



The Swedish Black Liquor Gasification R&D Program – BLG II 2007-2010

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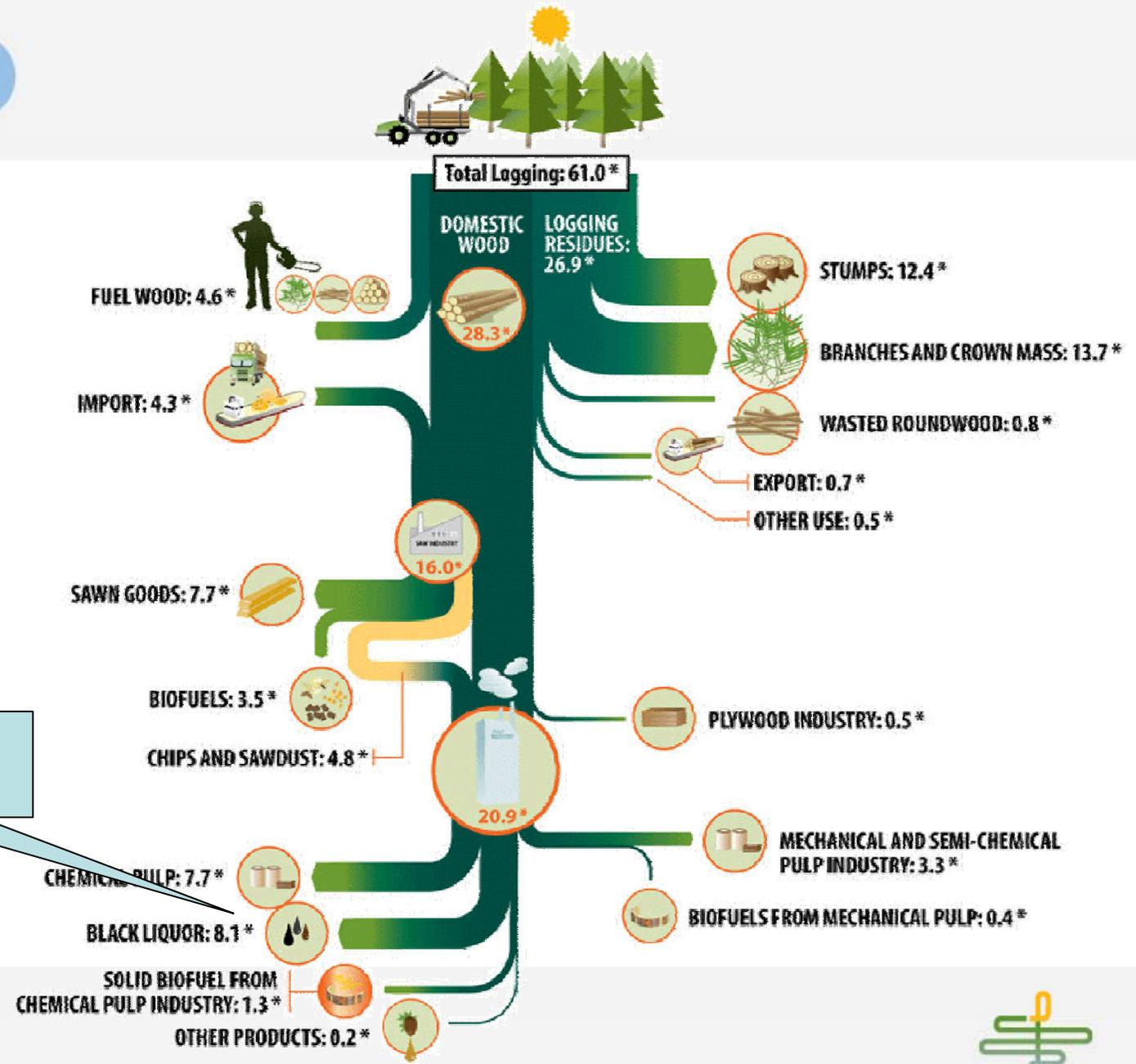
Background

- Sweden is one of Europe's largest virgin pulp producers
- Black liquor is concentrated at app. 20 pulp mills
- Black liquor is a liquid fuel suitable for pressurised gasification
- Estimates has shown that about 25% of Sweden's use of gasoline and diesel can be replaced with synthetic fuels from black liquor
- Long term support from the public and private sector has been strong



Use of forest feedstock in Sweden

40 TWh black liquor/year



*Million tons dry biomass

Source:
Biomassafföden i svensk
skogsnäring 2004,
Per Olov Nilsson.
Rapport 23-2006
Skogsstyrelsen
ISSN 1100-0295

www.solandersciencepark.se

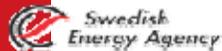


EF black liquor gasification history in Sweden

- 1987 – First pilot plant for a “Chemrec” gasifier in Hofors
- 1991 – Booster development plant in Frövi
- 1994 – First pressurised pilot in Skoghall
- 1996 – First commercial booster in New Bern
- 2004 – The BLG program Phase 1 starts
- 2005 – Commissioning of the DP-1 gasifier
- 2007 – The BLG program Phase 2 starts

The BLG II Consortium (2007 – 2010)

The Swedish Black Liquor Gasification program
phase II is sponsored by:



MISTRA

CHEMREC



The BLG research consortium consists of:

