Comparative assessment of concepts to improve the performance of CO_2 capture from the exhaust of gas turbines

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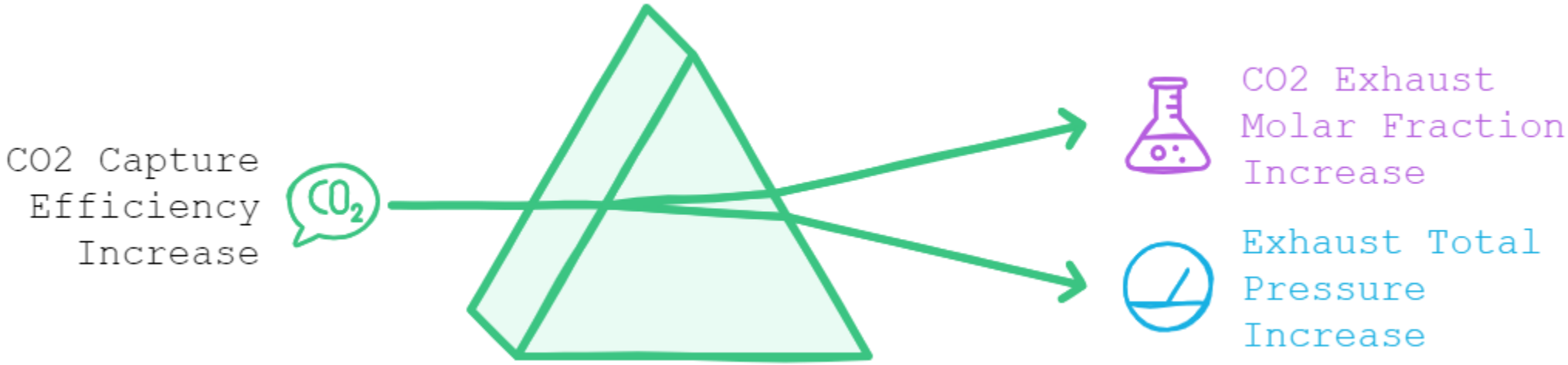
Introduction

- CO_2 capture from diluted gas streams (e.g., gas turbine exhaust) is challenging due to low driving force, leading to high energy consumption.
- Decarbonization of hard-to-abate sectors is essential to address climate, environmental, economic, and social impacts of carbon emissions.
- Comparative evaluation performed via modeling and simulation, benchmarked against standard CO_2 capture using MEA technology.



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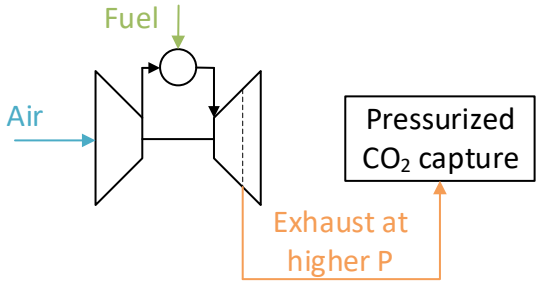
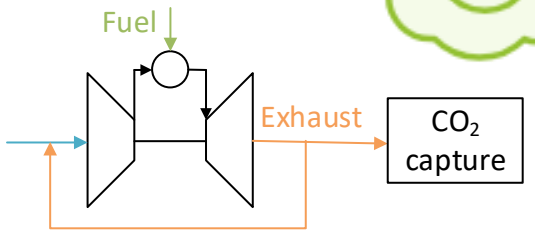
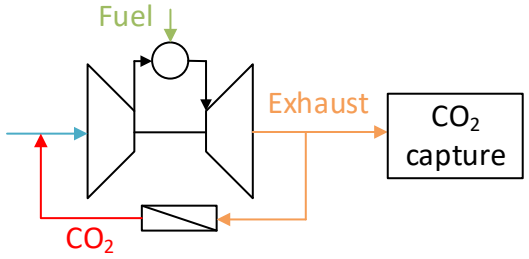
Pressurized CO2 Capture



