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Ireland - National Report



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Definition of shallow geothermal Energy

Does a definition exist in your country? Yes No

Geothermal Energy in Ireland is defined in the Draft Geothermal Development Bill as *'the energy stored in the form of heat beneath the surface of solid earth'* as defined in the RES Directive 2009/28 EC.

As of 2012, there is no specific definition or legal limitations defining shallow geothermal energy as part of the proposed legislation and no additional parameter are used to define operational boundaries between shallow and deep geothermal energy resources.

Regulations to be developed once the legislation is approved are expected to make some distinction between shallow and deep geothermal energy resources. Public consultation on the development of the Geothermal Energy Development Bill suggest a depth of 400m to be the possible maximum depth of shallow geothermal energy resources (SGE) in Ireland.

1 Introduction

1.1 Current situation in your country

Designers are predominantly	<input checked="" type="checkbox"/> National	<input type="checkbox"/> Foreign
Installers are predominantly	<input checked="" type="checkbox"/> National	<input type="checkbox"/> Foreign
Technology providers are predominantly	<input checked="" type="checkbox"/> National	<input type="checkbox"/> Foreign
Designers are predominantly independent from installers	<input checked="" type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
If no, specify:		
Designers' market is predominantly	<input type="checkbox"/> Local	<input type="checkbox"/> Regional <input checked="" type="checkbox"/> National
Installers' market is predominantly	<input type="checkbox"/> Local	<input type="checkbox"/> Regional <input checked="" type="checkbox"/> National

The role of designers and installers in Ireland is dependent on the type of project being developed. In many cases both roles are performed by the same company and in some cases by the same individual. The principal roles for residential and commercial systems are outlined below:

RESIDENTIAL:

- Design: as part of the planning application architects will frequently specify the inclusion of a geothermal system in the plans, however they will generally not perform the design of the actual system. The design is frequently undertaken by an installer/supplier of geothermal systems contracted directly by the resident. In this case the installer/supplier role covers the specification of the collector (with a majority of closed loop systems being installed) with regard to depth and size of vertical and horizontal collectors, the heating/cooling delivery system within the household and requirements for hot water tanks, buffer vessels and control system. The installer generally acts as the project manager making recommendations to the homeowner of adequate ground works or drilling contractors to be used for the construction/installation phase.
- Installation: Construction and preparation of collector areas are completed by individual contractors under the direction of the installer/designer. The installer has the responsibility for installation of collector and distribution pipe work, heat pump, control systems and integration with the other existing heating measures as well as being responsible for initial testing and system hand over.

COMMERCIAL:

- Design: this is carried out by specialised designers, engineering consultants in conjunction with the project architects. Designers generally also take on the responsibility of tender document preparation for the various aspects of the system construction process, project management ensuring compliance of installation and construction of the various system components. The designer is ultimately responsible for system hand over to the client.
- The installation, construction, borehole drilling and collector completion are carried out by specialised individual contractors under the management of the designer and engineering consultants in advance of the systems being tested and commissioned.

IRELAND MARKET CONDITIONS:

The thermal energy market in Ireland (excluding energy produced from electricity for space heating) accounts for 34% of the gross final energy consumption in 2011, with 47% accounted for by the residential sector (SEAI, 2011).

The SGE sector in Ireland had a very high growth rate until 2009. The installed capacity for geothermal heating and cooling in Ireland in 2010 totalled nearly 160 MW_{th} with an annual energy use of 7,65TJ/yr (Allen, A. *et al.*, 2010) with 152 MW_{th} installed capacity and 744 TJ/yr energy usage from ground source heat pumps. Cooling accounted for a total of 6.6MW_{th} installed capacity and 13.34 TJ/yr annual energy use in 2010.

The lack of a dedicated database for reporting the number and characteristics of installation of SGE systems in Ireland has made it difficult to determine exactly both the market conditions in terms of the contribution of ground source heat pumps to renewable heating and cooling at a national level.

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010
Residential									
New Units in Year	546	990	1300	1900	2205	2673	2751	922	1293
Cumulative Units	546	1536	2836	4736	6941	9614	12365	13287	14580
Total installed capacity (MW)	8	23	43	71	78	117	148	162	178
Commercial									
New Units in Year	5	10	50	100	220	268	306	103	144
Cumulative Units	5	15	65	165	385	653	959	1062	1206
Total installed capacity (MW)		1	2	7	15	25	38	42	48
Total									
New Units in Year	551	1000	1350	2000	2425	2941	3057	1025	1437
Cumulative Units	551	1551	2901	4901	7326	10267	13324	14349	15786
Total installed capacity (MW)	8	24	45	78	93	142	186	204	226

Table 1: Number of Installed GSHP Units (Heat Pump Association of Ireland, 2011)

Figures published by the Heat Pump Association of Ireland (2011) show a total number of installed units on 15,786 in 2010, however this does not differentiate between geothermal and air source heat pumps. Data for installed systems for 2011 are yet to be published.

In 2012 the SGE market in Ireland was dominated by the installations in the residential sector (85%) with lower uptake in the commercial and industrial processes sector (14% and 4% respectively) with

systems of intermediate installed capacity between 10kW and 20kW installed as the most widespread.

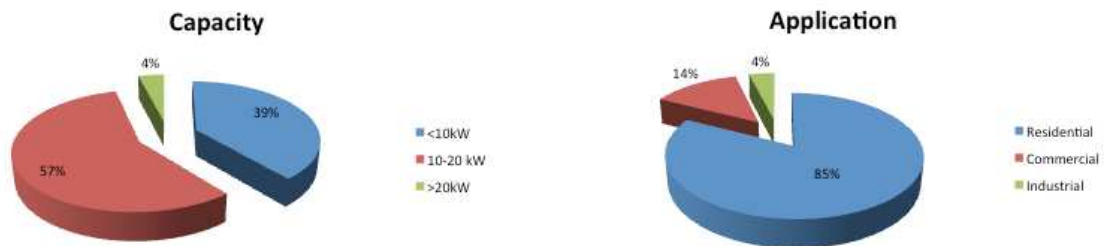


Figure 1: Ground Source Heat Pump Installations in Ireland

SGE system deployment was dominated by the new build sector (74%) reported in 2010 with only 26% of systems being installed in retrofit conditions (14%) and similar proportions in deployment values are expected for 2011 despite an average annual 2% decrease in renewable energy technology deployment in Ireland from 2006 to 2010 (SEAI, 2011) which is seen as most significant in the number of installed SGE systems post the 2008.

Please describe the typical procedures for a typical one well installation.

The lack of regulation and legislation for the completion of shallow geothermal wells in Ireland makes it such that there are no specific procedures (as of 2012) to be followed as part of the drilling and completion of a geothermal borehole system. Closed loop vertical collectors are generally completed by the drilling company leaving responsibility of construction and completion of geothermal wells with the contractor and ultimately with the owner of the system.