ETC



CHALMERS

CHEMREC

ETC

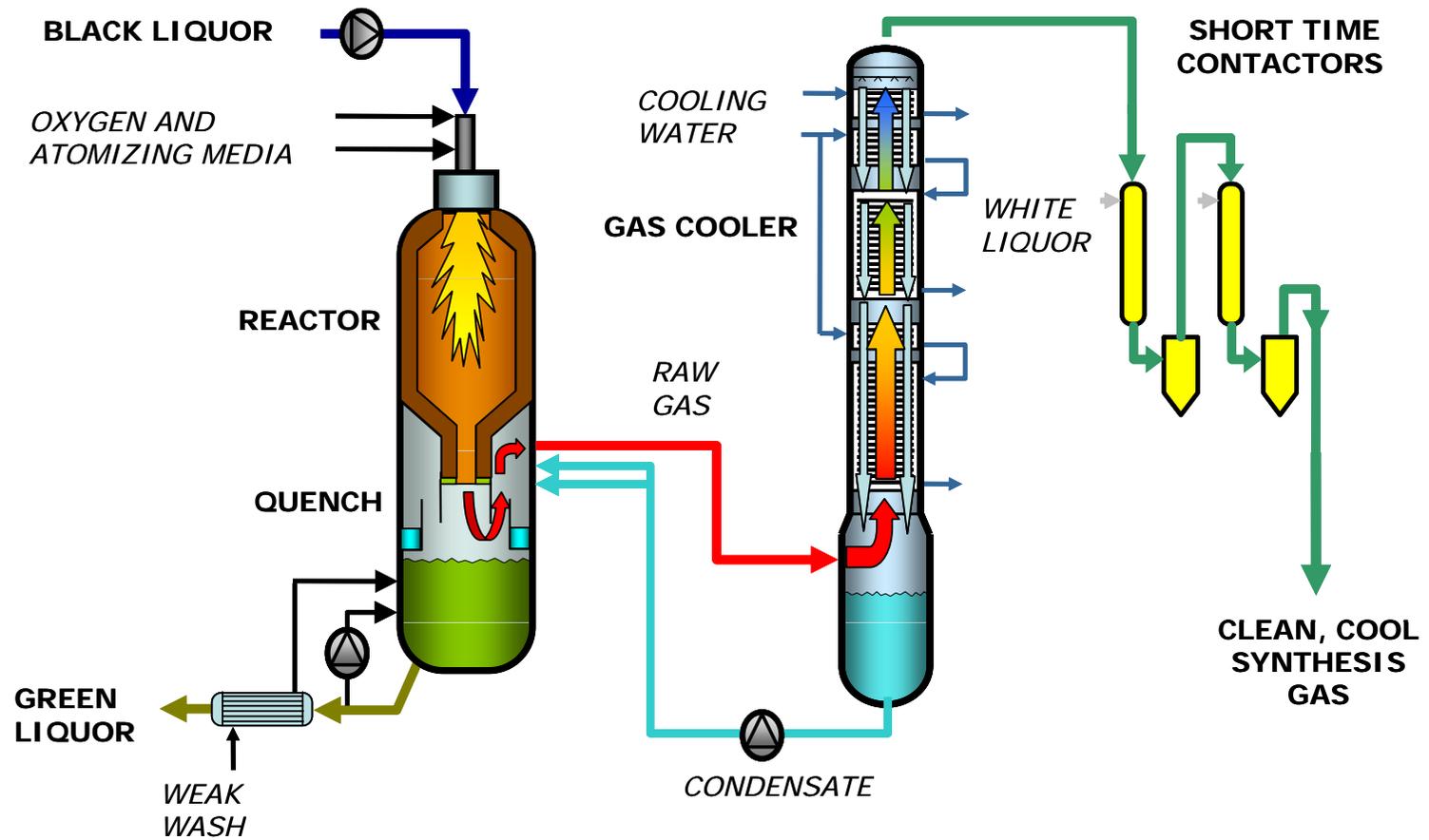
Energy Technology Centre

The DP1 Gasifier

- 3 MW thermal power (20 ton BL/day)
- 30 bar, 1000 °C
- Accumulated run time > 13 000 hours (Aug 2011)

