Invevitable Policy Response (IPR) Forecast Policy Scenario + Nature 2022 Value Drivers Database Guide

- IPR describes the outputs from the IPR scenarios as “value drivers” for portfolio construction.
- The value drivers contain the same land use variables for both the FPS (2022 update) and FPS + Nature. These are outlined below. All energy value drivers remain the same as 2021.

1.1 IPR FPS + Nature Value Driver Database

The IPR FPS + Nature value driver database includes updated land use variables and can be found here:
www.unpri.org/ipr-fps-nature-value-drivers

Value Diver Data Dictionary

1.2 Land use overview

- **Time horizon:** 2020-2050
- **Resolution:** 5 year intervals
- **Jurisdiction:** 16 world regions including 5 G20 countries
  - **Countries:** Brazil (BRA), Canada (CAN), China (CHA), India (IND), Russia (RUS), United States (USA)
  - **Composite regions:** Australia and New Zealand (ANZ), Developed East Asia (DEA), European Union & UK (EUR), Middle East Asia and North Africa (MEA), Non-EU Europe (excl. UK) (NEU), Eastern Europe and Central Asia (REF), Southern Africa (SAF), South Asia (SAS), Latin America's Southern Cone (SCO), Southeast Asia (SEA), Tropical Africa (TAF), Tropical Latin America (TLA)

Land use data variables dictionary:

1.3 Energy Overview

- **Time horizon:** 2020-2050
- **Resolution:** 1 year intervals*
- **Jurisdiction:** 21 world regions including 12 G20 countries*
  - **Countries:** Australia, Brazil, Canada, China, India, Indonesia, Japan, Russia, South Africa, South Korea, United Kingdom, United States
  - **Composite regions:** Central and South America, Eastern Europe, Eurasia, Gulf Cooperation Council, Middle East and North Africa, South Asia, South East Asia and Oceania, Sub-Saharan Africa, Western Europe

* for a small number of variables data is published at 10 year intervals, or at the world level

Energy data variables dictionary:

1. Capacity
2. Capex
3. CO2 removals
4. Demand
5. Electricity generation
6. GHG Emissions
7. New deployment
8. Price
9. Primary energy demand
10. Production
11. Sector energy demand

2 Land use data variables dictionary

Table 1 Land use data variables table of contents

Source: Vivid Economics

2.1 GHG Emissions

Table 2 Land use - GHG Emissions

Sub variable	Sub variable class	Description	unit
CO_2	N/A	CO2 emissions from land use change, including gross forest degradation, regrowth, timber plantations, secondary forest and other land	Mt CO_2

Source: Vivid Economics

2.2 Nature-based solutions

Table 3 Land use - Nature Based Solutions

Sub variable	Sub variable class	Description	unit
Area	Forest-restore-plant	Area of natural forest regrowth and managed afforestation, including NDC commitments and timber plantations	Million ha
Area	Forest-avoid	Area of protected and conserved primary and secondary forest	Million ha
Area	Peat-restore	Area of restored peatland	Million ha
Area	Mangrove-restore	Area of restored mangroves	Million ha
Area	Cropland-improve	Area of improved cropland through trees in cropland (agroforestry)	Million ha
Area	Pasture-improve	Area of pastureland improvements through silvopasture	Million ha
Area	All NBS	Sum of all NBS areas	Million ha
Annual revenue	Forest-restore-plant	Annual revenue of natural forest regrowth and managed afforestation, including NDC commitments and timber plantations	USD 2021
Annual revenue	Forest-avoid	Annual revenue of protected and conserved primary and secondary forest	USD 2021
Annual revenue	Peat-restore	Annual revenue of peatland restoration	USD 2021
Annual revenue	Mangrove-restore	Annual revenue of mangrove restoration	USD 2021
Annual revenue	Cropland-improve	Annual revenue of improved cropland through trees in cropland (agroforestry)	USD 2021
Annual revenue	Pasture-improve	Annual revenue of pastureland improvements through silvopasture	USD 2021
Annual revenue	All NBS	Sum of all NBS revenues in each time step	USD 2021
CAPEX	Forest-restore	Capital expenditure per hectare for natural forest regrowth and managed afforestation, including NDC commitments	USD 2021/ha
CAPEX	Forest-plant	Capital expenditure per hectare for timber plantations	USD 2021/ha
CAPEX	Forest-avoid	Capital expenditure per hectare for protection and conservation of primary and secondary forest	USD 2021/ha

Sub variable	Sub variable class	Description	unit
CAPEX	Peat-restore	Capital expenditure per hectare for restoration of peatland	USD 2021/ha
CAPEX	Mangrove-restore	Capital expenditure per hectare for restoration of mangroves	USD 2021/ha
CAPEX	Cropland-improve	Capital expenditure per hectare for cropland improvement through trees in cropland (agroforestry)	USD 2021/ha
CAPEX	Pasture-improve	Capital expenditure per hectare for pastureland improvement through silvopasture	USD 2021/ha
Cumulative investment	Forest-restore-plant	Cumulative capital expenditure and discounted operational expenditure for natural forest regrowth and managed afforestation, including NDC commitments	USD 2021
Cumulative investment	Forest-avoid	Cumulative capital expenditure and discounted operational expenditure for protection and conservation of primary and secondary forest	USD 2021
Cumulative investment	Peat-restore	Cumulative capital expenditure and discounted operational expenditure for restoration of peatland	USD 2021
Cumulative investment	Mangrove-restore	Cumulative capital expenditure and discounted operational expenditure for restoration of mangroves	USD 2021
Cumulative investment	Cropland-improve	Cumulative capital expenditure and discounted operational expenditure for cropland improvement through trees in cropland (agroforestry)	USD 2021
Cumulative investment	Pasture-improve	Cumulative capital expenditure and discounted operational expenditure for pastureland improvement through silvopasture	USD 2021
Cumulative investment	All NBS	Sum of all NBS cumulative investment	USD 2021
OPEX	Forest-restore	Operational expenditure per hectare for natural forest regrowth and managed afforestation, including NDC commitments	USD 2021/ha/yr
OPEX	Forest-plant	Operational expenditure per hectare for timber plantations	USD 2021/ha/yr

