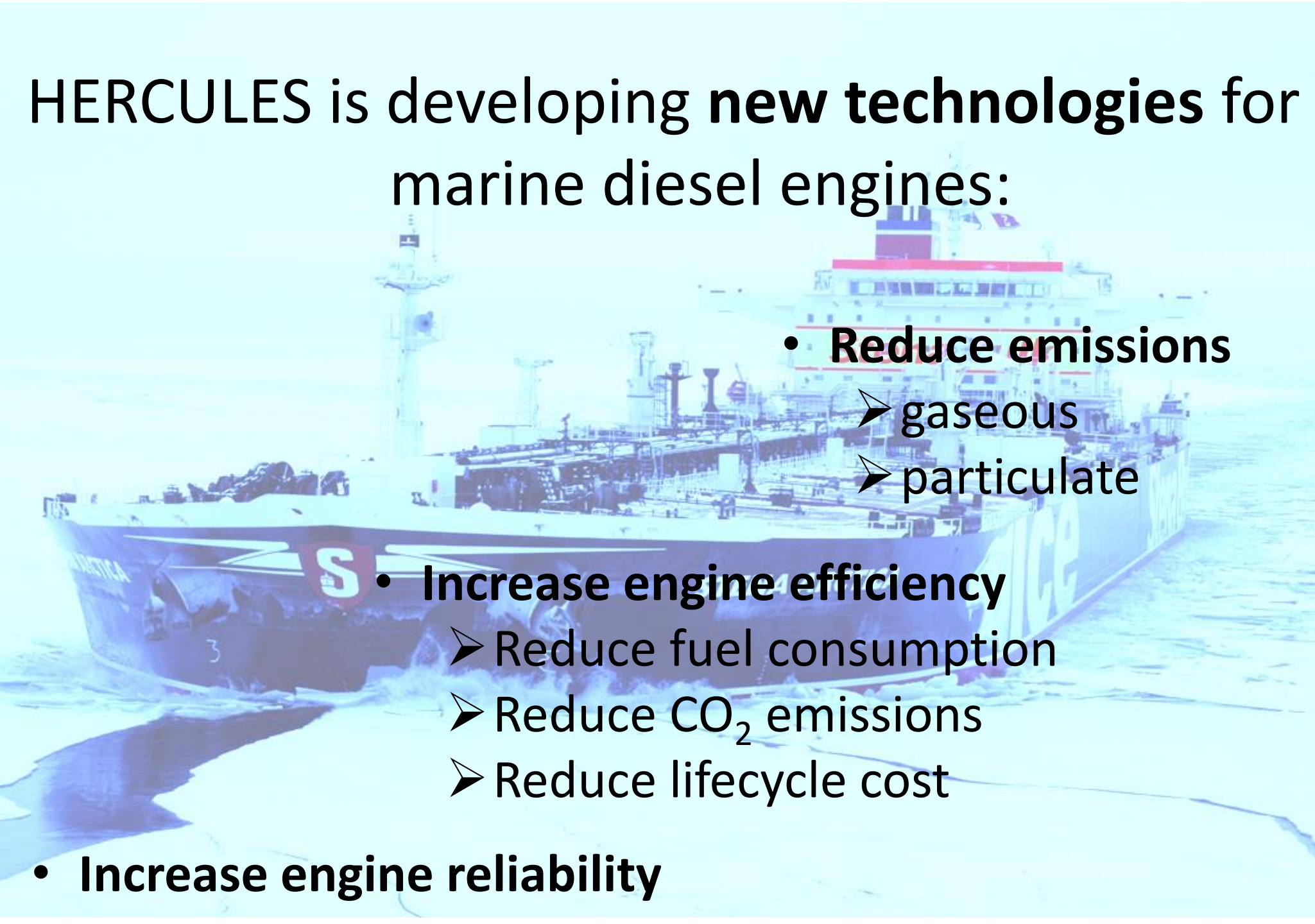


From HERCULES A-B-C to HERCULES-2 : A classic cooperative programme in Large engine R&D

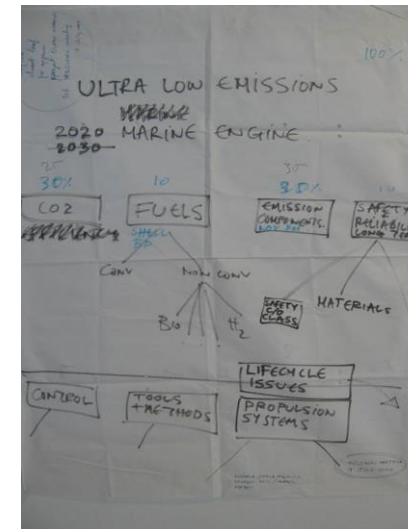
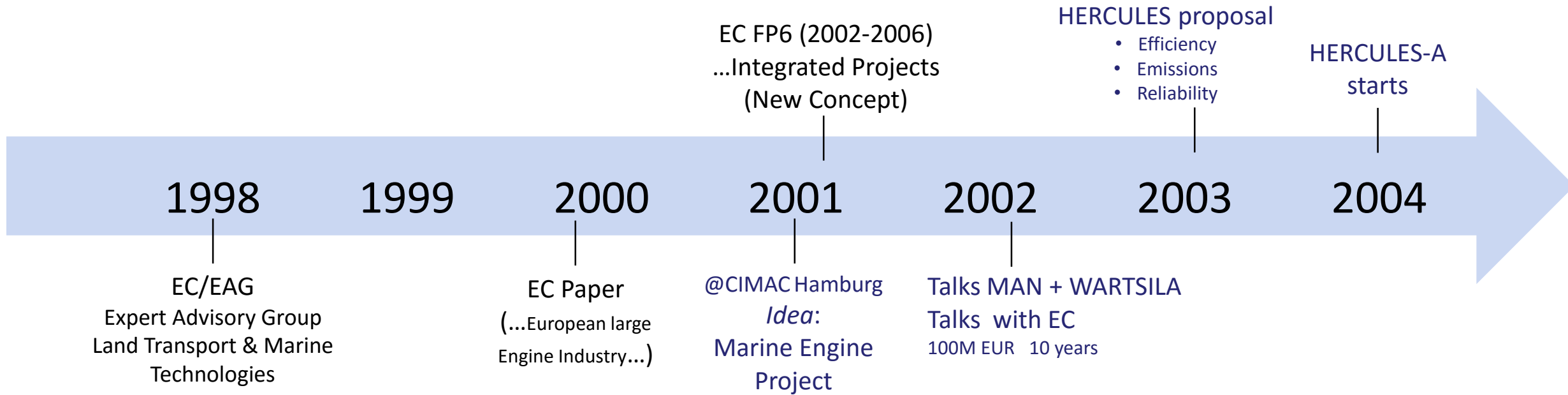
- Nikolaos Kyrtatos, NATIONAL TECHNICAL UNIVERSITY OF ATHENS
- Gunnar Stiesch, MAN DIESEL & TURBO SE,
- Ilari Kallio, WÄRTSILÄ Finland Oy



HERCULES is developing **new technologies** for marine diesel engines:

- 
- **Reduce emissions**
 - gaseous
 - particulate
 - **Increase engine efficiency**
 - Reduce fuel consumption
 - Reduce CO₂ emissions
 - Reduce lifecycle cost
 - **Increase engine reliability**