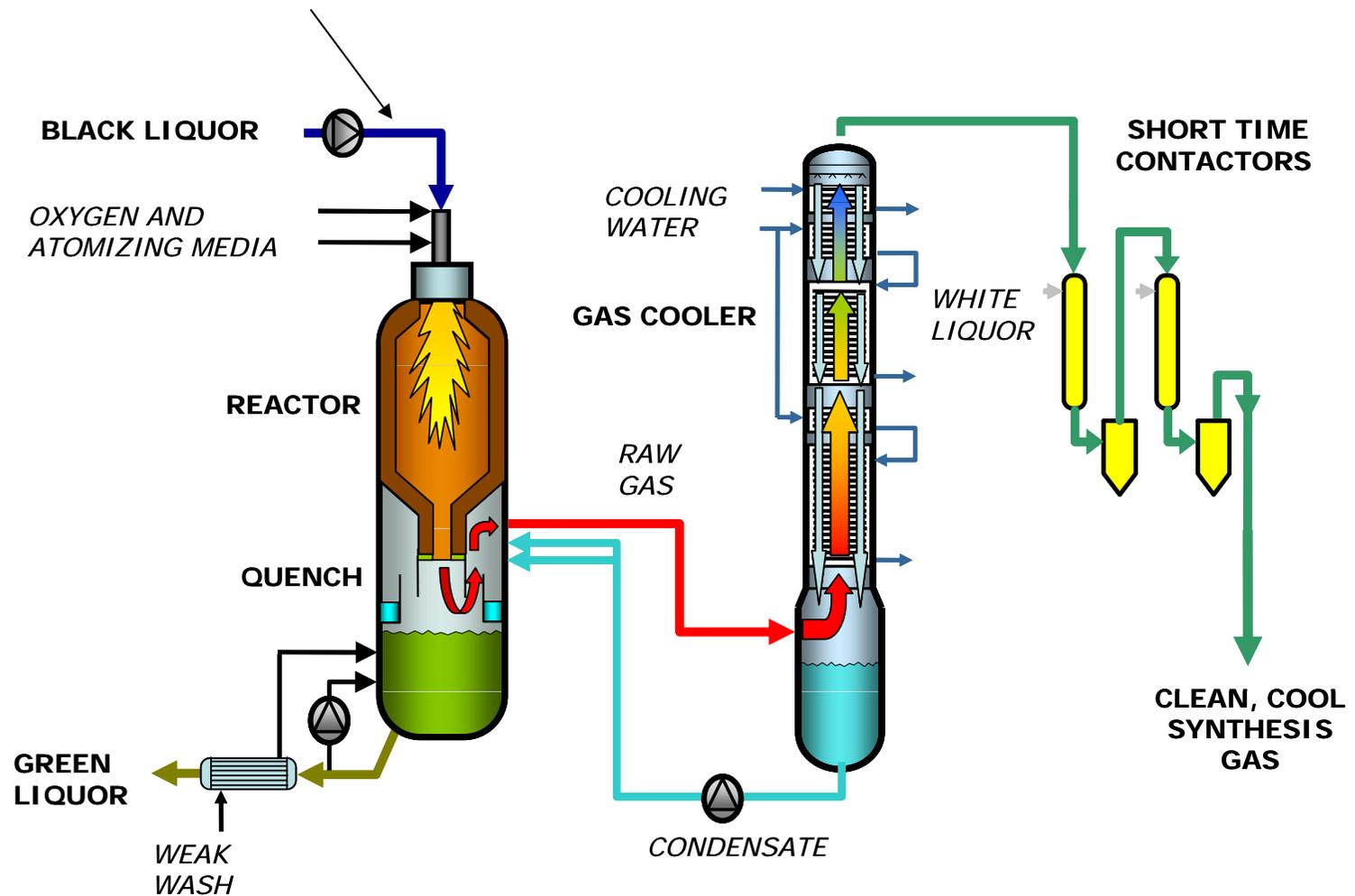


Experiments in DP1: Overview



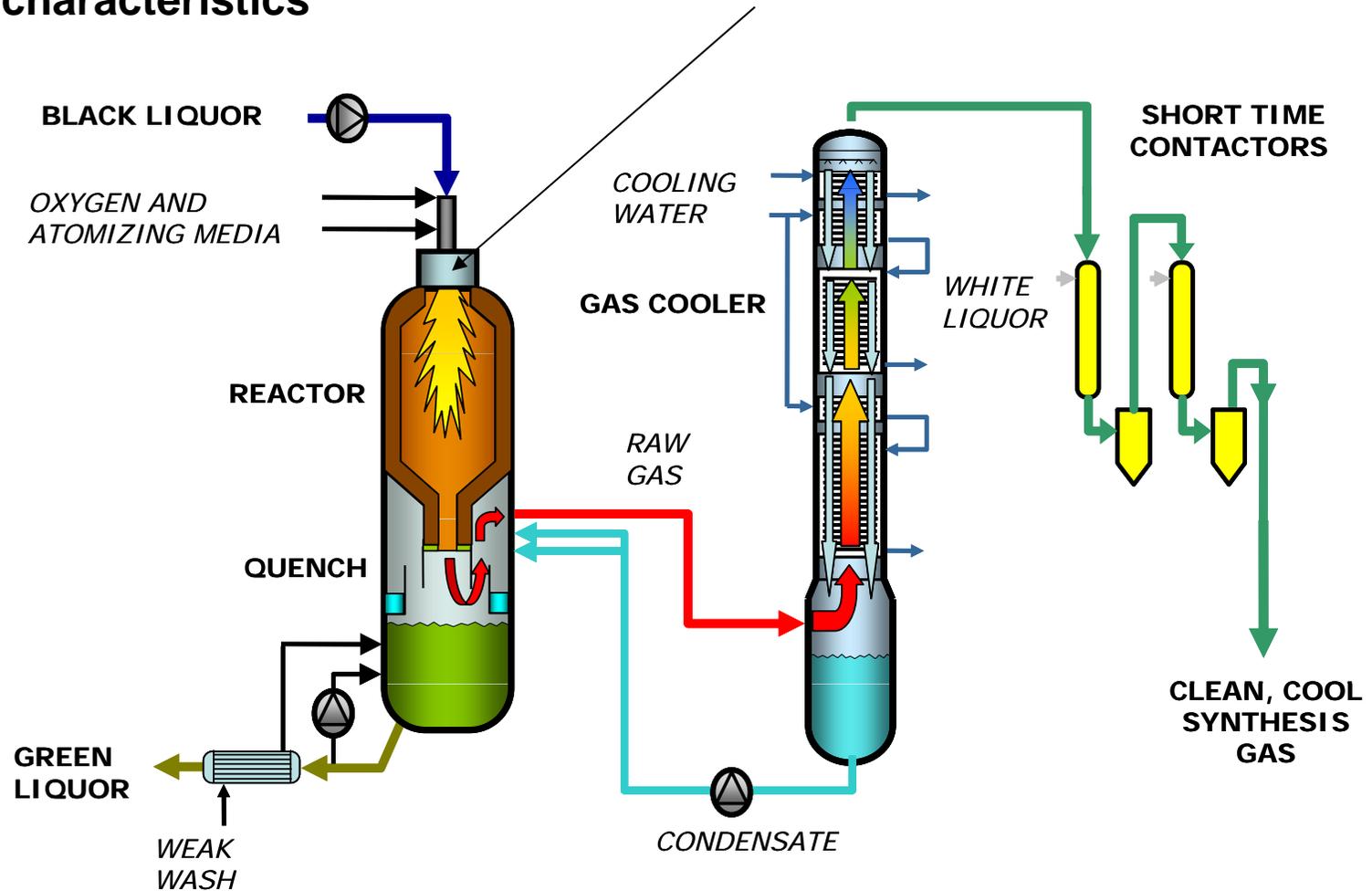
Experiments in DP1: Overview

Highly preheated BL (ST 4.2.6)



