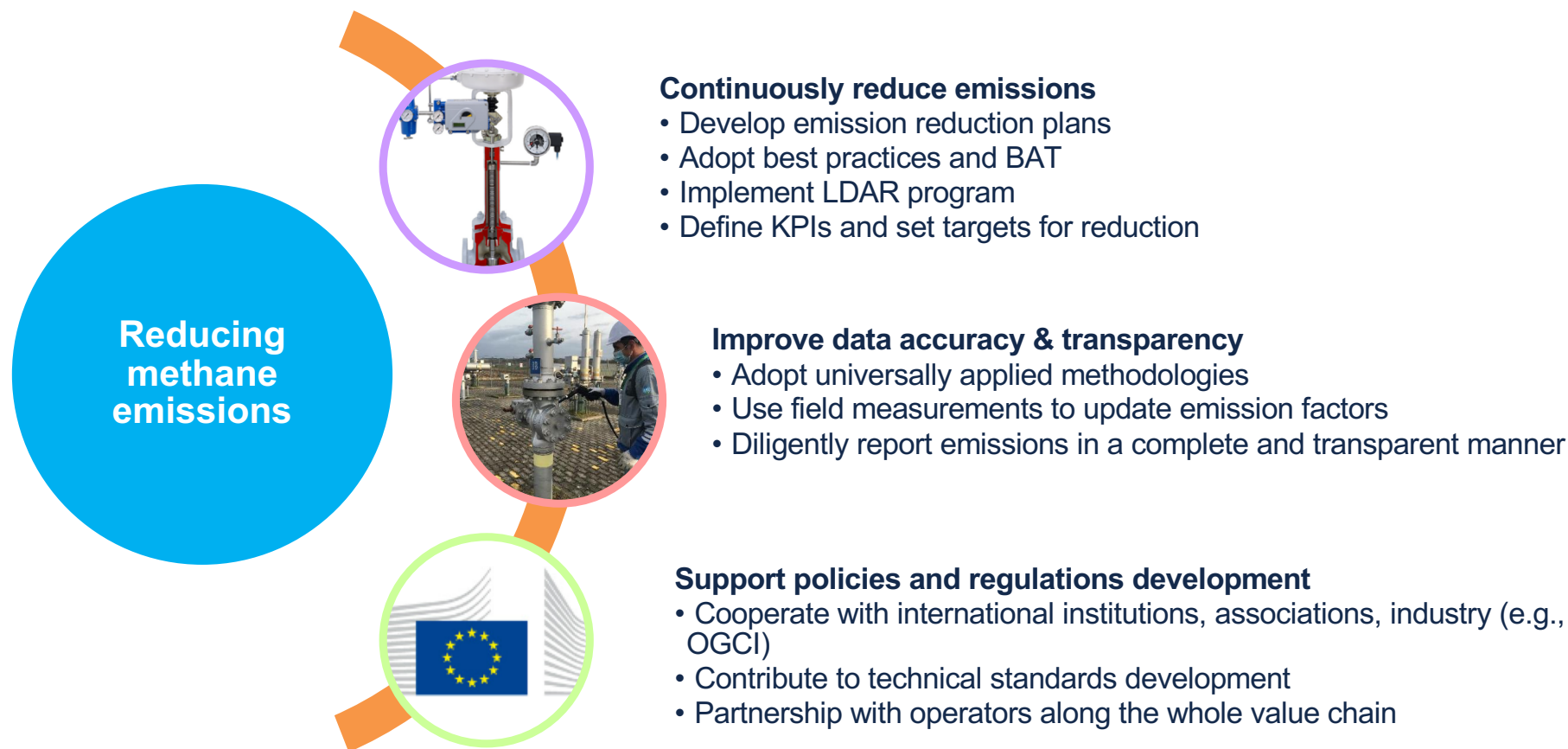


Technology available



Low cost

Operators' commitment: Supporting industry target carbon neutrality



Working group on methane emissions

Established in 2021, it includes 15 leading companies, representing the whole energy value chain