Sub variable	Sub variable class	Description	unit
OPEX	Forest-avoid	Operational expenditure per hectare for protected and conserved primary and secondary forest	USD 2021/ha/yr
OPEX	Peat-restore	Operational expenditure per hectare for peatland restoration	USD 2021/ha/yr
OPEX	Mangrove-restore	Operational expenditure per hectare for mangrove restoration	USD 2021/ha/yr
OPEX	Cropland-improve	Operational expenditure per hectare for cropland improvement through trees in cropland	USD 2021/ha/yr
OPEX	Pasture-improve	Operational expenditure per hectare for pastureland improvement through silvopasture	USD 2021/ha/yr

Source: Vivid Economics

2.3 Alternative protein

Table 4 Land use - Alternative protein

Sub variable	Sub variable class	Description	unit
Production	Plant-based ruminant meat	Production of plant-based alternatives to ruminant meat	Megatonnes dry matter
Production	Plant-based monogastric meat	Production of plant-based alternatives to monogastric meat	Megatonnes dry matter
Production	Plant-based poultry meat	Production of plant-based alternatives to poultry meat	Megatonnes dry matter
Production	Plant-based dairy	Production of plant-based alternatives to dairy	Megatonnes dry matter
Production	Cell-based ruminant meat	Production of cell-based alternatives to ruminant meat	Megatonnes dry matter
Production	Cell-based monogastric meat	Production of cell-based alternatives to monogastric meat	Megatonnes dry matter
Production	Cell-based poultry meat	Production of cell-based alternatives to poultry meat	Megatonnes dry matter
Price[1]	Plant-based ruminant meat	Farmgate price of plant-based ruminant meat in index form	Index (average cost of animal meat in 2020 = 100)
Price	Plant-based monogastric meat	Farmgate price of plant-based monogastric meat in index form	Index (average cost of animal meat in 2020 = 100)
Price	Plant-based poultry meat	Farmgate price of plant-based poultry meat in index form	Index (average cost of animal meat in 2020 = 100)
Price	Plant-based dairy	Farmgate price of plant-based dairy in index form	Index (dairy price in 2020 = 100)
Price	Cell-based ruminant meat	Farmgate price of cell-based ruminant meat in index form	Index (average cost of animal meat in 2020 = 100)
Price	Cell-based monogastric meat	Farmgate price of cell-based monogastric meat in index form	Index (average cost of animal meat in 2020 = 100)
Price	Cell-based poultry meat	Farmgate price of cell-based poultry meat in index form	Index (average cost of animal meat in 2020 = 100)

Source: Vivid Economics

[1] Price here refers to farmgate prices, and is assumed to be equal to production costs

2.4 Conventional protein

Table 5 Land use – Conventional protein

Sub variable	Sub variable class	Description	unit
Production	Ruminant meat	Production of ruminant meat	Megatonnes dry matter
Production	Monogastric meat	Production of monogastric meat	Megatonnes dry matter
Production	Poultry meat	Production of poultry meat	Megatonnes dry matter
Production	Dairy	Production of dairy	Megatonnes dry matter
Price	Ruminant	Farmgate price of ruminant meat in index form	Index (average cost of animal meat in 2020 = 100)
Price	Monogastric	Farmgate price of monogastric meat in index form	Index (average cost of animal meat in 2020 = 100)
Price	Poultry	Farmgate price of poultry meat in index form	Index (average cost of animal meat in 2020 = 100)
Price	Animal meat average	Average farmgate price of monogastric, poultry and ruminant meat in index form	Index (average cost of animal meat in 2020 = 100)
Price	Dairy	Farmgate price of dairy in index form	Index (dairy price in 2020 = 100)

Source: Vivid Economics

2.5 Timber

Table 6 Land use - Timber

Sub variable	Sub variable class	Description	unit
Production	Industrial roundwood	Production of industrial roundwood	Million m^3
Price	Industrial roundwood	Indexed price of industrial roundwood	Index (2020 = 100)

Source: Vivid Economics

2.6 Bioenergy

Table 7 Land use - Bioenergy

Sub variable	Sub variable class	Description	unit
Production	Second-generation	Production of second-generation bioenergy	EJ/yr
Price index	Second-generation	Indexed price of second-generation bioenergy	Index (2020 = 100)

