Appendix N

Public Health and Safety

Project Total — HAP Emissions Summary

Hydrogen Energy International LLC — *7/23/2008*
HECA Project

Compound	CAS #	Annual Rate (ton/yr)
1,3-Butadiene	106-99-0	2.32E-04
Acetaldehyde	75-07-0	2.72E-01
Acrolein	107-02-8	7.36E-03
Ammonia*	7664-41-7	1.01E+02
Antimony	7440-36-0	1.11E-02
Arsenic	7440-38-2	2.44E-02
Benzene	71-43-2	4.01E-02
Beryllium	7440-41-7	2.64E-03
Cadmium	7440-43-9	9.75E-02
Carbon Disulfide	75-15-0	4.66E-01
Carbonyl Sulfide	463-58-1	4.59E+00
Chromium	7440-47-3	3.69E-04
Chromium, (hexavalent)	18540-29-9	1.55E-03
Chromium, Total	0-00-5	5.16E-03
Cobalt	7440-48-4	2.65E-03
Copper*	7440-50-8	2.38E-04
Cyanides	57-12-5	5.77E-02
Ethylbenzene	100-41-4	1.17E-01
Fluoride*		1.21E-03
Formaldehyde	50-00-0	9.30E-01
Hexane	110-54-3	8.43E-01
Hydrochloric Acid	7647-01-0	1.32E-01
Hydrogen Fluoride (hydrofluoric acid)	7664-39-3	5.06E-01
Hydrogen Sulfide	7783-06-4	1.30E+00
Lead	7439-92-1	5.70E-03
Manganese	7439-96-5	1.41E-02
Mercury	7439-97-6	1.22E-02
Methyl Bromide (Bromomethane)	74-83-9	4.83E-01
Methylene Chloride (Dichloromethane)	75-09-2	2.23E-02
Naphthalene	91-20-3	2.91E-02
n-Hexane	110-54-3	1.69E-03
Nickel	7440-02-0	4.50E-03
Phenol	108-95-2	3.73E-01
Propylene*	115-07-1	1.55E+00
Propylene Oxide	75-56-9	8.74E-02
Selenium	7782-49-2	5.73E-03
Sulfuric Acid and Sulfates*	7664-93-9	5.79E+00
Toluene	108-88-3	1.34E-01
Vanadium*	7440-62-2	6.06E-04
Xylenes	1330-20-7	4.94E-02
Zinc*	7440-66-6	1.72E-03
Diesel Particulate Matter*	DPM	8.94E-03
2-Methylnaphthalene	PAH	4.93E-06
3-Methylchloranthrene	PAH	3.69E-07
7,12-Dimethylbenz(a)anthracene	PAH	3.28E-06
Acenaphthene	PAH	3.69E-07

Project Total — HAP Emissions Summary

Hydrogen Energy International LLC — *7/23/2008*
HECA Project

Compound	CAS #	Annual Rate (ton/yr)
Acenaphthylene	PAH	3.69E-07
Anthracene	PAH	4.93E-07
Benz(a)anthracene	PAH	2.37E-05
Benzo(a)anthracene	PAH	4.14E-05
Benzo(a)pyrene	PAH	2.57E-05
Benzo(b)fluoranthene	PAH	2.10E-05
Benzo(g,h,i)perylene	PAH	2.46E-07
Benzo(k)fluoranthene	PAH	2.04E-05
Chrysene	PAH	4.64E-05
Dibenzo(a,h)anthracene	PAH	4.31E-05
Fluoranthene	PAH	6.16E-07
Fluorene	PAH	5.75E-07
Indeno(1,2,3-cd)pyrene	PAH	4.32E-05
PAH (excluding Naphthalene)	PAH	1.75E-04
Phenanathrene	PAH	3.49E-06
Pyrene	PAH	1.03E-06
Total Combined HAPs and TACs		**119.27**
Total HAPs*		**10.62**

Notes:

1) * Denotes pollutants that are not listed as Federal HAPs. These pollutants are not included in the HAP total provided. As shown, combined annual HAP emissions are less than 25 ton/yr. Additionally, individual HAP emissions are below 10 ton/yr. As such, the source is not a major source of HAPs.

CTG/HRSG Stack - SynGas — HAP Emissions Summary

Hydrogen Energy International LLC — *7/23/2008*
HECA Project

Annual emissions based on 100% load at annual average temperature (65 F)

HRSG Heat Input (Yearly Average - 65°F) =	2,159.40	10^6 Btu/hr (HHV)
Duct Burner Heat Input (Yearly Average - 65°F) =	273.76	10^6 Btu/hr (HHV)
Total HRSG Heat Input (Yearly Average - 65°F) =	2,433.16	10^6 Btu/hr (HHV)

Hourly emissions based on 100% load at winter minimum temperature (20 F)

HRSG Heat Input (Winter Minimum - 20°F) =	2,175.92	10^6 Btu/hr (HHV)
Duct Burner Heat Input (Winter Minimum - 20°F) =	273.76	10^6 Btu/hr (HHV)
Total HRSG Heat Input (Winter Minimum - 20°F) =	2,449.68	10^6 Btu/hr (HHV)

