



# Net-Zero America Data Guide

2021-04-21

These data underlie graphs and tables presented in the Princeton Net-Zero America study:

E. Larson, C. Greig, J. Jenkins, E. Mayfield, A. Pascale, C. Zhang, J. Drossman, R. Williams, S. Pacala, R. Socolow, EJ Baik, R. Birdsey, R. Duke, R. Jones, B. Haley, E. Leslie, K. Paustian, and A. Swan, Net-Zero America: Potential Pathways, Infrastructure, and Impacts, interim report, Princeton University, Princeton, NJ, December 15, 2020. Report available at <https://netzeroamerica.princeton.edu>.

## Notes

- The eight first-level category filters in the data explorer (Pillar 1, Pillar 2, etc.) correspond to the main sections of the Net-Zero America report.
- The Net-Zero America study describes five pathways to reach net-zero emissions and one “no new policies” reference scenario. For some scenarios, the study generated national, but not state-level results.
- All 2020 values in the data explorer are model-produced values, not historical 2020 data.
- Some values in the data explorer are not modeled values, but rather they represent potentials or are limits that apply across all scenarios (e.g., maximum potential carbon storage potential in agricultural soils).
- The *Download this table as a csv* button downloads data as follows:
  - If no category filters are selected, the entire dataset for the selected year or pathway will be downloaded.
  - If one or more category filters are selected, all data for those categories (with all child subcategories) for the selected year or pathway will be downloaded.
  - If one or more subcategory filters are selected, only data for those subcategories for the selected year or pathway will be downloaded.
- PDF fact sheets that are downloaded using the *Download the fact sheet for “X” (state or nation)* button include a curated subset of all of the data available for region X in the online data explorer.

## Data by category and subcategory

1	MACRO RESULTS - Primary energy . . . . .	3
2	MACRO RESULTS - CO2 emissions . . . . .	3
3	MACRO RESULTS - System costs . . . . .	3
4	MACRO RESULTS - Marginal prices . . . . .	4
5	MACRO RESULTS - Liquid fuels . . . . .	4
6	MACRO RESULTS - Pipeline gas . . . . .	4
7	MACRO RESULTS - Hydrogen . . . . .	4
8	MACRO RESULTS - Industrial feedstocks . . . . .	4
9	PILLAR 1: Efficiency/Electrification - Overview . . . . .	4
10	PILLAR 1: Efficiency/Electrification - Electricity demand . . . . .	5
11	PILLAR 1: Efficiency/Electrification - Transportation . . . . .	5
12	PILLAR 1: Efficiency/Electrification - Residential . . . . .	7
13	PILLAR 1: Efficiency/Electrification - Commercial . . . . .	8
14	PILLAR 1: Efficiency/Electrification - Industrial . . . . .	9
15	PILLAR 2: Clean Electricity - Generating capacity . . . . .	10
16	PILLAR 2: Clean Electricity - Generation . . . . .	11
17	PILLAR 2: Clean Electricity - Capacity factors . . . . .	11
18	PILLAR 2: Clean Electricity - Transmission . . . . .	12
19	PILLAR 2: Clean Electricity - Land use . . . . .	12
20	PILLAR 3: Clean fuels - Bioenergy . . . . .	12
21	PILLAR 3: Clean fuels - Hydrogen . . . . .	14
22	PILLAR 4: CCUS - CO2 capture . . . . .	14
23	PILLAR 4: CCUS - CO2 use . . . . .	15
24	PILLAR 4: CCUS - CO2 pipelines . . . . .	15
25	PILLAR 4: CCUS - CO2 storage . . . . .	15
26	PILLAR 5: Non-CO2 emissions - Assumed non-CO2 emissions . . . . .	15
27	PILLAR 6: Land sinks - Forests - REF only . . . . .	15
28	PILLAR 6: Land sinks - Forests . . . . .	15
29	PILLAR 6: Land sinks - Agriculture . . . . .	17
30	PILLAR 6: Land sinks - Total assumed land sink . . . . .	17
31	IMPACTS - Health . . . . .	17
32	IMPACTS - Jobs . . . . .	17
33	IMPACTS - Capital Investments . . . . .	22
34	IMPACTS - Fossil fuel industries . . . . .	24
35	IMPACTS - Land use . . . . .	24
36	IMPACTS - Pipes and Wires . . . . .	25

### *MACRO RESULTS - Primary energy*

---

Biomass (EJ)  
Coal and Coke (EJ)  
Geothermal (EJ)  
Hydro (EJ)  
Natural Gas (EJ)  
Oil (EJ)  
Solar (EJ)  
Uranium (EJ)  
Wind (EJ)

---

### *MACRO RESULTS - CO2 emissions*

---

Coal (Gt CO2)  
Coke (Gt CO2)  
Diesel (Gt CO2)  
Gasoline (Gt CO2)  
Jet fuel (Gt CO2)  
LPG (Gt CO2)  
Natural gas (Gt CO2)  
Residual petroleum (Gt CO2)  
Industrial co2 (Gt CO2)  
Geologic sequestration (Gt CO2)  
Product co2 (Gt CO2)  
Net (Gt CO2)  
Product CO2 netted out - Coal (Gt CO2)  
Product CO2 netted out - Coke (Gt CO2)  
Product CO2 netted out - Diesel (Gt CO2)  
Product CO2 netted out - Gasoline (Gt CO2)  
Product CO2 netted out - Jet fuel (Gt CO2)  
Product CO2 netted out - LPG (Gt CO2)  
Product CO2 netted out - Natural gas (Gt CO2)  
Product CO2 netted out - Residual petroleum (Gt CO2)  
Product CO2 netted out - Industrial co2 (Gt CO2)  
Product CO2 netted out - Geologic sequestration (Gt CO2)  
Product CO2 netted out - Net (Gt CO2)

---

### *MACRO RESULTS - System costs*

---

Total - Annualized (trillion \$2018)  
Capital+O&M - Amortized payments - Incremental end-use investments (\$2018)  
Capital+O&M - Amortized payments - Renewable power plants (\$2018)  
Capital+O&M - Amortized payments - Nuclear plants (\$2018)  
Capital+O&M - Amortized payments - Grid batteries (\$2018)  
Capital+O&M - Amortized payments - Other, including NG-CCS power (\$2018)  
Capital+O&M - Amortized payments - Electricity T&D (\$2018)  
Capital+O&M - Amortized payments - Bioconversion plants (\$2018)  
Capital+O&M - Amortized payments - H2 from nat gas & electricity, synfuels (\$2018)  
Capital+O&M - Amortized payments - CO2 tpt/store and direct air capt (\$2018)  
Capital+O&M - Amortized payments - Natural gas infrastructure (\$2018)  
Capital+O&M - Amortized payments - Oil product delivery (\$2018)  
Total - % of GDP (%)

Total - NPV of all costs, 2020-2050 (billion \$2018)  
Capital - Cumulative from 2021 - Demand-side (billion \$2018)  
Capital - Cumulative from 2021 - Supply-side (billion \$2018)  
Capital - Cumulative from 2021 - Total (billion \$2018)

---

#### *MACRO RESULTS - Marginal prices*

CO2 emissions (\$2016/tCO2)  
Diesel blend (\$2016/Mbtu)  
Pipeline gas blend (\$2016/Mbtu)  
Hydrogen (\$2016/Mbtu)  
Steam (\$2016/Mbtu)

---

#### *MACRO RESULTS - Liquid fuels*

By source - Biomass (PJ)  
By source - Fossil (PJ)  
By source - Synthetic (PJ)

---

#### *MACRO RESULTS - Pipeline gas*

By source - Biomass (PJ)  
By source - Fossil (PJ)  
By source - Synthetic (PJ)  
By source - Electricity (PJ)

---

#### *MACRO RESULTS - Hydrogen*

By source - Biomass (PJ)  
By source - Fossil (PJ)  
By source - Electricity (PJ)

---

#### *MACRO RESULTS - Industrial feedstocks*

By source - Biomass (PJ)  
By source - Fossil (PJ)  
By source - Synthetic (PJ)  
By source - Electricity (PJ)

---

#### *PILLAR 1: Efficiency/Electrification - Overview*

Final energy use - Residential (PJ)  
Final energy use - Commercial (PJ)  
Final energy use - Transportation (PJ)  
Final energy use - Industry (PJ)  
Final energy use - Electricity (PJ)  
Final energy use - Hydrogen (PJ)  
Final energy use - Steam (PJ)  
Final energy use - Pipeline gas (PJ)  
Final energy use - Pipeline gas feedstock (PJ)

Final energy use - Gasoline (PJ)  
Final energy use - Distillate oil (PJ)  
Final energy use - Jet fuel (PJ)  
Final energy use - Lpg (PJ)  
Final energy use - Lpg feedstock (PJ)  
Final energy use - Other petroleum (PJ)  
Final energy use - Petrochemical feedstock (PJ)  
Final energy use - Biomass & waste (PJ)  
Final energy use - Coal & coking coal (PJ)