Source: Vivid Economics

2.7 Crops

Table 8 Land use - Crops

Sub variable	Sub variable class	Description	unit
Production	Maize	Production of maize	Mt DM/yr
Production	Oil palm fruit	Production of oil palm fruit	Mt DM/yr
Production	Rice	Production of rice	Mt DM/yr
Production	Soybean	Production of soybean	Mt DM/yr
Production	Sugar cane	Production of sugar cane	Mt DM/yr
Production	Temperate cereals	Production of temperate cereals (wheat, barley, rye, mixed, grain, oats, triticale)	Mt DM/yr
Production	Coffee	Production of coffee	Mt DM/yr
Production	Cocoa	Production of cocoa	Mt DM/yr
Production	Rubber	Production of rubber	Mt DM/yr
Yield	Global average crop yield	Global average crop yield	Mt DM/ha
Price	Food price index	Global average food price in index form	Index (2020 = 100)
Price	Land price index	Global average land price in index form	Index (2020 = 100)
Price	Maize	Farmgate price of maize	Index (2020 = 100)
Price	Oil palm fruit	Farmgate price of oil palm fruit	Index (2020 = 100)
Price	Rice	Farmgate price of rice	Index (2020 = 100)
Price	Soybean	Farmgate price of soybean	Index (2020 = 100)
Price	Sugar cane	Farmgate price of sugar cane	Index (2020 = 100)
Price	Temperate cereals	Farmgate price of temperate cereals (wheat, barley, rye, mixed, grain, oats, triticale)	Index (2020 = 100)
Price	Coffee	Farmgate price of coffee	Index (2020 = 100)
Price	Cocoa	Farmgate price of cocoa	Index (2020 = 100)
Price	Rubber	Farmgate price of rubber	Index (2020 = 100)

Source: Vivid Economics

3 Energy data variables dictionary

Energy data variables classes table of contents

Source: Vivid Economics

3.1 Capacity

Table 9 Energy - Capacity

Variable ID	Sub variable class	Sector	Definition	Units
Capacity_Electricity generation_Biomass CCS_Power	Electricity generation	Power	Total installed capacity: electricity generation by technology	GW
Capacity_Electricity generation_Biomass_Power	Electricity generation	Power	Total installed capacity: electricity generation by technology	GW
Capacity_Electricity generation_Coal CCS_Power	Electricity generation	Power	Total installed capacity: electricity generation by technology	GW
Capacity_Electricity generation_Coal_Power	Electricity generation	Power	Total installed capacity: electricity generation by technology	GW
Capacity_Electricity generation_Hydro_Power	Electricity generation	Power	Total installed capacity: electricity generation by technology	GW
Capacity_Electricity generation_Hydrogen_Power	Electricity generation	Power	Total installed capacity: electricity generation by technology	GW
Capacity_Electricity generation_Natural gas CCS_Power	Electricity generation	Power	Total installed capacity: electricity generation by technology	GW
Capacity_Electricity generation_Natural gas_Power	Electricity generation	Power	Total installed capacity: electricity generation by technology	GW
Capacity_Electricity generation_Nuclear_Power	Electricity generation	Power	Total installed capacity: electricity generation by technology	GW

Variable ID	Sub variable class	Sector	Definition	Units
Capacity_Electricity generation_Offshore wind_Power	Electricity generation	Power	Total installed capacity: electricity generation by technology	GW
Capacity_Electricity generation_Oil_Power	Electricity generation	Power	Total installed capacity: electricity generation by technology	GW
Capacity_Electricity generation_Solar_Power	Electricity generation	Power	Total installed capacity: electricity generation by technology	GW
Capacity_Electricity generation_Onshore wind_Power	Electricity generation	Power	Total installed capacity: electricity generation by technology	GW

Source: Vivid Economics

3.2 Technology Stock

Table 10 Energy – Technology stock

Variable ID	Sub variable class	Sector	Definition	Units
Technology stock_Electricity generation_Onshore wind_Hydrogen	Electricity generation	Hydrogen	Total installed capacity: electricity generation by technology	GW
Technology stock _Electricity generation_Offshore wind_Hydrogen	Electricity generation	Hydrogen	Total installed capacity: electricity generation by technology	GW
Technology stock _Electricity generation_Solar_Hydrogen	Electricity generation	Hydrogen	Total installed capacity: electricity generation by technology	GW
Technology stock _Heating systems_Biomass_Buildings_Commercial	Heating systems	Buildings	Total installed capacity: space/water heating systems by technology	% mix
Technology stock _Heating systems_Biomass_Buildings_Residential	Heating systems	Buildings	Total installed capacity: space/water heating systems by technology	# units
Technology stock _Heating systems_Coal_Buildings_Commercial	Heating systems	Buildings	Total installed capacity: space/water heating systems by technology	% mix
Technology stock _Heating systems_Coal_Buildings_Residential	Heating systems	Buildings	Total installed capacity: space/water heating systems by technology	# units
Technology stock _Heating systems_District heat_Buildings_Commercial	Heating systems	Buildings	Total installed capacity: space/water heating systems by technology	% mix

Variable ID	Sub variable class	Sector	Definition	Units
Technology stock _Heating systems_District heat_Buildings_Residential	Heating systems	Buildings	Total installed capacity: space/water heating systems by technology	# units
Technology stock_Heating systems_Heat pump_Buildings_Commercial	Heating systems	Buildings	Total installed capacity: space/water heating systems by technology	% mix
Technology stock _Heating systems_Heat pump_Buildings_Residential	Heating systems	Buildings	Total installed capacity: space/water heating systems by technology	# units
Technology stock _Heating systems_Hydrogen_Buildings_Commercial	Heating systems	Buildings	Total installed capacity: space/water heating systems by technology	% mix
Technology stock _Heating systems_Hydrogen_Buildings_Residential	Heating systems	Buildings	Total installed capacity: space/water heating systems by technology	# units
Technology stock _Heating systems_Natural gas_Buildings_Commercial	Heating systems	Buildings	Total installed capacity: space/water heating systems by technology	% mix
Technology stock _Heating systems_Natural gas_Buildings_Residential	Heating systems	Buildings	Total installed capacity: space/water heating systems by technology	# units
Technology stock _Heating systems_Oil_Buildings_Commercial	Heating systems	Buildings	Total installed capacity: space/water heating systems by technology	% mix

