WTW APPENDIX 1

Summary of WTW Energy and GHG balances

This appendix gives, for each WTW pathway, i.e. a combination of a fuel production route and a powertrain, the energy and GHG figures including uncertainty ranges for WTT, TTW and WTW.

New pathways in this version are highlighted in yellow.

Note that fossil energy is only indicated where lower than total energy (i.e. for partly renewable pathways).

Corrections from version 2b of May 2006
Small change to bio-diesel pathways as a result of addition of glycerine purification and accounting for fossil content of methanol affect tables in section 5 and section 10.

Table of contents

1 Crude oil based fuels

WTT Code	Powertrain	Energy MJ / 100 km												GHG g CO_{2eq} / km								
		Total									Fossil											
		TTW (MJ_f/100 km)			WTT (MJ_{pf}/100 km)			**WTW** (MJ/100km)			**WTW** (MJ_{fp}/100km)			TTW			WTT			**WTW**		
		Mean	Min	Max	Mean	Min	Max	**Mean**	Min	Max	**Mean**	Min	Max	Mean	Min	Max	Mean	Min	Max	**Mean**	Min	Max
Conventional fuels pathways																						
COG1	Conventional gasoline																					
	PISI 2002	224	0	0	31	4	6	**255**	4	6				168	0	0	28	3	5	**196**	3	5
	DISI 2002	209	8	8	29	4	6	**238**	10	11				157	6	6	26	3	4	**183**	7	8
	PISI 2010	190	6	6	26	4	5	**216**	7	8				140	4	4	24	3	4	**164**	5	6
	DISI 2010	188	9	9	26	4	5	**214**	11	12				139	7	7	24	3	4	**162**	8	9
	PISI hybrid	162	17	12	22	3	5	**184**	18	14				120	12	9	20	2	3	**140**	13	10
	DISI hybrid	163	17	13	23	3	5	**186**	18	14				121	12	9	20	2	3	**141**	13	11
	Reformer + FC	162	21	37	23	3	5	**185**	22	38				120	15	28	20	2	3	**140**	16	29
COD1	Conventional diesel																					
	DICI 2002	183	5	5	29	4	4	**212**	7	7				138	4	4	26	3	3	**164**	6	6
	DICI 2010 no DPF	172	7	7	27	4	4	**200**	9	9				128	5	5	24	3	3	**152**	7	7
	DICI 2010 DPF	177	7	7	28	4	4	**205**	9	9				131	6	6	25	3	3	**156**	7	7
	DICI hybrid n DPF	141	15	11	23	3	3	**164**	16	12				105	11	8	20	2	3	**125**	12	9
	DICI hybrid DPF	146	15	11	23	3	3	**169**	16	12				108	11	8	21	2	3	**129**	12	9
	Reformer + FC	162	28	41	26	4	4	**188**	29	43				121	21	31	23	3	3	**144**	22	32
CON1	Conventional naphtha																					
	Reformer + FC	162	7	4	18	2	3	**180**	8	5				118	20	30	16	2	3	**134**	20	30
LRLP1	LPG: imports from remote gas field																					
	PISI 2002	224	4	4	26	0	2	**250**	4	5				148	3	3	18	0	1	**166**	3	3
	PISI 2010	190	7	7	22	0	2	**212**	7	7				126	5	5	15	0	1	**141**	5	5

2 CNG / CBG

WTT Code	Powertrain	Energy MJ / 100 km												GHG g CO_{2eq} / km								
		Total								Fossil												
		TTW (MJ_f/100 km)			WTT (MJ_{pf}/100 km)			**WTW** (MJ/100km)			**WTW** (MJ_{fp}/100km)			TTW			WTT			**WTW**		
		Mean	Min	Max	Mean	Min	Max	**Mean**	Min	Max	**Mean**	Min	Max	Mean	Min	Max	Mean	Min	Max	**Mean**	Min	Max
CNG pathways																						
GMCG1	CNG: EU-mix																					
	PISI bi-fuel 2002	227	12	6	27	5	6	**254**	14	9				132	7	4	19	2	3	**151**	8	5
	PISI dedicated 2002	223	14	6	27	5	6	**249**	15	9				130	8	4	19	2	3	**149**	9	5
	PISI bi-fuel 2010	188	12	8	22	4	5	**211**	13	10				108	7	4	16	2	3	**124**	7	5
	PISI dedicated 2010	187	13	8	22	4	5	**209**	14	10				108	7	4	16	2	3	**123**	8	5
	PISI hybrid	139	17	13	17	3	4	**156**	17	14				81	10	8	12	1	2	**92**	10	8
GPCG1a	CNG: Pipeline 7000 km																					
	PISI bi-fuel 2002	227	12	6	67	24	1	**294**	30	7				132	7	4	49	13	1	**181**	18	4
	PISI dedicated 2002	223	14	6	66	23	1	**289**	31	7				130	8	4	48	13	1	**178**	18	4
	PISI bi-fuel 2010	188	12	8	56	20	1	**244**	26	9				108	7	4	41	11	1	**149**	15	5
	PISI dedicated 2010	187	13	8	56	20	1	**243**	27	8				108	7	4	41	11	1	**148**	16	5
	PISI hybrid	139	17	13	41	15	1	**181**	26	14				81	10	8	30	8	1	**111**	15	8
GPCG1b	CNG: Pipeline 4000 km																					
	PISI bi-fuel 2002	227	12	6	43	12	4	**270**	19	8				132	7	4	32	7	2	**164**	11	5
	PISI dedicated 2002	223	14	6	43	12	4	**265**	20	8				130	8	4	31	6	2	**161**	12	5
	PISI bi-fuel 2010	188	12	8	36	10	3	**224**	17	9				108	7	4	26	5	2	**135**	10	5
	PISI dedicated 2010	187	13	8	36	10	3	**223**	18	9				108	7	4	26	5	2	**134**	10	5
	PISI hybrid	139	17	13	27	7	2	**166**	20	14				81	10	8	20	4	1	**100**	12	8
GRCG1	CNG: LNG, Vap, Pipe																					
	PISI bi-fuel 2002	227	12	6	69	5	6	**296**	15	10				132	7	4	45	3	3	**177**	9	6
	PISI dedicated 2002	223	14	6	68	5	6	**291**	17	10				130	8	4	44	3	3	**174**	10	6
	PISI bi-fuel 2010	188	12	8	58	4	5	**246**	14	11				108	7	4	38	2	3	**146**	8	6
	PISI dedicated 2010	187	13	8	57	4	5	**244**	15	11				108	7	4	37	2	3	**145**	9	6
	PISI hybrid	139	17	13	43	3	4	**182**	19	15				81	10	8	28	2	2	**109**	11	9
GRCG1C	CNG: LNG, Vap, Pipe, CCS																					
	PISI bi-fuel 2002	227	12	6	72	5	6	**299**	15	10				132	7	4	37	3	3	**169**	8	6
	PISI dedicated 2002	223	14	6	71	5	6	**294**	17	10				130	8	4	36	3	3	**166**	9	5
	PISI bi-fuel 2010	188	12	8	60	5	5	**248**	14	11				108	7	4	31	2	2	**139**	8	6
	PISI dedicated 2010	187	13	8	60	5	5	**247**	15	11				108	7	4	31	2	2	**138**	9	6
	PISI hybrid	139	17	13	44	3	3	**184**	19	15				81	10	8	23	2	2	**104**	11	9
GRCG2	CNG: LNG, Road, Vap																					
	PISI bi-fuel 2002	227	12	6	59	3	6	**286**	13	10				132	7	4	46	1	3	**178**	8	6
	PISI dedicated 2002	223	14	6	58	2	5	**281**	15	9				130	8	4	45	1	3	**175**	9	6
	PISI bi-fuel 2010	188	12	8	49	2	5	**238**	13	10				108	7	4	38	1	2	**147**	8	6
	PISI dedicated 2010	187	13	8	49	2	5	**236**	14	10				108	7	4	38	1	2	**146**	8	6
	PISI hybrid	139	17	13	36	2	3	**176**	18	15				81	10	8	28	1	2	**109**	11	9
CBG pathways																						
OWCG1	CBG: municipal waste																					
	PISI bi-fuel 2002	227	12	6	198	29	33	**425**	42	39	**39**	15	10	132	7	4	-92	7	7	**41**	7	6
	PISI dedicated 2002	223	14	6	195	29	33	**417**	43	39	**38**	16	10	130	8	4	-90	7	7	**40**	8	5
	PISI bi-fuel 2010	188	12	8	164	24	28	**353**	36	35	**32**	13	10	108	7	4	-76	6	6	**32**	7	5
	PISI dedicated 2010	187	13	8	163	24	27	**351**	38	35	**32**	15	10	108	7	4	-76	6	5	**32**	7	5
	PISI hybrid	139	17	13	122	18	20	**261**	37	34	**24**	18	14	81	10	8	-56	4	4	**24**	10	8
OWCG2	CBG: liquid manure																					
	PISI bi-fuel 2002	227	12	6	219	40	34	**446**	53	41	**7**	12	7	132	7	4	-304	51	61	**-171**	36	52
	PISI dedicated 2002	223	14	6	215	39	33	**438**	55	40	**7**	14	6	130	8	4	-298	51	60	**-168**	33	51
	PISI bi-fuel 2010	188	12	8	182	33	28	**370**	46	37	**6**	12	8	108	7	4	-252	43	50	**-144**	28	40
	PISI dedicated 2010	187	13	8	181	33	28	**368**	47	36	**6**	13	8	108	7	4	-250	42	50	**-143**	26	40
	PISI hybrid	139	17	13	135	25	21	**274**	44	36	**4**	17	13	81	10	8	-186	32	37	**-106**	13	21
OWCG3	CBG: dry manure																					
	PISI bi-fuel 2002	227	12	6	215	38	36	**442**	51	43	**2**	12	6	132	7	4	-125	7	6	**7**	7	5
	PISI dedicated 2002	223	14	6	211	38	35	**434**	52	42	**2**	14	6	130	8	4	-123	7	6	**7**	8	4
	PISI bi-fuel 2010	188	12	8	179	32	30	**367**	44	38	**2**	12	8	108	7	4	-104	6	5	**5**	7	5
	PISI dedicated 2010	187	13	8	177	32	30	**365**	46	38	**2**	13	8	108	7	4	-103	6	5	**5**	8	5
	PISI hybrid	139	17	13	132	24	22	**272**	43	37	**1**	17	13	81	10	8	-77	4	4	**4**	11	8

