



NETL Life Cycle Inventory Data Process Documentation File

Tracked Output Flows:

Coal *Delivered coal at the energy conversion facility*

Section II: Process Description

Associated Documentation

This unit process is composed of this document and the data sheet (DS) *DS_RMT_Coal_Transport_2011.01.xls*, which provides additional details regarding relevant calculations, data quality, and references.

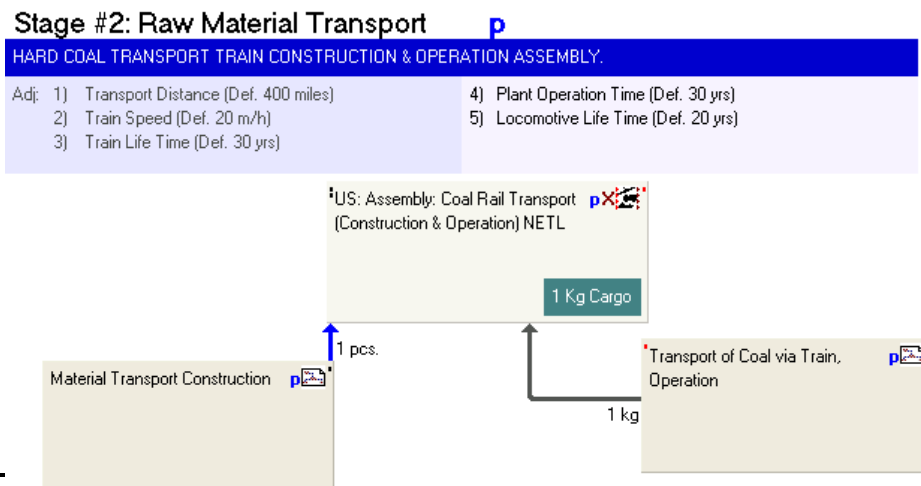
Goal and Scope

The scope of this unit process covers all aspects of raw material transportation (RMT) to the energy conversion facility as shown in **Figure 1**. At the downstream boundary for RMT, one kilogram of coal is delivered to the life cycle (LC) Stage #3 boundary.

Boundary and Description

LC Stage #2 (RMT) includes the transport of the mined and processed coal, of generic type, from the coal mine site to the energy conversion facility (LC Stage #3). The construction of equipment used to transport mined coal and the operation of that equipment comprise the two unit processes within RMT. Coal transport takes place via a train that is suitable for the transport of coal and is powered by a diesel-fired locomotive. The transport distance is included as an adjustable parameter for RMT. The modeling plan for RMT of coal is provided in **Figure 1**. The specific values presented throughout this document are based on the transportation of Illinois No. 6 (I-6) coal, but can be updated by the user for other coal types.

Figure 1: Plan for RMT of Coal, including Construction and Operation of Profiles for Transport



Construction of the train for RMT includes the materials required to construct the following pieces of equipment for transport:

- Coal railcar
(DS/DF_Stage2_C_Railcar_244000_lbs_Net_Capacity_2009.01)
- Diesel locomotive
(4,400 horsepower) (DS/DF_Stage2_C_Locomotive_2009.01)
- Coal unit train (100 railcars and the required number of locomotives)
(DS/DF_Stage2_C_Assembly_Coal_Unit_Train_100_Cars_2010.01)

The profiles and processes included in RMT are provided in **Table 1**. Those shown in bold face were developed by NETL.

Table 1: Profiles and Processes Included in RMT for Coal

Stage #2: Raw Material Transport

Material Transport Construction

RER: Aluminum sheet mix PE

US: Coal Railcar, 244000 lbs Net Capacity, Construction NETL <u-so>

US: Coal Unit Train Assembly, 100 Railcars, Construction NETL <u-so>

US: Diesel Locomotive, 4400 Horsepower, Construction NETL <u-so>

WOR: Steel Plate, BF, Manufacture NETL <u-so>

WOR: Steel, Stainless, 316 2B, 80% Recycled NETL <u-so>

Transport of Coal via Train, Operation

US: Coal, Train Transport NETL <u-so>

US: DIESEL, NATIONAL AVERAGE, 2009 NETL <u-so>

US: Assembly: Coal Rail Transport (Construction & Operation) NETL

Parameters and Balances

The parameters for the highest level modeling plans for RMT of coal are shown in **Table 2**. These parameters may or may not include the adjustable parameters shown previously, depending on how the model was created. **Table 3** presents the input and output balances for resources and emissions of interest for the RMT plan.