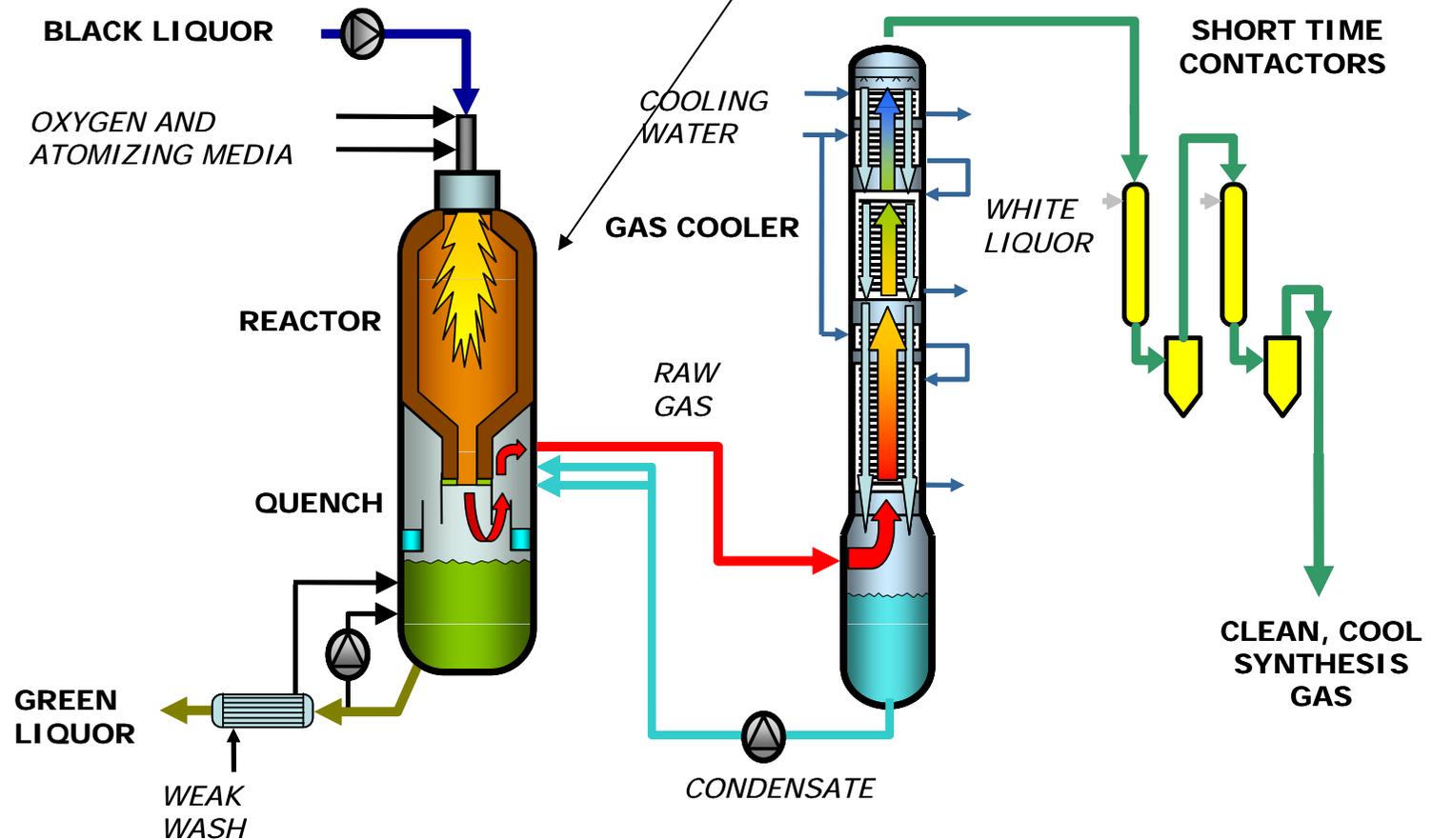
Experiments in DP1: Overview

Influence of BL preheating temperature on burner spray characteristics



