

Practitioners' observations on the policies and regulation of ground source energy use in Finland

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Keywords: ground source heat pump, policy, legislation, practitioner

ABSTRACT

This paper concentrates on environmental policies and legislation concerning the ground source heat pump industry in Finland. Special emphasis has been placed on the heat pump practitioners' responses to legislation, which has received little attention earlier. This study is based on interviews and questionnaire responses from heat pump professionals. Four areas of legislation are discussed: qualification requirements, the planning permission procedure, groundwater protection, and financial incentives. This study suggests that better training and guidelines are needed for public officials who work with GSHPs, and that officials need to have a clear authorization and liability to enforce the effective regulations. This study also highlights the importance of incorporating quality assurance into GSHP policies in the form of e.g. construction standards, and more diverse qualification requirements. Stakeholder participation can help in determining what to include in the standards and requirements.

1. INTRODUCTION

A number of publications have described the existing regulations and standards regarding GSHPs, and the need to develop these at the European level (e.g. Ground-Reach 2008; GEO.POWER 2012; REGEOCITIES 2013; Hähnlein et al. 2013). This paper aims at highlighting the practitioners' perspective in this discussion by examining (1) the ground source heat pump (GSHP) practitioners' observations and views of the policies, regulation and environmental impacts of GSHP energy use in Finland, and (2) their practical implications for future policymaking and legislative actions. Practitioners here include both installers and designers of GSHP systems.

2. MATERIALS AND METHODS

The practitioners' observations and views were collected in 2014 by means of a Webropol online

survey questionnaire and thematic interviews. The questionnaire was aimed at GSHP contractors, borehole contractors and consulting engineers that work with GSHP systems. The interviewees were Finnish heat pump professionals with remarkably long careers in the sector. Among the seven interviewees there were two borehole and GSHP contractors, a heat pump engineer, an emeritus professor, and representatives of a GSHP factory and a GSHP importer.

Four areas of legislation are discussed in this paper: (1) qualification of GSHP practitioners, (2) the planning permission for ground loop heat exchangers, (3) groundwater protection, and (4) financial incentives for GSHP deployment.

3. RESULTS AND DISCUSSION

Table 1 summarizes the legislation on ground source energy use in Finland that has been most essential from the practitioners' point of view.

Many international reports have underlined the importance of having proficient, qualified GSHP installers and drillers, as well as designers and architects (e.g. Ground-Reach 2008, REGEOCITIES 2013). In the questionnaire and interviews, many of the respondents expressed their concern over the amount of unqualified installers, and consequently the quality of installations within the GSHP sector in Finland. However, some respondents pointed out that the refrigerant qualification, which is obligatory in Finland, is useless as GSHP installers do not handle actual refrigerants. Hence, this particular qualification requirement does little to promote the quality of installations. The respondents were also disappointed with the lack of enforcement of this qualification requirement. Even though it is mandatory, there is no supervision, and even in public purchases unqualified contractors have been hired. Proper supervision, if applied, would support law-abiding contractors and promote achievement of the environmental objectives of this regulation (Majuri 2016).

Table 1: The most essential legislation on ground source energy use in Finland. Data from Majuri (2016).

Subject	Statute	Content	Notes
Qualification	Finnish statute 452/2009 (Government Decree on the Servicing and Maintenance of Devices Containing Ozone Depleting Substances or Certain Fluorinated Greenhouse Gases)	GSHPs with less than 3 kg refrigerant (1) Each GSHP contractor must employ a person in charge who has an applicable refrigerant qualification. (2) Each GSHP installer must have a refrigerant qualification. GSHPs with more than 3 kg refrigerant In addition to the above-mentioned, the person in charge must have a degree in refrigeration technique.	The qualification for devices with less than 3 kg refrigerant is incorporated into the EUCert training in Finland (the certification scheme co-ordinated by the European Heat Pump Association)
	The RES Directive 2009/28/EC	Certification or qualification must be available for GSHP installers. Guidance must be offered for planners and architects.	
	Note: For borehole construction no qualification requirements are in force, but The Finnish Well Drillers Association has established a degree programme for well drillers.		
Planning permission for ground loop heat exchangers	Finnish statutes 132/1999 and 895/1999 (Land Use and Building Act, and Decree), amendment 283/2011	The building of ground loop heat exchangers (GLHEs) requires a planning permission for minor construction, unless otherwise stated in the building code of the municipality.	
	The RES Directive 2009/28/EC , Article 13	Licensing procedures should be proportionate and necessary: e.g. procedures are streamlined and expedited; rules for licensing are objective, transparent, proportionate, impartial and consider the particularities of individual technologies; simplified authorisation procedures are established for smaller projects.	
Groundwater protection	Finnish statute 587/2011 (the Water Act)	On important groundwater areas, an additional permit is required for GLHEs.	The acts contain no explicit regulations, e.g. limits for temperature change, but regulations are included in the permit conditions
	Finnish statute 527/2014 (the Environmental Protection Act)	The pollution of groundwater with substances or energy is prohibited.	
Note: There are no mandatory standards for ground loop heat exchangers.			
Financial incentives for GSHP deployment	Finnish statute 1535/1992 (Income Tax Act), amendment 995/2000	A tax deduction is available for the expenses of person-hours and machine work in retrofit GSHP installations.	
	Finnish statutes 1021/2002 and 57/2003 (Act, and Decree on Residential Renovation and Energy Saving Grants)	Home owners with electrical heating could receive a state subsidy of up to 10% towards a retrofit GSHP system.	These statutes came into force in 2003.
	Finnish statute 115/2008 (Amendment to the Decree on Grants for Residential Renovation, Energy Saving and Health Standard Improvement)	Retrofit GSHP systems could be subsidised also if the house had previously had e.g. oil heating.	
	Finnish statute 1255/2010 (Amendment to the Decree on Grants for Residential Renovation, Energy Saving and Health Standard Improvement)	GSHP installations were taken away from the list of subsidised actions.	The subsidy scheme on a larger scale ended in 2011, and the last subsidies were granted in 2012.