HRSG (Firing Syngas) Operating Hours = 8,322.0 hr/yr

Compound	CAS #	Emission Factor ($lb/10^{12}$ Btu coal)	Hourly (lb/hr)	Annual (lb/yr)
Acetaldehyde	75-07-0	1.8	4.41E-03	3.64E+01
Ammonia	7664-41-7		1.84E+01	1.53E+05
Antimony	7440-36-0	1.1	2.69E-03	2.23E+01
Arsenic	7440-38-2	2.4	5.88E-03	4.86E+01
Benz[a]anthracene	56-55-3	0.0023	5.63E-06	4.66E-02
Benzene	71-43-2	2.4	5.88E-03	4.86E+01
Beryllium	7440-41-7	0.26	6.37E-04	5.26E+00
Cadmium	7440-43-9	9.6	2.35E-02	1.94E+02
Carbon disulfide	75-15-0	46	1.13E-01	9.31E+02
Chromium, (hexavalent)	18540-29-9	0.15	3.75E-04	3.10E+00
Chromium, total	0-00-5	0.51	1.25E-03	1.03E+01
Cobalt	7440-48-4	0.26	6.37E-04	5.26E+00
Cyanides	57-12-5	5.7	1.40E-02	1.15E+02
Formaldehyde	50-00-0	17	4.16E-02	3.44E+02
Hydrochloric acid	7647-01-0	13	3.18E-02	2.63E+02
Hydrogen fluoride (Hydrofluoric acid)	7664-39-3	50	1.22E-01	1.01E+03
Lead	7439-92-1	0.56	1.37E-03	1.13E+01
Manganese	7439-96-5	1.0	2.55E-03	2.11E+01

CTG/HRSG Stack - SynGas — HAP Emissions Summary

Hydrogen Energy International LLC — *7/23/2008*
HECA Project

Annual emissions based on 100% load at annual average temperature (65 F)

HRSG Heat Input (Yearly Average - 65°F) =	2,159.40	10^6 Btu/hr (HHV)
Duct Burner Heat Input (Yearly Average - 65°F) =	273.76	10^6 Btu/hr (HHV)
Total HRSG Heat Input (Yearly Average - 65°F) =	2,433.16	10^6 Btu/hr (HHV)

Hourly emissions based on 100% load at winter minimum temperature (20 F)

HRSG Heat Input (Winter Minimum - 20°F) =	2,175.92	10^6 Btu/hr (HHV)
Duct Burner Heat Input (Winter Minimum - 20°F) =	273.76	10^6 Btu/hr (HHV)
Total HRSG Heat Input (Winter Minimum - 20°F) =	2,449.68	10^6 Btu/hr (HHV)

HRSG (Firing Syngas) Operating Hours = 8,322.0 hr/yr

Compound	CAS #	Emission Factor ($lb/10^{12}$ Btu coal)	Hourly (lb/hr)	Annual (lb/yr)
Mercury	7439-97-6	1.2	2.94E-03	2.43E+01
Methyl bromide (Bromomethane)	74-83-9	47.7	1.17E-01	9.66E+02
Methylene chloride (Dichloromethane)	75-09-2	2.2	5.39E-03	4.45E+01
Naphthalene	91-20-3	2.5	6.12E-03	5.06E+01
Nickel	7440-02-0	0.39	9.55E-04	7.90E+00
Phenol	108-95-2	36.8	9.01E-02	7.45E+02
Selenium	7782-49-2	0.56	1.37E-03	1.13E+01
Sulfuric acid and sulfates	7664-93-9	572	1.40E+00	1.16E+04
Toluene	108-88-3	0.033	8.08E-05	6.68E-01

Notes:

Under a mature operating scenario, the unit will primarily fire syngas.

1) HRSG (firing syngas) operating hours = 8,322 hr/yr
2) Hourly emissions based on 100% load at winter minimum temperature (20 F)
3) Annual emissions based on 100% load at annual average temperature (65 F)
4) Emission rates are taken from Wabash River test data and the National Energy Technology Laboratory, U.S. Dept of Energy, Major Environmental Aspects of Gasification-based Power Generation Technologies, Final Report, December 2002.
5) Ammonia slip from the SCR (5 ppmvd @ 15% O2) - provided by Fluor - see Criteria Pollutant emission spreadsheet for details

Auxiliary CTG — HAP Emissions Summary

Hydrogen Energy International LLC — *7/23/2008*
HECA Project

Operating Parameters

Total CTG Heat Input (Yearly Average - 65°F) = 911 10^6 Btu/hr (HHV)
Auxiliary CTG Operating Hours = 4,110 hr/yr

Compound	CAS #	Emission Factor ($lb/10^6$ Btu coal)	Hourly (lb/hr)	Annual (lb/yr)
1,3-Butadiene	106-99-0	1.24E-07	1.13E-04	4.64E-01
Acetaldehyde	75-07-0	1.34E-04	1.22E-01	5.02E+02
Acrolein	107-02-8	3.62E-06	3.30E-03	1.36E+01
Ammonia	7664-41-7		1.20E+01	4.95E+04
Benzene	71-43-2	3.26E-06	2.97E-03	1.22E+01
Ethylbenzene	100-41-4	1.75E-05	1.59E-02	6.55E+01
Formaldehyde	50-00-0	3.60E-04	3.28E-01	1.35E+03
Hexane	110-54-3	2.53E-04	2.30E-01	9.47E+02
Propylene	115-07-1	7.53E-04	6.86E-01	2.82E+03
Propylene Oxide	75-56-9	4.67E-05	4.25E-02	1.75E+02
Toluene	108-88-3	6.93E-05	6.31E-02	2.59E+02
Xylenes	1330-20-7	2.55E-05	2.32E-02	9.55E+01
Benzo(a)anthracene	PAH	2.21E-08	2.01E-05	8.27E-02
Benzo(a)pyrene	PAH	1.36E-08	1.24E-05	5.09E-02
Benzo(b)fluoranthene	PAH	1.10E-08	1.00E-05	4.12E-02
Benzo(k)fluoranthene	PAH	1.07E-08	9.75E-06	4.01E-02
Chrysene	PAH	2.46E-08	2.24E-05	9.21E-02
Dibenz(a,h)anthracene	PAH	2.29E-08	2.09E-05	8.57E-02
Indeno(1,2,3-cd)pyrene	PAH	2.29E-08	2.09E-05	8.57E-02
Naphthalene	PAH	1.62E-06	1.48E-03	6.06E+00