3 Ethanol

WTT Code	Powertrain	Energy MJ / 100 km												GHG g CO_{2eq} / km								
		Total									Fossil											
		TTW (MJ/100 km)			WTT (MJ/100 km)			**WTW** (MJ/100km)			**WTW** (MJ_{fo}/100km)			TTW			WTT			**WTW**		
		Mean	Min	Max	Mean	Min	Max	**Mean**	Min	Max	**Mean**	Min	Max	Mean	Min	Max	Mean	Min	Max	**Mean**	Min	Max
Ethanol pathways, as blended fuels																						
SBET1	EtOH: Sugar beet, pulp to fodder																					
	PISI 2002 95/5	224	2	2	50	31	31	**274**	31	32	**252**			168	2	2	25	3	5	**193**	4	5
	DISI 2002 95/5	209	9	9	47	29	29	**256**	32	32	**235**			157	6	6	23	3	5	**180**	8	8
	PISI 2010 95/5	190	6	6	43	26	26	**233**	28	28	**214**			140	4	4	21	3	4	**162**	6	7
	DISI 2010 95/5	188	10	10	42	26	26	**230**	30	30	**212**			139	7	7	21	3	4	**160**	8	9
	DISI hybrid 95/5	163	17	13	37	22	23	**200**	31	28	**183**			120	13	9	18	2	4	**139**	13	11
SBET3	EtOH: Sugar beet, pulp to heat																					
	PISI 2002 95/5	224	2	2	44	8	8	**268**	8	9	**245**			168	2	2	22	3	5	**190**	4	5
	DISI 2002 95/5	209	9	9	41	7	7	**250**	12	12	**229**			157	6	6	21	3	4	**177**	8	8
	PISI 2010 95/5	190	6	6	37	6	7	**227**	10	10	**209**			140	4	4	19	3	4	**159**	6	6
	DISI 2010 95/5	188	10	10	37	6	7	**225**	13	13	**206**			139	7	7	18	3	4	**157**	8	9
	DISI hybrid 95/5	163	17	13	32	6	6	**195**	19	15	**179**			120	13	9	16	2	3	**136**	13	10
WTET1a	EtOH: Wheat, conv NG boiler, DDGS as AF																					
	PISI 2002 95/5	224	2	2	49	14	9	**273**	15	9	**252**			168	2	2	25	4	5	**193**	4	6
	DISI 2002 95/5	209	9	9	46	13	8	**255**	17	13	**235**			157	6	6	24	4	5	**180**	8	9
	PISI 2010 95/5	190	6	6	42	12	7	**232**	15	11	**214**			140	4	4	21	3	5	**162**	6	7
	DISI 2010 95/5	188	10	10	42	12	7	**229**	17	13	**212**			139	7	7	21	3	4	**160**	8	9
	DISI hybrid 95/5	163	17	13	36	10	6	**199**	22	16	**184**			120	13	9	18	3	4	**139**	13	11
WTET1b	EtOH: Wheat, conv NG boiler, DDGS as fuel																					
	PISI 2002 95/5	224	2	2	44	9	9	**268**	10	9	**247**			168	2	2	24	4	5	**192**	4	6
	DISI 2002 95/5	209	9	9	41	8	8	**250**	13	13	**231**			157	6	6	23	4	5	**180**	8	9
	PISI 2010 95/5	190	6	6	37	8	7	**227**	11	10	**210**			140	4	4	21	3	4	**161**	6	7
	DISI 2010 95/5	188	10	10	37	8	7	**225**	13	13	**207**			139	7	7	20	3	4	**159**	8	9
	DISI hybrid 95/5	163	17	13	32	7	6	**195**	20	15	**180**			120	13	9	18	3	4	**138**	13	11
WTET2a	EtOH: Wheat, NG GT+CHP, DDGS as AF																					
	PISI 2002 95/5	224	2	2	47	11	9	**270**	12	9	**249**			168	2	2	24	4	5	**192**	4	6
	DISI 2002 95/5	209	9	9	44	11	8	**252**	15	13	**233**			157	6	6	22	4	5	**179**	8	9
	PISI 2010 95/5	190	6	6	40	10	7	**230**	12	11	**212**			140	4	4	20	3	4	**160**	6	7
	DISI 2010 95/5	188	10	10	39	10	7	**227**	15	13	**209**			139	7	7	20	3	4	**159**	8	9
	DISI hybrid 95/5	163	17	13	34	8	6	**197**	21	15	**182**			120	13	9	17	3	4	**138**	13	11
WTET2b	EtOH: Wheat, NG GT+CHP, DDGS as fuel																					
	PISI 2002 95/5	224	2	2	41	6	9	**265**	7	9	**244**			168	2	2	23	4	5	**191**	4	6
	DISI 2002 95/5	209	9	9	39	6	8	**247**	11	13	**228**			157	6	6	21	3	5	**178**	8	9
	PISI 2010 95/5	190	6	6	35	5	7	**225**	9	10	**207**			140	4	4	19	3	4	**160**	6	7
	DISI 2010 95/5	188	10	10	35	5	7	**223**	12	13	**205**			139	7	7	19	3	4	**158**	8	9
	DISI hybrid 95/5	163	17	13	30	5	6	**193**	19	15	**178**			120	13	9	17	3	4	**137**	13	11
WTET3a	EtOH: Wheat, Lignite CHP, DDGS as AF																					
	PISI 2002 95/5	224	2	2	49	14	9	**273**	14	9	**251**			168	2	2	29	4	5	**197**	5	6
	DISI 2002 95/5	209	9	9	46	13	8	**255**	17	13	**235**			157	6	6	27	4	5	**184**	8	9
	PISI 2010 95/5	190	6	6	42	12	7	**232**	14	11	**214**			140	4	4	25	3	4	**165**	6	7
	DISI 2010 95/5	188	10	10	41	12	7	**229**	17	13	**211**			139	7	7	24	3	4	**163**	8	9
	DISI hybrid 95/5	163	17	13	36	10	6	**199**	22	16	**183**			120	13	9	21	3	4	**142**	13	11
WTET3b	EtOH: Wheat, Lignite CHP, DDGS as fuel																					
	PISI 2002 95/5	224	2	2	44	9	9	**267**	9	9	**246**			168	2	2	28	4	5	**196**	4	6
	DISI 2002 95/5	209	9	9	41	8	8	**250**	13	13	**230**			157	6	6	26	3	5	**183**	8	9
	PISI 2010 95/5	190	6	6	37	7	7	**227**	11	10	**209**			140	4	4	24	3	4	**164**	6	7
	DISI 2010 95/5	188	10	10	37	7	7	**225**	13	13	**207**			139	7	7	24	3	4	**162**	8	9
	DISI hybrid 95/5	163	17	13	32	6	6	**195**	20	15	**180**			120	13	9	20	3	4	**141**	13	11
WTET4a	EtOH: Wheat, Straw CHP, DDGS as AF																					
	PISI 2002 95/5	224	2	2	48	7	9	**272**	8	9	**245**			168	2	2	21	4	5	**189**	4	6
	DISI 2002 95/5	209	9	9	45	7	8	**254**	12	13	**229**			157	6	6	20	4	5	**177**	8	9
	PISI 2010 95/5	190	6	6	41	6	7	**231**	10	11	**208**			140	4	4	18	3	4	**158**	6	7
	DISI 2010 95/5	188	10	10	41	6	7	**229**	13	13	**206**			139	7	7	18	3	4	**157**	8	9
	DISI hybrid 95/5	163	17	13	35	5	6	**198**	19	16	**179**			120	13	9	16	3	4	**136**	13	11
WTET4b	EtOH: Wheat, Straw CHP, DDGS as fuel																					
	PISI 2002 95/5	224	2	2	43	2	9	**267**	3	9	**240**			168	2	2	20	4	5	**188**	4	6
	DISI 2002 95/5	209	9	9	40	2	8	**249**	9	13	**224**			157	6	6	19	4	5	**176**	8	9
	PISI 2010 95/5	190	6	6	37	2	7	**227**	7	10	**204**			140	4	4	17	3	4	**158**	6	7
	DISI 2010 95/5	188	10	10	36	2	7	**224**	10	13	**202**			139	7	7	17	3	4	**156**	8	9
	DISI hybrid 95/5	163	17	13	31	2	6	**194**	18	15	**175**			120	13	9	15	3	4	**135**	13	11
WWET1	EtOH: W Wood																					
	PISI 2002 95/5	224	2	2	51	7	7	**275**	8	8	**245**			168	2	2	21	3	4	**188**	4	5
	DISI 2002 95/5	209	9	9	48	7	6	**257**	12	12	**229**			157	6	6	19	3	4	**176**	7	8
	PISI 2010 95/5	190	6	6	44	6	6	**234**	10	9	**208**			140	4	4	18	3	4	**158**	5	6
	DISI 2010 95/5	188	10	10	43	6	6	**231**	13	12	**206**			139	7	7	17	3	4	**156**	8	8
	DISI hybrid 95/5	163	17	13	37	5	5	**200**	19	15	**179**			120	13	9	15	2	3	**136**	13	10
WFET1	EtOH: F wood																					
	PISI 2002 95/5	224	2	2	51	7	7	**275**	8	8	**245**			168	2	2	21	3	5	**189**	4	6
	DISI 2002 95/5	209	9	9	48	7	7	**257**	12	12	**229**			157	6	6	20	3	5	**177**	8	9
	PISI 2010 95/5	190	6	6	44	6	6	**234**	10	10	**208**			140	4	4	18	3	4	**158**	6	7
	DISI 2010 95/5	188	10	10	43	6	6	**231**	13	13	**206**			139	7	7	18	3	4	**156**	8	9
	DISI hybrid 95/5	163	17	13	37	5	5	**200**	19	15	**179**			120	13	9	15	2	4	**136**	13	11
STET1	EtOH: Wheat straw																					
	PISI 2002 95/5	224	2	2	44	5	7	**268**	6	7	**243**			168	2	2	20	3	4	**187**	4	5
	DISI 2002 95/5	209	9	9	41	5	6	**250**	11	12	**227**			157	6	6	18	3	4	**175**	7	8
	PISI 2010 95/5	190	6	6	38	5	6	**228**	8	9	**207**			140	4	4	17	3	4	**157**	5	6
	DISI 2010 95/5	188	10	10	37	4	6	**225**	12	12	**204**			139	7	7	17	3	4	**155**	8	8
	DISI hybrid 95/5	163	17	13	32	4	5	**195**	18	15	**177**			120	13	9	14	2	3	**135**	13	10
SCET1	EtOH: Sugar cane (Brazil)																					
	PISI 2002 95/5	224	2	2	50	4	7	**273**	5	8	**242**			168	2	2	20	3	4	**188**	4	5
	DISI 2002 95/5	209	9	9	46	4	6	**255**	10	12	**226**			157	6	6	19	3	4	**175**	7	8
	PISI 2010 95/5	190	6	6	42	4	6	**232**	8	9	**206**			140	4	4	17	3	4	**157**	5	6
	DISI 2010 95/5	188	10	10	42	4	6	**230**	11	12	**204**			139	7	7	17	3	4	**155**	8	8
	DISI hybrid 95/5	163	17	13	36	3	5	**199**	18	15	**177**			120	13	9	14	2	3	**135**	13	10

