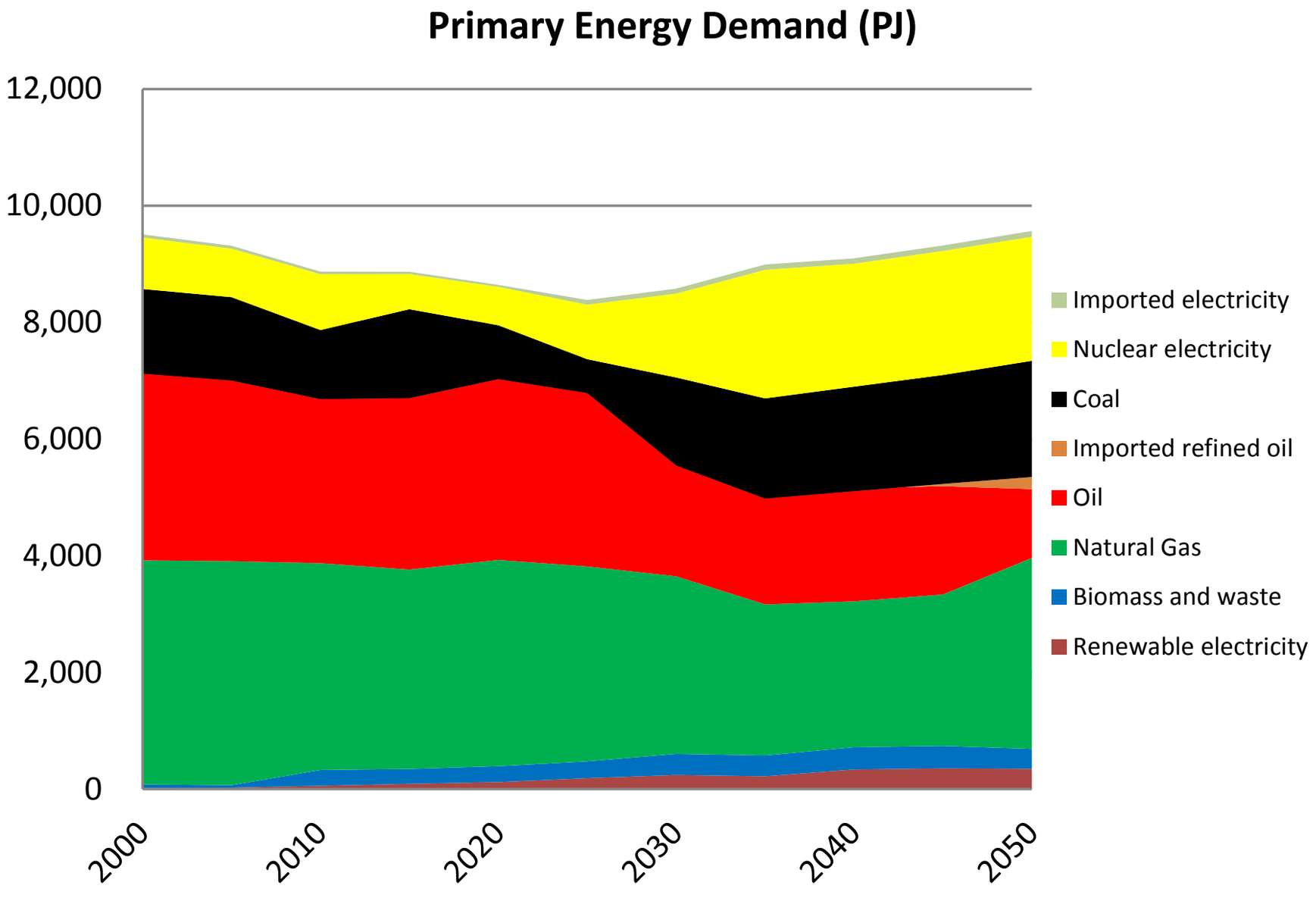
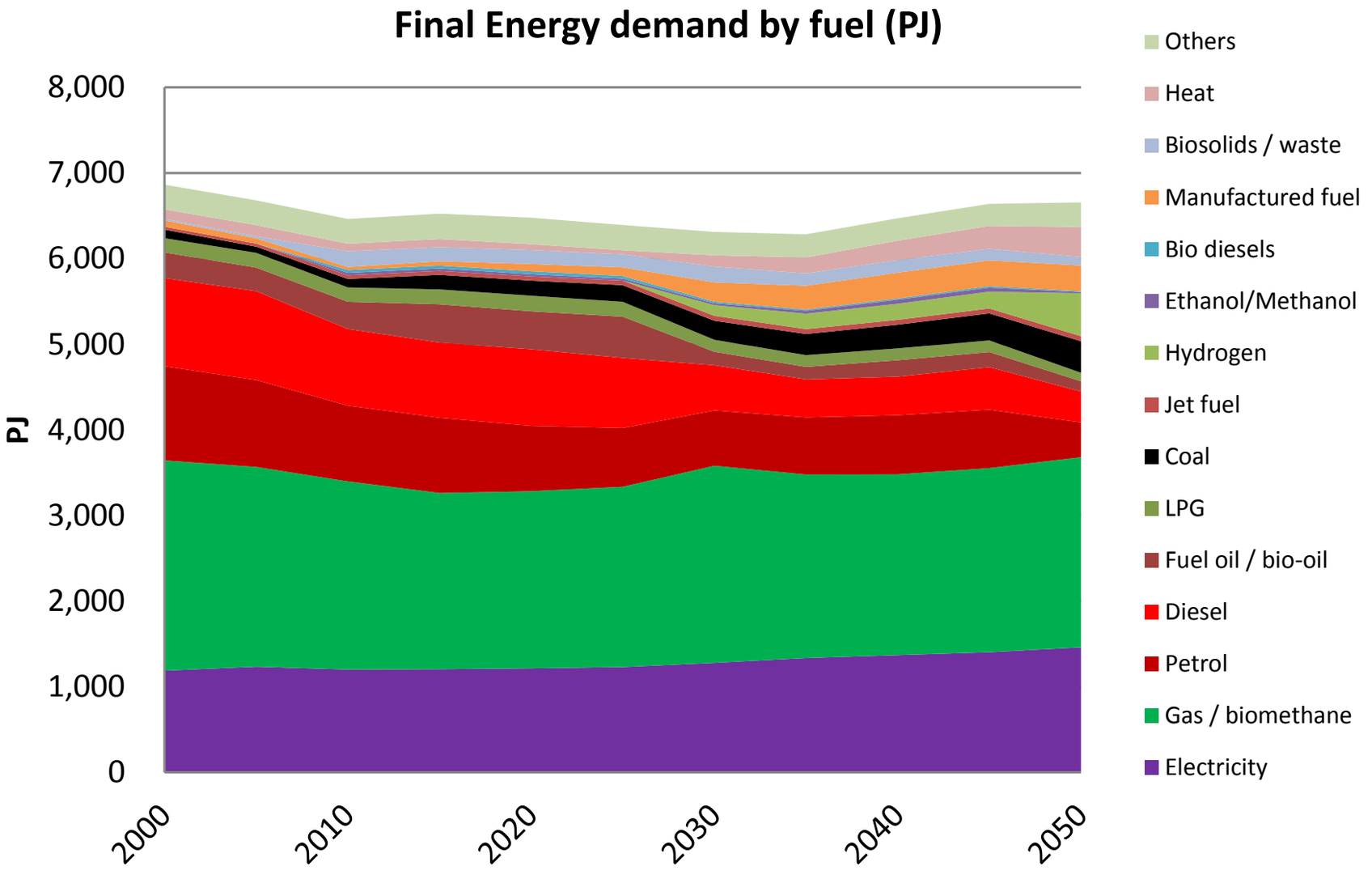
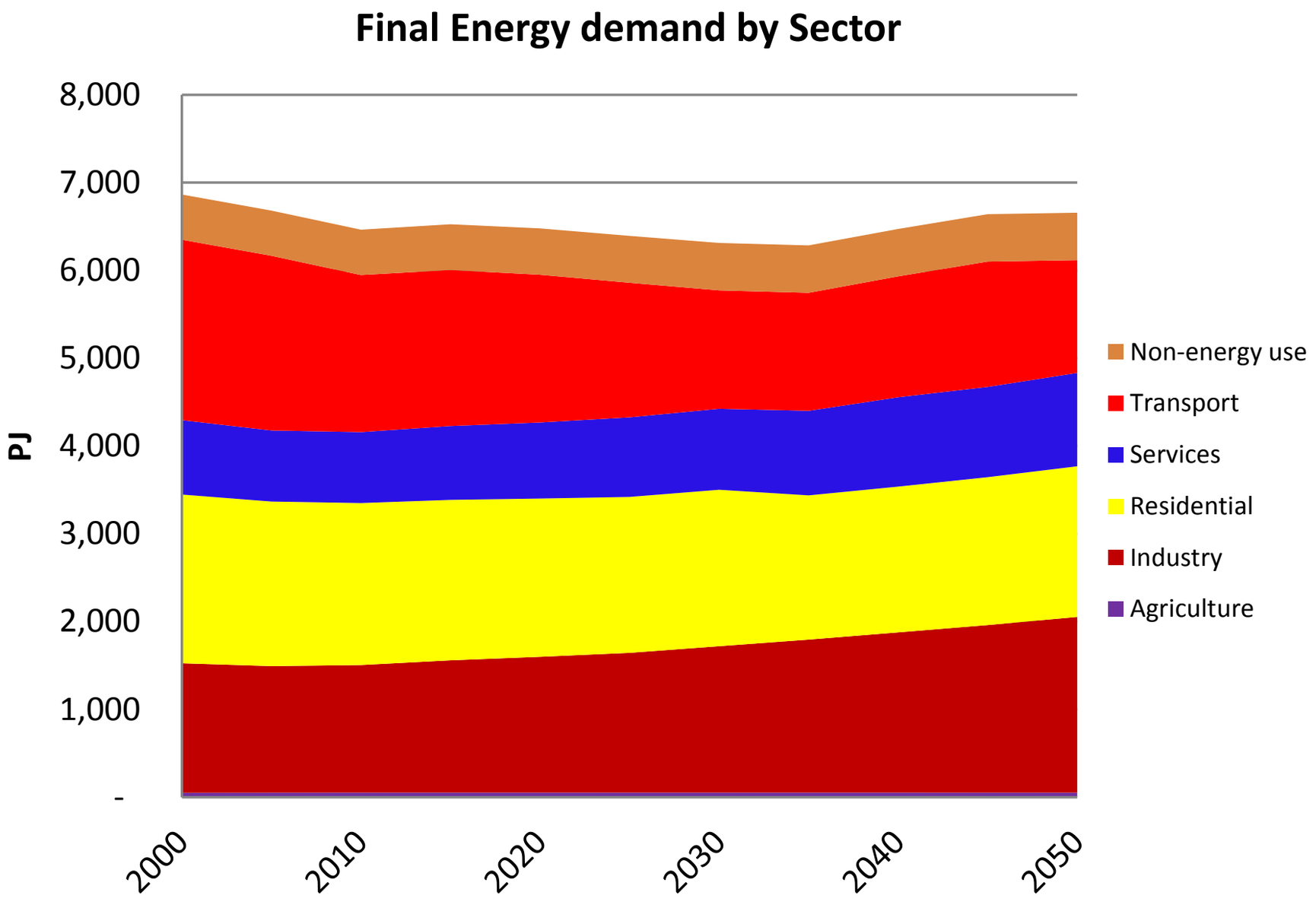
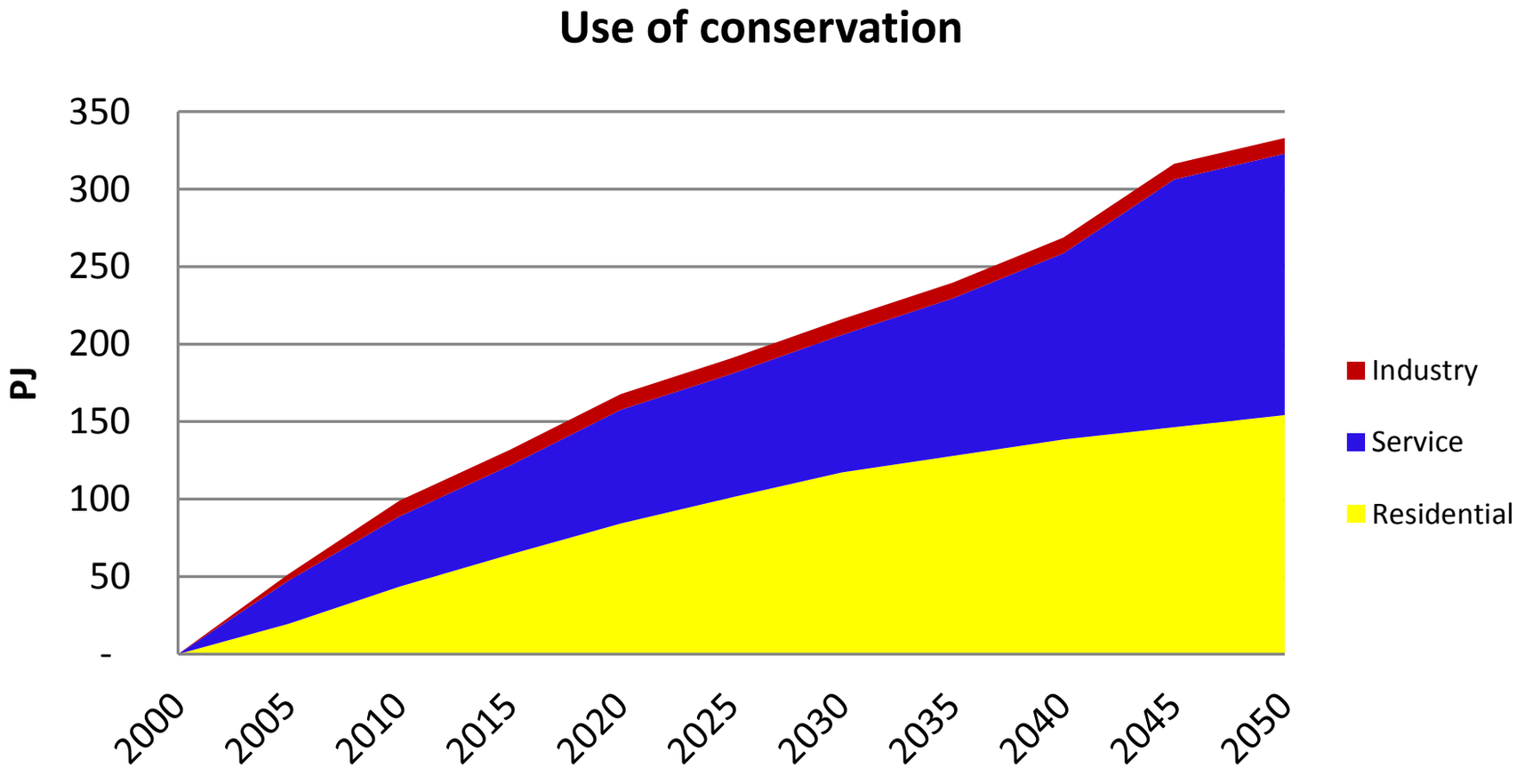
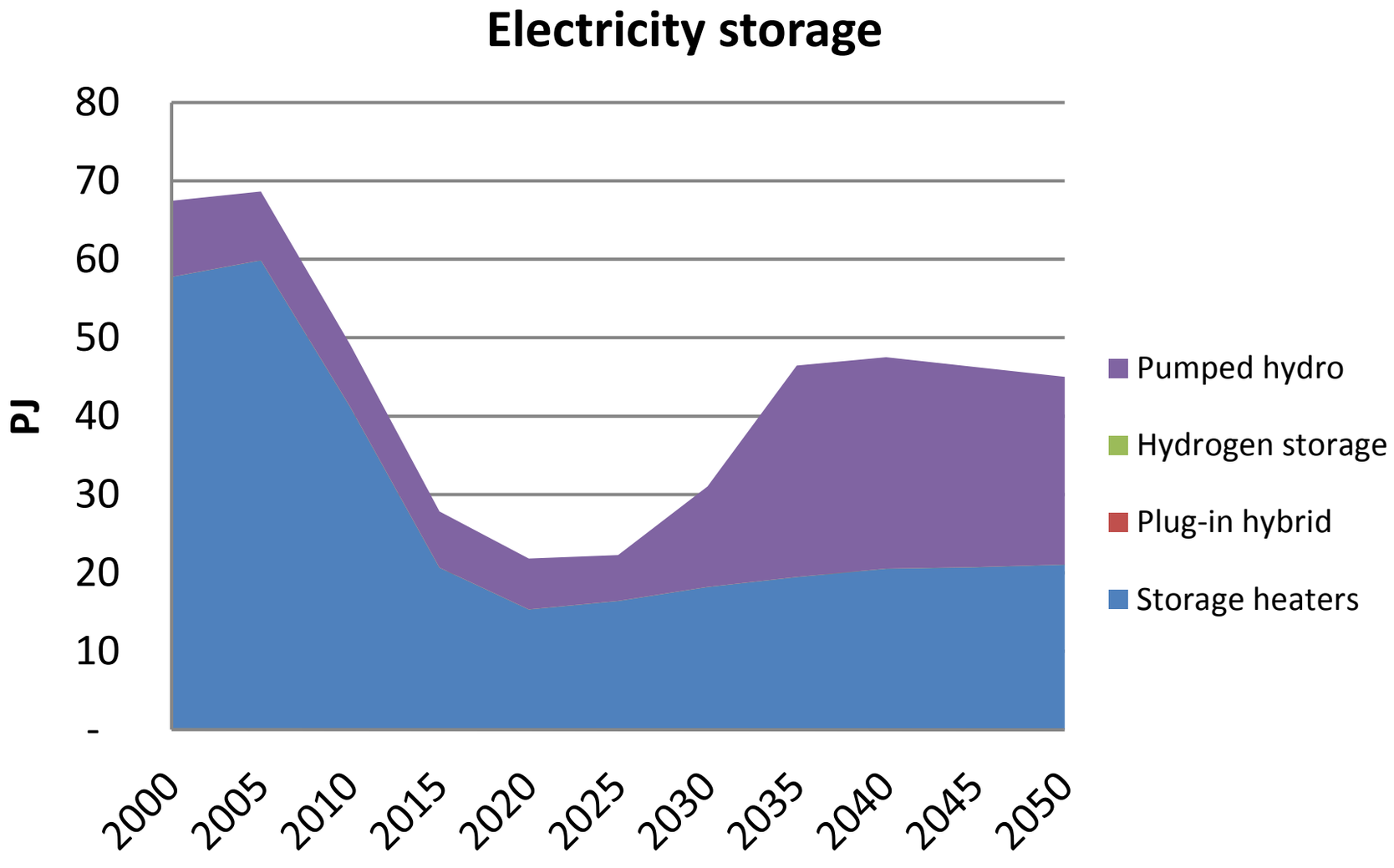
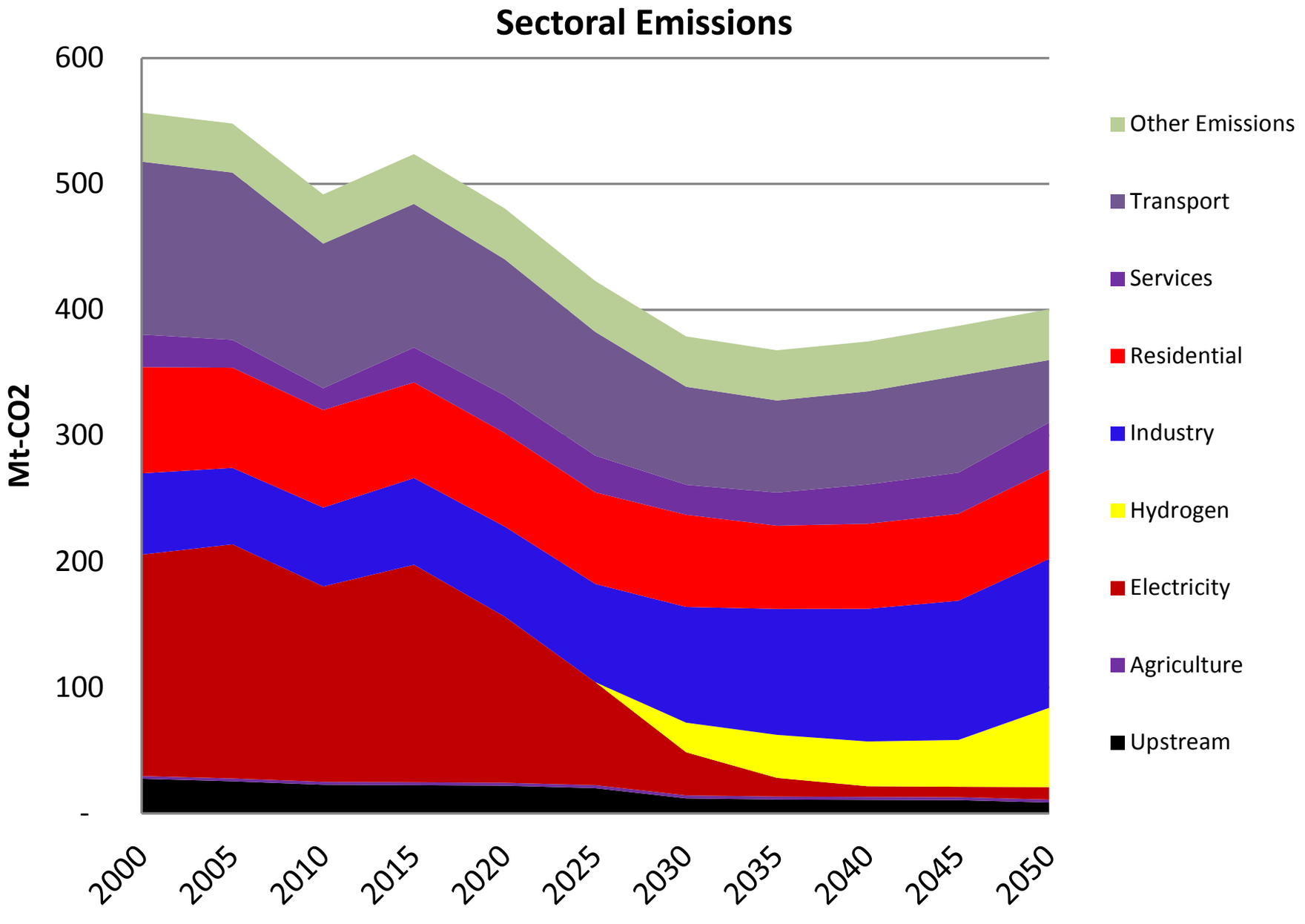

