# SOI-HITS
# CMOS Sensors for Harsh Environments

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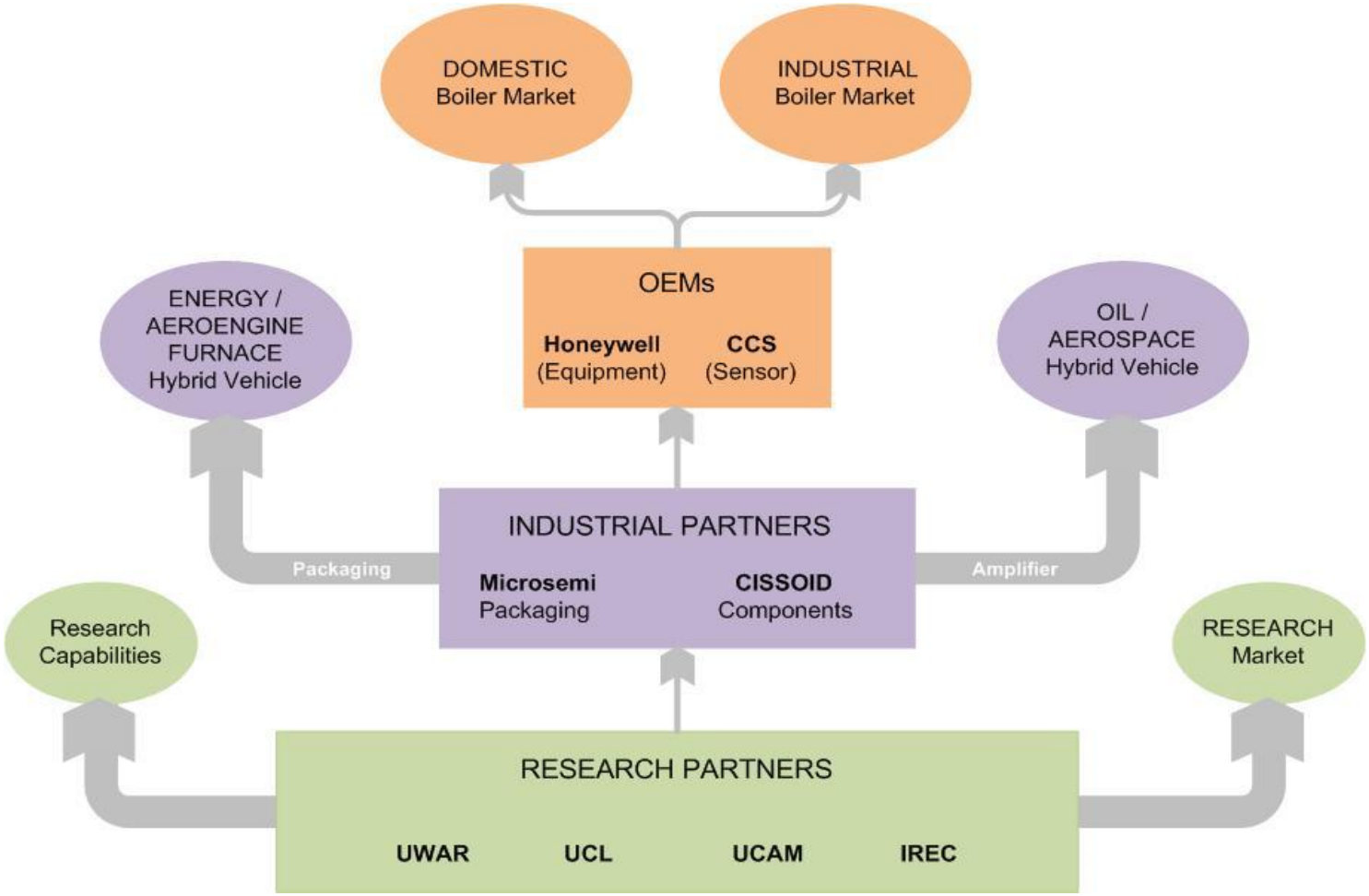
# Introduction to SOI-HITS

- CMOS Silicon on Insulator Sensing Systems at High Temperature”

- Key Objective
  - “enable energy saving, waste and $CO_2$ reduction through the use of high temperature sensors and electronics.”

