FROnT
FAIR RHC OPTIONS AND TRADE

Integrated Support Schemes for RHC

Assessment Report

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CONTENTS

EXECUTIVE SUMMARY

Fair Renewable Heating and Cooling Options and Trade, FROnT, intends to advance the penetration of RES-HC technologies by providing a better understanding of how to deploy renewable heating and cooling technologies in the market. In pursuit of this goal, it is important to understand the end-user key decision making factors that can improve market transparency of the costs of heating and cooling options. Furthermore, it is important to understand, which factors have been decisive in financial support schemes implemented in different countries so that they can be replicated or adapted to existing programs and different technology types.

It is widely accepted that for the less competitive technologies, a "technology policy" including economic support is therefore justified, also to allow newer RES technologies to progress and gain foothold in the market.

Against this background, RES-HC support schemes can be defined as instruments that promote the use of energy from renewable sources for heating or cooling purposes. They are set up to support increased market uptake of RES-HC technologies, and to help correcting a number of market distortions and failures, which can lead to unfair market competition from existing and more established carbon base energy sources. Their purpose is also to help boost consumer confidence in the RES-HC technology and drive uptake to a point whereby they are considered as a reliable, competitive and secure alternative to fossil fuels.

Support schemes for RES-HC fund technologies that do not require carbon intensive fuel to operate. On the other hand, by displacing the use of fossil fuels, RES-HC technologies reduce our reliance on external fuel markets. Since they involve no combustion, unlike fossil fuels plants, they emit very low levels of greenhouse gases.

This report is prepared in fulfilment of Task 2.1 of Work Package 2. It represents the first outcome of the initial phase and shall contribute to deliverables (D2.1 and D2.2) of the project. It presents a summary of key findings derived from the assessment of RES-HC schemes implemented in six European countries (Austria, the Netherlands, Poland, Portugal, Spain and the UK), based on initial inquiry conducted by the energy agencies participating in the project (AIT, NL Agency, KAPE, ADENE, IDAE, EST.

This report discusses the factors that might contribute to the success of the RES-HC schemes.

1. Introduction

Directive 2009/28/EC of the European Parliament and Council established the necessary policy framework for deployment of renewable energy fromr 2010 to2020. The 'FROnT' project intends to advance the penetration of RES-HC technologies by providing a better understanding of how to deploy renewable heating and cooling technologies in the market. In pursuit of this goal, it is important to understand the end-user key decision making factors that can improve market transparency of the costs of heating and cooling options. Furthermore, it is important to understand, which factors have been decisive in financial support schemes implemented in different countries so that they can be replicated or adapted to existing programs and different technology types.

Instruments to internalise negative externalities of energy resources extraction, transportation and conversion, for instance through a carbon tax or the EU ETS, are not sufficient to deliver the wide range of carbon neutral technologies at the necessary scale needed to decarbonise the economy. Where technologies are not yet competitive, a "technology policy" including economic support is therefore justified, also to allow newer RES technologies to progress and gain foothold in the market.

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The report focusses mainly on the discussion of factors that might contribute to the success of the RES-HC schemes.


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2. National support schemes

2.1 Overview of the analysed schemes

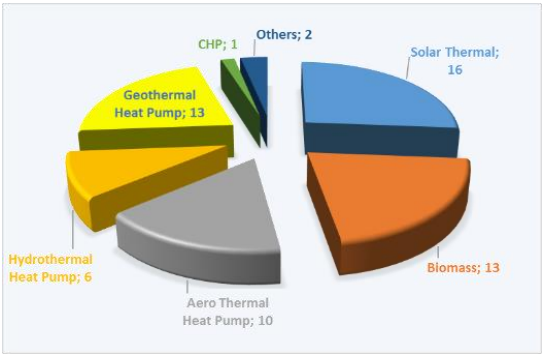
Information on 20 RES-HC support schemes addressing residential, non-residential and industrial applications, implemented in nine countries [Austria, France, Germany, Italy, the Netherlands, Poland, Portugal, Spain and the UK] were collected and analysed by the partners of the project, trying to address questions related to their design, setting up and operation.

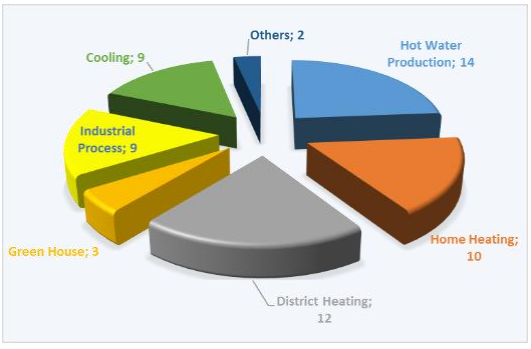
As a result of this analysis, it was possible to conclude that the RES-HC incentives that have been implemented in these countries cover practically all RES-HC technologies, namely solar thermal, biomass, geothermal, air and, water and ground source heat pumps. The majority of schemes cover multiple technologies, while a few cover single technologies. But in general, these support schemes do not cover cooling RES technologies.

Most of the schemes are implemented to support RES-H technology. The schemes were mainly targeted at sanitary hot water production and space heating and cooling, and were implemented to contribute to the following objectives:

- reducing greenhouse gas emissions and achieve the 2020 targets set by the Directive 2009/28/EC of the European Parliament and of the Council, of 23 April.,
- improving security of energy supply
- supporting consumers to save money on fuel bills.

The schemes were funded primarily by central Governments and, most of the time, were prepared by Government agencies in collaboration with the industry and trade organizations, a practice that further enhance the chances for success. Direct financial subsidies was the most dominant financial mechanism adopted, even though energy savings measures were also supported through other mechanisms.





2.2 Overview per country

2.2.1 Austria

A total of 10 schemes were analysed:

- Solar thermal - solar thermal large plants
- Solar thermal systems-companies
- Wood heaters Biomass
- Wood heaters for companies
- Climate protection in communities UFI
- Cooling systems for companies
- Heat pumps for companies
- Umweltförderung im Inland / Energy saving (Energiesparen)
- Energie Contracting Program Oberösterreich
- Erp Loan, Loan Guarantee for investments in Environmental protection

In Austria, the subsidy program (Umweltförderung Inland) is administered by Kommunal Kredit Public Consulting (KPC). Under the heading of "energy supply" wood boiler heating systems, local heating plants on the basis of renewable energy, heat pumps, biomass CHPs, natural gas CHPs and solar thermal plants are subsidised. The support generally lies in the range of 20-30% of eligible costs with a minimum investment of 10,000 Euro.

Under the heading of "energy saving", the following energy saving measures are subsidised in Austria: Insulation of buildings (for companies), air conditioning and cooling systems (ad- and absorption cooling driven by renewables or industrial waste heat up to 750 kW), free cooling, process cooling with alternative refrigerant (NH3 or CO2), energy saving measures in companies (heat recovery, heat pumps, energy efficient production processes, efficient lighting systems, optimisation of heating systems in existing buildings), induction ovens and LED systems. The subsidy is generally between 30-35% of eligible (environmentally relevant) costs. In Austria co-financing for such projects is available via European Regional Development Fund (ERDF) and European Agricultural Fund for Rural Development (EAFRD).

