Stage 1 (BFG and / or BOFG feedstock): Reduction and CO_2 recovery. Reduction of the RGH_2 oxygen-carrier with CO, H_2 and CH_4 from iron and steel making flue gases.

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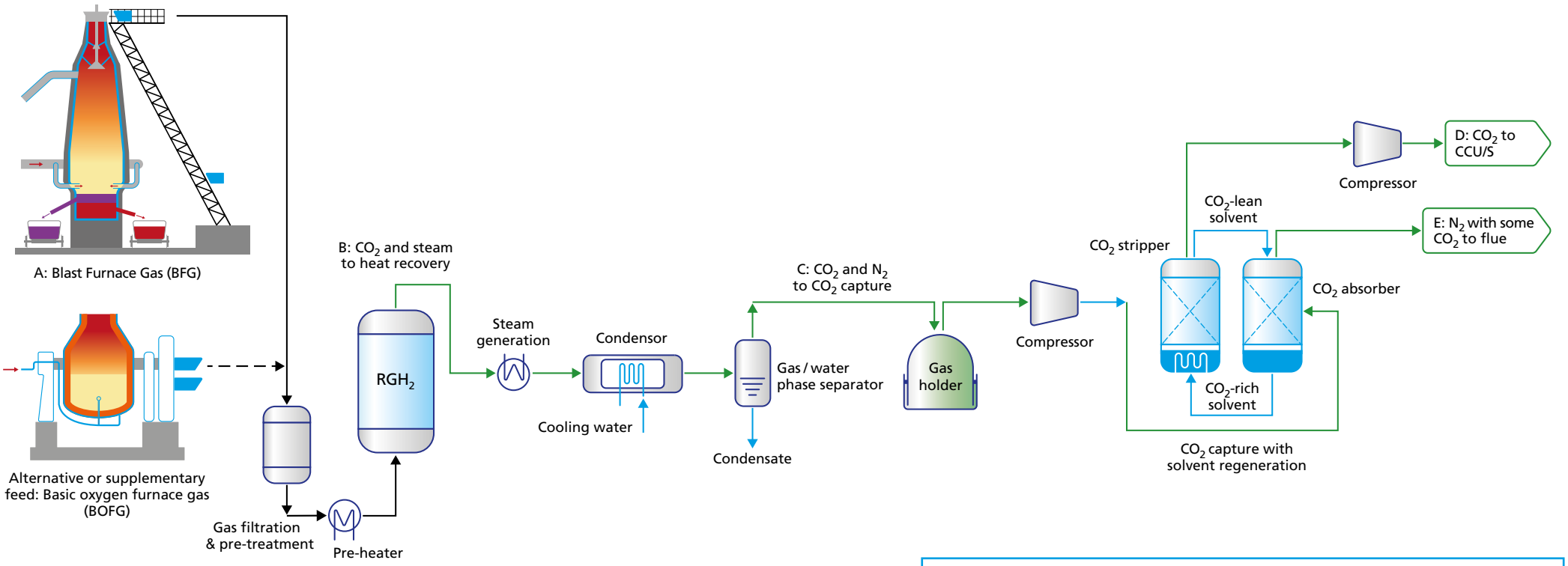

Stream	CO_2 Mol%	H_2 Mol%	CO Mol%	N_2 Mol%	H_2O Mol%	Temp °C
A: Blast Furnace Gas to RGH_2	22	4	24	50	0	50
B: CO_2, N_2 and steam from RGH_2	46	0	0	50	4	770
C: CO_2 and N_2 to CO_2 capture	46	0	0	50	4	50
D: CO_2 to utilisation or sequestration	97	0	0	0	3	100
E: Nitrogen and CO_2 slip to flue****	5	0	0	92	3	Ambient

**** Composition shown is indicative of solvent-based CO_2 capture plants operating at a reasonable balance of CO_2 capture rate and energy efficiency).

Key reactions in the RGH_2 plug-flow, iron-oxide chemical looping reactor

$3Fe_2O_3 + H_2 \rightarrow 2Fe_3O_4 + H_2O$*
$3Fe_2O_3 + CO \rightarrow 2Fe_3O_4 + CO_2$*

$2Fe_3O_4 + 2H_2 \leftrightarrow 6FeO + H_2O$**
$2Fe_3O_4 + 2CO \leftrightarrow 6FeO + 2CO_2$**

$6FeO + 6H_2 \leftrightarrow 6Fe + 6H_2O$***
$6FeO + 6CO \leftrightarrow 6Fe + 6CO_2$***

* This reaction non-reversible is required to ensure full conversion of H_2 and CO in the syngas feed to CO_2 and moisture.
** This reversible reaction converts 65 to 80% of hydrogen and CO in the syngas feed to CO_2 and moisture.
*** This reversible reaction converts 30 to 40% of hydrogen and CO in the syngas feed to CO_2 and moisture.