Table 2: Adjustable Parameters for RMT of Coal

Plan	Parameter	Value	Comment
<i>LC Stage #2</i>			
Stage #2: Raw Material Transport	CONS_MAT	1	[pcs/Kg] Pieces per kg of construction material.
Stage #2: Raw Material Transport	S2_TRAIN_DISNZ	400	[miles] User Defined parameter, default value is 200 miles one way
Stage #2: Raw Material Transport	S2_TRAIN_SPEED	20	[mph] Estimated average speed of coal unit trains for 6 railroads in US

Table 2: Inputs and Output Balances for RMT of Coal (kg/kg delivered)

Process or Category	Gate to Gate (RMT)
Inputs	
Flows	1.764E-02
Resources	1.764E-02
Energy resources	1.472E-03
Non renewable energy resources	1.472E-03
Crude oil (resource)	1.093E-03
Hard coal (resource)	1.081E-04
Lignite (resource)	7.512E-05
Natural gas (resource)	1.958E-04
Uranium (resource)	4.484E-09
Renewable energy resources	1.632E-08
Biomass	9.948E-10
Renewable fuels	1.134E-13
Wood	1.533E-08
Unspecified	0.000E+00
Land use	0.000E+00
Material resources	1.617E-02
Non renewable elements	2.705E-07
Aluminum	1.122E-12
Chromium	7.442E-14
Copper	5.819E-15
Iron	2.689E-07
Lead	4.589E-14
Magnesium	8.789E-17
Mercury	2.189E-14
Nickel	2.756E-16
Phosphorus	8.783E-12
Sulphur	8.404E-11
Zinc	1.497E-09
Non renewable resources	1.912E-03
Barium sulphate	2.288E-16
Basalt	3.300E-06
Bauxite	2.029E-04
Bentonite	4.888E-06
Calcium carbonate (CaCO ₃)	7.301E-09
Calcium chloride	2.342E-14
Chalk (Calciumcarbonate)	8.158E-41

Process or Category	Gate to Gate (RMT)
Chromium ore (39%)	5.660E-09
Clay	3.868E-07
Colemanite ore	1.275E-09
Copper - Gold - Silver - ore (1,0% Cu; 0,4 g/t Au; 66 g/t Ag)	1.721E-08
Copper - Gold - Silver - ore (1,1% Cu; 0,01 g/t Au; 2,86 g/t Ag)	1.049E-08
Copper - Gold - Silver - ore (1,16% Cu; 0,002 g/t Au; 1,06 g/t Ag)	5.919E-09
Copper - Molybdenum - Gold - Silver - ore (1,13% Cu; 0,02% Mo; 0,01 g/t Au; 2,86 g/t Ag)	1.442E-08
Copper ore (0.14%)	3.008E-08
Copper ore (1.2%)	1.785E-09
Copper ore (4%)	3.284E-18
Copper ore (sulphidic, 1.1%)	5.006E-10
Dolomite	6.646E-08
Feldspar (aluminum silicates)	6.194E-12
Ferro manganese	1.355E-14
Fluorspar (calcium fluoride; fluorite)	1.525E-06
Granite	1.678E-21
Gypsum (natural gypsum)	2.108E-07
Heavy spar (BaSO4)	1.182E-05
Ilmenite (titanium ore)	1.380E-16
Inert rock	1.637E-03
Iron ore (56,86%)	8.636E-06
Iron ore (65%)	4.837E-09
Kaolin ore	2.288E-09
Lead - zinc ore (4.6%-0.6%)	1.000E-06
Limestone (calcium carbonate)	2.465E-05
Magnesit (Magnesium carbonate)	4.867E-12
Magnesium chloride leach (40%)	2.835E-07
Manganese ore	1.275E-09
Manganese ore (R.O.M.)	6.048E-08
Molybdenite (Mo 0,24%)	8.895E-09
Molybdenum ore (0.1%)	1.092E-09
Natural Aggregate	7.625E-06
Nickel ore (1,5%)	7.745E-10
Nickel ore (1.6%)	1.527E-07
Olivine	1.412E-13
Peat	1.448E-07
Phosphate ore	6.512E-12
Phosphorus minerals	8.056E-10