Notes:

1) Auxiliary CTG operating hours = 4,110 hr/yr
2) Hourly and annual emissions based on 100% load at annual average temperature (65 F) with evaporative cooling. This scenario represents worst case heat input for both averaging periods.
3) Emission factors obtained from the CATEF database for natural-gas–fired combustion turbines. Formaldehyde, Benzene, and Acrolein emission factors are from the Background document for AP-42, Section 3.1, Table 3.4-1.
4) Ammonia emission rate based on an exhaust ammonia limit of 10 parts per million by volume at 15 percent oxygen.

Cooling Towers — HAP Emissions Summary

Hydrogen Energy International LLC — *7/23/2008*
HECA Project

Cooling Tower Operating Parameters

	Power Block	Process Area	ASU
Cooling water (CW) circulation rate, gpm =	175,000	42,300	40,200
CW circulation rate (million lb/hr) =	88	21	20
CW dissolved solids (ppmw) =	9,000	9,000	9,000
Drift, fraction of circulating CW =	0.0005%	0.0005%	0.0005%

Note: Assumed 9,000 ppm TDS in circulating cooling water. Circulating water could range from 1200 to 90,000 ppm TDS depending on makeup water quality and tower operation. PM_{10} emissions would vary proportionately.

Cooling Tower Operating Hours = 8,322.0 hr/yr

Power Block

Compound	CAS #	Emission Factor (ppm)	Hourly (lb/hr)	Annual (lb/yr)
Arsenic	7440-38-2	0.026	1.13E-05	9.38E-02
Copper	7440-50-8	0.005	2.19E-06	1.82E-02
Fluoride		0.45	1.97E-04	1.64E+00
Manganese	7439-96-5	1.29	5.63E-04	4.68E+00
Selenium	7784-49-2	0.02	9.36E-06	7.79E-02
Zinc	7440-66-6	0.01	4.38E-06	3.64E-02

Notes:

1) Power block operating hours = 8,322 hr/yr
2) Arsenic ppm value shown taken as average of analytical test results (Fruit Growers Laboratory)
3) Copper ppm value shown is one-half of stated detection limit
4) Fluoride ppm value shown taken as average of analytical test results (Fruit Growers Laboratory)
5) Manganese ppm value shown taken as average of analytical test results (Fruit Growers Laboratory)
5) Selenium ppm value shown taken as average of analytical test results (DWR)
7) Zinc ppm value shown is one-half of stated detection limit

Cooling Towers — HAP Emissions Summary

Hydrogen Energy International LLC — *7/23/2008*
HECA Project

Cooling Tower Operating Parameters

	Power Block	Process Area	ASU
Cooling water (CW) circulation rate, gpm =	175,000	42,300	40,200
CW circulation rate (million lb/hr) =	88	21	20
CW dissolved solids (ppmw) =	9,000	9,000	9,000
Drift, fraction of circulating CW =	0.0005%	0.0005%	0.0005%

Note: Assumed 9,000 ppm TDS in circulating cooling water. Circulating water could range from 1200 to 90,000 ppm TDS depending on makeup water quality and tower operation. PM_{10} emissions would vary proportionately.

Process Area

Compound	CAS #	Emission Factor (ppm)	Hourly (lb/hr)	Annual (lb/yr)
Arsenic	7440-38-2	0.026	2.72E-06	2.27E-02
Copper	7440-50-8	0.005	5.29E-07	4.40E-03
Fluoride		0.45	4.76E-05	3.96E-01
Manganese	7439-96-5	1.29	1.36E-04	1.13E+00
Selenium	7784-49-2	0.02	2.26E-06	1.88E-02
Zinc	7440-66-6	0.01	1.06E-06	8.80E-03

Notes:

1) Process area operating hours = 8,322 hr/yr

2) Arsenic ppm value shown taken as average of analytical test results (Fruit Growers Laboratory)
3) Copper ppm value shown is one-half of stated detection limit
4) Fluoride ppm value shown taken as average of analytical test results (Fruit Growers Laboratory)
5) Manganese ppm value shown taken as average of analytical test results (Fruit Growers Laboratory)
5) Selenium ppm value shown taken as average of analytical test results (DWR)
7) Zinc ppm value shown is one-half of stated detection limit

Cooling Towers — HAP Emissions Summary

Hydrogen Energy International LLC — *7/23/2008*
HECA Project

Cooling Tower Operating Parameters

	Power Block	Process Area	ASU
Cooling water (CW) circulation rate, gpm =	175,000	42,300	40,200
CW circulation rate (million lb/hr) =	88	21	20
CW dissolved solids (ppmw) =	9,000	9,000	9,000
Drift, fraction of circulating CW =	0.0005%	0.0005%	0.0005%

Note: Assumed 9,000 ppm TDS in circulating cooling water. Circulating water could range from 1200 to 90,000 ppm TDS depending on makeup water quality and tower operation. PM_{10} emissions would vary proportionately.