---

#### *PILLAR 1: Efficiency/Electrification - Electricity demand*

---

Bulk demand (GWh)  
Direct air capture (GWh)  
Electric boiler (GWh)  
Electrolysis (GWh)  
Flexible electric boiler capacity (GW)  
Peak electricity distribution load (excl big flex loads) (MW)  
Electricity distribution capital invested - Cumulative 5-yr (billion \$2018)

---

#### *PILLAR 1: Efficiency/Electrification - Transportation*

---

Final energy use - Electricity (PJ)  
Final energy use - Hydrogen (PJ)  
Final energy use - Gasoline fuel (PJ)  
Final energy use - Diesel fuel (PJ)  
Final energy use - Jet fuel (PJ)  
Final energy use - Lpg (PJ)  
Final energy use - Other petroleum (PJ)  
Final energy use - Pipeline gas (PJ)  
Final energy use - Light-duty cars (PJ)  
Final energy use - Light-duty trucks (PJ)  
Final energy use - Medium-duty trucks (PJ)  
Final energy use - Heavy-duty trucks (PJ)  
Final energy use - Aviation (PJ)  
Final energy use - Freight rail (PJ)  
Final energy use - International shipping (PJ)  
Final energy use - Military use (PJ)  
Final energy use - Other (PJ)  
Vehicle stocks - Light-duty - EV (1000 units)  
Vehicle stocks - Light-duty - gasoline (1000 units)  
Vehicle stocks - Light-duty - hybrid (1000 units)  
Vehicle stocks - Light-duty - diesel (1000 units)  
Vehicle stocks - Light-duty - hydrogen (1000 units)  
Vehicle stocks - Light-duty - other (1000 units)  
Vehicle stocks - Medium-duty - EV (1000 units)  
Vehicle stocks - Medium-duty - gasoline (1000 units)  
Vehicle stocks - Medium-duty - hybrid (1000 units)  
Vehicle stocks - Medium-duty - diesel (1000 units)  
Vehicle stocks - Medium-duty - hydrogen (1000 units)  
Vehicle stocks - Medium-duty - other (1000 units)  
Vehicle stocks - Heavy-duty - EV (1000 units)

Vehicle stocks - Heavy-duty - gasoline (1000 units)  
 Vehicle stocks - Heavy-duty - hybrid (1000 units)  
 Vehicle stocks - Heavy-duty - diesel (1000 units)  
 Vehicle stocks - Heavy-duty - hydrogen (1000 units)  
 Vehicle stocks - Heavy-duty - other (1000 units)  
 Vehicle stocks - Light-duty - EV (%)  
 Vehicle stocks - Light-duty - gasoline (%)  
 Vehicle stocks - Light-duty - hybrid (%)  
 Vehicle stocks - Light-duty - diesel (%)  
 Vehicle stocks - Light-duty - hydrogen (%)  
 Vehicle stocks - Light-duty - other (%)  
 Vehicle stocks - Medium-duty - EV (%)  
 Vehicle stocks - Medium-duty - gasoline (%)  
 Vehicle stocks - Medium-duty - hybrid (%)  
 Vehicle stocks - Medium-duty - diesel (%)  
 Vehicle stocks - Medium-duty - hydrogen (%)  
 Vehicle stocks - Medium-duty - other (%)  
 Vehicle stocks - Heavy-duty - EV (%)  
 Vehicle stocks - Heavy-duty - gasoline (%)  
 Vehicle stocks - Heavy-duty - hybrid (%)  
 Vehicle stocks - Heavy-duty - diesel (%)  
 Vehicle stocks - Heavy-duty - hydrogen (%)  
 Vehicle stocks - Heavy-duty - other (%)  
 Vehicle sales - Light-duty - EV (1000 units)  
 Vehicle sales - Light-duty - gasoline (1000 units)  
 Vehicle sales - Light-duty - hybrid (1000 units)  
 Vehicle sales - Light-duty - diesel (1000 units)  
 Vehicle sales - Light-duty - hydrogen FC (1000 units)  
 Vehicle sales - Light-duty - other (1000 units)  
 Vehicle sales - Medium-duty - EV (1000 units)  
 Vehicle sales - Medium-duty - gasoline (1000 units)  
 Vehicle sales - Medium-duty - hybrid (1000 units)  
 Vehicle sales - Medium-duty - diesel (1000 units)  
 Vehicle sales - Medium-duty - hydrogen FC (1000 units)  
 Vehicle sales - Medium-duty - other (1000 units)  
 Vehicle sales - Heavy-duty - diesel (1000 units)  
 Vehicle sales - Heavy-duty - EV (1000 units)  
 Vehicle sales - Heavy-duty - gasoline (1000 units)  
 Vehicle sales - Heavy-duty - hybrid (1000 units)  
 Vehicle sales - Heavy-duty - hydrogen FC (1000 units)  
 Vehicle sales - Heavy-duty - other (1000 units)  
 Vehicle sales - Light-duty - EV (units)  
 Vehicle sales - Light-duty - gasoline (units)  
 Vehicle sales - Light-duty - hybrid (units)  
 Vehicle sales - Light-duty - diesel (units)  
 Vehicle sales - Light-duty - hydrogen FC (units)  
 Vehicle sales - Light-duty - other (units)  
 Vehicle sales - Medium-duty - EV (units)  
 Vehicle sales - Medium-duty - gasoline (units)  
 Vehicle sales - Medium-duty - hybrid (units)  
 Vehicle sales - Medium-duty - diesel (units)  
 Vehicle sales - Medium-duty - hydrogen FC (units)  
 Vehicle sales - Medium-duty - other (units)

Vehicle sales - Heavy-duty - diesel (units)  
 Vehicle sales - Heavy-duty - EV (units)  
 Vehicle sales - Heavy-duty - gasoline (units)  
 Vehicle sales - Heavy-duty - hybrid (units)  
 Vehicle sales - Heavy-duty - hydrogen FC (units)  
 Vehicle sales - Heavy-duty - other (units)  
 Vehicle sales - Light-duty - EV (%)  
 Vehicle sales - Light-duty - gasoline (%)  
 Vehicle sales - Light-duty - hybrid (%)  
 Vehicle sales - Light-duty - diesel (%)  
 Vehicle sales - Light-duty - hydrogen FC (%)  
 Vehicle sales - Light-duty - other (%)  
 Vehicle sales - Medium-duty - EV (%)  
 Vehicle sales - Medium-duty - gasoline (%)  
 Vehicle sales - Medium-duty - hybrid (%)  
 Vehicle sales - Medium-duty - diesel (%)  
 Vehicle sales - Medium-duty - hydrogen FC (%)  
 Vehicle sales - Medium-duty - other (%)  
 Vehicle sales - Heavy-duty - diesel (%)  
 Vehicle sales - Heavy-duty - EV (%)  
 Vehicle sales - Heavy-duty - gasoline (%)  
 Vehicle sales - Heavy-duty - hybrid (%)  
 Vehicle sales - Heavy-duty - hydrogen FC (%)  
 Vehicle sales - Heavy-duty - other (%)  
 Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)  
 Public EV charging plugs - DC Fast (1000 units)  
 Public EV charging plugs - L2 (1000 units)  
 Public EV charging plugs capital - DC Fast (billion \$2014)  
 Public EV charging plugs capital - L2 (billion \$2014)

---

#### *PILLAR 1: Efficiency/Electrification - Residential*

---

Final energy use - Electricity (TJ)  
 Final energy use - Pipeline gas (TJ)  
 Final energy use - Lpg (TJ)  
 Final energy use - Gasoline fuel (TJ)  
 Final energy use - Diesel fuel (TJ)  
 Final energy use - Other petroleum (TJ)  
 Final energy use - Biomass & waste (TJ)  
 Final energy use - Solar (TJ)  
 Final energy use - Space conditioning (TJ)  
 Final energy use - Water heating (TJ)  
 Final energy use - Lights (TJ)  
 Final energy use - Cooking (TJ)  
 Final energy use - Other (TJ)  
 Sales of space heating - Electric Heat Pump (units)  
 Sales of space heating - Electric Resistance (units)  
 Sales of space heating - Gas Furnace (units)  
 Sales of space heating - Fossil (units)  
 Sales of water heating - Electric Heat Pump (units)  
 Sales of water heating - Electric Resistance (units)  
 Sales of water heating - Gas Furnace (units)  
 Sales of water heating - Other (units)