Process or Category	Gate to Gate (RMT)
Phosphorus ore (29% P2O5)	7.472E-14
Potassium chloride	1.141E-10
Precious metal ore (R.O.M)	4.427E-10
Quartz sand (silica sand; silicon dioxide)	1.967E-07
Raw pumice	2.508E-11
Rutile (titanium ore)	2.698E-12
sand	2.087E-11
Slate	3.082E-13
Sodium chloride (rock salt)	4.779E-06
Sodium nitrate	4.679E-21
Sodium sulphate	1.539E-10
Soil	2.511E-06
Sulphur (bonded)	8.313E-14
Talc	6.369E-12
Tin ore	1.984E-17
Titanium ore	1.556E-08
Zinc - copper ore (4.07%-2.59%)	1.659E-07
Zinc - lead - copper ore (12%-3%-2%)	7.646E-08
Zinc - lead ore (4.21%-4.96%)	1.121E-18
Zinc ore (4%)	-3.199E-08
Zinc ore (sulphidic, 4%)	6.428E-18
Renewable resources	1.426E-02
Water	1.134E-02
Water	6.208E-03
Water (feed water)	1.938E-06
Water (ground water)	8.198E-04
Water (sea water)	1.040E-05
Water (surface water)	4.304E-03
Water (well water)	6.205E-08
Water (with river silt)	1.223E-16
Air	2.911E-03
Carbon dioxide	5.071E-06
Nitrogen	1.195E-09
Oxygen	0.000E+00
Unspecified	3.219E-10
Unspecified minerals	7.323E-11
Unspecified resources	2.487E-10
Area of Production Land	0.000E+00

Process or Category	Gate to Gate (RMT)
Output	
Flows	2.024E-02
Resources	3.753E-03
Energy resources	0.000E+00
Land use	0.000E+00
Material resources	3.753E-03
Renewable resources	3.753E-03
Water	3.750E-03
Water (river water)	3.712E-03
Water (wastewater)	3.836E-05
Nitrogen	0.000E+00
Oxygen	2.928E-06
Ecoinvent	1.330E-14
Long-term emission	1.330E-14
Fresh water	1.330E-14
Dissolved organic carbon, DOC (Ecoinvent)	1.330E-14
Production residues in life cycle	6.582E-05
Hazardous waste for disposal	5.861E-05
Dross (Fines)	3.898E-07
Natrium oxide	6.625E-07
Red mud (dry)	5.756E-05
Soil and sand containing heavy metals	2.525E-11
Toxic chemicals (unspecified)	4.047E-10
Hazardous waste for recovery	1.611E-07
Used oil	1.048E-07
Waste water processing residue	5.634E-08
Waste for disposal	6.484E-06
Incineration good	2.208E-10
Sludge from water works (6% dry matter-content)	1.272E-11
Waste (solid)	9.048E-07
Waste from steel works	5.578E-06
Waste for recovery	5.620E-07
Aluminum scrap	5.071E-15
Chemicals (unspecified)	1.213E-10
Cooling water	3.760E-07
Cryolite	1.817E-07

Process or Category	Gate to Gate (RMT)
Dross	7.579E-10
Gypsum (FDI)	1.173E-16
Plastic (unspecified)	2.279E-10
Production residues (unspecified)	1.681E-12
Rolling tinder	2.063E-23
Slag	3.261E-09
Waste paper	3.349E-14
Wood	1.272E-13
Wooden pallet (EURO)	6.769E-19
Mixed Waste (Hazardous or Radioactive)	0.000E+00
Neutralized residues	2.222E-17
Emissions to air	1.636E-02
Heavy metals to air	2.636E-09
Antimony	5.184E-12
Arsenic (+V)	6.976E-11
Arsenic trioxide	6.565E-16
Cadmium (+II)	4.340E-12
Chromium (+III)	1.637E-13
Chromium (+VI)	2.449E-15
Chromium (unspecified)	3.171E-11
Cobalt	9.067E-12
Copper (+II)	1.960E-11
Heavy metals to air (unspecified)	6.284E-14
Hydrogen arsenic (arsine)	5.450E-14
Iron	1.331E-11
Lanthanides	3.021E-15
Lead (+II)	1.283E-10
Manganese (+II)	5.066E-11
Mercury (+II)	1.093E-11
Molybdenum	1.274E-12
Nickel (+II)	3.624E-10
Palladium	6.484E-19
Rhodium	6.259E-19
Selenium	1.074E-10
Silver	1.029E-19
Tellurium	2.183E-14
Thallium	1.672E-13
Tin (+IV)	6.120E-11

