



Annex

Tables and Numerical Data

The Annex presents tables and detailed numerical data on issues discussed in the Landsvirkjun Environmental Report, 2013.

The numerical environmental data is compiled from Landsvirkjun's accounting records, DynamicsAX, GB (green accounting), a human resource system, the geothermal database ViewData managed by Kemía sf., Landsnet's database on electricity generation and records on land-use, land-use change and forestry (LULUCF) from the Agricultural University of Iceland. The data published are either actual figures or calculations based on measured values and have been reviewed by EFLA Consulting Engineers. The information in this report is given to the best of knowledge and is considered accurate.



Electricity generation

A summary of Landsvirkjun's electricity generation is given in Tables 1 and 2. Table 1 shows the installed capacity of Landsvirkjun's power stations, the electricity generation within each operational area, electricity losses and the power stations' own energy consumption in 2013.

Landsvirkjun's overall electricity generation is also shown, not taking into account energy losses or

the energy consumption within the power stations between 2009 and 2013. Table 1 shows the total number of employees. Table 2 shows Landsvirkjun's total electricity generation in Iceland in 2009–2013 by energy source, including the total percentage of Landsvirkjun's electricity generation compared to the total electricity generation in Iceland for that period.

Table 1 – Overview of Landsvirkjun's operational areas, number of employees and electricity generation in 2013.

	Energy resource	Number of employees*	Capacity (MW)	Electricity generation (GWh)	Percentage of total electricity generation (%)
Headquarters: Reykjavík & Akureyri	–	146	–	–	–
Power stations					
Blanda Station	Hydropower	15	150	805	6
Laxá Station	Hydropower	5	28	172	1
Fljótsdalur Station	Hydropower	13	690	4,965	39
Mývatn area	Geothermal	18	63	501	4
Sog area	Hydropower	13	90	512	4
Entire Þjórsá area	Hydropower & wind power	38	842	5,888	46
– Hafið	Wind power	–	(1.8)	(5)	(<1%)
Energy losses and own usage			–	(131)	(1%)
Landsvirkjun: total 2013		248	1,863	12,843	100
Landsvirkjun: total 2012		247	1,861	12,312	100
Landsvirkjun: total 2011		233	1,861	12,485	100
Landsvirkjun: total 2010		227	1,861	12,625	100
Landsvirkjun: total 2009		229	1,861	12,242	100

*Number of employees at year-end.

Table 2 – Electricity generation by Landsvirkjun and total electricity generation in Iceland, 2009–2013.
(Source: Annual Report of the National Energy Authority 2009 – 2013).

	Landsvirkjun					Entire country				
	2013	2012	2011	2010	2009	2013	2012	2011	2010	2009
Hydropower stations	12,337	11,822	11,982	12,110	11,772	12,863	12,337	12,507	12,592	12,279
Geothermal power stations	500.5	490	503	515	470	5,245	5,210	4,701	4,465	4,553
Fuel	0	0	0	0	0	3	3	2	2	3
Wind power	5.5	0	0	0	0	5.5	0	0	0	0
Total	12,843	12,312	12,485	12,625	12,242	18,111	17,550	17,210	17,059	16,835
Hydropower stations	96	96	96	96	96	71	70	73	74	73
Geothermal power stations	4	4	4	4	4	29	30	27	26	27
Fuel	0	0	0	0	0	<1	<1	<1	<1	<1
Wind power	<1	0	0	0	0	<1	0	0	0	0
Total	100	100	100	100	100	100	100	100	100	100

Utilisation of geothermal resources

Table 3 shows information on the utilisation of geothermal resources for Landsvirkjun's electricity generation, the utilisation per energy unit between 2009 and 2013 and the change between years. The utilisation of water and steam for exploration drilling in

2009 to 2013 is shown in Table 4 as well as the change between years. Figures for exploratory drilling at Þeistareykir are also included. Landsvirkjun now has full utilisation rights for the geothermal resources at Þeistareykir.

Table 3 – Utilisation of geothermal source for electricity generation by Landsvirkjun 2009 – 2013.