Technology

Design

Construction

Operation

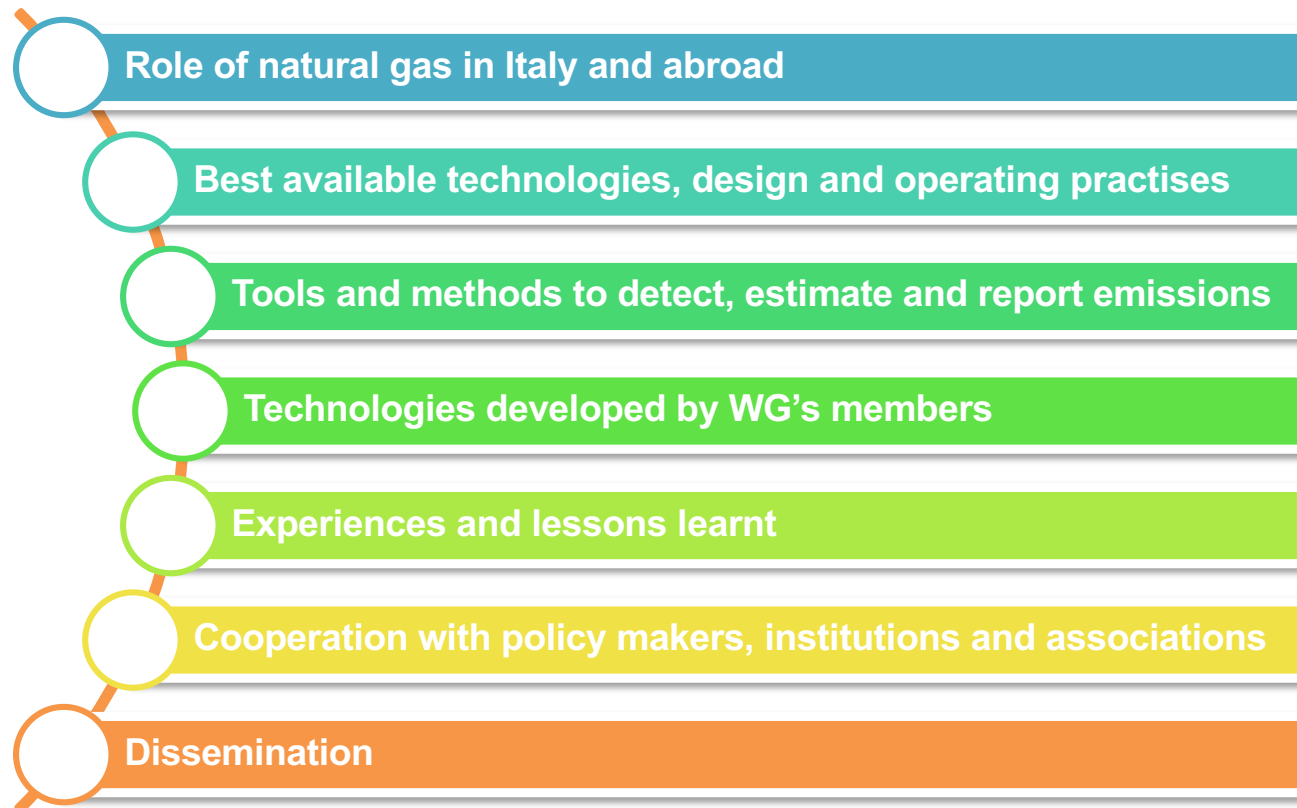
HSE

Inspection

Certification

Innovation 15

Our white paper on methane emissions



SPE Italian Section - Technical bulletin 4/2022



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Italian Sustainable Energy & Resources



Italian Section



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TECHNICAL BULLETIN 4/2022

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20098 San Giuliano Milanese (MI)

Workshop *GHG Emissions Beyond CO₂*



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Risorse Naturali ed Energie sostenibili

- Jointly organized by Assorisorse and SPE – Italian section
- Hosted in RINA Milan office on May 10th, 2023
- Attended by one hundred experts and stakeholders, twelve speakers, and a panel session moderated by IOGP

Operators

Ziretegas, ENI, Myrechemical, Snam, Total Energies, Unicalce, AcegasApsAmga, Italgas, Hera, Iren, Shell, Transigas, ireti

Associations

Assorisorse, IOGP, SPE, Proxigas, Unareti, OGCI

Universities

Università Cattolica, Politecnico di Milano

Institutions

ISPRA, UN, EU, IEA,

NGOs

Amici della Terra, Environmental Defense Fund

Contractors

Geolog, Rosetti Marino, Sicim

Engineering contractors

DG Impianti, eniprogetti, Pansoinco, RINA, Roland Berger, Techfem

Technology providers

Picarro, Schneider Electric, SLB, CMG, Lamberti, Seekops, GHGSat

Freelancers & experts



Program

h. 10.00 – 12.30

Italian Industry's Commitment to Reducing Methane Emissions – Angelo Lo Nigro, Assorisorse
Methane Emission in Italy – Antonio Caputo, ISPRA
IEA's Global Methane Tracker 2023 – Tomas Bredariol, IEA
Guideline of Methane Emission Detection – Dario Buccellato, IOGP
Aiming for Zero Methane Emissions Initiative – Julien Perez, OGCI
Methane emissions: the elephant leaves the room – Ilaria Carmen Restifo, EDF
Why we should worry about SF₆ – Tiziana Paolicelli, Schneider Electric

Light lunch – provided by RINA

h. 14.00 – 17.00

International Methane Emissions Observatory – Giulia Ferrini/Manfredi Caltagirone, OGMP 2.0
The commitment to reducing methane emissions in the natural gas supply chain – Giovanna Rotta, Proxigas

Panel: **Methane emissions mitigation & detection technologies**

Luigi Coluccio – Inrete Distribuzione
Davide Scrocchi – SNAM
Chiara Valentini – RINA
Sebastian Barale – Pansoinco
Concetto Fischetti – Moderator

Satellite technology for methane detection – Jean-Francois (J.F) Gauthier, GHG Sat
Guidelines for an Italian strategy to reduce methane emissions from the natural gas supply chain – Tommaso Franci, Amici della terra

Conclusions



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Cutting methane emissions at net zero cost: is this a dream or is it a real thing?

- Technologies and operating practices to reduce emissions in energy assets are well known and understood
- A variety of abatement options come at a relatively low cost, especially when compared with agriculture and waste
- The cost of mitigating methane from oil and gas operations can be lower than the market value of the captured gas

- Extremely patchy data reflect the differences among countries and regions
- Global warming puts us all on the same boat, but we are not all at the same level of maturity in terms of technology, development, and awareness of the issue of methane emissions
- Cooperation and sharing of best practices are key to success! Here is where we are focused as an association.
- Italy shows extremely good statistics, as an effect of the continuous effort of the operators, who started addressing this issue way before the interest from ongoing lawmaking effort in Bruxelles
- Cutting methane emissions might not be at no cost, but it is a very effective way to invest money to fight climate change

**Methane emission reduction is not at no net cost,
but it is the quick win to fight climate change!**



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Thank you for your kind attention

Angelo Lo Nigro (angelo.lonigro@rina.org)