Primary Energy Demand (PJ)
12,000
10,000
8,000
6,000
4,000
2,000
0
2000
2010
2020
2030
2040
2050
Imported electricity
Nuclear electricity
Coal
Imported refined oil
Oil
Natural Gas
Biomass and waste
Renewable electricity

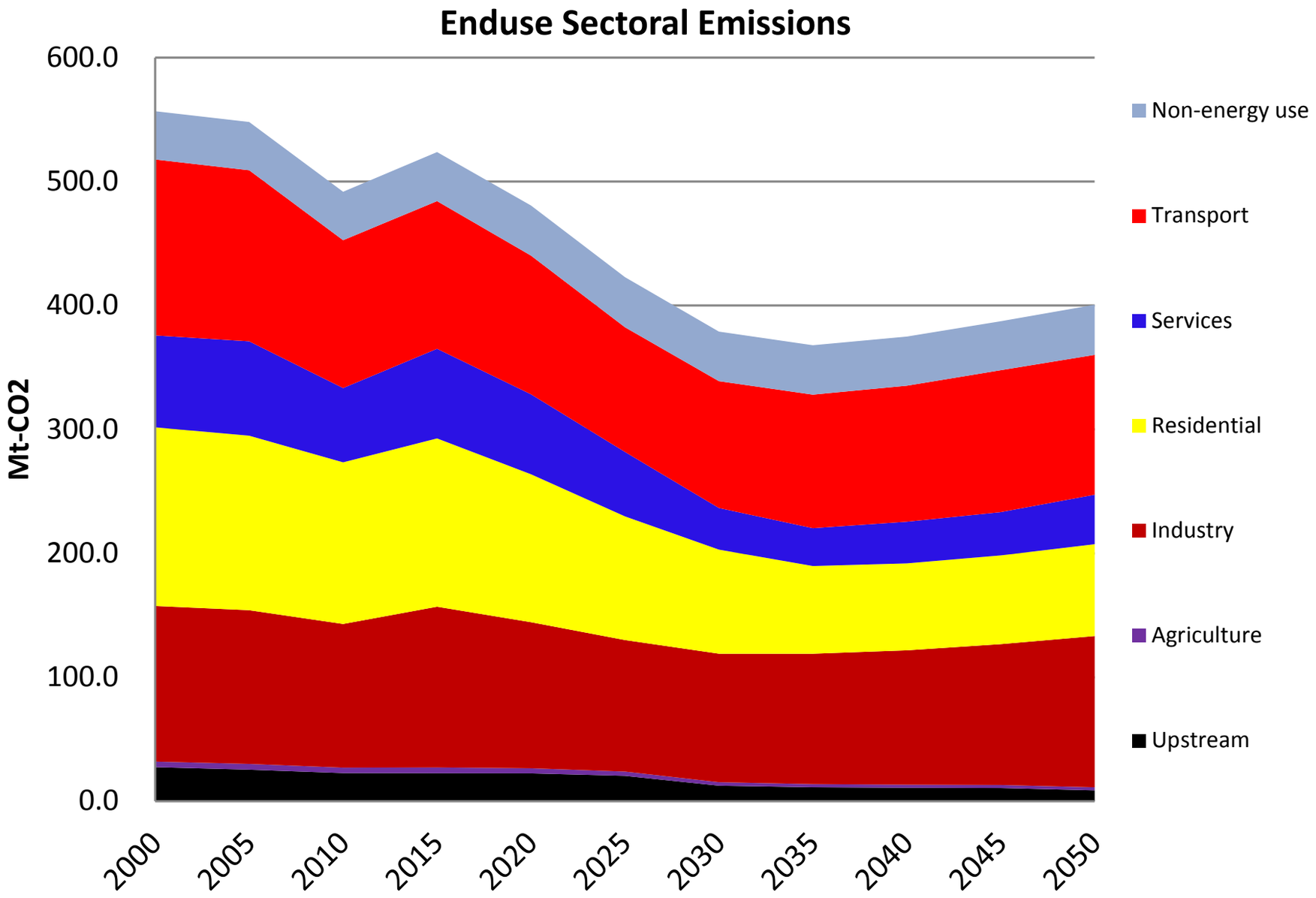

Final Energy demand by fuel (PJ)
PJ
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
2000
2010
2020
2030
2040
2050
Others
Heat
Biosolids / waste
Manufactured fuel
Bio diesels
Ethanol/Methanol
Hydrogen
Jet fuel
Coal
LPG
Fuel oil / bio-oil
Diesel
Petrol
Gas / biomethane
Electricity

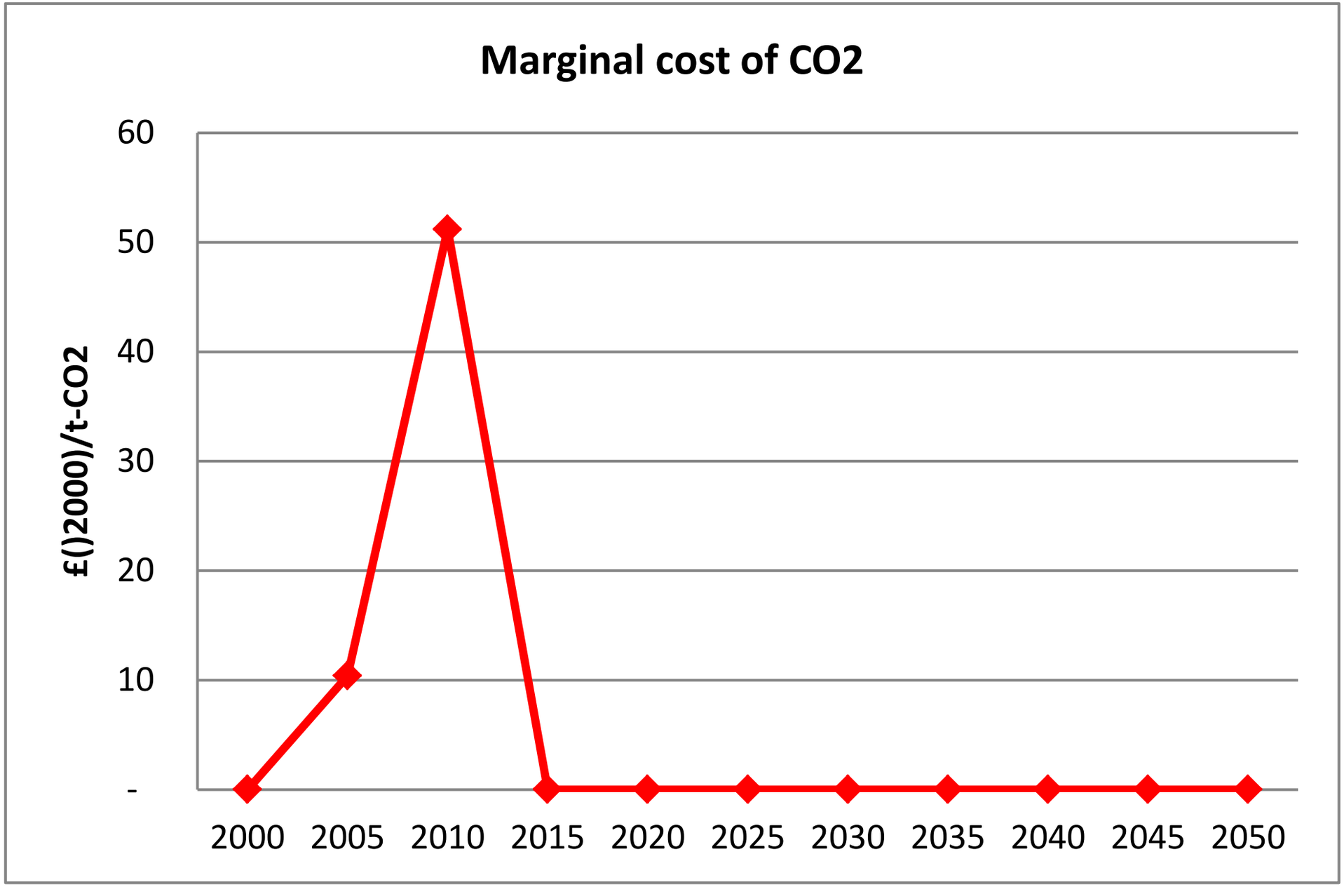

Final Energy demand by Sector
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
-
PJ
2000
2010
2020
2030
2040
2050
Non-energy use
Transport
Services
Residential
Industry
Agriculture

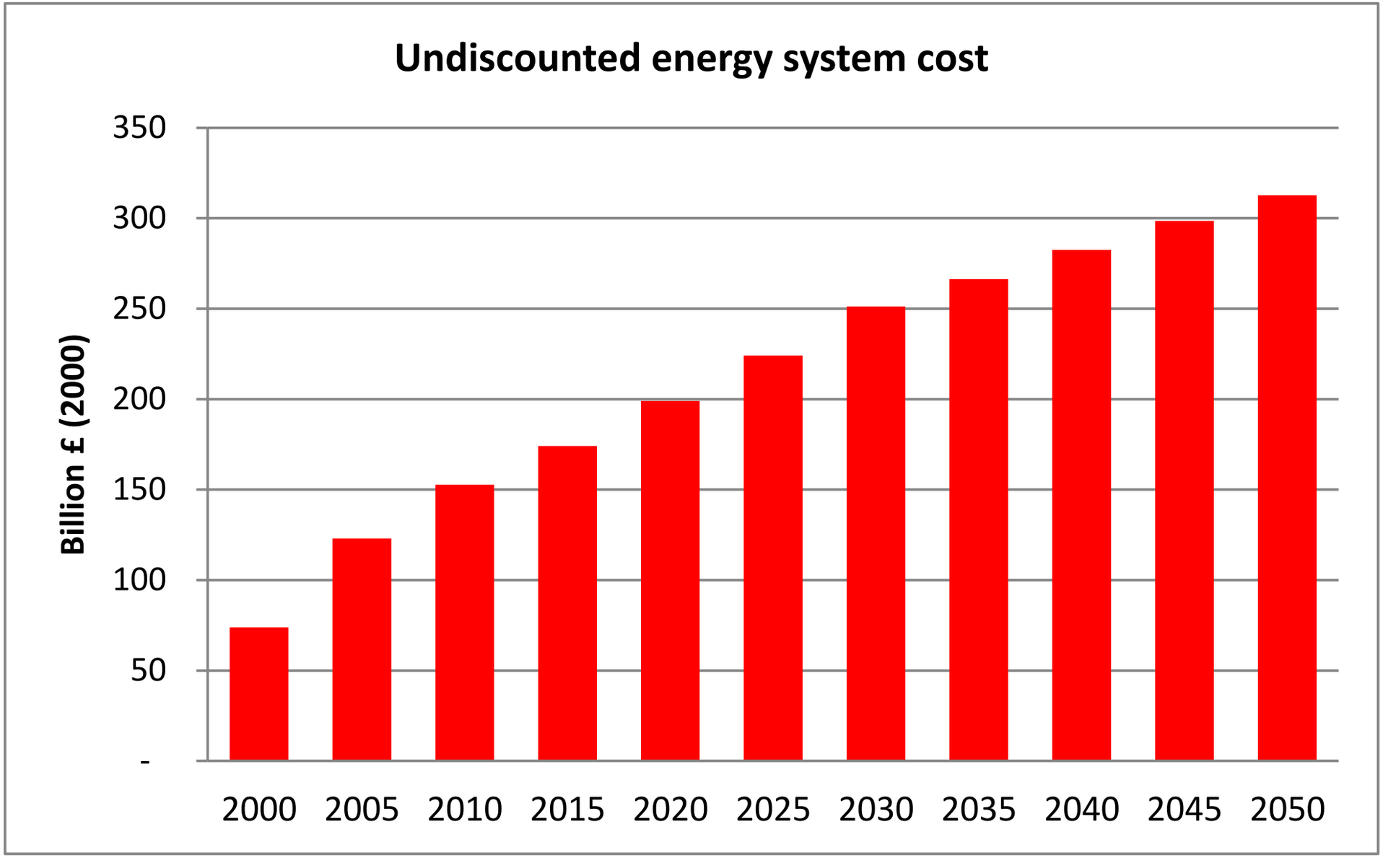

Use of conservation
PJ
350
300
250
200
150
100
50
-
2000
2005
2010
2015
2020
2025
2030
2035
2040
2045
2050
Industry
Service
Residential

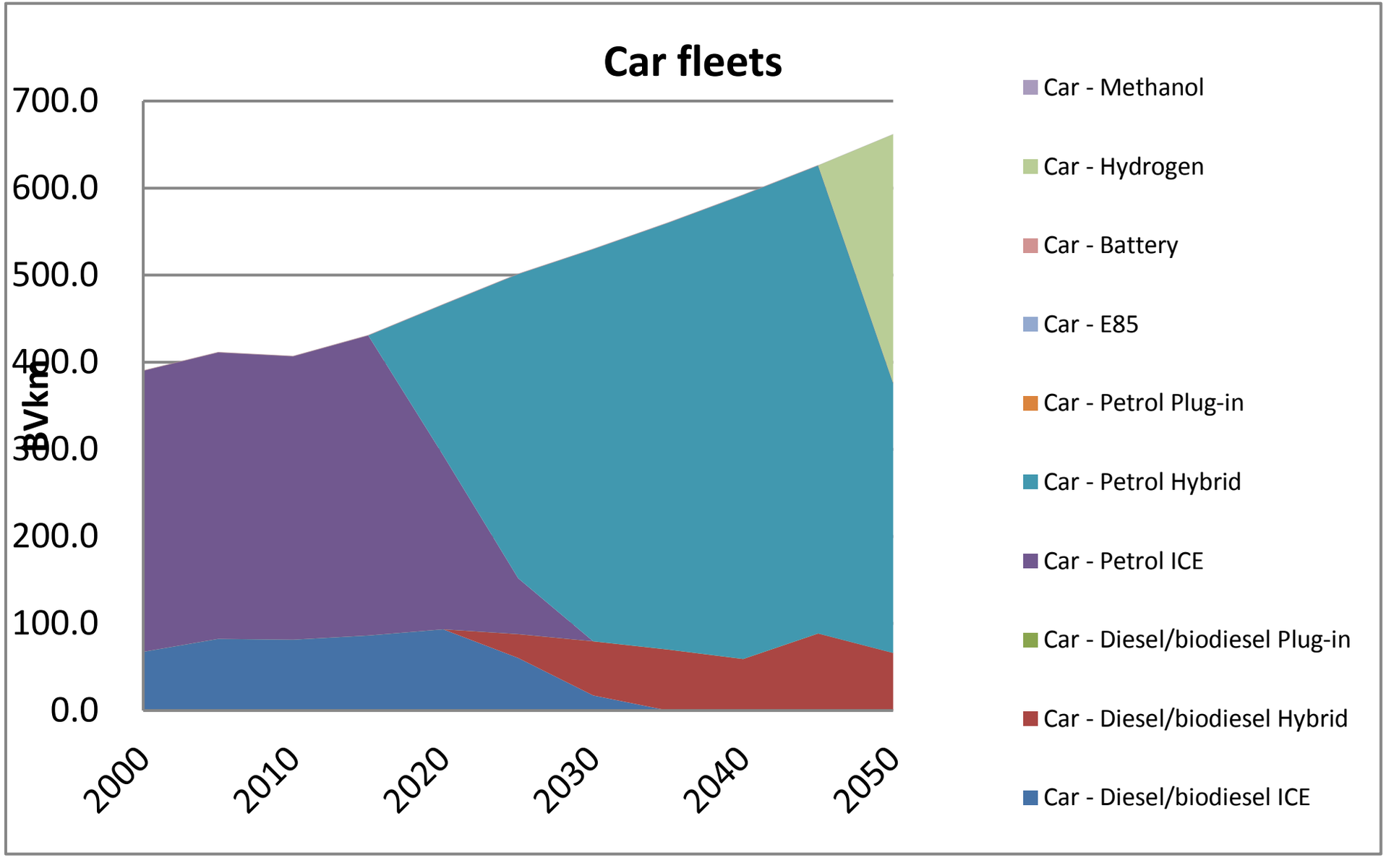

Electricity storage
PJ
80
70
60
50
40
30
20
10
-
2000
2005
2010
2015
2020
2025
2030
2035
2040
2045
2050
Pumped hydro
Hydrogen storage
Plug-in hybrid
Storage heaters