ASU

Compound	CAS #	Emission Factor (ppm)	Hourly (lb/hr)	Annual (lb/yr)
Arsenic	7440-38-2	0.026	2.59E-06	2.15E-02
Copper	7440-50-8	0.005	5.03E-07	4.18E-03
Fluoride		0.45	4.52E-05	3.76E-01
Manganese	7439-96-5	1.29	1.29E-04	1.08E+00
Selenium	7784-49-2	0.02	2.15E-06	1.79E-02
Zinc	7440-66-6	0.01	1.01E-06	8.36E-03

Notes:

1) ASU operating hours = 8,322 hr/yr
2) Arsenic ppm value shown taken as average of analytical test results (Fruit Growers Laboratory)
3) Copper ppm value shown is one-half of stated detection limit
4) Fluoride ppm value shown taken as average of analytical test results (Fruit Growers Laboratory)
5) Manganese ppm value shown taken as average of analytical test results (Fruit Growers Laboratory)
5) Selenium ppm value shown taken as average of analytical test results (DWR)
7) Zinc ppm value shown is one-half of stated detection limit

Gasifier Refractory Heaters — HAP Emissions Summary

Hydrogen Energy International LLC — *7/23/2008*
HECA Project

Operating Parameters

Gasifier Heat Input =	18	10^6 Btu/hr (HHV)
Reference HHV =	1050	Btu/scf
=	0.017	10^6 scf/hr
Gasifier Heater Operating Hours =	1,800	hr/yr

Please note that there are three gasifier heaters; however, the current assumption is that only one gasifier heater is expected to operate at any one time on an as-needed basis to pre-heat the gasifier.

Compound	CAS #	Emission Factor ($lb/10^6$ scf)	Hourly (lb/hr)	Annual (lb/yr)
Arsenic	7440-38-2	2.00E-04	3.43E-06	6.17E-03
Benzene	71-43-2	2.10E-03	3.60E-05	6.48E-02
Beryllium	7440-41-7	1.20E-05	2.06E-07	3.70E-04
Cadmium	7440-43-9	1.10E-03	1.89E-05	3.39E-02
Chromium	7440-47-3	1.40E-03	2.40E-05	4.32E-02
Cobalt	7440-48-4	8.40E-05	1.44E-06	2.59E-03
Copper	7440-50-8	8.50E-04	1.46E-05	2.62E-02
Formaldehyde	50-00-0	7.50E-02	1.29E-03	2.31E+00
Hexane	110-54-3	1.80E+00	3.09E-02	5.55E+01
Manganese	7439-96-5	3.80E-04	6.51E-06	1.17E-02
Mercury	7439-97-6	2.60E-04	4.46E-06	8.02E-03
Naphthalene	91-20-3	6.10E-04	1.05E-05	1.88E-02
Nickel	7440-02-0	2.10E-03	3.60E-05	6.48E-02
Selenium	7782-49-2	2.40E-05	4.11E-07	7.41E-04
Toluene	108-88-3	3.40E-03	5.83E-05	1.05E-01
Vanadium	7440-62-2	2.30E-03	3.94E-05	7.10E-02
Benzo(a)pyrene	PAH	1.20E-06	2.06E-08	3.70E-05
Benz(a)anthracene	PAH	1.80E-06	3.09E-08	5.55E-05
Benzo(b)fluoranthene	PAH	1.80E-06	3.09E-08	5.55E-05
Chrysene	PAH	1.80E-06	3.09E-08	5.55E-05
Dibenzo(a,h)anthracene	PAH	1.20E-06	2.06E-08	3.70E-05

Gasifier Refractory Heaters — HAP Emissions Summary

Hydrogen Energy International LLC — *7/23/2008*
HECA Project

Operating Parameters

Gasifier Heat Input =	18	10^6 Btu/hr (HHV)
Reference HHV =	1050	Btu/scf
=	0.017	10^6 scf/hr
Gasifier Heater Operating Hours =	1,800	hr/yr

Please note that there are three gasifier heaters; however, the current assumption is that only one gasifier heater is expected to operate at any one time on an as-needed basis to pre-heat the gasifier.

Compound	CAS #	Emission Factor ($lb/10^6$ scf)	Hourly (lb/hr)	Annual (lb/yr)
Indeno(1,2,3-cd)pyrene	PAH	1.80E-06	3.09E-08	5.55E-05
2-Methylnaphthalene	PAH	2.40E-05	4.11E-07	7.41E-04
3-Methylchloranthrene	PAH	1.80E-06	3.09E-08	5.55E-05
7,12-Dimethylbenz(a)anthracene	PAH	1.60E-05	2.74E-07	4.94E-04
Acenaphthene	PAH	1.80E-06	3.09E-08	5.55E-05
Acenaphthylene	PAH	1.80E-06	3.09E-08	5.55E-05
Anthracene	PAH	2.40E-06	4.11E-08	7.41E-05
Benzo(g,h,i)perylene	PAH	1.20E-06	2.06E-08	3.70E-05
Benzo(k)fluoranthene	PAH	1.80E-06	3.09E-08	5.55E-05
Fluoranthene	PAH	3.00E-06	5.14E-08	9.26E-05
Fluorene	PAH	2.80E-06	4.80E-08	8.64E-05
Phenanathrene	PAH	1.70E-05	2.91E-07	5.25E-04
Pyrene	PAH	5.00E-06	8.57E-08	1.54E-04

Notes:

1) Gasifier operating hours = 1,800 hr/yr
2) Emission factor source EPA AP-42 Section 1.4
3) Calculation assumes fuel heating value, Btu/scf, HHV 1,050

4) Please note that there are three gasifier heaters; however, the current assumption is that only one gasifier heater is iexpected to operate at any one time.