Positive aspects[1]

- Subsidies are given by national as well as regional entities and are run for many years. For most of the presented schemes, the control mechanism in place can be resumed to information provided by end users, most of the time at the end of the process.

2.2.2 France

- Heat funds (Fonds chaleur)

The Heat Funds have been available since 2009. They cover renewable and recoverable heat in district heating, including the heat plant and the distribution network, and installations for collective buidlings as well as for the tertiary, industrial, and agricultural sectors.

Two main procedures are in place:

- Annual tenders for large-sclae biomass installations (above 1,000 toe/y)
- Regional tenders for regional aid in line with regional plans and covering heat produced from deep and shallow geothermal reservoirs, solar thermal, biogas, biomass (below 1,000 toe/y), and the seaside, as well as energy recoved from industrial processes.

[1] AEBIOM comments:
To evaluate the Austrian funding schemes would be a seperate project (or diploma thesis). Some fundings are direct, others are indirect and included in other fundings (e.g. for House-building). The Key factors for a sucessful funding scheme (my opinion):
>it should be in place for a long period (at least 3 to 5 years)
>it should be stable (no changes) and simple (show the bill and get the money)
>it should be high enough (at least 20 to 30% of investment for RHC)
>there should be a communication budget to make the funding and its goals public

Renewable installations with a cooling component are included in a specific framework dedicated to new emerging technologies.

Quality: As of 2017, only projects relised by certified professionals recognised by ADEME (the French energy agency) are eligible for funding.

Level of support: The level of support is differenciated according to the different technologies, based on the production costs and a comparison to a reference (fossil fuel-based) system, and geographical location for solar thermal systems. The maximum intensity is set in compliance with the EU State Aid rules. The Heat funds can be combined with with revenues from the ETS and soft loans, while they are not cumulable with white certificates, aid for domestic projects, and tax incentives.

Eligibility criteria: Vary according to the technologies and are based on minimum production and efficiency levels. Projects subject to the minimum obligation of RES as set out in the Thermal Regulation 2012 are not eligible.

Monitoring system: ADEME requires the establishment of a metering system on the supported facilities. The operator must send actual data on heat production every year according to the contract.

Terms and conditions of payment: Aid is provided in three installments:
- A first after the contract is signed, a second payment after receiving documents certifying the good realisation for the installation, a last payment following the submission of actual data on the energy production over a period of 12 months.

Positive aspects

- As for control mechanism, the scheme accepts only certified equipment and uses random audit and information provided by end users to evaluate the implementation.
- From 2017 the scheme will only admit projects elaborated by certified professionals recognised by ADEME (the French energy agency) are eligible for funding.

Negative aspects

- Maybe the fact that it changes every year rather than having a stable and medium-term duration

2.2.3 Germany

The scheme analysed was:

- Marktanreizprogramm

As a successor to the "100 Million Programme," the Market Incentive Programme (Marktanreizprogramm), was introduced in 1999. Initially an annual budget of €100 million was allocated over five years. For several reasons it was not possible to exempt renewable energy power plants from the eco tax. As such, it was decided to use the income from the eco tax for sup-porting the further development of renewable energy technologies. The annual starting-budget therefore reflected the estimates of additional eco tax revenue from renewable energy power plants. In 2005, approximately one third of the revenue from the taxation of electricity from re-newables, amounting to EUR 659 million, went into the scheme. The last revision came into force in 1/4/2015 and re-introduced an innovation support for renewable technologies in the new-build market segment.

The Marktanreizprogramm is Germany's premier incentive scheme, which aimed to increase the use of renewable energy in heating and cooling systems and to improve competitiveness and innovation of the industry. It is intended to reduce dependency on fossil fuels and to protect the environment and the climate. Success of the program is measured against the national goal of 14% final energy in the heating and cooling sector by 2020.

The target groups are building and apartment owners; individuals as well as companies, local governments and other legal bodies are eligible for support. This scheme supports the use of dif-ferent technologies, including:

- Solar thermal applications
- Biomass
- Heat pumps (the use of energy from air, water, ground)

- Combinations of different technologies using RES.
- CHP

The German federal government supports the use of renewable energy sources for heating and cooling via direct financial grants, reduced loans, and financial support of expert advice. This support is granted via two bodies, the Federal Office for Economic Affairs and Export Control (BAFA) and through its own development bank "Kreditanstalt für Wiederaufbau"(KfW-Group). The first institution focus on smaller installations (up to 100 kW thermal output) and gives a di-rect support on the installation of heating systems, including heat distribution. On the other hand, the KfW focus on large commercial installations and supports these institutions via inter-est loans under repayment bonus conditions. This bank does not only provide loans for renewable energy, but also for energy efficient buildings and generally for the creation of new buildings for a large part of the population (home ownership program). KfW loans can be combined with other subsidy options.

Positive aspects:

- Supported installations must be operated for at least seven years
- Support can be combined with other schemes under conditions.

2.2.4 Italy

The scheme analysed was:

- Conto Termico

Conto Termico is the Italian support scheme, which has been implemented since 2012 and reformulated in 2016. It was designed by Government agencies in consultation with the industry and trade associations. GSE S.p.A is the national entity responsible for its implementation, including the concession of incentives to end users.

This scheme is financed through levies on natural gas consumption and applies to new[2] and exisiting buildings for systems until 2 MWth. It is open to the following categories

- (Beneficiaries, including public administrations, public companies, cooperatives, private households, businesses and entities with agricultural income.
- Companies executing the works, including Energy Service Companies (ESCOs)

It supports renewable heating technologies (heat pumps, biomass boilers and solar thermal collectors, both concentrating and non-concentrating, which could be combined with solar cooling technology) But for public admoinistrations only it also supports condensing gas boilers as well as interventions on the building envelope for existing buildings (wall and roof insulation, windows substitution). It also supports the substitution of existing mechanical active systems for others more efficient systems.

Conto Termico provides financial incentives on capital costs up to given maximum percentages on the eligible investment. The support level is granted on the basis of the type of technology, on the improvement of the energy performance of the building which may be achieved and/or on the energy which may be produced by renewable-energy systems. The incentive (contribution to the costs incurred for the project) will be paid in yearly instalments over a variable support period (two to five years), depending on the project (type of improvement implemented, technology type implemented and its scale). Moreover, the incentives may be granted only for projects which do not benefit from other forms of government support, except for guarantee funds, revolving funds and loans. For publicly-owned buildings for public use, the incentives introduced by the Ministerial Decree

[2] The incentive for new buildings covers the share of RES exceeding the minimum obligation, i.e. at least 50% of the demand for DHW and at least 35% of the combined demand for DHW, space heating, and space cooling (50% as of 2017).

of 28 December 2012 may be supported with grants, in accordance with national and EU legislation.

The decree allocates funds for a maximum yearly expenditure of € 200 million for projects implemented or to be implemented by public administrations and a yearly cumulative disbursement of € 700 million for projects implemented by private parties. Once this cap is achieved, the support comes to an end until a periodic review takes place and a new incentive mechanism is adopted through a new decree. Conto Termico also introduced specific incentives for energy audit and energy certification whenever used to support the interventions previously identified.