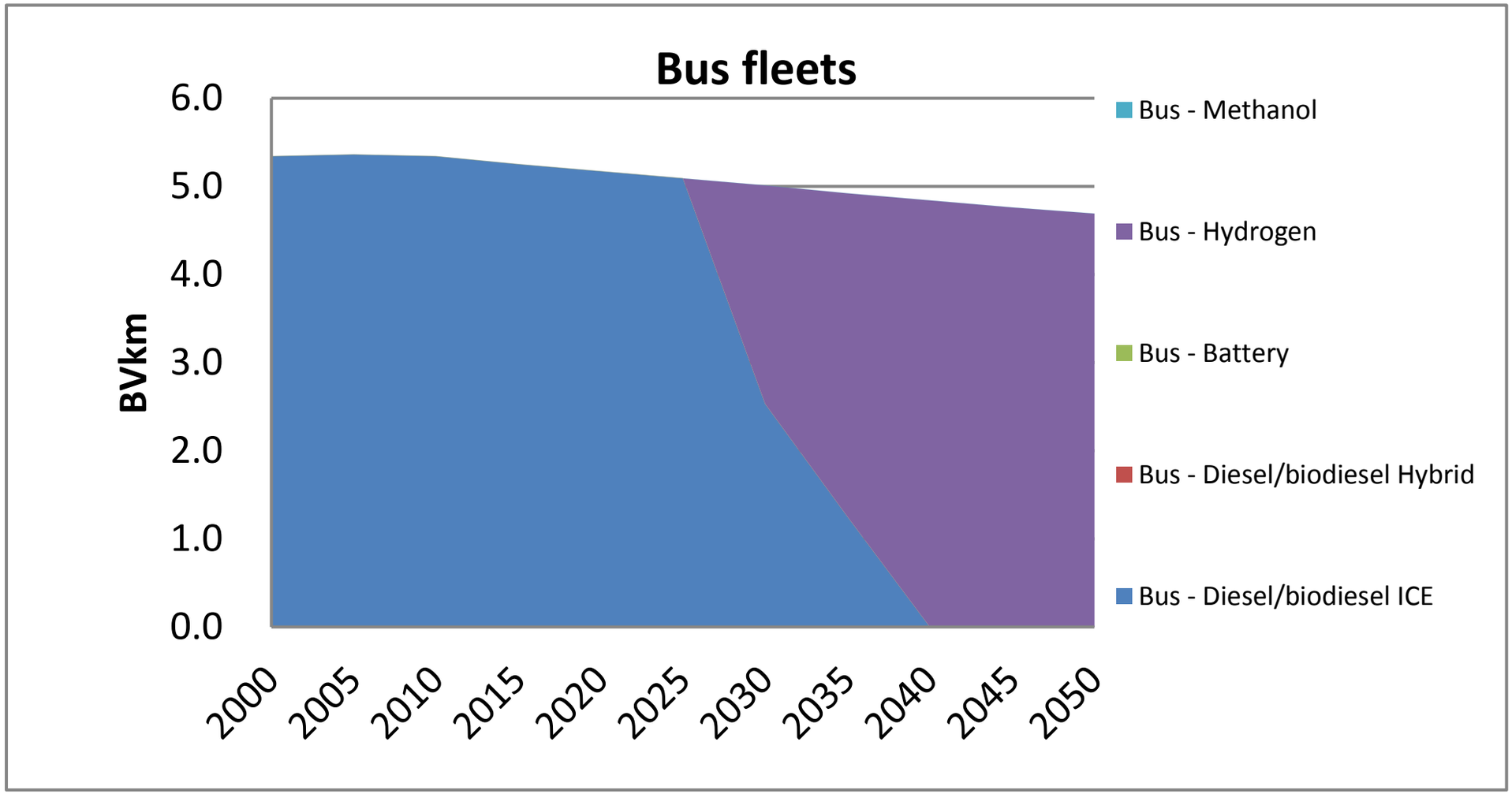

Sectoral Emissions
Mt-CO2
600
500
400
300
200
100
-
2000
2005
2010
2015
2020
2025
2030
2035
2040
2045
2050
Other Emissions
Transport
Services
Residential
Industry
Hydrogen
Electricity
Agriculture
Upstream

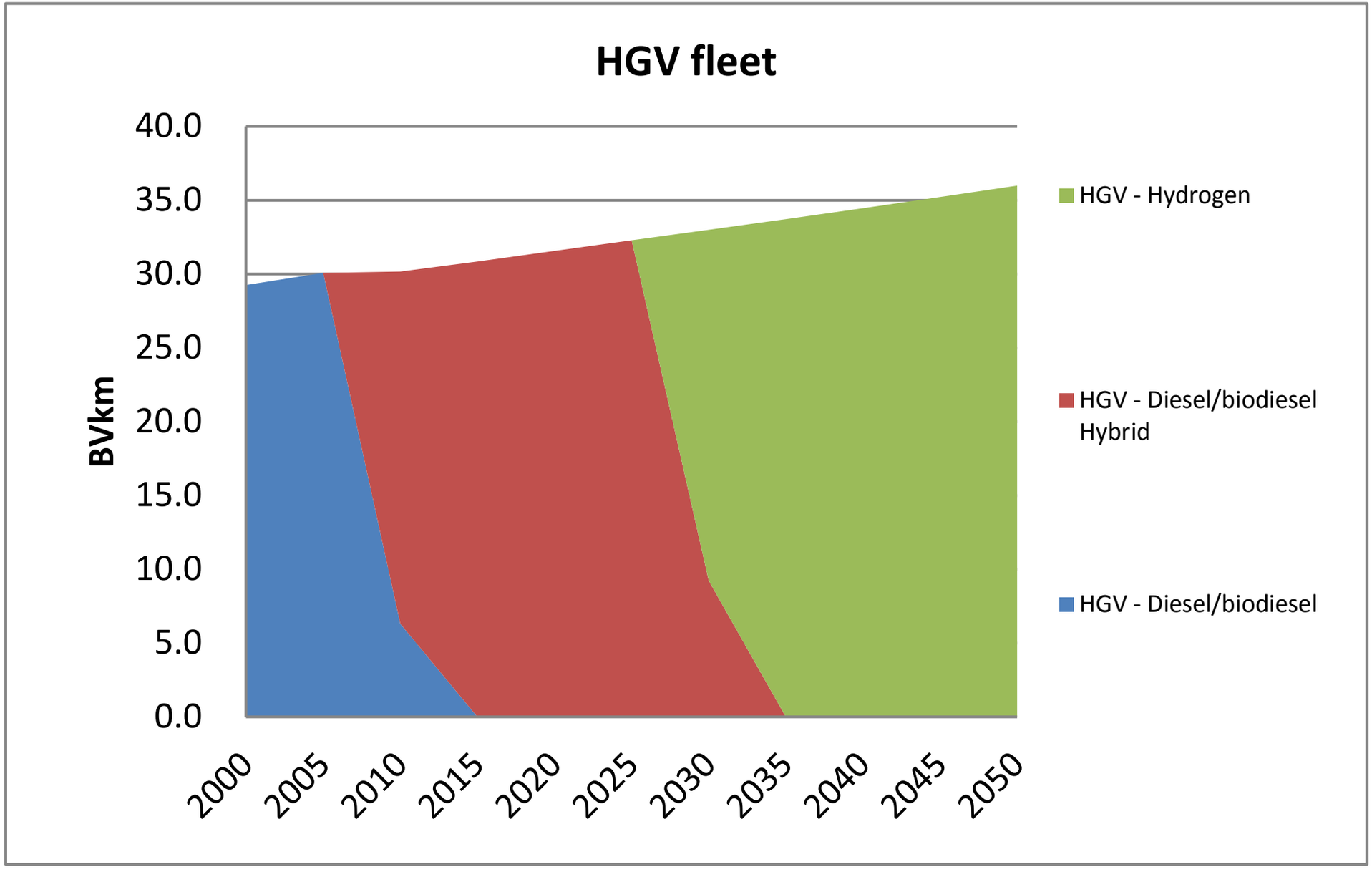

Enduse Sectoral Emissions
600.0
500.0
400.0
300.0
200.0
100.0
0.0
Mt-CO2
2000
2005
2010
2015
2020
2025
2030
2035
2040
2045
2050
Non-energy use
Transport
Services
Residential
Industry
Agriculture
Upstream

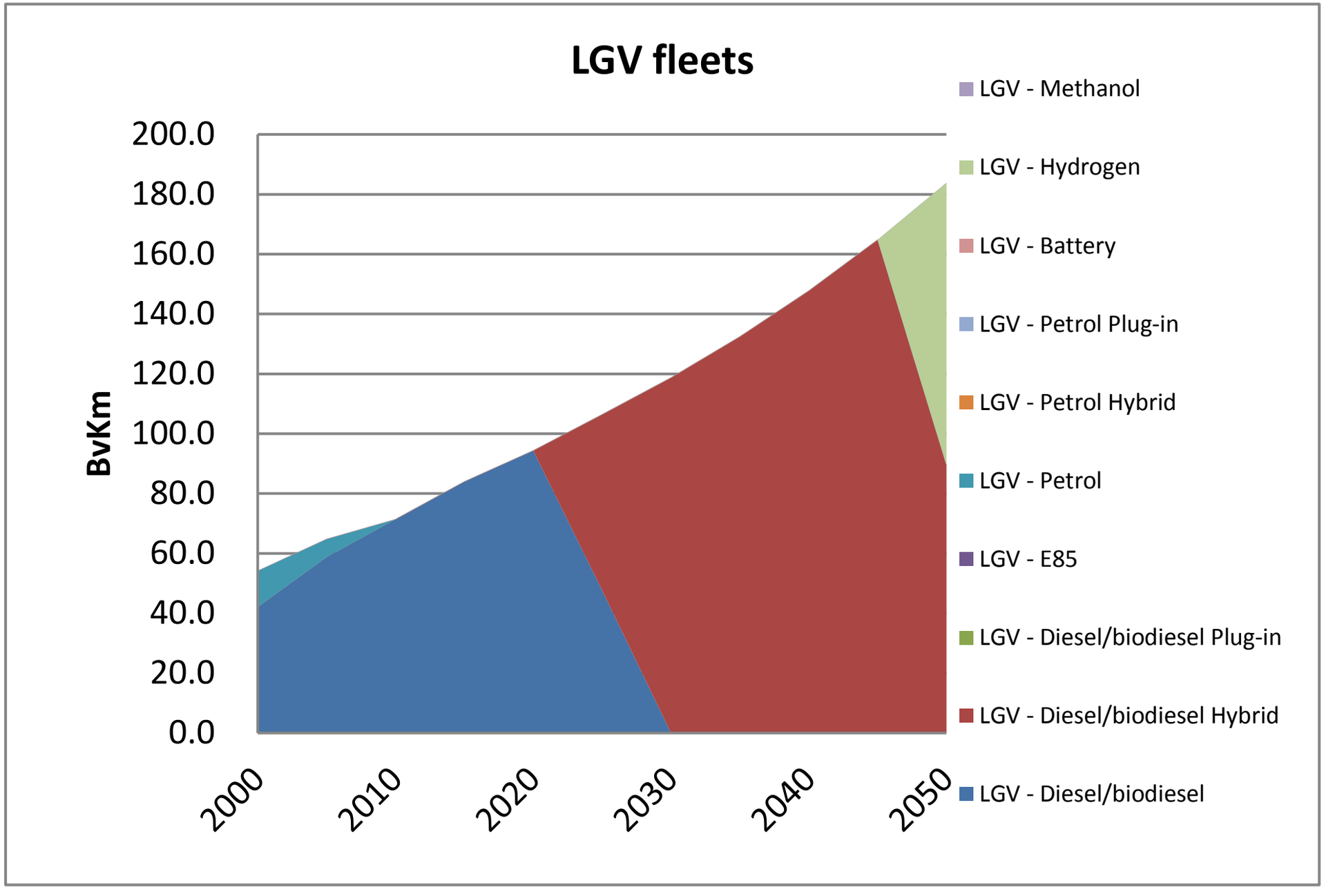

Marginal cost of CO2
£()2000)/t-CO2
60
50
40
30
20
10
-
2000
2005
2010
2015
2020
2025
2030
2035
2040
2045
2050

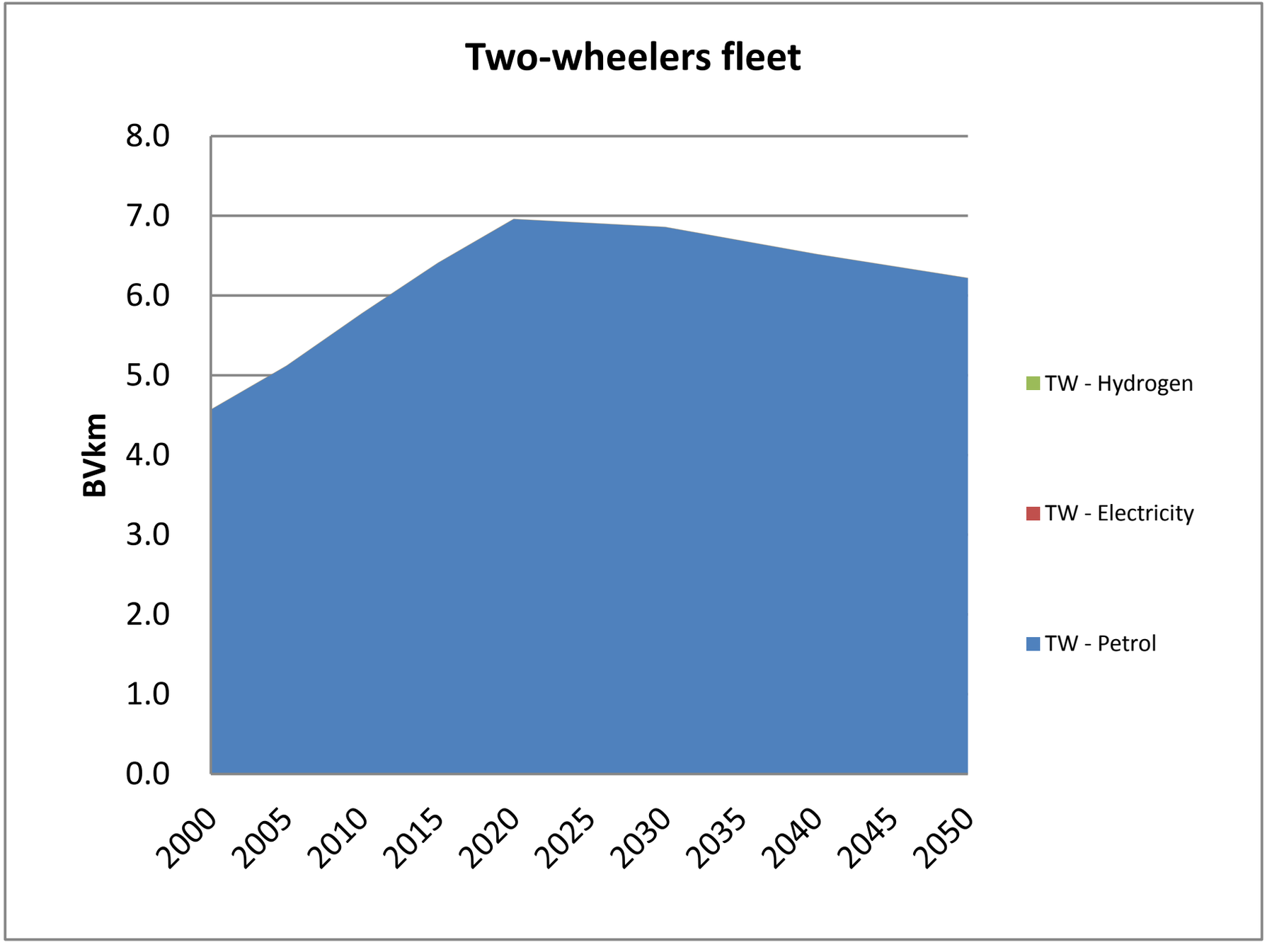

Undiscounted energy system cost
Billion £ (2000)
350
300
250
200
150
100
50
-
2000
2005
2010
2015
2020
2025
2030
2035
2040
2045
2050

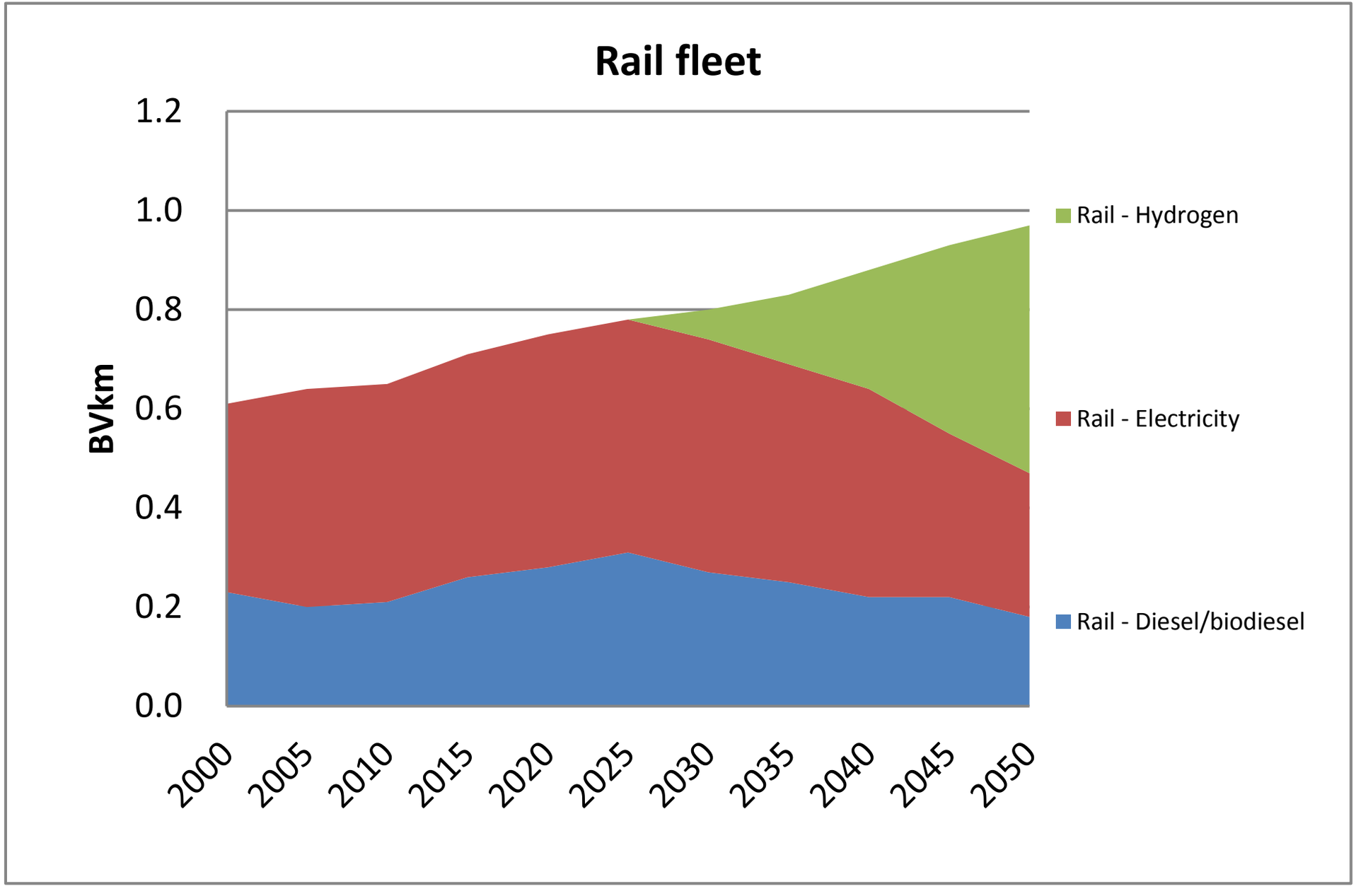

Car fleets
700.0
600.0
500.0
400.0
300.0
200.0
100.0
0.0
2000
2010
2020
2030
2040
2050
Car - Methanol
Car - Hydrogen
Car - Battery
Car - E85
Car - Petrol Plug-in
Car - Petrol Hybrid
Car - Petrol ICE
Car - Diesel/biodiesel Plug-in
Car - Diesel/biodiesel Hybrid
Car - Diesel/biodiesel ICE

