Clean Financing for Heavy Industry

Introduction

The majority of global emissions come from electricity generation and the production of commodities by carbon-intensive industries[1,2]. The goal of the Paris Agreements is to hold the increase in global average temperatures to well below 2 degrees Celsius above pre-industrial levels which requires global greenhouse gas (GHG) emissions to reach net-zero and probably negative by 2055-2080[3]. An emerging portfolio of new technologies and near-commercial technologies make it possible for carbon intensive industries to transition to the low carbon economy. Defining project categories that are consistent with a Clean Transition can help these firms and investors channel capital to the most viable options, while reducing risks[4] to capital providers.

The Clean Financing for Heavy Industry Taxonomy was determined through a collaborative and consultative process with contributions from stakeholders including issuers, arrangers and investors as well as civil society, overseen by Corporate Knights. The Project Categories are updated typically once a year.

[1] IPCC (2014) based on global emissions from 2010. Details about the sources included in these estimates can be found in the *Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*.

[2] A review of technology and policy deep decarbonization pathway, Journal of Cleaner Production 187 (2018) 960-973 (Chris Bataille et al)

[3] Ibid

[4] https://www.climatebonds.net/2017/05/oil-gas-bond-we-knew-would-come-eventually-repsol-good-gbps-not-so-sure-green-credentials

1. Eligible Transition Project Categories for Heavy Industry

The following list of projects deliver measurable GHG reductions but are not currently compatible with major green finance taxonomies used by global capital providers.

- Cleaner Fossil Fuels Extraction with significant reductions in GHG emission intensity
- GHG Efficient Fossil Fuel Refining Systems
- GHG Efficient Processes for non-fossil fuel commodities
- Cogeneration from Fossil Fuels

2. Eligible Clean Project Categories for Heavy Industry

The following list of clean project categories captures the most commonly used types of projects expected to be compatible with the Climate Bonds Taxonomy[5], Green Bond Principles[6] and Green Loan Principles[7].

- Site Remediation to leading standards
- Electric Service Vehicles or Fuel Cell Electric Service Vehicles
- Renewable energy for oil and gas transmission/transportation
- Hydrogen Storage
- Zero-Emission Fuels (based on Lifecycle Analysis)
- Biobased Polymers Products
- Electric or Hydrogen Vehicles and Hydrogen Re-Charging/Fuelling Infrastructure
- Clean Materials
- Critical Materials for the Low-Carbon Economy produced to high social and environmental standards
- Nearly Net-Zero Emissions Processes for non-fossil fuel commodities[8]
- Clean Power Generation, Storage and Transmission from renewable energy

[5] https://www.climatebonds.net/standard/taxonomy

[6] https://www.icmagroup.org/green-social-and-sustainability-bonds/green-bond-principles-gbp/

[7] https://www.icmagroup.org/assets/documents/Regulatory/Green-Bonds/LMA_Green_Loan_Principles_Booklet-220318.pdf

[8] See Appendix B for list of non-fossil fuel commodities.

3. Eligible Transition Project Category Examples by Industry

Oil and Gas Companies – Upstream		
Industry Activity		**Maximum allocation of proceeds %**
Cleaner Fossil Fuel Extraction[9]	Level 1: 25%-50% reduction in Well-to-Refinery Lifecycle Analysis GHG emission intensity, where the current volume averaged intensity benchmark is 10.3 g CO2/MJ[10].	25%
	Level 2: 50-90% reduction in Well-to-Refinery Lifecycle Analysis GHG emission intensity, where the global volume averaged intensity benchmark is 10.3 g CO2/MJ[10].	50%
Oil and Gas Companies – Downstream		
GHG Efficient Refining Systems	Level 1: 25%-50% reduction in GHG emission intensity based on the scope within company's control.	25%
	Level 2: 50-90% reduction in GHG emission intensity based on the scope within company's control.	50%

Non-Fossil Fuel Commodities (see Appendix B for industry list)		
Industry Activity		**Maximum allocation of proceeds %**
GHG Efficient Processes	Level 1: 25%-50% reduction in GHG emission intensity based on the scope within company's control.	25%
	Level 2: 50-90% reduction in GHG emission intensity based on the scope within company's control.	50%