Positive aspects

- As for control mechanism, the scheme accepts only certified equipment and uses random audit and information provided by end users to evaluate the implementation.
- The scheme set technology-specific level of support to take into account the different level of market and technology maturity of RHC applications.

The scheme is financed through a levy on gas consumption and applies also to new buildings for the share of RES exceeding the minimum obligation.

Eligibility criteria and technical conditions for access to funds are very clearly stated

Negative aspects

- The scheme is subject to stop and go once the cap is achieved
- The yearly budget (EUR 900 mio.) is negligible compared to the annual budget for renewable electricity (EUR 5.8 bn)

2.2.5 The Netherlands

A total of 3 schemes were analysed:

- SDE+
- Energy Investment Allowance
- Guarantee fund Geothermal Energy

The most important program to promote renewables heat production is the SDE+ feed in premium scheme[3]. It aims to promote the generation of as much renewable energy as possible per euro by promoting the cheapest technologies and by allocating the available budget on the basis of competition between renewable electricity, renewable heat and green gas projects. By covering the unprofitable gap of projects, SDE+ offers long-term financial security (up to 15 years). The scheme is financed by a surcharge on energy bills.

The Energy Investment Allowance (EIA) is a tax deduction scheme on energy invest-ments. Entrepreneurs investing in energy efficiency equipment or sustainable energy as-sets can deduct 41.5 % of the eligible investment costs from their taxable profit. This cor-responds with approximately 11% net benefits. In 2014 the following renewable heat assets are eligible in the EIA scheme: Solar thermal installations < 100 m2; biomass boilers < 500 kW; biogas boilers, high efficiency biomass CHP, high efficiency heat pumps and heat storage in aquifers. The EIA scheme is running since 1997.

Guarantee facility for Geothermal Energy supports deep geothermal drillings and reduces the risk of not finding adequate resources, a key barrier for the initial develop-ment of geothermal energy technologies.

In their state aid notification letter to the Euroepan Commission, "[t]he Dutch authorities have pointed out that a drilling failure has no economic value, whereas drilling wells is relatively capital intensive (approximately EUR 6-8 million per doublet). The authorities have explained that a company that wants to apply geothermal energy bears a […] finan-cial risk (for small companies possibly resulting in bankruptcy) without a guarantee or insurance. Because of the very limited practical experience of geothermal energy in the Netherlands, insurers consider the operation to be highly risky and would therefore ask for such a high premium that this

[3] http://english.rvo.nl/subsidies-programmes/sde-publications

would be prohibitive of the drilling operation"[4]. For this reason, the Netherlands decided to develop such a fund guarantee, which had been successful to trigger the initial market uptake for deep geothermal in France and Iceland, and is considered a best technology-specific policy instrument[5] for geothermal energy.

In the Dutch scheme, the participants must pay an "insurance fee" of 7% of the maxi-mum support. The maximum support/ risk covered is 7 million euro (normal) – 13 million euro (deep project).

Positive aspects

- Internal competition between the various renewable energy options, promoted mainly by SDE+, transparent tariff setting due to public market consultation. A market orientated approach due to premium system in which renewable heat is predominantly produced when there is a maximum demand and the prices of the produced heat are high.
- A technology-specific approach with the reduction of up-front geological risk through the implementation of a Geothermal Guarantee Facility.

2.2.6 Poland

- A total of 5 schemes were analysed:
- Solar Collectors in Households Sector;
- National Fund for Environmental Protection and Water Management - Stork (Loan);
- National Fund for Environmental Protection and Water Management - Prosumer (Subsidy);
- National Fund for Environmental Protection and Water Management - Solar (Subsidy);
- Thermo-modernisation grants (Subsidy).

The Solar Collectors in Households Sector scheme was designed by the Government and, Energy Agencies, in consultation with Industry and Trade Organisations, in order to develop the solar thermal energy sector in Poland. This scheme is open to the domestic sector and it has been running since 2010.

The National Fund for Environmental Protection and Water Management (NFOSiGW) – Stork grants low interests loans together with subsidies to support the purchase and installation of small and micro-RES installations for the needs of residential single-family or multi-family houses. There are two different schemes: one is designed for local government units or their compounds and is governed by the NFOSiGW, the other one which addresses private persons, homeowner associations and housing cooperatives is governed by a bank. Only biogas, biomass and geothermal energy thermal installations are eligible for this programme.

The National Fund for Environmental Protection and Water Management - Prosumer aims to achieve an ecological effect which focuses on reducing or avoiding carbon emissions by increasing energy production from renewable sources. There are some subsides and soft loans available for the purchase and installation of small or micro renewable sources systems, such as:

Heating sources fuelled by biomass, heating fans/pumps and solar collectors with heating power up to 300 kWt;

Photovoltaic systems, small wind power stations, micro biogas power stations and micro-cogeneration with electric power up to 40 kWe.

It is important to mention that the Prosumer (2014 to 2020) is a lot less attractive for solar thermal technology since solar water heaters are only accepted in combination with an electric source such as: "heat pump + PV" or "solar thermal collector + PV".

The National Fund for Environmental Protection and Water Management -Solar grants subsidies to cover parts of a loan taken out to purchase and install solar collectors. This scheme is going to be available from 2010 until 2015. The collectors must be installed by a certified expert and only solar

[4] European Commission, 2009, p. 2

[5] For further information, see IEE projects GEOELEC and GEODH.

thermal installations are eligible for this programme.

The Thermo-modernisation grant scheme supports building renovations which increase energy efficiency or the use of renewable energy sources for heating purposes. Lenders may receive grants to pay off part of the loan taken out to implement such measures. Eligible measures shall reduce a building's annual energy demand, annual energy losses or annual costs of heat production or replace existing heat generation plants with renewable or high-efficiency CHP plants.

In Poland, there are only two policy programmes related to renewable energy plants: A training programme for installers of RES installations, and a certification scheme for solar thermal installations which confirms compliance with specific technical and quality standards.

Positive aspects

- Only new and certified equipment can be used;
- Guarantee of maintenance for a period of 5 years;
- Installation of monitoring services.

2.2.7 Portugal

Three important schemes were analysed:

- Medida Solar Térmico 2009;
- Aviso 10 – Edifício Eficiente 2015;
- Aviso 12 – Requalificação de Sistemas Solares Térmicos 2015.

The "Medida Solar Térmico 2009" was a scheme designed by the Portuguese Government to help improve the economic situation of the country. The scheme was designed to help the industry, equipment producers, installers and companies that work in the field of mechanical installations maintenance of solar thermal systems. Through this scheme 50.158 solar thermal systems were installed, representing a total area of 197.730 m^2 covered by solar collectors.

There have been some regional support schemes for solar thermal and biomass, which are governed by local institutions. For instance, the regional programme for Lisbon and Tejo's Valley financed over 26 solar thermal installations and had one interesting requirement, every building requesting this support must have energy certificate.

Currently, in Portugal, there is an Energy Efficiency Fund (EEF) which aims to create programs and activities to finance the implementation of measures included in the National Energy Efficiency Action Plan (NEEAP).

The "Aviso 10 – Edifício Eficiente 2015", which was created by EEF, aims to support the implementation of thermal insulation solutions in residential buildings constructed be-fore 1990. There are two types of solutions which are covered by this fund:

- Thermal insulation placed on roofs of buildings;
- Thermal insulation placed along external walls of buildings.