Sales of cooking - Electric Resistance (units)  
 Sales of cooking - Gas (units)  
 Sales of space heating units - Electric Heat Pump (%)  
 Sales of space heating units - Electric Resistance (%)  
 Sales of space heating units - Gas (%)  
 Sales of space heating units - Fossil (%)  
 Sales of water heating units - Electric Heat Pump (%)  
 Sales of water heating units - Electric Resistance (%)  
 Sales of water heating units - Gas Furnace (%)  
 Sales of water heating units - Other (%)  
 Sales of cooking units - Electric Resistance (%)  
 Sales of cooking units - Gas (%)  
 Stock of space heating - Electric Heat Pump (1000 units)  
 Stock of space heating - Electric Resistance (1000 units)  
 Stock of space heating - Gas Furnace (1000 units)  
 Stock of space heating - Fossil (1000 units)  
 Stock of water heating - Electric Heat Pump (1000 units)  
 Stock of water heating - Electric Resistance (1000 units)  
 Stock of water heating - Gas Furnace (1000 units)  
 Stock of water heating - Other (1000 units)  
 Stocks of cooking - Electric Resistance (1000 units)  
 Stocks of cooking - Gas (1000 units)  
 Stock of space heating units - Electric Heat Pump (%)  
 Stock of space heating units - Electric Resistance (%)  
 Stock of space heating units - Gas Furnace (%)  
 Stock of space heating units - Fossil (%)  
 Stock of water heating units - Electric Heat Pump (%)  
 Stock of water heating units - Electric Resistance (%)  
 Stock of water heating units - Gas Furnace (%)  
 Stock of water heating units - Other (%)  
 Stocks of cooking units - Electric Resistance (%)  
 Stocks of cooking units - Gas Furnace (%)  
 Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)

---

#### *PILLAR 1: Efficiency/Electrification - Commercial*

---

Final energy use - Electricity (TJ)  
 Final energy use - Pipeline gas (TJ)  
 Final energy use - Steam (TJ)  
 Final energy use - Lpg (TJ)  
 Final energy use - Gasoline fuel (TJ)  
 Final energy use - Diesel fuel (TJ)  
 Final energy use - Other petroleum (TJ)  
 Final energy use - Space conditioning (TJ)  
 Final energy use - Water heating (TJ)  
 Final energy use - Lights (TJ)  
 Final energy use - Cooking (TJ)  
 Final energy use - Other (TJ)  
 Stock of space heating units - Electric Heat Pump (TJ)  
 Stock of space heating units - Electric Resistance (TJ)  
 Stock of space heating units - Gas Furnace (TJ)  
 Stock of space heating units - Fossil (TJ)  
 Stock of water heating units - Electric Heat Pump (TJ)



Stock of water heating units - Electric Resistance (TJ)  
 Stock of water heating units - Gas Furnace (TJ)  
 Stock of water heating units - Other (TJ)  
 Stock of cooking units - Electric Resistance (TJ)  
 Stock of cooking units - Gas (TJ)  
 Stock of space heating units - Electric Heat Pump (%)  
 Stock of space heating units - Electric Resistance (%)  
 Stock of space heating units - Gas Furnace (%)  
 Stock of space heating units - Fossil (%)  
 Stock of water heating units - Electric Heat Pump (%)  
 Stock of water heating units - Electric Resistance (%)  
 Stock of water heating units - Gas Furnace (%)  
 Stock of water heating units - Other (%)  
 Stock of cooking units - Electric Resistance (%)  
 Stock of cooking units - Gas (%)  
 Sales of space heating units - Electric Heat Pump (TJ)  
 Sales of space heating units - Electric Resistance (TJ)  
 Sales of space heating units - Gas Furnace (TJ)  
 Sales of space heating units - Fossil (TJ)  
 Sales of water heating units - Electric Heat Pump (TJ)  
 Sales of water heating units - Electric Resistance (TJ)  
 Sales of water heating units - Gas Furnace (TJ)  
 Sales of water heating units - Other (TJ)  
 Sales of cooking units - Electric Resistance (TJ)  
 Sales of cooking units - Gas (TJ)  
 Sales of space heating units - Electric Heat Pump (%)  
 Sales of space heating units - Electric Resistance (%)  
 Sales of space heating units - Gas Furnace (%)  
 Sales of space heating units - Fossil (%)  
 Sales of water heating units - Electric Heat Pump (%)  
 Sales of water heating units - Electric Resistance (%)  
 Sales of water heating units - Gas Furnace (%)  
 Sales of water heating units - Other (%)  
 Sales of cooking units - Electric Resistance (%)  
 Sales of cooking units - Gas (%)  
 Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)

---

#### *PILLAR 1: Efficiency/Electrification - Industrial*

---

Final energy use - Electricity (TJ)  
 Final energy use - Steam (TJ)  
 Final energy use - Pipeline gas (TJ)  
 Final energy use - Pipeline gas feedstock (TJ)  
 Final energy use - Hydrogen (TJ)  
 Final energy use - Gasoline (TJ)  
 Final energy use - Distillate oil (TJ)  
 Final energy use - Lpg (TJ)  
 Final energy use - Lpg feedstock (TJ)  
 Final energy use - Other petroleum (TJ)  
 Final energy use - Petrochemical feedstock (TJ)  
 Final energy use - Biomass & waste (TJ)  
 Final energy use - Coal & coking coal (TJ)  
 Final energy use by sector - Agriculture (PJ)

Final energy use by sector - Aluminum industry (PJ)  
 Final energy use by sector - Bulk chemicals (PJ)  
 Final energy use by sector - Cement & lime (PJ)  
 Final energy use by sector - Computer & electronic products (PJ)  
 Final energy use by sector - Construction (PJ)  
 Final energy use by sector - Electrical equip., appliances, & components (PJ)  
 Final energy use by sector - Fabricated metal products (PJ)  
 Final energy use by sector - Food & kindred products (PJ)  
 Final energy use by sector - Glass & glass products (PJ)  
 Final energy use by sector - Iron & steel (PJ)  
 Final energy use by sector - Machinery (PJ)  
 Final energy use by sector - Mining (PJ)  
 Final energy use by sector - Other manufacturing (PJ)  
 Final energy use by sector - Paper & allied products (PJ)  
 Final energy use by sector - Petroleum refining (PJ)  
 Final energy use by sector - Plastic & rubber products (PJ)  
 Final energy use by sector - Transportation equipment (PJ)  
 Final energy use by sector - Wood products (PJ)  
 Cement plant capacities - Total (MTPA)  
 Cement plant capacities - With carbon capture (MTPA)  
 Iron and steel production - BF/BOF raw steel (MMT)  
 Iron and steel production - COKE (MMT)  
 Iron and steel production - DRI (MMT)  
 Iron and steel production - DRI-H2 (MMT)  
 Iron and steel production - EAF raw steel (MMT)  
 Iron and steel production - Steel Mill products (MMT)

---

## *PILLAR 2: Clean Electricity - Generating capacity*

---

Installed - Onshore wind (MW)  
 Installed - Offshore wind (MW)  
 Installed - Rooftop PV (MW)  
 Installed - Utility-scale PV (MW)  
 Installed - Hydro (MW)  
 Installed - Geothermal (MW)  
 Installed - Nuclear (MW)  
 Installed - Ccgt & gas steam (MW)  
 Installed - Ccgt w cc (MW)  
 Installed - Ct (MW)  
 Installed - Biomass (MW)  
 Installed - Biomass w cc (MW)  
 Installed - Coal (MW)  
 Installed - Other (MW)  
 Installed - Grid battery storage (MW)  
 Installed grid battery storage (hours)  
 Installed - Pumped hydro storage (MW)  
 Installed renewables - Rooftop PV (MW)  
 Installed renewables - Solar - Base land use assumptions (MW)  
 Installed renewables - Wind - Base land use assumptions (MW)  
 Installed renewables - OffshoreWind - Base land use assumptions (MW)  
 Installed renewables - Solar - Constrained land use assumptions (MW)  
 Installed renewables - Wind - Constrained land use assumptions (MW)  
 Installed renewables - OffshoreWind - Constrained land use assumptions (MW)

Capital invested - Solar PV - Base (billion \$2018)  
 Capital invested - Wind - Base (billion \$2018)  
 Capital invested - Offshore Wind - Base (billion \$2018)  
 Capital invested - Solar PV - Constrained (billion \$2018)  
 Capital invested - Wind - Constrained (billion \$2018)  
 Capital invested - Offshore Wind - Constrained (billion \$2018)  
 Capital invested - Solar (billion \$2018)  
 Capital invested - Onshore Wind (billion \$2018)  
 Capital invested - Offshore Wind (billion \$2018)  
 Capital invested - Hydro (billion \$2018)  
 Capital invested - Geothermal (billion \$2018)  
 Capital invested - Nuclear (billion \$2018)  
 Capital invested - CCGT (billion \$2018)  
 Capital invested - CCGT w/ CC (billion \$2018)  
 Capital invested - CT (billion \$2018)  
 Capital invested - Biomass power plant (billion \$2018)  
 Capital invested - Biomass w/ccu allam power plant (billion \$2018)  
 Capital invested - Biomass w/ccu power plant (billion \$2018)  
 Capital invested - Biopower (billion \$2018)  
 Capital invested - Biopower w/ CC (billion \$2018)  
 Capital invested - Coal (billion \$2018)  
 Capital invested - Storage (billion \$2018)