Process or Category	Gate to Gate (RMT)
Titanium	1.913E-13
Vanadium (+III)	1.454E-09
Zinc (+II)	3.064E-10
Inorganic emissions to air	1.393E-02
Ammonia	4.451E-07
Ammonium	3.579E-15
Ammonium nitrate	4.756E-16
Barium	7.582E-09
Beryllium	1.511E-12
Boron compounds (unspecified)	1.121E-09
Bromine	3.926E-10
Carbon dioxide	1.264E-02
Carbon dioxide (biotic)	6.021E-07
Carbon disulphide	1.436E-13
Carbon monoxide	3.767E-05
Chloride (unspecified)	5.043E-10
Chlorine	1.365E-11
Cyanide (unspecified)	4.225E-12
Fluoride	2.880E-08
Fluorides	5.393E-12
Fluorine	2.132E-14
Helium	6.724E-12
Hydrogen	6.415E-09
Hydrogen bromine (hydrobromic acid)	1.024E-12
Hydrogen chloride	2.798E-08
Hydrogen cyanide (prussic acid)	4.615E-12
Hydrogen fluoride	2.920E-08
Hydrogen iodide	9.875E-16
Hydrogen phosphorous	9.551E-13
Hydrogen sulphide	3.920E-08
Lead dioxide	1.704E-14
Nitrogen (atmospheric nitrogen)	1.472E-07
Nitrogen dioxide	1.264E-07
Nitrogen monoxide	4.663E-12
Nitrogen oxides	3.134E-05
Nitrous oxide (laughing gas)	3.059E-07
Oxygen	7.979E-07
Scandium	1.546E-15

Process or Category	Gate to Gate (RMT)
Steam	1.203E-03
Strontium	5.743E-14
Sulphur dioxide	7.806E-06
Sulphur hexafluoride	5.208E-14
Sulphuric acid	9.941E-12
Tin oxide	6.485E-17
Unspecified Particles	5.994E-10
Zinc oxide	1.297E-16
Zinc sulphate	1.372E-12
Organic emissions to air (group VOC)	1.273E-05
Group NMVOC to air	2.509E-06
Group PAH to air	2.542E-09
Anthracene	1.738E-13
Benzo(a)anthracene	8.744E-14
Benzo(a)pyrene	4.415E-11
Benzo(ghi)perylene	7.800E-14
Benzo(a)fluoranthene	1.560E-13
Chrysene	2.148E-13
Dibenz(a)anthracene	4.860E-14
Indeno[1,2,3-cd]pyrene	5.804E-14
Naphthalene	1.825E-11
Phenanthrene	5.733E-12
Polycyclic aromatic hydrocarbons (PAH)	2.473E-09
Halogenated organic emissions to air	7.179E-09
Dichloroethane (ethylene dichloride)	2.380E-17
Dichloromethane (methylene chloride)	9.611E-16
Dioxins (unspec.)	-2.613E-17
Halogenated hydrocarbons (unspecified)	1.138E-13
Polychlorinated biphenyls (PCB unspecified)	1.198E-13
Polychlorinated dibenzo-p-dioxins (2,3,7,8 - TCDD)	5.092E-16
R 11 (trichlorofluoromethane)	3.279E-11
R 114 (dichlorotetrafluoroethane)	3.358E-11
R 116 (hexafluoroethane)	7.091E-10
R 12 (dichlorodifluoromethane)	7.050E-12
R 13 (chlorotrifluoromethane)	4.427E-12
R 22 (chlorodifluoromethane)	7.705E-12
Tetrafluoromethane	6.382E-09
Vinyl chloride (VCM; chloroethene)	2.277E-12