The budget available for this scheme is 1.000.000€ divided into two parts: 500.000€ for thermal insulation on roofs and the remaining 500.000€ for thermal insulation along external walls. This scheme supports practices that serve to enhance the energy performance of eligible buildings.

The "Aviso 12 – Requalificação de Sistemas Solares Térmicos 2015" was also created by EEF in order to requalify the solar thermal systems installed before December 2005. This scheme is focused on existing services buildings and there are two different main operational areas:

- Provide technical inspections (in order to identify eventual non-conformities) and energy audits (to define the level of intervention that is needed in the specific in-stallation);
- Rebuild the existing solar systems (provide, install and substitute equipment and offer commissioning services);

The budget for this scheme is divided into two parts: € 50.000 for energy audits plus € 450.000 to

rebuild the existing solar systems. This scheme is available for private non-profit institutions such as institutions of social solidarity and public utility sports associa-tions which have their own solar thermal systems.

The programs developed by EEF are considered passive since there is no legal obligation to implement the proposed solutions. Nevertheless, if some of those actions were executed they would contribute to increase the energy efficiency of Portuguese buildings as well as to improve the quality of life of their inhabitants.

Positive aspects

- Only certified equipment can be used.
- Maintenance warranty for a 6 years period.
- Energy certificate required for targeted building.

2.2.8 Spain

Two important schemes were analysed:

- SOLCASA, BIOMCASA II, GEOTCASA
- PAREER

During the last years, several specific RHC support schemes have been developed in Spain. Due to the economic and financial crisis, the RHC support schemes have varied notably along the time.

Mainly, at national level RHC support schemes are managed by Ministry of Industry, Energy and Tourism through the Institute for the Diversification and Energy Saving - IDAE. There are some support schemes implemented by other Ministries, like Ministry of Agriculture, Food and Environment (PIMA SOL) and Ministry of Public Works and Transport (Refurbishment Support Schemes Programs in buildings). Some regions (Autonomous Communities) and even municipalities have their own support schemes for RHC.

From 2000 to 2005, the ICO-IDAE financing line, offered soft loans coupled with non-refundable grants .The financing was given by the ICO (Official Credit Institute) and the non-refundable grants were given by the IDAE.

Within the framework of the Renewable Energy Plan 2005-2010, the main support schemes were based on direct grants. From 2006 to 2011, agreements between Autonomous Communities (CCAA) and IDAE were signed. The budget was mainly destined for investments in RHC facilities.

During 2009 and 2010 (ongoing) under the 2005-2010 Renewable Energy Plan, the funding programmes, called BIOMCASA, GEOTCASA, SOLCASA and GIT, started. The programmes BIOMCASA, GEOTCASA and SOLCASA finance RHC facilities in buildings, operated by Energy Service Companies (ESCOs). During 2012 and 2013 new calls of the programs have been re- edited. The GIT program is addressed to incorporate RES in industrial processes. The programs support biomass, solar thermal energy or geothermal energy for thermal uses and/or air conditioning excepting for applications in industrial processes.

PIMASOL was led by the Ministry of Agriculture, Food and Environment. It was a support scheme aimed to decrease CO_2 emissions in hotels. The reduction had to improve the Energy Performance Certificate in two letters or reach directly the letter B. The financing mechanism was operated by the European Bank of Investments. The program began in 2013 with a budget of 5,21M€ and finished in 2014. The considered CO_2 emissions price is 7€/tCO_2.

In October 2013 was launched the PAREER Programme – Energy Refurbishment in the Residential Sector. Within this program, the Ministry of Industry, Energy and Tourism through IDAE, provides financing to the owners of residential buildings and hotels and also to ESCOs providing heating and cooling to the final users. The scheme will run until 2015 and includes the domestic and service sectors, covering biomass, solar thermal, geothermal and aero-thermal sources of energy.

PAREER CRECE - This programme has been launched and an improvement of the aforementioned financing programme, amounting to M€200 so as to encourage and promote the implementation of reform measures enhancing energy conservation, improving energy efficiency, the use of renewable energy and reducing carbon dioxide emissions in existing buildings, regardless of their use and the legal nature of the owners; and also to help

achieve the objectives set out in Directive 2012/27/EU on energy efficiency, and in Action Plan 2014- 2020. It replaces the PAREER Programme. It was implemented in April 2015 and it will last till December 2016 or December 2020. It applies to all building types. It combines financing soft loans with non-refundables subsidies.

The State Plan to promote housing rental, building rehabilitation and urban regeneration and renovation 2013-2016, approved the 5th of April 2013 (on-going), aims at the adaptation of the aid system to meet current social needs and to the shortage of available resources, focusing on two axes: promotion of renting and promotion of rehabilitation and urban regeneration and renovation; the reactivation of the real estate sector from the two driving forces stated (promotion of renting and support of building rehabilitation and urban regeneration); the improvement of building quality and particularly, of its energy efficiency and integration of RHC.

Holding Fund F.I.D.A.E. is a fund allocated with nearly M€123, whose aim is to finance urban sustainable development projects to improve energy efficiency, use renewable energies and be developed by energy services companies (ESCOs) or other private enterprises. It is a Fund co-funded by FEDER and IDAE and operated by the European Investment Bank (EIB). The project must be located in one of the Spanish Regions included in F.I.D.A.E. and take part in one of the priority issues: energy efficiency projects, new buildings with energy rating A or B, renovation or enlargement of the heat/cool existing networks, renewable thermal energy projects, clean transport. The project must ensure an acceptable return of the investment and be included in an integrated plan for sustainable urban development.

Positive aspects

- Only certified equipment can be used.
- Admit only certified professionals.
- Random audit of the installation.
- Setting of specific target for renewable heating production in the buildings

2.2.9 The United Kingdom

A total of 4 schemes were collected and analysed:

- The Domestic RHI
- Non-Domestic RHI[6]
- Renewable Heat Premium Payment (RHPP)
- Low Carbon Buildings Program (LCBP)

The Domestic RHI is a financial support scheme for renewable heat, targeted at, but not limited to, off gas grid households. The support will be paid at a set rate per unit of re-newable heat produced (kilowatt hour or kWh), for 7 years, to the owner of the heating system. Open to homeowners, private landlords, social landlords and self-builders. It supports:

- Biomass (wood fuelled) boilers
- Biomass pellet stoves with integrated boilers providing space heating
- Ground to water heat pumps
- Air to water heat pumps
- Solar thermal panels (flat plate or evacuated tube only) providing hot water for your home

Air to air heat pumps, all log stoves, pellet stoves without back boilers and hybrid PVT are not supported by RHI.

The Non-Domestic RHI is a Government environmental programme open to the non-domestic sector including industrial, commercial, public sector and not-for-profit organi-zations with eligible installations, and to producers of biomethane. For the non-domestic sector broadly speaking it provides a subsidy, payable for 20 years. Non-Domestic RHI supports solid biomass, Combined Heat and Power (CHP) systems for solid, biomass, waste, geothermal and biogas, solid biomass contained in waste, heat pumps (ground source, water source

[6] AEBIOM:

> In general, they are quite happy with both RHI schemes. The major issue raised is the lack of budget allocated to the schemes, which doesn't allow a massive uptake of RES H&C technologies and makes it difficult for the UK to reach its RES target in the heating sector and its RES target in general (12% by 2020).

and air-to-water), solar thermal, geothermal, bio-methane, biogas.