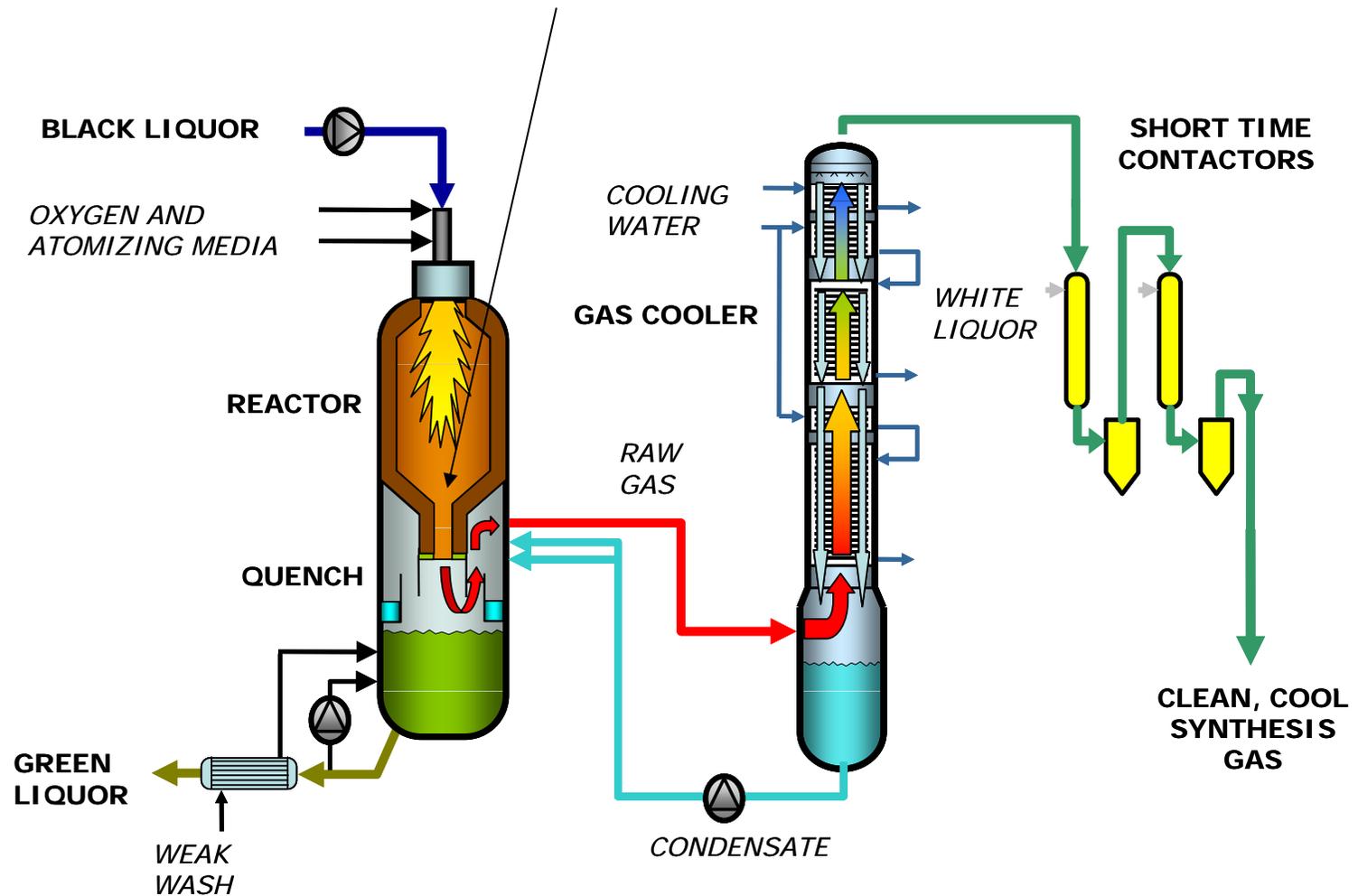
Experiments in DP1: Overview

Development of experimental methods, "hot probe", EMF, camera probe, (ST1.1.1, ST1.21.2, ST1.1.1, and ST1.7)