In the case of new build development, the inclusion of a SGE system is often included at the design stage by an architect in the residential sector or by the engineer responsible for

The completion of groundwater boreholes in Ireland are reported back to the GSI by either the drilling company and/or the consultant. This is currently not the case for SGE system boreholes, however a current proposal to develop a database of systems could include an element of reporting in the future by drilling contractors and project managers.

1.2 Barriers

Economic Conditions

The Irish economy is currently in state of recession since 2008/2009 and has suffered severe financial crisis and crash in the property sector. During 2007 and 2008 a significant amount of new properties were still under development and many of these remain incomplete today throughout the country. This has resulted in an excess of new property (and in some cases partly finished) developments for both residential and commercial sectors and new construction has significantly reduced from 2008 - 2009. This has significantly affected the deployment of renewable energy technologies and in particular SGE system as these were a popular form of alternative heating and cooling in advance of this economic situation.

Lack of financial support:

Grant schemes supporting previously the deployment of both residential and commercial SGE systems in Ireland were administered by SEAI. Specific grant funding has been stopped as a result of budget cuts in 2010 and 2011. Current financial support measures specific to GSHP are currently not available other than other grants which include the deployment of multiple renewable energy technologies. It is currently unclear if financial support specific to the deployment of GSHP will be made available again in the near future.

Lack of regulations for GSHP systems

The main barriers to the development of geothermal energy resource in Ireland remain the lack of specific legislation for resource exploration and development as outlined in the GTR-H project. The Draft Geothermal Development Bill has been drafted and reviewed by the attorney general. However further progress on the legislation and a subsequent regulation has not progressed since 2011. Despite the fact that *Geothermal Bill* is not expected to deal with shallow geothermal energy resources, the issued regulations are expected to define the cut off parameters between shallow and deep resources.

Despite this there is still a lack of a regulatory of best practice regime to define a common platform for the installation of SGE systems in Ireland is currently being addressed by the Geological Survey of Ireland who is developing technical guidance that will deal with collector installation.

Lack of information GSHP systems

One of the barrier previously recognised by the GTR-H project included the lack of information on the potential for installing ground source heat pumps. Specifically, despite there being guidance documents from SEAI explaining the use of the technology, not a lot of data is available to promote area and subsurface conditions that are adequate for the deployment of GSHP systems.

This information is essential to both the end users and the general public, but also to the local authorities who are tasked with assessing planning applications and in some cases discharge licenses for open loop systems. The GSI is currently in the process of developing collector suitability maps based on existing information and the inclusion of data from already installed and operating systems.

Lack of training and certification:

There is currently no dedicated training and specification for key contractors involved the installation of GSHP systems. Whilst the FETAC level 6 certification allow trades such as plumbers, electricians and refrigeration engineers to be trained and certified to install SGE systems, there are no dedicated training or certification courses for the ground works and drilling contractors that are in tasked with constructing collectors. In addition to this, dedicated courses on project management and system design are not currently open to other trades to include for example architects who are often tasked with designing system for new build development. The Geotrained programme has to some extent fulfilled this role, however further national and certification training initiative need to be put in place to promote a sustainable development of the SGE sector in the future.

2 Review of existing documents (or in progress)/Tools to support SGE development

Natural resource metadata and associated GIS mapping tools in Ireland are available from several data sources. The majority of the datasets are managed and compiled by the Department of Energy Communication and Natural Resources (DCENR) through the Geological Survey of Ireland (GSI) and the Sustainable Energy Authority of Ireland (SEAI). Both GSI and SEAI provide publicly available data for use in the assessment and planning of SGE systems in Ireland, these data are available and used at both national and local level with local authorities and municipalities accessing these as a source of information.

The section below presents some of the main GIS mapping tools that are currently available as part of the existing data and present some ongoing work which is more specifically targeted at assessing the potential of SGE resources on a national scale. In most cases the GIS metadata is also available for download from the relevant government agency sites.

2.1 National level

- **Dedicated Web sites and GIS (general public)** Yes No

- **Geothermal Atlas of Ireland (SEAI, 2004) – Temperature Maps to 100m and 500m - Free**
Access: http://www.seai.ie/Renewables/Geothermal_Energy/Geothermal_Maps/
- **EPA/Teagasc Soils Map (2011) - Irish National Soils and Subsoils Database – Free.** Specific data is available through the EPA website for download. No viewer provided.
Access: <http://erc.epa.ie/safer/iso19115/displayISO19115.jsp?isoID=7>
- **Bedrock Data and Bedrock Boreholes (ongoing) – Digital 1:100,000 bedrock geological data and borehole records.** These datasets are free to download.
Access: <http://erc.epa.ie/safer/iso19115/displayISO19115.jsp?isoID=7>
- **Groundwater Web-Mapping (GSI, 2007-ongoing) – Free.** Detailed online viewer provides information on vulnerability, aquifer and source protection datasets, karst features, groundwater wells data, aquifer classification and facilitates search by county of interest.
<http://spatial.dcenr.gov.ie/imf/imf.jsp?site=Groundwater>
- **GeoUrban Project (GSI, 2007 – 2013) - Free online geo-environmental GIS for the Dublin urban area, 2D/3D/4D** to provide corporate contribution to assist informed planning and infrastructural decision making in the Greater Dublin region, including forward looking flood/inundation protection requirements
Access: <http://spatial.dcenr.gov.ie/imf/imf.jsp?site=GeoUrban>
- **Geotechnical Viewer (GSI, 2007 – on going)** - site investigation reports, borehole and trial pit records are included in a free national geotechnical borehole database. The Geotechnical viewer represents only one-sixth of the total number of investigations held for the whole country. Soil types and Depth to Bedrock (DTB) data is frequently recorded which contributes to revised quaternary mapping, Depth to Bedrock and Rock head maps. Limited national coverage.

Access: <http://spatial.dcenr.gov.ie/GeologicalSurvey/GeoTechnicalViewer/index.html>

- **GSI Public Data Viewer – Free.** Online GIS encompassing summary data coverage for Quaternary data, Geohazards, Minerals, Groundwater, Geotechnical Bedrock data for the entire country (further detail on the related data is available through the specific viewers)
Access: http://spatial.dcenr.gov.ie/imf/imf.jsp?site=GSI_Simple

- **Support tools**

Geothermal operations inventories Yes No

Currently there are no databases or inventories of installed SGE system in Ireland. A record of installed systems that were grant aided through the SEAI residential 'Greener Homes Scheme' and the commercial 'ReHeat Scheme' closed in 2010 exist. However this data is not publicly available and access to this carries issues of confidentiality despite the Freedom of Information Act.

The GSI is currently developing a national database of installed and future SGE systems through its shallow geothermal energy programme. The database is expected to contain data relating to both the subsurface geological and hydrogeological conditions, system specifications outlining heat pump technology, collector type and completion as well as system efficiency and operational data.

Underground operations inventories Yes No

Inventories generally cover the subsurface installation of groundwater, geotechnical and mineral exploration boreholes, however no specific major underground infrastructure inventory is available.