Variable ID	Sub variable class	Sector	Definition	Units
Technology stock _Heating systems_Oil_Buildings_Residential	Heating systems	Buildings	Total installed capacity: space/water heating systems by technology	# units
Technology stock _Heating systems_Resistive_Buildings_Commercial	Heating systems	Buildings	Total installed capacity: space/water heating systems by technology	% mix
Technology stock _Heating systems_Resistive_Buildings_Residential	Heating systems	Buildings	Total installed capacity: space/water heating systems by technology	# units
Technology stock_Vehicles_BEV_Transport_Cars	Vehicles	Transport	Total stock of vehicles by technology (cars)	Vehicles (thousands)
Technology stock_Vehicles_BEV_Transport_Trucks	Vehicles	Transport	Total stock of vehicles by technology (trucks)	Vehicles (thousands)
Technology stock_Vehicles_BEV_Transport_Vans	Vehicles	Transport	Total stock of vehicles by technology (vans)	Vehicles (thousands)
Technology stock_Vehicles_H2_Transport_Cars	Vehicles	Transport	Total stock of vehicles by technology (cars)	Vehicles (thousands)
Technology stock_Vehicles_H2_Transport_Trucks	Vehicles	Transport	Total stock of vehicles by technology (trucks)	Vehicles (thousands)

Variable ID	Sub variable class	Sector	Definition	Units
Technology stock_Vehicles_H2_Transport_Vans	Vehicles	Transport	Total stock of vehicles by technology (vans)	Vehicles (thousands)
Technology stock_Vehicles_ICE_Transport_Cars	Vehicles	Transport	Total stock of vehicles by technology (cars)	Vehicles (thousands)
Technology stock_Vehicles_ICE_Transport_Trucks	Vehicles	Transport	Total stock of vehicles by technology (trucks)	Vehicles (thousands)
Technology stock_Vehicles_ICE_Transport_Vans	Vehicles	Transport	Total stock of vehicles by technology (vans)	Vehicles (thousands)
Technology stock_Vehicles_PHEV_Transport_Cars	Vehicles	Transport	Total stock of vehicles by technology (cars)	Vehicles (thousands)
Technology stock_Vehicles_PHEV_Transport_Trucks	Vehicles	Transport	Total stock of vehicles by technology (trucks)	Vehicles (thousands)
Technology stock_Vehicles_PHEV_Transport_Vans	Vehicles	Transport	Total stock of vehicles by technology (vans)	Vehicles (thousands)

Source: Vivid Economics

3.3 Capex

Table 11 Energy - Capex

Variable ID	Sub variable class	Sector	Definition	Units
Capex_Electricity generation_Biomass CCS_Power	Electricity generation	Power	Capital investment: electricity generation capacity	USD (million)
Capex_Electricity generation_Biomass_Power	Electricity generation	Power	Capital investment: electricity generation capacity	USD (million)
Capex_Electricity generation_Coal CCS_Power	Electricity generation	Power	Capital investment: electricity generation capacity	USD (million)
Capex_Electricity generation_Coal_Power	Electricity generation	Power	Capital investment: electricity generation capacity	USD (million)
Capex_Electricity generation_Hydro_Power	Electricity generation	Power	Capital investment: electricity generation capacity	USD (million)
Capex_Electricity generation_Hydrogen_Power	Electricity generation	Power	Capital investment: electricity generation capacity	USD (million)
Capex_Electricity generation_Natural gas CCS_Power	Electricity generation	Power	Capital investment: electricity generation capacity	USD (million)
Capex_Electricity generation_Natural gas_Power	Electricity generation	Power	Capital investment: electricity generation capacity	USD (million)
Capex_Electricity generation_Nuclear_Power	Electricity generation	Power	Capital investment: electricity generation capacity	USD (million)
Capex_Electricity generation_Offshore wind_Hydrogen	Electricity generation	Hydrogen	Capital investment: electricity generation capacity	USD (million)

Variable ID	Sub variable class	Sector	Definition	Units
Capex_Electricity generation_Offshore wind_Power	Electricity generation	Power	Capital investment: electricity generation capacity	USD (million)
Capex_Electricity generation_Oil_Power	Electricity generation	Power	Capital investment: electricity generation capacity	USD (million)
Capex_Electricity generation_Onshore wind_Hydrogen	Electricity generation	Hydrogen	Capital investment: electricity generation capacity	USD (million)
Capex_Electricity generation_Onshore wind_Power	Electricity generation	Power	Capital investment: electricity generation capacity	USD (million)
Capex_Electricity generation_Solar_Hydrogen	Electricity generation	Hydrogen	Capital investment: electricity generation capacity	USD (million)
Capex_Electricity generation_Solar_Power	Electricity generation	Power	Capital investment: electricity generation capacity	USD (million)
Capex_Heating systems_Biomass_Buildings_Commercial	Heating systems	Buildings	Capital investment: space/water heating systems by technology (commercial)	USD (million)
Capex_Heating systems_Biomass_Buildings_Residential	Heating systems	Buildings	Capital investment: space/water heating systems by technology (residential)	USD (million)
Capex_Heating systems_Coal_Buildings_Commercial	Heating systems	Buildings	Capital investment: space/water heating systems by technology (commercial)	USD (million)
Capex_Heating systems_Coal_Buildings_Residential	Heating systems	Buildings	Capital investment: space/water heating systems by technology (residential)	USD (million)