Both the domestic and non-domestic schemes set technology-specific tariffs to take into account the different level of market and technology maturity of the different technolo-gies.

Renewable Heat Premium Payment (RHPP) provided one-off payments to household-ers, communities and social housing landlords to help them buy renewable heating tech-nologies. It supports biomass, heat pumps, solar thermal.

Low Carbon Buildings Program (LCBP) provided funds to householders, schools, char-ities, businesses, communities and non-profit organizations to partially cover the cost of purchasing and installing microgeneration technologies. It supports biomass, heat pumps, solar thermal.

Positive aspects

- Only certified equipment can be used.
- The scheme accepts only certified professionals.
- Random audit of the installation.
- Installation of metering and monitoring services.
- Under the Domestic RHI, all installations must be certified under the Micro-generation Certification Scheme (MCS). All homes are require to provide a valid an 'Energy Performance Certificate' and minimum insulation requirements.
- Both the domestic and non-domestic schemes set technology-specific tariffs.

2.3 Overall assessments

In preparing this report, we consulted two important IEE supported projects, recently concluded, with the purpose of enriching the discussion and definition of KSF. The two projects were mainly focused on RES-E, although many of the aspects integrating the schemes could easily be applied to RES-HC.

2.3.1 RE-Shaping

The RE-Shaping project carried out a review on support schemes for renewable electricity and heating in Europe and made some recommendations that could help in the identification of key success factors.

Among the recommendations it was referred the need to implicitly implement RES-H building obligations which includes obligations for a minimum share of renewables in the building sector. At the moment, this policy is carried out in two of the countries participating in the FROnT project, Portugal and Spain. Considering that RES-HC technologies are well adjusted to home heating, this could be one of the KSF to integrate any RES-HC scheme.

The same report refers that an important aspect to take into consideration has to do with the fact that the success of some schemes will depend on the existing infrastructure, for example, the realization of renewable-based centralized heating systems can only be fully achieved if district heating grids exist, combined with the biomass availability and high heat demand. This combination could have an effect on the successful support of biomass-derived district heating and large-scale CHP-plants. From the analysis of the implemented schemes, it can be seen that the UK´s Non-Domestic Renewable Heat Incentive already integrates this idea.

It is also pointed out that the dependence on financial incentives – predominantly in terms of investment grants – on the public budget and a potential stop-and-go policy creates stronger uncertainty for investors in the heat sector. Existing successful support instruments in the heat sector should be maintained, but should be based on a stable financing source and stop-and-go policy should be avoided. Experiences in the RES-E sector show that instruments financed outside the state budget, for example, via surcharges on the heat (fuel) cost may considerably increase the stability of the support instrument.

2.3.2 BEYOND 2020

One of the documents produced during the development of the Beyond2020 project was a summary of key conclusions for a harmonization of RES-E support in Europe. Although carried out mainly for

RES-E, some outcomes of this project can be adopted to RES-HC.

The Beyound2020 project tried to design pathways of a harmonized European policy framework for supporting an enhanced exploitation of renewable electricity in particular, and RES in general. As presented in the Beyond2020 project, the success of RES-E promotion is as much an issue of choosing the appropriate instruments as it is of including suitable design elements. Thus, the focus on design elements is justified. It was considered that successful design element of a given country should be considered relevant for others and could be listed as relevant in the EU harmonization of schemes.

On the question of eligibility, whether the scheme should be given to new and existing plants, we should point out that all of the schemes analysed were design for new capacity. The Beyond2020 project considers that the scheme should be to promote new capacities and, therefore we will recommend that only new plants be considered on whenever eligibility is considered as key success factor.

As for the level of support, constant or decreasing along a defined period, it was stressed that the most important aspect is to know the terms and conditions of any support, which should be known beforehand by people participating in the scheme. This is an important aspect that a support scheme should contemplate and therefore must be consider a KSF.

The duration of the scheme is considered of major importance for the success of a given scheme. Among the analysed schemes, the Dutch schemes were the ones designed for long time frame, 20 years. This is an important aspect for a potential investor and therefore, long duration period can be considered a KSF.

Regarding who should pay, tax payer or energy consumer, the schemes analysed were mainly financed by public budgets which can be assumed as tax payer financing the schemes. According to the Beyond2020 project the choice of the funding source should be decided at EU level, pointing the preference for consumer supporting the funding of the RES-E. In the case of RES-HC, leaving the financing to consumer might not provide the sort of thrust needed.

Another important aspect to be considered in the design of a scheme as to do with the variability on the level of support according to technology. The schemes analysed show different level of support in accordance with technology.

Support level per type of technology can be seen in almost all the countries that presented more than one scheme. It was pointed out that there is no clear consensus on how the support level should be modulated to match specific technology.

The UK´s Domestic RHI shows that geographical location might be an important factor to take into consideration in order to avoid mismatch of available infrastructure for heat distribution and availability of RES-HC. On the other hand, modulating support level according to the location of the plant might contribute to reduce the risk of concentrating RES-HC installations in a few locations.

3. Financing renewable heating and cooling

3.1 Overview of existing possibilities

In this section, we briefly review in a non-exhaustive way the state-of-the-art regarding the financing tools currently used, or being explored, in order to finance renewable heating and cooling projects. It is possible to distinguish between the different financing tools according to their maturity degree and particular features, therefore identifying three different categories: mainstream or traditional financing tools, innovative financing tools and finally participated financing tools.

3.2 Mainstream financing

Traditional financing may refer to the tools that commonly used in renewable energy projects, and that are therefore established as the dominant ones. Access to public (national or European) funding is the most traditional financing tool, alongside with indirect public measures. Private financing from the capital markets remains another important traditional financing tool. An increasingly important sub-section of private financing is being provided by ESCOs.

3.2.1 Access to public financing

Public financing is commonly the most cherished source of financing for project developers, as it has favourable terms due to the non-speculative goals the public sector aims to, usually of an environmental or social nature. Public financing is also well suited to long term investments, as it does not need short term returns of investment as most of the private financing does. However, public financing is also severely affected by over-bureaucratic procedures, and has suffered by public spending cuts following the economic crisis. The relative decline in this source of financing has led to the development of alternative tools to access financing. Most traditional forms of public financing tools are direct support schemes, such as examined in the previous sections of this report. Those can be in the form of feed-in tariffs, where a fixed and guaranteed price is paid to entitled producers of renewable energy, or feed-in premiums, where a guaranteed premium is paid in addition to the income produced by selling renewable energy in the market. Other tools frequently used in public support schemes are soft loans with a guaranteed interest rate below market levels and with advantageous repayment time, or loans linked to guarantee funds that can absorb part of the risk (and its relative financial cost) of the projects. Finally, another tool traditionally used as a public support measure are tax incentives and/or exemptions. They can act in different ways, working as deductions and in combination with other support measures, targeting specific technologies, or specific (vulnerable) groups of consumers, being therefore very flexible and effective.