Inventory of Closed Mine Waste Facilities (Historic Mine Site Inventory) – Free

In 2009, The Environmental Protection Agency (EPA) published a "Historic Mine Site Inventory and Risk Characterisation (HMS - IRC)" report and GIS database. The historic mine site inventory report and a historic mine database are available for download from the EPA website.

Access: <http://www.epa.ie/downloads/pubs/land/mines/#d.en.27147>
<http://gis.epa.ie/>

Minerals Programme Datasets – Mostly Free but some directories are charged a small cost

The minerals section of the GSI keeps an inventory of all mine and quarry operations in Ireland along with mine records and mine waste sites.

Access: <http://www.gsi.ie/Programmes/Minerals/Databases/>

Geothermal resources evaluation Yes No

Collector Suitability Maps (GSI, under development) – Horizontal, Open Loop and Vertical Closed loop collector suitability maps based on newly collected shallow geothermal data & existing soils and geological data. - This online dataset will be available from the GSI website for Free and will be aimed primarily as an indicative tools for the end users and potentially installers of SGE systems to assess the suitability of an area to the deployment of a particular collector type distinguishing areas where closed loop is preferred over open loop as well as providing indication of the likely soil conditions.

The proposed collector suitability map is aimed at providing indicative assessments of the ground conditions and help guide design but will not provide a definitive tool for understanding the geothermal energy resources at a specific site.

Geothermal resources management Yes No

A geothermal resource management tool at national level is currently not planned with regard to existing and future SGE systems. However, the development of the inventory and database is expected to allow the compilation of operational data from SGE systems that will allow the potential new development of a geothermal energy resource management system.

Water resources management Yes No

Local Authorities jointly in Ireland and Northern Ireland along with government agencies including the Environmental Protection Agency, Department of Environment Heritage and Local Government, the Geological Survey of Ireland and the Water Framework Directive Advisory Committee are responsible for the management of national water and groundwater resources under the 8 River Basin Districts. The data from the Zones of Contribution for over 200 drinking water supplies distributed across Ireland the delineated zones of contribution assist the EPA to interpret and understand the groundwater chemistry for each of the monitoring points, thereby underpinning potential measures applied to these areas which potentially could impact on the deployment and completion of SGE systems. Information is available for the individual basin districts and can in most cases be accessed for free from the relevant authority. A dedicated website provides the overarching link to information access and GIS web viewer for the programme.

Access: <http://www.wfdireland.ie/maps.html>

- **Best practice (or technical) Guideline documentation** Yes No

Two guideline documents are being prepared by the Geological Survey of Ireland these are expected to cover the subsurface aspects of SGE installations to include horizontal collectors, vertical collectors and their construction.

A technical guideline manual for system completion to address adequate methodologies and procedures for suitably trained professionals to install SGE system in the context of the current environmental and building legislation and regulation is currently being. The manual is intended to cover the completion of the collector and subsurface parts of SGE systems with recommendations on project development and management methodologies. The integration of systems in buildings, the deployment of heating and cooling infrastructure as well as the monitoring and controls are not expected to be covered.

A homeowner manual is also currently being developed by to facilitate SGE system end users with the choice of SGE systems installation, the procedures and methodologies associated with each phase of installation and the professionals that will complete these as well as a case study examples showing the benefits of SGE systems compared to other renewable and fossil fuel fired heating systems.

The guidelines are not expected to cover the integration of SGE systems to retrofit buildings, the heating/cooling distribution systems and building control and monitoring measures.

If yes, do they include information about energy performances? Yes No

If yes, do they include information about economic performances? Yes No

The proposed homeowner manual is expected to provide an indicative case study to compare the deployment of renewable energy technologies against fossil fuel technologies in a new build detached home scenario. The proposed case study is aimed at outlining the running cost differences and potential benefits in terms of CO₂ emission saving for deployed SGE systems. Technical data on the SPF and COP of system operation is not expected to be included as part of the manual unless reliable data is made available from existing systems.

- **Training activities dedicated to SGE** Yes No

The Geotrainet programme drillers and designers (2 day course) has allowed a standard for design, drilling and completion of geothermal boreholes to be adopted and promoted in Ireland. The construction of open loop systems follows the Water Well Drilling Guidelines (IGI, 2008 – www.igi.ie) for the completion of domestic water wells.

Fetac/SEAI Heat Pumps Course for installers – (5 days – FETAC Level 6 Certification) aimed at providing basic information of Heat Pump technology and prepare candidates for the end of programme examinations leading to recommendation to FETAC for Certification and subsequent Registration with Sustainable Energy Authority Ireland as a Qualified Installer. The course is aimed at Plumbers, Electricians & Refrigeration Engineers. Candidates with Level 6 Advanced Certificate in Craft - Plumbing or equivalent. Practitioners with a background in related fields of technology and a number of years experience may also be considered. (This course pre-dates the Ground Source Heat Pumps Installer Certification Training Program was done by Arsenal, SEI & FÁS referenced in D9 of Groundreach).

Other geothermal design courses – Include independent course run on a once off basis by different association such as the Geothermal Association of Ireland, The Heat Pump Association and individual Universities. Course topics range from technology overview, thermal underground measurement properties shallow geothermal collector system design courses.

- **certification for professionals** Yes No

FETAC Level 6 Certification for installers- see above reference

No specific course is available for drillers other than the Geotrainet course

If yes, is it mandatory? Yes No

The FETAC course is not mandatory from a legislative or regulatory point of view, however the available grants pre-2011 required a certified installer be used to avail of the financial support.

certification for organizations Yes No
If yes, is it mandatory? Yes No

Current organisation certification is not mandatory; however some of the larger installers and technology providers have QA and ISO certification. Under the new current limited support measures, installers are expected to register on the SEAI approved list of installers.

There are also no common certification standard for drillers and drilling companies.

- **Codes/Regulations** **Yes** **No**
- **Other**

The Institute of Geologists of Ireland Domestic Water Well Drilling Guidelines (2008) were developed for the drilling and hydrogeological sector to ensure a consistent standard of borehole completion, promote well construction methodologies for minimising environmental impact and protecting aquifers. The guidelines are not specifically developed for geothermal energy resources, however the drilling industry is expected to respect similar principles for the completion of both open loop and closed loop vertical geothermal boreholes.

2.2 Local/Regional level

- Dedicated Web sites for information about Shallow Geothermal Energy

There are no specific regional shallow geothermal energy databases in Ireland held by individual local authorities. Similarly to other subsurface data including groundwater wells, the Geological Survey of Ireland, the Environmental Protection Agency and the Department of the Environmental Heritage and Local Government have the responsibility for licensing and data collation of data relating to subsurface operations.

Individual Local Authorities generally do not have independent datasets on SGE, however planning application documents relating to new build development generally have references to the outline location or detail of proposed SGE systems to be included. The submission of specific system details is however not mandatory and hence a planning application generally references little other than possible borehole or collector location.

