

# Clean and Efficient Combustion TCP

Highlights and updates from the TCP for EUWP

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## Policy related messages

- A roadmap for future fuels, supported by clear government policy commitments, is needed
  - Lack of it is a significant impediment to the decarbonization of combustion technologies
- Continued support of combustion research is essential for a low-carbon energy future:
  - Combustion remains a significant part of the global energy mix in the foreseeable future
  - Certain energy sectors are hard to electrify
  - Advanced, clean, and efficient combustion technologies operating on sustainable, zero- to low-carbon fuels offer the potential for low-carbon emissions in all energy sectors

# Strategic outlook

Three main purposes:

**Expand scientific knowledge base**  
to speed development and adaptation  
relating to low-carbon fuels



**Remove technological barriers**  
that impede decarbonization  
and emission reduction



**Guide decision makers**  
through systems analysis  
and policy recommendations

## Strategic outlook

- Accelerate energy system decarbonization and reduce harmful emissions through clean, efficient, cost-effective, low GHG combustion technologies
  - **Fuel flexibility** for rapid energy transition
  - **Local, sustainable energy resources** to strengthen local economies
  - Focus on **hard-to-electrify** sectors
    - Fuels of particular interest in the next term: H<sub>2</sub>, NH<sub>3</sub>, methanol, and other low net-carbon fuels
- Battery fires are a critical combustion/electrification intersection
- Consolidate technical information through systems analysis to highlight benefits of low GHG technologies and guide technology selection
- Advise policy makers on efficiency and emissions potential, cost benefits, and remaining barriers relating to combustion-based technologies

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## Achievements / Ongoing Activities

- Italy joined as a new member country, bringing the total CPs to 12
- A combustion research “trends and needs” survey in each member country was completed
  - Helped guide our continued transition toward research supporting clean and efficient combustion technologies for sustainable fuels
- Completed studies have now confirmed that current gas turbines operating on natural gas/H<sub>2</sub> mixtures containing up to 20-30% H<sub>2</sub> can be a first step into a H<sub>2</sub>-based economy
- Early results suggest that with optimized staged-combustion and pre-cracking of NH<sub>3</sub> into H<sub>2</sub> and N<sub>2</sub>, good combustion and a substantial reduction in NO<sub>x</sub> emissions can be achieved for all NH<sub>3</sub> applications (engines, turbines, furnaces, and process heaters)

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## Dissemination and Outreach

- Organized the TCP Annual Spray Workshop (April 4, 2022, SAE World Congress in Detroit, ~40 participants)
- Visibility in the scientific community continues with extensive publications of TCP research in peer reviewed journals and presentations at conferences

(List of publications available at <https://www.ieacombustion.com/meetings-publications/tcp-publications/> )

- Held first post pandemic in-person 3-day Task Leaders Meeting in Japan with a hybrid option
- More than 45 presentations and 40 participants.



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## Collaboration and Co-Operation

- In support of the IEA GREET+ Extension Project, a lifecycle assessment of hydrogen-fueled ICEs in collaboration with the AMF and Hydrogen TCPs has been initiated
- Participated in the first IEA Critical Minerals TCP Coordination Group meeting December 8, 2022
- TCP members serving as organizers, leaders and/or active participants in external meetings/consortium/workshops continue to bring IEA/TCP perspectives, influence, and visibility to the broader community. (e.g., 1<sup>st</sup> Symposium on Ammonia Energy, Sep. 1-2, 2022, Cardiff, UK , ~300 participants)