In the past, those tools have been mostly used for the renewable electricity sector. Less has been done for the renewable heating and cooling sector. There, four main tools have been mostly used so far: 'investment grants, tax exemptions, financial incentives and premiums/boni. The deployment of (combinations) of these instruments varies largely from country to country and from technology to technology. The main support comes in the form of investment grants and tax exemptions. These are available in quite some Member States for most RES-H&C technologies. Financial incentives such as soft loans are less commonly available. (RES based) district heating receives relatively little attention from Member States'[7].

[7] https://ec.europa.eu/energy/sites/ener/files/documents/2011_financing_renewable.pdf

Another widely used direct financing tool are risk sharing facilities, which aim at removing part of the uncertainty and first-loss risks associated to RES projects, by 'covering part of the risk of payment default- either through a guarantee or first-loss absorption'[8]. Risk-sharing facilities act as a facilitator, increasing the possibility to contract loans from the private sector, incrementing the ability to attract external investors and financial institutions by increasing the confidence in the bankability of the project, and being able to support other complementary support measures.

3.2.2 European public financing

Public financing can come from different levels of government, local, regional or national, and increasingly also from the European level. European funds targeting renewable energy projects have been increasing over time, and represent today a considerable share of the European Structural and Investment Funds (ESIF), whereas the new 2014-2020 programming period (totalling 351 billion euros for ESIF) has allocated specific resources to the low carbon economy according to the concentration principle: most developed regions must guarantee at least 20% of their ESIF spending towards low carbon economy, transition regions 15%, and less developed regions 12%. Those funds are often distributed through dedicated credit lines, or delegated to intermediary managing authorities at regional level, which are in charge of issuing calls for project proposals to fulfil the aims of the programmes.

3.2.3 Indirect public measures

There are other public measures that provide project developers with financing opportunities, but are not traditional support schemes, and act as indirect financing measures. Quota obligations are a good example: 'in countries with quota obligations, governments impose minimum shares of renewable [*energy*] on suppliers (or consumers and producers) that increase over time. If obligations are not met, financial penalties are to be paid. Penalties are recycled back to suppliers in proportion to how much renewable [*energy*] they have supplied. Obligations are combined with renewable obligation certificates (ROCs) that can be traded. Quota obligations create a market for the renewable property of [*energy*]. The government creates a demand through imposing an obligation on consumers or suppliers to source a certain percentage of their [*energy*] from RES. Hence, ROCs provide support in addition to the [*energy*] price and used as proof of compliance. A ROC represents the value of renewable [*energy*] and facilitates trade in the green property of [*energy*]'[9]. In the H&C sector, white certificates, certyfing the achievement of a certain amount of energy saving, accomplished also through RHC, are more common. Those certificates are issued and traded, as a result of energy efficiency obligations on utilities.

Another fundamental indirect public measure is represented by the regulatory imposition of minimum RES requirements. Minimum RES requirements usually are mandated upon new buildings, or buildings undergoing major renovations, and are enacted through building codes and regulations. This is achieved in Europe through the national implementation of EU legislation (art. 13.4 RES Directive[10])

3.2.4 Private financing

Traditional private financing tools refer to the most used forms of financing from the private sector to the development of RES projects, as for instance traditional bank loans. Those instruments are widespread in the RES financing market, and are commonly the bulk of the financing of a project, whereas public or alternative financing sources act

[8] https://ec.europa.eu/energy/sites/ener/files/documents/Final%20Report%20EEFIG%20v%209.1%20240220015%20clean%20FINAL%20sent.pdf

[9] Ibidem.

[10] Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC

as a complement of the private financing. Those instruments, however, are very much sensitive to fluctuations according to the risk perception of RES projects in the market, and several barriers have been growing up during the last years, following the economic crisis, when it comes at the effective possibility for RES projects to access private financing.

3.2.5 ESCOs

Energy services companies have been operating since a long time in the European energy sector, and have been among the first financial actors to differentiate their offer to include renewable energy. Their specific financing tools, however, have been changing over time, and some are quite recent, innovative and with a low uptake. ESCOs financing therefore sits in-between mainstream and innovative financing tools. ESCOs can offer different forms of contracts and agreements, from leasing (see below) to on-bill repayment contracts. ESCOs can perform Energy Performance contracts, between a recipient and the provider of a renewable energy installation, where investments for that installation are paid for in relation to a contractually agreed level of renewable energy production and/or other criteria, such as bills savings. Energy Performance contracts thus deliver a 'valuable and professional service to commercial and public buildings offering guaranteed savings, turnkey contracts and facilitating the market'[11]. Another tool being developed by ESCOs are Energy Savings agreements, which are contracts to 'deliver energy savings as a service. [...] A third party investor and an asset owner enter into an ESA contract (typically for 10 years) where the asset owner agrees to pay their historical utility bills to the third party. An up-front "access fee" or an ongoing utility bill discount may also be paid to the asset owner as incentive. The third party invests into money-saving, energy efficient opportunities and owns and operates the energy equipment to provide "energy services" to the asset/ building'[12].

3.3 Innovative financing

Innovative financing refers to non-traditional ways for project developers to access financing opportunities, whereas the project is not based on shared ownership such as in the participated financing tools (see below). Innovative tools are by definition recently introduced in the RES financing market, and are therefore mostly in an early development stage. Particular forms of innovative financing tools are leasing, investments from ethical banks, joint ventures, venture capital funds, green bonds.

3.3.1 Leasing

Leasing is a relatively mature financing scheme in the capital markets, however if applied to the RES project development sector, it is still used in a minority of situations and remains well underdeveloped, so that it can be considered as an innovative financing tool. In this context, leasing refers to an agreement by which a party can obtain the use of a particular RES installation on a rental basis from another party. Leasing is used in order to avoid capital expenditure in the equipment, such as the up-front investment cost of a RES installation, since 'payments in a lease merge capital and operational expenditures'[13]. The first party obtains the usage of the equipment, even though ownership remains with the party renting the equipment. Usually, at the end of the contracting period, the party that uses the equipment in leasing can be offered by the owning party to buy back the equipment, according to predetermined contractual clauses. Leasing is becoming an established financing tool for small scale renewable energy installations, even though it represents a minority of the market, and has still a great potential to increase further. It is an important tool in particular for ESCOs companies, who offer consumers leasing contracts for individual, domestic RES installations, in exchange of a fee at the signature of the contract, a periodical fee during the lifetime of the contract, and eventually

[11] Ibidem.
[12] https://ec.europa.eu/energy/sites/ener/files/documents/Final%20Report%20EEFIG%20v%209.1%20240220150%20clean%20FINAL%20sent.pdf
[13] Ibidem.

an agreed amount at the end of the contract, in order to buy back the installation. Those contracts can be easily tailored according to specific energy or financial needs of consumers, thus representing an interesting option for both leasing companies (stable and predictable incomes) and final users.

3.3.2 Ethical banks

Ethical banks are particular banks that 'work for the common good and ensure the right to receive credit through a bank activity consisting in raising funds and reallocating them in the form of credits for cultural, social and environmental projects. Through their activity, ethical banks promote social inclusion, sustainable development, development of social economy and social entrepreneurship'[14]. Ethical banks do not invest in the financial markets, and are non-speculative by nature, they provide instead loans exclusively to economically viable projects with a social character, in a transparent and accountable way, using capitals raised by individual savers who chose to adhere to the bank values. Often, ethical banks are cooperatives, and opening a savings account requires membership, which in turn grants voting rights and involvement in the management of the bank and in the decision of the projects funded. Ethical banks are particularly suited to RES projects, as they usually have a very good understanding of projects in the renewable energy sector, are used to long-term returns, and allow access to capital with a very low interest.