		2013	2012	2011	2010	2009	Change when compared with 2012	Change when compared with 2009
Utilisation per thousand tonnes:								
Steam	Thous. Tonnes	5,634	5,857	6,123	6,496	5,724	-4%	-2%
Water	Thous. Tonnes	5,190	5,230	5,170	5,142	4,861	-1%	7%
Re-injection	Thous. Tonnes	3,067	2,563	2,530	2,792	2,572	20%	19%
Utilisation per produced energy unit								
Steam	Thous. Tonnes/ GWh	11.3	12.0	12.2	12.6	12.2	-6%	-7%
Water	Thous. Tonnes/ GWh	10.4	10.7	10.3	10.0	10.3	-3%	1%
Re-injection	Thous. Tonnes/ GWh	6.1	5.2	5.0	5.4	5.5	17%	11%

Table 4 – Utilisation of geothermal sources during exploratory drilling by Landsvirkjun 2009 – 2013.

		2013	2012	2011	2010	2009	Change when compared with 2012	Change when compared with 2009
Utilisation per thousand tonnes:								
Steam	Thous. Tonnes	711	1,014	2,252	1,193	1,437	-30%	-51%
Water	Thous. Tonnes	13	233	1,596	125	520	-94%	-98%

Fuel consumption – purchased quantity

Table 5 shows the total amount of electricity generation in Landsvirkjun's power stations in 2013 as well as the quantity of fuel used within each operational area and Landsvirkjun's total fuel consumption.

Table 6 shows Landsvirkjun's total fuel consumption during the period between 2009 and 2013 with a comparison between years (2013 and 2012/ 2013 and 2009).

Table 5 – Fuel consumption in Landsvirkjun's operations 2013.

		LV total 2013	Blanda Station	Laxá Station	Electricity generation				Research and Devel- opment Division & Project Planning and Construction Division	Other operations LV
					Fljótsdalur Station	Krafla Station	Sog area	Þjórsá area		
Electricity generation	GWh	12,843	805	172	4,965	501	517	5,883	–	–
Petrol	Litres	12,572	240	5	433	2,436	306	1,875	5,588	1,689
Diesel oil	Litres	271,533	19,174	7,069	20,939	31,817	16,044	66,972	88,663	20,855
Methane	kg	270	0	0	0	0	0	0	0	270

Table 6 – Fuel consumption: 2009 – 2013 and comparison between years.

		LV total: 2013	LV total: 2012	LV total: 2011	LV total: 2010	LV total: 2009	Change when com- pared with 2012	Change when com- pared with 2009
Petrol	Litres	12,572	22,943	21,891	19,430	24,216	-45%	-48%
Diesel oil	Litres	271,533	243,006	257,572	235,759	356,407	12%	-24%
Methane	kg	270	504	339	0	0	-46%	100%
Hydrogen	kg	0	0	122	202	217	0%	-100%

Land reclamation and carbon binding

Table 7 summarises the amount of fertiliser and the number of plants planted in the environmental project “Many Hands Lighten the Load” during the same period. Table 8 shows the number of plants planted in 2009 to 2013 in the vicinity of power stations.

Table 7 – Distribution of commercial fertiliser and number of plants planted under the auspices of Landsvirkjun 2009 – 2013.

		2013	2012	2011	2010	2009
Fertiliser distribution: commercial fertiliser	Tonnes	409	482	456	495	505
Plants planted in vicinity of power stations	No of plants	63,050	5,480	72,150	106,658	60,452

Table 8 – Number of plants planted during the “Many hands lighten the load” cooperative project 2009 – 2013.

