

# Assessment of Existing Initiatives

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2023-01-19



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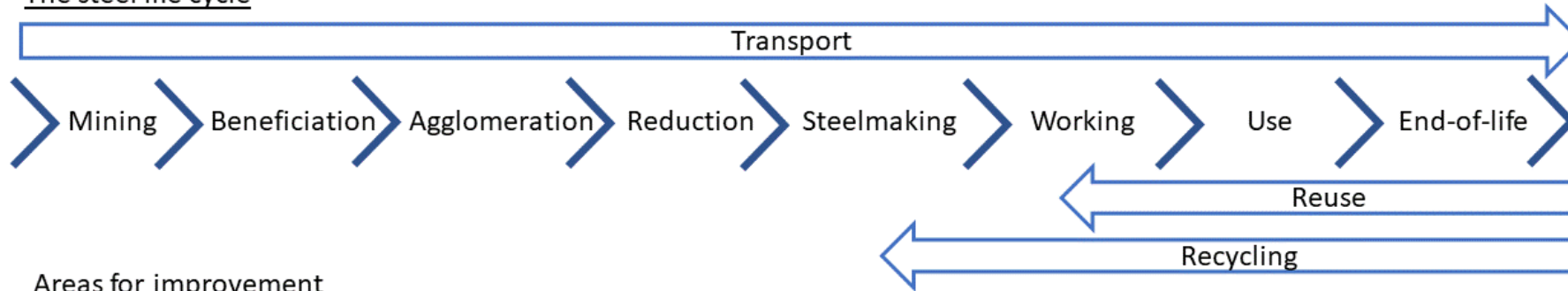
**DECARBONISING**

PRACTICAL STRATEGIES

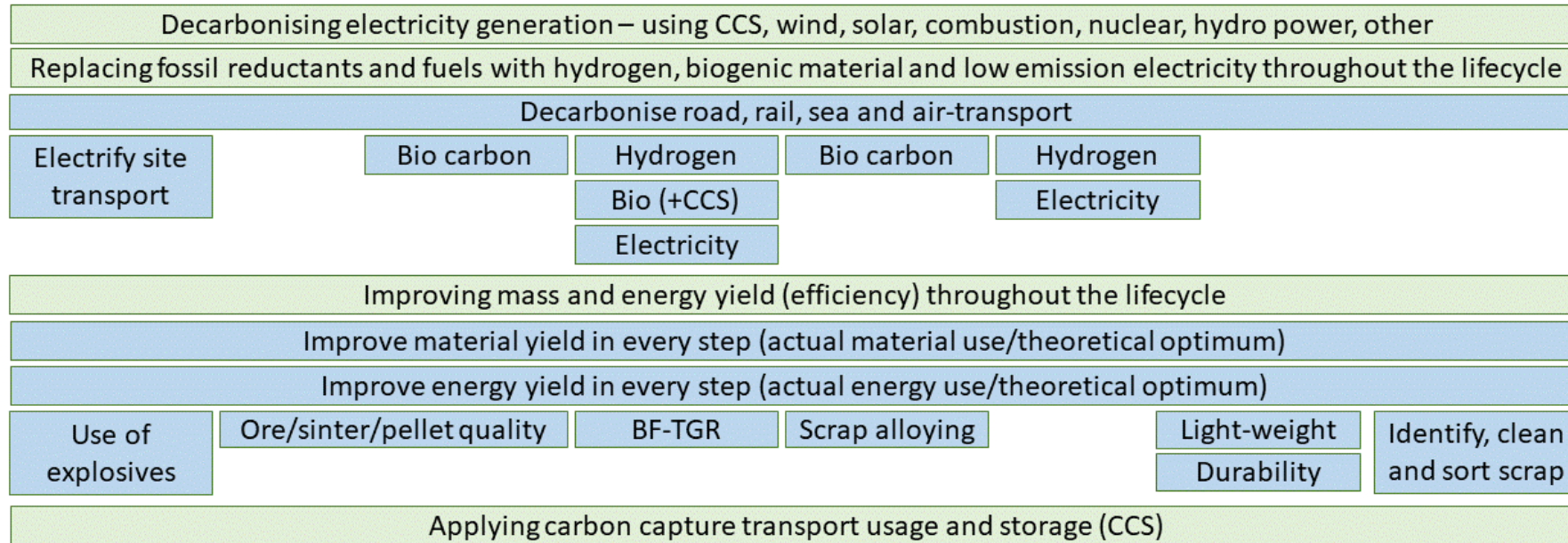
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# Roadmap