3.3.3 Joint ventures

A joint venture refers to a business agreement (formalized into a written joint venture agreement) aimed at the creation of a partnership between different companies, in which the parties agree to develop for a determined time a new entity combining part of their assets. It is therefore a new legal entity, which is jointly controlled by the contracting parties, and which revenues, expenses and assets are shared. Joint ventures are commonly used to share risks and minimize costs of projects, or to combine expertise and skills from different sectors into a single project, in order to create economies of scale, accessing new markets, or enhancing its own competitive positioning. Joint ventures are often used by SMEs to access financing from larger companies, and are used from the latter to acquire ideas from innovative but smaller companies.

3.3.4 Venture capital funds

Venture capital refers to high risk investment funds usually targeting start-up companies with a high potential for growth and innovation, often focusing on key technological sectors. The venture capital fund buys equities in the selected company usually at an early stage of development, with the intention of generating a high level return of investment in the case the company manages to develop to a mature stage. In consideration of the high risk faced by venture capitalists when investing in start-ups, they usually require important shares of the company ownership, and thus have a significant role in the company's management and strategic decisions. Venture capital is a mature financial tool in the United States, but it is only at a very early stage of development in Europe. European venture capital funds amounted to €17.8 billion between 2008 and 2011[15]. Their attention to the renewable energy sector has been growing recently, as clean technologies have shown a high growth potential worldwide, and research and development (thus marketable patents) are increasing in the sector.

3.3.5 Green bonds

Green bonds are a financing tool in which the 'proceeds are exclusively applied to (new and existing) "green projects" defined here as projects and activities that promote climate or other environmental sustainability outcomes. Given the long-term, stable characteristics of energy efficiency investments, debt financing is usual and the new market for green bonds is a natural place for investors to

[14] http://www.febea.org/sites/default/files/definition_ethical_bank-en.pdf

[15] http://ec.europa.eu/environment/ecoap/about-eco-innovation/business-fundings/eu/20130114-venture-capital-for-eco-innovation_en.htm

seek capital for investments in green buildings and energy efficiency in industry'. Green bonds can provide financing to renewable energy projects 'either directly through bonds issued by corporations, or indirectly through bonds issued by banks, which in turn can on-lend to all types of energy efficiency project hosts. The market for green bonds more than tripled in 2014 to $35 billion'[16].

3.4 Participatory financing

Participated (participatory?) financing refers to particular financing tools applied either in a context of shared ownership, including forms of self-financing, or from a wider, informal network of contributors to individual projects. The main differences between participated financing and the financing tools earlier examined are the ownership structure and the widespread, bottom-up and citizens-based source of financing. The two main categories of participated financing are renewable energy cooperatives and crowdfunding.

3.4.1 Renewable energy cooperatives

Renewable energy cooperatives are 'a group of citizens that cooperate in the field of renewable energy and energy efficiency, developing new production, selling renewable energy or providing services to new initiatives'[17]. The philosophy behind RES cooperatives is conceiving energy as a common good, and empowering people by taking concerted actions and ownership of the projects, creating an energy democracy. The term is extended to include not only legally defined cooperatives, but also groups of cooperating citizens involved in community energy initiatives with different legal statuses.

RES cooperatives have different options in terms of financing, being able to draw from both traditional and innovative financing tools, and also having access to specific financing tools related to the cooperative organisation. RES cooperatives are efficient ways to tackle the barrier of the upfront investment cost, as it is shared among a plurality of actors.

Mainstream financing tools for RES cooperatives can be traditional bank loans, access to public support schemes, grants, soft loans, traditional equity investments, and so on. Even if those tools have strong limitations in facing particular challenges in RES projects, RES cooperatives can perform better than other renewable energy projects in terms of access to traditional financing for several reasons. Firstly, RES cooperatives are better suited to collaborate with public local authorities (particularly in the case of signatories of the Covenant of Mayors), and thus can have better access to EU structural funds. Secondly, RES cooperatives can better combine renewable energy and energy efficiency investments in a single project, increasing its bankability. Thirdly, RES cooperatives can collaborate between themselves, with joint investments, loans and other financial assistance. Finally, RES cooperatives allow projects to reach a suitable investment size for larger sources of financing (such as the EIB).

Sector specific financing tools for RES cooperatives can be direct self-financing, citizens equities and cooperative funds.

Self-financing schemes are based on members' fees to participate in the cooperative. It is the most direct way for participants to directly co-own the energy producing installations that are realised via the cooperative's projects. In this case, cooperatives projects are therefore financed by capital raised among the members of the cooperative. Usually self-financing applies to very small projects, or is used as complementary to other sources of financing for larger projects.

[16] https://ec.europa.eu/energy/sites/ener/files/documents/Final%20Report%20EEFIG%20v%209.1%20240220150%20clean%20FINAL%20sent.pdf

[17] http://rescoop.eu/what-rescoop

Citizens' equities is a tool to raise capital attracting external people to a cooperative project. Membership can be granted, and also voting rights, to new members attracted by specific projects, or non-membership based forms of collaborations can be built with citizens willing to participate into projects. Cooperatives usually raise equity from citizens and pay in return an annual share interest, in relation to existing profit. Cooperatives are generally covered by specific financial regulations, having often privileged taxation regimes, capital raising is therefore much facilitated. Citizens' equities is a crucial tool for a RES cooperative to enlarge its financing capacity, attract new members, and complement financing from other sources (for instance, loans never cover 100% of RES cooperative projects). It also gives the opportunity to local citizens to engage in their community and to own part of the project. Besides the buying of shares for equity through a share offer, other ways to engage in direct financing for cooperatives projects are private loans to the project development, or offering financial guarantees to enable the cooperative to access a bank loan.

Cooperative funds are non-speculative funds that are collectively managed by different private and/or public stakeholders interested in the overall goals promoted through cooperative projects. Cooperative funds can act both at national and at European level, and invest in equities for different cooperatives projects, contributing to the management of those cooperatives (via equity rights). Cooperative funds are appreciated by investors who are sensible to the overall goals and aims of the RES cooperatives, as they invest more in cooperatives themselves rather than in individual projects, leaving much of the risks of individual projects to the cooperatives and providing secured investments. Those funds are also appreciated by project developers from cooperatives, as their cooperative nature involves participation in the management, long term return of investments and non-speculative attitude (dividends are often limited by statute)[18].

