

FUTURE MARINE PROPULSION: WHY NOT ADD A FUEL?

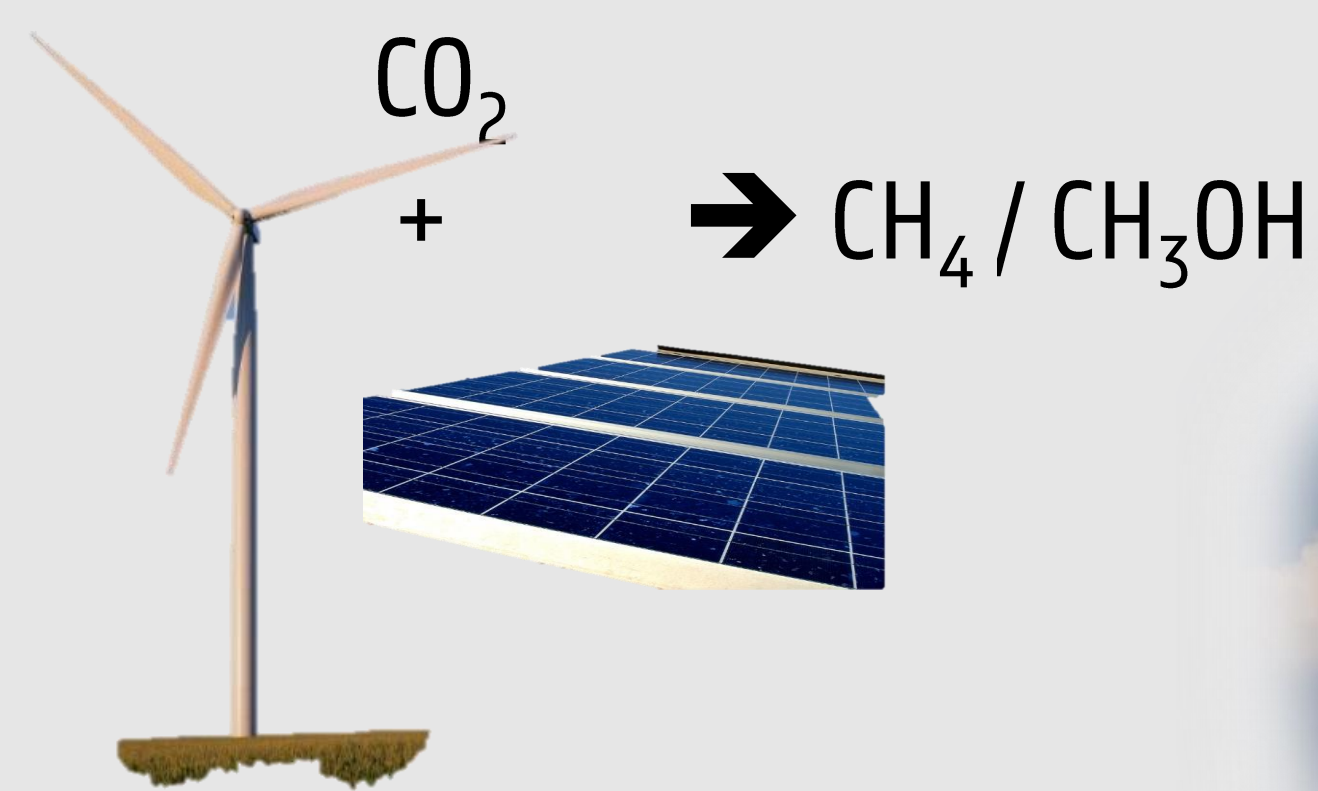
Marine transportation remains no° 1 carrier of consumer goods
Internal combustion engine for its propulsion