A future inventory of SGE systems such as the one proposed by the GSI, is expected to make reference, where possible, to a planning reference file similarly to how newly drilled groundwater supply boreholes for new build developments are recorded. This would facilitate data compilation of SGE systems and in particular in the potential future implementation of management tools that will allow assessment of the suitability of proposed systems based on existing system information in specific geological and subsurface conditions. This is however not possible at present.

- Support tools

<i>Geothermal operations inventories</i>	<input type="radio"/> Yes	<input checked="" type="radio"/> No
<i>Underground operations inventories</i>	<input type="radio"/> Yes	<input checked="" type="radio"/> No
<i>Geothermal resources evaluation</i>	<input type="radio"/> Yes	<input checked="" type="radio"/> No
<i>Geothermal resources management</i>	<input type="radio"/> Yes	<input checked="" type="radio"/> No
<i>Water resources management</i>	<input type="radio"/> Yes	<input type="radio"/> No
<i>Other</i>		

Best practice (or technical) Guideline documentation Yes No

Technical guidelines for systems are not likely to be specific to systems in different local authority jurisdictions but based on the national guideline documents prepared by central government agencies.

SEAI has developed a short best practice guide on ground source heat pumps (http://www.seai.ie/Publications/Renewables_Publications/Best_Practice_Guide_Heat_Pump_techn)

[ologies.pdf](#)) developed to inform end users of the technology, the potential project development steps and provide outline advice in identifying suitable contractors.

If yes, do they include information about energy performances? Yes No

If yes, do they include information about economic performances? Yes No

Training activities dedicated to SGE Yes No

Training and certification activities are carried out under a national FETAC certification programme. Specific local or regional courses are not required (refer to national training and certification section above).

certification for professionals Yes No

If, yes, is it mandatory? Yes No

certification for organizations Yes No

If yes, is it mandatory? Yes No

- **Codes/regulations** Yes No

No specific codes or regulations for SGE systems at local authority level are available. It is expected that technical guidelines for the development of shallow geothermal systems in Ireland will be adopted by the Local Authorities. These will potentially be considered in the context of any Renewable Energy Strategies developed by different authorities in the context of the LARES methodology proposed by SEAI.

- **Other**

The development of open loop systems in new build developments are assessed on a case by case basis at the planning stage. The Local Authority is responsible for the user application for a discharge license and in the case of commercial systems of an abstraction license. Individual local authorities will use a register of existing operations to assess potential impacts of a proposed system

3 Subsidies /Financial Incentives available

Subsidies and financial incentives for the deployment of residential and commercial SGE systems in Ireland are currently no longer available. Previous support schemes (pre May-2011) are described briefly below along with the most recent 'Better Energy in the Workplace Fund' from SEAI that provided support for the introduction of multiple renewable energy technology schemes in the commercial sector.

3.1 National level Yes No

Greener Homes Scheme (Sustainable Energy Authority of Ireland) – Residential

Year of Introduction: 2006 **Current Status:** Closed

Scheme provided capital investment grants towards the individual installation costs of a heat pump system (new build or retrofit) subject to the a number of criteria including using certified contractors. SGE systems were supported with the following amounts:

Heat Pump – Vertical Ground Collector:	€3,500
Heat Pump – Horizontal Ground Collector:	€2,500
Heat Pump – Water to Water:	€2,500

The support mechanism of this scheme has been modified in 2011 and 2012 to support the cost of insulation and the installation of heating system controls rather than supporting the installation of RE technologies.

Energy Efficient Works		Incentive Cash Grant Value
Insulation	Attic Insulation	€200
	Wall Insulation - Cavity	€320
	Wall Insulation - External	€4,000
	Wall Insulation - Internal Dry Lining	€2,000
Heating System	High Efficiency Oil / Gas Boiler with Controls upgrade.	€560
	Heating Controls Upgrade only	€400
	Solar Heating	€800
Building Energy Rating (BER)		€80

Table 2: Current Renewable Energy incentives - Greener Homes Scheme (SEAI, 2012)

Renewable Heat Deployment Programme - ReHeat (SEAI) – Commercial

Year of Introduction: 2006 **Current Status:** Closed

Scheme provided capital investment grants towards the individual installation of renewable heating technologies to include heat pumps in the commercial sector. Contrarily to the other residential scheme, this required the submission of a detailed feasibility study. SGE systems were supported based on the size of the proposed plant based on the grant figures listed below:

Plant Scale Ranges (kW)	Maximum Capacity Cost (€/kW)
≤ 20	€ 2,200
> 20 - ≤ 50	€ 1,300
> 50 - ≤ 250	€ 800
> 250 - ≤ 500	€ 700
> 500 - ≤ 1,000	€ 600
> 1,000	€ 500

Table 3: Previous GSHP Incentives - ReHeat Scheme (SEAI, 2009)

Better Energy in the Workplace (Sustainable Energy Authority of Ireland) – Commercial

Year of Introduction: 2011 **Current Status:** Closed for 2012

Scheme provided capital investment grants towards the installation of RE technologies, energy efficiency measure and improvements as well as building control and monitoring. The scheme is not limited to SGE systems, focuses on the installation of mixed technology systems rather than individual technologies. The scheme fund up to 35% of capital investment costs on projects of between €20,000 and €500,000 from suppliers listed on the Triple E register only.

Under the Government's Jobs Initiative, the 'Better Energy – The National Upgrade Programme' was launched by the Minister for Communications, Energy & Natural Resources on 11th May 2011. This new programme aims to deliver a major increase in the pace, scale and depth of sustainable energy investments in upgrading existing buildings and facilities.

Within this programme, financial support is available through the Better Energy Workplaces scheme for implementing a wide range of qualifying sustainable energy upgrading projects in the public, commercial, industrial and community sectors.

Such projects may comprise individual or packaged measures aimed at achieving lasting savings in energy usage for thermal, electrical or transport purposes. The main focus of the support will be on achieving delivery in 2011 of sustainable energy (mainly energy efficiency) investment projects of differing sizes and complexities.

The Scheme offers support up to the following grant levels depending on the nature of the project and sectoral category outlined below:

- Non-commercial public sector: Support of typically 50% of eligible costs is available; although in some cases public bodies may qualify for support of up to 80%.
- Private sector, voluntary/ community sector and commercial public sector organisations: Support of up to 35% of eligible costs is available. However, voluntary/ community organisations funded primarily by from public funds may be open to consideration for similar treatment as non-commercial public sector organisations.

In general, grant support per project will not be less than €20,000 and will not exceed €500,000.

Note: Projects of a scale eligible to attract grant support of over €100,000 and projects submitted via Obligated Parties (i.e. energy supply companies) are particularly encouraged.

3.2 City or regional level Yes No

There are currently local or regional support mechanisms for SGE systems.

4 Insurance systems Yes No

There are currently no insurance systems specifically dedicated to the development of SGE systems in Ireland.

5 Existing action plans

5.1 Elements of the NREAP applying to SGE (heating & cooling)

The NREAP for Ireland makes reference to renewable energy from heat pumps with no distinction between heating and cooling. The projected installed capacity figures are shown in the table below.