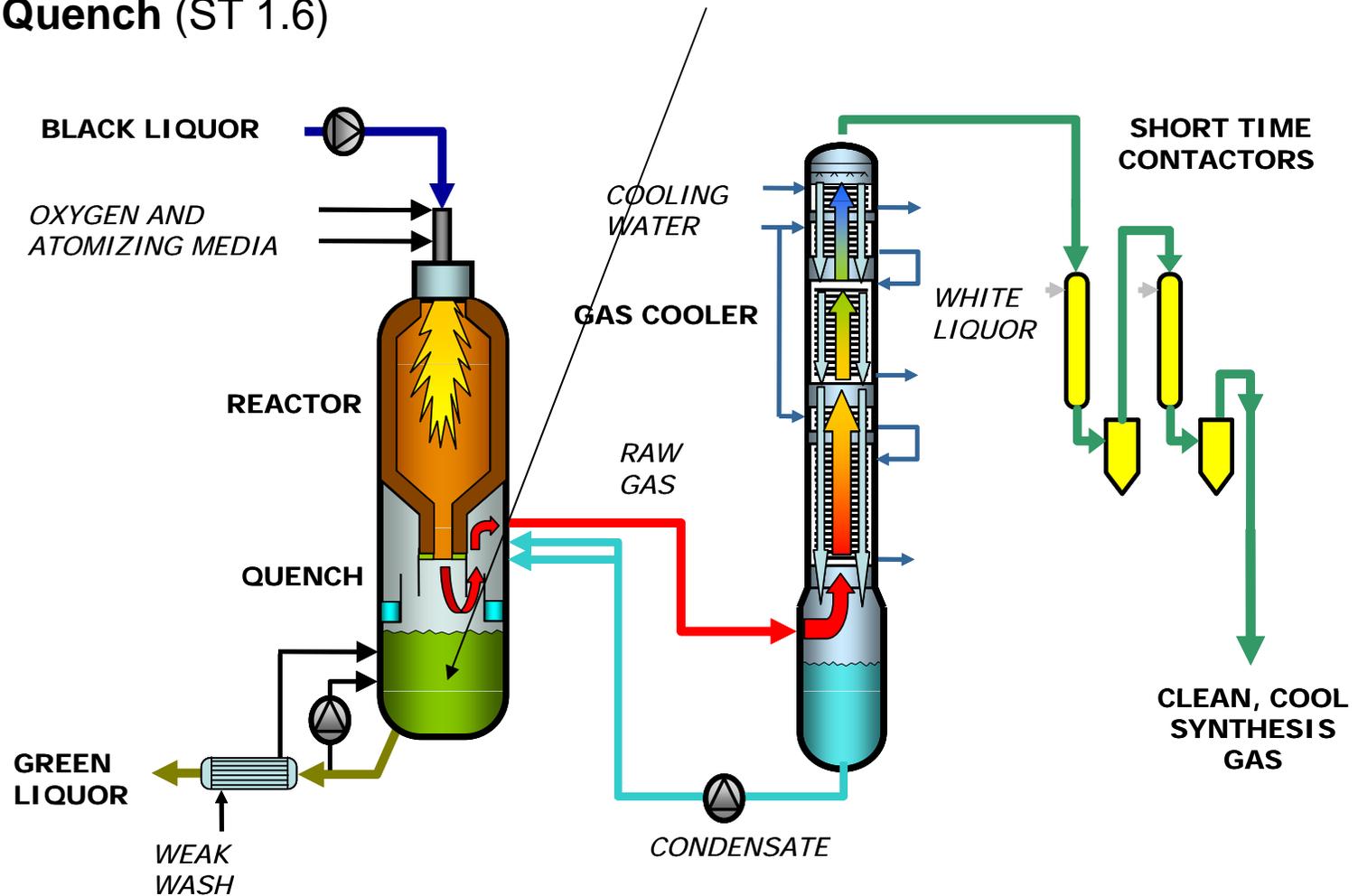
Experiments in DP1: Overview

Gas phase sampling (ST 1.2)