The planning permission procedure regarding ground loop heat exchangers (GLHEs) has had many advantages: the placement of GLHEs is controlled so that neighbours' interests are also considered; officials may attach case-specific building specifications to the permissions; GLHEs may be prohibited near sensitive groundwater areas and pumping stations; each GLHE is documented in a database.

Many practitioners agreed that the placement of borehole heat exchangers must be supervised to minimize thermal interference on neighboring properties, and to ensure sufficient distances between boreholes and potential sources of contamination. However, the permission procedure has been criticised within the GSHP sector. The questionnaire and interview responses underlined the need for (1) permission practices that are practical and consistent in all municipalities, (2) fluent and prompt handling of permissions, and (3) more training and better instructions for the permit issuing authorities, concerning the building of GSHP systems. These points appear quite similar to the requirements in the RES Directive. Currently a national committee is considering possible changes to the permission procedure (<http://www.ym.fi/mrlmuutokset>).

The groundwater legislation did not come up in the questionnaire responses. However, 62% of all the questionnaire respondents (N=63) were in favour of mandatory construction standards for borehole heat exchangers. 16% opposed, and 22% did not have an opinion. This indicates that many practitioners consider heterogeneous construction practices and defective installations to be a problem. The attitude towards standards differed between groups of respondents. Borehole contractors (N=17) were less enthusiastic about standards (47% in favour and 29% against) than HPAC designers (92% in favour and none against; N=12) (Majuri 2016).

Currently the only financial incentive for GSHP deployment in Finland is the tax deduction for household and renovation work. The questionnaire respondents and interviewees seem to be mostly happy with the tax deduction as it has been fairly constant, and customers have been encouraged to choose law-abiding companies instead of the black economy.

The direct subsidy program that ran from 2003 to 2011 evoked both positive and negative opinions among the questionnaire respondents and interviewees. On the positive side, the subsidy expressed governmental approval and directly boosted the market for GSHPs, and the application period resulted in favourable publicity. On the other hand, several negative aspects were mentioned:

- The subsidy process created strong fluctuations in demand and workload: The announcement of the subsidies for the coming year stopped the heat pump sales. Then there was an enormous rush for tenders as the application period for the year approached. Meanwhile installers had little to do

as the projects were not allowed to commence before the subsidy resolutions were made. When the resolutions finally came, the installers had more work than they could handle.

- The subsidy program was unpredictable: Availability of the subsidy for each year was determined at the end of the previous year.
- The subsidy program distorted competition and impaired quality: The spells of peak demand attracted numerous new contractors to the GSHP business. Many of them were inexperienced, which resulted in deficient installations. Overcapacity led to aggressive price competition, in which prices were, and still are, dumped at the expense of quality.

As a result of these problems, it seems that many contractors do not miss the abolished subsidy program. Generally, the volume of the GSHP trade in Finland is already so large that public subsidies are no longer an efficient way to advance the industry (cf. Lund 2007).

An essential weakness with the subsidy program in Finland was that it did not include any prerequisites for quality. For a GSHP project to receive the subsidy, there were no specifications for construction methods, or quality of the heat pumps, parts and installers. The absence of quality inducements, combined to the overcapacity, played an important role in how the price competition started to undermine quality. In this regard the subsidy was an unsuccessful policy action, as deteriorating quality had scarcely been the aim of the subsidy program (Majuri 2016).

4. CONCLUSIONS

If public officials are to manage GSHP matters efficiently and fluently, they obviously need to have the appropriate authority, training and guidelines for the tasks: Somebody has to be authorized and liable to enforce the effective regulations. The officials need sufficient knowledge of, for example, GSHP systems and borehole construction to handle the permission procedure. Clear national guidelines need to be developed for the permission procedure.

Quality assurance is an issue that has thus far received little attention in the Finnish GSHP policies. Good quality is in the interests of all stakeholders, including GSHP customers, the industry itself, the administration and the environment. In the case of Finland, for example, quality can be promoted by developing more diverse qualification requirements, and by adopting mandatory standards for the construction of ground loop heat exchangers (Majuri 2016). Stakeholder participation can help the administration in determining which topics to cover in the qualification requirements, and what kind of techniques and structures to include in the standards.

The relationship between quality and public subsidies is a lesson that other countries can learn from the

Finnish experience: When considering or planning to adopt subsidy schemes for GSHP installations, the inclusion of quality assurance into the system deserves to be thoroughly discussed.

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Acknowledgements

I want to thank the following groups, individuals and organisations: The interviewees and questionnaire respondents for providing the data; Timo Vuorisalo and Jouni Lehtonen for advice and comments; and Fortum Foundation and Kone Foundation for funding the research work.