WTW APPENDIX 1

WTT Code	Powertrain	Energy MJ / 100 km									GHG g CO_{2eq} / km								
		Total								Fossil									
		TTW (MJ_f/100 km)			WTT (MJ_{xf}/100 km)			**WTW** (MJ/100km)			**WTW** (MJ_{fo}/100km)			TTW			WTT			**WTW**		
		Mean	Min	Max	Mean	Min	Max	**Mean**	Min	Max	**Mean**	Min	Max	Mean	Min	Max	Mean	Min	Max	**Mean**	Min	Max
EtOH pathways contribution based on neat fuel (netback calculation)																						
SBET1	EtOH: Sugar beet, pulp to fodder																					
	PISI 2002	224	2	2	415	26	30	**639**	30	34	**194**	14	16	161	2	2	-31	7	8	**130**	7	8
	DISI 2002	209	9	9	388	24	28	**597**	41	45	**181**	21	22	151	6	6	-29	7	7	**122**	8	9
	PISI 2010	190	6	6	353	22	25	**543**	34	37	**165**	17	18	137	4	4	-26	6	7	**111**	7	7
	DISI 2010	188	10	10	349	22	25	**537**	41	44	**163**	21	22	136	7	7	-26	6	7	**110**	8	9
	DISI hybrid	163	17	13	303	19	22	**466**	53	47	**142**	29	25	118	13	9	-23	5	6	**96**	13	10
SBET3	EtOH: Sugar beet, pulp to heat																					
	PISI 2002	224	2	2	290	26	27	**513**	29	30	**69**	7	8	161	2	2	-93	6	4	**68**	5	4
	DISI 2002	209	9	9	271	24	26	**480**	36	38	**65**	12	12	151	6	6	-87	6	4	**64**	7	6
	PISI 2010	190	6	6	246	22	23	**436**	30	32	**59**	9	10	137	4	4	-79	5	4	**58**	5	5
	DISI 2010	188	10	10	244	22	23	**432**	36	37	**58**	13	13	136	7	7	-78	5	4	**58**	7	7
	DISI hybrid	163	17	13	211	19	20	**374**	44	38	**51**	20	15	118	13	9	-68	4	3	**50**	13	10
WTET1a	EtOH: Wheat, conv NG boiler, DDGS as AF																					
	PISI 2002	224	2	2	397	4	5	**621**	8	9	**198**	5	5	161	2	2	-27	16	18	**134**	16	18
	DISI 2002	209	9	9	371	4	5	**580**	21	22	**185**	13	13	151	6	6	-26	15	17	**125**	16	17
	PISI 2010	190	6	6	338	4	4	**528**	15	16	**168**	9	10	137	4	4	-23	14	15	**114**	14	15
	DISI 2010	188	10	10	334	4	4	**522**	23	23	**167**	14	14	136	7	7	-23	14	15	**113**	15	16
	DISI hybrid	163	17	13	290	3	4	**453**	37	29	**144**	24	18	118	13	9	-20	12	13	**98**	16	15
WTET1b	EtOH: Wheat, conv NG boiler, DDGS as fuel																					
	PISI 2002	224	2	2	292	5	5	**515**	9	8	**98**	4	3	161	2	2	-47	15	15	**115**	15	15
	DISI 2002	209	9	9	272	5	4	**481**	18	18	**92**	10	10	151	6	6	-44	14	14	**107**	14	14
	PISI 2010	190	6	6	248	5	4	**438**	14	13	**84**	7	7	137	4	4	-40	13	13	**98**	13	12
	DISI 2010	188	10	10	245	5	4	**433**	20	19	**83**	11	11	136	7	7	-39	13	13	**97**	13	13
	DISI hybrid	163	17	13	213	4	3	**376**	31	24	**72**	19	14	118	13	9	-34	11	11	**84**	15	12
WTET2a	EtOH: Wheat, NG GT+CHP, DDGS as AF																					
	PISI 2002	224	2	2	342	4	5	**566**	8	8	**145**	4	4	161	2	2	-55	16	15	**106**	16	14
	DISI 2002	209	9	9	320	4	4	**529**	19	20	**135**	11	11	151	6	6	-52	15	14	**99**	15	13
	PISI 2010	190	6	6	291	4	4	**481**	14	15	**123**	8	8	137	4	4	-47	14	13	**90**	13	12
	DISI 2010	188	10	10	288	4	4	**476**	21	21	**122**	12	12	136	7	7	-47	14	13	**89**	13	12
	DISI hybrid	163	17	13	250	3	3	**413**	34	26	**106**	21	16	118	13	9	-40	12	11	**78**	15	12
WTET2b	EtOH: Wheat, NG GT+CHP, DDGS as fuel																					
	PISI 2002	224	2	2	236	5	5	**460**	7	7	**45**	3	3	161	2	2	-75	14	15	**87**	13	15
	DISI 2002	209	9	9	221	4	4	**430**	16	16	**42**	9	9	151	6	6	-70	13	14	**81**	12	13
	PISI 2010	190	6	6	201	4	4	**391**	12	12	**38**	6	6	137	4	4	-64	12	13	**74**	11	12
	DISI 2010	188	10	10	199	4	4	**387**	17	17	**38**	10	10	136	7	7	-63	12	13	**73**	11	12
	DISI hybrid	163	17	13	172	3	3	**335**	27	21	**33**	17	13	118	13	9	-55	10	11	**64**	13	12
WTET3a	EtOH: Wheat, Lignite CHP, DDGS as AF																					
	PISI 2002	224	2	2	390	1	1	**613**	5	5	**193**	3	3	161	2	2	47	17	17	**209**	18	17
	DISI 2002	209	9	9	364	1	1	**573**	18	18	**180**	12	12	151	6	6	44	16	15	**195**	19	18
	PISI 2010	190	6	6	331	1	1	**521**	13	13	**164**	8	8	137	4	4	40	15	14	**178**	17	16
	DISI 2010	188	10	10	328	1	1	**516**	20	20	**162**	13	13	136	7	7	40	15	14	**176**	18	17
	DISI hybrid	163	17	13	284	1	1	**447**	35	26	**140**	23	17	118	13	9	35	13	12	**153**	20	17
WTET3b	EtOH: Wheat, Lignite CHP, DDGS as fuel																					
	PISI 2002	224	2	2	284	1	1	**508**	4	4	**93**	3	3	161	2	2	28	14	17	**189**	14	17
	DISI 2002	209	9	9	265	1	1	**474**	15	15	**87**	9	9	151	6	6	26	13	16	**177**	16	18
	PISI 2010	190	6	6	241	1	1	**431**	10	10	**79**	7	7	137	4	4	24	12	14	**161**	13	16
	DISI 2010	188	10	10	239	1	1	**427**	16	16	**78**	10	10	136	7	7	24	12	14	**160**	15	17
	DISI hybrid	163	17	13	207	1	1	**370**	28	21	**68**	18	14	118	13	9	20	10	12	**139**	18	17
WTET4a	EtOH: Wheat, Straw CHP, DDGS as AF																					
	PISI 2002	224	2	2	378	1	1	**602**	5	5	**62**	2	2	161	2	2	-104	16	15	**57**	15	14
	DISI 2002	209	9	9	353	1	1	**562**	18	18	**58**	9	9	151	6	6	-97	15	14	**54**	13	12
	PISI 2010	190	6	6	321	1	1	**511**	12	12	**53**	6	6	137	4	4	-88	14	13	**49**	12	11
	DISI 2010	188	10	10	318	1	1	**506**	19	19	**52**	10	10	136	7	7	-88	14	13	**48**	11	11
	DISI hybrid	163	17	13	276	1	1	**439**	34	25	**45**	18	13	118	13	9	-76	12	11	**42**	13	11
WTET4b	EtOH: Wheat, Straw CHP, DDGS as fuel																					
	PISI 2002	224	2	2	272	1	1	**496**	4	4	**-38**	2	2	161	2	2	-123	17	15	**38**	16	14
	DISI 2002	209	9	9	254	1	1	**463**	14	14	**-35**	9	9	151	6	6	-115	16	14	**36**	13	11
	PISI 2010	190	6	6	231	1	1	**421**	10	10	**-32**	6	6	137	4	4	-105	15	13	**33**	12	10
	DISI 2010	188	10	10	229	1	1	**417**	16	16	**-32**	10	10	136	7	7	-104	14	13	**32**	12	10
	DISI hybrid	163	17	13	199	1	1	**362**	27	20	**-27**	17	13	118	13	9	-90	13	11	**28**	13	10
WWET1	EtOH: W Wood																					
	PISI 2002	224	2	2	434	23	23	**657**	28	28	**60**	4	4	161	2	2	-119	0	0	**42**	2	2
	DISI 2002	209	9	9	405	22	22	**614**	40	39	**56**	10	10	151	6	6	-112	0	0	**39**	8	8
	PISI 2010	190	6	6	369	20	20	**559**	32	32	**51**	7	7	137	4	4	-101	0	0	**36**	5	5
	DISI 2010	188	10	10	365	20	20	**553**	39	39	**50**	11	11	136	7	7	-100	0	0	**36**	9	9
	DISI hybrid	163	17	13	316	17	17	**479**	53	43	**44**	18	14	118	13	9	-87	0	0	**31**	15	11
WFET1	EtOH: F wood																					
	PISI 2002	224	2	2	435	24	23	**659**	28	27	**61**	5	4	161	2	2	-111	6	15	**50**	5	14
	DISI 2002	209	9	9	407	22	21	**615**	40	39	**57**	10	10	151	6	6	-104	6	14	**47**	7	11
	PISI 2010	190	6	6	370	20	19	**560**	32	32	**52**	7	7	137	4	4	-94	5	12	**43**	5	10
	DISI 2010	188	10	10	366	20	19	**554**	40	39	**51**	11	11	136	7	7	-93	5	12	**43**	7	10
	DISI hybrid	163	17	13	317	17	17	**480**	53	43	**45**	18	14	118	13	9	-81	4	11	**37**	13	10
STET1	EtOH: Wheat straw																					
	PISI 2002	224	2	2	295	0	0	**519**	4	4	**24**	2	2	161	2	2	-140	0	0	**22**	2	2
	DISI 2002	209	9	9	276	0	0	**485**	14	14	**22**	9	9	151	6	6	-130	0	0	**20**	8	8
	PISI 2010	190	6	6	251	0	0	**441**	10	10	**20**	6	6	137	4	4	-119	0	0	**19**	6	6
	DISI 2010	188	10	10	248	0	0	**436**	16	16	**20**	10	10	136	7	7	-117	0	0	**19**	9	9
	DISI hybrid	163	17	13	215	0	0	**378**	28	21	**18**	17	13	118	13	9	-102	0	0	**16**	16	12
SCET1	EtOH: Sugar cane (Brazil)																					
	PISI 2002	224	2	2	401	1	1	**625**	5	5	**5**	2	2	161	2	2	-136	1	1	**25**	2	2
	DISI 2002	209	9	9	375	1	1	**583**	18	18	**5**	9	9	151	6	6	-127	0	1	**24**	8	8
	PISI 2010	190	6	6	341	1	1	**531**	13	13	**4**	6	6	137	4	4	-116	0	1	**22**	5	5
	DISI 2010	188	10	10	337	1	1	**525**	20	20	**4**	10	10	136	7	7	-115	0	0	**21**	9	9
	DISI hybrid	163	17	13	292	0	0	**455**	35	26	**4**	17	13	118	13	9	-99	0	0	**19**	16	12

4 Ethers

WTT Code	Powertrain	Energy MJ / 100 km												GHG g CO_{2eq} / km								
		Total								Fossil												
		TTW (MJ_f/100 km)			WTT (MJ_{pf}/100 km)			**WTW** (MJ/100km)			**WTW** (MJ_{fp}/100km)			TTW			WTT			**WTW**		
		Mean	Min	Max	Mean	Min	Max	**Mean**	Min	Max	**Mean**	Min	Max	Mean	Min	Max	Mean	Min	Max	**Mean**	Min	Max
Ethers (as neat fuels)																						
GRMB1	MTBE: remote plant																					
	PISI 2002	224	2	2	67	1	3	**290**	3	4				159	2	2	30	0	2	**189**	2	3
	DISI 2002	209	9	9	63	1	3	**271**	9	10				149	6	6	28	0	2	**177**	7	7
	PISI 2010	190	6	6	57	1	3	**247**	6	7				135	4	4	26	0	2	**161**	5	5
	DISI 2010	188	10	10	56	1	3	**244**	10	11				134	7	7	25	0	2	**159**	7	8
	DISI hybrid	163	17	13	49	0	2	**212**	18	14				116	12	9	22	0	1	**138**	13	10
LREB1	ETBE: imported C4 and wheat ethanol																					
	PISI 2002	224	2	2	169	1	3	**392**	4	5	**240**	5	7	160	2	2	-8	6	6	**152**	6	6
	DISI 2002	209	9	9	157	1	3	**366**	12	13	**224**	14	16	149	6	6	-7	5	6	**142**	8	8
	PISI 2010	190	6	6	143	1	2	**333**	8	9	**204**	10	12	136	4	4	-6	5	5	**129**	6	7
	DISI 2010	188	10	10	142	1	2	**330**	13	14	**202**	15	17	134	7	7	-6	5	5	**128**	8	9
	DISI hybrid	163	17	13	123	1	2	**286**	22	17	**175**	26	21	116	12	9	-6	4	5	**111**	13	10