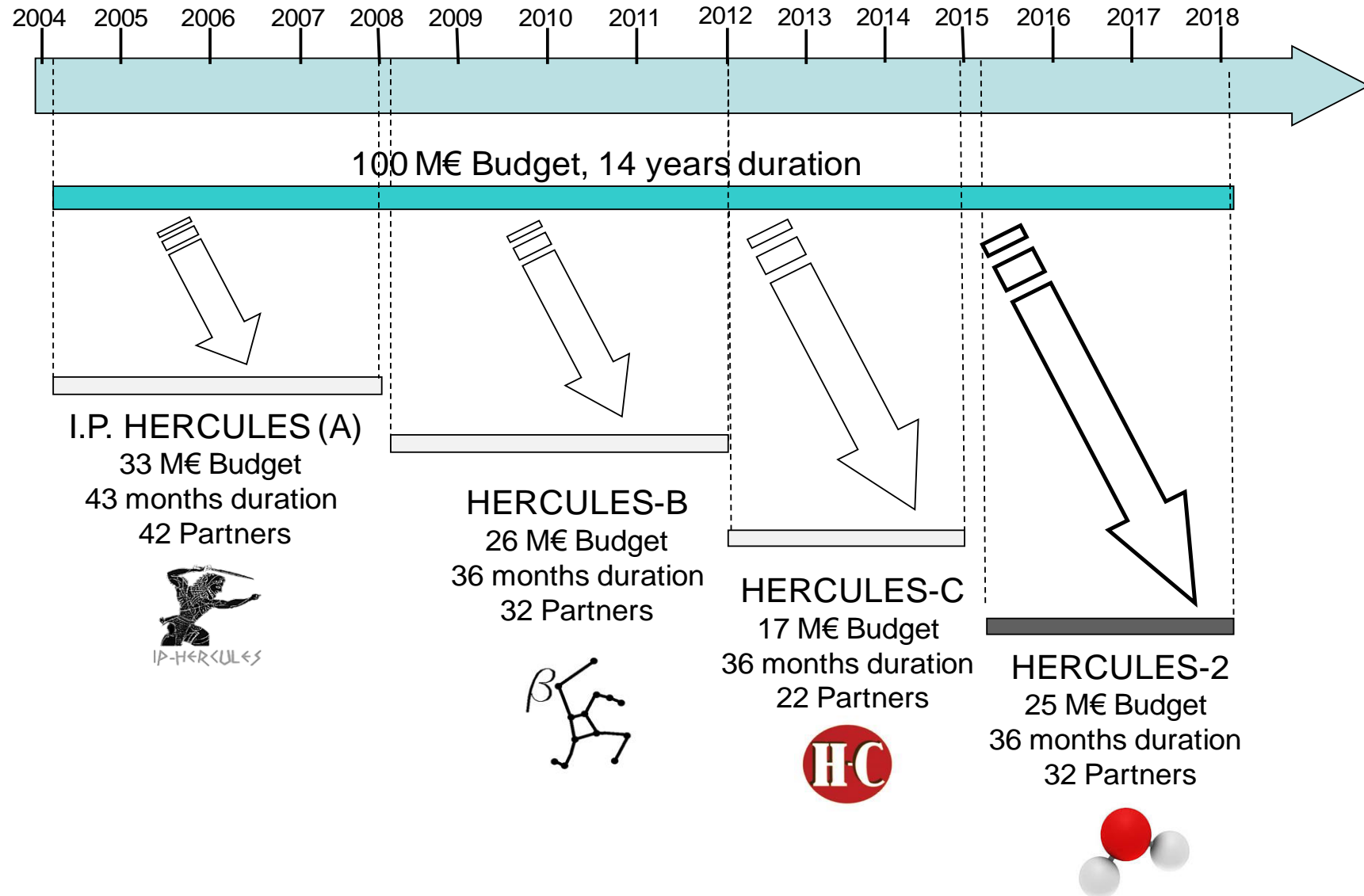
HERCULES Mythology



Flipchart page
First MAN – WARTSILA
joint Meeting: Helsinki,
4th July 2002

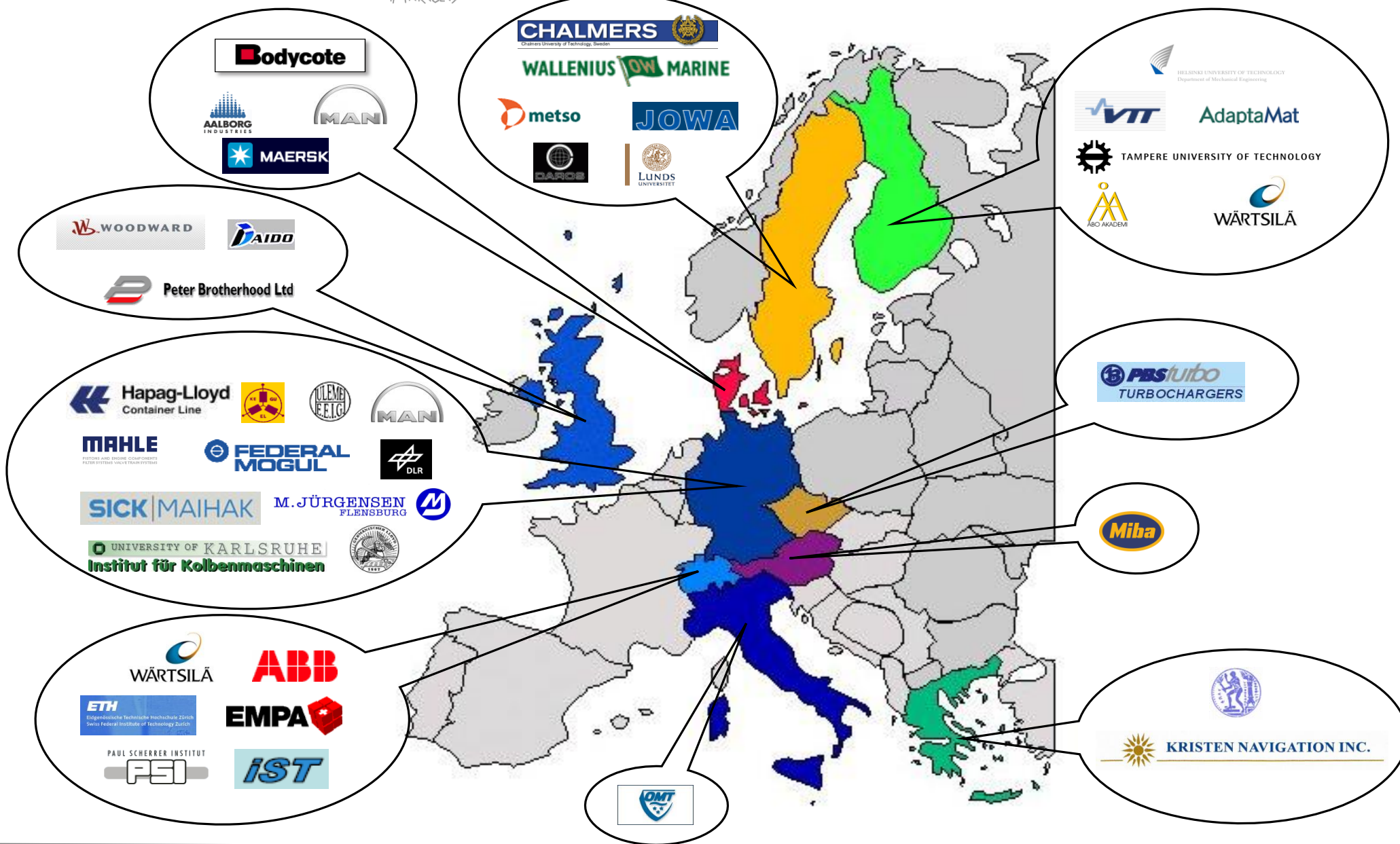


HERCULES TIMELINE