Variable ID	Sub variable class	Sector	Definition	Units
Capex_Heating systems_District heat_Buildings_Commercial	Heating systems	Buildings	Capital investment: space/water heating systems by technology (commercial)	USD (million)
Capex_Heating systems_District heat_Buildings_Residential	Heating systems	Buildings	Capital investment: space/water heating systems by technology (residential)	USD (million)
Capex_Heating systems_Heat pump_Buildings_Commercial	Heating systems	Buildings	Capital investment: space/water heating systems by technology (commercial)	USD (million)
Capex_Heating systems_Heat pump_Buildings_Residential	Heating systems	Buildings	Capital investment: space/water heating systems by technology (residential)	USD (million)
Capex_Heating systems_Hydrogen_Buildings_Commercial	Heating systems	Buildings	Capital investment: space/water heating systems by technology (commercial)	USD (million)
Capex_Heating systems_Hydrogen_Buildings_Residential	Heating systems	Buildings	Capital investment: space/water heating systems by technology (residential)	USD (million)
Capex_Heating systems_Natural gas_Buildings_Commercial	Heating systems	Buildings	Capital investment: space/water heating systems by technology (commercial)	USD (million)
Capex_Heating systems_Natural gas_Buildings_Residential	Heating systems	Buildings	Capital investment: space/water heating systems by technology (residential)	USD (million)
Capex_Heating systems_Oil_Buildings_Commercial	Heating systems	Buildings	Capital investment: space/water heating systems by technology (commercial)	USD (million)
Capex_Heating systems_Oil_Buildings_Residential	Heating systems	Buildings	Capital investment: space/water heating systems by technology (residential)	USD (million)
Capex_Heating systems_Resistive_Buildings_Commercial	Heating systems	Buildings	Capital investment: space/water heating systems by technology (commercial)	USD (million)

Variable ID	Sub variable class	Sector	Definition	Units
Capex_Heating systems_Resistive_Buildings_Residential	Heating systems	Buildings	Capital investment: space/water heating systems by technology (residential)	USD (million)
Capex_Vehicles_BEV_Transport_Cars	Vehicles	Transport	Capital investment: vehicles by technology (cars)	USD (million)
Capex_Vehicles_BEV_Transport_Trucks	Vehicles	Transport	Capital investment: vehicles by technology (trucks)	USD (million)
Capex_Vehicles_BEV_Transport_Vans	Vehicles	Transport	Capital investment: vehicles by technology (vans)	USD (million)
Capex_Vehicles_H2_Transport_Cars	Vehicles	Transport	Capital investment: vehicles by technology (cars)	USD (million)
Capex_Vehicles_H2_Transport_Trucks	Vehicles	Transport	Capital investment: vehicles by technology (trucks)	USD (million)
Capex_Vehicles_H2_Transport_Vans	Vehicles	Transport	Capital investment: vehicles by technology (vans)	USD (million)
Capex_Vehicles_ICE_Transport_Cars	Vehicles	Transport	Capital investment: vehicles by technology (cars)	USD (million)
Capex_Vehicles_ICE_Transport_Trucks	Vehicles	Transport	Capital investment: vehicles by technology (trucks)	USD (million)
Capex_Vehicles_ICE_Transport_Vans	Vehicles	Transport	Capital investment: vehicles by technology (vans)	USD (million)

Source: Vivid Economics

CO_2 removals

Table 12 Energy - CO_2 removals

Variable ID	Sub variable class	Sector	Definition	Units
CO2 removals_BECCS_Industry	BECCS	Industry	Carbon sequestration: biomass (industry)	Mt
CO2 removals_BECCS_Power	BECCS	Power	Carbon sequestration: biomass (power)	Mt
CO2 removals_DACS_Non-sector	DACS	Non-sector	Carbon sequestration: direct air capture	Mt

Source: Vivid Economics

3.4 Demand

Table 13 Energy - Demand

Variable ID	Sub variable class	Sector	Definition	Units
Demand_Aviation_Transport	Aviation	Transport	Aviation revenue tonne km	RTK (billion)

Source: Vivid Economics

3.5 Electricity generation

Table 14 Energy - Electricity generation

Variable ID	Sub variable class	Sector	Definition	Units
Electricity generation_Biomass CCS_Power	Biomass CCS	Power	Electricity generation by technology	TWh
Electricity generation_Biomass_Power	Biomass	Power	Electricity generation by technology	TWh
Electricity generation_Coal CCS_Power	Coal CCS	Power	Electricity generation by technology	TWh
Electricity generation_Coal_Power	Coal	Power	Electricity generation by technology	TWh
Electricity generation_Hydro_Power	Hydro	Power	Electricity generation by technology	TWh
Electricity generation_Hydrogen_Power	Hydrogen	Power	Electricity generation by technology	TWh
Electricity generation_Natural gas CCS_Power	Natural gas CCS	Power	Electricity generation by technology	TWh
Electricity generation_Natural gas_Power	Natural gas	Power	Electricity generation by technology	TWh
Electricity generation_Nuclear_Power	Nuclear	Power	Electricity generation by technology	TWh
Electricity generation_Offshore wind_Power	Offshore wind	Power	Electricity generation by technology	TWh
Electricity generation_Oil_Power	Oil	Power	Electricity generation by technology	TWh

Variable ID	Sub variable class	Sector	Definition	Units
Electricity generation_Onshore wind_Power	Onshore wind	Power	Electricity generation by technology	TWh
Electricity generation_Solar_Power	Solar	Power	Electricity generation by technology	TWh