5 Bio-diesel

WTT Code	Powertrain	Energy MJ / 100 km												GHG g CO_{2eq} / km								
		Total									Fossil											
		TTW (MJ_f/100 km)			WTT (MJ_{pl}/100 km)			**WTW** (MJ/100km)			**WTW** (MJ_{fp}/100km)			TTW			WTT			**WTW**		
		Mean	Min	Max	Mean	Min	Max	**Mean**	Min	Max	**Mean**	Min	Max	Mean	Min	Max	Mean	Min	Max	**Mean**	Min	Max
Bio-diesel pathways, as blended fuels																						
ROFA1	RME: Gly as chemical																					
	DICI 2002 95/5	183	6	6	39	8	7	**222**	11	10	**206**			138	4	4	22	5	5	**160**	7	7
	DICI 2010 no DPF 95/5	172	8	8	36	8	6	**208**	12	11	**193**			128	6	6	21	5	5	**149**	8	8
	DICI 2010 DPF 95/5	177	8	8	37	8	7	**214**	12	11	**198**			132	6	6	21	5	5	**153**	8	8
	DICI hybrid n DPF 95/5	141	15	11	30	6	5	**171**	17	13	**158**			106	11	8	16	4	4	**122**	12	10
	DICI hybrid DPF 95/5	146	15	11	31	6	5	**176**	18	14	**164**			109	11	8	17	4	4	**126**	13	10
ROFA2	RME: Gly as animal feed																					
	DICI 2002 95/5	183	6	6	39	9	7	**222**	11	10	**206**			138	4	4	23	5	5	**161**	7	7
	DICI 2010 no DPF 95/5	172	8	8	37	8	6	**209**	12	11	**194**			128	6	6	21	5	5	**150**	8	8
	DICI 2010 DPF 95/5	177	8	8	38	8	7	**214**	13	11	**199**			132	6	6	22	5	5	**154**	8	8
	DICI hybrid n DPF 95/5	141	15	11	30	7	5	**171**	18	13	**159**			106	11	8	17	4	4	**123**	12	10
	DICI hybrid DPF 95/5	146	15	11	31	7	5	**177**	18	14	**164**			109	11	8	18	4	4	**126**	13	10
ROFE1	REE: Gly as chemical																					
	DICI 2002 95/5	183	6	6	39	8	7	**222**	11	10	**205**			138	4	4	22	5	5	**160**	7	7
	DICI 2010 no DPF 95/5	172	8	8	37	7	6	**209**	12	11	**193**			128	6	6	20	4	5	**149**	8	8
	DICI 2010 DPF 95/5	177	8	8	38	7	6	**215**	12	11	**198**			132	6	6	21	4	5	**153**	8	8
	DICI hybrid n DPF 95/5	141	15	11	30	6	5	**171**	17	13	**158**			106	11	8	16	4	4	**122**	12	10
	DICI hybrid DPF 95/5	146	15	11	31	6	5	**177**	18	14	**163**			109	11	8	17	4	4	**126**	13	10
ROFE2	REE: Gly as animal feed																					
	DICI 2002 95/5	183	6	6	40	8	7	**223**	11	10	**206**			138	4	4	22	5	5	**160**	7	7
	DICI 2010 no DPF 95/5	172	8	8	37	8	6	**209**	12	11	**193**			128	6	6	21	4	5	**149**	8	8
	DICI 2010 DPF 95/5	177	8	8	38	8	6	**215**	12	11	**198**			132	6	6	21	4	5	**153**	8	8
	DICI hybrid n DPF 95/5	141	15	11	31	6	5	**172**	17	13	**158**			106	11	8	17	4	5	**122**	12	10
	DICI hybrid DPF 95/5	146	15	11	32	6	5	**177**	18	14	**164**			109	11	8	17	4	5	**126**	13	10
SOFA1	SME: Gly as chemical																					
	DICI 2002 95/5	183	6	6	37	7	6	**220**	10	9	**205**			138	4	4	20	4	4	**158**	6	7
	DICI 2010 no DPF 95/5	172	8	8	34	7	5	**207**	11	10	**193**			128	6	6	19	4	4	**147**	7	7
	DICI 2010 DPF 95/5	177	8	8	35	7	6	**212**	12	11	**198**			132	6	6	19	4	4	**151**	7	8
	DICI hybrid n DPF 95/5	141	15	11	28	6	4	**169**	17	13	**158**			106	11	8	14	3	3	**120**	12	9
	DICI hybrid DPF 95/5	146	15	11	29	6	5	**175**	18	13	**163**			109	11	8	15	3	4	**124**	12	10
SOFA2	SME: Gly as animal feed																					
	DICI 2002 95/5	183	6	6	37	8	6	**220**	11	9	**205**			138	4	4	21	4	4	**159**	6	6
	DICI 2010 no DPF 95/5	172	8	8	35	7	5	**207**	12	10	**193**			128	6	6	19	4	4	**148**	7	7
	DICI 2010 DPF 95/5	177	8	8	36	7	6	**213**	12	11	**198**			132	6	6	20	4	4	**152**	7	8
	DICI hybrid n DPF 95/5	141	15	11	29	6	4	**170**	17	13	**158**			106	11	8	15	3	3	**121**	12	9
	DICI hybrid DPF 95/5	146	15	11	30	6	5	**175**	18	13	**163**			109	11	8	16	3	4	**124**	12	10
Bio-diesel pathways contribution based on neat fuel (netback calculation)																						
ROFA1	RME: Gly as chemical																					
	DICI 2002	183	5	5	218	16	20	**401**	23	27	**84**	10	11	143	4	4	-53	39	37	**90**	38	35
	DICI 2010 no DPF	172	7	7	205	15	18	**377**	25	28	**79**	12	13	133	6	6	-50	37	35	**83**	35	33
	DICI 2010 DPF	177	7	7	210	15	19	**387**	25	29	**81**	12	13	136	6	6	-51	38	35	**85**	36	34
	DICI hybrid n DPF	141	15	11	168	12	15	**309**	33	30	**65**	19	15	109	11	8	-41	30	28	**69**	28	27
	DICI hybrid DPF	146	15	11	173	13	16	**319**	34	31	**67**	19	16	113	12	9	-42	31	29	**71**	29	27
ROFA2	RME: Gly as animal feed																					
	DICI 2002	183	5	5	227	21	19	**411**	28	26	**93**	13	12	143	4	4	-43	39	30	**100**	37	29
	DICI 2010 no DPF	172	7	7	214	19	17	**386**	29	27	**88**	14	13	133	6	6	-41	36	28	**92**	35	27
	DICI 2010 DPF	177	7	7	219	20	18	**396**	30	28	**90**	14	13	136	6	6	-42	37	29	**95**	36	28
	DICI hybrid n DPF	141	15	11	175	16	14	**316**	37	30	**72**	20	16	109	11	8	-33	30	23	**76**	29	22
	DICI hybrid DPF	146	15	11	181	16	15	**326**	38	31	**74**	21	16	113	12	9	-34	31	24	**78**	29	23
ROFE1	REE: Gly as chemical																					
	DICI 2002	183	5	5	229	19	17	**412**	26	24	**75**	10	9	143	4	4	-59	35	37	**84**	33	35
	DICI 2010 no DPF	172	7	7	215	18	16	**387**	28	26	**70**	11	11	133	6	6	-55	33	35	**78**	31	33
	DICI 2010 DPF	177	7	7	221	18	16	**398**	28	27	**72**	12	11	136	6	6	-57	34	35	**80**	32	34
	DICI hybrid n DPF	141	15	11	176	14	13	**318**	36	29	**58**	18	14	109	11	8	-45	27	28	**64**	25	26
	DICI hybrid DPF	146	15	11	182	15	13	**328**	37	29	**60**	19	14	113	12	9	-47	28	29	**66**	26	27
ROFE2	REE: Gly as animal feed																					
	DICI 2002	183	5	5	238	19	18	**421**	26	26	**83**	11	10	143	4	4	-50	35	43	**93**	34	42
	DICI 2010 no DPF	172	7	7	223	18	17	**396**	28	28	**78**	12	12	133	6	6	-47	33	40	**86**	31	39
	DICI 2010 DPF	177	7	7	229	18	18	**406**	29	28	**80**	12	12	136	6	6	-48	34	41	**88**	32	40
	DICI hybrid n DPF	141	15	11	183	14	14	**324**	36	30	**64**	19	15	109	11	8	-39	27	33	**71**	26	31
	DICI hybrid DPF	146	15	11	189	15	15	**335**	38	31	**66**	19	15	113	12	9	-40	28	34	**73**	26	32
SOFA1	SME: Gly as chemical																					
	DICI 2002	183	5	5	179	19	17	**362**	25	23	**67**	11	10	143	4	4	-93	23	21	**50**	21	18
	DICI 2010 no DPF	172	7	7	168	18	16	**340**	26	24	**63**	12	11	133	6	6	-87	22	19	**46**	19	17
	DICI 2010 DPF	177	7	7	172	18	16	**349**	27	25	**64**	12	12	136	6	6	-90	22	20	**47**	19	17
	DICI hybrid n DPF	141	15	11	138	15	13	**279**	32	26	**51**	18	14	109	11	8	-71	18	16	**38**	15	13
	DICI hybrid DPF	146	15	11	142	15	13	**288**	33	27	**53**	19	14	113	12	9	-74	18	16	**39**	16	14
SOFA2	SME: Gly as animal feed																					
	DICI 2002	183	5	5	188	17	15	**371**	23	22	**76**	11	10	143	4	4	-83	20	20	**60**	18	18
	DICI 2010 no DPF	172	7	7	177	16	14	**349**	25	23	**71**	12	11	133	6	6	-78	18	18	**55**	16	16
	DICI 2010 DPF	177	7	7	182	16	15	**358**	25	24	**73**	12	12	136	6	6	-80	19	19	**56**	17	17
	DICI hybrid n DPF	141	15	11	145	13	12	**286**	32	25	**58**	18	14	109	11	8	-64	15	15	**45**	14	13
	DICI hybrid DPF	146	15	11	150	13	12	**295**	33	26	**60**	19	15	113	12	9	-66	16	16	**47**	15	14