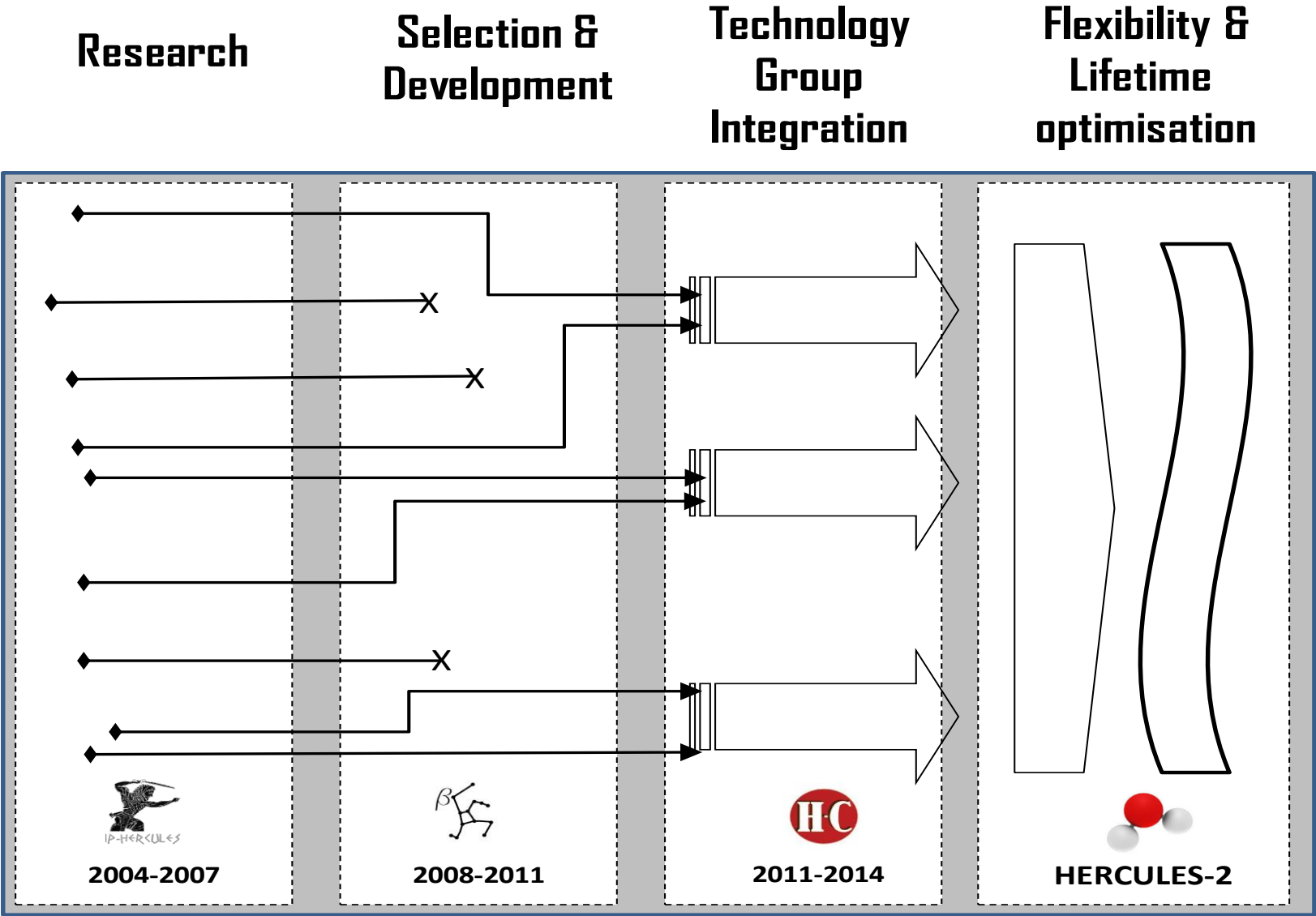


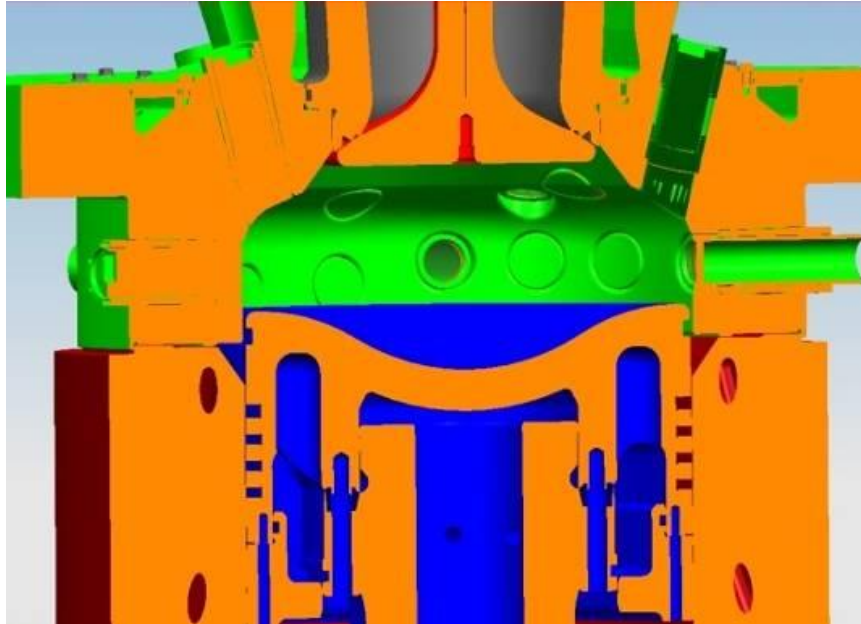


I.P. HERCULES-A – Consortium



From HERCULES-A, B, C to HERCULES-2



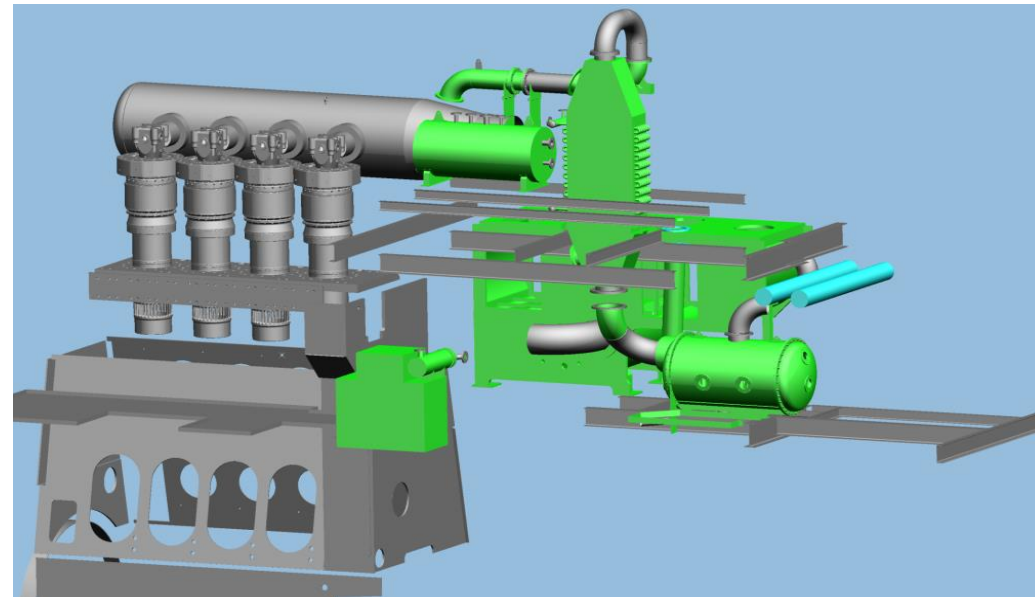
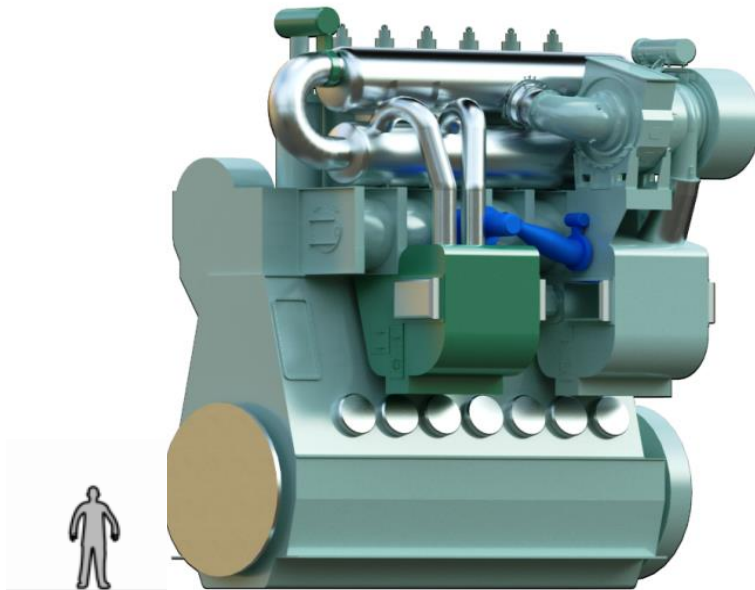