---

#### *PILLAR 2: Clean Electricity - Generation*

---

Onshore wind (TWh)  
 Offshore wind (TWh)  
 Rooftop PV (TWh)  
 Utility-scale PV (TWh)  
 Hydro (TWh)  
 Geothermal (TWh)  
 Nuclear (TWh)  
 Gas (TWh)  
 Gas w cc (TWh)  
 Biomass (TWh)  
 Biomass w cc (TWh)  
 Coal (TWh)  
 Solar - Base land use assumptions (GWh)  
 Wind - Base land use assumptions (GWh)  
 OffshoreWind - Base land use assumptions (GWh)  
 Solar - Constrained land use assumptions (GWh)  
 Wind - Constrained land use assumptions (GWh)  
 OffshoreWind - Constrained land use assumptions (GWh)  
 Biomass power plant (GWh)  
 Biomass w/ccu power plant (GWh)  
 Biomass w/ccu allam power plant (GWh)

---

#### *PILLAR 2: Clean Electricity - Capacity factors*

---

Power generation - Solar (%)  
 Power generation - Onshore wind (%)  
 Power generation - Offshore wind (%)

Power generation - Hydro (%)  
Power generation - Geothermal (%)  
Power generation - Nuclear (%)  
Power generation - Ccgt & gas steam (%)  
Power generation - Gas w cc (%)  
Power generation - Ct (%)  
Power generation - Biomass (%)  
Power generation - Biomass w cc (%)  
Power generation - Coal (%)  
Power generation - Solar - Base land use assumptions (%)  
Power generation - Wind - Base land use assumptions (%)  
Power generation - OffshoreWind - Base land use assumptions (%)  
Power generation - Solar - Constrained land use assumptions (%)  
Power generation - Wind - Constrained land use assumptions (%)  
Power generation - OffshoreWind - Constrained land use assumptions (%)

---

#### *PILLAR 2: Clean Electricity - Transmission*

---

Total HV transmission (for wind and solar) - Base all (%)  
Total HV transmission (for wind and solar) - Constrained all (%)  
Added HV transmission vs. 2020 (for wind and solar) - Base all (GW-km)  
Added HV transmission vs. 2020 (for wind and solar) - Base other intra-state (GW-km)  
Added HV transmission vs. 2020 (for wind and solar) - Base spur intra-state (GW-km)  
Added HV transmission vs. 2020 (for wind and solar) - Constrained all (GW-km)  
Added HV transmission vs. 2020 (for wind and solar) - Constrained other intra-state (GW-km)  
Added HV transmission vs. 2020 (for wind and solar) - Constrained spur intra-state (GW-km)

---

#### *PILLAR 2: Clean Electricity - Land use*

---

Solar - Candidate Project Area - Base land use assumptions (km2)  
Solar - Used - Base land use assumptions (km2)  
Solar - Candidate Project Area - Constrained land use assumptions (km2)  
Solar - Used - Constrained land use assumptions (km2)  
Onshore wind - Candidate Project Area - Base land use assumptions (km2)  
Onshore wind - Used - Base land use assumptions (km2)  
Onshore wind - Candidate Project Area - Constrained land use assumptions (km2)  
Onshore wind - Used - Constrained land use assumptions (km2)  
Offshore wind - Candidate Project Area - Base land use assumptions (km2)  
Offshore wind - Used - Base land use assumptions (km2)  
Offshore wind - Candidate Project Area - Constrained land use assumptions (km2)  
Offshore wind - Used - Constrained land use assumptions (km2)

---

#### *PILLAR 3: Clean fuels - Bioenergy*

---

Output capacity - Biopower (GW)  
Output capacity - Biopower w/ CC (GW)  
Output capacity - BECCS-H2 (GW)  
Output capacity - FT diesel (GW)  
Output capacity - Bio-FT w/ CC (GW)  
Output capacity - Pyrolysis liquids (GW)  
Output capacity - Pyrolysis liquids w/ CC (GW)  
Output capacity - SNG (GW)

Output capacity - Bio-SNG w/cc (GW)  
 Biomass input - Biopower (1000 tonnes)  
 Biomass input - Biopower w/ cc (1000 tonnes)  
 Biomass input - BECCS-H2 (1000 tonnes)  
 Biomass input - FT diesel (1000 tonnes)  
 Biomass input - Bio-FT w/ CC (1000 tonnes)  
 Biomass input - Pyrolysis liquids (1000 tonnes)  
 Biomass input - Pyrolysis liquids w/ cc (1000 tonnes)  
 Biomass input - SNG (1000 tonnes)  
 Biomass input - Bio-SNG w/ CC (1000 tonnes)  
 Biomass input - Ethanol (1000 tonnes)  
 Conversion outputs - Biopower (GWh)  
 Conversion outputs - Biopower w/ CC (GWh)  
 Conversion outputs - BECCS-H2 (GWh)  
 Conversion outputs - FT diesel (GWh)  
 Conversion outputs - Bio-FT w/ CC (GWh)  
 Conversion outputs - Pyrolysis liquids (GWh)  
 Conversion outputs - Pyrolysis liquids w/ CC (GWh)  
 Conversion outputs - SNG (GWh)  
 Conversion outputs - Bio-SNG w/ CC (GWh)  
 Conversion outputs - Ethanol (GWh)  
 Capacity factor - Biopower (%)  
 Capacity factor - Biopower w/ CC (%)  
 Capacity factor - BECCS-H2 (%)  
 Capacity factor - FT diesel (%)  
 Capacity factor - Bio-FT w/ CC (%)  
 Capacity factor - Pyrolysis liquids (%)  
 Capacity factor - Pyrolysis liquids w/ CC (%)  
 Capacity factor - SNG (%)  
 Capacity factor - Bio-SNG w/cc (%)  
 Number of facilities - Power (quantity)  
 Number of facilities - Power ccu (quantity)  
 Number of facilities - Allam power w ccu (quantity)  
 Number of facilities - Beccs hydrogen (quantity)  
 Number of facilities - Diesel (quantity)  
 Number of facilities - Diesel ccu (quantity)  
 Number of facilities - Pyrolysis (quantity)  
 Number of facilities - Pyrolysis ccu (quantity)  
 Number of facilities - Sng (quantity)  
 Number of facilities - Sng ccu (quantity)  
 Average biomass input capacity - Power (TPA)  
 Average biomass input capacity - Power ccu (TPA)  
 Average biomass input capacity - Allam power w ccu (TPA)  
 Average biomass input capacity - Beccs hydrogen (TPA)  
 Average biomass input capacity - Diesel (TPA)  
 Average biomass input capacity - Diesel ccu (TPA)  
 Average biomass input capacity - Pyrolysis (TPA)  
 Average biomass input capacity - Pyrolysis ccu (TPA)  
 Average biomass input capacity - Sng (TPA)  
 Average biomass input capacity - Sng ccu (TPA)  
 Conversion capital investment - Cumulative 5-yr (million \$2018)  
 Biomass purchases (million \$2018/year)  
 Corn purchases (at 2019 corn price) (thousand \$2018/y)

Area converted to perennial energy grasses - Conservation reserve program (km2)  
Area converted to perennial energy grasses - Cropland (km2)  
Area converted to perennial energy grasses - Ethanol land (km2)  
Area converted to perennial energy grasses - Pasture (km2)

---

### *PILLAR 3: Clean fuels - Hydrogen*

---

Output capacity - SMR (GW)  
Output capacity - ATR w/ CC (GW)  
Output capacity - BECCS-H2 (GW)  
Output capacity - Electrolysis (GW)  
Production - SMR (GWh)  
Production - ATR (GWh)  
Production - BECCS-H2 (GWh)  
Production - BECCS-H2 (PJ)  
Production - Electrolysis (GWh)  
Uses - Bulk chemicals manufacturing (GWh)  
Uses - Direct-reduced iron production (GWh)  
Uses - Gas turbine fuel (GWh)  
Uses - Gaseous fuels synthesis (GWh)  
Uses - Hythane (GWh)  
Uses - Industrial boilers (GWh)  
Uses - Liquid fuels synthesis (GWh)  
Uses - Medium and heavy fuel cell vehicles (GWh)  
Uses - Other industry (GWh)  
Uses - Other transportation (GWh)

---

### *PILLAR 4: CCUS - CO2 capture*

---

Annual - ATR-CCS (MMT)  
Annual - BECCS (MMT)  
Annual - BECCS-electricity (MMT)  
Annual - BECCS-H2 (MMT)  
Annual - Bio-FT w/ CC (MMT)  
Annual - BECCS-pyrolysis (MMT)  
Annual - Bio-SNG w/ CC (MMT)  
Annual - Cement and lime (MMT)  
Annual - NGCC (MMT)  
Annual - NGCC-CCS (MMT)  
Annual - DAC (MMT)  
Annual - All (MMT)  
Cumulative - ATR-CCS (MMT)  
Cumulative - BECCS (MMT)  
Cumulative - BECCS-electricity (MMT)  
Cumulative - BECCS-H2 (MMT)  
Cumulative - Bio-FT w/ CC (MMT)  
Cumulative - BECCS-pyrolysis (MMT)  
Cumulative - Bio-SNG w/ CC (MMT)  
Cumulative - Cement and lime (MMT)  
Cumulative - NGCC (MMT)  
Cumulative - NGCC-CCS (MMT)  
Cumulative - DAC (MMT)