Initial figures compiled in 2010 suggested that Ireland was on track to meet the targets set for installed GSHP system. However with the lack of grants and of centralised inventory of systems, it is now difficult to track the progression of new system installations post 2010. Current market conditions would suggest the market has not progressed significantly in 2011 and 2012.

	2005	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Renewable Energy from Heat Pumps	10	18	25	31	38	44	51	58	64	71	78	84
Total	193	220	253	311	348	387	451	493	509	527	559	591
of which District Heating		0	16	29	43	56	70	83	96	110	123	131

Table 4: Ireland National Renewable Energy Action Plan Targets (DCENR, 2010)

5.2 Sub-national energy scenarios

Cities supporting REGEOCITIES:

- **South Dublin County Council (SDCC)**

SDCC is a signatory of the Covenant of Mayors and is in the process of preparing Sustainable Energy Action Plan (expected November 2012). The plan proposes to endorse the potential of geothermal energy resources (shallow and deep) and to promote these for inclusion in both new build and retrofit buildings. The potential for the inclusion of district heating technology for increasing efficiency of existing development and for any new proposed areas is expected to be considered following a feasibility study undertaken for the Tallaght area in early 2010.

Legal obligation Yes No
 Volunteer Yes No

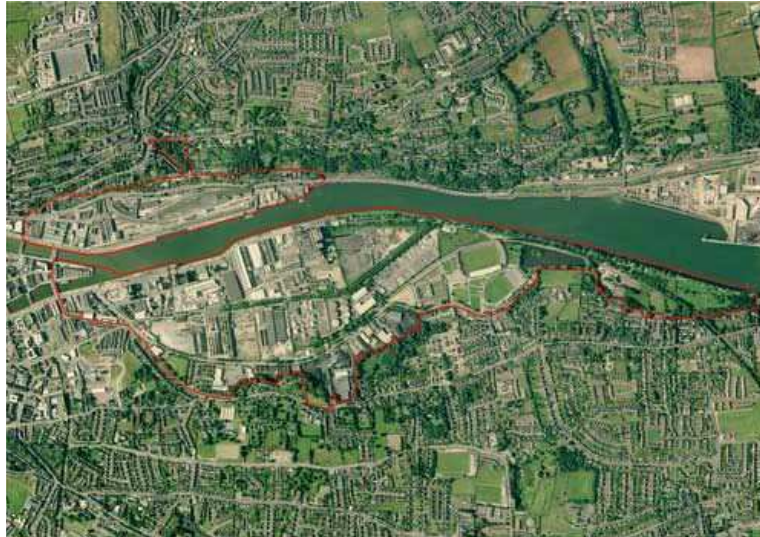
- **Cork City Council**

Cork City Council is not a signatory of the Covenant of Mayors, however has had the longest history of shallow geothermal energy resource development through open loop SGE systems along the river Lee. The Council is considering a Renewable Energy Strategy in which it is expected to promote the use of shallow geothermal energy resources provided that adequate management and monitoring of operating systems can be put in place.

Legal obligation Yes No
 Volunteer Yes No

Cork City Council has undertaken a detailed feasibility study for the implementation of a mixed fuel district heating network in the north and south Docklands area of the city and specifically identifies shallow geothermal heating and cooling as one of the energy source (<http://www.corkcity.ie/services/docklands/sustainability/districtheatingfeasibilitystudy/District%20Heating%20Feasibility%20Study.pdf>)

A feasibility study undertaken by the Environment Directorate and Docklands Directorate of Cork City Council, the Cork City Energy Agency and the Geology Department of UCC to research the potential of using groundwater from shallow aquifers to harness geothermal resource beneath the Docklands area to heat the buildings. Two 30m deep boreholes have already been drilled and the quality, quantity and temperature of the ground water in Docklands were assessed and the flow modelling was used to investigate the environmental impact related to long-term continuous pumping activity in response to continuous abstractions of groundwater for geothermal heating.



The results of study determined the maximum volumes of groundwater that can safely be abstracted has made detailed recommendation to potential development strategies and suggests possible locations for re-injection wells below Cork City. Much of the Cork Docklands development and the completion of the proposed district heating network in the areas is expected to be undertaken over a period of 25 years, however and the timing progress of this project at the time of completing this report is unclear. Some individual SGE open loop projects are currently operating such as the Lifetime Lab, City Hall extensions, Glucksman Gallery and the Tory Hall Library. A likely development scenario for the area will include small scale individual system being developed in a advance of these being connected to a larger, mixed source, district heating network.

Cities not yet supporting REGEOCITIES:

- **Dublin City Council**

Dublin City Council is a signatory of the Covenant of Mayors and has published a Sustainable Energy Action Plan in December 2010 (period 2010 – 2020). The plan makes reference to the potential for development of deep geothermal energy resource within the city in the scheme of future district heating and new university campus developments. Specific references on the potential impacts and contributions expected from SGE systems to are not motioned.

A study on district heating feasibility for Dublin City Centre in 2008, highlighted geothermal energy as a possible contributor to the possible fuel energy sources.