6 Synthetic diesel fuel

WTT Code	Powertrain	Energy MJ / 100 km												GHG g CO_{2eq} / km								
		Total									Fossil											
		TTW (MJ_f/100 km)			WTT (MJ_{pf}/100 km)			**WTW** (MJ/100km)			**WTW** (MJ_{fp}/100km)			TTW			WTT			**WTW**		
		Mean	Min	Max	Mean	Min	Max	**Mean**	Min	Max	**Mean**	Min	Max	Mean	Min	Max	Mean	Min	Max	**Mean**	Min	Max
SD pathways, as blended fuels																						
GRSD1	Syn-diesel: Rem GTL, Sea, Diesel mix																					
	DICI 2002	183	5	5	34	4	5	**217**	8	8				138	4	4	27	3	4	**165**	6	6
	DICI 2010 no DPF	172	7	7	32	4	4	**204**	9	9				128	6	6	25	3	3	**153**	7	7
	DICI 2010 DPF	177	7	7	33	4	4	**209**	9	10				131	6	6	26	3	3	**157**	7	7
	DICI hybrid n DPF	141	15	11	26	3	4	**167**	16	12				105	11	8	21	2	3	**126**	12	9
	DICI hybrid DPF	146	15	11	27	3	4	**173**	16	13				108	11	8	21	2	3	**130**	12	10
WWSD1	Syn-diesel: W Wood, diesel mix																					
	DICI 2002	183	5	5	39	5	5	**222**	8	8	**202**			138	4	4	19	3	3	**156**	6	6
	DICI 2010 no DPF	172	7	7	36	5	5	**208**	10	10	**190**			128	6	6	18	3	3	**145**	7	7
	DICI 2010 DPF	177	7	7	37	5	5	**214**	10	10	**195**			131	6	6	18	3	3	**149**	7	7
	DICI hybrid n DPF	141	15	11	30	4	4	**171**	16	12	**156**			105	11	8	14	2	2	**119**	12	9
	DICI hybrid DPF	146	15	11	31	4	4	**176**	17	13	**161**			108	11	8	15	2	3	**123**	12	9
WFSD1	Syn-diesel: F wood, diesel mix																					
	DICI 2002	183	5	5	39	5	5	**222**	8	8	**202**			138	4	4	19	3	4	**157**	6	6
	DICI 2010 no DPF	172	7	7	36	5	5	**208**	10	10	**190**			128	6	6	18	3	4	**145**	7	7
	DICI 2010 DPF	177	7	7	37	5	5	**214**	10	10	**195**			131	6	6	18	3	4	**149**	7	7
	DICI hybrid n DPF	141	15	11	30	4	4	**171**	16	12	**156**			105	11	8	15	2	3	**119**	12	9
	DICI hybrid DPF	146	15	11	31	4	4	**176**	17	13	**161**			108	11	8	15	2	3	**123**	12	9
BLSD1	Syn-diesel: W Wood, Black liquor																					
	DICI 2002	183	5	5	36	4	5	**219**	8	8	**202**			138	4	4	18	3	3	**156**	6	6
	DICI 2010 no DPF	172	7	7	34	4	4	**206**	9	9	**190**			128	6	6	17	3	3	**145**	7	7
	DICI 2010 DPF	177	7	7	35	4	4	**212**	9	10	**195**			131	6	6	18	3	3	**149**	7	7
	DICI hybrid n DPF	141	15	11	28	3	3	**169**	16	12	**156**			105	11	8	14	2	2	**119**	12	9
	DICI hybrid DPF	146	15	11	29	4	4	**174**	16	13	**160**			108	11	8	15	2	3	**123**	12	9
SD pathways as neat fuel																						
GRSD1	Syn-diesel: Rem GTL, Sea, Diesel mix																					
	DICI 2002	183	5	5	124	8	13	**307**	13	17				133	4	4	46	5	7	**179**	7	9
	DICI 2010 no DPF	172	7	7	117	8	12	**289**	15	18				124	5	5	43	4	7	**167**	8	10
	DICI 2010 DPF	177	7	7	120	8	12	**297**	15	19				127	5	5	44	5	7	**171**	8	10
	DICI hybrid n DPF	141	15	15	96	6	10	**237**	22	25				102	11	11	35	4	6	**137**	13	14
	DICI hybrid DPF	146	15	15	99	7	10	**244**	23	25				105	11	11	36	4	6	**141**	13	14
GRSD2	Syn-diesel: Rem GTL, Sea, Rail/Road																					
	DICI 2002	183	5	5	125	9	11	**308**	14	16				133	4	4	46	5	6	**179**	7	9
	DICI 2010 no DPF	172	7	7	117	8	11	**289**	15	17				124	5	5	43	5	6	**167**	8	9
	DICI 2010 DPF	177	7	7	120	8	11	**297**	15	18				127	5	5	44	5	6	**171**	8	10
	DICI hybrid n DPF	141	15	11	96	7	9	**237**	22	19				102	11	8	35	4	5	**137**	13	11
	DICI hybrid DPF	146	15	11	99	7	9	**245**	23	20				105	11	8	36	4	5	**141**	13	11
GRSD2C	Syn-diesel: Rem GTL, Sea, Rail/Road, CC&S																					
	DICI 2002	183	5	5	139	9	11	**323**	15	16				133	4	4	24	5	6	**157**	7	8
	DICI 2010 no DPF	172	7	7	131	9	10	**303**	16	17				124	5	5	22	5	6	**146**	8	9
	DICI 2010 DPF	177	7	7	135	9	10	**311**	17	18				127	5	5	23	5	6	**150**	8	9
	DICI hybrid n DPF	141	15	11	107	7	8	**249**	23	20				102	11	8	18	4	5	**120**	12	10
	DICI hybrid DPF	146	15	11	111	7	9	**257**	24	20				105	11	8	19	4	5	**124**	12	10
KOSD1	Syn-diesel: CTL, Diesel mix																					
	DICI 2002	183	5	5	178	15	15	**361**	21	21				133	4	4	236	15	15	**369**	23	23
	DICI 2010 no DPF	172	7	7	167	14	14	**339**	23	22				124	5	5	222	14	14	**346**	24	24
	DICI 2010 DPF	177	7	7	172	15	14	**348**	23	23				127	5	5	228	15	15	**355**	25	25
	DICI hybrid n DPF	141	15	11	137	12	11	**278**	30	25				102	11	8	182	12	12	**284**	32	27
	DICI hybrid DPF	146	15	11	142	12	12	**287**	31	25				105	11	8	188	12	12	**293**	33	28
KOSD1C	Syn-diesel: CTL, CC&S, Diesel mix																					
	DICI 2002	183	5	5	194	14	15	**377**	21	22				133	4	4	71	14	15	**204**	17	18
	DICI 2010 no DPF	172	7	7	182	13	14	**354**	22	23				124	5	5	67	14	14	**191**	17	18
	DICI 2010 DPF	177	7	7	187	14	14	**363**	23	24				127	5	5	69	14	15	**196**	18	18
	DICI hybrid n DPF	141	15	11	149	11	12	**290**	30	25				102	11	8	55	11	12	**157**	20	18
	DICI hybrid DPF	146	15	11	154	11	12	**299**	31	26				105	11	8	57	12	12	**162**	20	18
WWSD1	Syn-diesel: W Wood, diesel mix																					
	DICI 2002	183	5	5	219	21	19	**402**	28	26	**12**	6	6	133	4	4	-121	0	0	**12**	5	5
	DICI 2010 no DPF	172	7	7	205	20	18	**378**	30	28	**11**	7	7	124	5	5	-114	0	0	**10**	7	7
	DICI 2010 DPF	177	7	7	211	20	19	**388**	30	29	**12**	8	8	127	5	5	-117	0	0	**10**	7	7
	DICI hybrid n DPF	141	15	11	168	16	15	**310**	37	30	**9**	15	11	102	11	8	-93	0	0	**8**	14	10
	DICI hybrid DPF	146	15	11	174	17	15	**319**	38	31	**9**	15	11	105	11	8	-96	0	0	**9**	14	11
WFSD1	Syn-diesel: F wood, diesel mix																					
	DICI 2002	183	5	5	219	21	17	**402**	28	24	**12**	6	6	133	4	4	-116	5	12	**17**	4	9
	DICI 2010 no DPF	172	7	7	205	20	16	**378**	29	26	**11**	7	7	124	5	5	-109	5	11	**14**	5	8
	DICI 2010 DPF	177	7	7	211	20	17	**388**	30	27	**11**	8	8	127	5	5	-112	5	11	**15**	5	9
	DICI hybrid n DPF	141	15	11	168	16	13	**309**	36	28	**9**	15	11	102	11	8	-90	4	9	**12**	12	8
	DICI hybrid DPF	146	15	11	174	17	14	**319**	38	29	**9**	15	11	105	11	8	-92	4	9	**12**	12	8
BLSD1	Syn-diesel: W Wood, Black liquor																					
	DICI 2002	183	5	5	167	10	10	**350**	16	16	**7**	6	6	133	4	4	-125	0	0	**8**	5	5
	DICI 2010 no DPF	172	7	7	157	9	10	**329**	17	18	**6**	7	7	124	5	5	-118	0	0	**6**	7	7
	DICI 2010 DPF	177	7	7	161	9	10	**338**	18	18	**6**	8	8	127	5	5	-121	0	0	**6**	7	7
	DICI hybrid n DPF	141	15	11	128	8	8	**270**	25	21	**5**	15	11	102	11	8	-97	0	0	**5**	14	11
	DICI hybrid DPF	146	15	11	133	8	8	**278**	26	21	**5**	15	11	105	11	8	-100	0	0	**5**	15	11

7 Methanol and DME

WTT Code	Powertrain	Energy MJ / 100 km												GHG g CO_{2eq} / km								
		Total									Fossil											
		TTW (MJ_f/100 km)			WTT (MJ_{pf}/100 km)			**WTW** (MJ/100km)			**WTW** (MJ_{fp}/100km)			TTW			WTT			**WTW**		
		Mean	Min	Max	Mean	Min	Max	**Mean**	Min	Max	**Mean**	Min	Max	Mean	Min	Max	Mean	Min	Max	**Mean**	Min	Max
Methanol pathways																						
GPME1a	MeOH: NG 7000 km, Syn, Rail/Road																					
	Reformer + FC	148	18	34	125	2	1	**273**	25	45				109	13	25	61	12	2	**170**	23	30
GPME1b	MeOH: NG 4000 km, Syn, Rail/Road																					
	Reformer + FC	148	18	34	102	9	2	**250**	28	43				109	13	25	44	5	1	**154**	17	28
GRME1	MeOH: Rem Syn, Sea, Rail/Road																					
	Reformer + FC	148	18	34	90	3	4	**238**	23	42				109	13	25	35	2	3	**145**	15	27
KOME1	MeOH: Coal EU-mix, Cen, Rail/Road																					
	Reformer + FC	148	18	34	138	13	15	**286**	35	58				109	13	25	188	13	15	**297**	39	64
WWME1	MeOH: W Wood, Road																					
	Reformer + FC	148	18	34	158	19	20	**306**	42	65	**9**	18	34	109	13	25	-95	0	0	**14**	18	33
WFME1	MeOH: F Wood, Road																					
	Reformer + FC	148	18	34	158	20	18	**306**	43	64	**9**	18	34	109	13	25	-92	3	6	**18**	16	29
BLME1	MeOH: W Wood, Black liquor																					
	Reformer + FC	148	18	34	87	7	7	**235**	25	43	**5**	18	34	109	13	25	-99	0	0	**11**	18	34
DME pathways																						
GPDE1a	DME: NG 7000 km, Syn, Rail/Road																					
	DICI 2002	183	5	5	141	26	3	**324**	31	9				127	4	4	71	15	2	**198**	17	6
	DICI 2010 no DPF	172	7	7	133	25	3	**305**	31	11				118	5	5	67	14	2	**185**	17	7
	DICI hybrid n DPF	141	15	11	109	20	3	**250**	35	15				97	10	7	55	11	1	**152**	20	9
GPDE1b	DME: NG 4000 km, Syn, Rail/Road																					
	DICI 2002	183	5	5	114	12	4	**297**	16	9				127	4	4	51	7	2	**178**	9	5
	DICI 2010 no DPF	172	7	7	107	11	3	**279**	17	11				118	5	5	48	6	2	**166**	10	6
	DICI hybrid n DPF	141	15	11	88	9	3	**229**	23	14				97	10	7	40	5	2	**136**	14	9
GRDE1	DME: Rem Syn, Sea, Rail/Road																					
	DICI 2002	183	5	5	97	3	6	**280**	8	10				127	4	4	38	0	0	**165**	4	4
	DICI 2010 no DPF	172	7	7	91	3	6	**264**	10	12				118	5	5	36	0	0	**154**	5	5
	DICI hybrid n DPF	141	15	11	75	3	5	**216**	18	15				97	10	7	29	0	0	**126**	11	8
KODE1	DME: Coal EU-mix, Cen, Rail/Road																					
	DICI 2002	183	5	5	170	18	15	**353**	24	21				127	4	4	235	1	0	**361**	8	8
	DICI 2010 no DPF	172	7	7	160	17	14	**332**	25	22				118	5	5	221	1	1	**338**	11	11
	DICI hybrid n DPF	141	15	11	131	14	12	**272**	31	24				97	10	7	181	1	1	**278**	23	17
GRDE1C	DME: Rem Syn, Sea, Rail/Road, CCS																					
	DICI 2002	183	5	5	99	0	13	**282**	6	17				127	4	4	20	0	0	**146**	4	4
	DICI 2010 no DPF	172	7	7	93	0	12	**265**	8	18				118	5	5	19	0	0	**136**	5	5
	DICI hybrid n DPF	141	15	11	76	0	10	**217**	17	19				97	10	7	15	0	0	**112**	10	8
WWDE1	DME: W Wood, Road																					
	DICI 2002	183	5	5	196	22	27	**379**	29	34	**11**	6	6	127	4	4	-115	0	0	**12**	5	5
	DICI 2010 no DPF	172	7	7	184	21	26	**356**	30	34	**10**	7	8	118	5	5	-108	0	0	**10**	7	7
	DICI hybrid n DPF	141	15	11	151	17	21	**292**	36	34	**9**	15	11	97	10	7	-89	0	0	**8**	13	10
WFDE1	DME: F Wood, Road																					
	DICI 2002	183	5	5	196	24	24	**379**	31	30	**11**	6	6	127	4	4	-110	3	9	**16**	4	7
	DICI 2010 no DPF	172	7	7	184	23	22	**356**	31	31	**10**	8	7	118	5	5	-104	3	8	**14**	5	6
	DICI hybrid n DPF	141	15	11	151	19	18	**292**	37	32	**8**	15	11	97	10	7	-85	3	7	**12**	12	7
BLDE1	DME: W Wood, Black liquor																					
	DICI 2002	183	5	5	101	8	10	**284**	12	14	**6**	6	6	127	4	4	-119	0	0	**7**	5	5
	DICI 2010 no DPF	172	7	7	95	7	9	**267**	14	15	**5**	7	7	118	5	5	-112	0	0	**6**	7	7
	DICI hybrid n DPF	141	15	11	78	6	7	**219**	20	17	**4**	15	11	97	10	7	-92	0	0	**5**	14	10