Source: Vivid Economics

3.6 GHG Emissions

Table 15 Energy - GHG Emissions

Variable ID	Sub variable class	Sector	Definition	Units
GHG emissions_CO2_Buildings	CO2	Buildings	CO2 emissions in buildings	Mt
GHG emissions_CO2_Industry_Chemicals	CO2	Industry	CO2 emissions in industry (iron and steel)	Mt
GHG emissions_CO2_Industry_Iron and steel	CO2	Industry	CO2 emissions in industry (non-metallic minerals)	Mt
GHG emissions_CO2_Industry_Non-metallic minerals	CO2	Industry	CO2 emissions in industry (chemicals)	Mt
GHG emissions_CO2_Industry_Other industry	CO2	Industry	CO2 emissions in industry (other industry)	Mt
GHG emissions_CO2_Other	CO2	Other	CO2 emissions in other sectors	Mt
GHG emissions_CO2_Power	CO2	Power	CO2 emissions in power	Mt
GHG emissions_CO2_Total	CO2	Total	CO2 emissions (total)	Mt
GHG emissions_CO2_Transport	CO2	Transport	CO2 emissions in transport	Mt
GHG emissions_CO2_Transport_Cars	CO2	Transport	CO2 emissions in transport (Cars)	Mt
GHG emissions_CO2_Transport_Trucks	CO2	Transport	CO2 emissions in transport (Trucks)	Mt

Variable ID	Sub variable class	Sector	Definition	Units
GHG emissions_CO2_Transport_Aviation	CO2	Transport	CO2 emissions in transport (Aviation)	Mt
GHG emissions_CO2_Transport_Shipping	CO2	Transport	CO2 emissions in transport (Shipping)	Mt
GHG emissions_CO2_Transport_Other transport	CO2	Transport	CO2 emissions in transport (Transport Other)	Mt

Source: Vivid Economics

3.7 New deployment

Table 16 Energy - New deployment

Variable ID	Sub variable class	Sector	Definition	Units
New deployment_Battery capacity_Total	Battery capacity	Total	Total battery capacity	GWh
New deployment_Electricity generation_Biomass CCS_Power	Electricity generation	Power	New electricity generation capacity by technology for grid electricity	GW
New deployment_Electricity generation_Biomass_Power	Electricity generation	Power	New electricity generation capacity by technology for grid electricity	GW
New deployment_Electricity generation_Coal CCS_Power	Electricity generation	Power	New electricity generation capacity by technology for grid electricity	GW
New deployment_Electricity generation_Coal_Power	Electricity generation	Power	New electricity generation capacity by technology for grid electricity	GW
New deployment_Electricity generation_Hydro_Power	Electricity generation	Power	New electricity generation capacity by technology for grid electricity	GW
New deployment_Electricity generation_Hydrogen_Power	Electricity generation	Power	New electricity generation capacity by technology for grid electricity	GW
New deployment_Electricity generation_Natural gas CCS_Power	Electricity generation	Power	New electricity generation capacity by technology for grid electricity	GW
New deployment_Electricity generation_Natural gas_Power	Electricity generation	Power	New electricity generation capacity by technology for grid electricity	GW
New deployment_Electricity generation_Nuclear_Power	Electricity generation	Power	New electricity generation capacity by technology for grid electricity	GW

Variable ID	Sub variable class	Sector	Definition	Units
New deployment_Electricity generation_Offshore wind_Hydrogen	Electricity generation	Hydrogen	New electricity generation capacity by technology for hydrogen production	GW
New deployment_Electricity generation_Offshore wind_Power	Electricity generation	Power	New electricity generation capacity by technology for grid electricity	GW
New deployment_Electricity generation_Oil_Power	Electricity generation	Power	New electricity generation capacity by technology for grid electricity	GW
New deployment_Electricity generation_Onshore wind_Hydrogen	Electricity generation	Hydrogen	New electricity generation capacity by technology for hydrogen production	GW
New deployment_Electricity generation_Onshore wind_Power	Electricity generation	Power	New electricity generation capacity by technology for grid electricity	GW
New deployment_Electricity generation_Solar_Hydrogen	Electricity generation	Hydrogen	New electricity generation capacity by technology for hydrogen production	GW
New deployment_Electricity generation_Solar_Power	Electricity generation	Power	New electricity generation capacity by technology for grid electricity	GW
New deployment_Heating systems_Biomass_Buildings_Commercial	Heating systems	Buildings	New capacity additions: space/water heating systems by technology (commercial)	% mix
New deployment_Heating systems_Biomass_Buildings_Residential	Heating systems	Buildings	New capacity additions: space/water heating systems by technology (commercial)	# units
New deployment_Heating systems_Coal_Buildings_Commercial	Heating systems	Buildings	New capacity additions: space/water heating systems by technology (commercial)	% mix