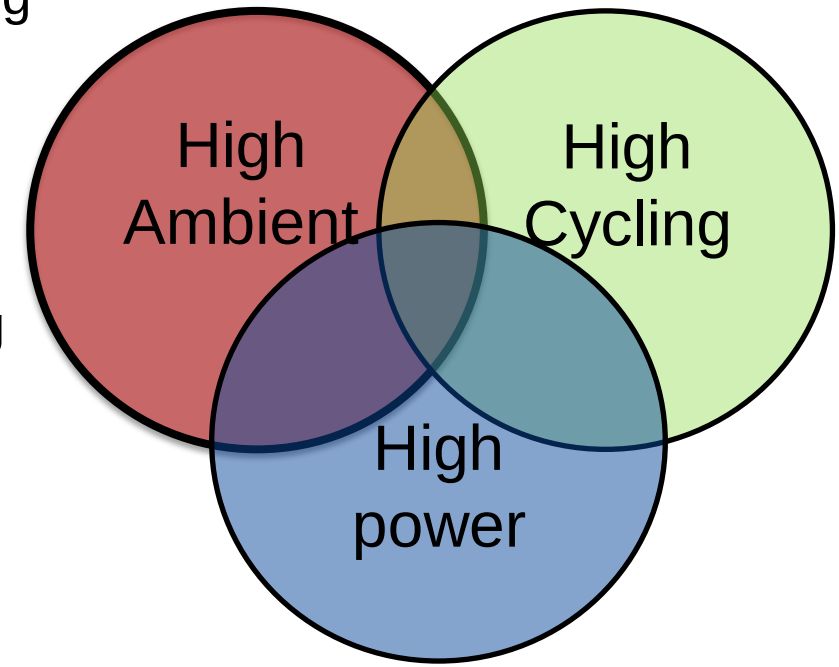
- €4M 3year Collaborative project part funded by the Seventh Framework Programme