8 Compressed hydrogen (C-H_2)

8.1 C-H_2 from natural gas reforming and coal gasification

WTT Code	Powertrain	Energy MJ / 100 km												GHG g CO_{2eq} / km								
		Total									Fossil											
		TTW (MJ_f/100 km)			WTT (MJ_{pr}/100 km)			**WTW** (MJ/100km)			**WTW** (MJ_{fp}/100km)			TTW			WTT			**WTW**		
		Mean	Min	Max	Mean	Min	Max	**Mean**	Min	Max	**Mean**	Min	Max	Mean	Min	Max	Mean	Min	Max	**Mean**	Min	Max
C-H2 pathways																						
GMCH1	C-H2, EU-mix, O/S Ref																					
	PISI 2002	180	0	0	152	6	10	**332**	6	10				0	0	0	189	3	5	**189**	3	5
	PISI 2010	168	5	5	141	6	9	**309**	11	14				0	0	0	175	3	5	**176**	8	10
	PISI hybrid	149	13	11	125	5	8	**274**	20	21				0	0	0	155	3	4	**156**	16	16
	FC	94	12	12	79	3	5	**173**	17	19				0	0	0	98	2	3	**98**	14	15
	FC hybrid	84	10	10	71	3	4	**154**	15	17				0	0	0	88	2	2	**88**	12	13
GPCH1a	C-H2, NG 7000 km, O/S Ref																					
	PISI 2002	180	0	0	199	28	4	**379**	28	4				0	0	0	220	15	3	**220**	15	3
	PISI 2010	168	5	5	185	26	4	**353**	32	10				0	0	0	205	14	2	**205**	20	8
	PISI hybrid	149	13	11	164	23	3	**313**	39	19				0	0	0	181	13	2	**182**	28	16
	FC	94	12	12	104	14	2	**198**	29	19				0	0	0	115	8	1	**115**	22	15
	FC hybrid	84	10	10	93	13	2	**176**	26	17				0	0	0	102	7	1	**102**	20	14
GPCH1b	C-H2, NG 4000 km, O/S Ref																					
	PISI 2002	180	0	0	171	14	6	**351**	14	6				0	0	0	200	8	3	**200**	8	3
	PISI 2010	168	5	5	159	13	5	**327**	19	11				0	0	0	186	8	3	**186**	13	8
	PISI hybrid	149	13	11	141	12	5	**290**	27	19				0	0	0	165	7	2	**165**	21	15
	FC	94	12	12	89	7	3	**183**	22	18				0	0	0	104	4	2	**104**	17	14
	FC hybrid	84	10	10	80	7	3	**163**	19	16				0	0	0	93	4	1	**93**	15	13
GPCH2a	C-H2: NG 7000 km, Cen ref, Pipe																					
	PISI 2002	180	0	0	154	26	5	**334**	26	5				0	0	0	195	15	3	**195**	15	3
	PISI 2010	168	5	5	144	24	4	**311**	29	10				0	0	0	182	14	2	**182**	19	8
	PISI hybrid	149	13	11	127	22	4	**276**	35	18				0	0	0	161	12	2	**161**	26	14
	FC	94	12	12	81	14	2	**175**	26	17				0	0	0	102	8	1	**102**	20	14
	FC hybrid	84	10	10	72	12	2	**155**	23	15				0	0	0	91	7	1	**91**	18	12
GPCH2b	C-H2: NG 4000 km, Cen Ref, Pipe																					
	PISI 2002	180	0	0	129	13	5	**309**	13	5				0	0	0	177	7	3	**177**	7	3
	PISI 2010	168	5	5	120	12	5	**287**	16	10				0	0	0	164	7	3	**165**	12	8
	PISI hybrid	149	13	11	106	11	4	**255**	24	17				0	0	0	146	6	2	**146**	19	13
	FC	94	12	12	67	7	3	**161**	19	16				0	0	0	92	4	1	**92**	15	13
	FC hybrid	84	10	10	60	6	2	**144**	17	14				0	0	0	82	3	1	**82**	13	11
GPCH2bC	C-H2: NG 4000 km, Cen Ref, Pipe, CCS																					
	PISI 2002	180	0	0	139	14	6	**319**	14	6				0	0	0	67	8	3	**67**	8	3
	PISI 2010	168	5	5	129	13	5	**297**	17	11				0	0	0	62	7	3	**63**	9	5
	PISI hybrid	149	13	11	115	11	5	**263**	25	18				0	0	0	55	6	2	**56**	11	7
	FC	94	12	12	73	7	3	**167**	20	17				0	0	0	35	4	2	**35**	8	6
	FC hybrid	84	10	10	65	6	3	**148**	18	15				0	0	0	31	4	1	**31**	7	5
GPCH3b	C-H2: NG 4000 km, Cen Ref, Road																					
	PISI 2002	180	0	0	129	12	4	**309**	12	4				0	0	0	178	7	2	**178**	7	2
	PISI 2010	168	5	5	120	11	4	**288**	15	9				0	0	0	166	6	2	**166**	11	7
	PISI hybrid	149	13	11	107	10	3	**255**	23	16				0	0	0	147	6	2	**148**	18	13
	FC	94	12	12	67	6	2	**161**	18	16				0	0	0	93	4	1	**93**	15	13
	FC hybrid	84	10	10	60	5	2	**144**	16	14				0	0	0	83	3	1	**83**	13	11
GPLCHb	C-H2: NG 4000 km, Cen Ref, Liq, Road, Vap/comp.																					
	PISI 2002	180	0	0	230	25	14	**410**	25	14				0	0	0	239	15	8	**239**	15	8
	PISI 2010	168	5	5	214	24	13	**382**	30	20				0	0	0	222	14	8	**223**	21	14
	PISI hybrid	149	13	11	190	21	11	**338**	39	28				0	0	0	197	12	7	**198**	29	22
	FC	94	12	12	120	13	7	**214**	30	25				0	0	0	125	8	4	**125**	23	20
	FC hybrid	84	10	10	107	12	6	**191**	27	22				0	0	0	111	7	4	**111**	21	17
GRCH1	C-H2: LNG, O/S Ref																					
	PISI 2002	180	0	0	202	6	11	**382**	6	11				0	0	0	215	4	6	**215**	4	6
	PISI 2010	168	5	5	188	6	10	**355**	12	16				0	0	0	200	3	5	**201**	9	11
	PISI hybrid	149	13	11	166	5	9	**315**	23	24				0	0	0	177	3	5	**178**	18	18
	FC	94	12	12	105	3	6	**199**	20	22				0	0	0	112	2	3	**112**	16	17
	FC hybrid	84	10	10	94	3	5	**177**	18	19				0	0	0	100	2	3	**100**	14	15
GRCH2	C-H2: LNG, Cen Ref, Pipe																					
	PISI 2002	180	0	0	157	7	9	**337**	7	9				0	0	0	191	3	5	**191**	3	5
	PISI 2010	168	5	5	146	6	8	**313**	12	14				0	0	0	178	3	5	**178**	9	10
	PISI hybrid	149	13	11	129	5	7	**278**	21	21				0	0	0	157	3	4	**158**	16	16
	FC	94	12	12	82	3	5	**176**	18	19				0	0	0	100	2	3	**100**	14	15
	FC hybrid	84	10	10	73	3	4	**156**	16	17				0	0	0	89	2	2	**89**	12	13
GRCH3	C-H2: Rem NG, methanol, O/S Ref																					
	PISI 2002	180	0	0	204	4	8	**384**	4	8				0	0	0	214	2	4	**214**	2	4
	PISI 2010	168	5	5	190	4	7	**357**	11	14				0	0	0	199	2	4	**199**	8	10
	PISI hybrid	149	13	11	168	4	6	**316**	22	22				0	0	0	176	2	3	**177**	17	17
	FC	94	12	12	106	2	4	**200**	19	21				0	0	0	111	1	2	**111**	15	16
	FC hybrid	84	10	10	95	2	4	**178**	17	18				0	0	0	99	1	2	**99**	13	14
KOCH1	C-H2: Coal EU-mix, cen Ref, Pipe																					
	PISI 2002	180	0	0	252	3	3	**432**	3	3				0	0	0	419	2	1	**419**	2	1
	PISI 2010	168	5	5	234	3	3	**402**	11	11				0	0	0	390	1	1	**391**	13	13
	PISI hybrid	149	13	11	207	3	3	**356**	24	22				0	0	0	346	1	1	**346**	31	27
	FC	94	12	12	131	2	2	**225**	21	21				0	0	0	219	1	1	**219**	28	28
	FC hybrid	84	10	10	117	2	1	**201**	19	19				0	0	0	195	1	1	**195**	25	25
KOCH1C	C-H2: Coal EU-mix, cen Ref, Pipe, CCS																					
	PISI 2002	180	0	0	319	3	3	**499**	3	3				0	0	0	92	1	1	**92**	1	1
	PISI 2010	168	5	5	297	3	3	**464**	13	13				0	0	0	85	1	1	**86**	4	4
	PISI hybrid	149	13	11	263	2	2	**412**	28	25				0	0	0	76	1	1	**76**	8	7
	FC	94	12	12	167	2	2	**261**	25	25				0	0	0	48	1	1	**48**	7	7
	FC hybrid	84	10	10	148	1	1	**232**	22	22				0	0	0	43	1	1	**43**	6	6