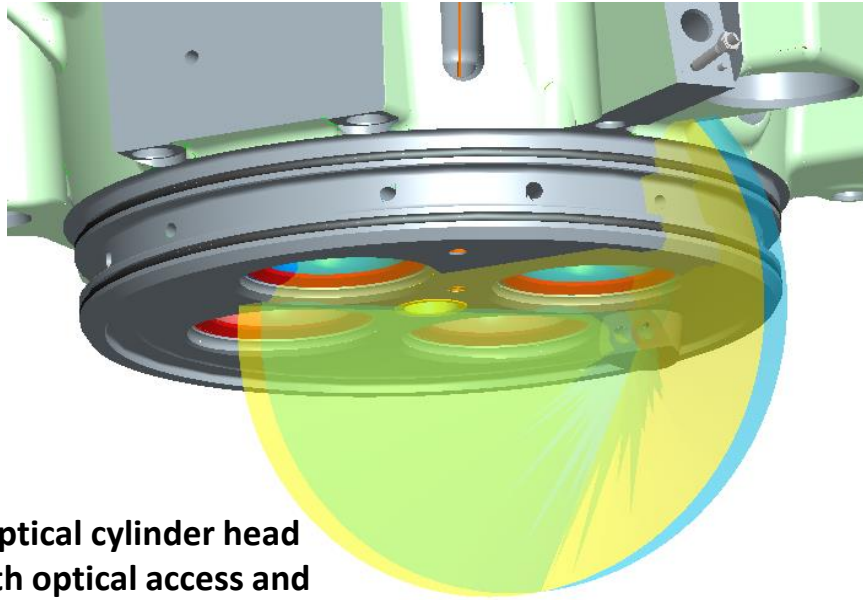
Optical cylinder covers for 2-stroke



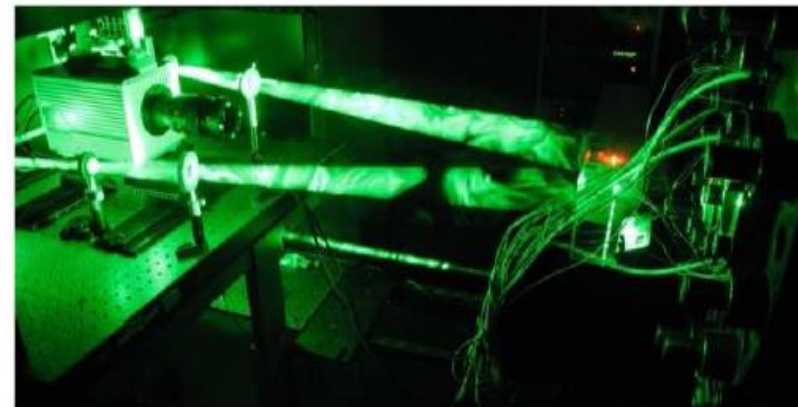
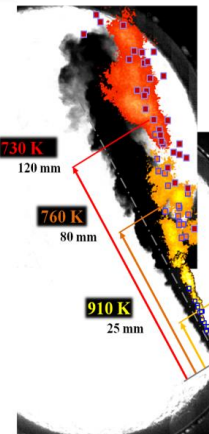
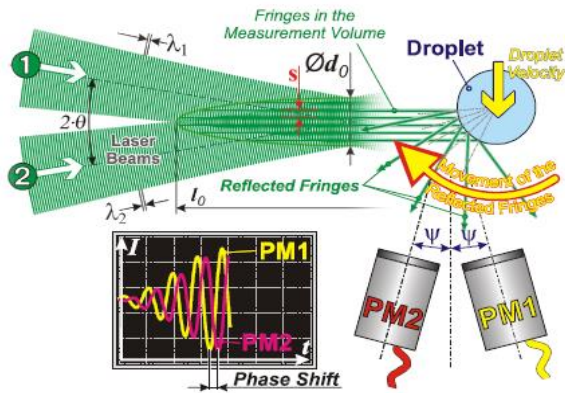
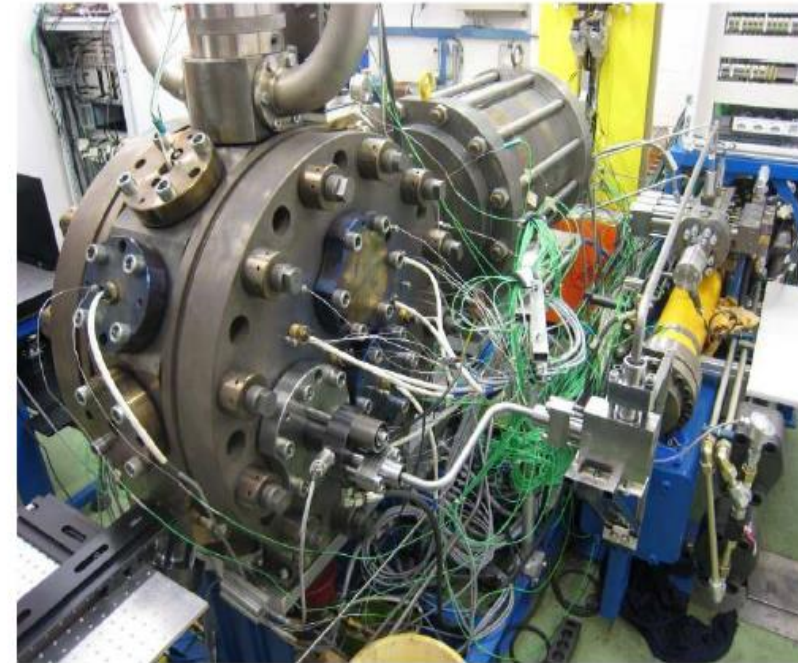


High Pressure Boiler installed on 4T50ME-X





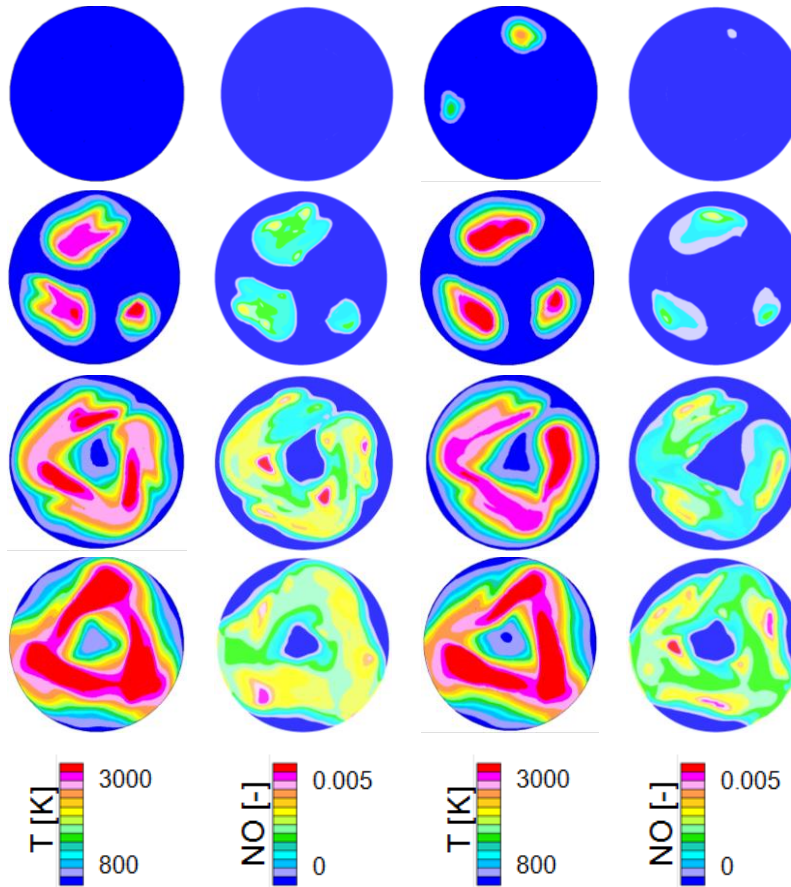
**Optical cylinder head
with optical access and
viewing range**



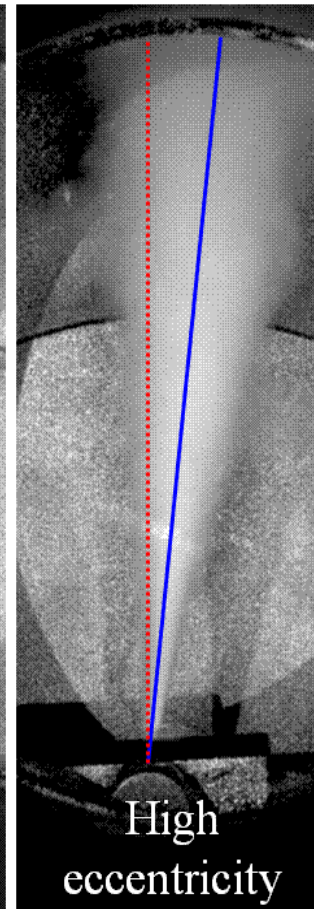
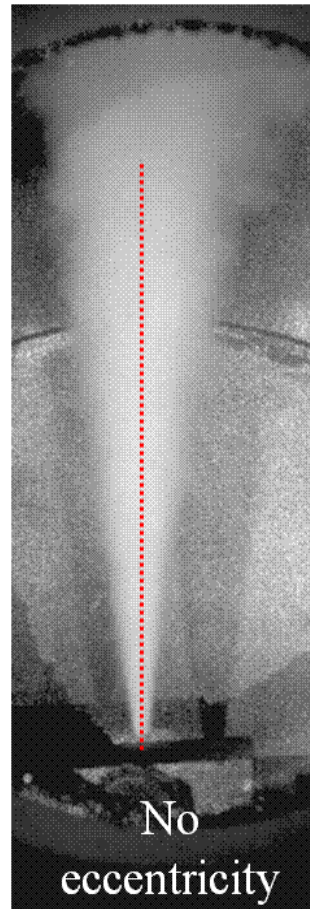
WP 3: Injection, Spray Formation and Combustion

Ref. single injection

Multiple injection

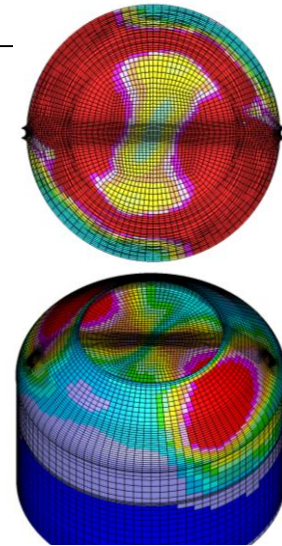
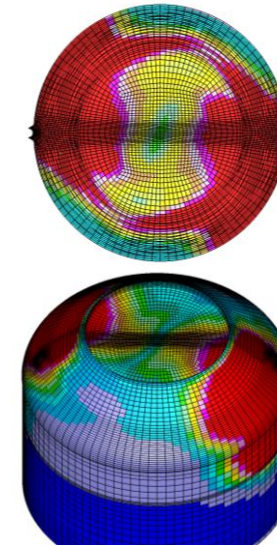