## The steel life cycle



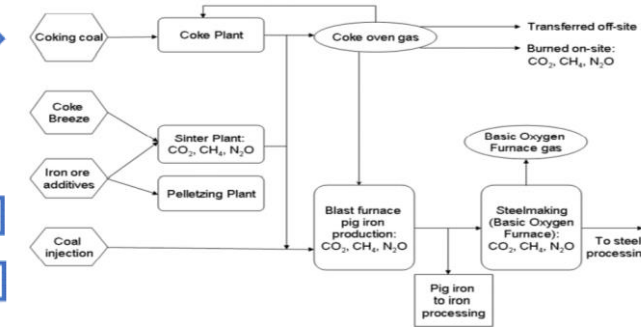
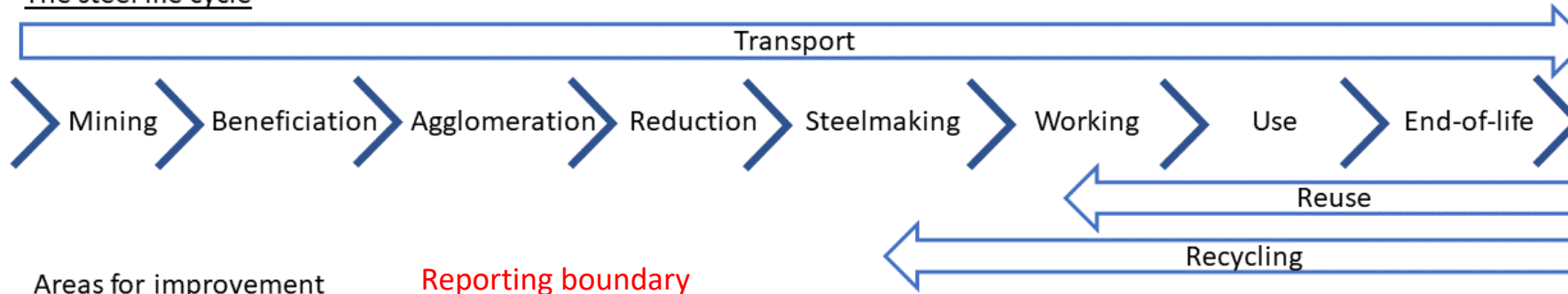
## Areas for improvement



# GHG Protocol



## The steel life cycle



### Areas for improvement

### Reporting boundary

Decarbonising electricity generation – using CCS, wind, solar, combustion, nuclear, hydro power, other						
Replacing fossil reductants and fuels with hydrogen, biogenic material and low emission electricity throughout the lifecycle						
Decarbonise road, rail, sea and air-transport						
Electrify site transport	Bio carbon	Hydrogen	Bio carbon	Hydrogen	Electricity	Electricity
		Bio (+CCS)		Electricity		
		Electricity				
Improving mass and energy yield (efficiency) throughout the lifecycle						
Improve material yield in every step (actual material use/theoretical optimum)						
Improve energy yield in every step (actual energy use/theoretical optimum)						
Use of explosives	Ore/sinter/pellet quality	BF-TGR	Scrap alloying	Light-weight	Identify, clean and sort scrap	Durability
Applying carbon capture transport usage and storage (CCS)						

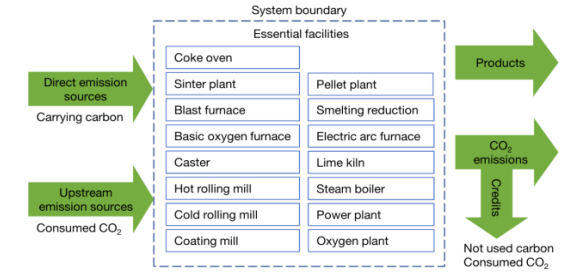
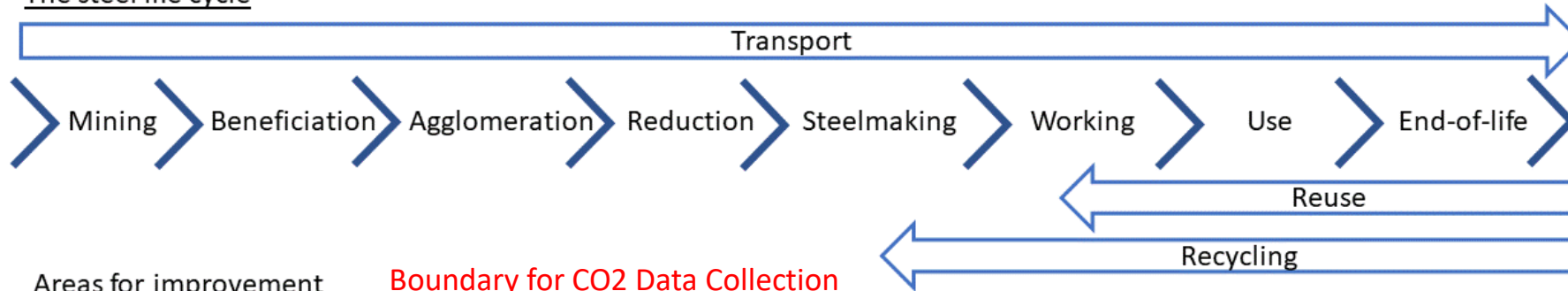
- **WRI & WBCSD**
- **Corporate Standard (2004)**  
Scope 1+2
- **Corporate Scope 3 Standard (2011)**  
Scope 3
- **Product Standard (2011):**  
- refer to ISO 14044 LCA  
- CTGate or CTGrave
- **Calculation Tool (Steel)**  
out-of-date (2007)