Cumulative - All (MMT)  
Direct air capture - Capacity (MTPA)  
Direct air capture - Capacity factor (%)

---

*PILLAR 4: CCUS - CO2 use*

---

Liquid fuel synthesis (MTPA)  
Methane synthesis (kTPA)

---

*PILLAR 4: CCUS - CO2 pipelines*

---

Trunk (km)  
Spur (km)  
All (km)  
Capacity - Trunk (MTPA-km)  
Capacity - Spur (MTPA-km)  
Capacity - All (MTPA-km)  
Cumulative investment - Trunk (million \$2018)  
Cumulative investment - Spur (million \$2018)  
Cumulative investment - All (million \$2018)

---

*PILLAR 4: CCUS - CO2 storage*

---

CO2 storage (MMT)  
Injection wells (wells)  
Resource characterization, appraisal, permitting costs (million \$2020)  
Wells and facilities construction costs (million \$2020)

---

*PILLAR 5: Non-CO2 emissions - Assumed non-CO2 emissions*

---

Assumed non-CO2 emissions (Gt CO2e/y)

---

*PILLAR 6: Land sinks - Forests - REF only*

---

Business-as-usual carbon sink - Natural uptake (Mt CO2e/y)  
Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y)  
Business-as-usual carbon sink - Total (Mt CO2e/y)

---

*PILLAR 6: Land sinks - Forests*

---

Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)  
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)  
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)  
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)  
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)  
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)  
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)  
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)  
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)  
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)

Carbon sink potential - Mid - Accelerate regeneration (1000 tCO<sub>2</sub>e/y)

Carbon sink potential - Mid - Avoid deforestation (1000 tCO<sub>2</sub>e/y)

Carbon sink potential - Mid - Extend rotation length (1000 tCO<sub>2</sub>e/y)

Carbon sink potential - Mid - Improve plantations (1000 tCO<sub>2</sub>e/y)

Carbon sink potential - Mid - Increase retention of HWP (1000 tCO<sub>2</sub>e/y)

Carbon sink potential - Mid - Increase trees outside forests (1000 tCO<sub>2</sub>e/y)

Carbon sink potential - Mid - Reforest cropland (1000 tCO<sub>2</sub>e/y)

Carbon sink potential - Mid - Reforest pasture (1000 tCO<sub>2</sub>e/y)

Carbon sink potential - Mid - Restore productivity (1000 tCO<sub>2</sub>e/y)

Carbon sink potential - Mid - All (not counting overlap) (1000 tCO<sub>2</sub>e/y)

Carbon sink potential - High - Accelerate regeneration (1000 tCO<sub>2</sub>e/y)

Carbon sink potential - High - Avoid deforestation (1000 tCO<sub>2</sub>e/y)

Carbon sink potential - High - Extend rotation length (1000 tCO<sub>2</sub>e/y)

Carbon sink potential - High - Improve plantations (1000 tCO<sub>2</sub>e/y)

Carbon sink potential - High - Increase retention of HWP (1000 tCO<sub>2</sub>e/y)

Carbon sink potential - High - Increase trees outside forests (1000 tCO<sub>2</sub>e/y)

Carbon sink potential - High - Reforest cropland (1000 tCO<sub>2</sub>e/y)

Carbon sink potential - High - Reforest pasture (1000 tCO<sub>2</sub>e/y)

Carbon sink potential - High - All (not counting overlap) (1000 tCO<sub>2</sub>e/y)

Carbon sink potential - High - Restore productivity (1000 tCO<sub>2</sub>e/y)

Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)

Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)

Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)

Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)

Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)

Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)

Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)

Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)

Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)

Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)

Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)

Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)

Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)

Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)

Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)

Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)

Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)

Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)

Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)

Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)

Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)

Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)

Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)

Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)

Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)

Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)

Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)

Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)

Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)

Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)

---



#### *PILLAR 6: Land sinks - Agriculture*

---

Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO<sub>2</sub>e/y)  
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO<sub>2</sub>e/y)  
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO<sub>2</sub>e/y)  
Carbon sink potential - Moderate deployment - Cropland to woody energy crops (1000 tCO<sub>2</sub>e/y)  
Carbon sink potential - Moderate deployment - Pasture to energy crops (1000 tCO<sub>2</sub>e/y)  
Carbon sink potential - Moderate deployment - Total (1000 tCO<sub>2</sub>e/y)  
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)  
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)  
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)  
Land impacted for carbon sink - Moderate deployment - Cropland to woody energy crops (1000 hectares)  
Land impacted for carbon sink - Moderate deployment - Pasture to energy crops (1000 hectares)  
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)  
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO<sub>2</sub>e/y)  
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO<sub>2</sub>e/y)  
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO<sub>2</sub>e/y)  
Carbon sink potential - Aggressive deployment - Cropland to woody energy crops (1000 tCO<sub>2</sub>e/y)  
Carbon sink potential - Aggressive deployment - Pasture to energy crops (1000 tCO<sub>2</sub>e/y)  
Carbon sink potential - Aggressive deployment - Total (1000 tCO<sub>2</sub>e/y)  
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)  
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)  
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)  
Land impacted for carbon sink - Aggressive deployment - Cropland to woody energy crops (1000 hectares)  
Land impacted for carbon sink - Aggressive deployment - Pasture to energy crops (1000 hectares)  
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)

---

#### *PILLAR 6: Land sinks - Total assumed land sink*

Total assumed land sink (Gt CO<sub>2</sub>e/y)

---

#### *IMPACTS - Health*

---

Premature deaths from air pollution - Coal (deaths)  
Premature deaths from air pollution - Natural Gas (deaths)  
Premature deaths from air pollution - Transportation (deaths)  
Avoided premature deaths from air pollution - Coal (net deaths)  
Avoided premature deaths from air pollution - Natural Gas (net deaths)  
Avoided premature deaths from air pollution - Transportation (net deaths)  
Monetary damages from air pollution - Coal (million 2019\$)  
Monetary damages from air pollution - Natural Gas (million 2019\$)  
Monetary damages from air pollution - Transportation (million 2019\$)  
Avoided monetary damages from air pollution - Coal (million 2019\$)  
Avoided monetary damages from air pollution - Natural Gas (million 2019\$)  
Avoided monetary damages from air pollution - Transportation (million 2019\$)

---

#### *IMPACTS - Jobs*

---

By resource sector - Biomass (jobs)  
By resource sector - CO<sub>2</sub> (jobs)  
By resource sector - Coal (jobs)  
By resource sector - Grid (jobs)

By resource sector - Natural Gas (jobs)  
 By resource sector - Nuclear (jobs)  
 By resource sector - Oil (jobs)  
 By resource sector - Solar (jobs)  
 By resource sector - Wind (jobs)  
 By economic sector - Agriculture (jobs)  
 By economic sector - Construction (jobs)  
 By economic sector - Manufacturing (jobs)  
 By economic sector - Mining (jobs)  
 By economic sector - Other (jobs)  
 By economic sector - Pipeline (jobs)  
 By economic sector - Professional (jobs)  
 By economic sector - Trade (jobs)  
 By economic sector - Utilities (jobs)  
 By education level - All sectors - High school diploma or less (jobs)  
 By education level - All sectors - Associates degree or some college (jobs)  
 By education level - All sectors - Bachelors degree (jobs)  
 By education level - All sectors - Masters or professional degree (jobs)  
 By education level - All sectors - Doctoral degree (jobs)  
 By education level - Biomass sector - High school diploma or less (jobs)  
 By education level - Biomass sector - Associates degree or some college (jobs)  
 By education level - Biomass sector - Bachelors degree (jobs)  
 By education level - Biomass sector - Masters or professional degree (jobs)  
 By education level - Biomass sector - Doctoral degree (jobs)  
 By education level - CO2 sector - High school diploma or less (jobs)  
 By education level - CO2 sector - Associates degree or some college (jobs)  
 By education level - CO2 sector - Bachelors degree (jobs)  
 By education level - CO2 sector - Masters or professional degree (jobs)  
 By education level - CO2 sector - Doctoral degree (jobs)  
 By education level - Coal sector - High school diploma or less (jobs)  
 By education level - Coal sector - Associates degree or some college (jobs)  
 By education level - Coal sector - Bachelors degree (jobs)  
 By education level - Coal sector - Masters or professional degree (jobs)  
 By education level - Coal sector - Doctoral degree (jobs)  
 By education level - Grid sector - High school diploma or less (jobs)  
 By education level - Grid sector - Associates degree or some college (jobs)  
 By education level - Grid sector - Bachelors degree (jobs)  
 By education level - Grid sector - Masters or professional degree (jobs)  
 By education level - Grid sector - Doctoral degree (jobs)  
 By education level - Natural gas sector - High school diploma or less (jobs)  
 By education level - Natural gas sector - Associates degree or some college (jobs)  
 By education level - Natural gas sector - Bachelors degree (jobs)  
 By education level - Natural gas sector - Masters or professional degree (jobs)  
 By education level - Natural gas sector - Doctoral degree (jobs)  
 By education level - Nuclear sector - High school diploma or less (jobs)  
 By education level - Nuclear sector - Associates degree or some college (jobs)  
 By education level - Nuclear sector - Bachelors degree (jobs)  
 By education level - Nuclear sector - Masters or professional degree (jobs)  
 By education level - Nuclear sector - Doctoral degree (jobs)  
 By education level - Oil sector - High school diploma or less (jobs)  
 By education level - Oil sector - Associates degree or some college (jobs)  
 By education level - Oil sector - Bachelors degree (jobs)  
 By education level - Oil sector - Masters or professional degree (jobs)