8.2 C-H_2 from biomass processing

WTT Code	Powertrain	Energy MJ / 100 km												GHG g CO_{2eq} / km								
		Total								Fossil												
		TTW (MJ_f/100 km)			WTT (MJ_{xf}/100 km)			**WTW** (MJ/100km)			**WTW** (MJ_{fp}/100km)			TTW			WTT			**WTW**		
		Mean	Min	Max	Mean	Min	Max	**Mean**	Min	Max	**Mean**	Min	Max	Mean	Min	Max	Mean	Min	Max	**Mean**	Min	Max
WWCH1	C-H2: Wood W, O/S gasif																					
	PISI 2002	180	0	0	220	18	18	**400**	18	18	**34**	3	3	0	0	0	19	1	1	**19**	1	1
	PISI 2010	168	5	5	204	17	17	**372**	24	24	**32**	6	6	0	0	0	18	1	1	**18**	2	2
	PISI hybrid	149	13	11	181	15	15	**330**	33	31	**28**	14	12	0	0	0	16	1	1	**16**	3	2
	FC	94	12	12	115	10	10	**209**	26	26	**18**	12	12	0	0	0	10	1	1	**10**	2	2
	FC hybrid	84	10	10	102	9	9	**186**	23	23	**16**	11	11	0	0	0	9	1	1	**9**	2	2
WWCH2	C-H2: Wood W, Cen gasif. Pipe																					
	PISI 2002	180	0	0	175	15	14	**355**	15	14	**41**	3	3	0	0	0	22	1	1	**22**	1	1
	PISI 2010	168	5	5	162	14	13	**330**	19	18	**38**	7	7	0	0	0	20	1	1	**21**	2	2
	PISI hybrid	149	13	11	144	12	11	**293**	28	25	**34**	14	12	0	0	0	18	1	1	**18**	3	3
	FC	94	12	12	91	8	7	**185**	22	22	**22**	12	12	0	0	0	11	1	1	**11**	2	2
	FC hybrid	84	10	10	81	7	6	**165**	20	19	**19**	11	11	0	0	0	10	1	1	**10**	2	2
WFCH1	C-H2: Wood F, O/S gasif																					
	PISI 2002	180	0	0	224	19	18	**404**	19	18	**39**	3	3	0	0	0	27	4	8	**27**	4	8
	PISI 2010	168	5	5	208	17	17	**376**	24	24	**36**	6	6	0	0	0	25	4	7	**26**	4	8
	PISI hybrid	149	13	11	185	15	15	**333**	34	31	**32**	14	12	0	0	0	23	3	7	**23**	5	8
	FC	94	12	12	117	10	10	**211**	27	27	**20**	12	12	0	0	0	14	2	4	**14**	4	6
	FC hybrid	84	10	10	104	9	9	**188**	24	24	**18**	11	11	0	0	0	13	2	4	**13**	3	5
WFCH2	C-H2: Wood F, Cen gasif, pipe																					
	PISI 2002	180	0	0	175	15	15	**355**	15	15	**41**	4	4	0	0	0	26	2	7	**26**	2	7
	PISI 2010	168	5	5	162	14	14	**330**	20	20	**38**	7	7	0	0	0	24	2	7	**24**	3	7
	PISI hybrid	149	13	11	144	12	13	**292**	28	26	**34**	14	13	0	0	0	21	2	6	**22**	4	8
	FC	94	12	12	91	8	8	**185**	22	22	**22**	12	12	0	0	0	13	1	4	**13**	3	5
	FC hybrid	84	10	10	81	7	7	**165**	20	20	**19**	11	11	0	0	0	12	1	3	**12**	3	5
BLCH1	C-H2: Wood W, Black liquor																					
	PISI 2002	180	0	0	92	5	7	**272**	5	7	**37**	2	3	0	0	0	18	1	1	**18**	1	1
	PISI 2010	168	5	5	86	5	7	**253**	9	11	**34**	6	6	0	0	0	17	1	1	**17**	2	2
	PISI hybrid	149	13	11	76	4	6	**224**	17	16	**30**	13	12	0	0	0	15	1	1	**15**	2	2
	FC	94	12	12	48	3	4	**142**	14	15	**19**	12	12	0	0	0	9	1	1	**9**	2	2
	FC hybrid	84	10	10	43	2	3	**126**	13	13	**17**	11	11	0	0	0	8	1	1	**8**	2	2

8.3 C-H_2 from electrolysis (all electricity sources)

WTT Code	Powertrain	Energy MJ / 100 km												GHG g CO_{2eq} / km								
		Total								Fossil												
		TTW (MJ_f/100 km)			WTT (MJ_{xf}/100 km)			**WTW** (MJ/100km)			**WTW** (MJ_{fp}/100km)			TTW			WTT			**WTW**		
		Mean	Min	Max	Mean	Min	Max	**Mean**	Min	Max	**Mean**	Min	Max	Mean	Min	Max	Mean	Min	Max	**Mean**	Min	Max
GPEL1a/CH1	C-H2: NG 7000 km, CCGT, O/S Ely																					
	PISI 2002	180	0	0	490	75	21	**670**	75	21				0	0	0	406	45	13	**406**	45	13
	PISI 2010	168	5	5	456	70	19	**623**	84	33				0	0	0	377	41	12	**378**	53	23
	PISI hybrid	149	13	11	404	62	17	**552**	98	49				0	0	0	335	37	11	**335**	65	36
	FC	94	12	12	256	39	11	**350**	72	44				0	0	0	212	23	7	**212**	49	33
	FC hybrid	84	10	10	228	35	10	**311**	64	39				0	0	0	189	21	6	**189**	44	29
GPEL1b/CH1	C-H2: NG 4000 km, CCGT, O/S Ely																					
	PISI 2002	180	0	0	433	43	29	**613**	43	29				0	0	0	364	25	17	**364**	25	17
	PISI 2010	168	5	5	402	40	27	**570**	52	40				0	0	0	339	24	16	**339**	34	26
	PISI hybrid	149	13	11	357	35	24	**505**	67	52				0	0	0	300	21	14	**301**	47	37
	FC	94	12	12	226	22	15	**320**	51	44				0	0	0	190	13	9	**190**	37	32
	FC hybrid	84	10	10	201	20	14	**285**	46	40				0	0	0	169	12	8	**169**	33	29
GPEL1b/CH2	C-H2: NG 4000 km, CCGT, Cen Ely, Pipe																					
	PISI 2002	180	0	0	442	47	34	**622**	47	34				0	0	0	364	28	20	**364**	28	20
	PISI 2010	168	5	5	411	44	32	**578**	56	44				0	0	0	339	26	19	**339**	36	29
	PISI hybrid	149	13	11	364	39	28	**513**	71	57				0	0	0	300	23	17	**301**	49	39
	FC	94	12	12	231	24	18	**325**	54	47				0	0	0	190	15	10	**190**	38	34
	FC hybrid	84	10	10	205	22	16	**289**	48	42				0	0	0	169	13	9	**169**	34	30
GREL1/CH1	C-H2: LNG, O/S Ely																					
	PISI 2002	180	0	0	495	43	45	**675**	43	45				0	0	0	396	25	26	**396**	25	26
	PISI 2010	168	5	5	460	40	42	**628**	54	56				0	0	0	368	23	24	**369**	34	36
	PISI hybrid	149	13	11	408	36	37	**557**	72	69				0	0	0	327	21	22	**327**	49	47
	FC	94	12	12	258	23	24	**352**	55	56				0	0	0	207	13	14	**207**	38	39
	FC hybrid	84	10	10	230	20	21	**314**	49	50				0	0	0	184	12	12	**184**	34	35
WFEL2/CH1	C-H2: F Wood, 200 MW gasif, CCGT, O/S Ely																					
	PISI 2002	180	0	0	469	38	39	**649**	38	39	**14**	1	1	0	0	0	23	6	16	**23**	6	16
	PISI 2010	168	5	5	436	35	37	**603**	48	50	**13**	5	5	0	0	0	21	5	15	**22**	6	16
	PISI hybrid	149	13	11	386	31	32	**535**	66	63	**11**	13	11	0	0	0	19	5	13	**19**	6	15
	FC	94	12	12	245	20	21	**339**	51	52	**7**	12	12	0	0	0	12	3	9	**12**	4	10
	FC hybrid	84	10	10	218	18	18	**301**	45	46	**6**	10	10	0	0	0	11	3	8	**11**	4	9
WFEL3/CH1	C-H2: F Wood, Conv power, O/S Ely																					
	PISI 2002	180	0	0	797	68	52	**977**	68	52	**20**	2	1	0	0	0	56	9	24	**56**	9	24
	PISI 2010	168	5	5	741	64	49	**909**	86	71	**19**	5	5	0	0	0	52	8	22	**52**	10	24
	PISI hybrid	149	13	11	657	56	43	**806**	114	94	**17**	13	12	0	0	0	46	7	20	**46**	11	23
	FC	94	12	12	416	36	27	**510**	87	79	**11**	12	12	0	0	0	29	5	12	**29**	8	16
	FC hybrid	84	10	10	370	32	24	**454**	78	70	**9**	10	10	0	0	0	26	4	11	**26**	7	14
EMEL1/CH1	C-H2: Elec EU-mix, O/S Ely																					
	PISI 2002	180	0	0	652	31	31	**833**	31	31				0	0	0	375	14	14	**375**	14	14
	PISI 2010	168	5	5	607	29	29	**774**	47	47				0	0	0	349	13	13	**349**	23	23
	PISI hybrid	149	13	11	538	26	25	**686**	73	67				0	0	0	309	11	11	**310**	38	35
	FC	94	12	12	340	16	16	**434**	59	59				0	0	0	196	7	7	**196**	31	31
	FC hybrid	84	10	10	303	14	14	**387**	53	52				0	0	0	174	6	6	**174**	28	28
KOEL1/CH1	C-H2: Elec coal EU-mix, O/S Ely																					
	PISI 2002	180	0	0	571	96	76	**751**	96	76				0	0	0	763	85	90	**763**	85	90
	PISI 2010	168	5	5	531	89	71	**699**	105	87				0	0	0	709	79	84	**710**	101	105
	PISI hybrid	149	13	11	471	79	63	**619**	120	99				0	0	0	629	70	74	**629**	124	122
	FC	94	12	12	298	50	40	**392**	87	77				0	0	0	398	44	47	**398**	93	96
	FC hybrid	84	10	10	265	45	36	**349**	78	69				0	0	0	354	40	42	**354**	83	85
KOEL1/CH2	C-H2: Elec coal EU-mix, Cen ely, Pipe																					
	PISI 2002	180	0	0	571	96	76	**751**	96	76				0	0	0	763	85	90	**763**	85	90
	PISI 2010	168	5	5	531	89	71	**699**	105	87				0	0	0	709	79	84	**710**	101	105
	PISI hybrid	149	13	11	471	79	63	**619**	120	99				0	0	0	629	70	74	**629**	124	122
	FC	94	12	12	298	50	40	**392**	87	77				0	0	0	398	44	47	**398**	93	96
	FC hybrid	84	10	10	265	45	36	**349**	78	69				0	0	0	354	40	42	**354**	83	85
NUEL1/CH1	C-H2: Elec nuclear, O/S Ely																					
	PISI 2002	180	0	0	905	48	48	**1085**	48	48				0	0	0	13	1	1	**13**	1	1
	PISI 2010	168	5	5	842	45	45	**1010**	70	70				0	0	0	12	1	1	**12**	1	1
	PISI hybrid	149	13	11	746	40	40	**895**	105	97				0	0	0	10	1	1	**11**	1	1
	FC	94	12	12	472	25	25	**566**	84	84				0	0	0	7	0	0	**7**	1	1
	FC hybrid	84	10	10	421	22	22	**504**	75	75				0	0	0	6	0	0	**6**	1	1
WDEL1/CH2	C-H2: Wind, Cen Ely, Pipe																					
	PISI 2002	180	0	0	142	11	10	**322**	11	10	**35**	3	2	0	0	0	16	1	1	**16**	1	1
	PISI 2010	168	5	5	132	10	9	**299**	15	14	**32**	6	6	0	0	0	15	1	1	**16**	2	2
	PISI hybrid	149	13	11	117	9	8	**265**	23	21	**29**	14	12	0	0	0	14	1	1	**14**	2	2
	FC	94	12	12	74	6	5	**168**	19	18	**18**	12	12	0	0	0	9	1	1	**9**	2	2
	FC hybrid	84	10	10	66	5	5	**150**	17	16	**16**	11	11	0	0	0	8	1	1	**8**	2	2