Engine-out CO₂ and emissions of NO_x and soot have to decrease

CO₂ capture + renewable energy → “electro”- or “sun”-fuels

Gradually implement these new fueling techniques in the current marine fleet

Computational Fluid Dynamics as an optimization tool



Dual-Fuel concepts as a transitioning tool to sustainable marine transportation

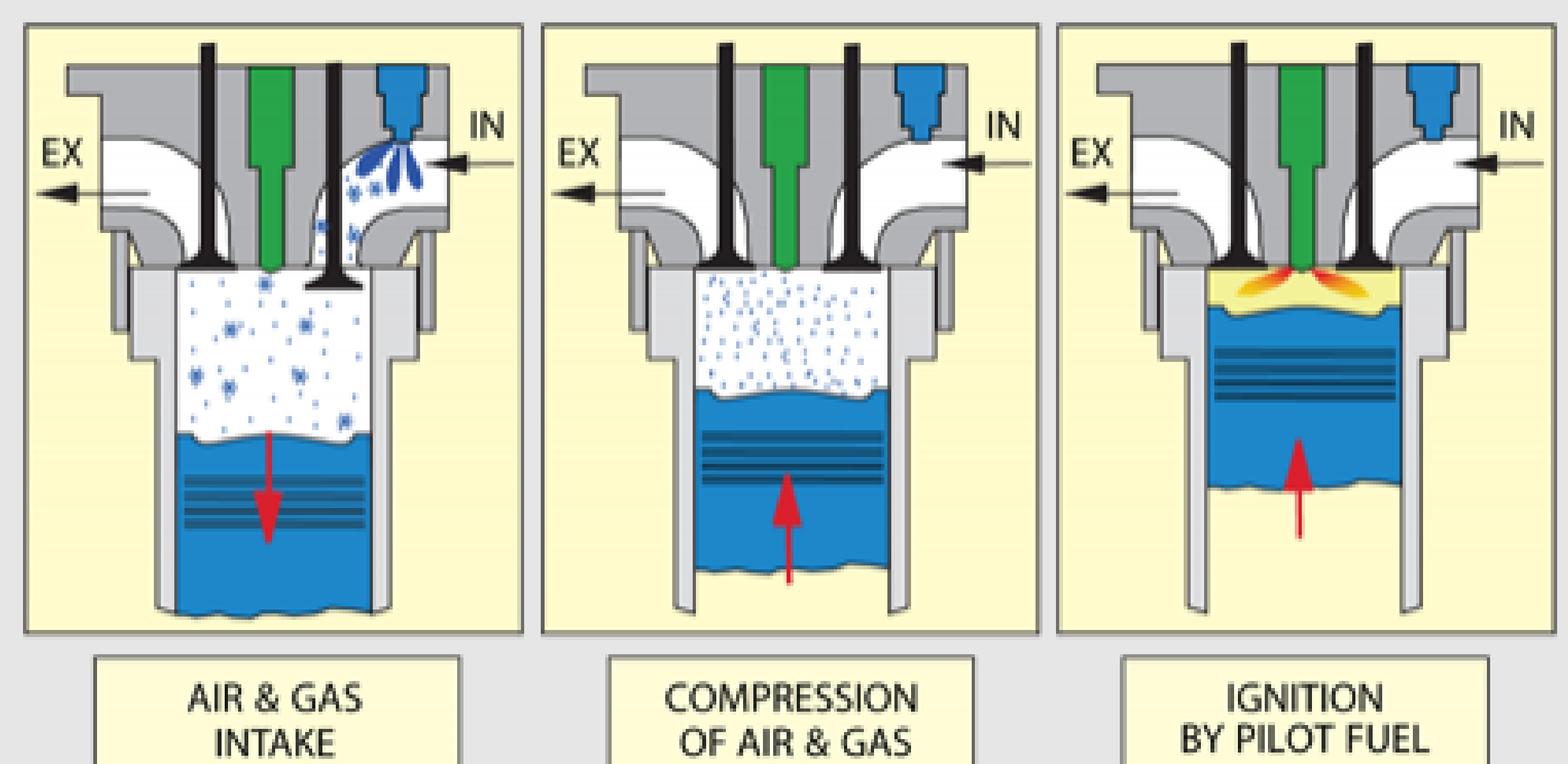
Easy and cost-efficient retrofit of current marine engines