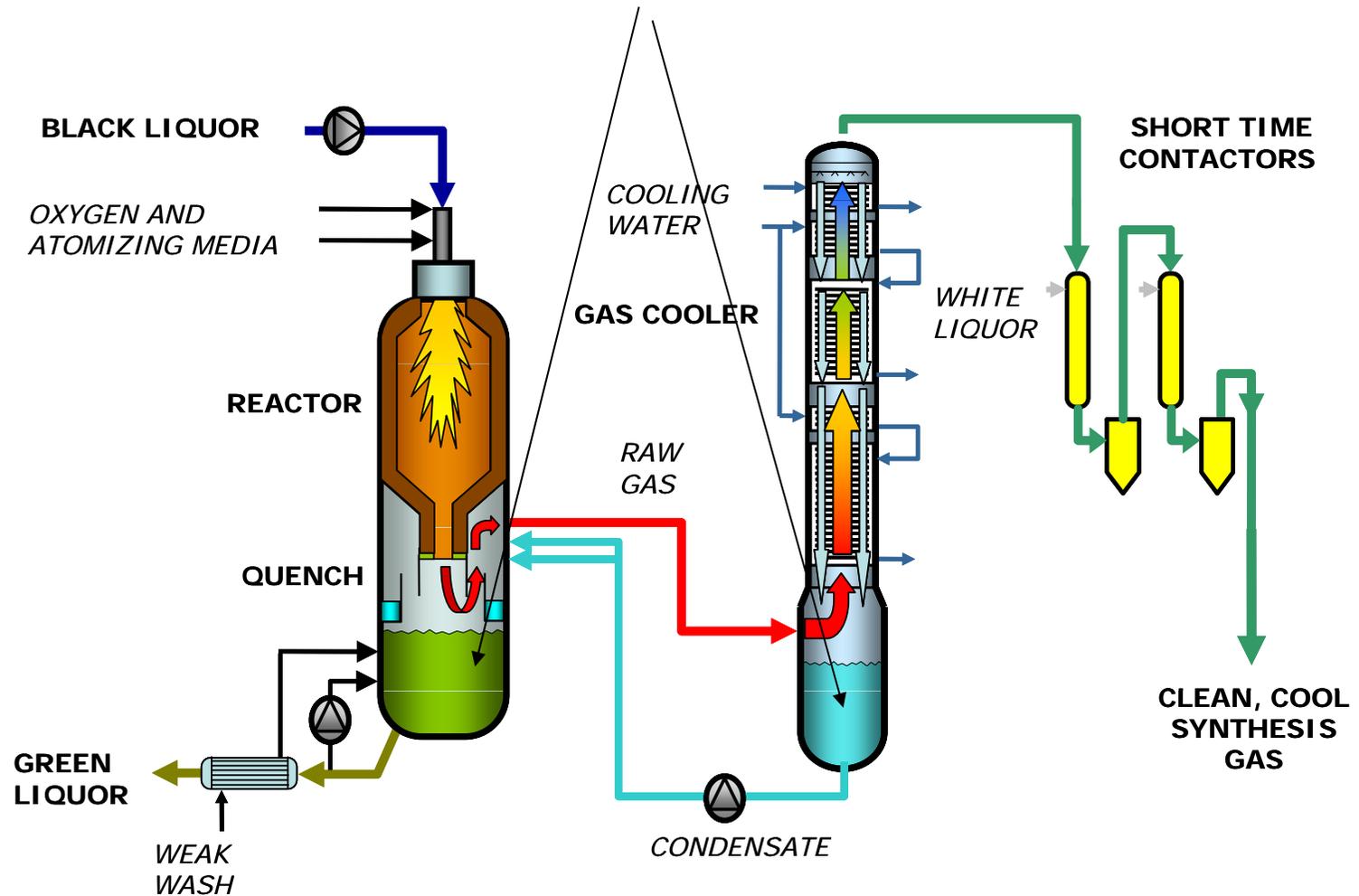
Experiments in DP1: Overview

Sampling and characterisation of hot GL from different levels in Quench (ST 1.6)



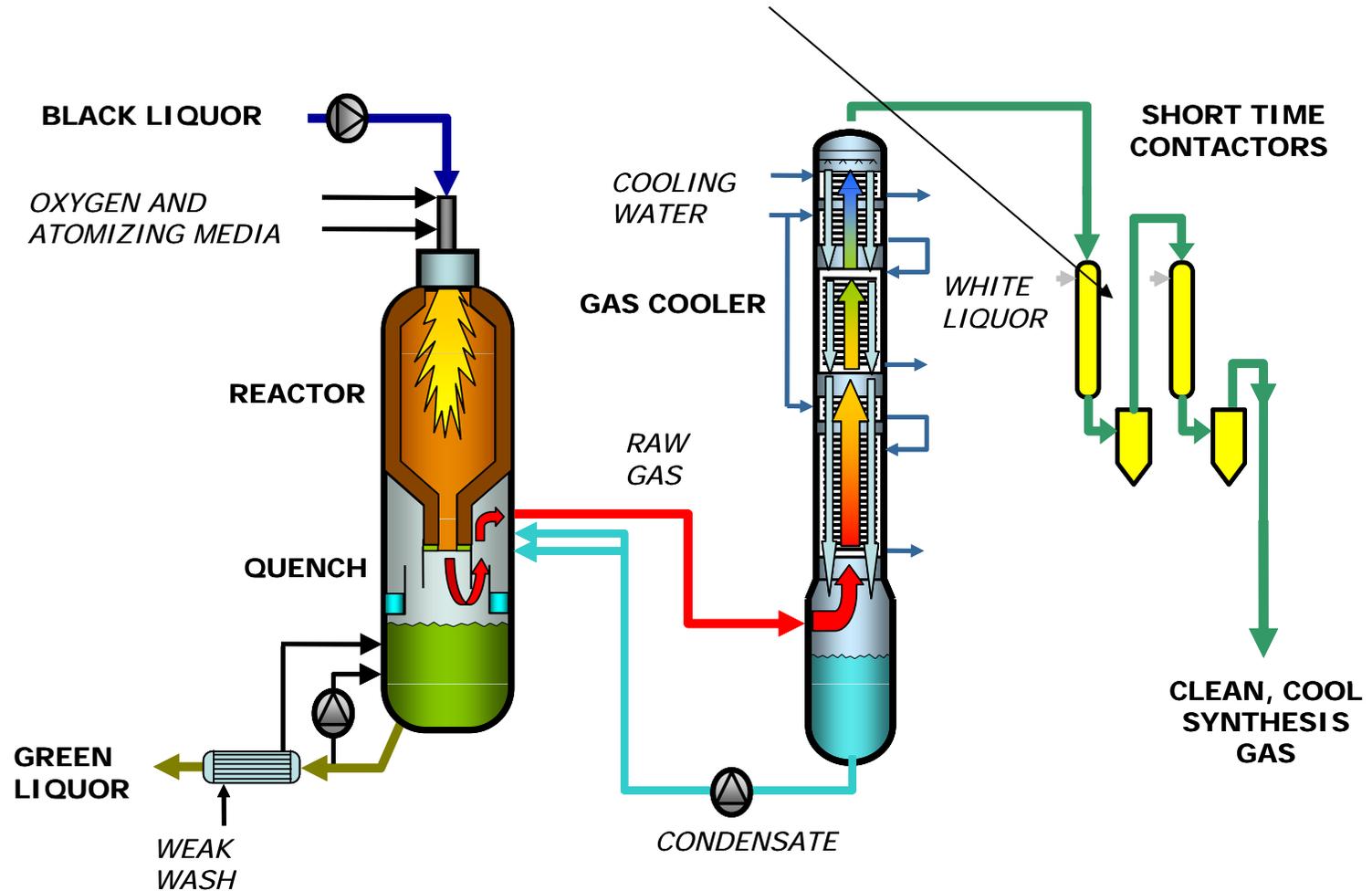
Experiments in DP1: Overview

Characterisation of tar components in liquid samples (ST1.4.2)