Auxiliary Boiler — HAP Emissions Summary

Hydrogen Energy International LLC — *7/23/2008*
HECA Project

Operating Parameters

Auxiliary Boiler Heat Input =	142	10^6 Btu/hr (HHV)
=	1050	Btu/scf
=	0.135	10^6 scf/hr
Auxiliary Boiler Operating Hours =	2,190	hr/yr

Compound	CAS #	Emission Factor ($lb/10^6$ scf)	Hourly (lb/hr)	Annual (lb/yr)
Arsenic	7440-38-2	2.00E-04	2.70E-05	5.92E-02
Benzene	71-43-2	2.10E-03	2.84E-04	6.22E-01
Beryllium	7440-41-7	1.20E-05	1.62E-06	3.55E-03
Cadmium	7440-43-9	1.10E-03	1.49E-04	3.26E-01
Chromium	7440-47-3	1.40E-03	1.89E-04	4.15E-01
Cobalt	7440-48-4	8.40E-05	1.14E-05	2.49E-02
Copper	7440-50-8	8.50E-04	1.15E-04	2.52E-01
Formaldehyde	50-00-0	7.50E-02	1.01E-02	2.22E+01
Hexane	110-54-3	1.80E+00	2.43E-01	5.33E+02
Manganese	7439-96-5	3.80E-04	5.14E-05	1.13E-01
Mercury	7439-97-6	2.60E-04	3.52E-05	7.70E-02
Naphthalene	91-20-3	6.10E-04	8.25E-05	1.81E-01
Nickel	7440-02-0	2.10E-03	2.84E-04	6.22E-01
Selenium	7782-49-2	2.40E-05	3.25E-06	7.11E-03
Toluene	108-88-3	3.40E-03	4.60E-04	1.01E+00
Vanadium	7440-62-2	2.30E-03	3.11E-04	6.81E-01
Benzo(a)pyrene	PAH	1.20E-06	1.62E-07	3.55E-04
Benz(a)anthracene	PAH	1.80E-06	2.43E-07	5.33E-04
Benzo(b)fluoranthene	PAH	1.80E-06	2.43E-07	5.33E-04
Chrysene	PAH	1.80E-06	2.43E-07	5.33E-04
Dibenzo(a,h)anthracene	PAH	1.20E-06	1.62E-07	3.55E-04
Indeno(1,2,3-cd)pyrene	PAH	1.80E-06	2.43E-07	5.33E-04
2-Methylnaphthalene	PAH	2.40E-05	3.25E-06	7.11E-03

Auxiliary Boiler — HAP Emissions Summary

Hydrogen Energy International LLC — *7/23/2008*
HECA Project

Operating Parameters

Auxiliary Boiler Heat Input =	142	10^6 Btu/hr (HHV)
=	1050	Btu/scf
=	0.135	10^6 scf/hr
Auxiliary Boiler Operating Hours =	2,190	hr/yr

Compound	CAS #	Emission Factor ($lb/10^6$ scf)	Hourly (lb/hr)	Annual (lb/yr)
3-Methylchloranthrene	PAH	1.80E-06	2.43E-07	5.33E-04
7,12-Dimethylbenz(a)anthracene	PAH	1.60E-05	2.16E-06	4.74E-03
Acenaphthene	PAH	1.80E-06	2.43E-07	5.33E-04
Acenaphthylene	PAH	1.80E-06	2.43E-07	5.33E-04
Anthracene	PAH	2.40E-06	3.25E-07	7.11E-04
Benzo(g,h,i)perylene	PAH	1.20E-06	1.62E-07	3.55E-04
Benzo(k)fluoranthene	PAH	1.80E-06	2.43E-07	5.33E-04
Fluoranthene	PAH	3.00E-06	4.06E-07	8.89E-04
Fluorene	PAH	2.80E-06	3.79E-07	8.29E-04
Phenanathrene	PAH	1.70E-05	2.30E-06	5.03E-03
Pyrene	PAH	5.00E-06	6.76E-07	1.48E-03

Notes:

1) Auxiliary boiler operating hours = 2,190 hr/yr
2) Emission factor source EPA AP-42 Section 1.4
3) Calculation assumes fuel heating value, Btu/scf, HHV 1,050

Ground Flare — HAP Emissions Summary

Hydrogen Energy International LLC — *7/23/2008*
HECA Project

Operating Parameters

Reference HHV =	1050	btu/scf

Ground Flare - Normal Operating Emissions From Pilot

Total Hours of Pilot Operation =	8,760	hr/yr
Ground Flare Pilot Fuel Use =	0.5	10^6 Btu/hr

Ground Flare - Operating Emissions During Gasifier Startup and Shutdown

Total Flare SU/SD Operation =	115,500	10^6 Btu/yr
Wet Unshifted Gas Firing Rate =	1195	10^6 Btu/hr - conservatively assuming maximum possible rate
Dry Shifted Gas Firing Rate =	1020	10^6 Btu/hr - conservatively assuming maximum possible rate

Startup and shutdown flared gas scenario

Cold plant startup =	30,000	10^6 Btu/yr (1 event)	(assume 20% unshifted)
Plant shutdown =	500	10^6 Btu/yr (1 event)	(assume 100% unshifted)
Gasifier outages =	60,000	10^6 Btu/yr (24 events)	(assume 100% unshifted)
Gasifier hot restarts =	25,000	10^6 Btu/yr (12 events)	(assume 100% unshifted)
Total	115,500	10^6 Btu/yr	(approx 75% unshifted)