9 Liquid hydrogen (L-H_2)

WTT Code	Powertrain	Energy MJ / 100 km												GHG g CO_{2eq} / km								
		Total									Fossil											
		TTW (MJ_f/100 km)			WTT (MJ_{pr}/100 km)			**WTW** (MJ/100km)			**WTW** (MJ_{fp}/100km)			TTW			WTT			**WTW**		
		Mean	Min	Max	Mean	Min	Max	**Mean**	Min	Max	**Mean**	Min	Max	Mean	Min	Max	Mean	Min	Max	**Mean**	Min	Max
L-H2 pathways																						
GPLH1a	L-H2:NG 7000 km, Cen Ref, Liq, Road																					
	PISI 2002	180	0	0	240	40	6	**420**	40	6				0	0	0	253	23	4	**253**	23	4
	PISI 2010	168	5	5	223	37	6	**391**	44	14				0	0	0	236	21	4	**236**	28	11
	PISI hybrid	141	11	12	188	31	5	**330**	47	24				0	0	0	199	18	3	**199**	33	20
	FC	94	12	12	125	21	3	**219**	38	22				0	0	0	132	12	2	**132**	28	18
	FC hybrid	84	10	10	111	18	3	**195**	34	20				0	0	0	118	11	2	**118**	25	16
GPLH1b	L-H2: NG 4000 km, Cen Ref, Liq, Road																					
	PISI 2002	180	0	0	204	25	15	**384**	25	15				0	0	0	227	15	9	**227**	15	9
	PISI 2010	168	5	5	190	23	14	**357**	29	20				0	0	0	212	14	8	**212**	20	15
	PISI hybrid	141	11	12	160	19	12	**302**	33	28				0	0	0	179	11	7	**179**	25	22
	FC	94	12	12	107	13	8	**201**	28	24				0	0	0	119	8	5	**119**	22	19
	FC hybrid	84	10	10	95	11	7	**179**	25	21				0	0	0	106	7	4	**106**	20	17
GRLH1	L-H2: Rem Ref, Liq, Sea, Road																					
	PISI 2002	180	0	0	256	22	27	**437**	22	27				0	0	0	250	13	15	**250**	13	15
	PISI 2010	168	5	5	238	21	25	**406**	28	32				0	0	0	232	12	14	**233**	19	21
	PISI hybrid	141	11	12	201	18	21	**343**	35	40				0	0	0	196	10	12	**197**	25	29
	FC	94	12	12	134	12	14	**228**	30	32				0	0	0	130	7	8	**130**	23	24
	FC hybrid	84	10	10	119	10	12	**203**	27	29				0	0	0	116	6	7	**116**	20	21
GRLH2	L-H2: LNG, Cen Ref, Liq, Road																					
	PISI 2002	180	0	0	241	21	23	**421**	21	23				0	0	0	247	12	13	**247**	12	13
	PISI 2010	168	5	5	224	19	21	**392**	26	28				0	0	0	229	11	12	**230**	18	19
	PISI hybrid	141	11	12	189	16	18	**331**	32	36				0	0	0	194	9	10	**194**	24	27
	FC	94	12	12	126	11	12	**220**	29	30				0	0	0	129	6	7	**129**	22	23
	FC hybrid	84	10	10	112	10	11	**196**	25	26				0	0	0	115	6	6	**115**	20	20
WFLH1	L-H2: Wood F, Cen gasif, Liq, Road																					
	PISI 2002	180	0	0	270	30	24	**450**	30	24	**12**	1	1	0	0	0	15	3	9	**15**	3	9
	PISI 2010	168	5	5	251	28	22	**418**	36	30	**11**	5	5	0	0	0	14	2	8	**14**	3	9
	PISI hybrid	141	11	12	212	24	19	**353**	41	39	**9**	11	12	0	0	0	11	2	7	**12**	3	8
	FC	94	12	12	141	16	13	**235**	35	32	**6**	12	12	0	0	0	8	1	5	**8**	2	5
	FC hybrid	84	10	10	125	14	11	**209**	31	28	**5**	10	10	0	0	0	7	1	4	**7**	2	5
GPEL1b/LH1	L-H2: NG 4000 km, CCGT, Cen Ely, Liq, Road																					
	PISI 2002	180	0	0	516	53	30	**696**	53	30				0	0	0	415	31	18	**415**	31	18
	PISI 2010	168	5	5	480	49	28	**647**	64	43				0	0	0	386	29	17	**386**	40	28
	PISI hybrid	141	11	12	405	41	24	**546**	73	60				0	0	0	325	24	14	**326**	49	42
	FC	94	12	12	269	28	16	**363**	62	50				0	0	0	216	16	9	**216**	43	36
	FC hybrid	84	10	10	240	25	14	**323**	55	45				0	0	0	193	14	8	**193**	38	32
EMEL1/LH1	L-H2: Elec EU-mix, Cen Ely, Liq, Road																					
	PISI 2002	180	0	0	761	38	36	**941**	38	36				0	0	0	425	17	16	**425**	17	16
	PISI 2010	168	5	5	708	35	33	**875**	56	55				0	0	0	395	16	15	**396**	28	27
	PISI hybrid	141	11	12	597	30	28	**739**	76	80				0	0	0	334	13	13	**334**	39	41
	FC	94	12	12	397	20	19	**491**	69	68				0	0	0	222	9	8	**222**	36	36
	FC hybrid	84	10	10	354	17	17	**437**	62	61				0	0	0	197	8	7	**197**	32	32
KOEL1/LH1	L-H2: Elec coal EU-mix, Cen Ely, Liq, Road																					
	PISI 2002	180	0	0	672	99	77	**852**	99	77				0	0	0	854	79	101	**854**	79	101
	PISI 2010	168	5	5	625	93	72	**793**	111	91				0	0	0	795	73	94	**795**	97	118
	PISI hybrid	141	11	12	528	78	61	**669**	119	107				0	0	0	671	62	80	**671**	113	137
	FC	94	12	12	351	52	40	**445**	96	84				0	0	0	446	41	53	**446**	96	108
	FC hybrid	84	10	10	312	46	36	**396**	85	75				0	0	0	397	37	47	**397**	85	96

10 Summary of pathways with CC&S

WTT Code	Powertrain	Energy MJ / 100 km												GHG g CO_{2eq} / km								
		Total									Fossil											
		TTW (MJ_f/100 km)			WTT (MJ_{pf}/100 km)			**WTW** (MJ/100km)			**WTW** (MJ_{fp}/100km)			TTW			WTT			**WTW**		
		Mean	Min	Max	Mean	Min	Max	**Mean**	Min	Max	**Mean**	Min	Max	Mean	Min	Max	Mean	Min	Max	**Mean**	Min	Max
CCS pathways																						
GRCG1C	CNG: LNG, Vap, Pipe, CC&S																					
	PISI bi-fuel 2002	227	12	6	72	5	6	**299**	15	10				132	7	4	37	3	3	**169**	8	6
	PISI dedicated 2002	223	14	6	71	5	6	**294**	17	10				130	8	4	36	3	3	**166**	9	5
	PISI bi-fuel 2010	188	12	8	60	5	5	**248**	14	11				108	7	4	31	2	2	**139**	8	6
	PISI dedicated 2010	187	13	8	60	5	5	**247**	15	11				108	7	4	31	2	2	**138**	9	6
	PISI hybrid	139	17	13	44	3	3	**184**	19	15				81	10	8	23	2	2	**104**	11	9
GPCH2bC	C-H2: NG 4000 km, Cen Ref, Pipe, CC&S																					
	PISI 2002	180	0	0	139	14	6	**319**	14	6				0	0	0	67	8	3	**67**	8	3
	PISI 2010	168	5	5	129	13	5	**297**	17	11				0	0	0	62	7	3	**63**	9	5
	PISI hybrid	149	13	11	115	11	5	**263**	25	18				0	0	0	55	6	2	**56**	11	7
	FC	94	12	12	73	7	3	**167**	20	17				0	0	0	35	4	2	**35**	8	6
	FC hybrid	84	10	10	65	6	3	**148**	18	15				0	0	0	31	4	1	**31**	7	5
KOCH1C	C-H2: Coal EU-mix, cen Ref, Pipe, CC&S																					
	PISI 2002	180	0	0	319	3	3	**499**	3	3				0	0	0	92	1	1	**92**	1	1
	PISI 2010	168	5	5	297	3	3	**464**	13	13				0	0	0	85	1	1	**86**	4	4
	PISI hybrid	149	13	11	263	2	2	**412**	28	25				0	0	0	76	1	1	**76**	8	7
	FC	94	12	12	167	2	2	**261**	25	25				0	0	0	48	1	1	**48**	7	7
	FC hybrid	84	10	10	148	1	1	**232**	22	22				0	0	0	43	1	1	**43**	6	6
GRSD2C	Syn-diesel: Rem GTL, Sea, Rail/Road, CC&S																					
	DICI 2002	183	5	5	139	9	11	**323**	15	16				133	4	4	24	5	6	**157**	7	8
	DICI 2010 no DPF	172	7	7	131	9	10	**303**	16	17				124	5	5	22	5	6	**146**	8	9
	DICI 2010 DPF	177	7	7	135	9	10	**311**	17	18				127	5	5	23	5	6	**150**	8	9
	DICI hybrid n DPF	141	15	11	107	7	8	**249**	23	20				102	11	8	18	4	5	**120**	12	10
	DICI hybrid DPF	146	15	11	111	7	9	**257**	24	20				105	11	8	19	4	5	**124**	12	10
KOSD1C	Syn-diesel: CTL, CC&S, Diesel mix																					
	DICI 2002	183	5	5	194	14	15	**377**	21	22				133	4	4	71	14	15	**204**	17	18
	DICI 2010 no DPF	172	7	7	182	13	14	**354**	22	23				124	5	5	67	14	14	**191**	17	18
	DICI 2010 DPF	177	7	7	187	14	14	**363**	23	24				127	5	5	69	14	15	**196**	18	18
	DICI hybrid n DPF	141	15	11	149	11	12	**290**	30	25				102	11	8	55	11	12	**157**	20	18
	DICI hybrid DPF	146	15	11	154	11	12	**299**	31	26				105	11	8	57	12	12	**162**	20	18
GRDE1C	DME: Rem Syn, Sea, Rail/Road, CC&S																					
	DICI 2002	183	5	5	99	0	13	**282**	6	17				127	4	4	20	0	0	**146**	4	4
	DICI 2010 no DPF	172	7	7	93	0	12	**265**	8	18				118	5	5	19	0	0	**136**	5	5
	DICI hybrid n DPF	141	15	11	76	0	10	**217**	17	19				97	10	7	15	0	0	**112**	10	8