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- ✓ Allocation credit (SE-system expansion, E-Economic, P-physical)
- X CCUS+Bioenergy (TBD-To Be Developed, early 2023)

# Climate Action Data Collection System

The steel life cycle



Areas for improvement

Boundary for CO2 Data Collection

Decarbonising electricity generation – using CCS, wind, solar, combustion, nuclear, hydro power, other					
Replacing fossil reductants and fuels with hydrogen, biogenic material and low emission electricity throughout the lifecycle					
Decarbonise road, rail, sea and air-transport					
Electrify site transport	Bio carbon	Hydrogen	Bio carbon	Hydrogen	
		Bio (+CCS)		Electricity	
		Electricity			
Improving mass and energy yield (efficiency) throughout the lifecycle					
Improve material yield in every step (actual material use/theoretical optimum)					
Improve energy yield in every step (actual energy use/theoretical optimum)					
Use of explosives	Ore/sinter/pellet quality	BF-TGR	Scrap alloying	Light-weight	Identify, clean and sort scrap
				Durability	
Applying carbon capture transport usage and storage (CCS)					

HR,CR,Coating

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## 1 CO2 Data Collection

- Site-level
- GHG Protocol, S1+S1.1+S2+S3
- Report only CO2 emissions
- Create global ave.CO2 intensity

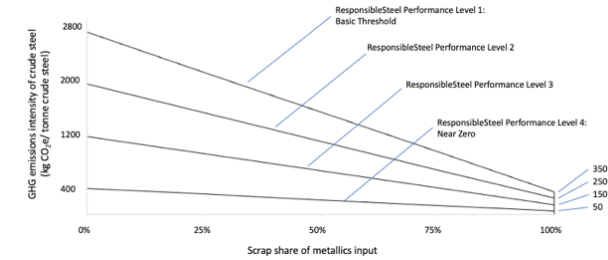
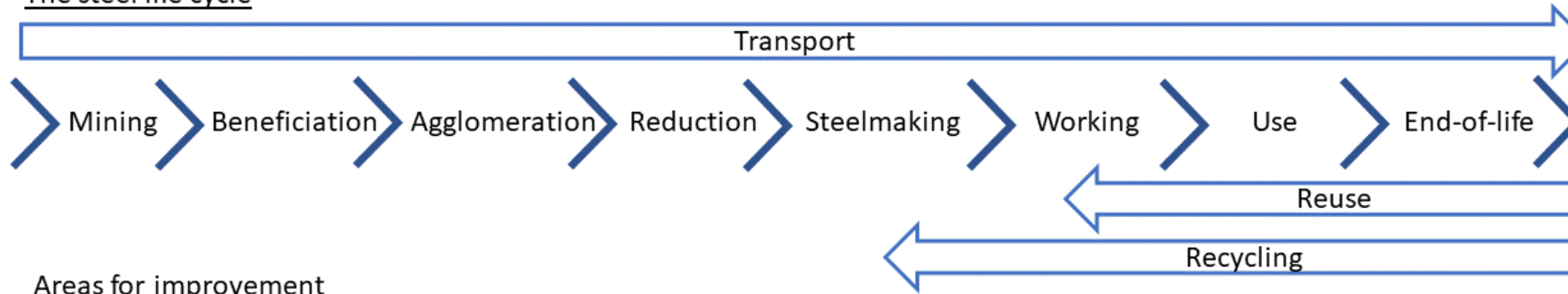
## 2 LCI Data Collection (2017)

- Product-level, 15 products
- ISO 14040, ISO 14044 (GaBi)
- Report CO2-eq
- S1+S2+S3+Credit
- CTGate
- Allocation (SE)
- Create LCI for steel product