Variable ID	Sub variable class	Sector	Definition	Units
New deployment_Heating systems_Coal_Buildings_Residential	Heating systems	Buildings	New capacity additions: space/water heating systems by technology (commercial)	# units
New deployment_Heating systems_District heat_Buildings_Commercial	Heating systems	Buildings	New capacity additions: space/water heating systems by technology (commercial)	% mix
New deployment_Heating systems_District heat_Buildings_Residential	Heating systems	Buildings	New capacity additions: space/water heating systems by technology (commercial)	# units
New deployment_Heating systems_Heat pump_Buildings_Commercial	Heating systems	Buildings	New capacity additions: space/water heating systems by technology (commercial)	% mix
New deployment_Heating systems_Heat pump_Buildings_Residential	Heating systems	Buildings	New capacity additions: space/water heating systems by technology (commercial)	# units
New deployment_Heating systems_Hydrogen_Buildings_Commercial	Heating systems	Buildings	New capacity additions: space/water heating systems by technology (commercial)	% mix
New deployment_Heating systems_Hydrogen_Buildings_Residential	Heating systems	Buildings	New capacity additions: space/water heating systems by technology (commercial)	# units
New deployment_Heating systems_Natural gas_Buildings_Commercial	Heating systems	Buildings	New capacity additions: space/water heating systems by technology (commercial)	% mix
New deployment_Heating systems_Natural gas_Buildings_Residential	Heating systems	Buildings	New capacity additions: space/water heating systems by technology (commercial)	# units

Variable ID	Sub variable class	Sector	Definition	Units
New deployment_Heating systems_Oil_Buildings_Commercial	Heating systems	Buildings	New capacity additions: space/water heating systems by technology (commercial)	% mix
New deployment_Heating systems_Oil_Buildings_Residential	Heating systems	Buildings	New capacity additions: space/water heating systems by technology (commercial)	# units
New deployment_Heating systems_Resistive_Buildings_Commercial	Heating systems	Buildings	New capacity additions: space/water heating systems by technology (commercial)	% mix
New deployment_Heating systems_Resistive_Buildings_Residential	Heating systems	Buildings	New capacity additions: space/water heating systems by technology (commercial)	# units
New deployment_Vehicles_BEV_Transport_Cars	Vehicles	Transport	New vehicle sales by technology (cars)	Vehicles (thousands)
New deployment_Vehicles_BEV_Transport_Trucks	Vehicles	Transport	New vehicle sales by technology (trucks)	Vehicles (thousands)
New deployment_Vehicles_BEV_Transport_Vans	Vehicles	Transport	New vehicle sales by technology (vans)	Vehicles (thousands)
New deployment_Vehicles_H2_Transport_Cars	Vehicles	Transport	New vehicle sales by technology (cars)	Vehicles (thousands)
New deployment_Vehicles_H2_Transport_Trucks	Vehicles	Transport	New vehicle sales by technology (trucks)	Vehicles (thousands)

Variable ID	Sub variable class	Sector	Definition	Units
New deployment_Vehicles_H2_Transport_Vans	Vehicles	Transport	New vehicle sales by technology (vans)	Vehicles (thousands)
New deployment_Vehicles_ICE_Transport_Cars	Vehicles	Transport	New vehicle sales by technology (cars)	Vehicles (thousands)
New deployment_Vehicles_ICE_Transport_Trucks	Vehicles	Transport	New vehicle sales by technology (trucks)	Vehicles (thousands)
New deployment_Vehicles_ICE_Transport_Vans	Vehicles	Transport	New vehicle sales by technology (vans)	Vehicles (thousands)

Source: Vivid Economics

3.8 Population

Table 17 Energy - Population

Variable ID	Sub variable class	Sector	Definition	Units
Population_Total	N/A	Total	Population	Million

Source: Vivid Economics

3.9 Price

Table 18 Energy - Price

Variable ID	Sub variable class	Sector	Definition	Units
Price_Aluminium_Other	Aluminium	Other	Change in commodity price	Index
Price_Cobalt_Other	Cobalt	Other	Change in commodity price	Index
Price_Copper_Other	Copper	Other	Change in commodity price	Index
Price_Lithium_Other	Lithium	Other	Change in commodity price	Index
Price_Natural gas_Other	Natural gas	Other	Change in commodity price	Index
Price_Nickel_Other	Nickel	Other	Change in commodity price	Index
Price_Oil_Other	Oil	Other	Change in commodity price	Index

Note: Prices of key minerals (aluminium, cobalt, copper, lithium, nickel) reflect assume no major structural changes in the cost of supply, such as costs involved in new production methods (e.g. subsea extraction) environmental permitting. Prices reflect current evidence on costs; there is a high degree of uncertainty in long-run costs for immature markets such as lithium

Source: Vivid Economics

3.10 Primary energy demand

Table 19 Energy - Primary energy demand

Variable ID	Sub variable class	Sector	Definition	Units
Primary energy demand_Biomass_Non-sector	Biomass	Non-sector	Total primary energy demand by fuel	PJ
Primary energy demand_Coal (thermal)_Non-sector	Coal	Non-sector	Total primary energy demand by fuel	PJ
Primary energy demand_Natural gas_Non-sector	Natural gas	Non-sector	Total primary energy demand by fuel	PJ
Primary energy demand_Oil_Non-sector	Oil	Non-sector	Total primary energy demand by fuel	PJ

Source: Vivid Economics

3.11 Production

Table 20 Energy - Production

Variable ID	Sub variable class	Sector	Definition	Units
Production_Aggregates_Cement_Industry	Aggregates	Industry	Commodity production	Mt
Production_Aluminium_Industry	Aluminium	Industry	Commodity production	KT
Production_Cement_Biomass CCS_Industry	Cement	Industry	Commodity production	Mt
Production_Cement_Biomass_Industry	Cement	Industry	Commodity production	Mt
Production_Cement_Coal CCS_Industry	Cement	Industry	Commodity production	Mt
Production_Cement_Coal_Industry	Cement	Industry	Commodity production	Mt
Production_Cement_Natural gas CCS_Industry	Cement	Industry	Commodity production	Mt
Production_Cement_Natural gas_Industry	Cement	Industry	Commodity production	Mt
Production_Cement_Oil_Industry	Cement	Industry	Commodity production	Mt
Production_Chemicals_Plastics_Industry	Chemicals	Industry	Commodity production	Mt
Production_Cobalt_Industry	Cobalt	Industry	Commodity production	Kt
Production_Copper_Industry	Copper	Industry	Commodity production	Kt