By education level - Oil sector - Doctoral degree (jobs)  
 By education level - Solar PV sector - High school diploma or less (jobs)  
 By education level - Solar PV sector - Associates degree or some college (jobs)  
 By education level - Solar PV sector - Bachelors degree (jobs)  
 By education level - Solar PV sector - Masters or professional degree (jobs)  
 By education level - Solar PV sector - Doctoral degree (jobs)  
 By education level - Wind sector - High school diploma or less (jobs)  
 By education level - Wind sector - Associates degree or some college (jobs)  
 By education level - Wind sector - Bachelors degree (jobs)  
 By education level - Wind sector - Masters or professional degree (jobs)  
 By education level - Wind sector - Doctoral degree (jobs)  
 Median wages - Annual - Biomass (\$2019 per job)  
 Median wages - Annual - CO2 (\$2019 per job)  
 Median wages - Annual - Coal (\$2019 per job)  
 Median wages - Annual - Grid (\$2019 per job)  
 Median wages - Annual - Natural Gas (\$2019 per job)  
 Median wages - Annual - Nuclear (\$2019 per job)  
 Median wages - Annual - Oil (\$2019 per job)  
 Median wages - Annual - Solar (\$2019 per job)  
 Median wages - Annual - Wind (\$2019 per job)  
 Median wages - Annual - All (\$2019 per job)  
 Wage income - Biomass (million \$2019)  
 Wage income - CO2 (million \$2019)  
 Wage income - Coal (million \$2019)  
 Wage income - Grid (million \$2019)  
 Wage income - Natural Gas (million \$2019)  
 Wage income - Nuclear (million \$2019)  
 Wage income - Oil (million \$2019)  
 Wage income - Solar (million \$2019)  
 Wage income - Wind (million \$2019)  
 Wage income - All (million \$2019)  
 Related work experience - All sectors - None (jobs)  
 Related work experience - All sectors - Up to 1 year (jobs)  
 Related work experience - All sectors - 1 to 4 years (jobs)  
 Related work experience - All sectors - 4 to 10 years (jobs)  
 Related work experience - All sectors - Over 10 years (jobs)  
 Related work experience - Biomass sector - None (jobs)  
 Related work experience - Biomass sector - Up to 1 year (jobs)  
 Related work experience - Biomass sector - 1 to 4 years (jobs)  
 Related work experience - Biomass sector - 4 to 10 years (jobs)  
 Related work experience - Biomass sector - Over 10 years (jobs)  
 Related work experience - CO2 sector - None (jobs)  
 Related work experience - CO2 sector - Up to 1 year (jobs)  
 Related work experience - CO2 sector - 1 to 4 years (jobs)  
 Related work experience - CO2 sector - 4 to 10 years (jobs)  
 Related work experience - CO2 sector - Over 10 years (jobs)  
 Related work experience - Coal sector - None (jobs)  
 Related work experience - Coal sector - Up to 1 year (jobs)  
 Related work experience - Coal sector - 1 to 4 years (jobs)  
 Related work experience - Coal sector - 4 to 10 years (jobs)  
 Related work experience - Coal sector - Over 10 years (jobs)  
 Related work experience - Grid sector - None (jobs)  
 Related work experience - Grid sector - Up to 1 year (jobs)

Related work experience - Grid sector - 1 to 4 years (jobs)  
 Related work experience - Grid sector - 4 to 10 years (jobs)  
 Related work experience - Grid sector - Over 10 years (jobs)  
 Related work experience - Natural gas sector - None (jobs)  
 Related work experience - Natural gas sector - Up to 1 year (jobs)  
 Related work experience - Natural gas sector - 1 to 4 years (jobs)  
 Related work experience - Natural gas sector - 4 to 10 years (jobs)  
 Related work experience - Natural gas sector - Over 10 years (jobs)  
 Related work experience - Nuclear sector - None (jobs)  
 Related work experience - Nuclear sector - Up to 1 year (jobs)  
 Related work experience - Nuclear sector - 1 to 4 years (jobs)  
 Related work experience - Nuclear sector - 4 to 10 years (jobs)  
 Related work experience - Nuclear sector - Over 10 years (jobs)  
 Related work experience - Oil sector - None (jobs)  
 Related work experience - Oil sector - Up to 1 year (jobs)  
 Related work experience - Oil sector - 1 to 4 years (jobs)  
 Related work experience - Oil sector - 4 to 10 years (jobs)  
 Related work experience - Oil sector - Over 10 years (jobs)  
 Related work experience - Solar PV sector - None (jobs)  
 Related work experience - Solar PV sector - Up to 1 year (jobs)  
 Related work experience - Solar PV sector - 1 to 4 years (jobs)  
 Related work experience - Solar PV sector - 4 to 10 years (jobs)  
 Related work experience - Solar PV sector - Over 10 years (jobs)  
 Related work experience - Wind sector - None (jobs)  
 Related work experience - Wind sector - Up to 1 year (jobs)  
 Related work experience - Wind sector - 1 to 4 years (jobs)  
 Related work experience - Wind sector - 4 to 10 years (jobs)  
 Related work experience - Wind sector - Over 10 years (jobs)  
 On-the-Job Training - All sectors - None (jobs)  
 On-the-Job Training - All sectors - Up to 1 year (jobs)  
 On-the-Job Training - All sectors - 1 to 4 years (jobs)  
 On-the-Job Training - All sectors - 4 to 10 years (jobs)  
 On-the-Job Training - All sectors - Over 10 years (jobs)  
 On-the-Job Training - Biomass sector - None (jobs)  
 On-the-Job Training - Biomass sector - Up to 1 year (jobs)  
 On-the-Job Training - Biomass sector - 1 to 4 years (jobs)  
 On-the-Job Training - Biomass sector - 4 to 10 years (jobs)  
 On-the-Job Training - Biomass sector - Over 10 years (jobs)  
 On-the-Job Training - CO2 sector - None (jobs)  
 On-the-Job Training - CO2 sector - Up to 1 year (jobs)  
 On-the-Job Training - CO2 sector - 1 to 4 years (jobs)  
 On-the-Job Training - CO2 sector - 4 to 10 years (jobs)  
 On-the-Job Training - CO2 sector - Over 10 years (jobs)  
 On-the-Job Training - Coal sector - None (jobs)  
 On-the-Job Training - Coal sector - Up to 1 year (jobs)  
 On-the-Job Training - Coal sector - 1 to 4 years (jobs)  
 On-the-Job Training - Coal sector - 4 to 10 years (jobs)  
 On-the-Job Training - Coal sector - Over 10 years (jobs)  
 On-the-Job Training - Grid sector - None (jobs)  
 On-the-Job Training - Grid sector - Up to 1 year (jobs)  
 On-the-Job Training - Grid sector - 1 to 4 years (jobs)  
 On-the-Job Training - Grid sector - 4 to 10 years (jobs)  
 On-the-Job Training - Grid sector - Over 10 years (jobs)