		2013	2012	2011	2010	2009
Plants planted during “Many hands lighten the load” project	No. of plants	162,500	30,450	73,690	96,535	111,488

Releases into water and soil from geothermal power stations

Table 9 shows the amount of condensate and separated water, heavy metals, nutrients, hydrogen sulphide and carbon dioxide from the Krafla and Bjarnarflag power stations. The amount of heavy metals is calculated based on measured concentrations in condensate and separated water. The table shows that the percentage of re-injected heavy metals does not correlate with the percentage of re-injected water. This is, to some extent, explained by the fact that specific amounts of heavy metals are released with the corrosion of machinery. Hydrogen sulphide and carbon dioxide released into surface waters or rein-

jection wells, reduce the emission of these gases into the atmosphere. Limit values for the release of these compounds are not defined in the operating permit, except that the concentration in the receiver must be below environmental limits in category I, in accordance with regulation no.796/1999 on mitigation measures against water contamination. The table also shows the amount of heavy metals and nutrients released into surface waters as a result of exploration drilling in the Mývatn area. No re-injection is carried out in exploration drilling.

Table 9 – Quantity of chemicals in condensate and separated water (heavy metals, nutrients and gases) reinjected and released into surface waters in the years 2009 – 2013.

	Energy generation and research														
	Energy generation						Research								
	Release into surface waters			Re-injection			Release into surface waters			Release into surface waters					
	2013	2012	2011	2010	2009	2013	2012	2011	2010	2009	2013	2012	2011	2010	2009
Water															
- Water from geo-thermal stations	4,047	4,640	4,693	4,507	4,223	3,067	2,563	2,530	2,792	2,572	-	-	-	-	-
Heavy metals															
- Arsenic	143	173	190	167	157	5	10	7	28	33	0	5	27	0	1
- Copper	1	4	3	2	1	0	0	1	0	0	0	0	0	0	0
- Chromium	3	4	4	3	6	0	0	0	0	0	0	0	0	0	0
- Nickel	2	1	3	2	12	0	0	0	1	0	0	0	0	0	0
- Zinc	4	5	12	15	8	1	1	2	2	2	0	0	2	0	0
Nutrients															
- Phosphorus	10	9	9	11	10	3	3	3	3	3	0	0	1	0	0
Other															
- Hydrogen sulphide	178,212	108,215	128,000	117,000	64,000	144,040	120,363	119,000	131,000	121,000	-	-	-	-	-
- Carbon dioxide	350,408	306,510	263,000	225,000	212,000	127,224	163,511	149,000	137,000	139,000	-	-	-	-	-

Waste

Table 10 shows the quantity of waste generated as a result of Landsvirkjun's operations by category and disposal method 2009 to 2013. Table 11 shows the quantity of waste generated in Landsvirkjun's operational areas in 2013 by waste categories and disposal

method. Table 12 shows the quantity of hazardous materials generated from overall operation in 2009–2013 by category. The quantity of hazardous materials generated in different operational areas in 2013 can be seen in table 13.

Table 10 – Quantity of waste by category and disposal method 2009 – 2013.

		LV total: 2013	LV total: 2012	LV total: 2011	LV total: 2010	LV total: 2009
Unsorted waste	kg	34,893	46,274*	52,536	69,415	51,924
Landfill	kg	33,533	39,515	42,326	59,378	41,899
Incineration***	kg	1,360***	6,759	10,210	10,037	10,025
Waste for recycling and reuse	kg	276,240	80,309	467,378	171,231	96,833
Tyres	kg	122	1,784	1,155	270	100
Household goods	kg	105	35	0	0	0
Organic waste	kg	17,674	12,301	13,830	13,132	8,148
Metals and various equipment	kg	123,355	36,943	225,034	82,810	39,795
Paper, cardboard and packaging	kg	13,562	12,514	16,560	12,140	7,423
Plastic	kg	3,272	451	346	4,853	3,795
Timber	kg	118,150	16,351	210,454	58,027	37,572
Inert waste**	kg	351,648	55,860	8,296	83,517	68,975
Earth and minerals, glass and porcelain	kg	351,648	55,860	8,296	83,517	68,975
Hazardous waste	kg	5,827	4,759	11,647	52,710	12,223
Total waste	kg	668,608	187,271	539,857	376,873	229,955

* Corrected amount from previous year

** Inert waste is disposed of in a landfill for inert waste

*** Incineration of waste discontinued in Húsavík in 2013

Table 11 – Amount of waste from Landsvirkjun's operational stations in 2013 by category and disposal method.