Process or Category	Gate to Gate (RMT)
Acetaldehyde (Ethanal)	2.627E-10
Acetic acid	1.040E-09
Acetone (dimethylcetone)	2.588E-10
Acrolein	1.226E-12
Aldehyde (unspecified)	1.618E-11
Alkane (unspecified)	2.493E-09
Alkene (unspecified)	1.599E-09
Aromatic hydrocarbons (unspecified)	9.498E-11
Benzene	6.351E-10
Butadiene	3.435E-15
Butane	9.507E-08
Butane (n-butane)	8.967E-10
Caprolactam	6.492E-14
Cyclohexane (hexahydro benzene)	2.944E-12
Diethylamine	8.948E-20
Ethane	2.611E-07
Ethanol	4.921E-10
Ethene (ethylene)	7.722E-12
Ethyl benzene	1.557E-09
Fluoranthene	5.660E-13
Fluorene	1.796E-12
Formaldehyde (methanal)	1.832E-09
Heptane (isomers)	3.138E-09
Hexamethylene diamine (HMDA)	2.021E-16
Hexane (isomers)	4.714E-09
Mercaptan (unspecified)	3.006E-11
Methanethiol	1.524E-11
Methanol	4.709E-10
NM VOC (unspecified)	1.618E-06
Octane	1.726E-09
Pentane (n-pentane)	3.462E-08
Phenol (hydroxy benzene)	7.462E-14
Propane	4.623E-07
Propene (propylene)	1.412E-10
Propionic acid (propane acid)	5.942E-14
Styrene	3.530E-15
Toluene (methyl benzene)	7.596E-10
Trimethylbenzene	6.317E-16

Process or Category	Gate to Gate (RMT)
Xylene (dimethyl benzene)	6.531E-09
Hydrocarbons (unspecified)	1.067E-10
Methane	6.884E-06
Organic chlorine compounds	1.419E-13
Unspecified Organic Compounds	4.166E-16
VOC (unspecified)	3.335E-06
Other emissions to air	2.380E-03
Aldehydes, unspecified	2.083E-16
Exhaust	2.376E-03
Particulate Matter, unspecified	3.813E-08
Sand (Silica) (SiO ₂)	3.971E-12
Used air	3.559E-06
Particles to air	4.125E-05
Dust (PM ₁₀)	1.978E-08
Dust (PM _{2.5})	8.588E-08
Dust (unspecified)	4.115E-05
Metals (unspecified)	1.124E-13
Unspecified Organic Chlorine Compounds	2.749E-15
Wood (dust)	2.393E-14
Radioactive emissions to air	3.853E-11
Uranium (total)	3.853E-11
Unspecified Heavy Metals	2.147E-19
Emissions to fresh water	4.331E-05
Analytical measures to fresh water	2.928E-07
Adsorbable organic halogen compounds (AOX)	3.474E-10
Biological oxygen demand (BOD)	9.775E-09
Chemical oxygen demand (COD)	2.653E-07
Nitrogenous Matter (unspecified, as N)	5.926E-10
Solids (dissolved)	5.746E-09
Total dissolved organic bounded carbon	2.197E-11
Total organic bounded carbon	1.098E-08
Heavy metals to fresh water	8.623E-06
Aluminium	1.542E-06
Antimony	1.366E-08
Arsenic (+V)	4.378E-08
Cadmium (+II)	4.313E-09
Chromium (+III)	1.133E-11
Chromium (+VI)	4.331E-13

Process or Category	Gate to Gate (RMT)
Chromium (unspecified)	7.563E-08
Cobalt	1.144E-12
Copper (+II)	6.363E-08
Heavy metals to water (unspecified)	1.633E-12
Iron	3.509E-06
Lead (+II)	1.479E-07
Manganese (+II)	4.455E-10
Mercury (+II)	7.446E-10
Molybdenum	9.391E-11
Nickel (+II)	1.172E-06
Selenium	1.647E-11
Silver	1.334E-08
Strontium	3.620E-09
Thallium	2.302E-14
Tin (+IV)	4.018E-12
Titanium	1.064E-11
Unspecified Substance	1.857E-15
Vanadium (+III)	3.167E-11
Zinc (+II)	2.033E-06
Inorganic emissions to fresh water	2.675E-05
Acid (calculated as H+)	4.033E-08
Aluminum (+III)	3.037E-09
Ammonia	7.686E-10
Ammonium (total N)	1.669E-05
Ammonium / ammonia	3.578E-09
Barium	8.558E-10
Beryllium	1.153E-13
Boron	9.204E-10
Bromate	1.264E-15
Bromine	9.435E-14
Calcium (+II)	2.881E-07
Carbonate	5.348E-08
Chlorate	1.211E-12
Chloride	6.269E-06
Chlorine (dissolved)	4.171E-09
Copper ion (+II/+III)	1.005E-14
Cyanide	1.241E-07
Fluoride	3.225E-07