Reduction of NO_x and soot

Introduction of sustainable/renewable fuels

Scalable solution

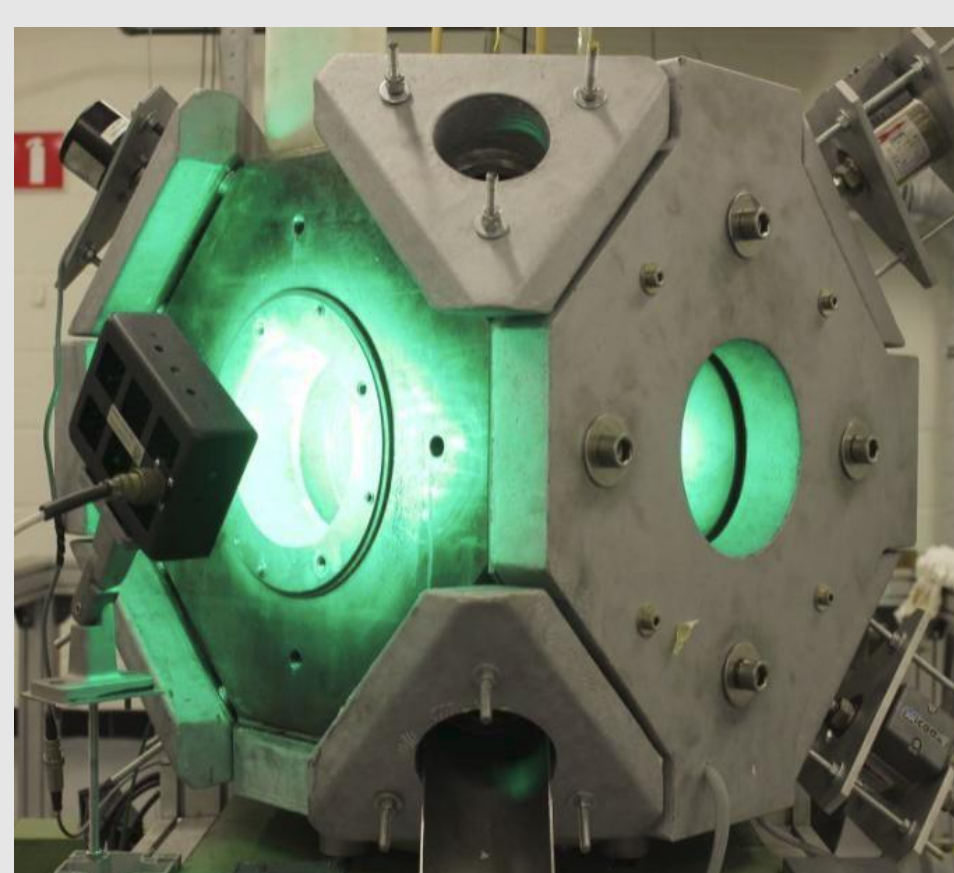
Optimization needed → Computational Fluid Dynamics