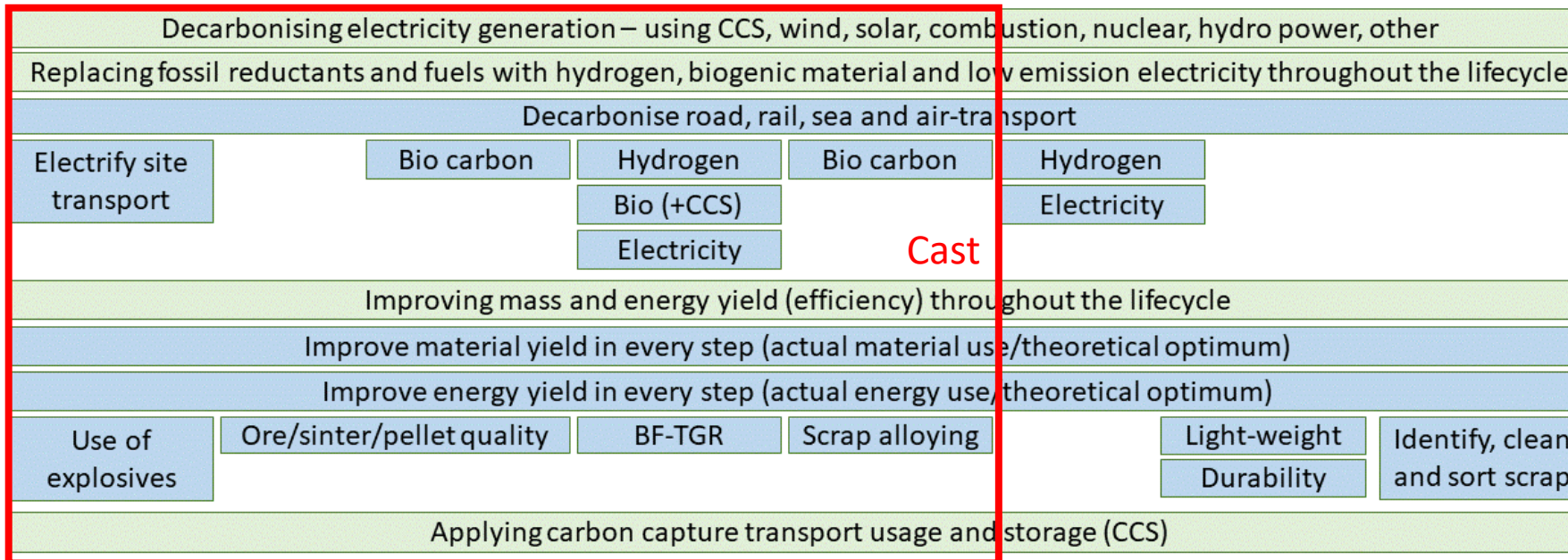
# ResponsibleSteel™



## The steel life cycle



## Areas for improvement

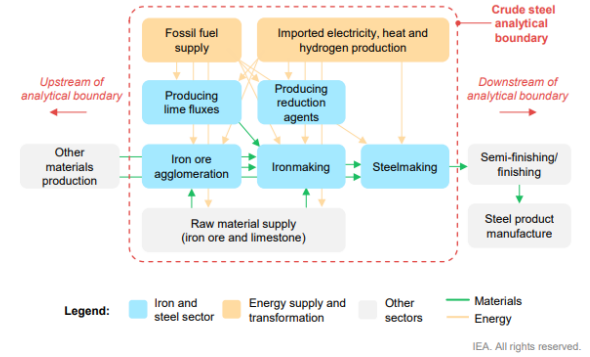
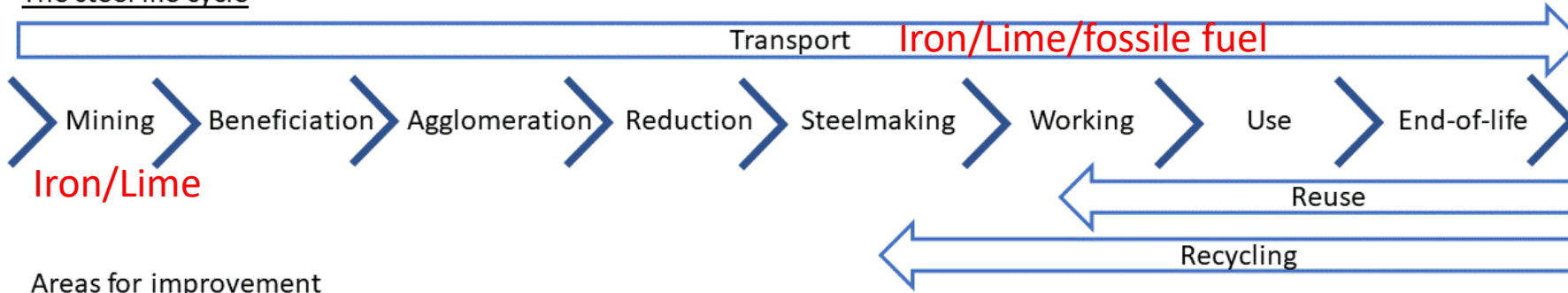


X Allocation credit  
 ✓ CCUS (off gas) ?