CFD models for multiple injection

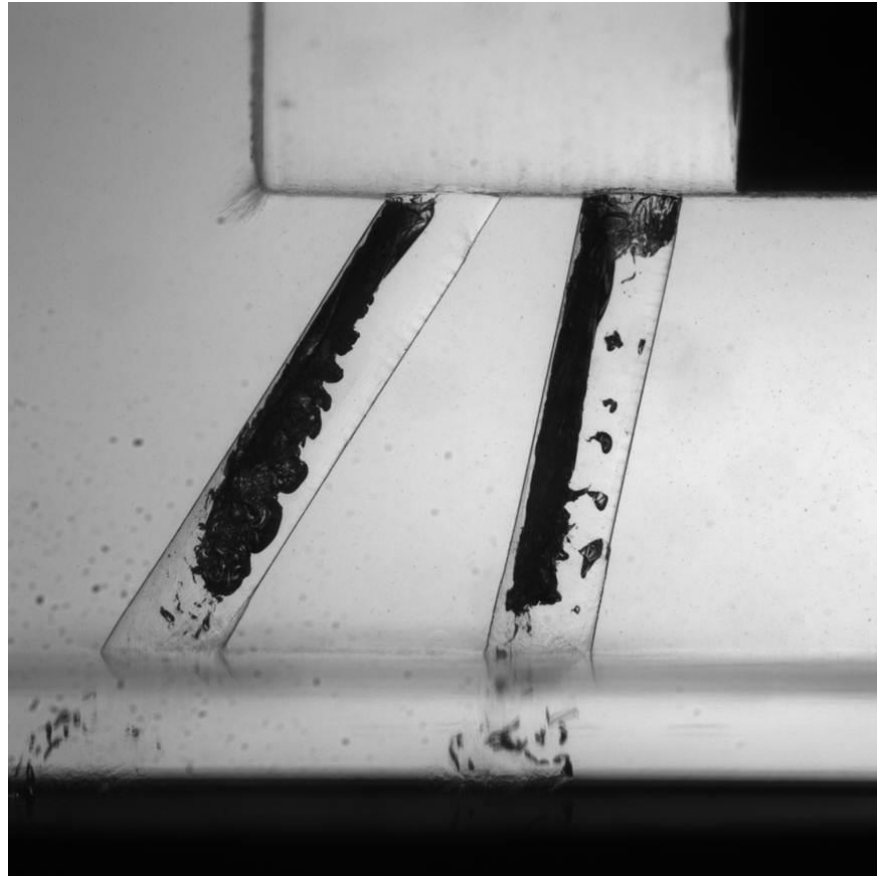


Eccentric nozzle

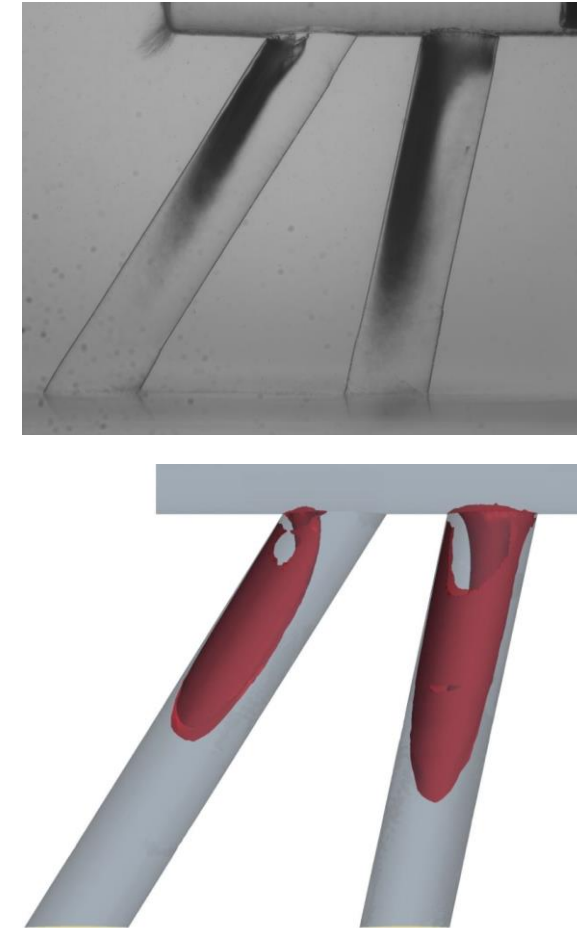
Non-eccentric nozzle



Nozzle bore eccentricity investigation

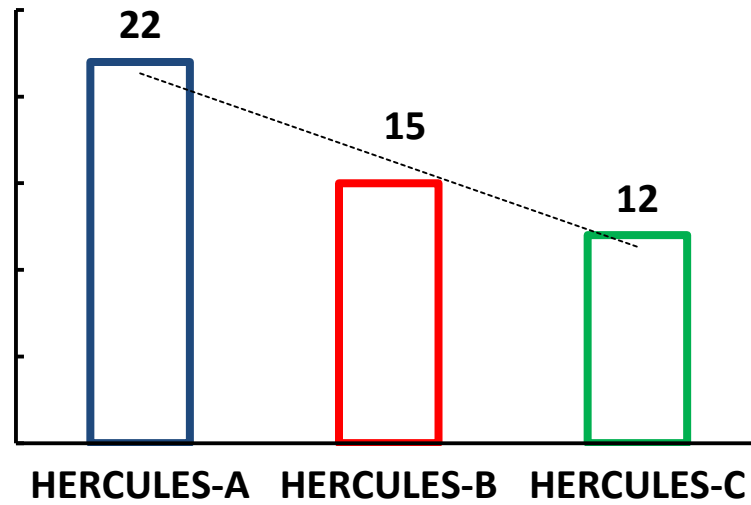


Instantaneous in-nozzle cavitation pattern for a two hole nozzle layout

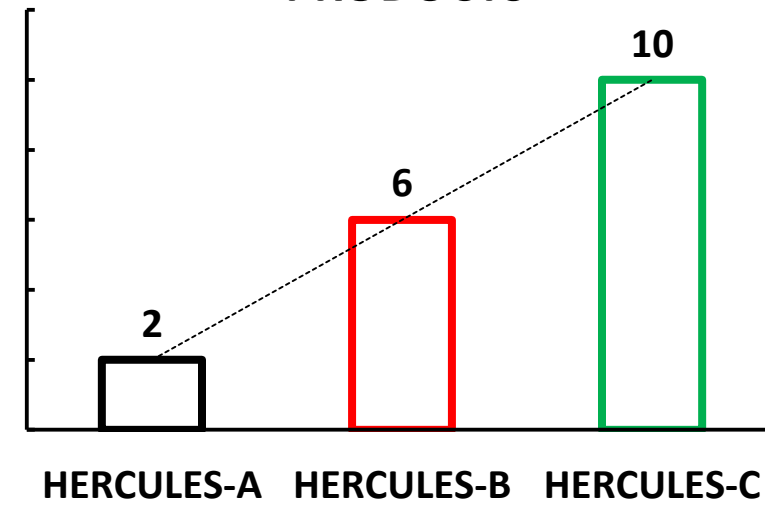


Evaluation of flow coefficients and describing in-nozzle flow and cavitation

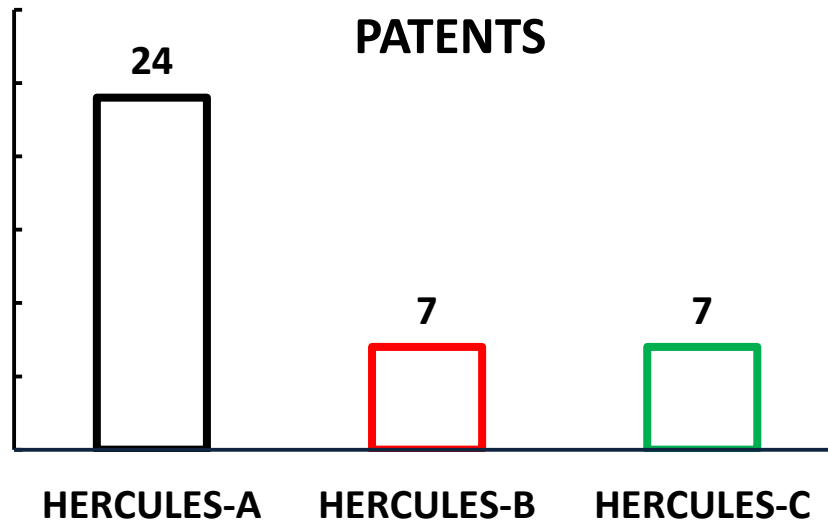
PROTOTYPES