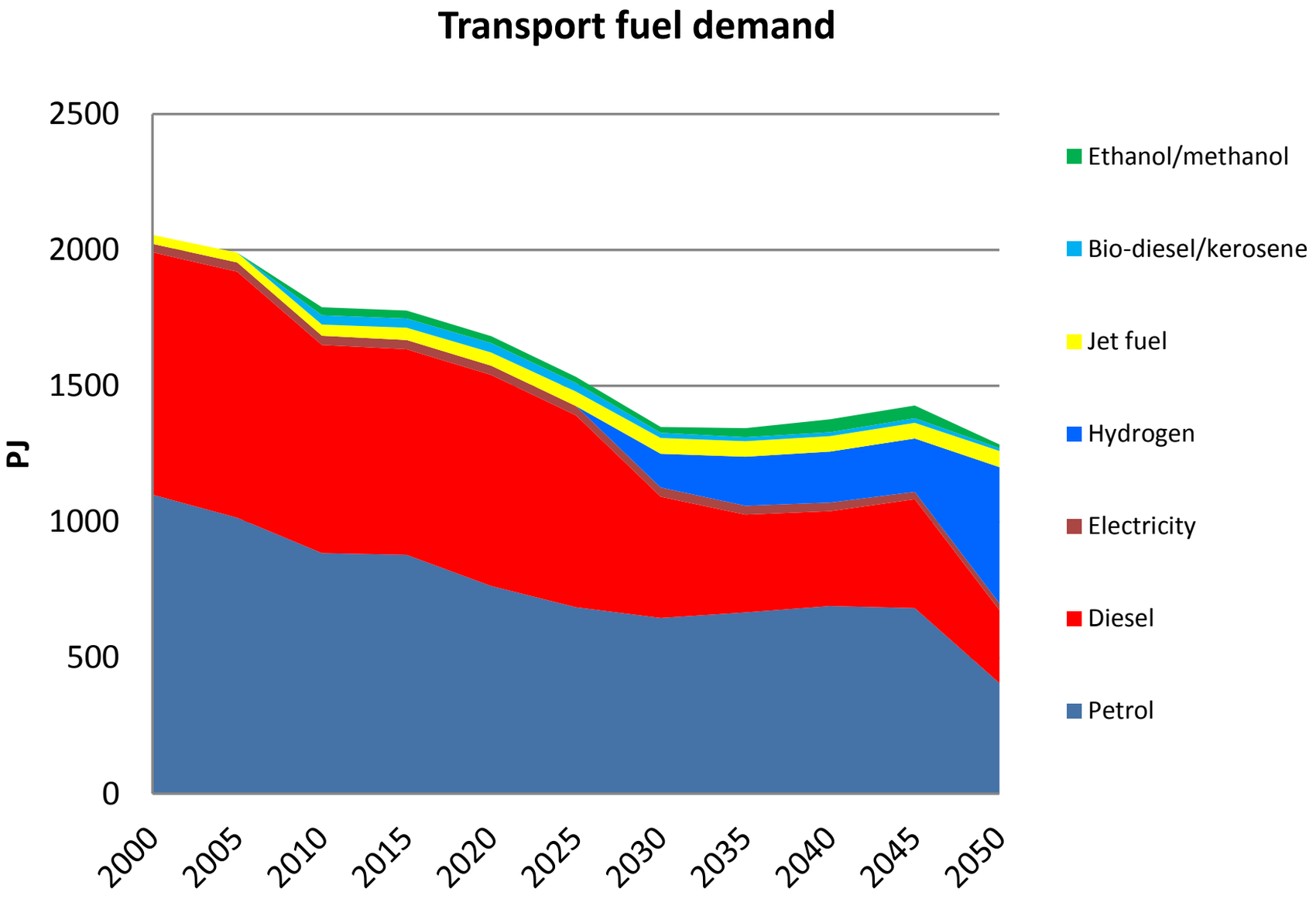

Bus fleets
BVkm
6.0
5.0
4.0
3.0
2.0
1.0
0.0
2000
2005
2010
2015
2020
2025
2030
2035
2040
2045
2050
Bus - Methanol
Bus - Hydrogen
Bus - Battery
Bus - Diesel/biodiesel Hybrid
Bus - Diesel/biodiesel ICE

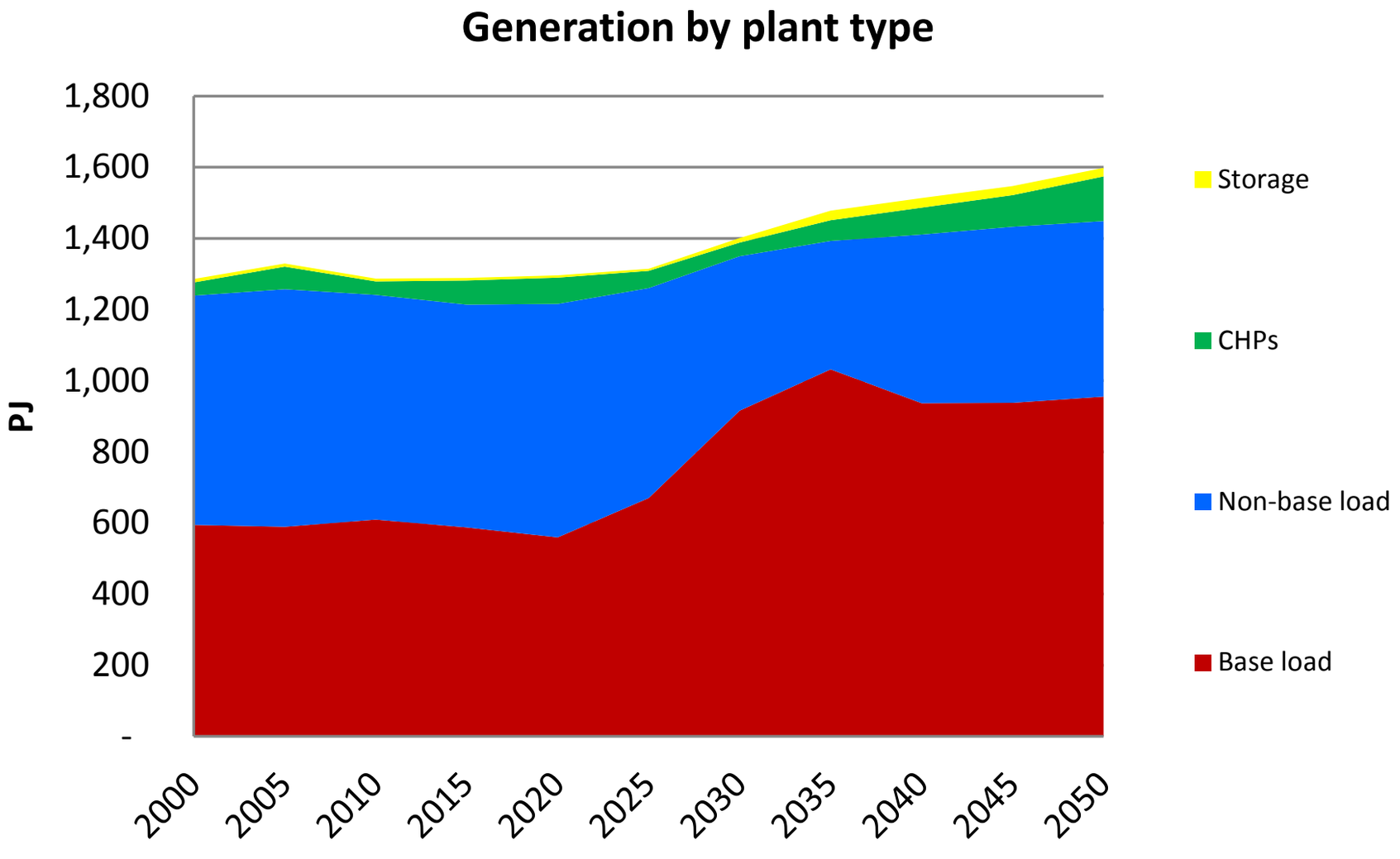

HGV fleet
BVkm
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
2000
2005
2010
2015
2020
2025
2030
2035
2040
2045
2050
HGV - Hydrogen
HGV - Diesel/biodiesel Hybrid
HGV - Diesel/biodiesel

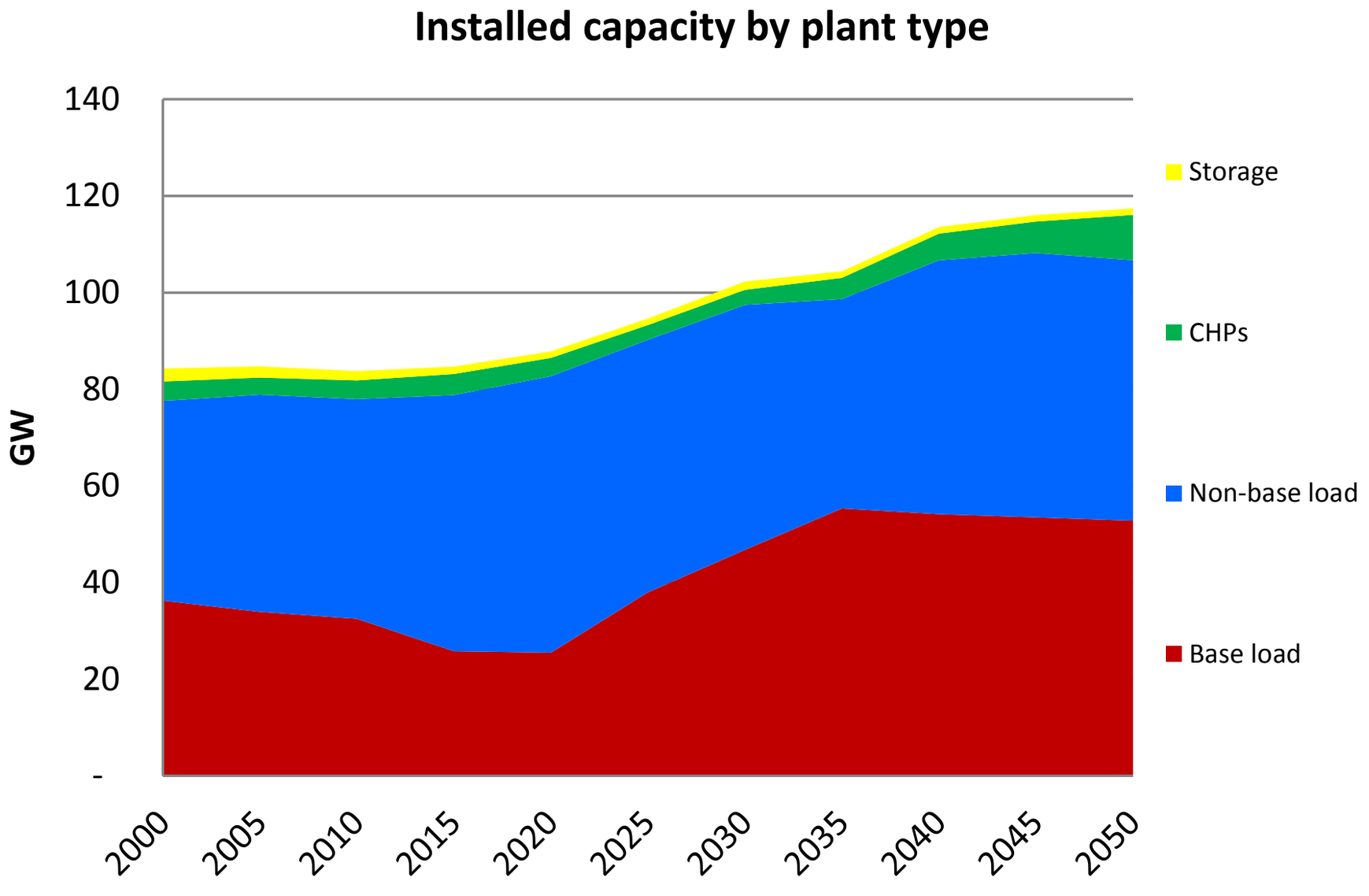

LGV fleets
BvKm
200.0
180.0
160.0
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
2000
2010
2020
2030
2040
2050
LGV - Methanol
LGV - Hydrogen
LGV - Battery
LGV - Petrol Plug-in
LGV - Petrol Hybrid
LGV - Petrol
LGV - E85
LGV - Diesel/biodiesel Plug-in
LGV - Diesel/biodiesel Hybrid
LGV - Diesel/biodiesel

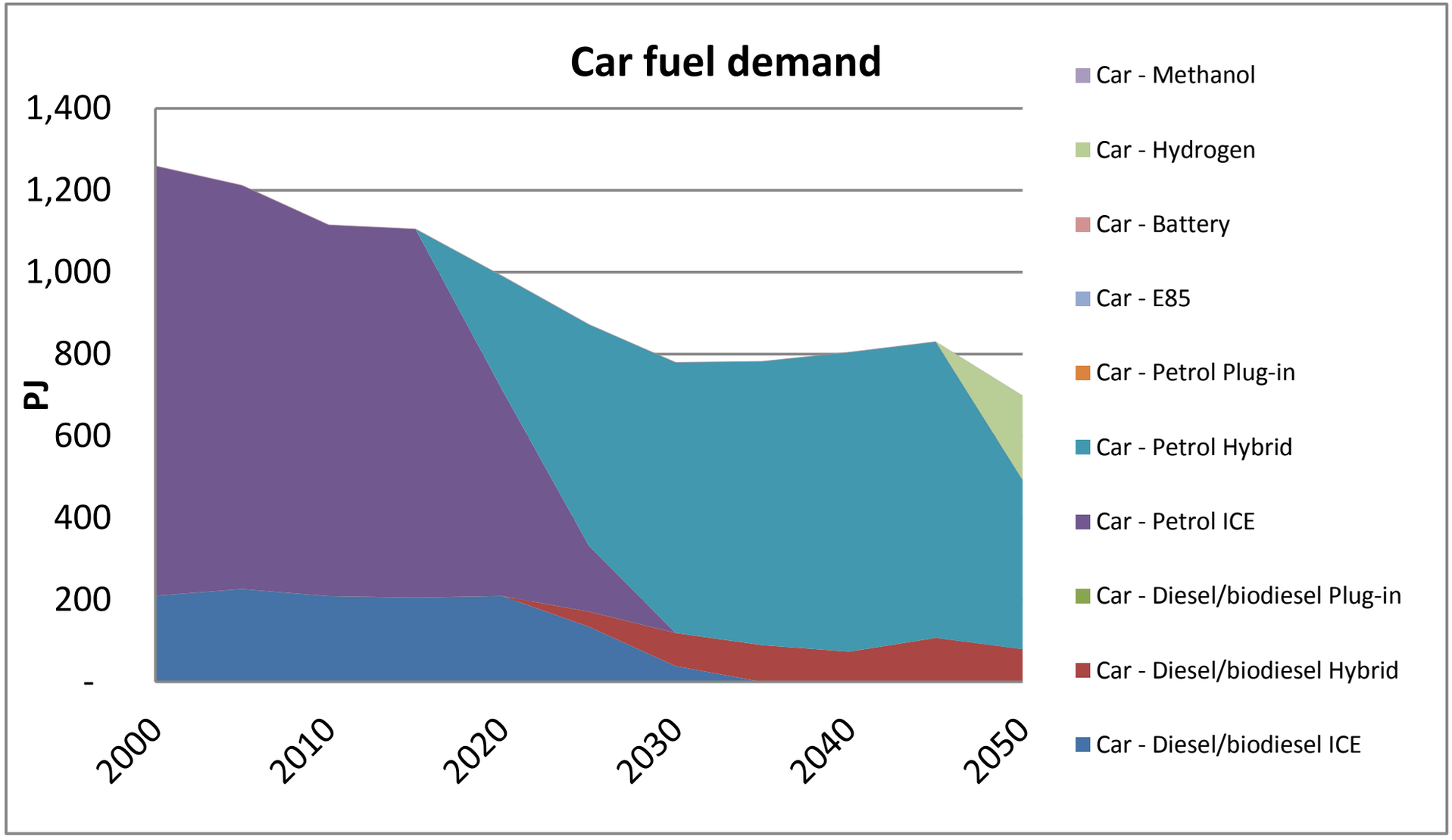

Two-wheelers fleet
BVkm
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
2000
2005
2010
2015
2020
2025
2030
2035
2040
2045
2050
TW - Hydrogen
TW - Electricity
TW - Petrol

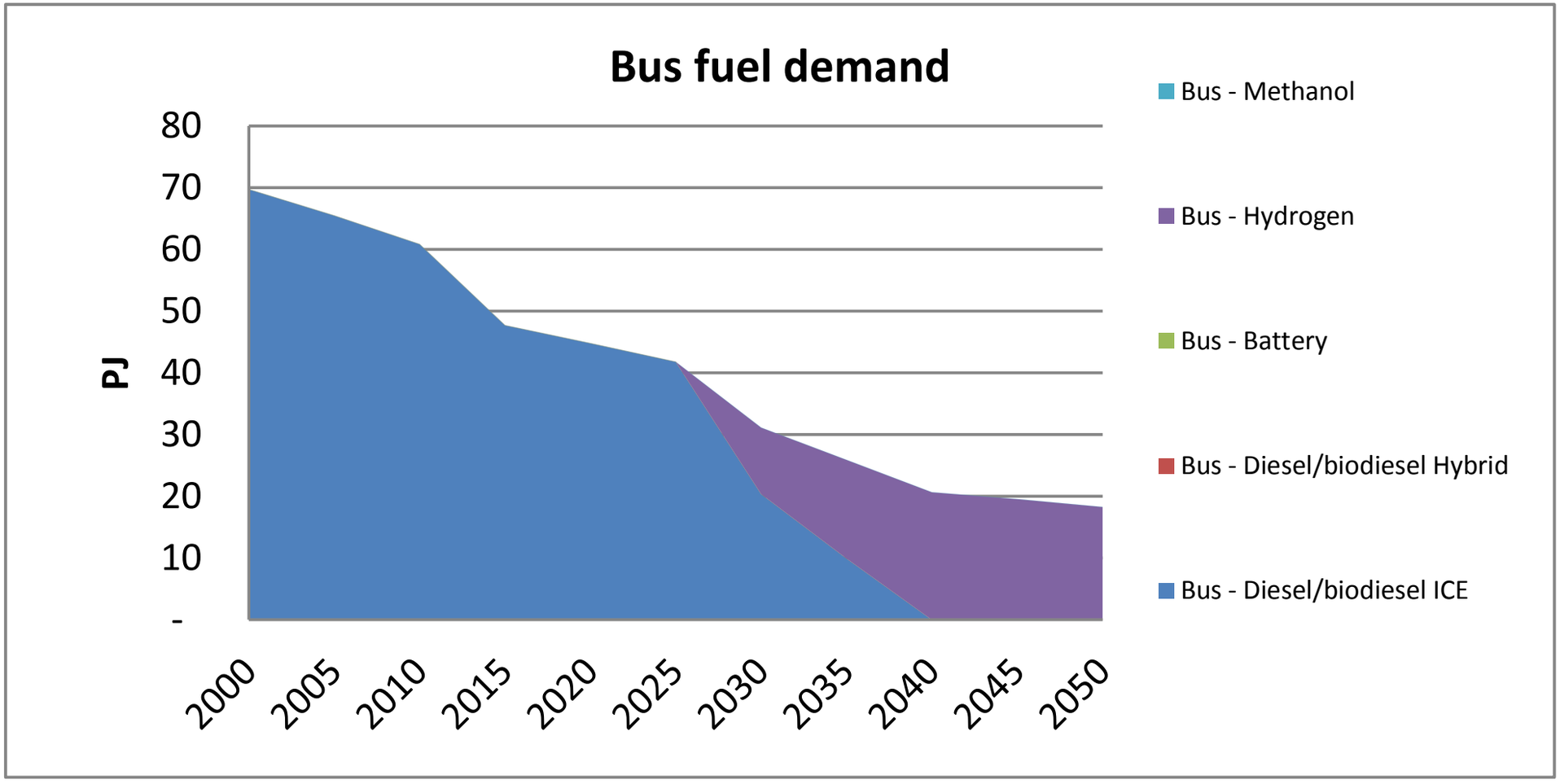

Rail fleet
BVkm
1.2
1.0
0.8
0.6
0.4
0.2
0.0
2000
2005
2010
2015
2020
2025
2030
2035
2040
2045
2050
Rail - Hydrogen
Rail - Electricity
Rail - Diesel/biodiesel