Energy Utilities		
Industry Activity		**Maximum allocation of proceeds %**
Cogeneration from Fossil Fuels	Level 1: 25-50% reduction in GHG emission intensity based on the scope within company's control.	25%
	Level 2: 50-90% reduction in GHG emission intensity based on the scope within company's control.	50%

[9] The benchmark for cleaner fossil fuels will be reviewed periodically and adjusted in line with global trends. There are many ways to reduce GHGs associated with fossil fuel extraction including: Solvent assisted in-situ bitumen recovery, Solvent use in Enhanced Oil Recovery, In-situ combustion, CO2 enhanced oil recovery, Natural gas purification, Electric heating for extraction, CO2 capture and storage, Renewable energy mixes including wind, solar, geothermal, and/or co-generation as energy sources for fossil fuel production.

[10] Masnadi, et al. (2018). Global carbon intensity of crude oil production. *Science* 361, 851. DOI: 10.1126/science.aar6859.

4. Eligible Clean Project Category Examples

The following 'clean' categories provides a more granular range of examples for the types of projects in line with currently accepted definitions of green finance.

Site Remediation of Well Site, Water and Soil Remediation	Well site restoration
	Bio/genomic/microbial water and soil remediation
	Shrimp/arctic microbial remediation
	Microbial land-spill remediation
EVs and FCEVs Service Vehicles	Vehicle fleets
Renewable Energy for Oil and Gas Transmission/Transportation	Power for Oil and Gas Transmission/Transportation from Renewables
Hydrogen Storage[11]	Hydrogen storage in natural gas pipelines
Zero-Emission Fuels (based on Lifecycle Analysis)	Renewable Hydrogen (made from renewable energy or natural gas with CCS)
	Renewable natural gas from wastes
	Renewable propane from wastes
	Bio-methanol from sustainable feedstock including wastes, sugar and grains[12]
	Bio-ethanol from sustainable feedstock including wastes, sugar and grains[12]
	Cellulosic ethanol[12]
	Bio-diesel from sustainable feedstocks including oil seeds, animal fat, and grease[12]
	Biomass (solids-biochar, pellets from sustainable feedstock) [12]
	Synthetic fuels made with Carbon Capture and Utilization (CCU)
	Biomass-to-liquids with CCS
	Low GHG steel, iron ore, aluminium etc.
	Mechanical energy storage (Flywheels, pumped hydro – where the facility will not be charged with carbon intensive energy OR facility is contributing to a grid which has at least 20% share of intermittent renewables, compressed air energy storage)
	Chemical energy storage (Batteries, flow cells, thermochemical energy storage)
	Electrical energy storage (Capacitors, supercapacitors, superconducting magnetic energy storage (SMES))
	Thermal energy storage (Low and high temperature storage)
	Electric vehicles as storage for grid support (Mobile storage)

[11] https://www.energy.gov/eere/fuelcells/hydrogen-storage

[12] GHG emission of biomass or biofuel used must be 80% lower than fossil fuel baseline, the energy efficiency achieved must be at least 80%, and the emissions of electricity generated must be lower than 100gCO2/kWh.

	Wind
	Marine renewables including tidal and wave energy generation facilities – using ocean thermals, salinity, gradients, etc; and heating/cooling facilities using ocean thermals (where an 80% reduction in gCO2e/kWh is achieved compared to fossil fuel alternatives)
	Geothermal power plant (where direct emission amounts to less than 100g/CO2/kWh)
	Hydropower plant (run-of-river and large scale where the power density >5W/m2 or emissions of electricity generated <100gCO2e/kWh)
	Solar photovoltaic (PV) and Concentrated solar power plant (CSP)
	Transmission to enable renewable electricity
	Electricity as a service
	Smart Grid and Microgrid Systems (smart meters, voltage reduction/control technologies, advanced monitoring and forecasting systems, integration and Control systems, communication and cyber security systems)
	Distributed energy resource management systems (ability to monitor, control and optimize distributed-connected Generation such as smaller scale (<50MW) wind, solar, geothermal, etc.)
	Solar thermal heat
	Geothermal heat (where direct emission amounts to less than 100g/CO2/kWh)
	Waste heat (emissions of electricity generated must be lower than 100gCO2/kWh; waste to energy conversion is at a minimum 25%; gas capture of at least 75% and the gas must be used to generate electricity)
	Ground heat pump
	District heat
	Cogeneration (CHP) with clean fuels, including Biofuel Heat Systems (biomass, biogas and bioliquid from sustainable feedstock), soil, air and marine thermal gradients, solar thermal and geothermal heat systems.
Biobased Polymer Products	Bioplastics and other biobased polymer products
	Renewable chemicals and polymers
EV and Hydrogen Re-Charging/Fuelling Infrastructure	EV and Hydrogen Re-Charging/Fuelling Infrastructure at Gas stations and Retail outlets
Clean Materials	CCU, using CO_2 as a feedstock raw material
	CCU for Chemicals and Polymers
	CCU for Aggregates and Cement
	Asphalt from bitumen feedstock
	Carbon fibres (structural)
	Carbon fibres (non-structural)