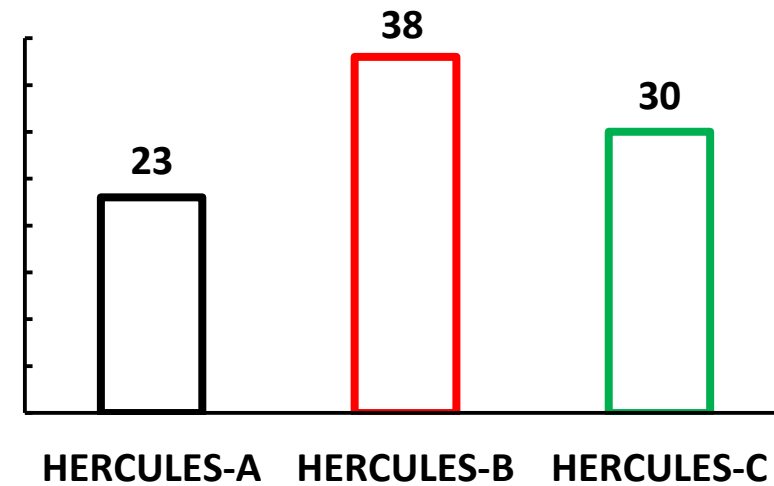
PRODUCTS



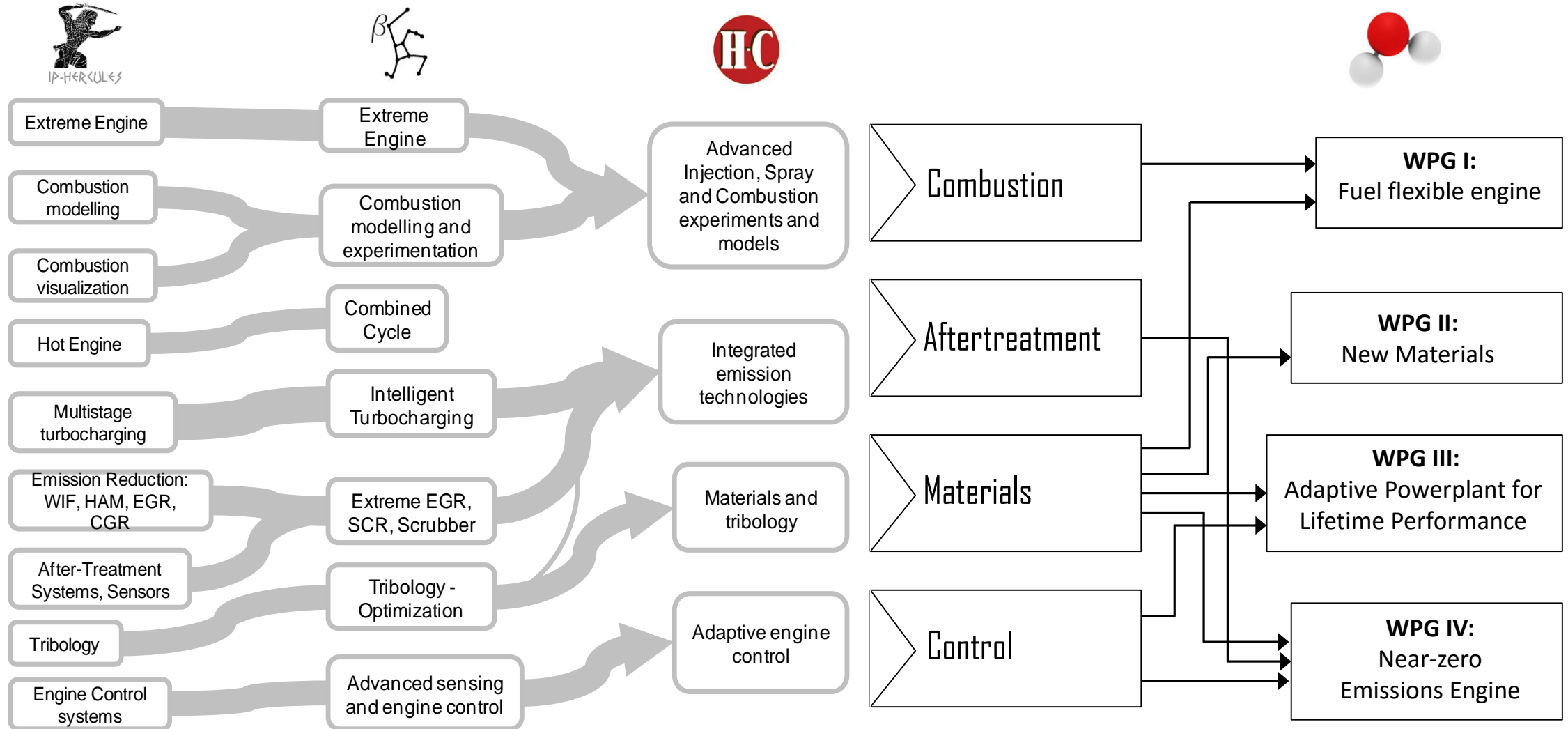
PATENTS



PUBLICATIONS



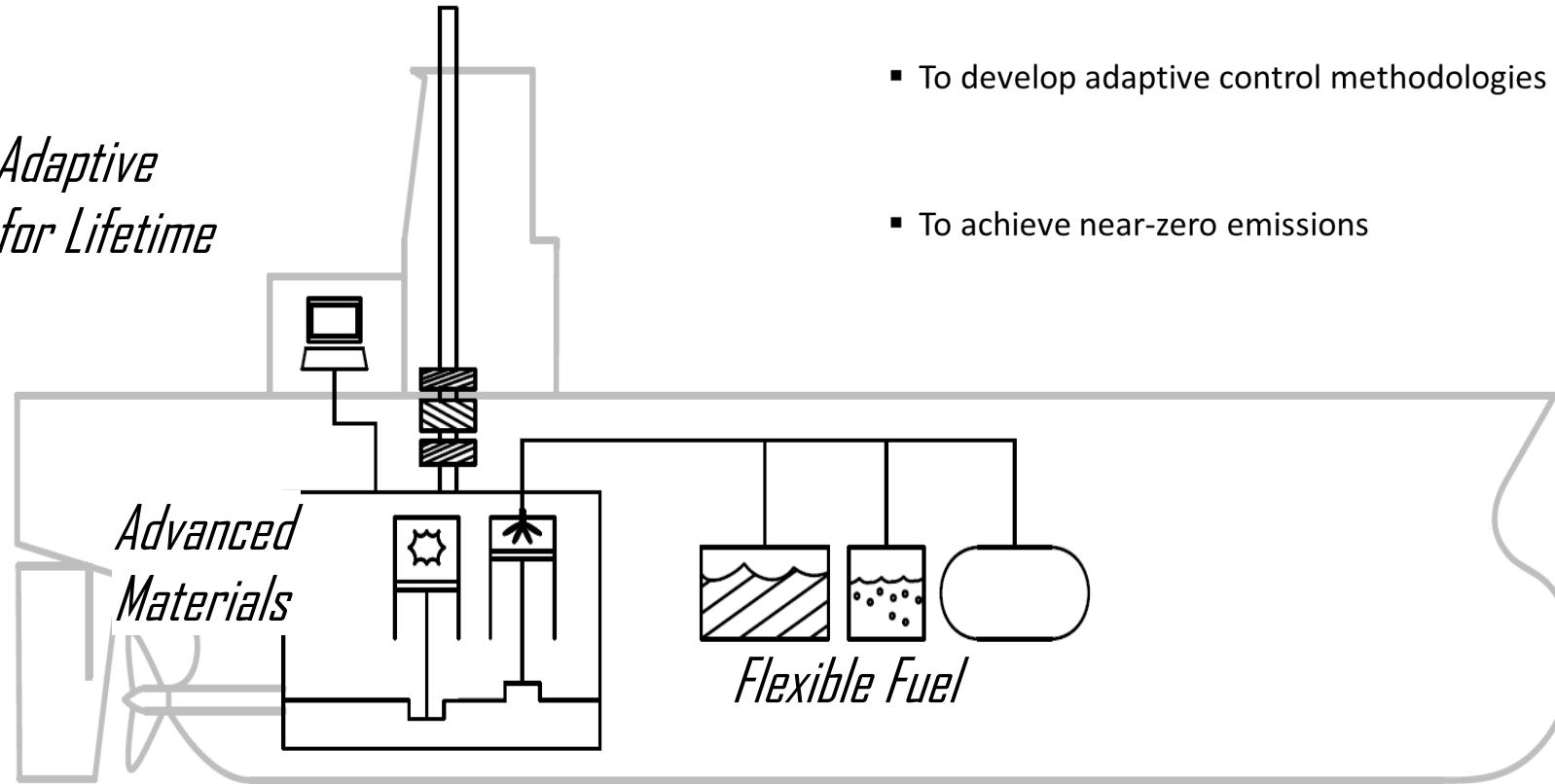
Links from H-A, H-B and H-C to HERCULES-2





*Near Zero
Emissions*

*Adaptive
for Lifetime*



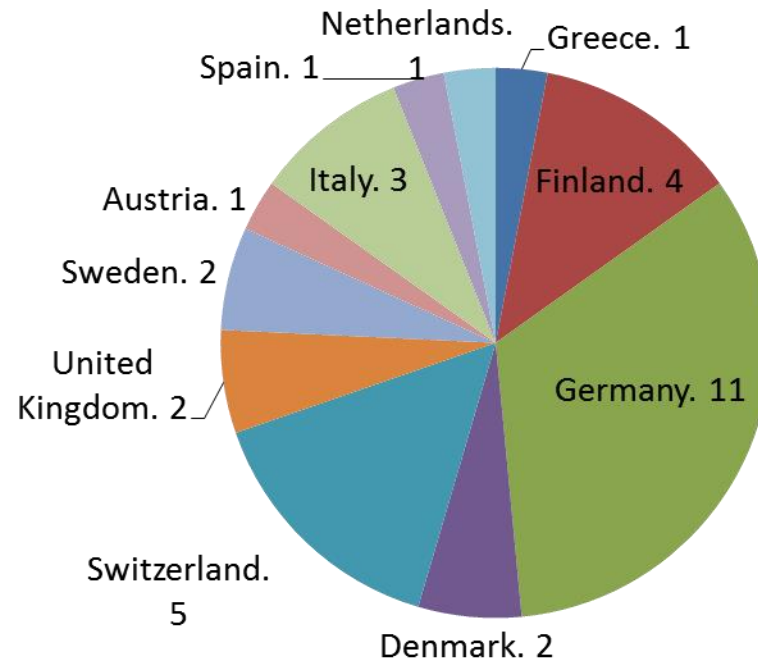
- To improve fuel flexibility
- To formulate new materials to support high temperature applications
- To develop adaptive control methodologies to retain Lifetime powerplant performance
- To achieve near-zero emissions