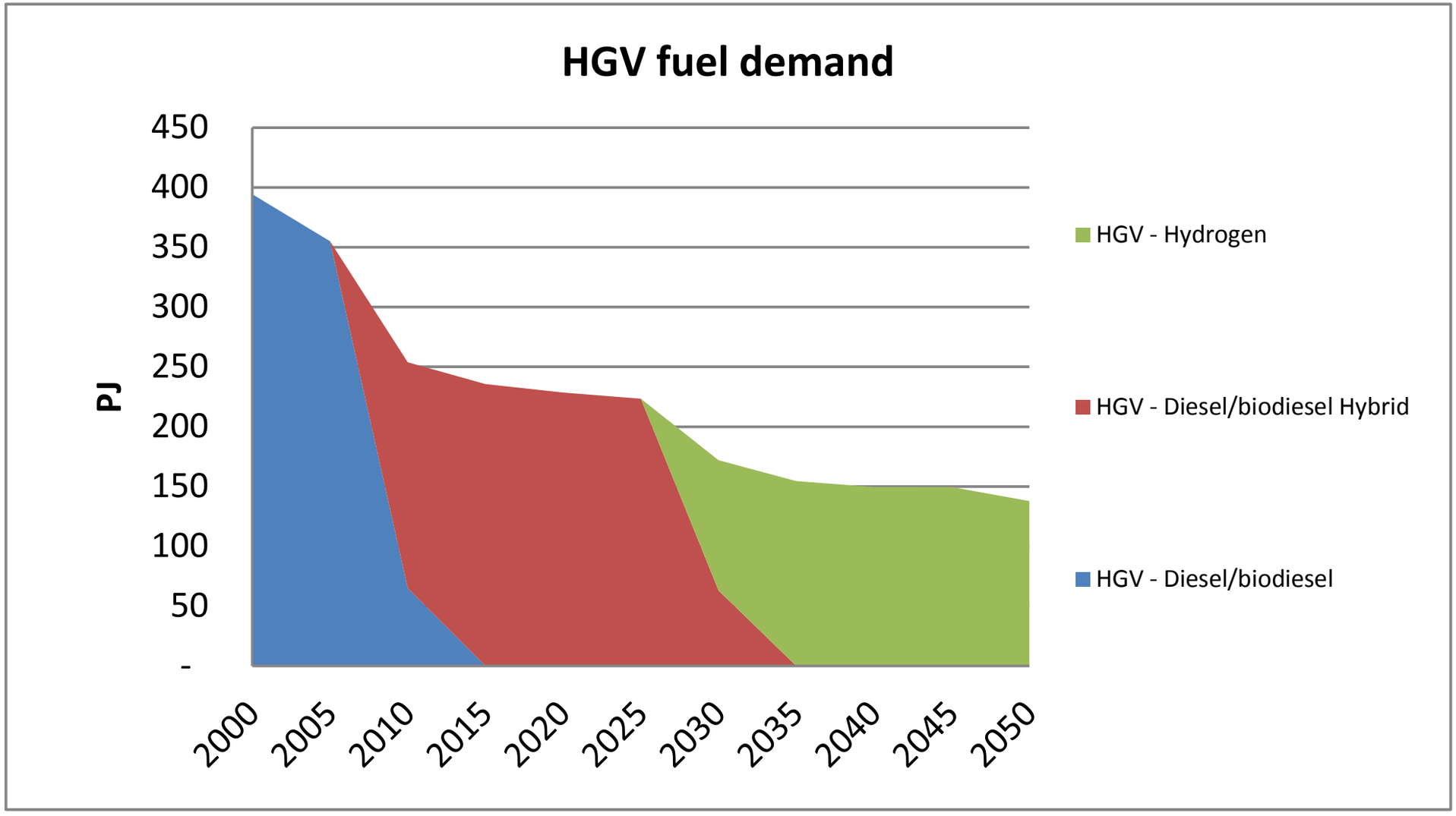

Transport fuel demand
PJ
2500
2000
1500
1000
500
0
2000
2005
2010
2015
2020
2025
2030
2035
2040
2045
2050
Ethanol/methanol
Bio-diesel/kerosene
Jet fuel
Hydrogen
Electricity
Diesel
Petrol

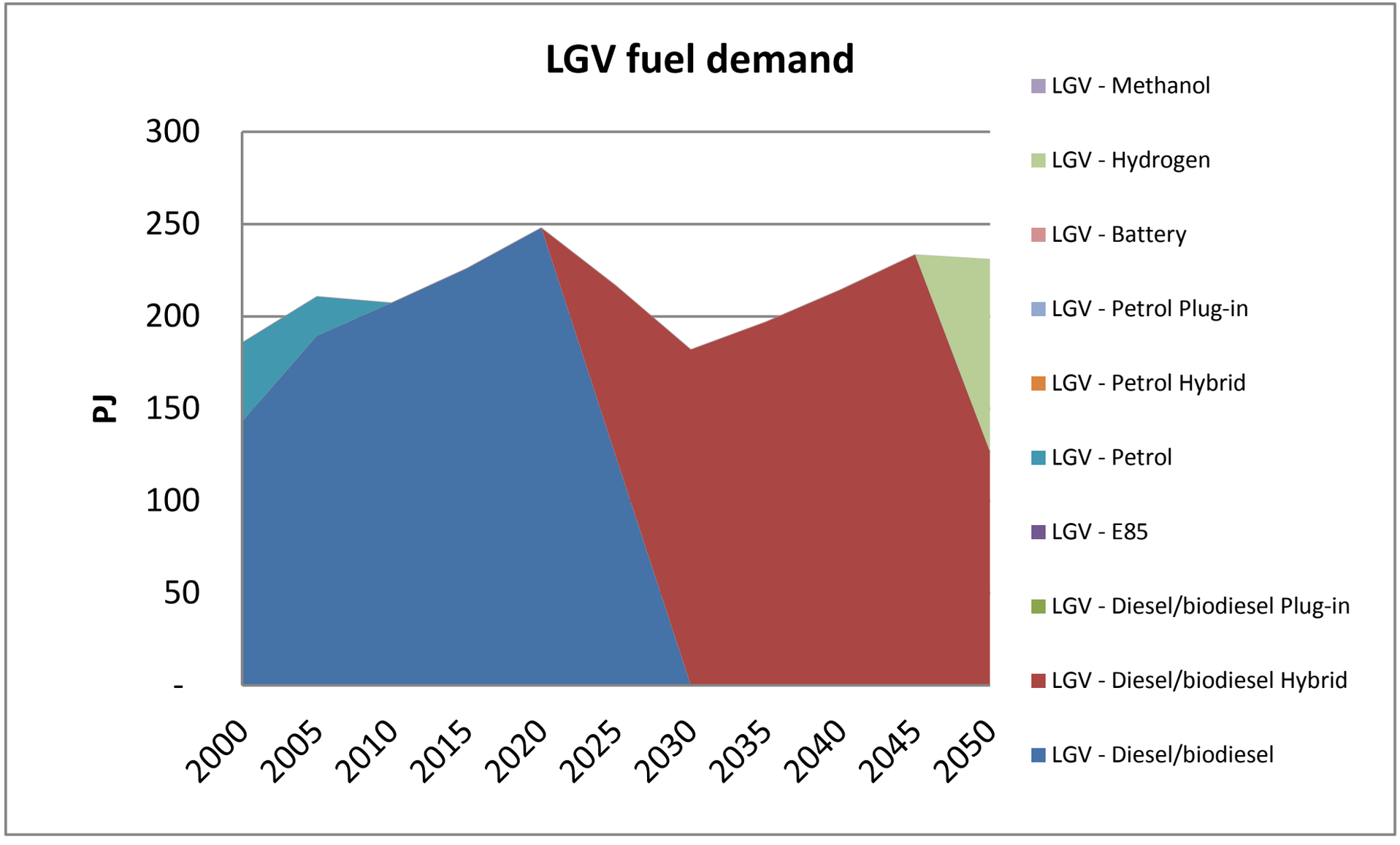

Generation by plant type
PJ
1,800
1,600
1,400
1,200
1,000
800
600
400
200
-
2000
2005
2010
2015
2020
2025
2030
2035
2040
2045
2050
Storage
CHPs
Non-base load
Base load

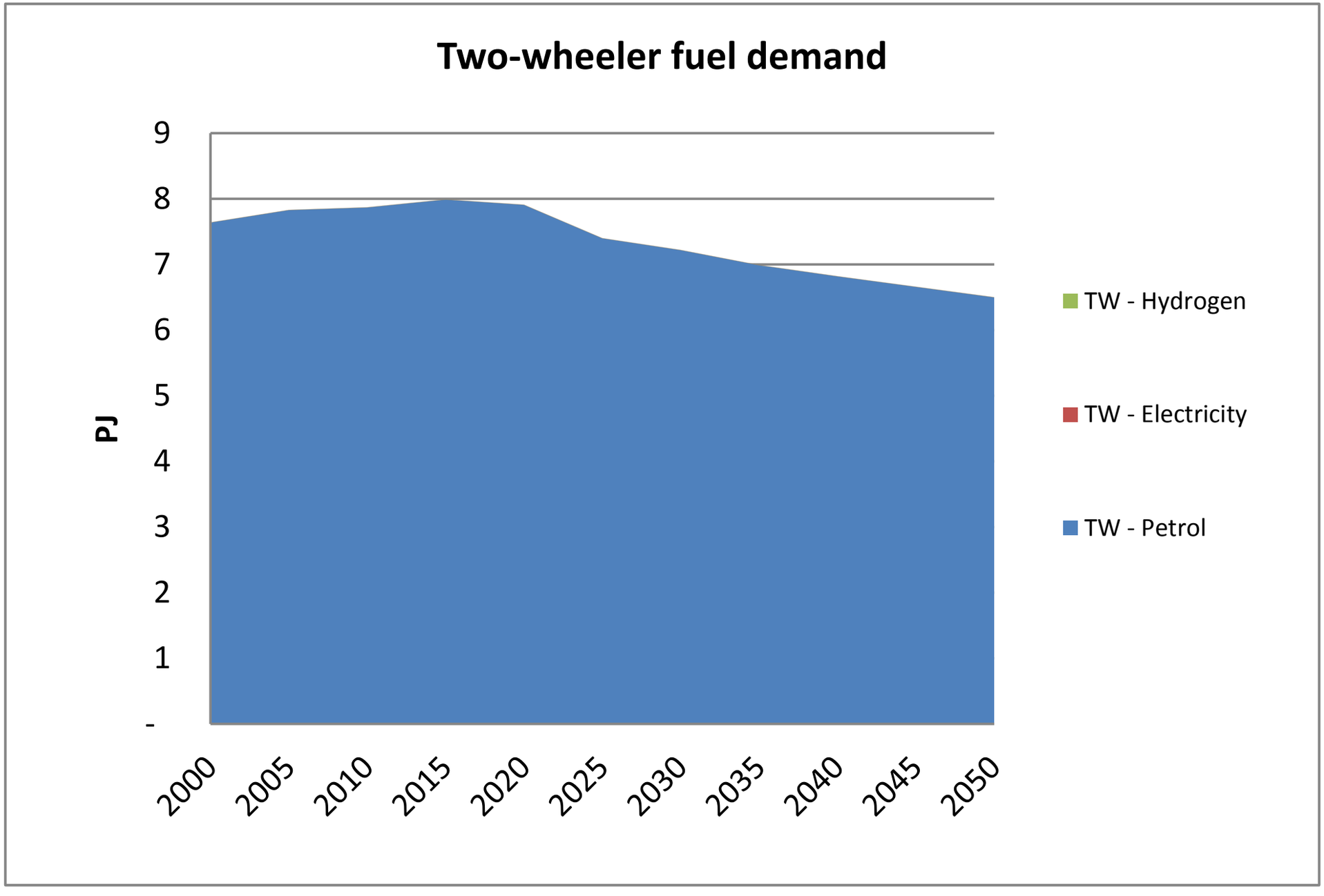

Installed capacity by plant type
GW
140
120
100
80
60
40
20
-
2000
2005
2010
2015
2020
2025
2030
2035
2040
2045
2050
Storage
CHPs
Non-base load
Base load

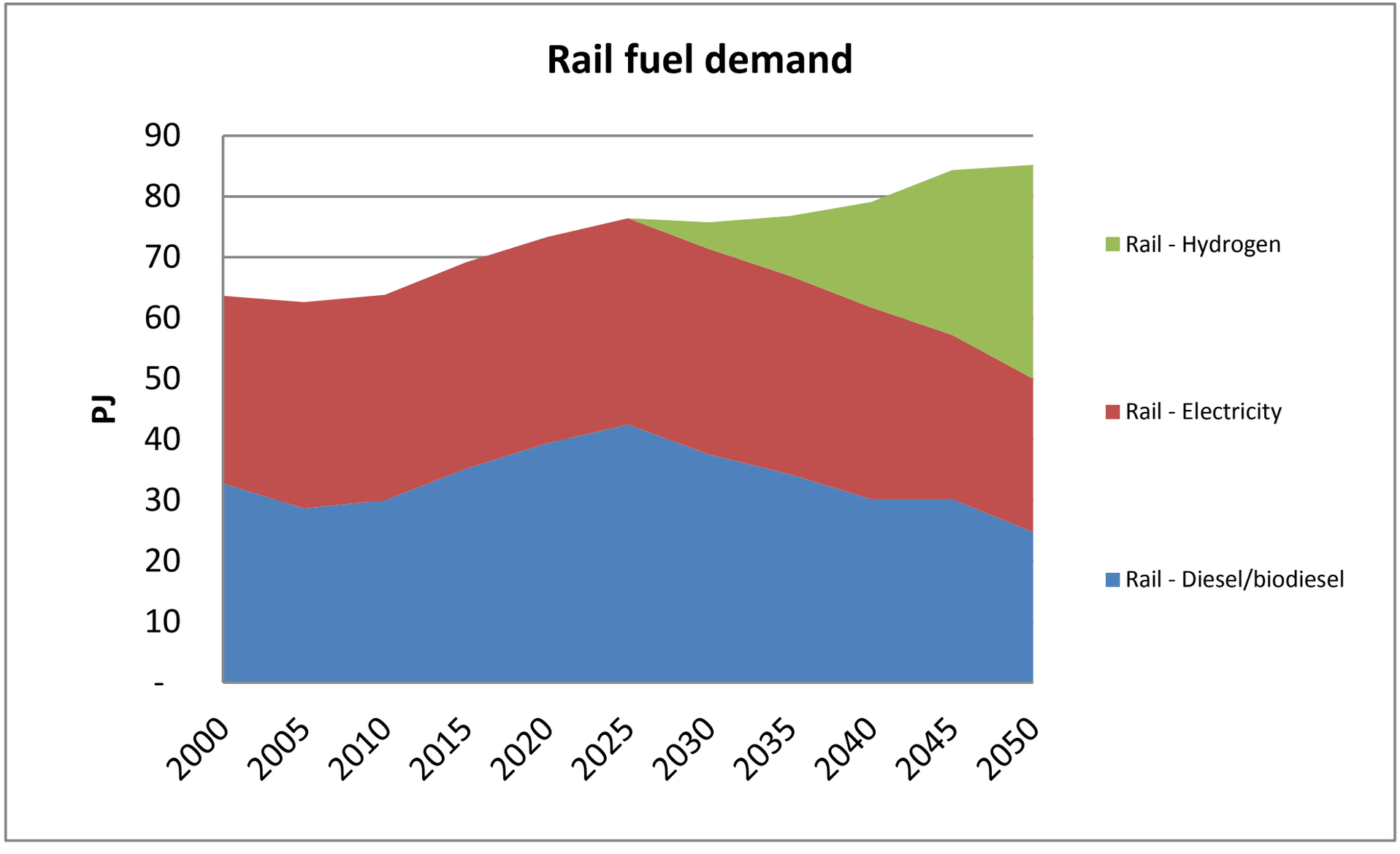

Car fuel demand
1,400
1,200
1,000
800
600
400
200
-
PJ
2000
2010
2020
2030
2040
2050
Car - Methanol
Car - Hydrogen
Car - Battery
Car - E85
Car - Petrol Plug-in
Car - Petrol Hybrid
Car - Petrol ICE
Car - Diesel/biodiesel Plug-in
Car - Diesel/biodiesel Hybrid
Car - Diesel/biodiesel ICE

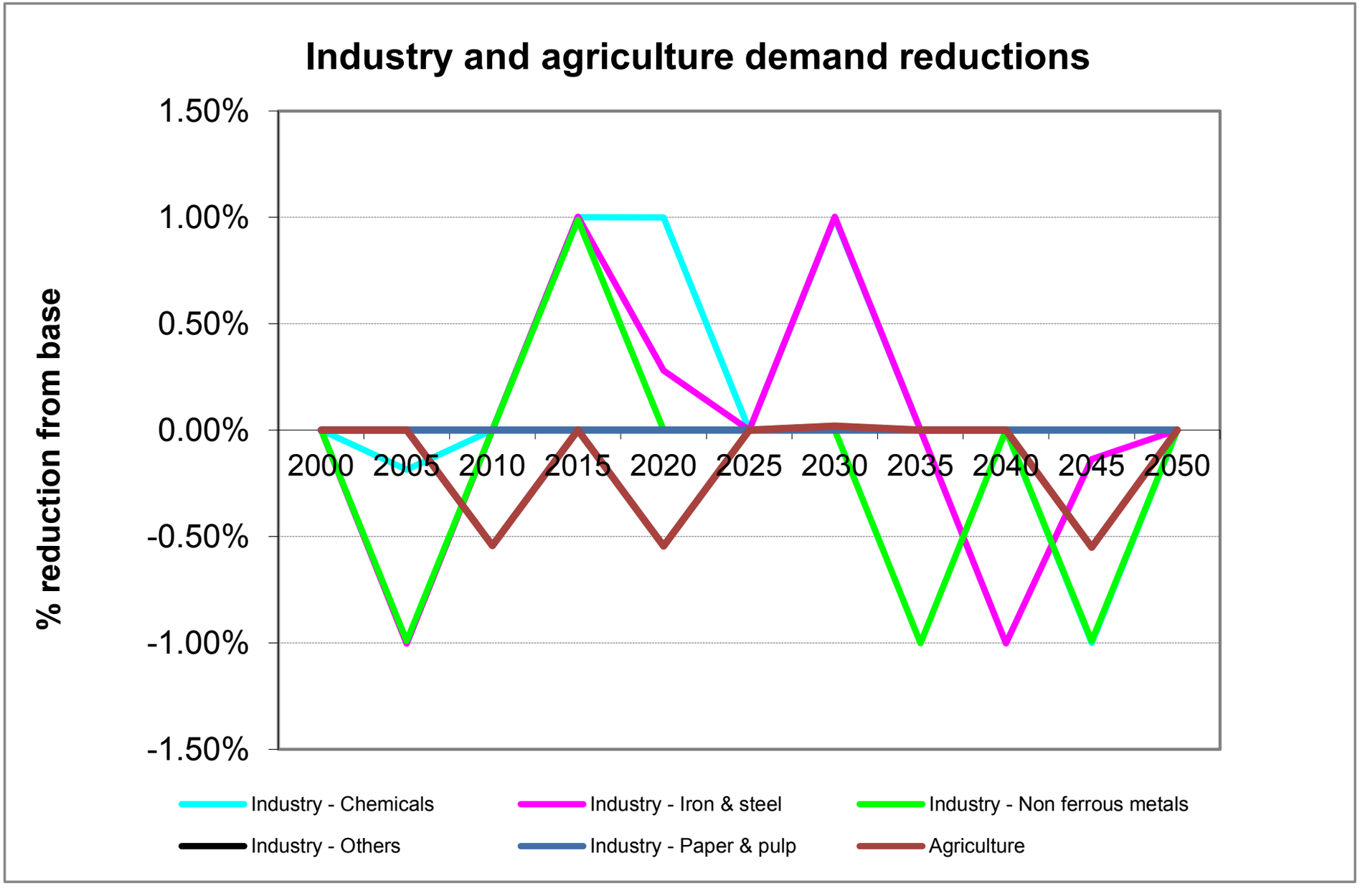

Bus fuel demand
PJ
80
70
60
50
40
30
20
10
-
2000
2005
2010
2015
2020
2025
2030
2035
2040
2045
2050
Bus - Methanol
Bus - Hydrogen
Bus - Battery
Bus - Diesel/biodiesel Hybrid
Bus - Diesel/biodiesel ICE