# SOI-HITS Vertical Integrated Project

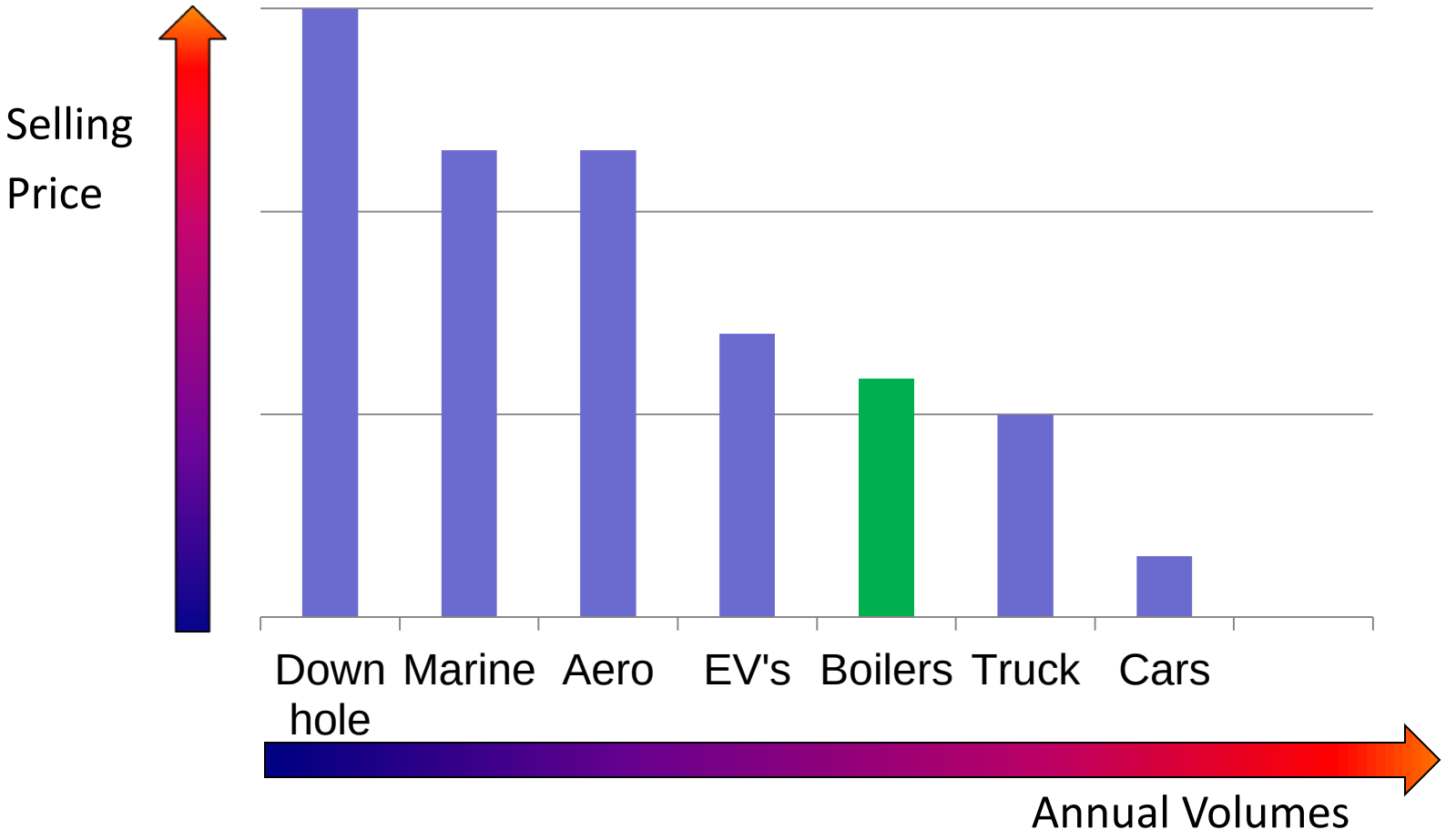


# High Temperature Market Areas

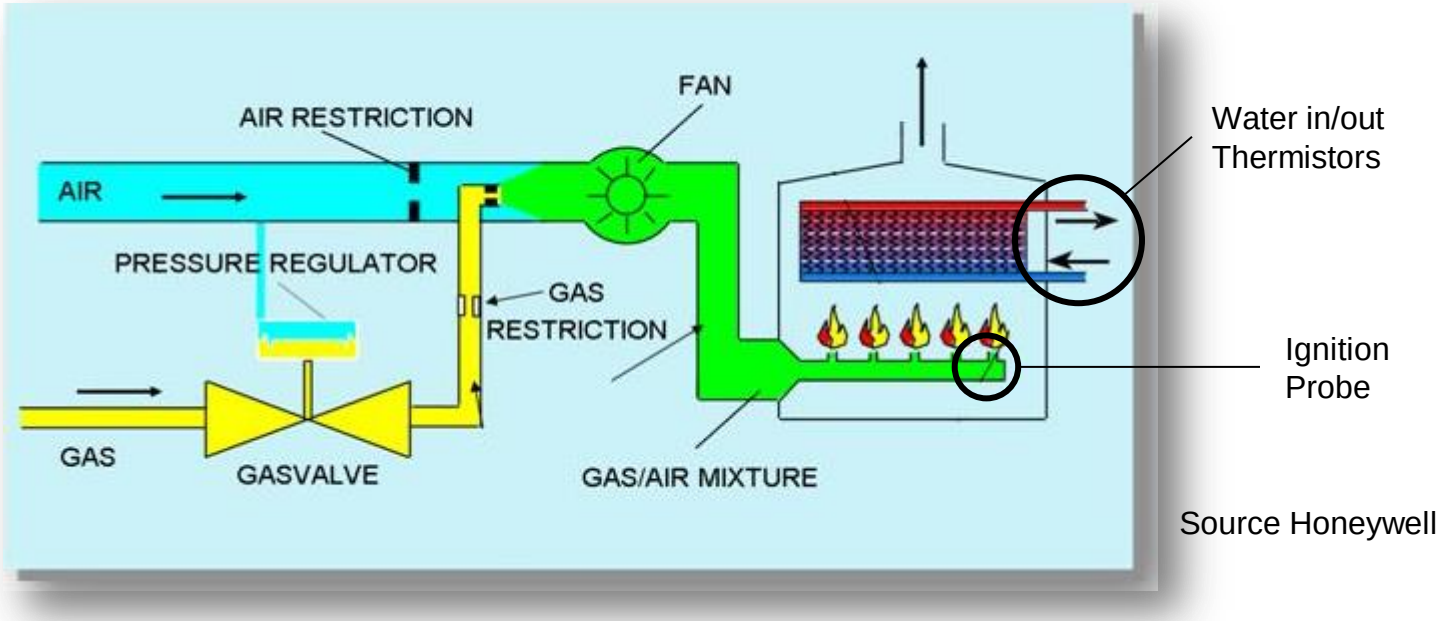
- Key Market Areas for HT Applications
  - High ambient temperature sensing
    - Measurement while drilling
    - Well logging
    - CO2 capture and sequestration
  - High cycling temperature sensing
    - Domestic/industrial boilers
    - Internal combustion engines
    - Turbo chargers
    - Gas turbines (aero and marine)
  - High power dissipation applications
    - Electric vehicle
    - All electric aircraft