Process or Category	Gate to Gate (RMT)
Fluorine	8.376E-12
Hydrogen chloride	1.668E-13
Hydrogen fluoride (hydrofluoric acid)	9.612E-14
Hydrogen Ions (H+)	4.145E-13
Hydroxide	1.243E-07
Inorganic salts and acids (unspecified)	6.746E-21
Iron ion (+II/+III)	4.506E-12
Magnesium (+III)	2.922E-08
Magnesium chloride	1.764E-13
Metal ions (unspecific)	5.733E-11
Neutral salts	1.610E-13
Nickel ion (+III)	2.849E-13
Nitrate	1.198E-08
Nitrate (as total N)	6.658E-15
Nitrogen	7.944E-11
Phosphate	1.348E-10
Phosphorus	1.473E-06
Potassium	5.808E-11
Silicate particles	4.546E-14
Sodium (+I)	5.937E-07
Sodium chloride (rock salt)	3.455E-13
Sodium hypochlorite	1.239E-12
Sulphate	7.123E-07
Sulphite	2.147E-10
Sulphur	1.135E-10
Sulphuric acid	2.151E-11
Unspecified Iron Oxides	4.755E-15
Unspecified Organic Chlorine compounds	3.817E-17
Unspecified Salt	1.527E-13
Unspecified Solids (Suspended)	5.929E-13
Organic emissions to fresh water	1.865E-08
Halogenated organic emissions to fresh water	3.715E-13
1,2-Dibromoethane	6.914E-16
Chlorinated hydrocarbons (unspecified)	2.053E-19
Chloromethane (methyl chloride)	3.703E-13
Dichloroethane (ethylene dichloride)	6.383E-20
Dichloropropane	1.622E-19
Polychlorinated dibenzo-p-dioxins (2,3,7,8 - TCDD)	3.031E-21

Process or Category	Gate to Gate (RMT)
Vinyl chloride (VCM; chloroethene)	5.185E-16
Hydrocarbons to fresh water	3.769E-09
Acenaphthene	1.628E-13
Acenaphthylene	6.776E-14
Acetic acid	2.134E-11
Acrylonitrile	1.186E-14
Anthracene	2.356E-13
Aromatic hydrocarbons (unspecified)	9.851E-11
Benzene	3.272E-10
Benzo{a}anthracene	2.329E-14
Benzofluoranthene	1.234E-14
Chrysene	1.044E-13
Cresol (methyl phenol)	2.941E-12
Ethyl benzene	1.639E-11
Fluoranthene	2.730E-14
Hexane (isomers)	3.211E-13
Hydrocarbons (unspecified)	4.961E-11
Methanol	4.601E-10
Oil (unspecified)	2.003E-09
Phenol (hydroxy benzene)	3.004E-10
Polycyclic aromatic hydrocarbons (PAH, unspec.)	2.050E-10
Toluene (methyl benzene)	2.099E-10
Xylene (isomers; dimethyl benzene)	7.399E-11
Carbon, organically bound	1.485E-08
Naphthalene	1.041E-11
N-unspecified (N)	1.318E-14
Organic chlorine compounds (unspecified)	2.150E-14
Organic compounds (dissolved)	9.141E-12
Organic compounds (unspecified)	2.558E-12
Unspecified wastewater	9.968E-12
Other emissions to fresh water	0.000E+00
Particles to fresh water	7.616E-06
Metals (unspecified)	8.007E-13
Silicon dioxide (silica)	1.510E-11
Soil loss by erosion into water	1.756E-12
Solids (suspended)	7.615E-06
Suspended solids, unspecified	1.014E-09
Unspecified Oxides	3.953E-15