- **Waterford County Council**

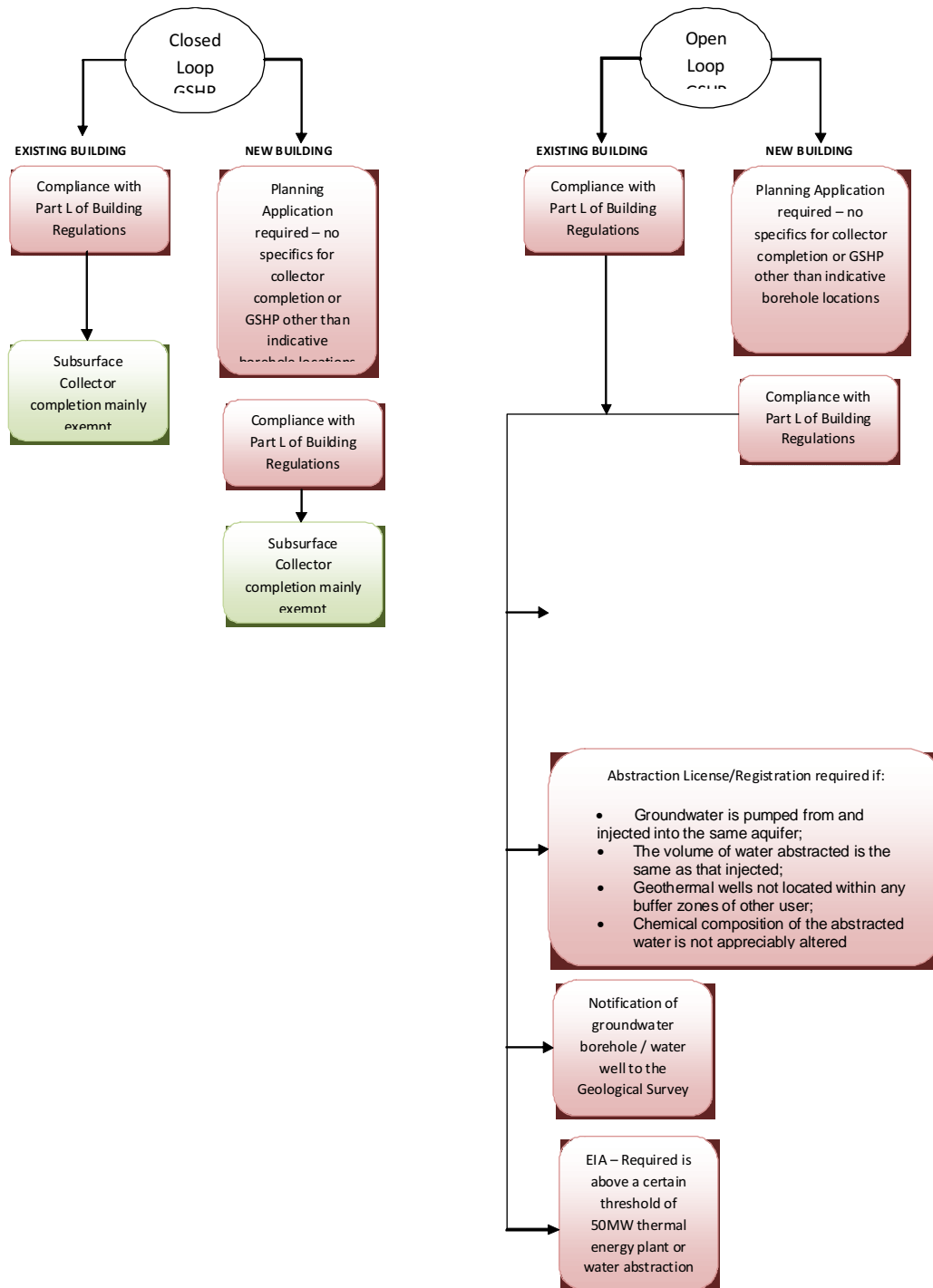
Waterford County Council is a signatory of the Covenant of Mayors and has published a Sustainable Energy Action Plan in December 2008 for the period of 2008 to 2014. The plan makes specific reference to the deployment of ground source heat pumps and SGE technologies to contribute to contribute the reduction of 20% of CO₂ emissions for housing and the residential sector. The Waterford City SEAP suggests deployment of 800 systems with a total energy saving of 9.6 GWh by 2020, with an additional 2.5GWh and 0.5 GWh achieved form the industrial and commercial and services sectors.

- **Cork County Council**

Cork County Council is a signatory of the Covenant of Mayors and has published a Sustainable Energy Action Plan in 2010 for the period of 2010 to 2014. The Cork County Council SEAP makes reference to the inclusion of Cork City Council as part of the SEAP. The plan does not make specific reference to the deployment of ground source heat pumps and SGE technologies as a contribution to renewable energy technology deployment actions however the deployment of geothermal energy is assumed to be considered as part of the proposed Cork Docklands Development referenced above.

6 Legal framework and Cities Planning

The table below represents a summary of the applicable regulations and the necessary permits required for the development of shallow geothermal energy resources. However, the applicability of the legislation and regulations in some cases is not yet entirely defined and further clarification and possible future modification of the legislation may be required with the passing of the Geothermal Development Bill. Additional details on the applicability of these is discussed in the sections below.



See Annexe 1 for Reference

6.1 Current legislation and permit procedures in relation to SGE

The main legislative and regulatory mechanisms relating to the development of geothermal energy resources in Ireland are discussed based on the results of the public consultation process for the development of the Geothermal Energy Development Bill. The summary specifically deals with legislation and regulation specific to SGE systems and not with those dealing with deep resources.

Water Framework Directive and Groundwater Directive

Abstractions:

Article 11(3)(e) of the Water Framework Directive (2000/60/EC) required that controls on the abstraction of fresh surface water and groundwater, including a register or registers of water abstractions and a requirement of prior authorisation for abstraction and impoundment are put in place. Abstractions or impoundments which have no significant impact on water status may be exempted from these controls.

Several types of abstractions are identified as exempt from licensing, including closed-loop geothermal systems, subject to certain conditions. However open loop geothermal systems require an abstraction licence.

Local authorities implement a regulatory framework is implemented by the Department of the Environment and Local Government for groundwater abstractions on a risk based licensing framework. In practice the system might involve the applicant submitting an application for an abstraction licence to a Local Authority. The application would be screened against certain criteria and thresholds, and the application would subsequently be processed, either by the Local Authority (for low-risk cases) or the Regulator for substantial abstraction schemes (greater than 1,000 m³/day) and involving certain hydrogeological scenarios might have to be processed by the Regulator, bringing in specialised expertise in the ecological and hydrogeological sciences.

Currently proposed technical thresholds that will apply mostly to lower-risk abstraction scenarios for open loop schemes in the range of 10-1,000 m³/day would require reduced levels of technical assessment and reporting than higher risk-cases.

Discharges:

Discharges to surface waters resulting from open loop geothermal require a section 4 discharge licence as required under the European Communities Environmental Objectives (Surface Waters) Regulations 2009 (<http://www.epa.ie/whatwedo/licensing/eo/monitoringguidance/#d.en.30894>) and the Groundwater Regulations 2010 (<http://www.epa.ie/downloads/pubs/water/ground/dischgw/Guidance%20on%20the%20Authorisation%20of%20Discharges%20to%20Groundwater%20Version%201%20Part2%20of%202.pdf>). This is in accordance with Article 11(3)(j) of the Water Framework Directive (2000/60/EC) discharge of pollutants into groundwater or surface waters.

The activities include reinjection of water for geothermal and contaminated water for exploration purposes, reinjection of pumped groundwater related to mines and quarries and the storage of gas/LPG provided certain conditions are met.

Temperature (but also pH and conductivity) standards for surface waters are included in the proposed surface water environmental objectives regulations are relevant to discharges from open loop geothermal systems to surface water. The standard involves limiting the increase in water temperature below a discharge point to less than 1.5°C above the ambient water temperature for rivers, lakes, transitional and coastal waters. These apply to both abstractions/discharges and large scale use of heat pumps, either ground source or using surface water as the heat source.

Planning Acts - & Environmental Impact Assessment:

Section 32 of the Planning and Development Act 2000 requires, as a general principle, that all development - unless specifically exempted under the Act or the Planning Regulations - requires planning permission. Section 3 defines development as the carrying out of any works on, in, over or

under land or the making of any material change in the use of any structures or other land. Section 4 of the Act deals with exempted development; nothing in section 4(1) refers to drilling, geothermal or otherwise. Section 4(2) allows the Minister for the Environment to make Regulations providing for classes of exempted development that because of their limited size, nature and environmental impacts would be acceptable from a planning viewpoint. These are set out in Part 2 and Schedule 2 of the Planning and Development Regulations 2001, and works are only exempt subject to a strict interpretation of the limiting conditions.