		LV total: 2013	Blanda Station	Fljótsdalur Station	Krafla St.	Laxá St.	Sog area	Þjórsá area	Other operations: LV
Unsorted waste:	kg	34,893	3,370	4,220	3,688	1,043	4,498	7,220	10,854
Landfill	kg	33,533	3,370	4,220	2,328	1,043	4,498	7,220	10,854
Incinerated	kg	1,360*	–	–	1,360	–	–	–	–
Waste for recycling or reuse:	kg	276,240	1,882	5,460	51,354	163,643	8,665	25,472	19,764
Tyres	kg	122	–	–	82	40	–	–	–
Household goods	kg	105	–	–	–	75	–	–	30
Organic waste	kg	17,674	672	1,890	2,692	–	–	4,000	8,420
Metals and various equipment	kg	123,355	315	370	38,849	64,779	6,769	10,470	1,803
Paper, cardboard and packaging	kg	13,562	450	1,660	1,197	50	390	4,190	5,625
Plastic	kg	3,272	285	80	2,704	175	–	12	16
Timber	kg	118,150	160	1,460	5,830	98,524	1,506	6,800	3,870
Inert waste	kg	351,648	20	40	900	350,170	–	–	518
Earth and minerals, glass and porcelain	kg	351,648	20	40	900	350,170	–	–	518
Hazardous waste	kg	5,827	50	281	83	974	1,119	709	2,612
Total waste	kg	668,608	5,322	10,001	56,025	515,830	14,282	33,401	33,748

* Incineration discontinued in Húsavík in 2013.

Table 12 – Quantity of hazardous waste by category 2009 – 2013.

		LV total: 2013	LV total: 2012	LV total: 2011	LV total:2010	LV total: 2009
Hazardous waste for disposal:	kg	3,999	2,528	2,944	3,360	4,797
Asbestos	kg	0	0	0	0	960
Poisons	kg	6	12	0	31	0
Organic waste	kg	198	259	117	310	1,669
Coal slack	kg	0	0	21	0	20
Batteries	kg	2,921	1,181	1,255	2,002	1,078
Hazardous waste containers	kg	10	233	50	210	935
Inorganic waste	kg	0	57	611	79	10
Other hazardous waste	kg	865	786	890	728	125
Oil waste:	kg	1,828	2,231	8,703	49,350	7,426
Hazardous waste total	kg	5,827	4,759	11,647	52,710	12,223

Table 13 – Quantity and type of hazardous waste from Landsvirkjun's operations in 2013.

		LV total: 2013	Blanda Station	Fljótsdalur Station	Krafla St.	Laxá St.	Sog area	Þjórsá area	Other opera- tions: LV
Hazardous waste for disposal:	kg	3,999	0	46	3	568	596	175	2,612
Poisons	kg	6	0	6	0	0	0	0	0
Organic waste	kg	198	0	13	0	35	150	0	0
Coal slack	kg	0	0	0	0	0	0	0	0
Batteries	kg	2,921	0	0	0	135	233	0	2,553
Hazardous waste containers	kg	10	0	0	0	10	0	0	0
Inorganic waste	kg	0	0	0	0	0	0	0	0
Other hazardous waste	kg	865	0	27	3	388	213	175	59
Oil waste:	kg	1,828	50	235	80	406	523	534	0
Total hazardous waste and oil waste	kg	5,827	50	281	83	974	1,119	709	2,612

Noise

Measured sound levels at Krafla and Bjarnarflag Stations 2009–2013 are shown in Tables 14 and 15. Blue coloured rows represent areas where measurements are carried out in sensitive tourist areas or areas outside of the industrial area. Values in red represent

measured sound levels exceeding 50 dB (A) in such areas. Grey rows represent additional measurement locations, but no measurements have been conducted in these locations since 2010.

Table 14 – Equivalent sound levels at Krafla 2009 – 2013. Blue coloured rows represent measurement locations in popular tourist areas, within or outside the industrial area. Values in red represent measured sound levels exceeding 50 dB(A) in such areas. Grey rows represent additional measurement locations.