Compound	CAS #	Emission Factor ($lb/10^6$ scf)	Emission ($lb/10^6$ Btu)	Hourly (lb/hr)	Annual (lb/yr)
Acetaldehyde	75-07-0	0.043	4.10E-05	9.07E-02	4.91E+00
Acrolein	107-02-8	0.01	9.52E-06	2.11E-02	1.14E+00
Benzene	71-43-2	0.159	1.51E-04	3.35E-01	1.82E+01
Ethyl Benzene	100-41-4	1.444	1.38E-03	3.05E+00	1.65E+02
Formaldehyde	50-00-0	1.169	1.11E-03	2.47E+00	1.33E+02
Naphthalene	91-20-3	0.011	1.05E-05	2.32E-02	1.26E+00
n-Hexane	110-54-3	0.029	2.76E-05	6.12E-02	3.31E+00
PAH (excluding Naphthalene)	PAH	0.003	2.86E-06	6.33E-03	3.43E-01
Propylene	115-07-1	2.44	2.32E-03	5.15E+00	2.79E+02
Toluene	108-88-3	0.058	5.52E-05	1.22E-01	6.62E+00

Ground Flare — HAP Emissions Summary

Hydrogen Energy International LLC — *7/23/2008*
HECA Project

Operating Parameters

Reference HHV =	1050	btu/scf

Ground Flare - Normal Operating Emissions From Pilot

Total Hours of Pilot Operation =	8,760	hr/yr
Ground Flare Pilot Fuel Use =	0.5	10^6 Btu/hr

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Total Flare SU/SD Operation =	115,500	10^6 Btu/yr
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Dry Shifted Gas Firing Rate =	1020	10^6 Btu/hr - conservatively assuming maximum possible rate

Startup and shutdown flared gas scenario

Cold plant startup =	30,000	10^6 Btu/yr (1 event)	(assume 20% unshifted)
Plant shutdown =	500	10^6 Btu/yr (1 event)	(assume 100% unshifted)
Gasifier outages =	60,000	10^6 Btu/yr (24 events)	(assume 100% unshifted)
Gasifier hot restarts =	25,000	10^6 Btu/yr (12 events)	(assume 100% unshifted)
Total	115,500	10^6 Btu/yr	(approx 75% unshifted)

Compound	CAS #	Emission Factor ($lb/10^6$ scf)	Emission ($lb/10^6$ Btu)	Hourly (lb/hr)	Annual (lb/yr)
Xylene(s)	1330-20-7	0.029	2.76E-05	6.12E-02	3.31E+00
Arsenic	7440-38-2	2.00E-04	1.90E-07	4.22E-04	2.28E-02
Beryllium	7440-41-7	1.20E-05	1.14E-08	2.53E-05	1.37E-03
Cadmium	7440-43-9	1.10E-03	1.05E-06	2.32E-03	1.26E-01
Chromium	7440-47-3	1.40E-03	1.33E-06	2.95E-03	1.60E-01
Cobalt	7440-48-4	8.40E-05	8.00E-08	1.77E-04	9.59E-03
Copper	7440-50-8	8.50E-04	8.10E-07	1.79E-03	9.70E-02
Lead	7439-92-1	5.00E-04	4.76E-07	1.05E-03	5.71E-02
Manganese	7439-96-5	3.80E-04	3.62E-07	8.02E-04	4.34E-02
Mercury	7439-97-6	2.60E-04	2.48E-07	5.49E-04	2.97E-02

Ground Flare — HAP Emissions Summary

Hydrogen Energy International LLC — *7/23/2008*
HECA Project

Operating Parameters

Reference HHV =	1050	btu/scf

Ground Flare - Normal Operating Emissions From Pilot

Total Hours of Pilot Operation =	8,760	hr/yr
Ground Flare Pilot Fuel Use =	0.5	10^6 Btu/hr

Ground Flare - Operating Emissions During Gasifier Startup and Shutdown

Total Flare SU/SD Operation =	115,500	10^6 Btu/yr
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Dry Shifted Gas Firing Rate =	1020	10^6 Btu/hr - conservatively assuming maximum possible rate

Startup and shutdown flared gas scenario

Cold plant startup =	30,000	10^6 Btu/yr (1 event)	(assume 20% unshifted)
Plant shutdown =	500	10^6 Btu/yr (1 event)	(assume 100% unshifted)
Gasifier outages =	60,000	10^6 Btu/yr (24 events)	(assume 100% unshifted)
Gasifier hot restarts =	25,000	10^6 Btu/yr (12 events)	(assume 100% unshifted)
Total	115,500	10^6 Btu/yr	(approx 75% unshifted)

Compound	CAS #	Emission Factor ($lb/10^6$ scf)	Emission ($lb/10^6$ Btu)	Hourly (lb/hr)	Annual (lb/yr)
Nickel	7440-02-0	2.10E-03	2.00E-06	4.43E-03	2.40E-01
Selenium	7782-49-2	2.40E-05	2.29E-08	5.06E-05	2.74E-03
Vanadium	7440-62-2	2.30E-03	2.19E-06	4.85E-03	2.63E-01
Zinc	7440-66-6	2.90E-02	2.76E-05	6.12E-02	3.31E+00

Notes:

1) Annual operation assumes total pilot operation of 8,760 hr/yr and 115,500 10^6 Btu/yr during gasifier startup and shutdown.

2) Emission factors based on AP-42 Chpt. 1.4 (for metals) and VCAPCD AB2588 (for non-metals).