Planning Permission is required for all new development and associated SGE systems other than for installing ground source heat pumps on existing houses, commercial and industrial premises, and farms. These are exempt developments (SIs 83 of 2007 and 235 of 2008) provided certain conditions are met, e.g. noise levels and compliance with SEI guidelines on distance from property boundaries (for commercial and industrial buildings only).

Environmental Impact Assessment is required under Article 2 of Part 2 of Schedule 5 of the Planning and Development Regulations 2001 which states: *“All geothermal drilling and drilling for the storage of nuclear waste material; drilling, other than test drilling, for water supplies, where the expected supply would exceed 2 million cubic metres per annum.”* This is therefore only the case for large scale open loop system regardless of the source.

Further clarity in the Planning and Development Acts and regulations is required to make appropriate distinctions in the scales of activities likely to be encountered in the exploration for and exploitation of geothermal energy from shallow and deep resources.

The lack of distinction is made between Open and Closed Loops in the Regulations making the installation of GSHPs for existing buildings exempt development. However there is a general condition that such exemptions do not apply if Environmental Impact Assessment is required. Since the EIA Regulations refer to all geothermal drilling, this may make the exemption inapplicable to many installations. Open Loop Systems of a substantial scale or involving a number of boreholes are considered as requiring an EIA as they have potential to impact on third party wells, however the exemptions for Open-Loop GSHPs still needs further clarification.

There have been suggestions for the requirement amendment to the current EIS regulations to clarify a threshold to avoid unduly complicating the permitting process for small scale SGE projects, which do not have significant potential impacts on the environment.

A separation distance of approximately 5m between boreholes for closed loop systems similar to that proposed in some areas of Germany is being considered.

Environmental Liability Directive (2004/35/CE)

“Abstractions and discharges of pollutants subject to authorisation under the Water Framework Directive” are included in this Directive. It places strict liability on operators for certain forms of environmental damage. Small abstractions from SGE systems are not expected to authorisation under the Water Framework Directive.

Minerals Development Act 1940 and proposed new Act

Section 75 of the act requires any person proposing to sink a boreholes intended to reach a depth of more than twenty feet below the surface must give the Minister two weeks' notification with a requirement of detailed records and any rock samples to be retained for two months. Despite this

act giving legal power to the minister to potentially collect information on any geothermal boreholes it has not and cannot be directly enforced other than for minerals boreholes.

GSI has extensive databases on both water wells and geotechnical boreholes. These have mainly been collected by actively pursuing relevant firms and convincing them that it is their interests to provide data to a common database, with the Minerals Development Act powers available as an implicit threat to assist in getting cooperation. A similar approach is likely to be the effective one for geothermal boreholes, except insofar as a licensing regime for deep geothermal activity is put in place. The implication of this to the development of boreholes for SGE systems under the both mineral and geothermal acts is currently not clear.

6.2 (Underground) Space planning

There are no specific legislations governing the use of the underground aside from the legislation and regulations reviewed above. The use underground space and future planning is one of the objectives of cooperation between government agencies and private sector through the Geoscience Initiative in Ireland. Further research and future policy concerning the integration of underground uses and planning of both resource development and infrastructure are expected.

Underground uses licensed under the Water Act, The Minerals Development Act and the Petroleum Act could have the potential of affecting the development of SGE resources in Ireland, however without threshold and characterisation parameters defined in potential legislation and regulations, it is difficult to understand how these could affect SGE resources.

Is there a will in your country to link urban planning closer with renewable energy plans?

Yes No

The Sustainable Energy Authority of Ireland (SEAI) has developed a methodology for Local Authorities to assess the potential for renewable energy resources in their jurisdiction. Local Authority Renewable Energy Strategies (LARES – www.seai.ie/lares) are aimed allowing local authorities to profile renewable energy technologies, assess their potential for deployment in their jurisdiction and help Local Authorities implement Renewable Energy Strategies. The methodology for local authorities to complete Renewable Energy Strategies was out for a public consultation process that closed on the 5th of October 2012.

Shallow geothermal energy resources are identified in the methodology as having the potential to provide heating and cooling in many parts of the country in new build infrastructure and in and in a retrofit scenario when energy efficiency measures are implemented.

Some County Development Plans and Local Area Plans have mention of geothermal energy resources, however these tend to relate to areas where deep geothermal energy development or potential resources have been highlighted. These include Dublin, South Dublin, Mayo and Meath.

There is no specific reference to SGE resources other than those mentioned in section 5.2 above. It is expected that the development of Renewable Energy Strategies will better define the role SGE resources will play and in some cases that certain local authorities may look at the shallow geothermal feasibility studies in the future.

Are there specific considerations of renewable energy integration (i.e geothermal energy) into construction licences?

Yes No

Is there a regulation concerning interactions between thermal uses of the underground and other utilisations (such as constructions, use of water, ...)?

Yes No

Is there a national/regional/local database of wells?

If yes, who is responsible body, what does it contain (data fields) and what is the general quality of the data, is it public available, does it cost, who is obligated to report in data?

Yes No

Yes, there are national databases for groundwater wells and geotechnical borehole, mineral exploration boreholes held by the Department of Energy, Communication and natural Resources (DCENR). See details listed in section 2.1 above.

Are there public databases concerning all the uses of the underground?

Yes No

There is no centralised database of the underground major infrastructure projects, however, there are national databases for mines, quarries and groundwater abstractions – see section 2.1 above.

Additional databases covering the location of electricity grid infrastructure, underground pipelines (gas, water) and telecoms are available from individual state and private companies. These are made available under application.

6.3 Integration of H&C systems in buildings

Do you have specific targets for integration of H&C systems (in parallel to development of renewable energy) concerning renovation/refurbishment of buildings?

Yes No

Do you have a specific regulation on H&C systems concerning new constructions?

Yes No

Part L of the Second Schedule to the Building Regulations 1997 (S.I. No. 497 of 1997) as amended by the Building Regulations (Part L Amendment) Regulations 2011 (S.I. No. 259 of 2011)

These Regulations require that buildings are designed and constructed to limit energy use and CO₂ emissions and increase energy efficiency as far as is “reasonably practicable”. The overall objective of the regulations is to achieve and increase in 60% efficiency in buildings by 2012 and decrease CO₂ emissions.

For **new dwellings**, the following thresholds relating to renewable technology (including GSHP) contributions are:

- 10 kWh/m²/annum contributing to energy use for domestic hot water heating, space heating or cooling; or

In addition the regulations make provisions for building or development containing more than one dwelling, reasonable provision would be to show that:

- every individual dwelling should meet the minimum provision from renewable energy technologies or
- the average contribution of renewable technologies to all dwellings in the building or development should meet that minimum level of provision per dwelling without including common areas of the building.

Specifically in the case of heat pumps the regulations state that: *'electrically powered heat pumps, only energy in excess of 2.5 times the electrical energy directly consumed by the heat pump can be counted towards meeting the minimum level of energy provision from renewable technology'*.