Monitoring location	Krafla	3.10.2013 LAeq[dB(A)]	21. og 22.08. 2012 LAeq[dB(A)]	21.02. 2011 LAeq[dB(A)]	08. og 11.02. 2010 LAeq[dB(A)]	31.07. 2009 LAeq[dB(A)]
1	Krafla control room	55.5	46.1	56.5	56	53.9
2	East of turbine 1	90.8	83.7	88.7	89.1	89.1
3	East of turbine 2	91.7	90	90.1	89.5	89.9
4	Powerhouse	77.3	79.8	67.9	73.4	72
5	Storehouse 1a	69.3	70.3	60.8	71.5	67.6
6	Residence at Sigurbogi	57.1 ¹⁾	71.9	56.3	79.9	50
7	By well 6	74	74.9	52.3	81.8	55.5
8	By well 26	51.5	56.1	45.4	62.2	50
13	By well 34	88.5 ²⁾	79.5	74.9	73.3	75
14	By well 19	46.4 ³⁾	65.8	60.2	61.9	68
15	By well 31	43.5	45.2	51.5	44.9	57
16	By well 14	42.5	51.5	43.4	48	52
17	By well 18	32.7	33.3	41.2	41.2	52
18	By well 1 – in the SV area	– ⁴⁾	34.9	43.1	38.6	42
19	Parking lot at power station's cafeteria	51.9	65	53.3	46.7	48
21	By well 21	40.6	47.2	54	41.7	48
37	By well 22	–	–	–	–	active
38	By well 37	–	–	–	–	active
39	By well 39	–	–	–	101	–
40	IDDP deep drilling well	–	–	–	117	–
10	By well 8 in parking lot at Saurbær	44	46.5	39.7	48	50
11	By well 10 – viewing platform	47.7	57.6	51.1	73.5	64
12	Parking lot at Víti	47.3	59.8	48.4	39	50
20	By the sign on Kröfluvegur – near waterhole house	37.3	49.7	53	37.8	51
22	Parking lot at Skarðssel	35.5 ⁵⁾	41.1	47.5	35.9	44

1) In well KJ-6 (active). There is a substantial amount of water in the well and this affects the noise levels.

2) Work recently completed on wellhead when measurements were conducted. Casting still needs to be insulated and this increases noise levels. Wind direction at time of measurement also increased noise levels.

3) In well KJ-15 (active). Substantial water present but not much noise.

4) Well inaccessible

5) Well KS-1: active

Table 15 – Equivalent sound levels at Bjarnarflag 2009 – 2013. Blue coloured rows represent measurement locations in popular tourist areas, within or outside the industrial area. Values in red represent measured sound levels exceeding 50 dB(A) in such areas.

Monitoring location	Bjarnarflag	3.10. 2013 LAeq[dB(A)]	21. og 22.08. 2012 LAeq[dB(A)]	15. og 18.02. 2011 LAeq[dB(A)]	08. og 11.02. 2010 LAeq[dB(A)]	31.07. 2009 LAeq[dB(A)]
24	By well 11	43.1	44.1	58.6	100.1	40
25	By well 12	50.9	56.9	71.1	77.2	90
27	At steam station	85.7	82.8	85.7	84.8	48
28	By well 9	69.3	65.3	71.2	82.6	36
29	Heat exchange station – electr. Room	69.8	83.3	84.5	77.1	66
32	Separation station 1	88.1	87.1	84.1	84.1	69
33	Separation station 2	76.3	82.0	73.5	83.0	56.7
34	Parking lot at Grænar lausnir	47.5	72.6	45.9	47.0	40
35	On embankment	46	46.1	56.6	34.9	40
23	Viewing platform at Námaskarð	42	48.9	47.6	48.5	43
26	Viewing platform at Námaskarð	58.3 ¹⁾	57.7	57.7	63.0	34
30	Parking lot for the bathing area entrance	42.4	39.0	52.3	46.7	43
31	At the new nature baths	42	38.5	44.9	47.7	35
36	Skútahraun 6	40.8	35.6	43.7	35.5	40

1) The viewing platform is in vicinity of the separation station where the noise level is somewhat high. The separation station also releases emissions which enter the reservoir and increases noise levels.