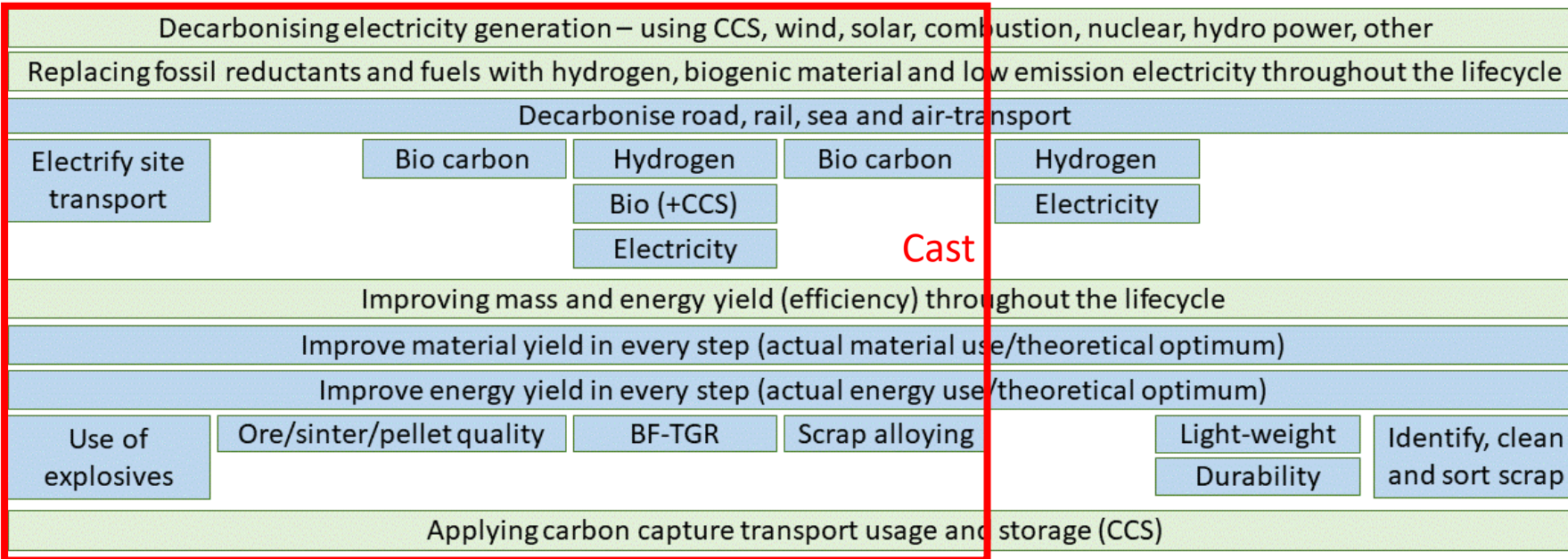
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- **Site-level**
- **Certification system**  
 -GHG & other impacts  
 -Standard V 2.0.1 (Sep. 2022)
- Low alloy steel (<8%)  
 High alloy steel (TBD)
- **Near-zero steel**  
 50-400kgCO<sub>2</sub>e/t  
 Sliding ore/scrap scale  
 ✓ home+prompt+EoL+NF  
 X Internal scrap

### The steel life cycle



### Areas for improvement

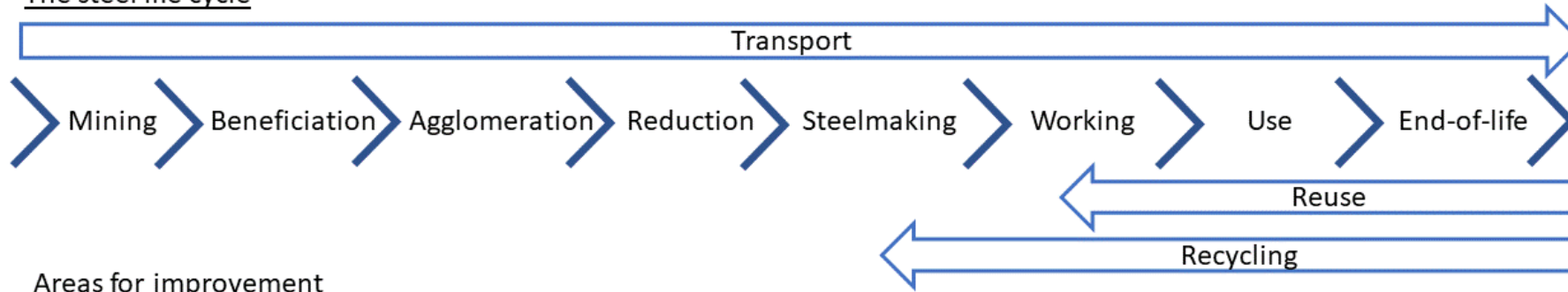


✓ Allocation (credit for slag, not for exported electricity)