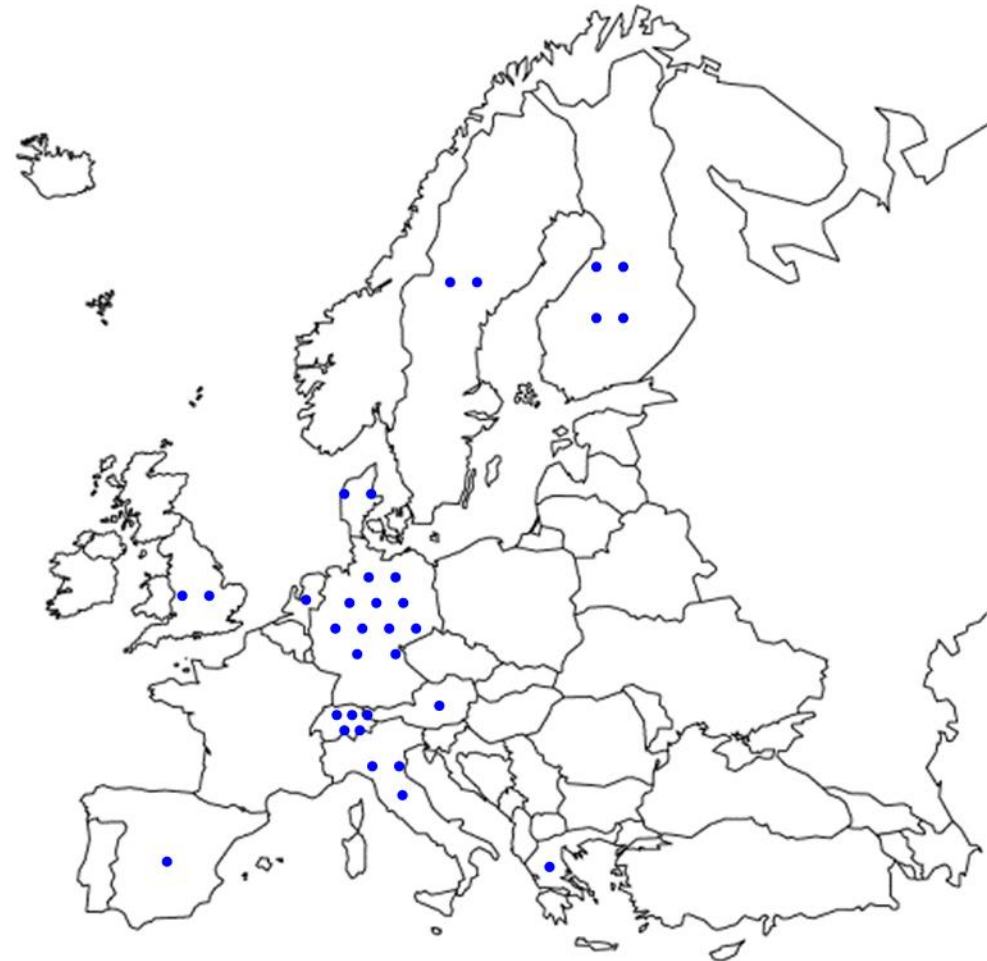


No of Partners: 33

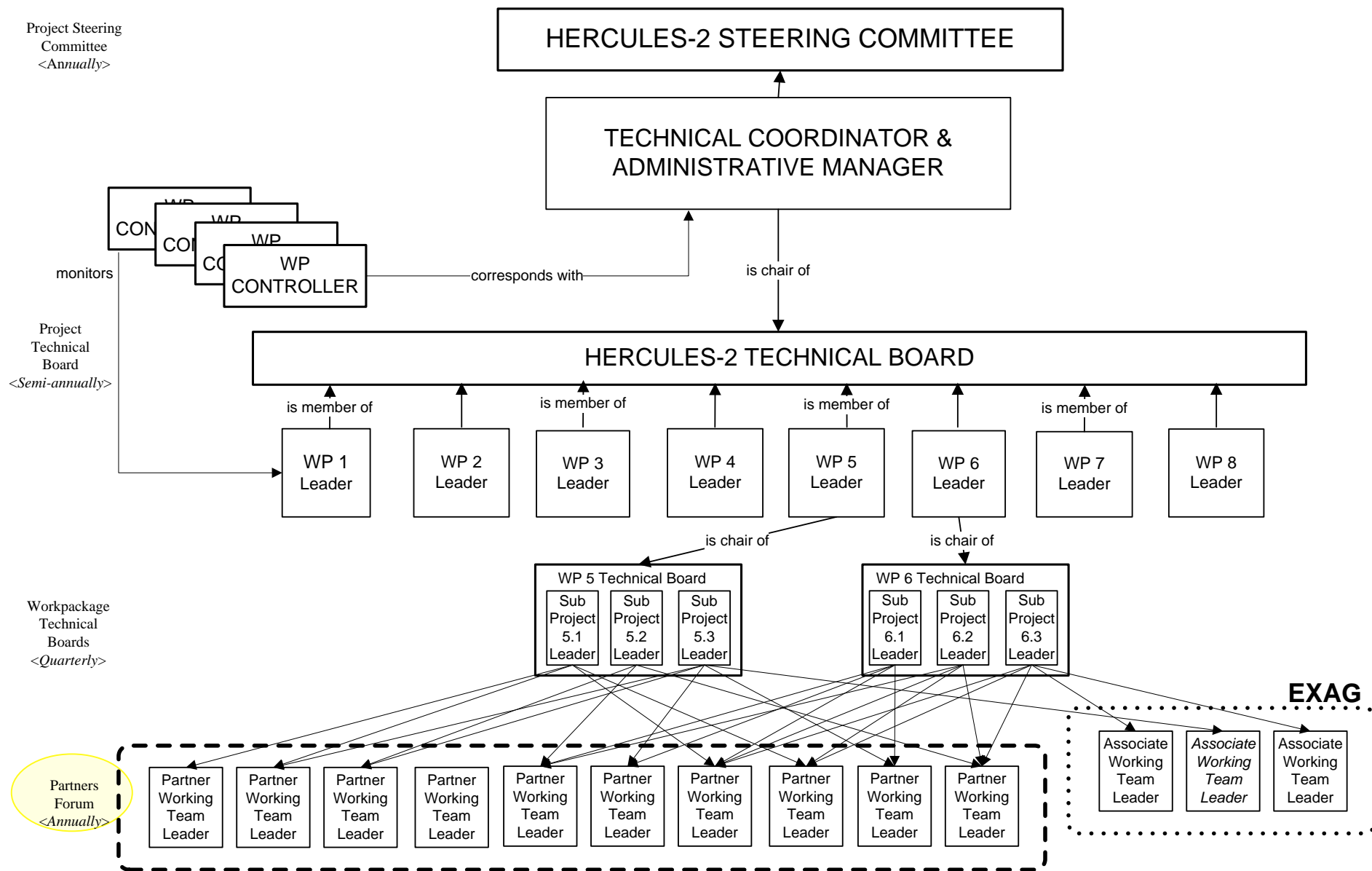
20 New Partners in relation to H-C (60% renewal)

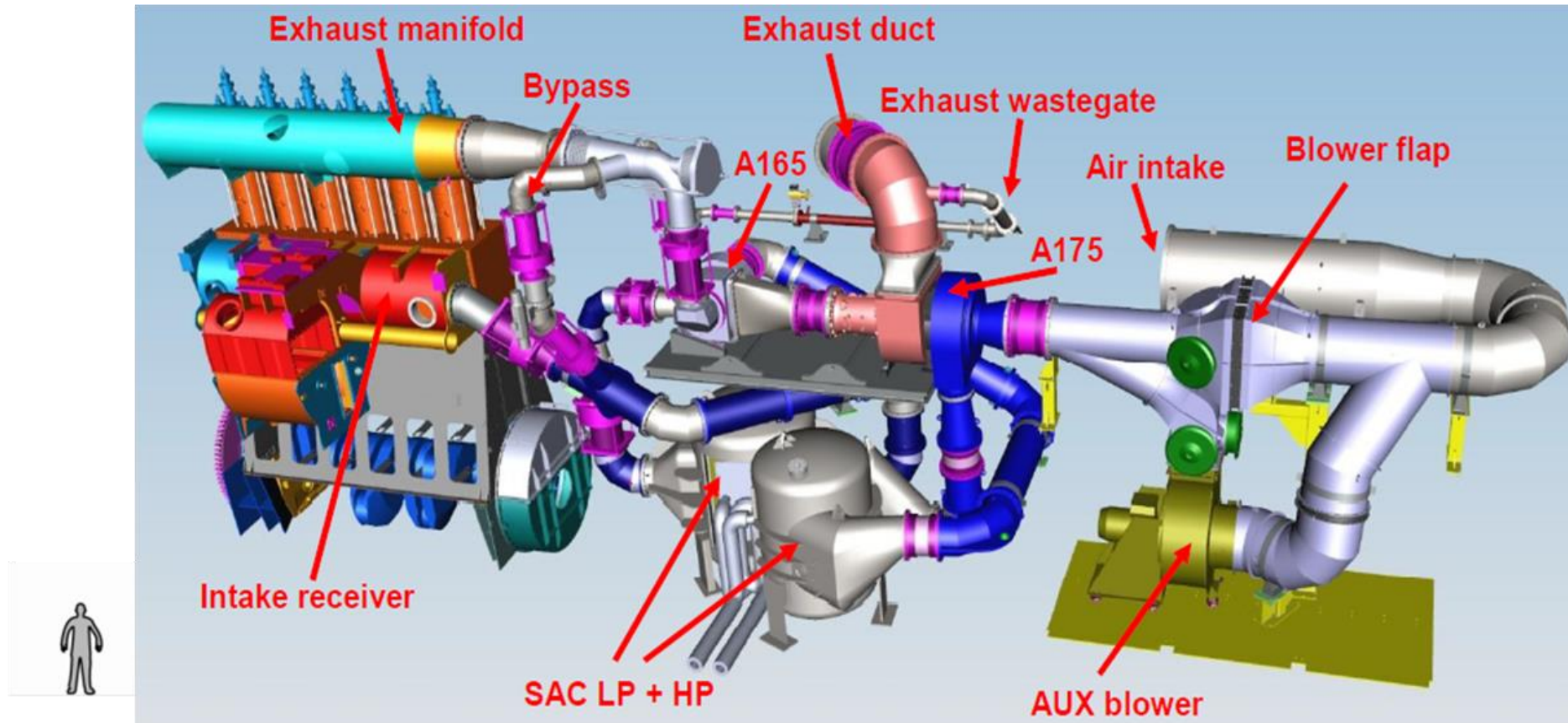


33% Industry
52% Universities
15% Research Inst.