Greenhouse gas emissions

Table 16 shows the greenhouse gas (GHG) emissions from Landsvirkjun's operations between 2009 and 2013. Table 17 shows the GHG emissions from Landsvirkjun's operations in 2013 by source. Table 18 shows the GHG emissions calculated per generated GWh of electricity, excluding emissions from exploration drilling and a comparison between years. Emissions due to exploration drilling are not included as these

are not directly related to the electricity generation. Table 19 summarises the GHG emissions from Landsvirkjun's hydropower and geothermal electricity generation, in 2013. The GHG emissions are presented as emissions in terms of CO₂-eq. and CO₂-eq./ GWh. Finally, Table 20 shows the GHG emissions from Landsvirkjun's hydropower reservoirs in 2013.

Table 16 – Greenhouse gas emissions from Landsvirkjun's operations 2009 – 2013.

		LV total: 2013	LV total: 2012	LV total: 2011	LV total: 2010	LV total: 2009	Changes com- pared to 2012	Changes com- pared to 2009
Geothermal stations: total emissions	tonnes CO ₂ - eq	33,632	41,959	42,999	45,346	46,827	-20%	-28%
<i>Electricity generation</i>	tonnes CO ₂ - eq	32,324	37,836	40,164	44,121	41,292	-15%	-22%
<i>Research wells</i>	tonnes CO ₂ - eq	1,308	4,123	2,835	1,225	5,535	-68%	-76%
Hydropower reservoirs	tonnes CO ₂ - eq	14,504	12,680	13,780	12,380	12,880	14%	13%
Combustion of fossil fuels	tonnes CO ₂ - eq	1,001	940	1,083	1,012	1,377	6%	-27%
<i>Petrol for equipment and vehicles</i>	tonnes CO ₂ - eq	31	57	55	48	60	-46%	-48%
<i>Diesel oil for equipment and vehicles</i>	tonnes CO ₂ - eq	740	662	702	642	971	12%	-24%
<i>Flights: total emissions</i>	tonnes CO ₂ - eq	230	221	326	322	346	4%	-34%
– Domestic flights	tonnes CO ₂ - eq	109	92	76	72	96	18%	14%
– International flights	tonnes CO ₂ - eq	121	129	250*	250*	250*	-6%	-52%
Waste	tonnes CO ₂ - eq	26	37	44	56	43	-30%	-40%
Emissions from electrical equipment	tonnes CO ₂ - eq	0	0	0	0	12	0%	0%
GHG emissions	tonnes CO ₂ - eq	49,163	55,616	57,906	58,794	61,139	-12%	-20%
Carbon binding (LV)	tonnes CO ₂ - eq	-22,000	-22,000	-22,000	-22,000	-22,000	0%	0%
Carbon binding (Kolviður)	tonnes CO ₂ - eq	-1,027	–	–	–	–	100%	100%
Landsvirkjun's carbon footprint	tonnes CO ₂ - eq	26,136	33,616	35,906	36,794	39,139	-22%	-33%

*Emissions from international flights were estimated between 2009 – 2011.

Table 17 – Greenhouse gas emissions from Landsvirkjun's operations in 2013.