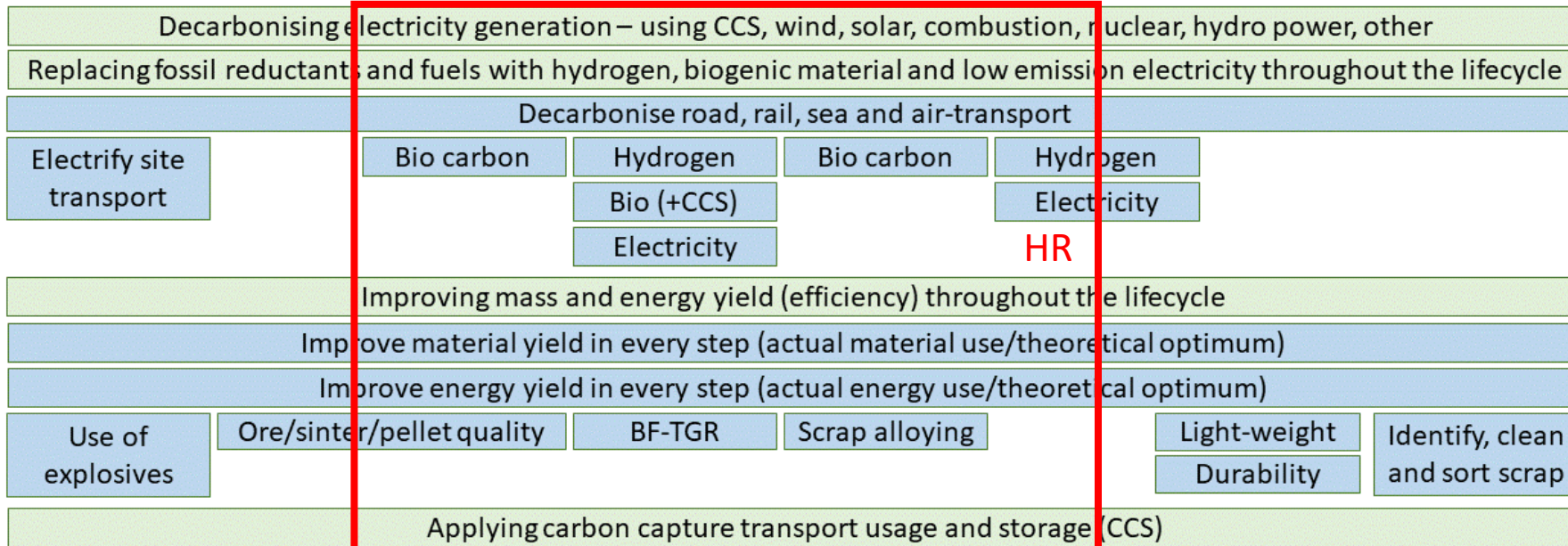
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- Company-level
- Steel and cement sectors
- Low alloy steel
- Direct/indirect other than S1/2/3
- CO<sub>2</sub>+ partial CH<sub>4</sub> emissions
- **Near-zero steel: 50-400kgCO<sub>2e</sub>/t**
- Low emission production
- Recognition of interim measurement

## The steel life cycle



## Areas for improvement



- ✓ Bioenergy benefit, reported separately
- X Allocation credit
- X Secondary metallurgy
- X CCUS (TBD)

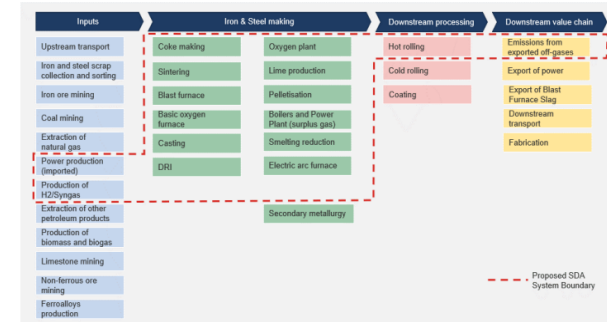
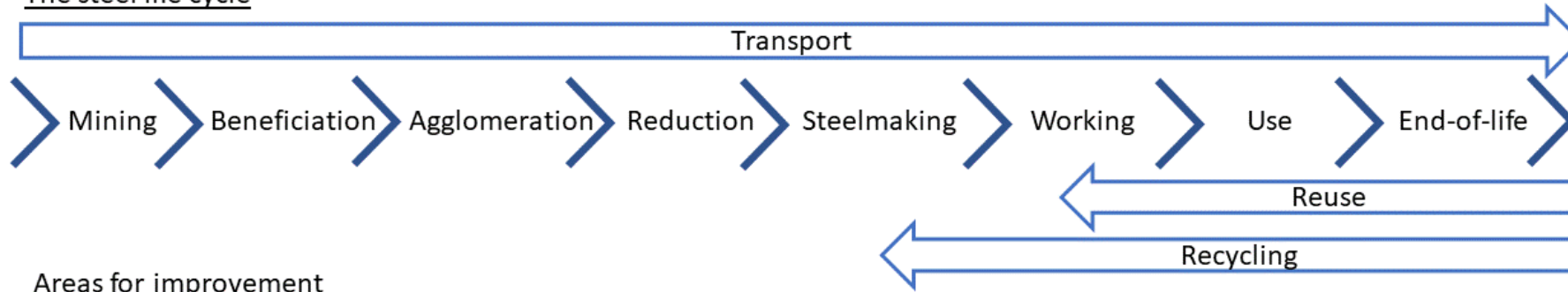


Figure 3: Iron & steel core SDA boundary.

- Company-level
- Multi-sector (cement, transp. Etc.)
- Steel sector (Draft), co-work MPP
- Set Emission Reduction Target (scrap ratio)
  - ✓ Internal+home+prompt+EoL
  - X Non-ferrous scrap
- Low alloy steel: S1+S2 Target, S3 (>40%)
- High alloy steel, S1+S2+S3 Target
- Sold interm. products(coke, sinter, pig iron) -S1+S2 within SDA boundary

