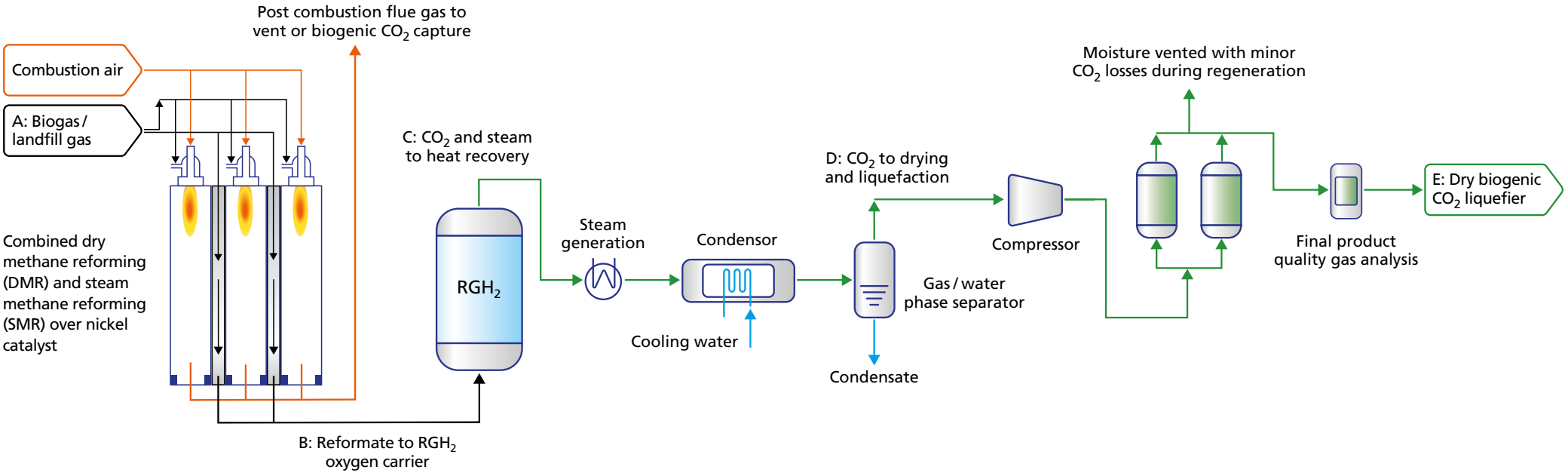
Stage 1 (landfill gas or biogas reformate feedstock): Reduction and biogenic CO_2 production. Reduction of the RGH_2 oxygen-carrier with CO, H_2 and CH_4 from biogenic syngas.

sbh4 consulting



Stream	CH_4 Mol%	CO_2 Mol%	H_2 Mol%	CO Mol%	H_2O Mol%	Temp °C
A: Feed gas to reformer	45	45	0	0	10	Ambient
B: Reformate / syngas to RGH_2	3	6	45	39	7	650
C: CO_2 and steam from RGH_2	0	45	0	0	55	707
D: CO_2 to dryer	0	96	0	0	4	Ambient
E: CO_2 to liquefier	0	99.95	0	0	0.05	Ambient

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.