	Advanced Carbon Materials (Graphene, carbon nanotubes, carbon foam, etc.)
	Lithium (from waste recovery)
	Heavy metals from wastes (V, Zr, Ti, etc.)
	Other rare earth metals (from waste recovery)
	Synthetic Chemicals
Critical Materials for the Low-Carbon Economy produced to high social and environmental standards	Conflict-free cobalt (See Appendix A for more examples)
Nearly Net-Zero Emissions Processes for non-fossil fuel commodities	GHG-free aluminum smelting process, GHG-free steel, zero-carbon iron ore, carbon negative cement
Clean Power Generation, Storage and Transmission	Mechanical energy storage (Flywheels, pumped hydro – where the facility will not be charged with carbon intensive energy OR facility is contributing to a grid which has at least 20% share of intermittent renewables, compressed air energy storage)
	Chemical energy storage (Batteries, flow cells, thermochemical energy storage)
	Electrical energy storage (Capacitors, supercapacitors, superconducting magnetic energy storage (SMES))
	Thermal energy storage (Low and high temperature storage)
	Electric vehicles as storage for grid support (Mobile storage)
	Wind
	Marine renewables including tidal and wave energy generation facilities – using ocean thermals, salinity, gradients, etc; and heating/cooling facilities using ocean thermals (where an 80% reduction in gCO_2e/kWh is achieved compared to fossil fuel alternatives)
	Geothermal power plant (where direct emission amounts to less than $100g/CO_2/kWh$)
	Hydropower plant (run-of-river and large scale where the power density >5W/m2 or emissions of electricity generated $<100gCO_2e/kWh$)
	Solar photovoltaic (PV) and Concentrated solar power plant (CSP)
	Transmission to enable renewable electricity
	Electricity as a service
	Smart Grid and Microgrid Systems (smart meters, voltage reduction/control technologies, advanced monitoring and forecasting systems, integration and Control systems, communication and cyber security systems)
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	Cogeneration (CHP) with clean fuels, including Biofuel Heat Systems (biomass, biogas and bioliquid from sustainable feedstock), soil, air and marine thermal gradients, solar thermal and geothermal heat systems.

Appendix A

The following materials are recognized as critical inputs for the low carbon economy[13,14]:

- aluminum (including its key constituent, bauxite),
- cobalt,
- copper,
- iron ore (cast iron and magnet iron)
- lead
- lithium,
- nickel,
- manganese,
- the platinum group of metals,
- rare earth metals including cadmium, molybdenum, neodymium (proxy for rare earth metals), and
- indium—silver, steel, titanium and zinc.

Appendix B

The following sectors are recognized as being part of the Non-Fossil Fuel Commodities[15]:

- Cement
- Chemical and Fertilizers
- Iron and Steel
- Lime and Gypsum
- Mining
- Pulp and Paper
- Smelting and Refining (Non-Ferrous Metals)

[13] https://openknowledge.worldbank.org/handle/10986/28312

[14] http://documents.worldbank.org/curated/en/207371500386458722/pdf/117581-WP-P159838-PUBLIC-ClimateSmartMiningJuly.pdf

[15] Data for the 2005 to 2015 period comes from Canada's National Inventory Report 1990-2015: Greenhouse Gas Sources and Sinks in Canada (https://www.canada.ca/en/environment-climate-change/services/climate-change/greenhouse-gas-emissions/inventory.html).