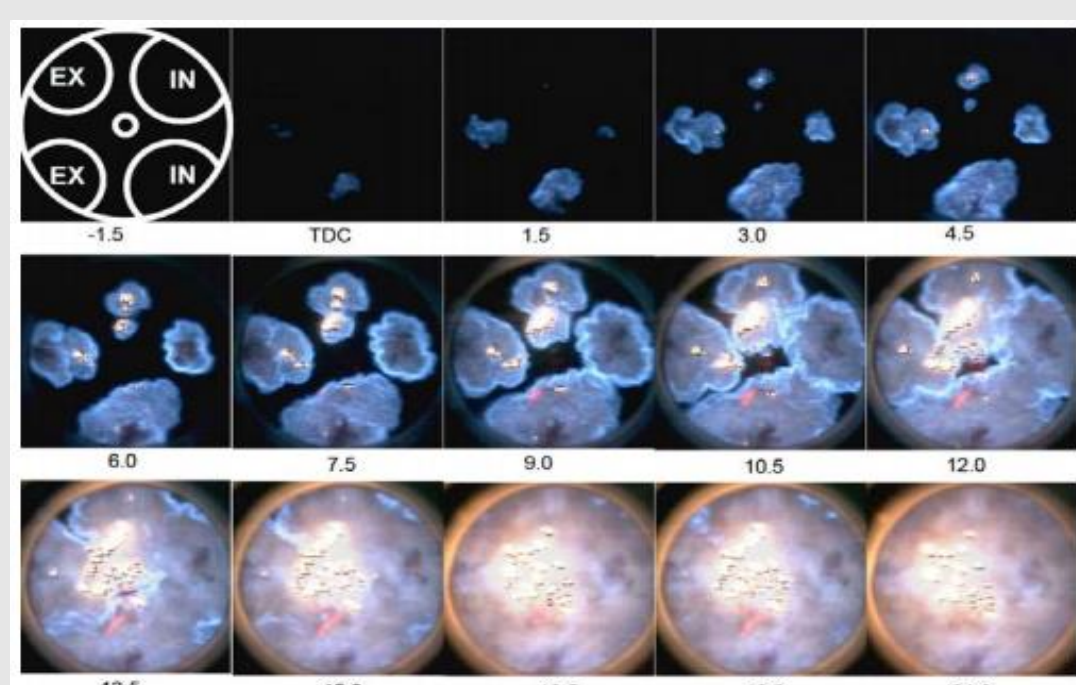
CFD Roadmap



I. Heat Transfer simulations

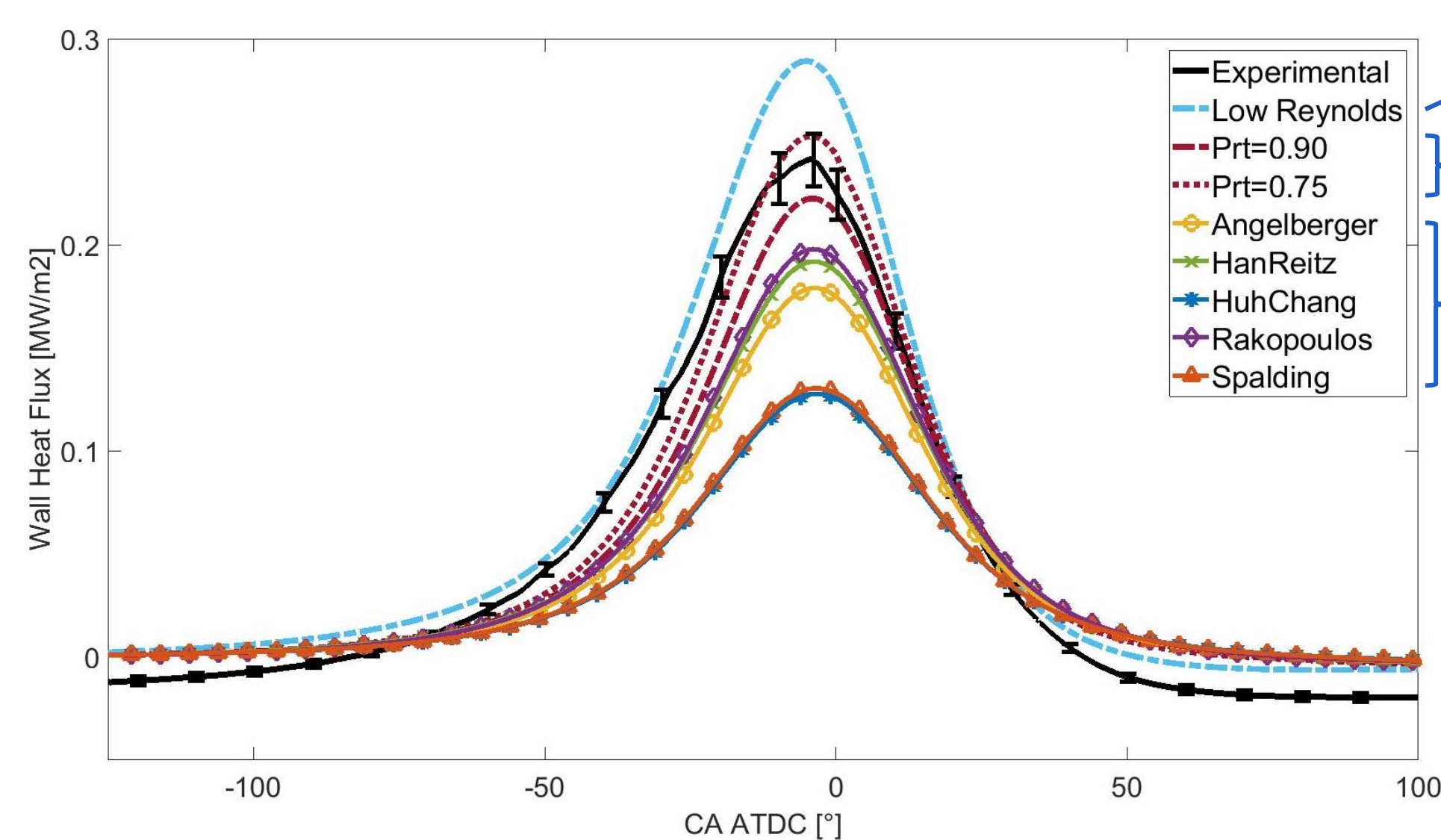


II. Spray simulations



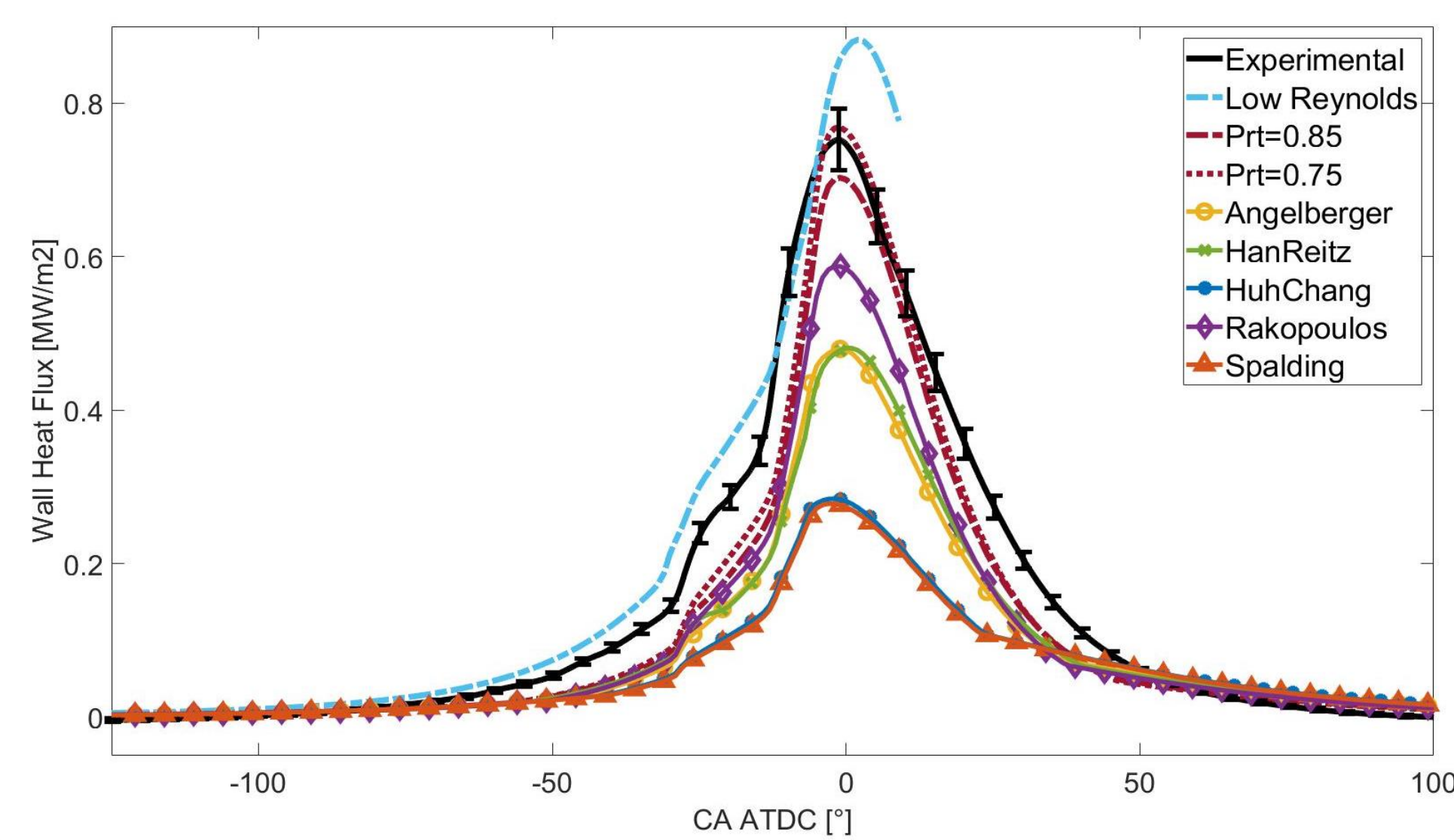
III. Dual fuel combustion – flame propagation – prediction of flame extinction

Part I: Heat Transfer Simulations & Analysis of Wall Heat Flux Models



Resolve thermo-viscous boundary
Tune heat flux with Pr_t
Wall heat flux models

Compare CFD simulations with up-to-date engine technologies and experiments



Evaluate local instantaneous heat flux

Wall heat flux models incapable of accurately predicting the heat flux

Tuning with Pr_t or resolving thermo-viscous boundary gives more accurate results

Marine transportation will remain prominent in the future as the main carrier of consumer goods. For its propulsion technique, we believe in the internal combustion engine, provided it can operate on alternative renewable and low-carbon fuels. In studying and optimizing these new fueling strategies, Computational Fluid Dynamics is a helpful and necessary instrument.

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