	Usage	Release into atmosphere	
	Quantity	Quantity [tonnes]	Quantity [kg CO ₂ - eq]
Emissions from geothermal power stations			
Steam from geothermal stations ¹⁾	5,633,641 tonnes	3,709,713	
– Carbon dioxide emissions		39,807	31,980,676
– Methane emissions		17	343,345
– Hydrogen sulphide emissions		5,627	0
Emissions from research wells			
Steam from research wells	711,436 tonnes	1,163,259	
– Carbon dioxide emissions		757	1,297,421
– Methane emissions		12	10,500
– Hydrogen sulphide emissions		909	0
Emissions from hydropower reservoirs	339 km ²		
– Carbon dioxide emissions		6,820	7,872,000
– Methane emissions		279	6,632,000
Emissions from fossil fuel consumption: petrol for vehicles and machinery	12,572 litres		
– Carbon dioxide emissions		50	28,947
– Methane emissions		0.005	59
– Nitrous oxide emissions		0.014	2,338
Emissions from fossil fuel consumption: Diesel for vehicles and machinery	271,533 litres		
– Carbon dioxide emissions		649	725,319
– Methane emissions		0.016	383
– Nitrous oxide emissions		0.041	14,141
Emissions from flights (employees)			
– Domestic flights		91.9	109,440
– International flights		129.3	120,570
Emissions from waste disposal			
– Landfill	29 tonnes	–	23,976
– Incineration	12 tonnes	–	1,780
Electrical equipment emissions			
– SF ₆ emissions	0	0	0
Total GHG emissions			49,162,896

1) Difference between the use and quantity released is due to reinjection

Table 18 – GHG emissions per GWh excluding emissions from research wells 2009 – 2013 and a comparison between years.

	LV total: 2013	LV total: 2012	LV total: 2011	LV total: 2010	LV total: 2009	Changes compared to 2012	Changes compared to 2009
Geothermal power stations: electricity generation	2.517	3.073	3.217	3.604	3.321	-18%	-24%
tonnes CO ₂ - eq/GWh							
Hydropower reservoirs	1.129	0.987	1.104	1.011	1.036	14%	9%
tonnes CO ₂ - eq/GWh							
Petrol for vehicles and machinery	0.002	0.004	0.004	0.004	0.005	-50%	-60%
tonnes CO ₂ - eq/GWh							
Diesel oil for vehicles and machinery	0.058	0.052	0.056	0.052	0.078	12%	-26%
tonnes CO ₂ - eq/GWh							
Flights total emissions	0.017	0.017	0.026	0.026	0.028	0%	-39%
tonnes CO ₂ - eq/GWh							
- Domestic flights	0.008	0.007	0.006	0.006	0.008	14%	0%
tonnes CO ₂ - eq/GWh							
- International flights	0.009	0.010	0.020	0.020	0.020	-10%	-55%
tonnes CO ₂ - eq/GWh							
Waste	0.002	0.003	0.004	0.005	0.003	-33%	-33%
tonnes CO ₂ - eq/GWh							
Emissions from electrical equipment	0	0	0	0	0.001	0%	0%
tonnes CO ₂ - eq/GWh							
GHG emissions: exploratory drilling excluded	3.726	4.009	4.411	4.703	4.472	-7%	-17%
tonnes CO ₂ - eq/GWh							
Carbon binding (LV)	-1.713	-1.713	-1.762	-1.797	-1.769	0%	-3%
tonnes CO ₂ - eq/GWh							
Carbon binding (Kolvidur)	-0.080	-	-	-	-	100%	100%
tonnes CO ₂ - eq/GWh							
Landsvirkjun's carbon footprint: excluding exploratory drilling and including carbon binding and carbon offsetting	1.933	2.296	2.649	2.906	2.703	-16%	-28%
tonnes CO ₂ - eq/GWh							

Table 19 – Summary of greenhouse gas emissions due to electricity generation in Landsvirkjun’s hydropower stations and geothermal power stations in 2013, excluding emissions from research wells.

	Hydropower station		Geothermal power station		Hydropower station		Geothermal power station	
	tonnes CO ₂ - eq		tonnes CO ₂ - eq/GWh		tonnes CO ₂ - eq/GWh			
Petrol consumption	25	7	0.002	0.014				
Diesel oil consumption	641	98	0.052	0.196				
Geothermal power stations	-	32,324	-	64.583				
Hydropower reservoirs	14,504	-	1.176	-				
Flights	221	9	0.018	0.018				
Waste	25	1	0.002	0.002				
SF ₆ emissions from electrical equipment	0	-	0	-				
GHG emissions from research wells	15,416	32,439	1.250	64.813				
Carbon binding (LV)	-21,141	-859	-1.714	-1.716				
Carbon binding (Kolviður)	-912	-115	-0.074	-0.230				
GHG emissions: excluding research wells and including carbon binding	-6,637	31,465	-0.538	62.867				

Table 20 – Calculated annual greenhouse gas emissions from Landsvirkjun's hydropower reservoirs in 2013.