On-the-Job Training - Natural gas sector - None (jobs)  
 On-the-Job Training - Natural gas sector - Up to 1 year (jobs)  
 On-the-Job Training - Natural gas sector - 1 to 4 years (jobs)  
 On-the-Job Training - Natural gas sector - 4 to 10 years (jobs)  
 On-the-Job Training - Natural gas sector - Over 10 years (jobs)  
 On-the-Job Training - Nuclear sector - None (jobs)  
 On-the-Job Training - Nuclear sector - Up to 1 year (jobs)  
 On-the-Job Training - Nuclear sector - 1 to 4 years (jobs)  
 On-the-Job Training - Nuclear sector - 4 to 10 years (jobs)  
 On-the-Job Training - Nuclear sector - Over 10 years (jobs)  
 On-the-Job Training - Oil sector - None (jobs)  
 On-the-Job Training - Oil sector - Up to 1 year (jobs)  
 On-the-Job Training - Oil sector - 1 to 4 years (jobs)  
 On-the-Job Training - Oil sector - 4 to 10 years (jobs)  
 On-the-Job Training - Oil sector - Over 10 years (jobs)  
 On-the-Job Training - Solar PV sector - None (jobs)  
 On-the-Job Training - Solar PV sector - Up to 1 year (jobs)  
 On-the-Job Training - Solar PV sector - 1 to 4 years (jobs)  
 On-the-Job Training - Solar PV sector - 4 to 10 years (jobs)  
 On-the-Job Training - Solar PV sector - Over 10 years (jobs)  
 On-the-Job Training - Wind sector - None (jobs)  
 On-the-Job Training - Wind sector - Up to 1 year (jobs)  
 On-the-Job Training - Wind sector - 1 to 4 years (jobs)  
 On-the-Job Training - Wind sector - 4 to 10 years (jobs)  
 On-the-Job Training - Wind sector - Over 10 years (jobs)  
 On-Site or In-Plant Training - Total jobs - None (jobs)  
 On-Site or In-Plant Training - Total jobs - Up to 1 year (jobs)  
 On-Site or In-Plant Training - Total jobs - 1 to 4 years (jobs)  
 On-Site or In-Plant Training - Total jobs - 4 to 10 years (jobs)  
 On-Site or In-Plant Training - Total jobs - Over 10 years (jobs)  
 On-Site or In-Plant Training - Biomass sector - None (jobs)  
 On-Site or In-Plant Training - Biomass sector - Up to 1 year (jobs)  
 On-Site or In-Plant Training - Biomass sector - 1 to 4 years (jobs)  
 On-Site or In-Plant Training - Biomass sector - 4 to 10 years (jobs)  
 On-Site or In-Plant Training - Biomass sector - Over 10 years (jobs)  
 On-Site or In-Plant Training - CO2 sector - None (jobs)  
 On-Site or In-Plant Training - CO2 sector - Up to 1 year (jobs)  
 On-Site or In-Plant Training - CO2 sector - 1 to 4 years (jobs)  
 On-Site or In-Plant Training - CO2 sector - 4 to 10 years (jobs)  
 On-Site or In-Plant Training - CO2 sector - Over 10 years (jobs)  
 On-Site or In-Plant Training - Coal sector - None (jobs)  
 On-Site or In-Plant Training - Coal sector - Up to 1 year (jobs)  
 On-Site or In-Plant Training - Coal sector - 1 to 4 years (jobs)  
 On-Site or In-Plant Training - Coal sector - 4 to 10 years (jobs)  
 On-Site or In-Plant Training - Coal sector - Over 10 years (jobs)  
 On-Site or In-Plant Training - Grid sector - None (jobs)  
 On-Site or In-Plant Training - Grid sector - Up to 1 year (jobs)  
 On-Site or In-Plant Training - Grid sector - 1 to 4 years (jobs)  
 On-Site or In-Plant Training - Grid sector - 4 to 10 years (jobs)  
 On-Site or In-Plant Training - Grid sector - Over 10 years (jobs)  
 On-Site or In-Plant Training - Natural gas sector - None (jobs)  
 On-Site or In-Plant Training - Natural gas sector - Up to 1 year (jobs)  
 On-Site or In-Plant Training - Natural gas sector - 1 to 4 years (jobs)

On-Site or In-Plant Training - Natural gas sector - 4 to 10 years (jobs)  
 On-Site or In-Plant Training - Natural gas sector - Over 10 years (jobs)  
 On-Site or In-Plant Training - Nuclear sector - None (jobs)  
 On-Site or In-Plant Training - Nuclear sector - Up to 1 year (jobs)  
 On-Site or In-Plant Training - Nuclear sector - 1 to 4 years (jobs)  
 On-Site or In-Plant Training - Nuclear sector - 4 to 10 years (jobs)  
 On-Site or In-Plant Training - Nuclear sector - Over 10 years (jobs)  
 On-Site or In-Plant Training - Oil sector - None (jobs)  
 On-Site or In-Plant Training - Oil sector - Up to 1 year (jobs)  
 On-Site or In-Plant Training - Oil sector - 1 to 4 years (jobs)  
 On-Site or In-Plant Training - Oil sector - 4 to 10 years (jobs)  
 On-Site or In-Plant Training - Oil sector - Over 10 years (jobs)  
 On-Site or In-Plant Training - Solar PV sector - None (jobs)  
 On-Site or In-Plant Training - Solar PV sector - Up to 1 year (jobs)  
 On-Site or In-Plant Training - Solar PV sector - 1 to 4 years (jobs)  
 On-Site or In-Plant Training - Solar PV sector - 4 to 10 years (jobs)  
 On-Site or In-Plant Training - Solar PV sector - Over 10 years (jobs)  
 On-Site or In-Plant Training - Wind sector - None (jobs)  
 On-Site or In-Plant Training - Wind sector - Up to 1 year (jobs)  
 On-Site or In-Plant Training - Wind sector - 1 to 4 years (jobs)  
 On-Site or In-Plant Training - Wind sector - 4 to 10 years (jobs)  
 On-Site or In-Plant Training - Wind sector - Over 10 years (jobs)

---

#### *IMPACTS - Capital Investments*

---

Capital under construction - Cumulative from 2021 - CO2 Transport & Storage (billion \$2018)  
 Capital under construction - Cumulative from 2021 - Distribution (billion \$2018)  
 Capital under construction - Cumulative from 2021 - Fuels Conversion (billion \$2018)  
 Capital under construction - Cumulative from 2021 - Industry (billion \$2018)  
 Capital under construction - Cumulative from 2021 - Power Generation (billion \$2018)  
 Capital under construction - Cumulative from 2021 - Total System (billion \$2018)  
 Capital under construction - Cumulative from 2021 - Transmission (billion \$2018)  
 Capital - Annual - Demand-side (billion \$2018/y)  
 Capital - Annual - Supply-side (billion \$2018/y)  
 Capital - Annual - Total (billion \$2018/y)  
 FOAK Projects (million \$2018/y)  
 FOAK Projects - Advanced Geothermal (million \$2018/y)  
 FOAK Projects - Advanced Nuclear (million \$2018/y)  
 FOAK Projects - ATR Hydrogen with CC (million \$2018/y)  
 FOAK Projects - Biomass Gasification H2 with CC (million \$2018/y)  
 FOAK Projects - Biomass IGCC w CC (million \$2018/y)  
 FOAK Projects - Biomass Pyrolysis (million \$2018/y)  
 FOAK Projects - CCGT with CC (million \$2018/y)  
 FOAK Projects - CCGT with CC (Oxy) (million \$2018/y)  
 FOAK Projects - Cement with CC (million \$2018/y)  
 FOAK Projects - Direct Air Capture (million \$2018/y)  
 FOAK Projects - DRI Iron (million \$2018/y)  
 FOAK Projects - Electrolysis (million \$2018/y)  
 FOAK Projects - High H2 Turbines (million \$2018/y)  
 FOAK Projects - Cumulative from 2021 (million \$2018)  
 FOAK Projects - Cumulative from 2021 - Advanced Geothermal (million \$2018)  
 FOAK Projects - Cumulative from 2021 - Advanced Nuclear (million \$2018)  
 FOAK Projects - Cumulative from 2021 - ATR Hydrogen with CC (million \$2018)