3) Calculation assumes fuel heating value, Btu/scf, HHV 1,050

Elevated Acid Flare — HAP Emissions Summary

Hydrogen Energy International LLC — *7/23/2008*
HECA Project

Operating Parameters

Reference HHV = 1050 btu/scf

Elevated Acid Flare - Normal Operating Emissions From Pilot

Total Hours of Pilot Operation = 8,760 hr/yr
Elevated Flare Pilot Fuel Use = 0.3 10^6 Btu/hr

Elevated Acid Flare - Operating Emissions During Gasifier Startup and Shutdown

Total Flare Operation During SU/SD = 6.0 hr/yr — assumes approximately 6 hours (2 events)
Natural Gas Heat Rate (assist gas) = 36.0 10^6 Btu/hr

Compound	CAS #	Emission Factor ($lb/10^6$ scf)	Emission ($lb/10^6$ Btu)	Hourly (lb/hr)	Annual (lb/yr)
Acetaldehyde	75-07-0	0.043	4.10E-05	1.49E-03	1.16E-01
Acrolein	107-02-8	0.01	9.52E-06	3.46E-04	2.71E-02
Benzene	71-43-2	0.159	1.51E-04	5.50E-03	4.31E-01
Ethyl Benzene	100-41-4	1.444	1.38E-03	4.99E-02	3.91E+00
Formaldehyde	50-00-0	1.169	1.11E-03	4.04E-02	3.17E+00
Naphthalene	91-20-3	0.011	1.05E-05	3.80E-04	2.98E-02
n-Hexane	110-54-3	0.029	2.76E-05	1.00E-03	7.85E-02
PAH (excluding Naphthalene)	PAH	0.003	2.86E-06	1.04E-04	8.13E-03
Propylene	115-07-1	2.44	2.32E-03	8.44E-02	6.61E+00
Toluene	108-88-3	0.058	5.52E-05	2.01E-03	1.57E-01
Xylene(s)	1330-20-7	0.029	2.76E-05	1.00E-03	7.85E-02
Arsenic	7440-38-2	2.00E-04	1.90E-07	6.91E-06	5.42E-04
Beryllium	7440-41-7	1.20E-05	1.14E-08	4.15E-07	3.25E-05
Cadmium	7440-43-9	1.10E-03	1.05E-06	3.80E-05	2.98E-03
Chromium	7440-47-3	1.40E-03	1.33E-06	4.84E-05	3.79E-03
Cobalt	7440-48-4	8.40E-05	8.00E-08	2.90E-06	2.28E-04
Copper	7440-50-8	8.50E-04	8.10E-07	2.94E-05	2.30E-03

Elevated Acid Flare — HAP Emissions Summary

Hydrogen Energy International LLC — *7/23/2008*
HECA Project

Operating Parameters

Reference HHV = 1050 btu/scf

Elevated Acid Flare - Normal Operating Emissions From Pilot

Total Hours of Pilot Operation = 8,760 hr/yr
Elevated Flare Pilot Fuel Use = 0.3 10^6 Btu/hr

Elevated Acid Flare - Operating Emissions During Gasifier Startup and Shutdown

Total Flare Operation During SU/SD = 6.0 hr/yr — assumes approximately 6 hours (2 events)
Natural Gas Heat Rate (assist gas) = 36.0 10^6 Btu/hr

Compound	CAS #	Emission Factor ($lb/10^6$ scf)	Emission ($lb/10^6$ Btu)	Hourly (lb/hr)	Annual (lb/yr)
Lead	7439-92-1	5.00E-04	4.76E-07	1.73E-05	1.35E-03
Manganese	7439-96-5	3.80E-04	3.62E-07	1.31E-05	1.03E-03
Mercury	7439-97-6	2.60E-04	2.48E-07	8.99E-06	7.04E-04
Nickel	7440-02-0	2.10E-03	2.00E-06	7.26E-05	5.69E-03
Selenium	7782-49-2	2.40E-05	2.29E-08	8.30E-07	6.50E-05
Vanadium	7440-62-2	2.30E-03	2.19E-06	7.95E-05	6.23E-03
Zinc	7440-66-6	2.90E-02	2.76E-05	1.00E-03	7.85E-02

Notes:

1) Annual operation assumes total pilot operation of 8,760 hr/yr and 6 hr/yr during gasifier startup and shutdown with assist gas.
2) Emission factors based on AP-42 Chpt. 1.4 (for metals) and VCAPCD AB2588 (for non-metals).
3) Calculation assumes fuel heating value, Btu/scf, HHV 1,050

Tail Gas Thermal Oxidizer — HAP Emissions Summary

Hydrogen Energy International LLC — *7/23/2008*
HECA Project

Operating Parameters

Tail Gas Thermal Oxidizer Heat Input =	10	10^6 Btu/hr (HHV)
Reference HHV =	1050	Btu/scf
=	0.010	10^6 scf/hr
Tail Gas Thermal Oxidizer Operating Hours =	8,760	hr/yr