Station/source	Reservoirs/Lakes	Total surface area [km ²]	Total surface area for calculation [km ²]	CO ₂ Ice-free [tonnes CO ₂]	CH ₄ Ice-free [tonnes CO ₂ -eq]	GHG total [tonnes CO ₂ -eq]
Blanda		70 (8)	62	6,602	5,572	12,174
Blanda	Blanda	57	57	5,377	4,522	9,899
Blanda	Gilsárlón	5	5	1,225	1,050	2,275
Blanda	(Lakes in waterway)	(8.2)	0	0	0	0
Fljótsdalur		70 (4)	66	620	520	1,140
Fljótsdalur	Háslón	61 (2.6)	58	490	420	910
Fljótsdalur	Kelduárlón	7.5 (1.1)	6	110	90	200
Fljótsdalur	Ufsárlón	1.1 (0.14)	1	20	10	30
Fljótsdalur	Grjótárlón	0.1 (0.02)	0	<1	<1	<1
Laxá		38	0	0	0	0
Laxá	(Mývatn)	(38.0)	0	0	0	0
Sog		(86)	0	0	0	0
Sog	Úlfjótavatn	(3)	0	0	0	0
Sog	Þingvallavatn	(83.0)	0	0	0	0
Þjórsá area		199 (70)	129	650	540	1,190
Þórisvatn	Þórisvatn	85.2 (70)	15	50	40	90
Þórisvatn	Sauðafellslón	4.5	5	20	10	30
Sigalda Station	Krókslón	14	14	70	60	130
Hrauneyjafoss Station	Hrauneyjalón	9	9	20	20	40
Búrfell Station	Bjarnalón	1	1	<10	<10	<10
Hágöngur Reservoir	Hágöngulón	37	37	130	110	240
Kvíslaveita	Kvíslavatn	22	22	270	230	500
Kvíslaveita	Dratthalavatn	2	2	40	30	70
Kvíslaveita	Eyvindarlón	0	0	<1	<1	<1
Kvíslaveita	Hreysislón	0	0	<1	<1	<1
Kvíslaveita	Þjórsárlón	4	4	10	10	20
Vatnsfell Station	Vatnsfellslón	1	1	0	0	0
Sultartanga Station	Sultartangalón	20	20	40	30	70
Total		339 (82)	257	7,872	6,632	14,504

Numbers in parentheses are lakes, and do not contribute to the corresponding power station's GHG emissions. These lakes are either lakes in diversion or natural lakes which have not been created by flooded land (Þingvallavatn Lake and the Mývatn Lake). The Úlfjótavatn Lake was partly created by flooded land, but was created approximately 70 years ago and therefore does not contribute to GHG emissions.

Búðarháls Hydropower Station

The quantity of waste generated in the Búðarháls construction area and the use of diesel oil can be seen in Table 21. Additionally, the table shows the estimated amount of GHG emissions from the burning of diesel oil and disposal of waste

Table 21 – Quantity of waste generated in the Búðarháls construction area, the fossil fuel use and the corresponding greenhouse gas emissions.

	Usage	GHG emissions
Diesel oil: total	1,430,127 Litres	
Contractor	1,430,127 Litres	3,820 tonnes CO ₂ -eq
Unsorted waste: total	74,020 kg	
Landfill	74,020 kg	53 tonnes CO ₂ -eq
Waste for recycling and reuse:	384,040 kg	
Organic waste	21,300 kg	
Metals	128,950 kg	
Paper	7,410 kg	
Timber	226,380 kg	
Other recyclable waste	–	
Inert waste:	234,130 kg	
Earth materials, minerals, glass and porcelain	234,130 kg	
Hazardous waste:	7,321 kg	
Waste oil	6,621 kg	
Other hazardous waste	700 kg	
GHG emissions: total		3,873 tonnes CO ₂ -eq