Process or Category	Gate to Gate (RMT)
Radioactive emissions to fresh water	0.000E+00
Bromide	0.000E+00
Radionuclide	0.000E+00
Sulfite	0.000E+00
Unspecified Solids (Dissolved)	1.143E-12
Uranium (total)	0.000E+00
Emissions to sea water	1.758E-05
Analytical measures to sea water	7.880E-08
Adsorbable organic halogen compounds (AOX)	5.043E-15
Biological oxygen demand (BOD)	5.563E-09
Chemical oxygen demand (COD)	6.768E-08
Total organic bounded carbon	5.563E-09
Heavy metals to sea water	1.675E-08
Arsenic (+V)	1.801E-10
Cadmium (+II)	9.093E-11
Chromium (unspecified)	2.901E-10
Cobalt	1.874E-11
Copper (+II)	5.639E-10
Iron	9.718E-10
Lead (+II)	1.511E-10
Manganese (+II)	9.698E-11
Mercury (+II)	2.083E-12
Molybdenum	5.765E-12
Nickel (+II)	1.841E-10
Silver	1.710E-11
Strontium	1.379E-08
Tin (+IV)	2.049E-11
Titanium	2.087E-12
Vanadium (+III)	1.546E-11
Zinc (+II)	3.432E-10
Inorganic emissions to sea water	1.305E-05
Aluminum (+III)	6.718E-11
Ammonia	1.996E-09
Barium	2.496E-09
Beryllium	7.526E-13
Boron	1.086E-09
Calcium (+II)	1.186E-07
Carbonate	1.570E-07

Process or Category	Gate to Gate (RMT)
Chloride	1.253E-05
Magnesium	2.961E-08
Nitrate	2.035E-10
Sodium (+I)	1.111E-07
Sulphate	6.632E-08
Sulphide	2.857E-08
Sulphur	5.813E-10
Organic emissions to sea water	7.869E-09
Hydrocarbons to sea water	7.824E-09
Acenaphthene	1.050E-12
Acenaphthylene	4.110E-13
Acetic acid	9.711E-13
Anthracene	6.357E-13
Aromatic hydrocarbons (unspecified)	5.563E-11
Benzene	8.902E-10
Benzo(a)anthracene	2.109E-13
Benzo(a)fluoranthene	2.088E-13
Chrysene	1.140E-12
Cresol (methyl phenol)	1.506E-11
Ethyl benzene	4.768E-11
Fluoranthene	2.458E-13
Hexane (isomers)	1.644E-12
Oil (unspecified)	5.204E-09
Phenol (hydroxy benzene)	8.156E-10
Toluene (methyl benzene)	5.904E-10
Xylene (isomers; dimethyl benzene)	1.983E-10
Naphthalene	4.496E-11
Particles to sea water	4.427E-06
Solids (suspended)	4.427E-06
Emissions to agricultural soil	0.000E+00
Emissions to industrial soil	5.777E-08
Heavy metals to industrial soil	1.452E-08
Arsenic (+V)	1.736E-14
Cadmium (+II)	1.818E-13
Chromium (+III)	6.852E-14
Chromium (unspecified)	4.071E-11
Cobalt	7.054E-13
Copper (+II)	4.562E-13

Process or Category	Gate to Gate (RMT)
Iron	5.691E-11
Lead (+II)	1.131E-13
Manganese (+II)	9.956E-12
Mercury (+II)	1.446E-15
Nickel (+II)	1.693E-11
Strontium	1.439E-08
Zinc (+II)	4.813E-12
Inorganic emissions to industrial soil	4.297E-08
Aluminum (+III)	4.587E-11
Ammonia	2.235E-08
Bromide	6.046E-12
Calcium (+II)	7.664E-10
Chloride	7.098E-09
Fluoride	2.015E-10
Magnesium (+III)	1.060E-10
Phosphorus	2.340E-09
Potassium (+I)	5.065E-09
Sodium (+I)	6.703E-11
Sulphate	7.032E-10
Sulphide	4.219E-09
Organic emissions to industrial soil	2.867E-10
Oil (unspecified)	2.867E-10
Radioactive emissions to industrial soil	0.000E+00
Calcium Fluoride	0.000E+00
Radionuclide	0.000E+00

Embedded Unit Processes

NETL (2010). *NETL Life Cycle Inventory Data – Unit Process: Coal Unit Train Assembly, 100 Railcars, Construction*. U.S. Department of Energy, National Energy Technology Laboratory. Last Updated: January 2010 (version 01). www.netl.doe.gov/energy-analyses (<http://www.netl.doe.gov/energy-analyses>)

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References

None.

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