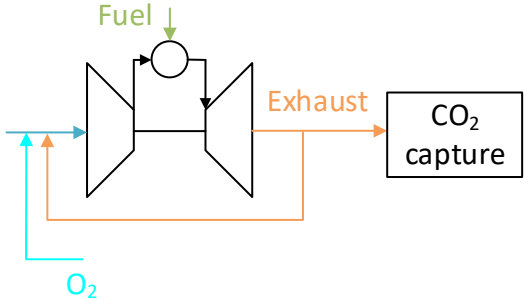
Simple EGR



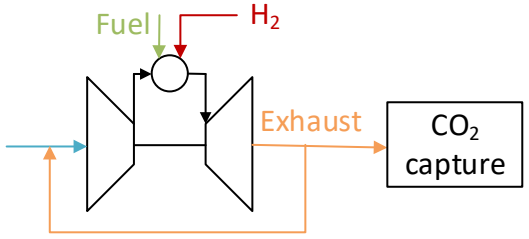
Selective EGR

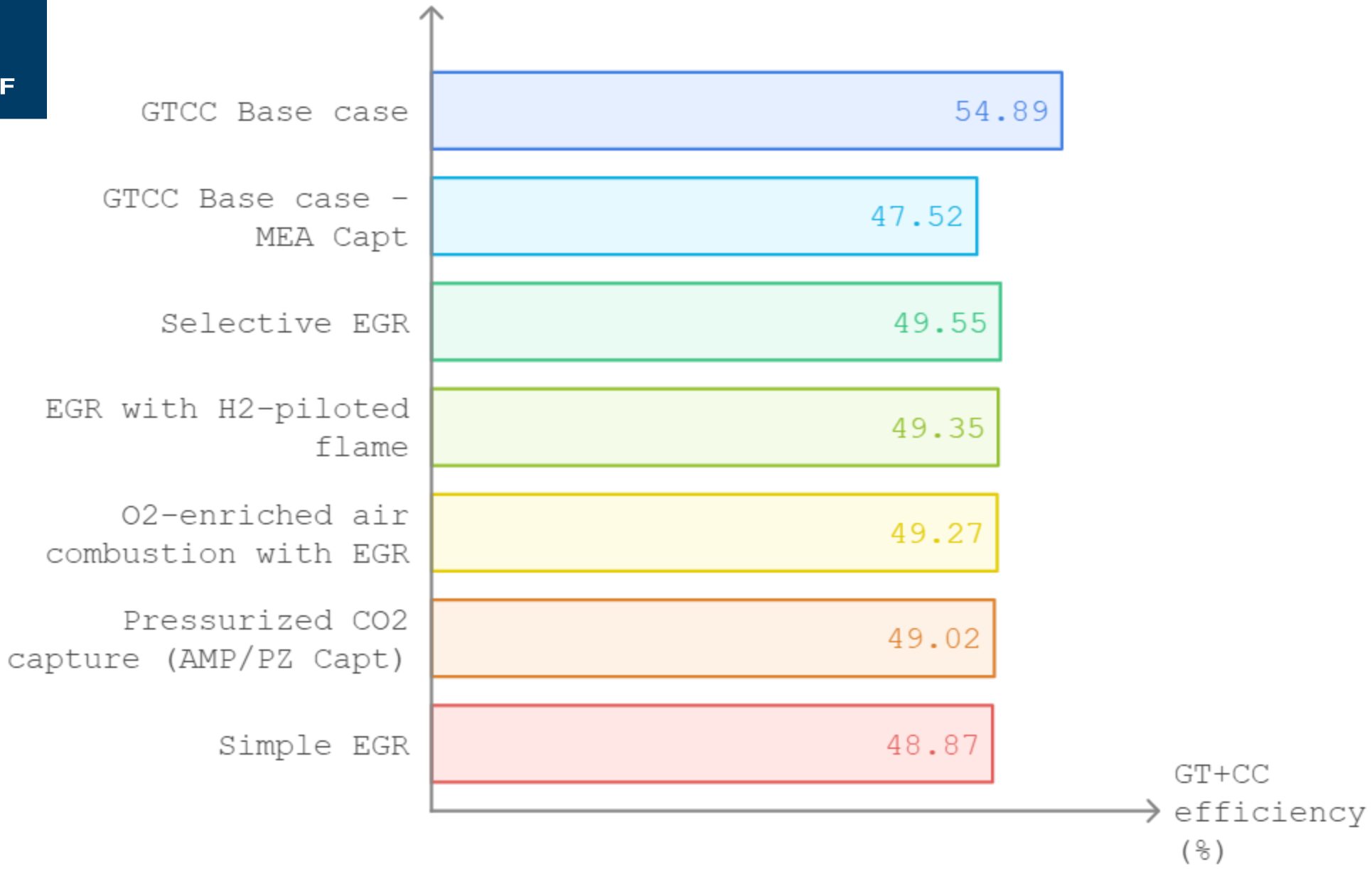


O2-enriched air combustion with EGR



EGR with H2-piloted flame




GTCC Base case
54.89
GTCC Base case – MEA Capt
47.52
Selective EGR
49.55
EGR with H2-piloted flame
49.35
O2-enriched air combustion with EGR
49.27
Pressurized CO2 capture (AMP/PZ Capt)
49.02
Simple EGR
48.87
GT+CC efficiency (%)

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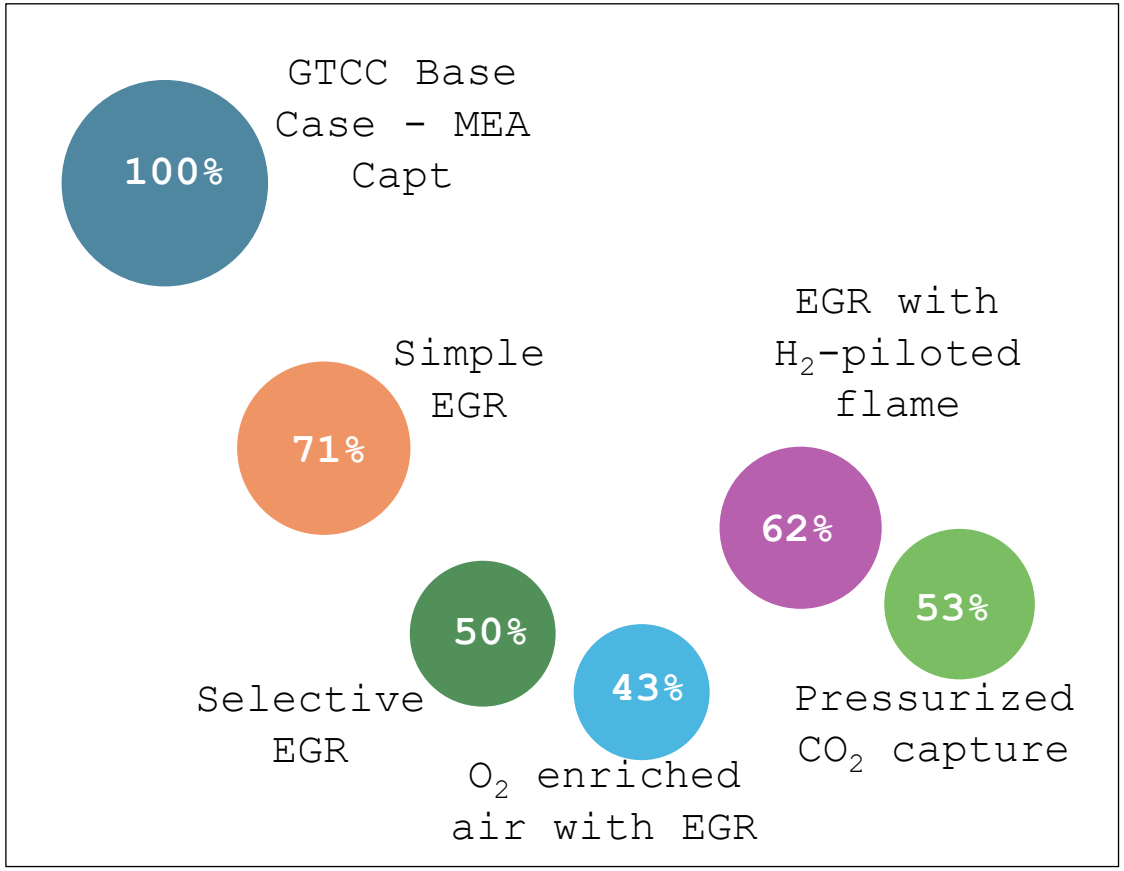
Capture volume



Conclusions and way forward

- Preliminary indicators are useful to evaluate the potential of the technologies and for a first screening
- More detailed evaluations should consider additional factors:
  - H_2 production impact (cost and energy)
  - Pressurized heat integration optimization with special heat exchangers design
  - Gas turbine design for extraction at higher pressure levels

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Technology for a better society