Published by: Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

Supported by: Federal Ministry for Economic Affairs and Climate Action on the basis of a decision by the German Bundestag

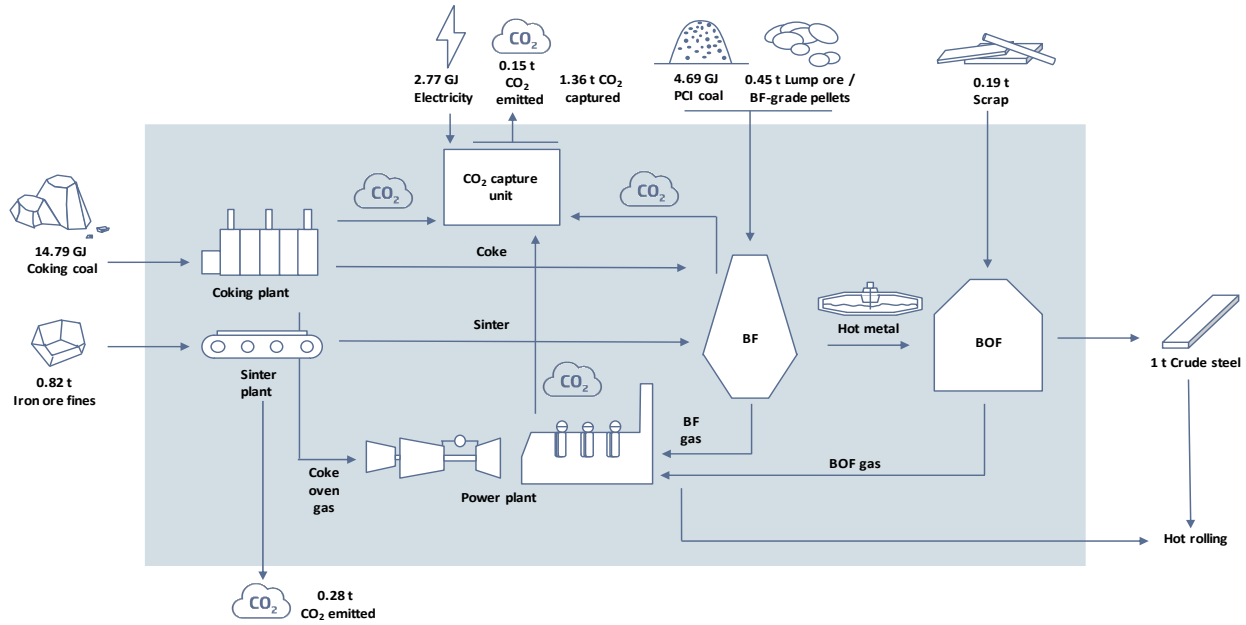
IKI International Climate Initiative

In cooperation with: Wuppertal Institut

Steel

Blast furnace • basic oxygen furnace route with Carbon Capture and Storage (BF-BOF+CCS)

Description | Carbon Capture and Storage (CCS) includes the capture of CO_2 at the plant and its subsequent transport to an underground storage site such as exploited oil and gas fields or saline aquifers in which the captured CO_2 will be permanently stored underground. For this, main point sources in the BF-BOF route with high CO_2 concentrations and high CO_2 generation are retrofitted with post-combustion CO_2 capture technology. These point sources are the coke oven under-firing stack, the hot-blast stoves and the onsite combined heat and power plant.



Process inputs and outputs per t of crude steel[2]

	Unit	Value
Electricity demand	GJ	2.77
Coal (coking coal, PCI coal)	GJ	19.48
Iron ore fines	t	0.82
Lump ore / pellets	t	0.45
Scrap	t	0.19
CO_2 emissions (scope-1)	t CO_2	0.41
CO_2 emissions (scope-2)*	t CO_2	0.40
CO_2 captured	t CO_2	1.36

*Assumed emission intensity of electricity: 516 g CO_2/ kWh_{el}

Key characteristics:[3]

- Retrofit to existing plants possible
- CO_2 emission reduction compared to conventional BF-BOF: 77%
- Cost increase of steel production compared to BF-BOF (w/o CO_2 costs): 35% – 50%
- CO_2 avoidance costs: 100 – 140 $/t CO_2

Key requirements:

- Access to CO_2 infrastructure

Applicability to the Kazakh context:

- Promising CO_2 storage sites have distance of several hundred up to two thousand km from current iron ore mining and steel production sites. Currently no transport infrastructure exists
- Application of CCS in the steel industry must be assessed in the context of a broader CCS-strategy

[1] The system boundary is crude steel production w/o rolling and finishing

[2] The system boundary for the shown values is iron and steel production up to crude steel

[3] More information and assumptions are provided in the final report of the *DeKaMe* project (https://epub.wupperinst.org/frontdoor/index/index/docId/8779)

This fact sheet is the result of the project "Providing a knowledge base for decarbonizing the Kazakh metals industries (DeKaMe)" which was granted to Wuppertal Institut by Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH in the context of the GIZ project "Capacity Development for climate policy in the countries of South East, Eastern Europe, the South Caucasus and Central Asia, Phase III' (CDCPIII) as part of the International Climate Initiative (IKI).