FOAK Projects - Cumulative from 2021 - Biomass Gasification H2 with CC (million \$2018)  
 FOAK Projects - Cumulative from 2021 - Biomass IGCC w CC (million \$2018)  
 FOAK Projects - Cumulative from 2021 - Biomass Pyrolysis (million \$2018)  
 FOAK Projects - Cumulative from 2021 - CCGT with CC (million \$2018)  
 FOAK Projects - Cumulative from 2021 - CCGT with CC (Oxy) (million \$2018)  
 FOAK Projects - Cumulative from 2021 - Cement with CC (million \$2018)  
 FOAK Projects - Cumulative from 2021 - Direct Air Capture (million \$2018)  
 FOAK Projects - Cumulative from 2021 - DRI Iron (million \$2018)  
 FOAK Projects - Cumulative from 2021 - Electrolysis (million \$2018)  
 FOAK Projects - Cumulative from 2021 - High H2 Turbines (million \$2018)  
 Pre-FID - CO2 Transport & Storage (million \$2018/y)  
 Pre-FID - Distribution (million \$2018/y)  
 Pre-FID - Fuels Conversion (million \$2018/y)  
 Pre-FID - Power Generation (million \$2018/y)  
 Pre-FID - Total System (million \$2018/y)  
 Pre-FID - Transmission (million \$2018/y)  
 Pre-FID - Cumulative from 2021 - CO2 Transport & Storage (million \$2018)  
 Pre-FID - Cumulative from 2021 - Distribution (million \$2018)  
 Pre-FID - Cumulative from 2021 - Fuels Conversion (million \$2018)  
 Pre-FID - Cumulative from 2021 - Power Generation (million \$2018)  
 Pre-FID - Cumulative from 2021 - Total System (million \$2018)  
 Pre-FID - Cumulative from 2021 - Transmission (million \$2018)  
 In-service (excl. pre-FID) - CO2 Transport & Storage (million \$2018/y)  
 In-service (excl. pre-FID) - Distribution (million \$2018/y)  
 In-service (excl. pre-FID) - Fuels Conversion (million \$2018/y)  
 In-service (excl. pre-FID) - Power Generation (million \$2018/y)  
 In-service (excl. pre-FID) - Total System (million \$2018/y)  
 In-service (excl. pre-FID) - Transmission (million \$2018/y)  
 In-service (excl. pre-FID) - Cumulative from 2021 - CO2 Transport & Storage (million \$2018)  
 In-service (excl. pre-FID) - Cumulative from 2021 - Distribution (million \$2018)  
 In-service (excl. pre-FID) - Cumulative from 2021 - Fuels Conversion (million \$2018)  
 In-service (excl. pre-FID) - Cumulative from 2021 - Power Generation (million \$2018)  
 In-service (excl. pre-FID) - Cumulative from 2021 - Total System (million \$2018)  
 In-service (excl. pre-FID) - Cumulative from 2021 - Transmission (million \$2018)  
 In-service (excl. pre-FID) - Advanced Geothermal (million \$2018/y)  
 In-service (excl. pre-FID) - Advanced Nuclear (million \$2018/y)  
 In-service (excl. pre-FID) - ATR Hydrogen w CC (million \$2018/y)  
 In-service (excl. pre-FID) - Biomass Gasification H2 w CC (million \$2018/y)  
 In-service (excl. pre-FID) - Biomass IGCC w CC (million \$2018/y)  
 In-service (excl. pre-FID) - Biomass pyrolysis (million \$2018/y)  
 In-service (excl. pre-FID) - Biomass pyrolysis w CC (million \$2018/y)  
 In-service (excl. pre-FID) - CCGT (million \$2018/y)  
 In-service (excl. pre-FID) - CCGT w CC (million \$2018/y)  
 In-service (excl. pre-FID) - Cement with CC (million \$2018/y)  
 In-service (excl. pre-FID) - Direct Air Capture (million \$2018/y)  
 In-service (excl. pre-FID) - Electrolysis (million \$2018/y)  
 In-service (excl. pre-FID) - H2-Direct Reduced Iron (million \$2018/y)  
 In-service (excl. pre-FID) - High H2 Turbines (million \$2018/y)  
 In-service (excl. pre-FID) - Li-Ion Battery (million \$2018/y)  
 In-service (excl. pre-FID) - Offshore wind (million \$2018/y)  
 In-service (excl. pre-FID) - Onshore wind (million \$2018/y)  
 In-service (excl. pre-FID) - SMR Hydrogen (million \$2018/y)  
 In-service (excl. pre-FID) - Solar PV (million \$2018/y)

In-service (excl. pre-FID) - Synthetic Gas (million \$2018/y)  
 In-service (excl. pre-FID) - Synthetic Liquid Fuels (million \$2018/y)  
 In-service (excl. pre-FID) - Cumulative from 2021 - Advanced Geothermal (million \$2018)  
 In-service (excl. pre-FID) - Cumulative from 2021 - Advanced Nuclear (million \$2018)  
 In-service (excl. pre-FID) - Cumulative from 2021 - ATR Hydrogen w CC (million \$2018)  
 In-service (excl. pre-FID) - Cumulative from 2021 - Biomass Gasification H2 w CC (million \$2018)  
 In-service (excl. pre-FID) - Cumulative from 2021 - Biomass IGCC w CC (million \$2018)  
 In-service (excl. pre-FID) - Cumulative from 2021 - Biomass pyrolysis (million \$2018)  
 In-service (excl. pre-FID) - Cumulative from 2021 - Biomass pyrolysis w CC (million \$2018)  
 In-service (excl. pre-FID) - Cumulative from 2021 - CCGT (million \$2018)  
 In-service (excl. pre-FID) - Cumulative from 2021 - CCGT w CC (million \$2018)  
 In-service (excl. pre-FID) - Cumulative from 2021 - Cement with CC (million \$2018)  
 In-service (excl. pre-FID) - Cumulative from 2021 - Direct Air Capture (million \$2018)  
 In-service (excl. pre-FID) - Cumulative from 2021 - Electrolysis (million \$2018)  
 In-service (excl. pre-FID) - Cumulative from 2021 - H2-Direct Reduced Iron (million \$2018)  
 In-service (excl. pre-FID) - Cumulative from 2021 - High H2 Turbines (million \$2018)  
 In-service (excl. pre-FID) - Cumulative from 2021 - Li-Ion Battery (million \$2018)  
 In-service (excl. pre-FID) - Cumulative from 2021 - Offshore wind (million \$2018)  
 In-service (excl. pre-FID) - Cumulative from 2021 - Onshore wind (million \$2018)  
 In-service (excl. pre-FID) - Cumulative from 2021 - SMR Hydrogen (million \$2018)  
 In-service (excl. pre-FID) - Cumulative from 2021 - Solar PV (million \$2018)  
 In-service (excl. pre-FID) - Cumulative from 2021 - Synthetic Gas (million \$2018)  
 In-service (excl. pre-FID) - Cumulative from 2021 - Synthetic Liquid Fuels (million \$2018)

---

#### *IMPACTS - Fossil fuel industries*

Oil consumption - Annual (million bbls)  
 Oil consumption - Cumulative (million bbls)  
 Oil production - Annual (million bbls)  
 Oil production - Cumulative (million bbls)  
 Natural gas consumption - Annual (tcf)  
 Natural gas consumption - Cumulative (tcf)  
 Natural gas production - Annual (tcf)  
 Natural gas production - Cumulative (tcf)  
 Age of natural gas mains as of 2020 (vintage)

---

#### *IMPACTS - Land use*

Solar - Candidate Project Area - Base land use assumptions (km2)  
 Solar - Used - Base land use assumptions (km2)  
 Onshore wind - Candidate Project Area - Base land use assumptions (km2)  
 Onshore wind - Used - Base land use assumptions (km2)  
 Offshore wind - Candidate Project Area - Base land use assumptions (km2)  
 Offshore wind - Used - Base land use assumptions (km2)  
 Solar - Candidate Project Area - Constrained land use assumptions (km2)  
 Solar - Used - Constrained land use assumptions (km2)  
 Onshore wind - Candidate Project Area - Constrained land use assumptions (km2)  
 Onshore wind - Used - Constrained land use assumptions (km2)  
 Offshore wind - Candidate Project Area - Constrained land use assumptions (km2)  
 Offshore wind - Used - Constrained land use assumptions (km2)  
 Solar base area used - Total - Crop\_Pasture\_Herbaceous (km2)  
 Solar base area used - Total - Forest (km2)



Solar base area used - Total - Scrub (km2)  
 Solar base area used - Total - Wetland (km2)  
 Solar base area used - Total - Other (km2)  
 Solar base area used - Direct - Crop\_Pasture\_Herbaceous (km2)  
 Solar base area used - Direct - Forest (km2)  
 Solar base area used - Direct - Scrub (km2)  
 Solar base area used - Direct - Wetland (km2)  
 Solar base area used - Direct - Other (km2)  
 Wind base area used - Total - Crop\_Pasture\_Herbaceous (km2)  
 Wind base area used - Total - Forest (km2)  
 Wind base area used - Total - Scrub (km2)  
 Wind base area used - Total - Wetland (km2)  
 Wind base area used - Total - Other (km2)  
 Wind base area used - Direct - Crop\_Pasture\_Herbaceous (km2)  
 Wind base area used - Direct - Forest (km2)  
 Wind base area used - Direct - Scrub (km2)  
 Wind base area used - Direct - Wetland (km2)  
 Wind base area used - Direct - Other (km2)  
 Perennial energy crops - Ethanol land (km2)  
 Perennial energy crops - Conservation reserve program (km2)  
 Perennial energy crops - Cropland (km2)  
 Perennial energy crops - Pasture (km2)

---

#### *IMPACTS - Pipes and Wires*

---

Total HV transmission (for wind and solar) - Base (percent of 2020)  
 Added HV transmission vs. 2020 (for wind and solar) - Base spur intra-state (GW-km)  
 Added HV transmission vs. 2020 (for wind and solar) - Base other intra-state (GW-km)  
 Added HV transmission vs. 2020 (for wind and solar) - Base all (GW-km)  
 Total HV transmission (for wind and solar) - Constrained (percent of 2020)  
 Added HV transmission vs. 2020 (for wind and solar) - Constrained spur intra-state (GW-km)  
 Added HV transmission vs. 2020 (for wind and solar) - Constrained other intra-state (GW-km)  
 Added HV transmission vs. 2020 (for wind and solar) - Constrained all (GW-km)  
 CO2 pipelines - All (km)  
 CO2 pipelines - Spur (km)  
 CO2 pipelines - Trunk (km)  
 CO2 pipelines - All (MTPA-km)  
 CO2 pipelines - Spur (MTPA-km)  
 CO2 pipelines - Trunk (MTPA-km)

---