The regulations also state that *'the use of centralised renewable energy sources contributing to a heat distribution system serving all dwelling units in a development or part of a development, e.g. an apartment block, may prove to be more practicable than providing separate renewable energy for each dwelling individually'*.

Requirements for controls in new dwellings for space and water heating systems are described as: *'having to be effectively controlled so as to ensure the efficient use of energy by limiting the provision of heat energy use to that required to satisfy user requirements, insofar as reasonably practicable. The aim should be to provide the following minimum level of control: -*

- automatic control of space heating on the basis of room temperature;

- automatic control of heat input to stored hot water on the basis of stored water temperature;

- separate and independent automatic time control of space heating and hot water;

☒- shut down of boiler or other heat source when there is no demand for either space or water heating from that source'

Existing dwellings – the regulations make no specific provisions for GSHPs but state that the implementation of control measures for reducing space heating and hot water consumption should be implemented.

What are the intentions in the regulations and specific targets and how does it fit with geothermal energy development?

Are existing plants subject to periodic monitoring/report? **Yes** **No**

Are existing plants subject to mandatory maintenance? **Yes** **No**

Under Part L of 2011 of the Building Regulations states that measures for system maintenance should be implemented. The measure include providing the end user with sufficient information on the system and on how to

(a) make adjustments to the timing and temperature control settings; and

(b) what routine maintenance is needed to enable operating efficiency to be maintained at a reasonable level through the service life(lives) of the system(s).

Are operational performances (e.g. energy efficiency) guaranteed? Yes No

If yes, specify (in average) how many years, designer/installer/technology provider, single component/whole system

Operational performance is not generally guaranteed but this can vary from different installers. Guarantees are offered with system components such as the heat pump, collector and under floor pipe, these are typically 10 years or better.

7 Additional Table

We propose the tables below, From the publication of Haehnlein, Bayer, Blum, 2010 (To facilitate the comparison of the situations between countries)

We suggest 2 tables:

- a) For Ground Water Heat Pumps
- b) For vertical Heat exchangers connected to Heat Pump

For Ground Water Heat Pump	Possible answer	Comments
Are there temperature thresholds?	Yes	Proposed re-injection within 1.5°C of ambient surface water temperature
If yes:		
Please report the specific values	Technical thresholds	
	Relative values	A depth cut off of 400m for shallow geothermal energy resources has been proposed
	(limit for heating/cooling)	
	Absolute values	
	(maximum/minimum temperature)	
	Technical thresholds	
	Relative values	
	(limit for heating/cooling)	
	Absolute values	
	(maximum/minimum temperature)	
Are the thresholds legally binding?	Yes/No; Level (state, city, etc.) -	

Which are the relevant laws/ordinances?	Title, year	
What is the basis for these values?	Rule of thumb	
	Scientific studies	Feasibility of shallow geothermal open loop system from the gravels of the river Lee Cork City Centre.
	Something else	
If no:		
Is there a particular reason?	Yes/No; Explanation	
Are regulations planned for the future?	No	Regulations for SGEs specifically are not expected for the future
Are there regulations referring to minimum distances?	No	
If yes:		
Which are the relevant laws/ordinances?	Title, year, name of the law/ordinance	
What is the basis for these values?	Rule of thumb	
	Result of research	
	Something else	
If no:		
Is there a particular reason?	Yes/No; Explanation	The impacts of proximity of SGE systems have not previously been considered as a result of the lack of regulations.
Are any regulations planed for the future?	No	No but technical guidelines for the development of shallow geothermal systems are being developed in consultation with other statutory agencies.
Does your country have any other laws, ordinances or regulations concerning thermal groundwater use?	Yes/No	Yes – refer to section 6.1 above

If yes, which are the relevant laws or ordinances?	Title, year, comments	
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For vertical heat exchangers	Possible answer	Comments
Are there distance thresholds?	Yes/No	
Minimum distance between 2 systems	Yes/No	
Minimum between two vertical heat exchangers		Proposed 5m distance
If yes:		
Please report the specific values	Technical thresholds	
	Relative values	Possible EIA requirement for large scale or non-residential systems
	(limit for heating/cooling)	
	Absolute values	
(maximum/minimum temperature)		
Are the thresholds legally binding?	Yes/No; Level (state, city, etc.)	No
Which are the relevant laws/ordinances?	Title, year	
What is the basis for these values?	Rule of thumb	Based on distances used in German systems.
	Scientific studies	No
	Something else	
If no:		
Is there a particular reason?	Yes/No; Explanation	
Are any regulations planned for the future?	Yes/No; Description	Yes these are more technical guidelines than regulation being compiled by the GSI with input from other government

		agencies.
Are there regulations referring to minimum distances?	Yes/No	No

ANNEXE 1:

Building Regulations – Department of the Environment, Heritage & Local Government.

[SI 243 of 2012 EUROPEAN UNION \(ENERGY PERFORMANCE OF BUILDINGS\) REGULATIONS 2012](#)

[SI 259 of 2011 Building Regulations \(Part L Amendment\) Regulations 2011 \(pdf, 109kb\)](#)

[SI 259 of 2008 Building Regulations \(Part L Amendment\) Regulations 2008 \(pdf, 110kb\)](#)

[SI 229 of 2008 European Communities \(Energy Performance of Buildings\) \(Amendment\) Regulations 2008 \(pdf, 945kb\)](#)

[SI 854 of 2007 \(Part L\) \(pdf, 106kb\)](#)

[SI 666 of 2006 \(European Communities \(Energy Performance of Buildings\) Regulations \(doc, 1.8mb\)](#)

[SI 115 of 2006 - \(Part B\) - Building Regulations \(Amendment\) Regulations 2006 \(doc, 49kb\)](#)

[SI 872 of 2005 \(European Communities \(Energy Performance of Buildings Regulations\) \(doc, 29kb\)](#)

[S.I. No. 284 of 2002 \(Part - L\) \(doc, 33kb\) & S.I. No. 581 of 2002 \(Part - F\) \(doc, 30kb\)](#)

[S.I. No. 441 of 2000 \(Class 9 exemption extension\) \(doc, 26kb\)](#)

[S.I. No. 249 of 2000 \(Part - D\) \(doc, 24kb\)](#)

[Amending Regulations:- S.I. No. 179 of 2000 \(Part - M\) \(doc, 25kb\)](#)

[S.I. No. 497 of 1997 \(pdf, 355kb\)](#)

Groundwater & Discharge Licensing - Department of the Environment, Heritage & Local Government / Environmental Protection Agency

[S.I. No. 9 of 2010 - Regulation 4 of the Groundwater Regulations](#)

[Local Government \(Water Pollution\) Act, 1977 to 1990](#)

[Environmental Protection Agency Act, 1992- 2011](#)

[S.I. No 684 of 2007 Waste Water Discharge \(Authorisation\) Regulations 2007](#)

[S.I. No. 231 of 2010 – Waste Water Discharge Licence or Certificate of Authorisation - Ammendment.](#)