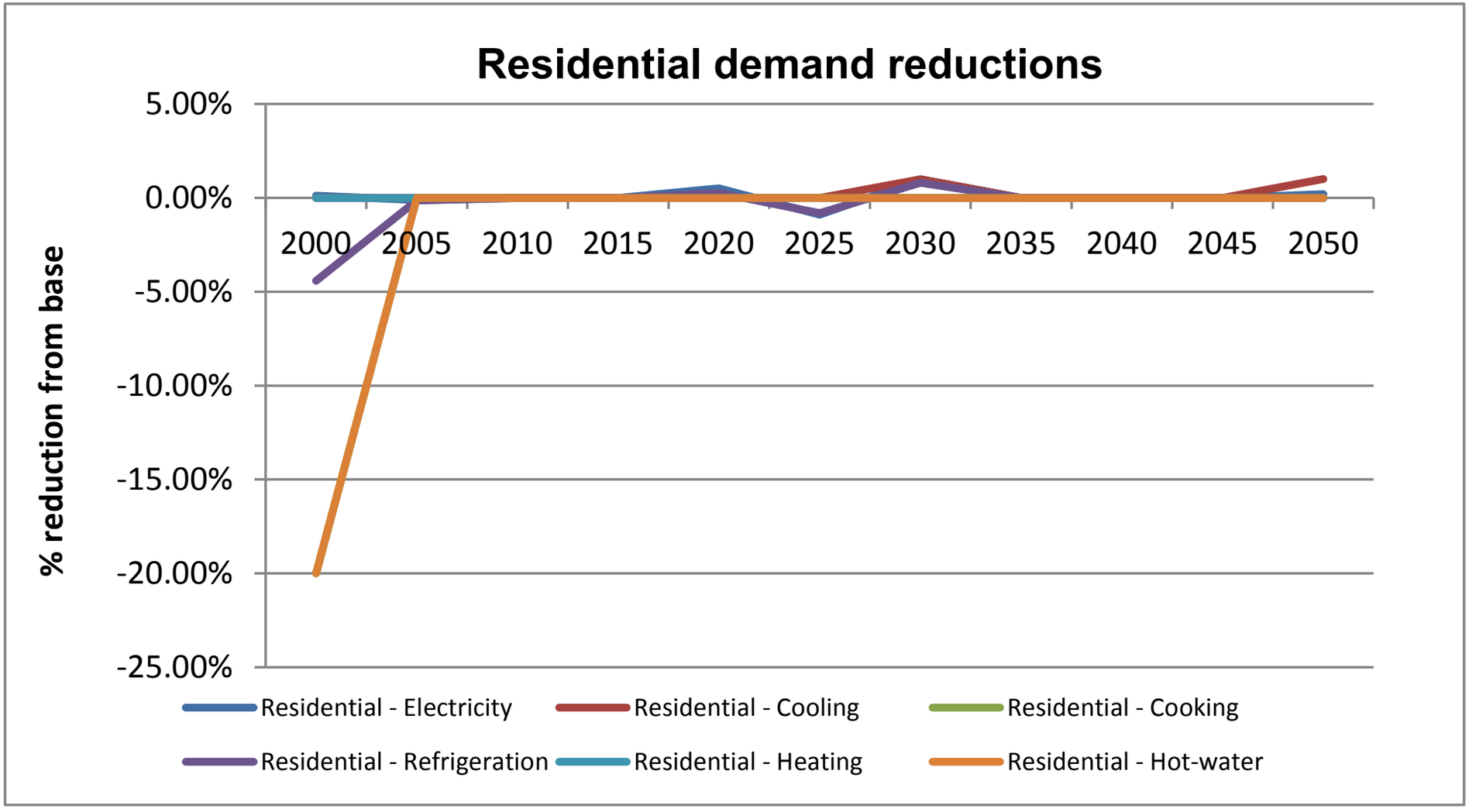

HGV fuel demand
PJ
450
400
350
300
250
200
150
100
50
-
2000
2005
2010
2015
2020
2025
2030
2035
2040
2045
2050
HGV - Hydrogen
HGV - Diesel/biodiesel Hybrid
HGV - Diesel/biodiesel

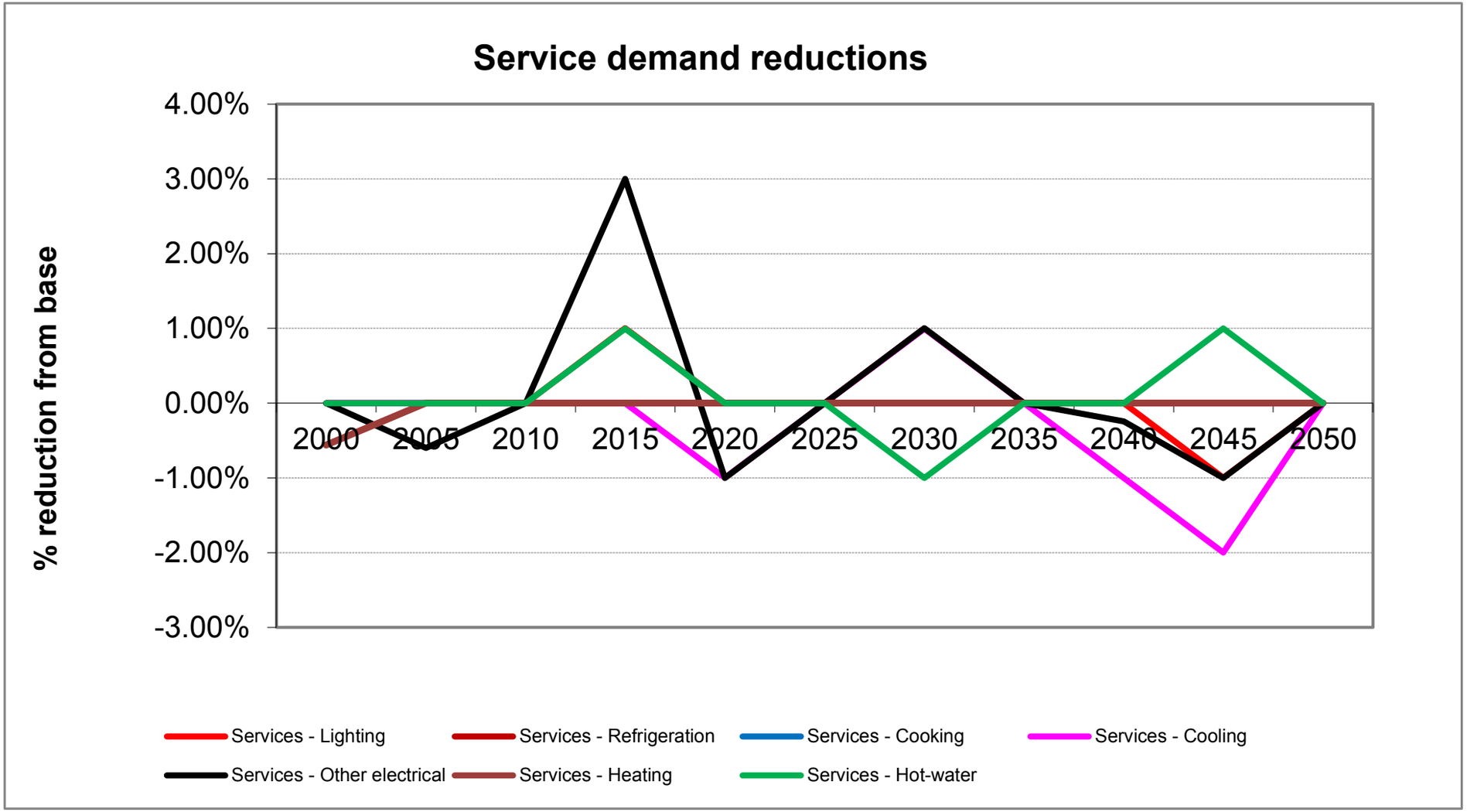

LGV fuel demand
PJ
300
250
200
150
100
50
-
2000
2005
2010
2015
2020
2025
2030
2035
2040
2045
2050
LGV - Methanol
LGV - Hydrogen
LGV - Battery
LGV - Petrol Plug-in
LGV - Petrol Hybrid
LGV - Petrol
LGV - E85
LGV - Diesel/biodiesel Plug-in
LGV - Diesel/biodiesel Hybrid
LGV - Diesel/biodiesel

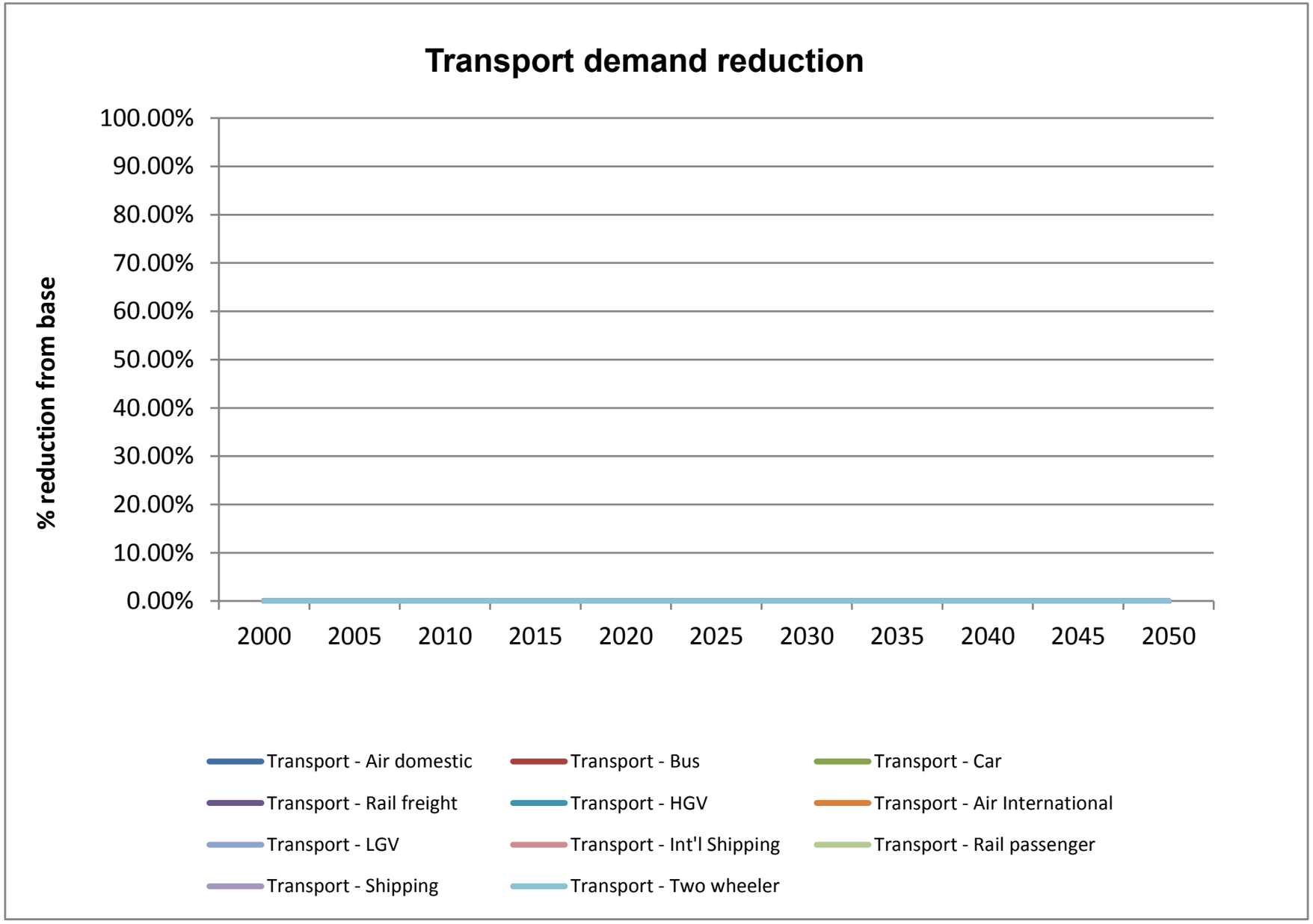

Two-wheeler fuel demand
PJ
9
8
7
6
5
4
3
2
1
-
2000
2005
2010
2015
2020
2025
2030
2035
2040
2045
2050
TW - Hydrogen
TW - Electricity
TW - Petrol

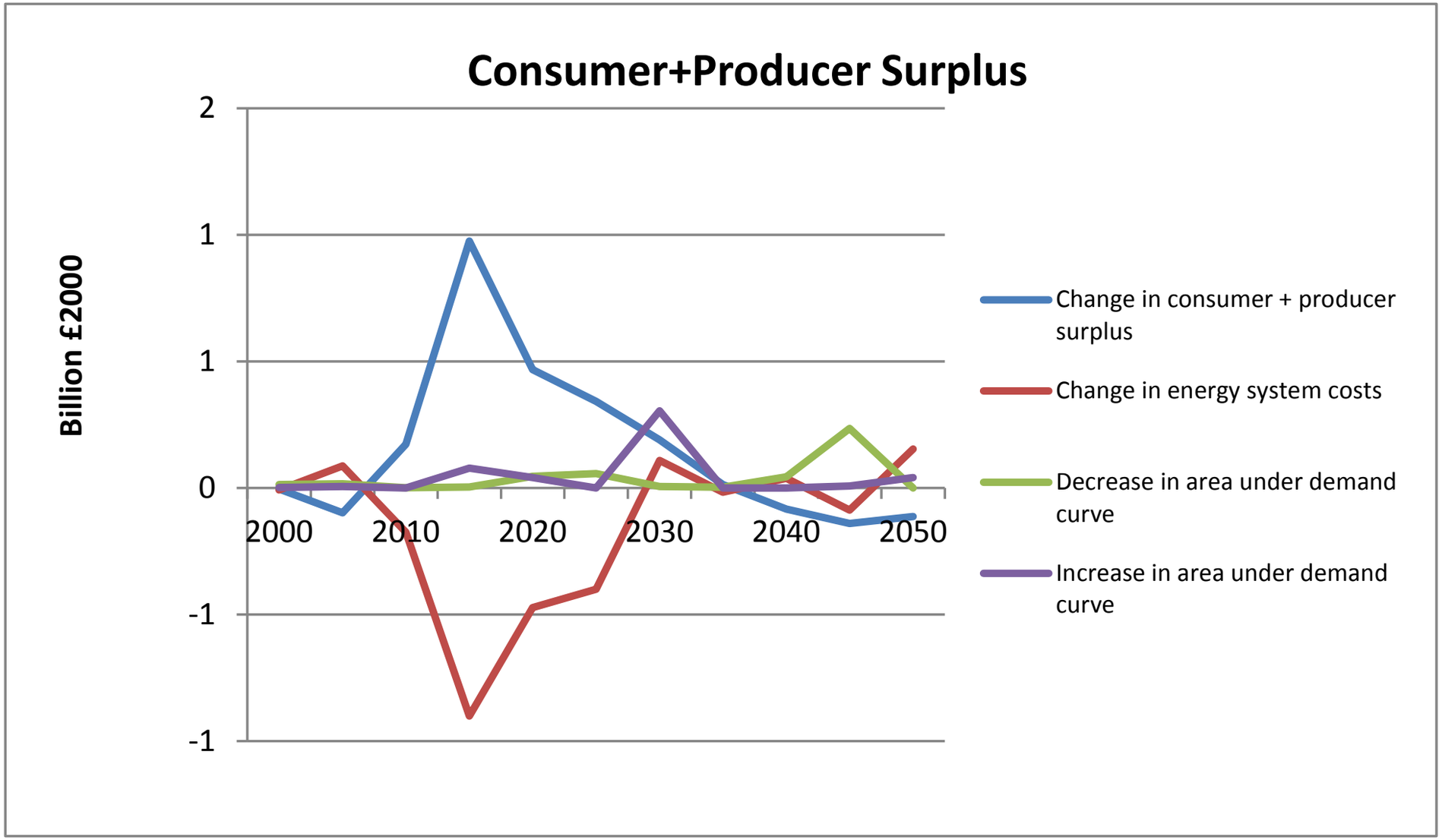

Rail fuel demand
PJ
90
80
70
60
50
40
30
20
10
-
2000
2005
2010
2015
2020
2025
2030
2035
2040
2045
2050
Rail - Hydrogen
Rail - Electricity
Rail - Diesel/biodiesel

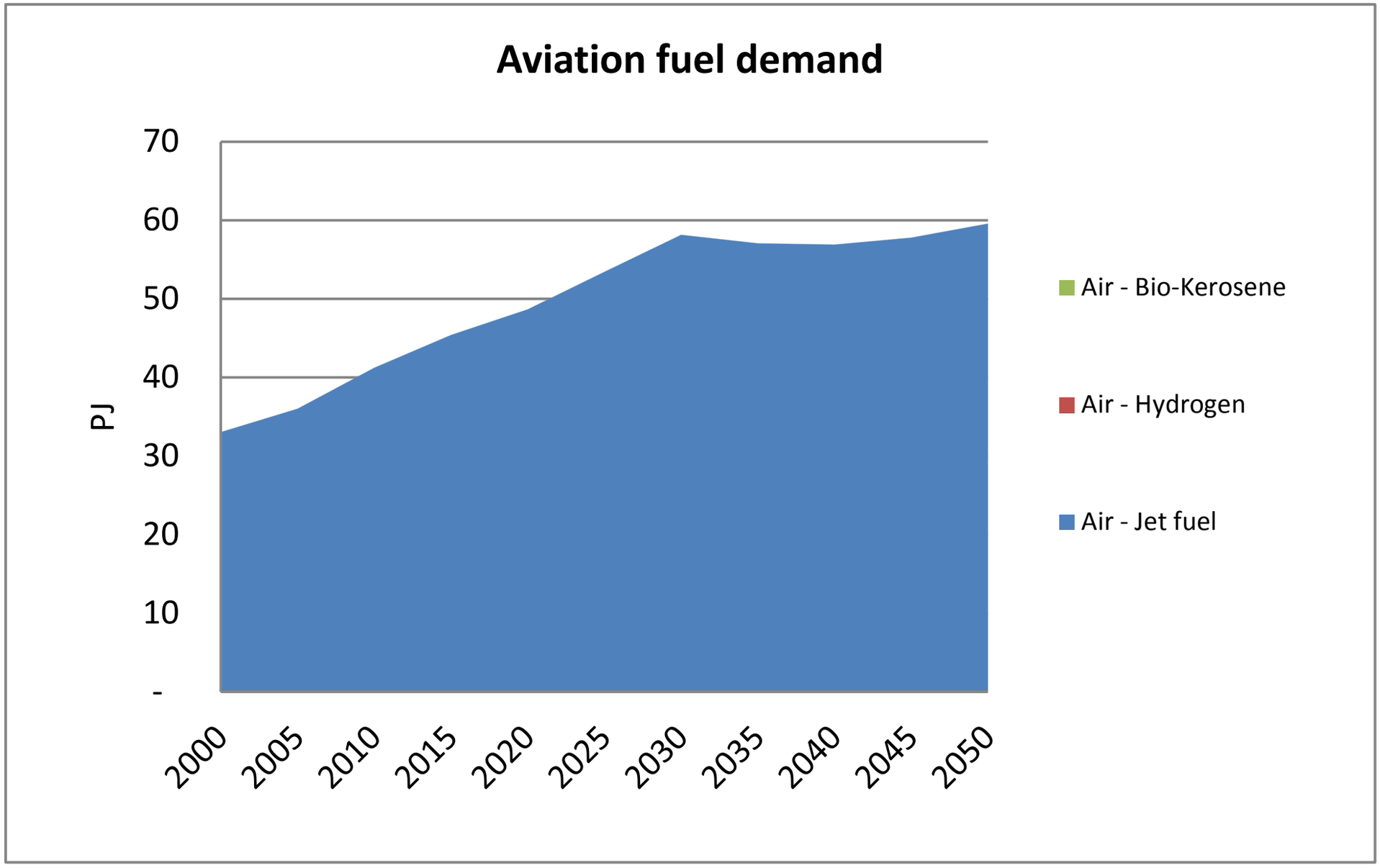

Industry and agriculture demand reductions
% reduction from base
1.50%
1.00%
0.50%
0.00%
-0.50%
-1.00%
-1.50%
2000
2005
2010
2015
2020
2025
2030
2035
2040
2045
2050
Industry - Chemicals
Industry - Iron & steel
Industry - Non ferrous metals
Industry - Others
Industry - Paper & pulp
Agriculture