# Green Steel Label

## The steel life cycle



## Areas for improvement

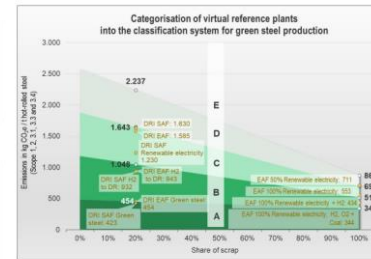
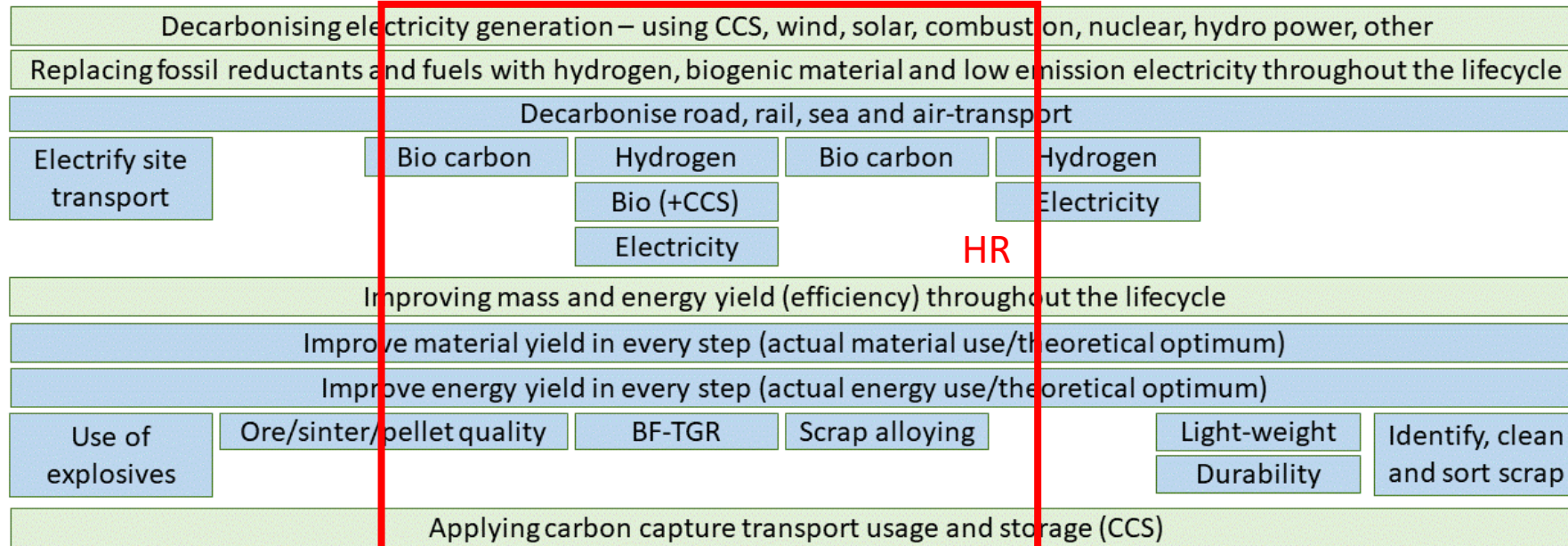


Figure 5: Categorisation of virtual reference plants into the classification system for green steel production

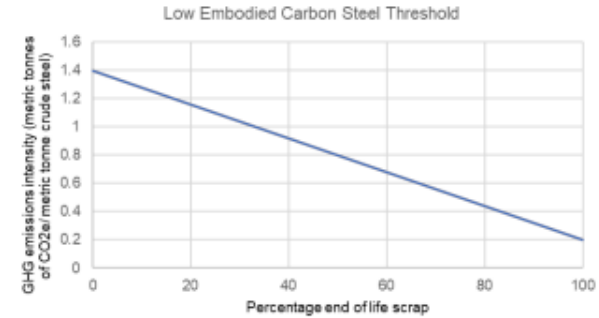
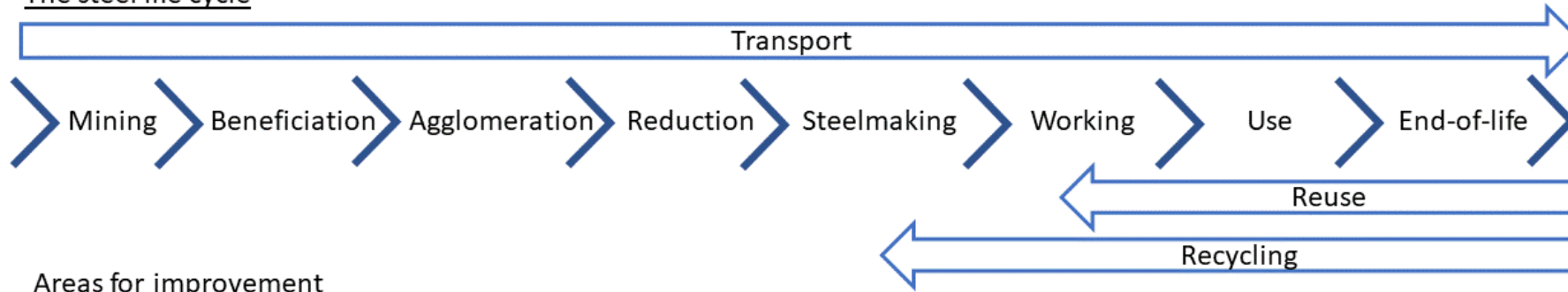
- **Product-level**
- Classification system
- **Only for low alloy steel**
- Sliding ore/scrap scale
- A rulebook (TBD)