# HT Market from Commercial Point

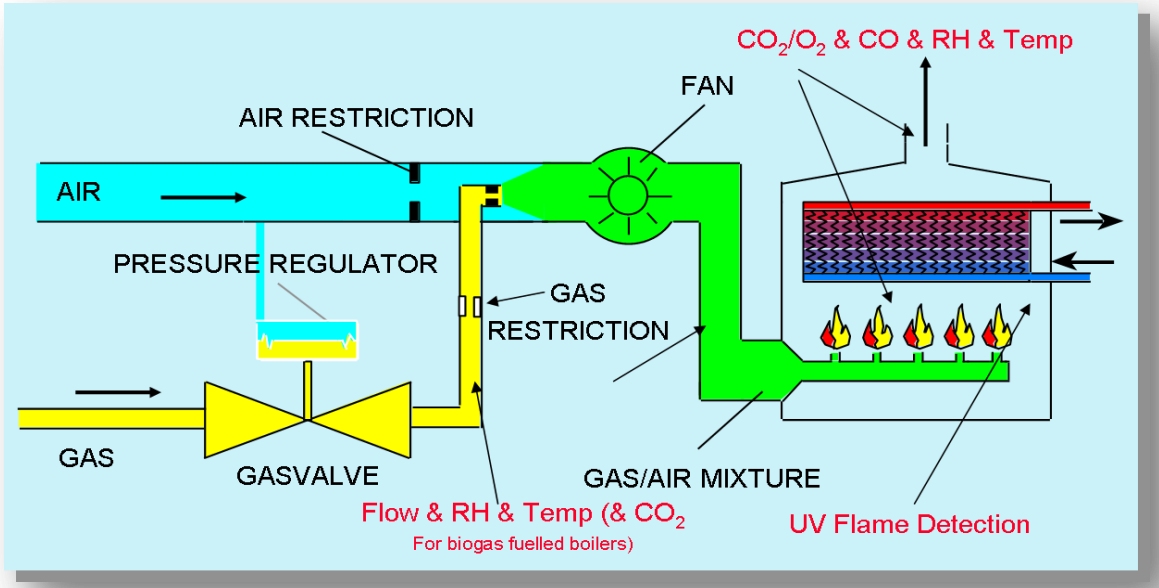


# Simplified Existing Boiler




- Simplified boiler block **diagram**
  - Very few sensors mainly temperature in water inlet and outlet
  - Minimal feedback control loop largely on/off
  - Minimal control of the burn efficiency

# SOI-HITS Proposal




Source Honeywell

- SOI-HITS high temperature transducers
  - Allow monitoring of inlet and flue gas concentrations
    - **$CO_2$, $O_2$, CO, $H_2S$ Relative Humidity, Temp, Flow and UV flame detect**
  - Monitoring of gas concentrations will allow the OEM to develop of feedback control loops for fine control of burn

# Domestic Boiler Sales 2010

- EU markets for domestic heating boilers sold 2010
  - UK 1.6M units PA
  - Italy 1.1M units PA
  - Germany 0.6M units PA
  - France 0.5M units PA
  - Spain 0.4M units PA

- Significant savings in $CO_2$ numbers for minor efficiency improvements!

Data Source BSRIA 2011

# Beyond the State of the Art

- To go beyond the State of the Art in Sensing
  - Extended operating temperature to a minimum of 175$^{o}$C target 225$^{o}$C
  - Extend operation life to minimum 10k hour target 50k hour with repeated temperature cycling 0-225$^{o}$C
  - Reduce the cost of packaging and assembly methods to sub $10
  - Minimise power consumption

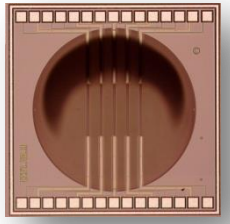
    - Develop stable Gas sensitive nano-materials for HT sensors
    - Develop new amplifiers that operate at long term at 225$^{o}$C
    - Define low cost HT packging and assembly

# SOI-HITS Sensors

- High Temp NDIR Sensor
  - **Based on CCS NDIR sensor for $CO_2$**

- High Temp UV Flame detector
  - **Based on UCL UV diode sensor**

- High Temp Gas Flow Sensor
  - **Based on CCS Micro-hotplate sensor direct measurement of CO, $O_2$, RH and Temp**



# SOI-HITS

**www.soi-hits.eu**