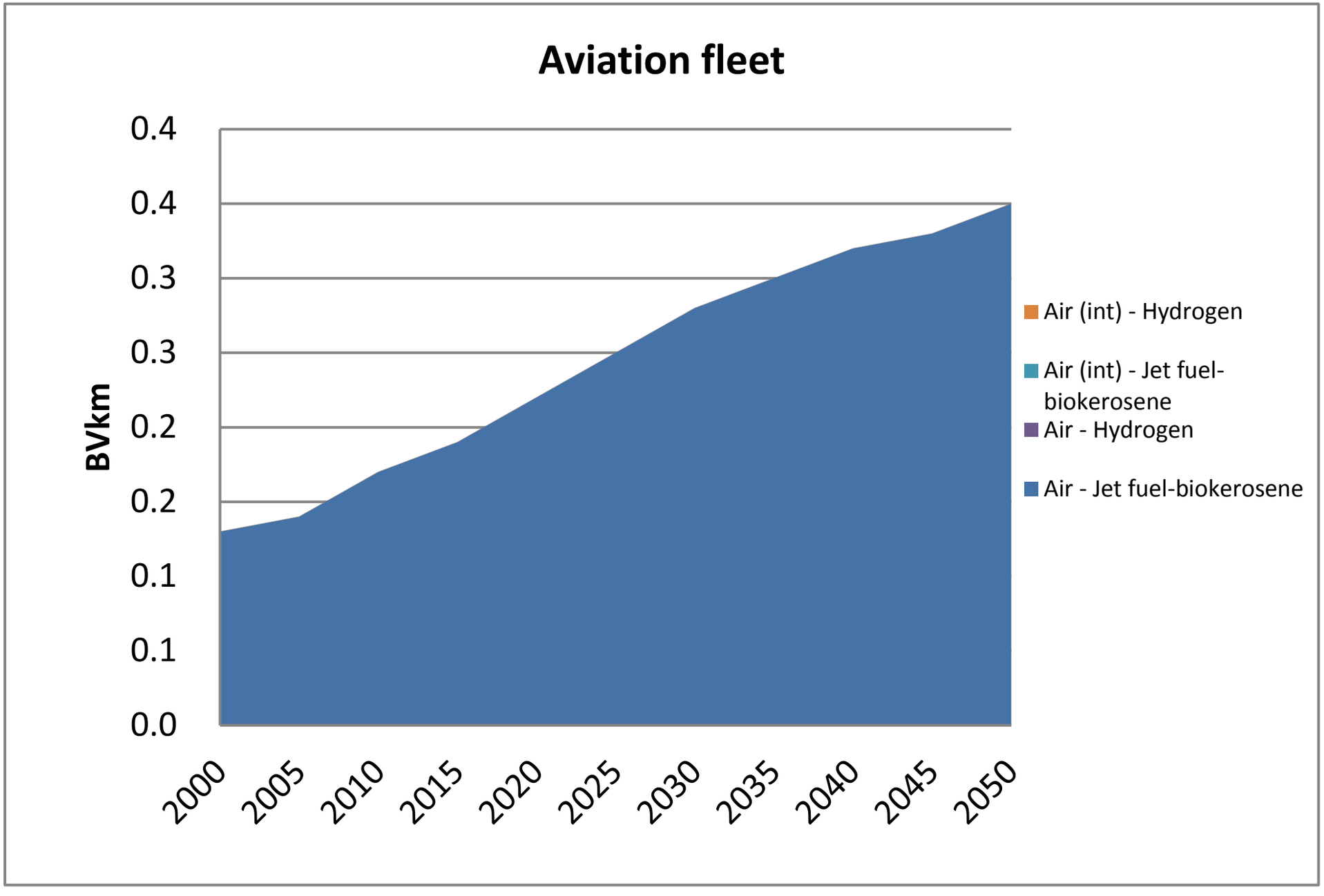

Residential demand reductions
% reduction from base
5.00%
0.00%
-5.00%
-10.00%
-15.00%
-20.00%
-25.00%
2000
2005
2010
2015
2020
2025
2030
2035
2040
2045
2050
Residential - Electricity
Residential - Cooling
Residential - Cooking
Residential - Refrigeration
Residential - Heating
Residential - Hot-water

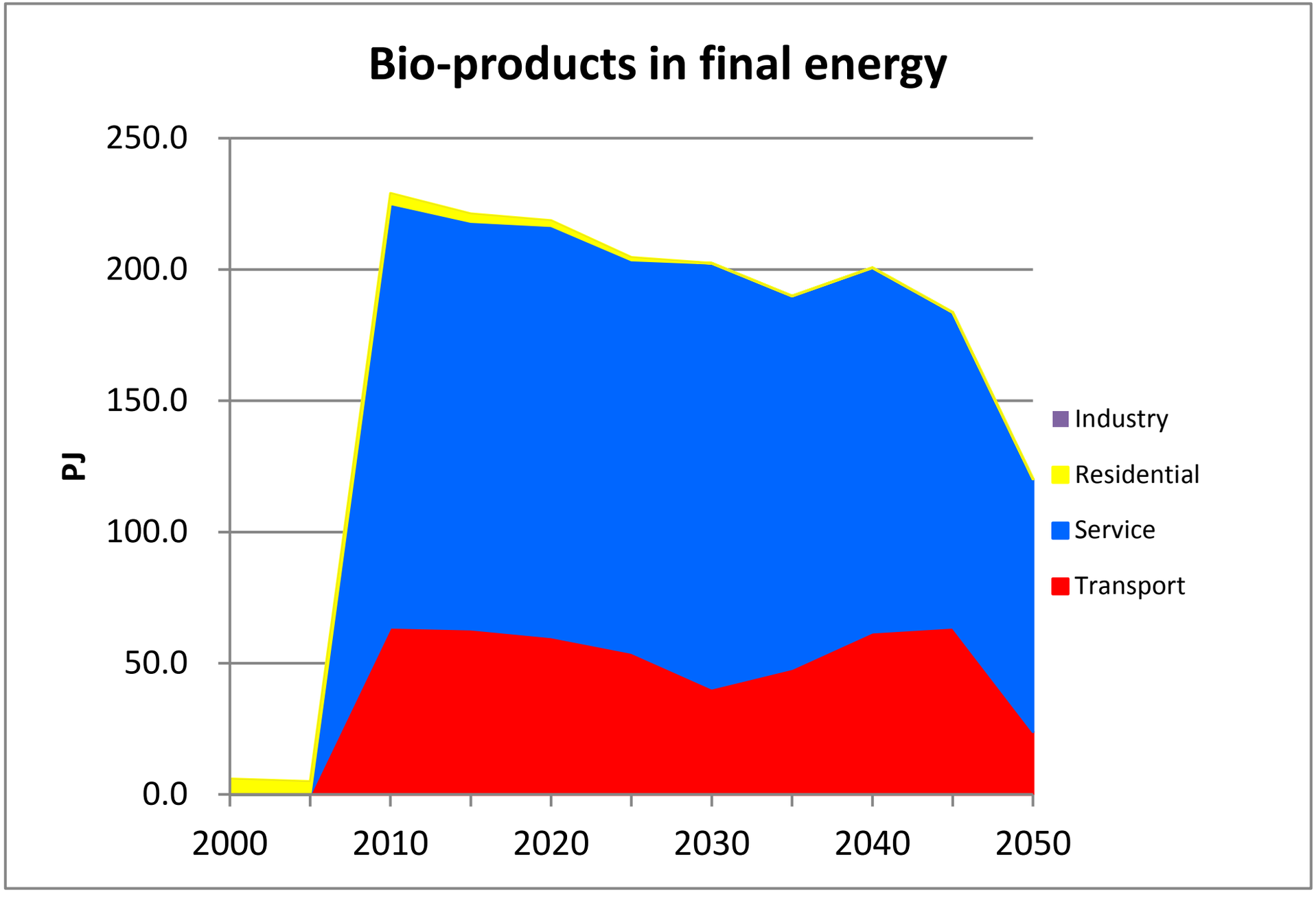

Service demand reductions
% reduction from base
4.00%
3.00%
2.00%
1.00%
0.00%
-1.00%
-2.00%
-3.00%
2000
2005
2010
2015
2020
2025
2030
2035
2040
2045
2050
Services - Lighting
Services - Refrigeration
Services - Cooking
Services - Cooling
Services - Other electrical
Services - Heating
Services - Hot-water

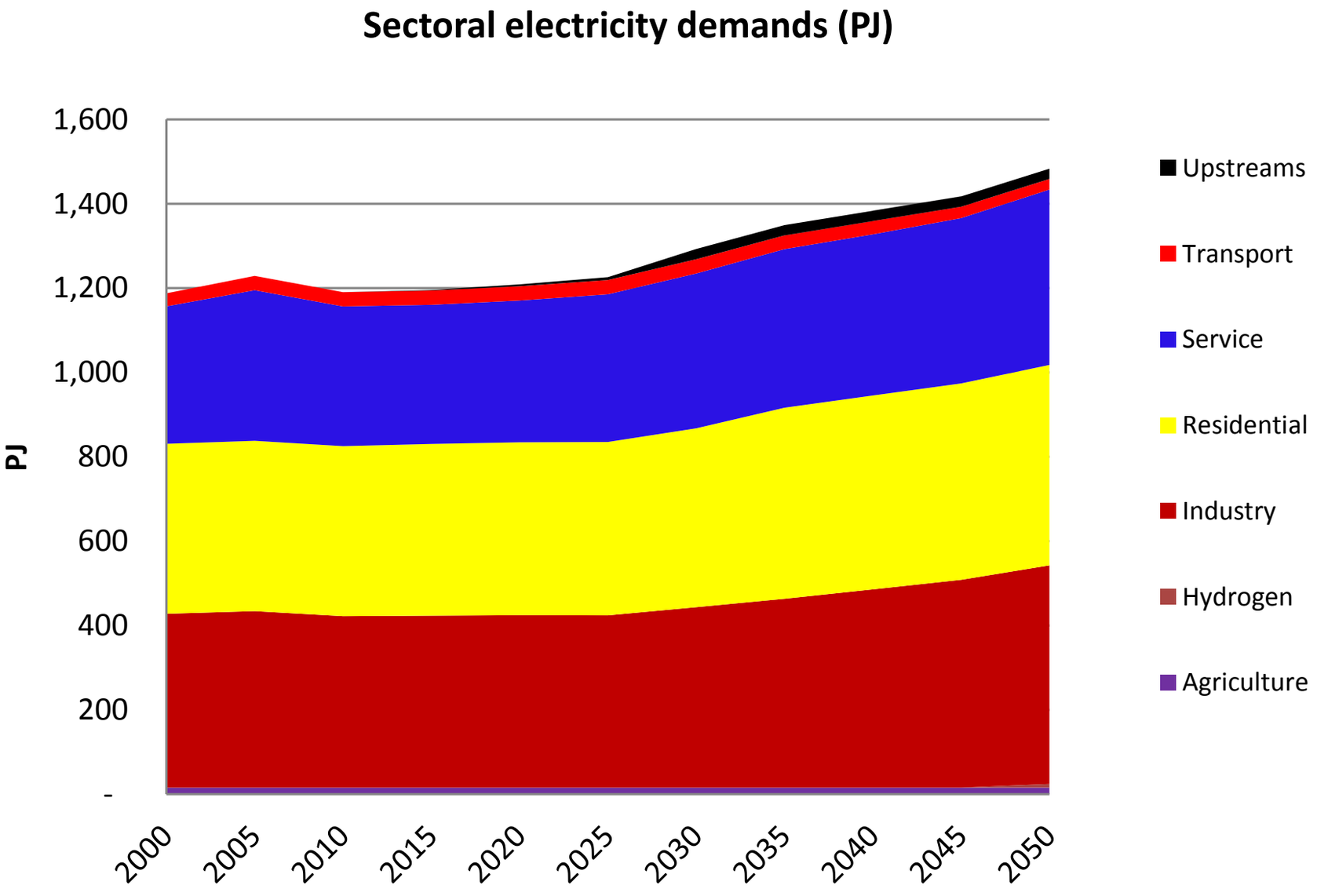

Transport demand reduction
% reduction from base
100.00%
90.00%
80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
2000
2005
2010
2015
2020
2025
2030
2035
2040
2045
2050
Transport - Air domestic
Transport - Bus
Transport - Car
Transport - Rail freight
Transport - HGV
Transport - Air International
Transport - LGV
Transport - Int'l Shipping
Transport - Rail passenger
Transport - Shipping
Transport - Two wheeler

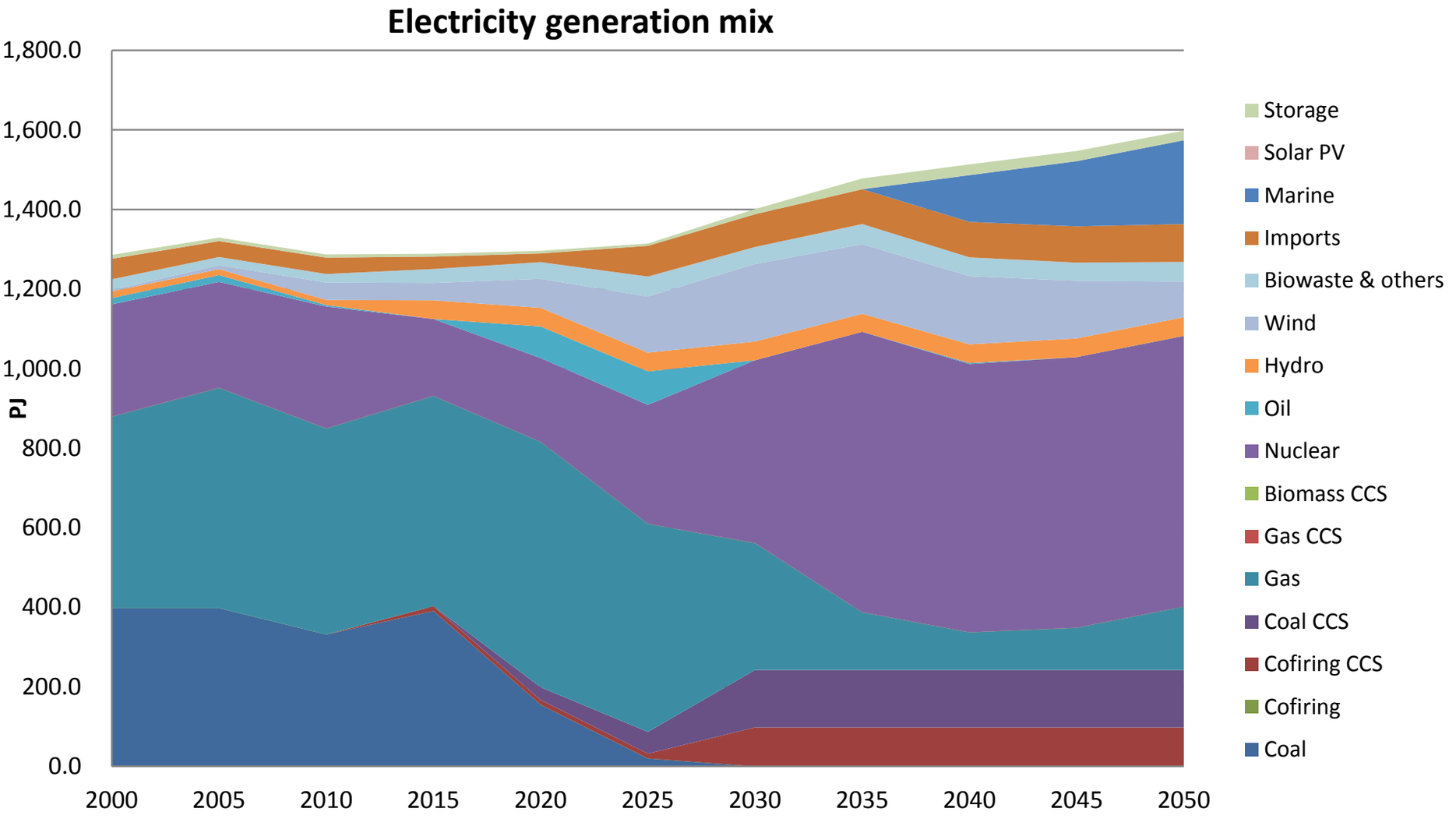

Consumer+Producer Surplus
Billion £2000
2
1
1
0
-1
-1
2000
2010
2020
2030
2040
2050
Change in consumer + producer surplus
Change in energy system costs
Decrease in area under demand curve
Increase in area under demand curve

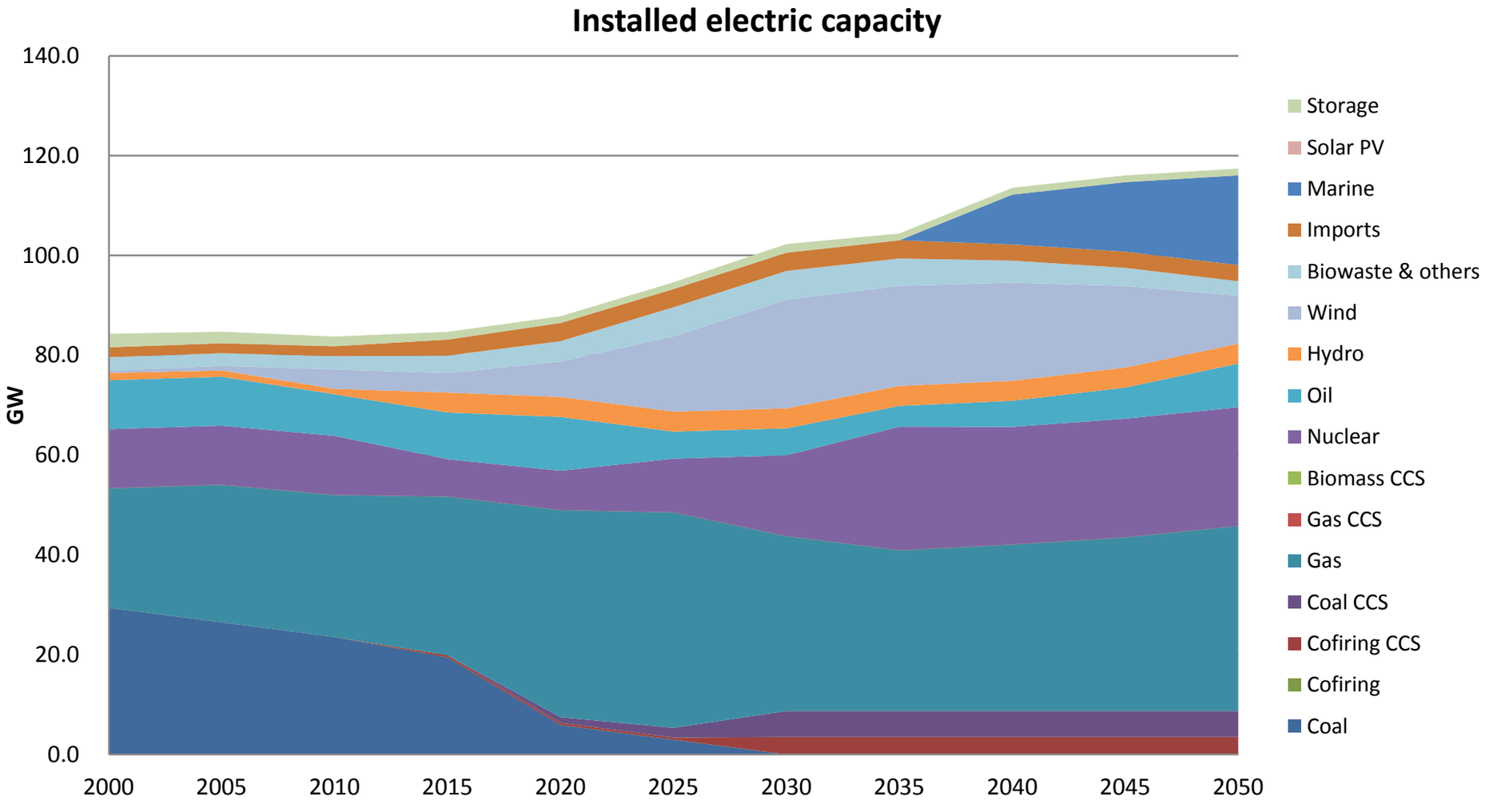

Aviation fuel demand
70
60
50
40
30
20
10
-
PJ
2000
2005
2010
2015
2020
2025
2030
2035
2040
2045
2050
Air - Bio-Kerosene
Air - Hydrogen
Air - Jet fuel