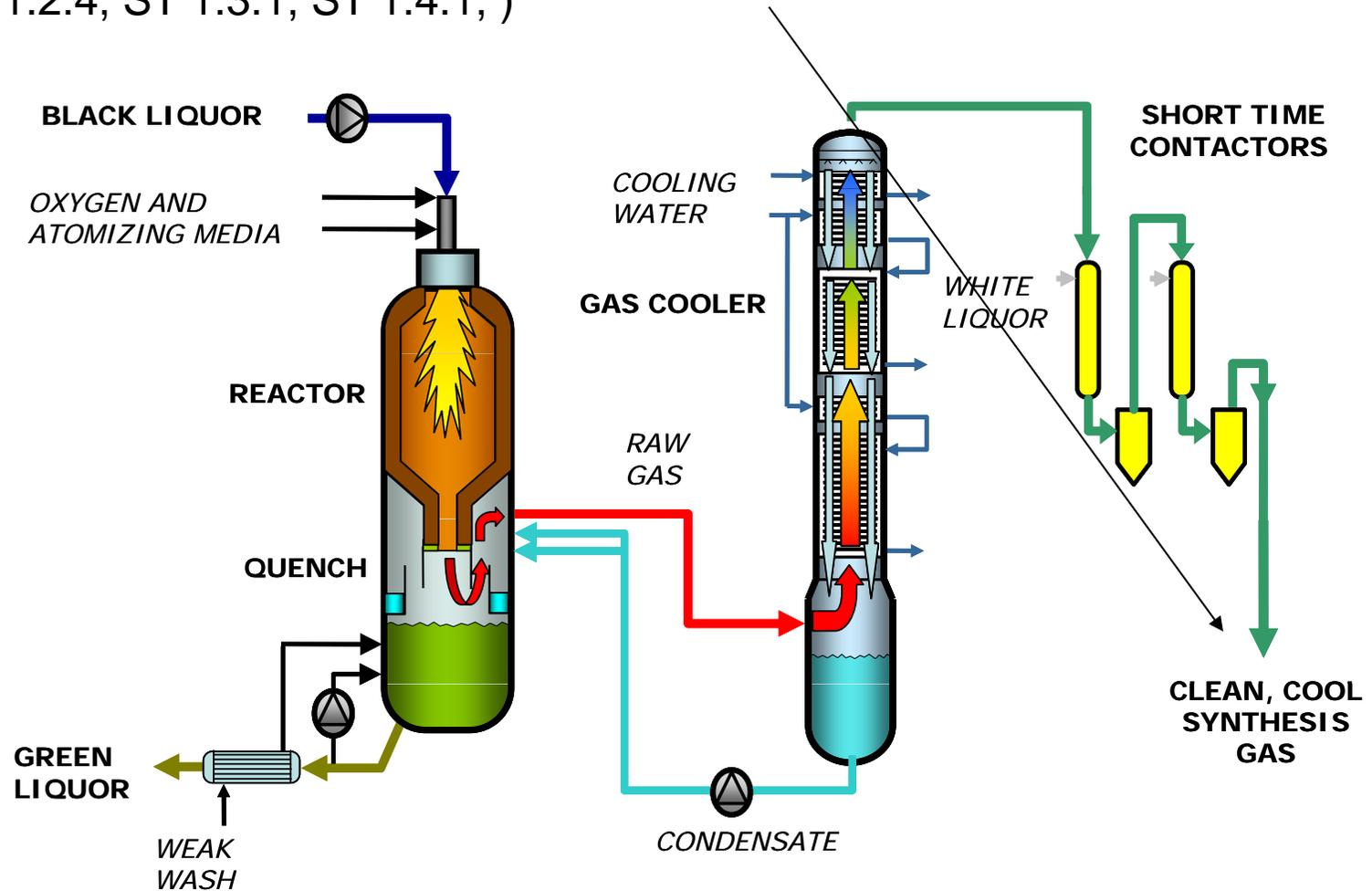
Experiments in DP1: Overview

Selective absorption of H₂S in short time contactors (ST1.8)



Experiments in DP1: Overview

Impurities (tars, particles and trace elements) in syngas (ST 1.2.4, ST 1.3.1, ST 1.4.1,)



High temperature gas sampling system

- Design, construct and evaluate a system for gas sampling inside the hot reactor
- Improve understanding of fuel conversion
- Data for validation of mathematical models (CFD and thermo-chemical equilibrium)
- Process optimisation
- Harsh environment (1000 °C, 30 bar, reducing conditions and corrosive smelt) => safety aspects
- ATEX, IEC 61508, and IEC 61511

High temperature gas sampling system



Operation of high temperature gas sampling system without plugging

CO₂, CO and H₂