H-2 Management Structure







The Programme

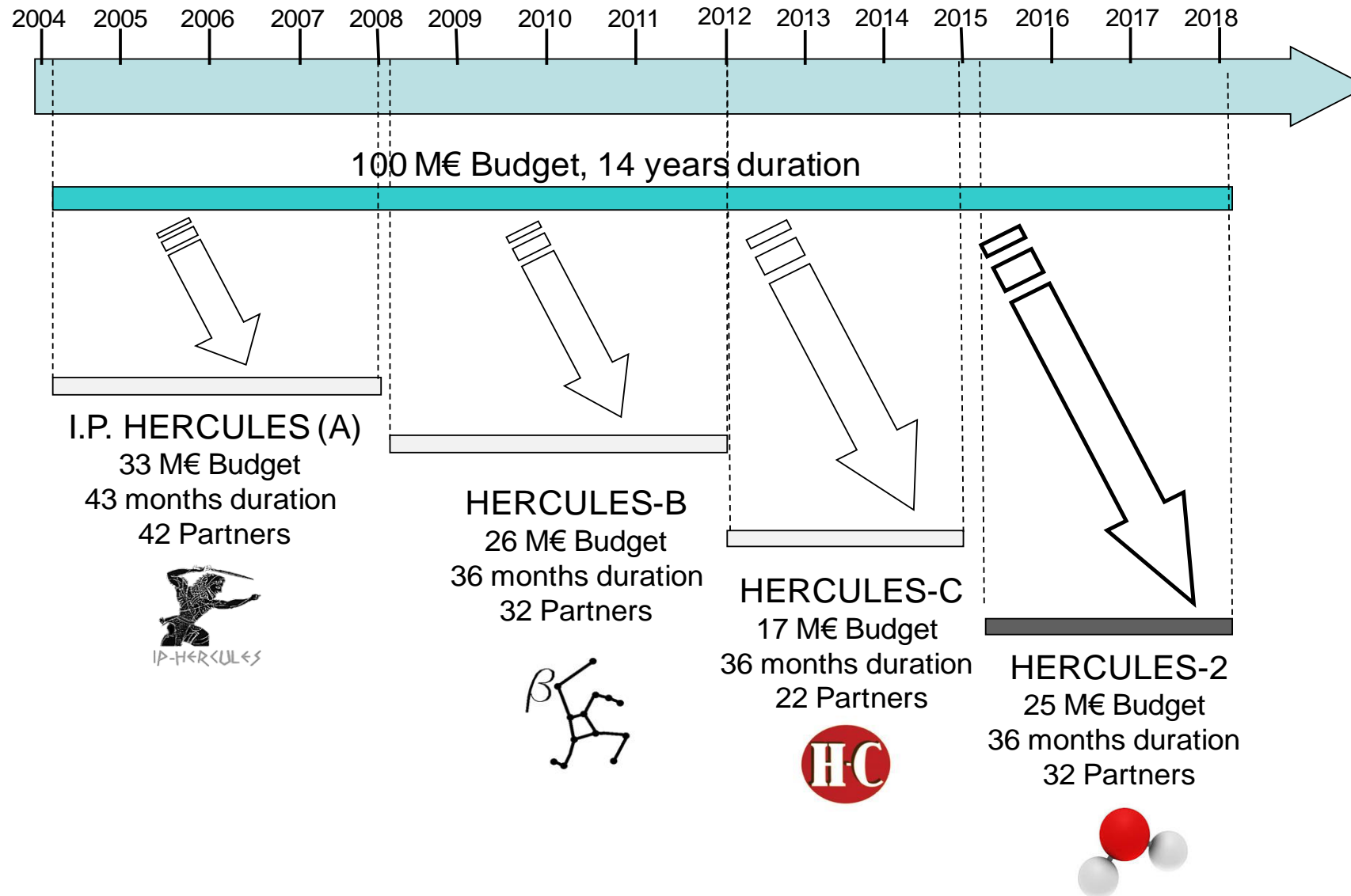
HERCULES was conceived in 2002 as a long-term R&D Programme, to develop new technologies for marine engines. It is the outcome of a joint vision by the two major European engine manufacturer Groups MAN & Wärtsilä, which together hold 90% of the world's marine engine market.

Three consecutive projects namely HERCULES - A, -B, -C spanned the years 2004-2014 with a

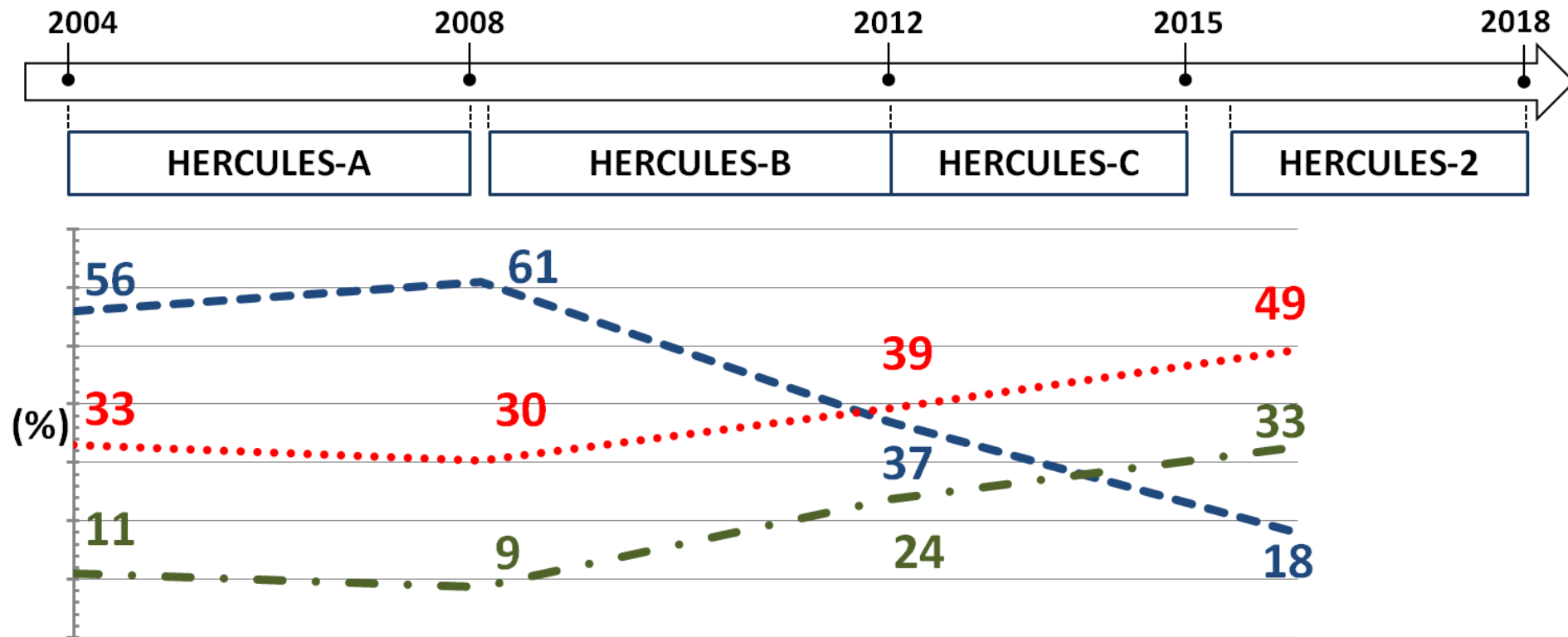
Latest news

- The HERCULES-2 1st Partners Forum will take place in Copenhagen, Denmark, on 22-23 October 2015, hosted by MAN Diesel & Turbo.

HERCULES TIMELINE



Percentage allocation of budget into 3 main areas of R&D in the 4 HERCULES Projects (189 subprojects)



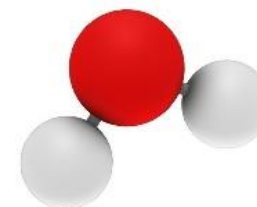
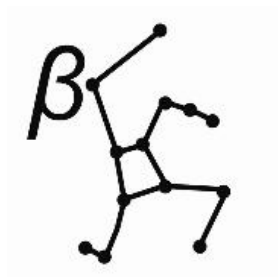
% of individual project budget

— Efficiency

... Emissions

— Reliability & Lifetime





End of Presentation



SIXTH FRAMEWORK PROGRAMME