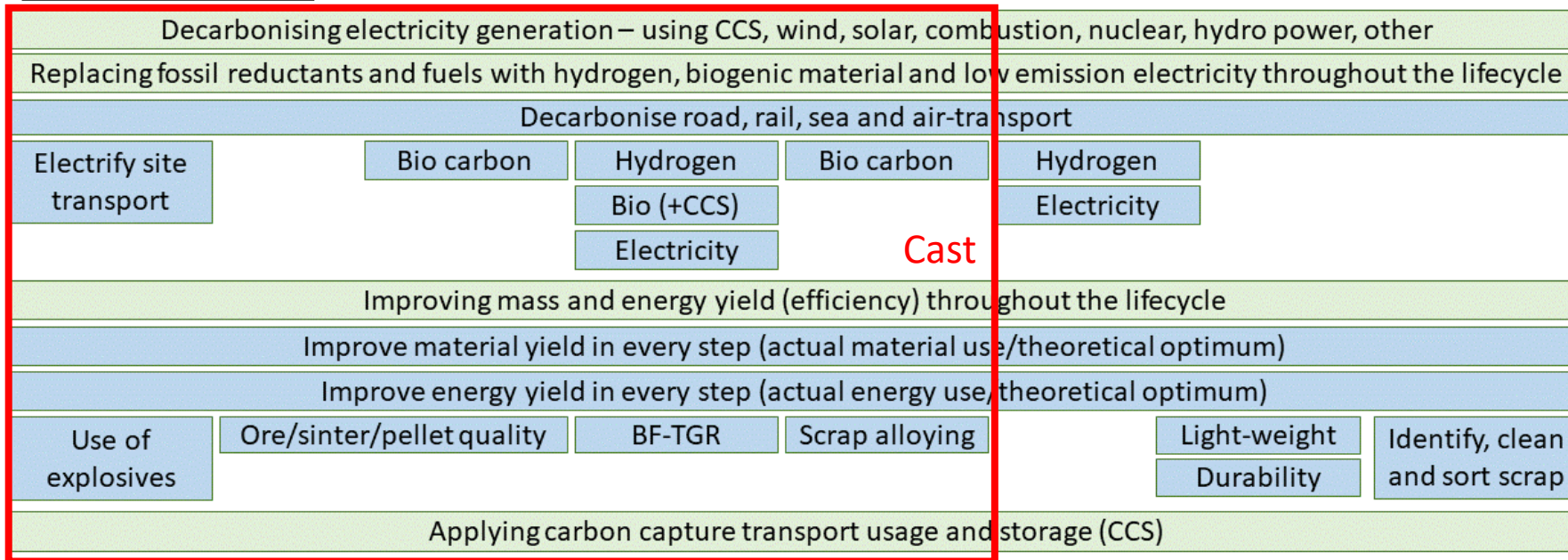
# SteelZero



## The steel life cycle



## Areas for improvement



- Company level
- Cooperated with ResponsibleSteel
- GPP initiative, purchase commitment
  - 100% Net Zero Steel by 2050
  - 50% of below steel by 2030
    - ResponsibleSteel certified or
    - Steel produced with SBT or
    - Low embodied carbon steel 200-1400 kgCO<sub>2</sub>e/t (Only EoL scrap counts)
- **Ongoing Reporting framework (2023)**
- For all steel types

# Summary

Initiative	Level	Steel	Scope	Allocation	Transport	Product Scope	Source	Near Zero kg CO2/t	Bioenergy	CCUS
GHG Protocol (Corp. Standard)	Corporate	All	1+2+3 (opt.)	√(SE/E/P)	√		CO2 eq.	X	(TBD)	(TBD)
GHG Protocol (Product Standard)	Product	All	1+2+3	√(SE/E/P)	√	steel product	CO2 eq.	X	(TBD)	(TBD)
worldsteel (CO2 data)	site	All	1+2+3 (part)	No credit for slag (SE)	only on-site	Crude steel	CO2	X	√	√
worldsteel(LCI data)	Product	Low alloy	1+2+3	√(SE)	√	steel product (e.g. slab)	CO2 eq.	X	X	√
ResponsibleSteel	Site	Low alloy	1+2+3 (part)	X	√	Hot rolled	CO2 eq.	100% ore<400; 100%Scrap<50	√	√ (off gas?)
IEA-G7	Company	Low alloy	1+2+3 (limited)	No credit for ex. electricity	only iron/lime, fossil fuel	Crude steel	CO2, CH4	100% ore<400; 100%Scrap<50		
SBTi (draft)	Company	All	Low alloy: 1+2+3 (>40%); high alloy: 1+2+3	X	√(if S3>40%)	Hot rolled	CO2 eq.		Reported separate	(TBD)
Green steel label (ongoing work)	Product	Low alloy	1+2+3 (part)	√	√	Hot rolled	CO2 eq.	100% ore<482; 100%Scrap<344	√	√
SteeZero (ongoing work)	Company	All	1+2+3 (part)	(TBD)	(TBD)	Crude steel	CO2 eq.	100% ore<400; 100%Scrap<50	(TBD)	(TBD)

TBD: to be developed



Question