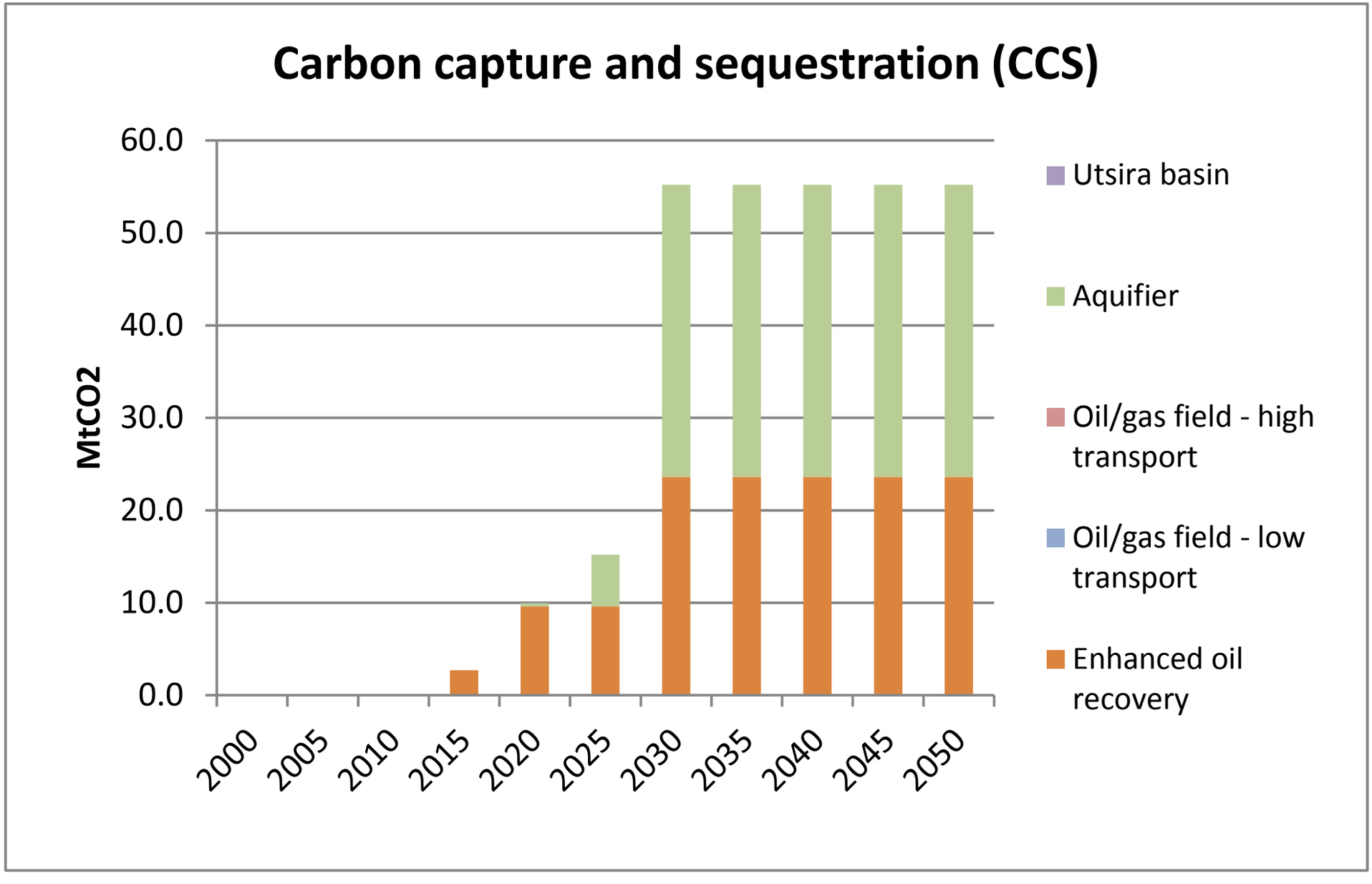

Aviation fleet
BVkm
0.4
0.4
0.3
0.3
0.2
0.2
0.1
0.1
0.0
2000
2005
2010
2015
2020
2025
2030
2035
2040
2045
2050
Air (int) - Hydrogen
Air (int) - Jet fuel-biokerosene
Air - Hydrogen
Air - Jet fuel-biokerosene

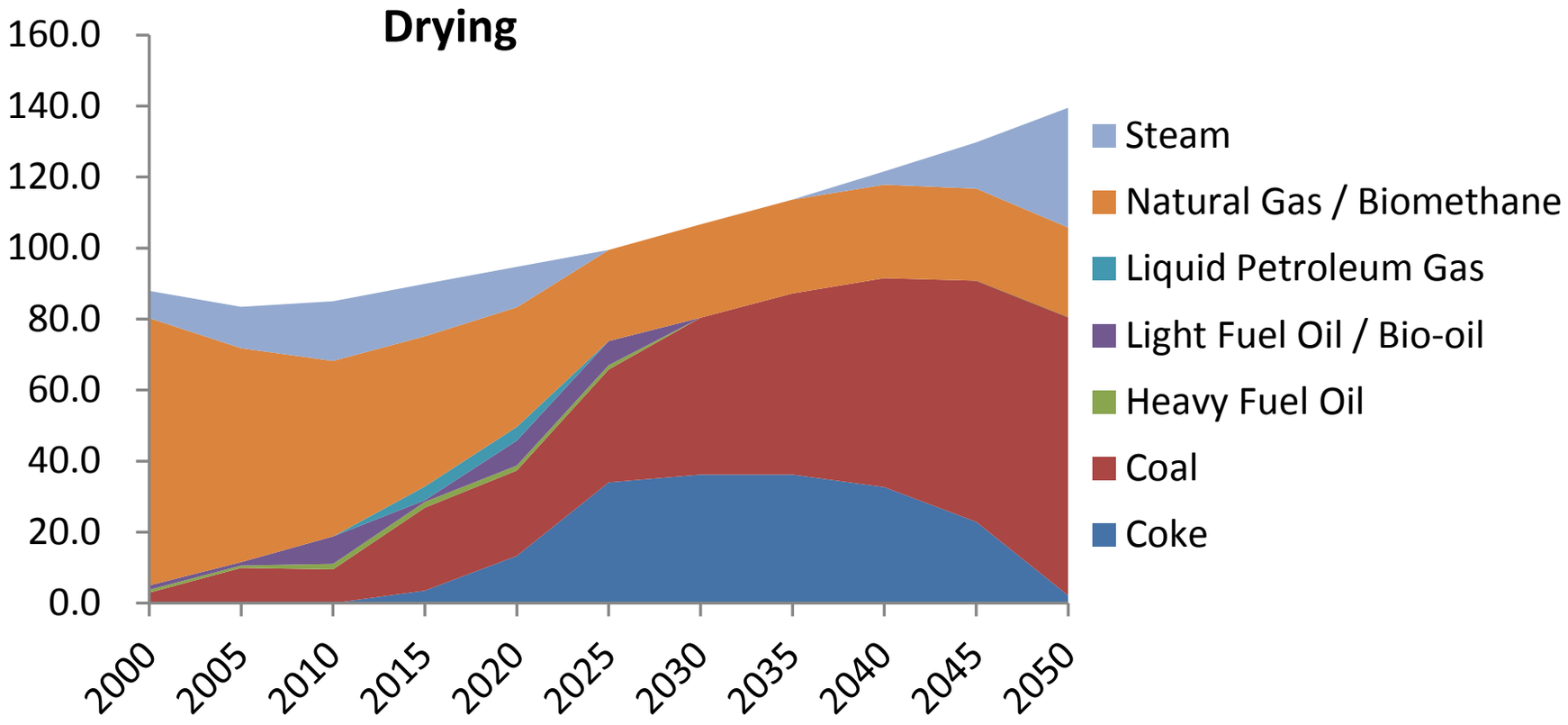

Bio-products in final energy
250.0
200.0
150.0
100.0
50.0
0.0
PJ
2000
2010
2020
2030
2040
2050
Industry
Residential
Service
Transport

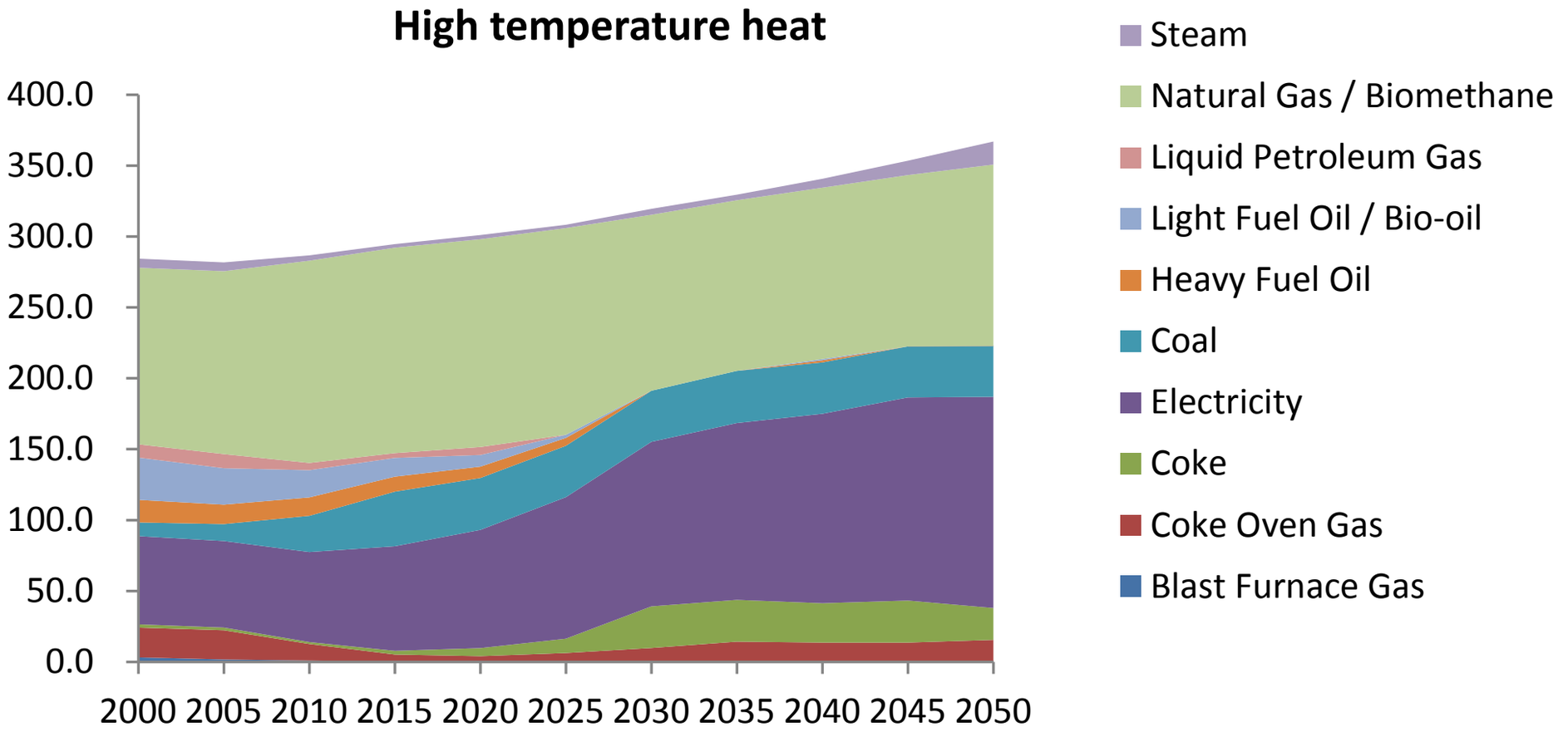

Sectoral electricity demands (PJ)
PJ
1,600
1,400
1,200
1,000
800
600
400
200
-
2000
2005
2010
2015
2020
2025
2030
2035
2040
2045
2050
Upstreams
Transport
Service
Residential
Industry
Hydrogen
Agriculture

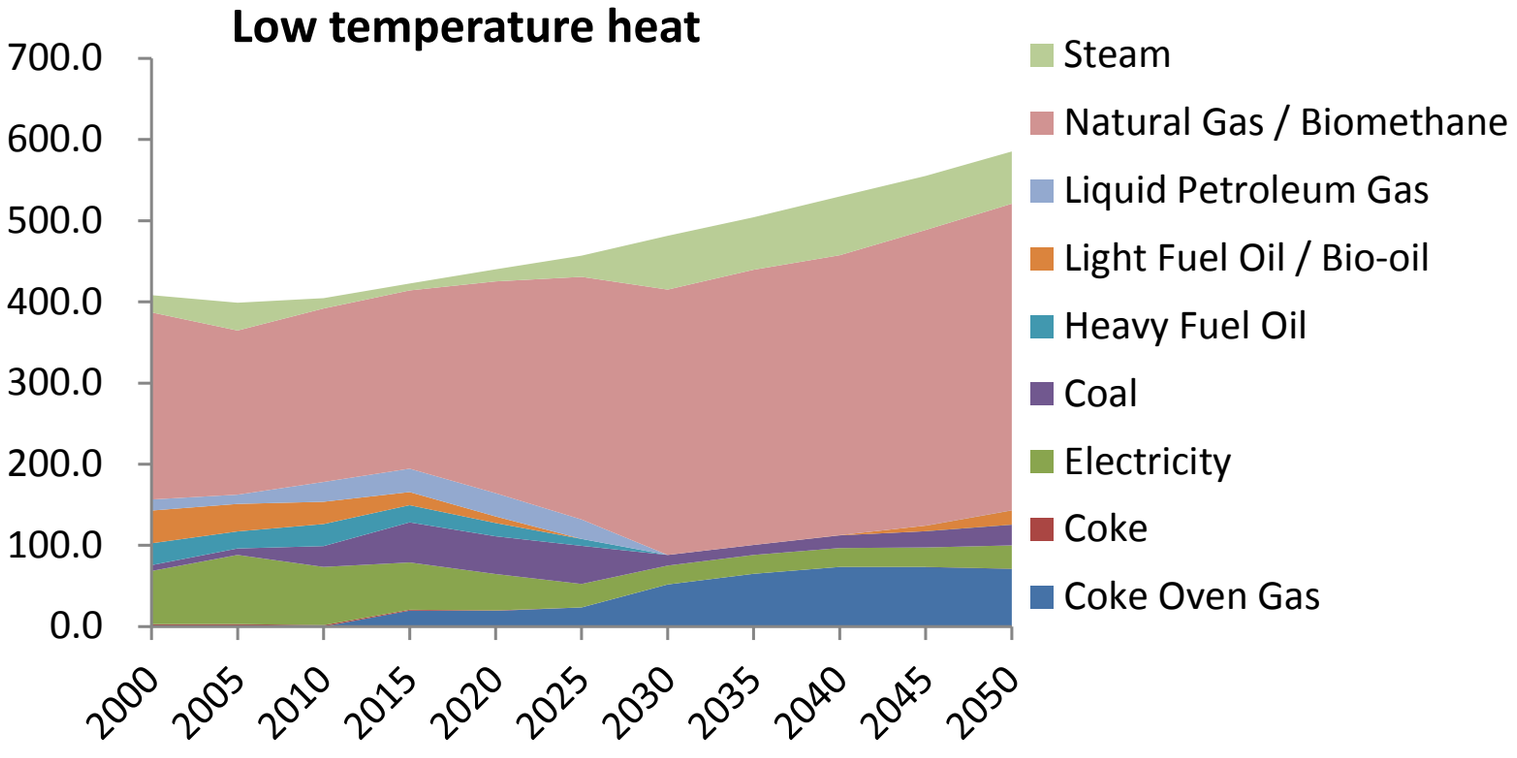

Electricity generation mix
1,800.0
1,600.0
1,400.0
1,200.0
1,000.0
800.0
600.0
400.0
200.0
0.0
PJ
2000
2005
2010
2015
2020
2025
2030
2035
2040
2045
2050
Storage
Solar PV
Marine
Imports
Biowaste & others
Wind
Hydro
Oil
Nuclear
Biomass CCS
Gas CCS
Gas
Coal CCS
Cofiring CCS
Cofiring
Coal

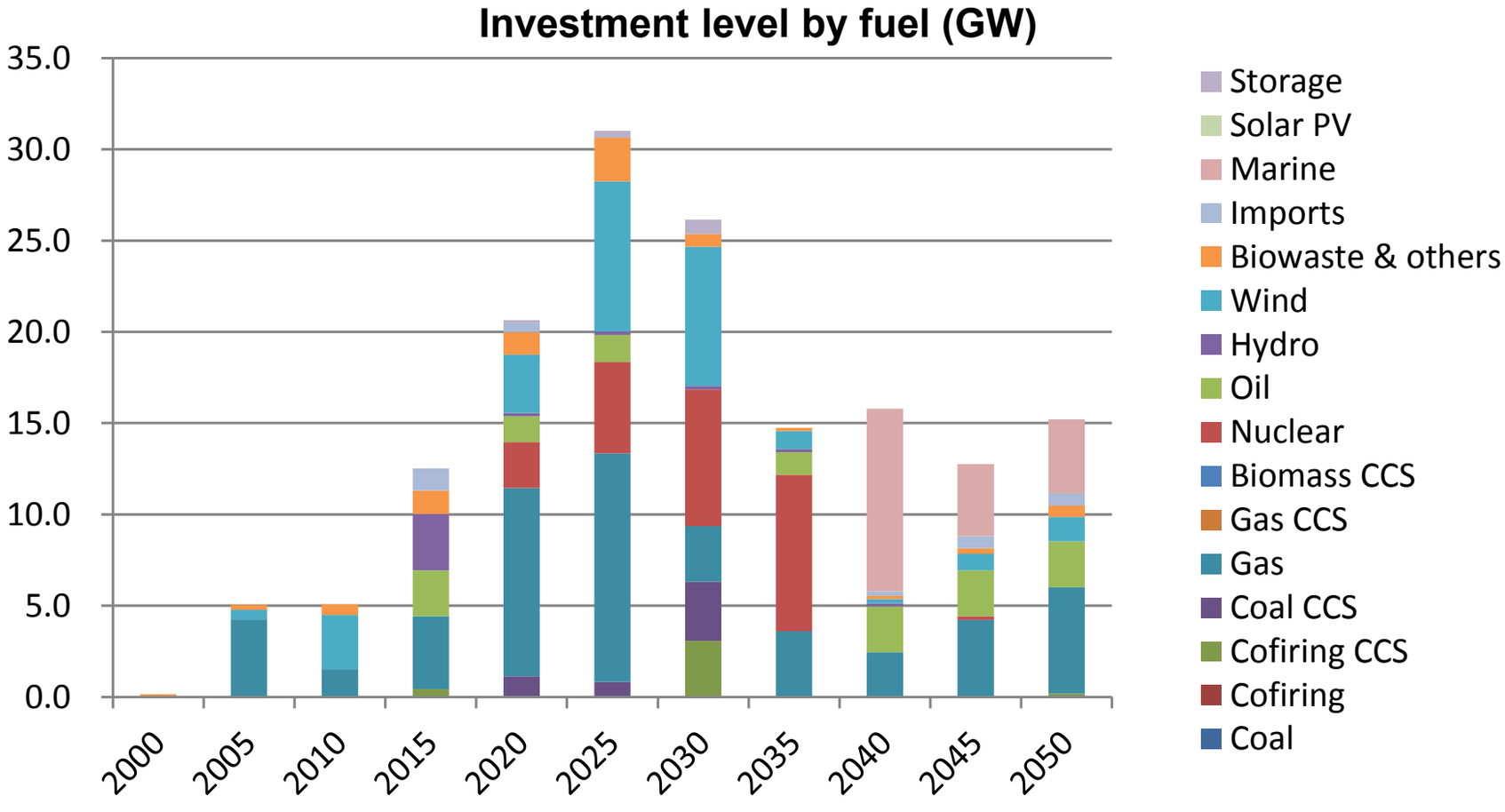

Installed electric capacity
GW
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
2000
2005
2010
2015
2020
2025
2030
2035
2040
2045
2050
Storage
Solar PV
Marine
Imports
Biowaste & others
Wind
Hydro
Oil
Nuclear
Biomass CCS
Gas CCS
Gas
Coal CCS
Cofiring CCS
Cofiring
Coal


Carbon capture and sequestration (CCS)
MtCO2
60.0
50.0
40.0
30.0
20.0
10.0
0.0
2000
2005
2010
2015
2020
2025
2030
2035
2040
2045
2050
Utsira basin
Aquifier
Oil/gas field - high transport
Oil/gas field - low transport
Enhanced oil recovery


Drying
160.0
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
2000
2005
2010
2015
2020
2025
2030
2035
2040
2045
2050
Steam
Natural Gas / Biomethane
Liquid Petroleum Gas
Light Fuel Oil / Bio-oil
Heavy Fuel Oil
Coal
Coke


High temperature heat
400.0
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
2000 2005 2010 2015 2020 2025 2030 2035 2040 2045 2050
Steam
Natural Gas / Biomethane
Liquid Petroleum Gas
Light Fuel Oil / Bio-oil
Heavy Fuel Oil
Coal
Electricity
Coke
Coke Oven Gas
Blast Furnace Gas


Low temperature heat
700.0
600.0
500.0
400.0
300.0
200.0
100.0
0.0
2000
2005
2010
2015
2020
2025
2030
2035
2040
2045
2050
Steam
Natural Gas / Biomethane
Liquid Petroleum Gas
Light Fuel Oil / Bio-oil
Heavy Fuel Oil
Coal
Electricity
Coke
Coke Oven Gas


Investment level by fuel (GW)
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
2000
2005
2010
2015
2020
2025
2030
2035
2040
2045
2050
Storage
Solar PV
Marine
Imports
Biowaste & others
Wind
Hydro
Oil
Nuclear
Biomass CCS
Gas CCS
Gas
Coal CCS
Cofiring CCS
Cofiring
Coal