Compound	CAS #	Emission Factor ($lb/10^6$ scf)	Hourly (lb/hr)	Annual (lb/yr)
Arsenic	7440-38-2	2.00E-04	1.90E-06	1.67E-02
Benzene	71-43-2	2.10E-03	2.00E-05	1.75E-01
Beryllium	7440-41-7	1.20E-05	1.14E-07	1.00E-03
Cadmium	7440-43-9	1.10E-03	1.05E-05	9.18E-02
Chromium	7440-47-3	1.40E-03	1.33E-05	1.17E-01
Cobalt	7440-48-4	8.40E-05	8.00E-07	7.01E-03
Copper	7440-50-8	8.50E-04	8.10E-06	7.09E-02
Formaldehyde	50-00-0	7.50E-02	7.14E-04	6.26E+00
Hexane	110-54-3	1.80E+00	1.71E-02	1.50E+02
Manganese	7439-96-5	3.80E-04	3.62E-06	3.17E-02
Mercury	7439-97-6	2.60E-04	2.48E-06	2.17E-02
Naphthalene	91-20-3	6.10E-04	5.81E-06	5.09E-02
Nickel	7440-02-0	2.10E-03	2.00E-05	1.75E-01
Selenium	7782-49-2	2.40E-05	2.29E-07	2.00E-03
Toluene	108-88-3	3.40E-03	3.24E-05	2.84E-01
Vanadium	7440-62-2	2.30E-03	2.19E-05	1.92E-01
Benzo(a)pyrene	PAH	1.20E-06	1.14E-08	1.00E-04
Benz(a)anthracene	PAH	1.80E-06	1.71E-08	1.50E-04
Benzo(b)fluoranthene	PAH	1.80E-06	1.71E-08	1.50E-04
Chrysene	PAH	1.80E-06	1.71E-08	1.50E-04
Dibenzo(a,h)anthracene	PAH	1.20E-06	1.14E-08	1.00E-04
Indeno(1,2,3-cd)pyrene	PAH	1.80E-06	1.71E-08	1.50E-04
2-Methylnaphthalene	PAH	2.40E-05	2.29E-07	2.00E-03
3-Methylchloranthrene	PAH	1.80E-06	1.71E-08	1.50E-04

Tail Gas Thermal Oxidizer — HAP Emissions Summary

Hydrogen Energy International LLC — *7/23/2008*
HECA Project

Operating Parameters

Tail Gas Thermal Oxidizer Heat Input =	10	10^6 Btu/hr (HHV)
Reference HHV =	1050	Btu/scf
=	0.010	10^6 scf/hr
Tail Gas Thermal Oxidizer Operating Hours =	8,760	hr/yr

Compound	CAS #	Emission Factor ($lb/10^6$ scf)	Hourly (lb/hr)	Annual (lb/yr)
7,12-Dimethylbenz(a)anthracene	PAH	1.60E-05	1.52E-07	1.33E-03
Acenaphthene	PAH	1.80E-06	1.71E-08	1.50E-04
Acenaphthylene	PAH	1.80E-06	1.71E-08	1.50E-04
Anthracene	PAH	2.40E-06	2.29E-08	2.00E-04
Benzo(g,h,i)perylene	PAH	1.20E-06	1.14E-08	1.00E-04
Benzo(k)fluoranthene	PAH	1.80E-06	1.71E-08	1.50E-04
Fluoranthene	PAH	3.00E-06	2.86E-08	2.50E-04
Fluorene	PAH	2.80E-06	2.67E-08	2.34E-04
Phenanathrene	PAH	1.70E-05	1.62E-07	1.42E-03
Pyrene	PAH	5.00E-06	4.76E-08	4.17E-04

Notes:

1) Tail gas thermal oxidizer operating hours = 8,760 (accounting for both process vent and SRU startup)
2) Emission factor source EPA AP-42 Section 1.4
3) Calculation assumes fuel heating value, Btu/scf, HHV 1,050

Intermittent CO_2 Vent — HAP Emissions Summary

Hydrogen Energy International LLC — *7/23/2008*
HECA Project

Operating Parameters

Total Days of Operation =	21	day/yr
Total Hours of Operation =	504	hr/yr
Total Flow =	656,000	lb/hr
Total Flow =	15,150	lbmol/hr
Molecular weight		
COS	60	lb/lbmol
H_2S	34	lb/lbmol

PLEASE NOTE THAT THIS EMISSIONS SOURCE WILL BE MODELED IN DEGADIS.

Compound	CAS #	Emission Factor (ppm)	Hourly (lb/hr)	Annual (lb/yr)
Carbonyl Sulfide	463-58-1	20	1.82E+01	9.17E+03
Hydrogen Sulfide	7783-06-4	10	5.15E+00	2.60E+03

Notes:
1) Emission rates based on plant design and 21 day/yr full venting.

Emergency Diesel Generator — HAP Emissions Summary

Hydrogen Energy International LLC — *7/23/2008*
HECA Project

Operating Parameters

Emergency Generator Specification = 2,800 Bhp
Emergency Generator Operating Hours = 50 hr/yr

PLEASE NOTE THAT THERE ARE TWO GENERATORS; EMISSION SHOWN IS FOR INDIVIDUAL GENERATORS.

Compound	CAS #	Emission Factor (g/Bhp/hr)	Hourly (lb/hr)	Annual (lb/yr)
Diesel Particulate Matter	DPM	0.03	1.60E-01	8.02E+00

Note:

1) Emergency generator operating hours = 50 hr/yr per generator.
2) Emissions factor shown is site specific diesel emission rate based on vendor data.
3) emission rate shown is for individual generator.

Emergency Diesel Firewater Pump — HAP Emissions Summary

Hydrogen Energy International LLC — *7/23/2008*
HECA Project

Operating Parameters

Fire Water Pump Specification = 556 Bhp
Fire Water Pump Operating Hours = 100 hr/yr

Compound	CAS #	Emission Factor (g/Bhp/hr)	Hourly (lb/hr)	Annual (lb/yr)
Diesel Particulate Matter	DPM	0.015	1.84E-02	1.84E+00

Note:

1) Fire water pump operating hours = 100 hr/yr.
2) Emission factor shown is from Tier 4 requirements.