Variable ID	Sub variable class	Sector	Definition	Units
Production_Hydrogen_Blue_Hydrogen	Hydrogen	Hydrogen	Hydrogen production by technology	Mt
Production_Hydrogen_Green_Hydrogen	Hydrogen	Hydrogen	Hydrogen production by technology	Mt
Production_Hydrogen_Unabated_Hydrogen	Hydrogen	Hydrogen	Hydrogen production by technology	Mt
Production_Lithium_Industry	Lithium	Industry	Commodity production	Kt
Production_Nickel_Industry	Nickel	Industry	Commodity production	Kt
Production_Steel_BFBOF with CCS_Industry	Steel	Industry	Commodity production	Mt
Production_Steel_Conventional coal (BF-BOF)_Industry	Steel	Industry	Commodity production	Mt
Production_Steel_Gas DRI_Industry	Steel	Industry	Commodity production	Mt
Production_Steel_Hydrogen DRI_Industry	Steel	Industry	Commodity production	Mt
Production_Steel_Industry	Steel	Industry	Commodity production	Mt
Production_Steel_Scrap with EAF_Industry	Steel	Industry	Commodity production	Mt

Source: Vivid Economics

3.12 Sector energy demand

Table 21 Energy - Sector energy demand variables

Variable ID	Sub variable class	Sector	Definition	Units
Sector energy demand_Biomass_Buildings	Biomass	Buildings	Energy demand by sector and fuel	PJ
Sector energy demand_Biomass_Industry	Biomass	Industry	Energy demand by sector and fuel	PJ
Sector energy demand_Biomass_Other	Biomass	Other	Energy demand by sector and fuel	PJ
Sector energy demand_Biomass_Power	Biomass	Power	Energy demand by sector and fuel	PJ
Sector energy demand_Biomass_Transport	Biomass	Transport	Energy demand by sector and fuel	PJ
Sector energy demand_Coal (metallurgical)_Industry	Coal (metallurgical)	Industry	Energy demand by sector and fuel	PJ
Sector energy demand_Coal (thermal)_Buildings	Coal	Buildings	Energy demand by sector and fuel	PJ
Sector energy demand_Coal (thermal)_Industry	Coal	Industry	Energy demand by sector and fuel	PJ

Variable ID	Sub variable class	Sector	Definition	Units
Sector energy demand_Coal (thermal)_Non-energy use	Coal	Non-energy use	Energy demand by sector and fuel	PJ
Sector energy demand_Coal (thermal)_Other	Coal	Other	Energy demand by sector and fuel	PJ
Sector energy demand_Coal (thermal)_Power	Coal	Power	Energy demand by sector and fuel	PJ
Sector energy demand_Electricity_Buildings	Electricity	Buildings	Energy demand by sector and fuel	PJ
Sector energy demand_Electricity_Industry	Electricity	Industry	Energy demand by sector and fuel	PJ
Sector energy demand_Electricity_Other	Electricity	Other	Energy demand by sector and fuel	PJ
Sector energy demand_Electricity_Power	Electricity	Power	Energy demand by sector and fuel	PJ
Sector energy demand_Electricity_Transport	Electricity	Transport	Energy demand by sector and fuel	PJ
Sector energy demand_Hydrogen_Buildings	Hydrogen	Buildings	Energy demand by sector and fuel	PJ

Variable ID	Sub variable class	Sector	Definition	Units
Sector energy demand_Hydrogen_Industry	Hydrogen	Industry	Energy demand by sector and fuel	PJ
Sector energy demand_Hydrogen_Other	Hydrogen	Other	Energy demand by sector and fuel	PJ
Sector energy demand_Hydrogen_Power	Hydrogen	Power	Energy demand by sector and fuel	PJ
Sector energy demand_Hydrogen_Transport	Hydrogen	Transport	Energy demand by sector and fuel	PJ
Sector energy demand_Natural gas_Buildings	Natural gas	Buildings	Energy demand by sector and fuel	PJ
Sector energy demand_Natural gas_Industry	Natural gas	Industry	Energy demand by sector and fuel	PJ
Sector energy demand_Natural gas_Non-energy use	Natural gas	Non-energy use	Energy demand by sector and fuel	PJ
Sector energy demand_Natural gas_Other	Natural gas	Other	Energy demand by sector and fuel	PJ
Sector energy demand_Natural gas_Power	Natural gas	Power	Energy demand by sector and fuel	PJ

Variable ID	Sub variable class	Sector	Definition	Units
Sector energy demand_Natural gas_Transport	Natural gas	Transport	Energy demand by sector and fuel	PJ
Sector energy demand_Oil_Buildings	Oil	Buildings	Energy demand by sector and fuel	PJ
Sector energy demand_Oil_Industry	Oil	Industry	Energy demand by sector and fuel	PJ
Sector energy demand_Oil_Non-energy use	Oil	Non-energy use	Energy demand by sector and fuel	PJ
Sector energy demand_Oil_Other	Oil	Other	Energy demand by sector and fuel	PJ
Sector energy demand_Oil_Power	Oil	Power	Energy demand by sector and fuel	PJ
Sector energy demand_Oil_Transport	Oil	Transport	Energy demand by sector and fuel	PJ

Source: Vivid Economics