3.4.2 Crowdfunding

Crowdfunding is a financing tool that involves a fund-raising campaign launched to collect the amount of capital needed to develop a specific project. Citizens are therefore given the opportunity to choose the project on which to invest, through open calls that state the goals and the financial needs of the project. Crowdfunding schemes aim at collecting usually small amounts of money per each contribution, but from a large number of citizens. It is an increasing trend and a concrete alternative to traditional financing, as it appeals to a different and wider spectrum of people, ordinarily not interested in traditional financing of projects, and it is a very flexible and fast tool for fundraising, providing easier and cheaper access to finance than mainstream financing tools. Crowdfunding usually involves an intense communication campaign on the internet and social media, and aims at connecting people interested in contributing to projects that are deemed as significant and worthy, and project developers. In 2012, crowdfunding in Europe grew 65% over the previous year in Europe, reaching € 735 million[19]. Despite the strong growth, partly due to the crisis of traditional financing tools, crowdfunding is still a recently new financing tool and has not reached yet full maturity.

From a financial point of view, the collection of money can be either direct, or mediated by an internet platform dedicated to crowdfunding (over 200 platforms existed in Europe at the end of 2012). Crowdfunding campaigns usually establish a target to be reached in order to kick-off the project: if the amount is not reached before a certain established date, the money can be either returned to the contributors, or kept to develop a smaller version of the project, or project developers try to integrate the fund with other sources of financing. The contributions can be different in their nature, being either donations, or sponsoring for advertising, rewards, pre-selling (if a product is to be delivered at the end of the project), lending

[18] http://rescoop.eu/sites/default/files/project-resources/handbook_on_citizens_res_investment_schemes_final.pdf

[19] http://www.eurocrowd.org/

at very low/ no interests, securities-based investments (where shares are issued by the project to contributors)[20].

Sed eu cursus est. Phasellus scelerisque tempus varius. Etiam aliquam rhoncus nisi ac sagittis. Vivamus semper vestibulum augue, sed dictum nibh accumsan sit amet. Morbi auctor pharetra metus sit amet semper. Quisque congue nulla mattis mi viverra vel porta leo condimentum. Praesent aliquet nisl nec enim tristique accumsan. Proin eget viverra leo. Nullam vulputate bibendum laoreet. Sed vel justo quam, at venenatis felis. Cum sociis natoque penatibus et magnis dis parturient montes, nascetur ridiculus mus. Duis mollis, nunc ac euismod dignissim, augue quam euismod orci, a vulputate ipsum orci non enim. Suspendisse ultricies, tellus eget pellentesque faucibus, ligula mauris interdum ipsum, in accumsan lorem tellus ut sapien.

[20] http://rescoop.eu/sites/default/files/project-resources/handbook_on_citizens_res_investment_schemes_final.pdf

4. Key success factors (KSF)

4.1 Summary

For the purpose of this report, key success factors (KSF) are factors that characterize a support scheme, making it accountable, ensuring its cost effectiveness and helping boost confidence on the RES technology supported.

In this section, we identify and discuss factors that might contribute to the success of RES-HC schemes. The report does not grade, in any form, the listed factors. Instead, it looks at their positive aspects and evaluates how easily or difficult they can integrate a particular scheme. Following is the list of factors considered in this report:

- Contribution of different stakeholders
- Quality and performance assurance
- Transparency and measurability
- Financial adequacy and flow support rate
- Predictability, stability and time frame

4.2 Identified Key Success Factors

4.2.1 Contribution of different stakeholders

The analysis of the schemes implemented in different countries confirms the variety of factors which can contribute to the success of a particular programme. From the onset, it became clear that from a design aspect, it is important to include the wide variety of different stakeholders chiefly: Government agencies, trade organizations and industry. This is an important way to assure that different experiences are embedded in a program and relevant aspects such as equipment quality, control mechanisms and certification of professionals are integrated in the scheme. By assuring the participation of regional and local entities a valuable experience and know how on local conditions that could contribute to the increased uptake of RES-HC.

It may be considered easier to call for the participation of specific stakeholders when the scheme is focusing on a single technology type, as was the cases for solar thermal schemes implemented in Poland and Portugal. On the other hand, the participation of different stakeholders can, sometimes, lead to difficulty in generating consensus, as there may be conflicting interests. This can happen, e.g. whenever organizations defend national products as a way of boosting national industry for a particular technology or, whenever an organization defends an exclusive technology. So, in calling for the collaboration of stakeholders, the institutions to be participating in the design of a scheme should represent a broad spectrum of interest and not a single one.

One of the three analysed Dutch schemes was designed exclusively by Government agencies, while three of the four UK schemes did have the collaboration of at least one additional entity, apart from Government agencies, on their design. The Spanish scheme was designed exclusively by the IDAE, a Government agency, although details of the consultation process that may have taken place during the design phase, was not determined by this enquiry. It is worth noting that public consultation process is another important format to involve other stakeholders in the initial phase of a scheme. It takes place when the terms of reference of a design scheme are presented in public session, workshop or any other format, allowing the participants to comment on them.

4.2.2 Quality and performance assurance

An important aspect considered in this inquiry was the inclusion of energy efficiency aspects on the design of the schemes. Since the objective of any RES-HC scheme is to achieve improved energy efficiency, increase the proportion of heat that is generated from renewable sources and encourage the switch from fossil fuels, it is important that support schemes should implement some degree of energy efficiency measures as a pre-requisite. Among the schemes analysed, the UK´s RHI domestic scheme is the only one to consider 'Energy Performance Certificate' to identify the heat demand of the property. It is expected that the incorporation of RES-H technology on building requirements of member states, fulfilling one of the obligations of the Directive2009/28/EC, which obliges countries to use obligations for renewable heating, could help attain a minimum share of RES-HC in the building sector. Another important aspect that makes the integration of building efficiency in a scheme very interesting is that fitting of any RES-HC solution can be best achieved in new construction rather than during retrofitting of a building and, the final cost can be greatly influenced. The referred reasons demonstrate that integrating energy efficiency in building requirement should be considered a key success factor.

Sometimes building requirements are designed in such a way that the minimum share can impede the integration of RES-HC technology, since by fulfilling the minimum requirements the full potential for the integration of RES technology can be withhold for many years.

Adequate heating systems and insulation can also be paramount to the success of a RES-HC scheme considering that RES-HC applications only operate effectively when incorporated into the design of the system. For example, when evaluating the overall heat delivered by a Ground Source Heat Pump to a house with inadequate heating system design and insulation. This fact reveals that the schemes should also integrate aspects related to overall system performance. One way to achieve this would be to specify a minimum level of building energy performance before support can be offered. Another option would be to conduct a building energy performance audit prior to any form of support offered

It should be stated that energy efficiency requirements can be integrated in almost all RES-HC support schemes.

Whilst the issue of available local energy resource was not specifically considered in this report, the UK´s RHI support scheme does consider this feature and encourages candidates of RES-HC support schemes to consider the type of RES fuel available to them. For example, in rural off-gas grid and sparsely populated areas, consumers are encourage to use individual or shared low carbon heating systems such as renewable heating systems. On the other hand, for the non-domestic RHI - high density urban areas are considered better suited to heat networks powered from renewable sources. The RHI support (domestic and non-domestic) for projects is conditional on microgeneration Certification Scheme (MCS), a recognised quality assurance scheme that certifies microgeneration technologies and installer standards to produce electricity and heat from renewable sources.

Any scheme being designed should consider that the integration of the geographical considerations will most likely contribute to the success of the program since it will try to match the resource availability with other constrains such as accessibility and quality of heat distribution infrastructure. On the other hand, the construction of new infrastructure for natural gas distribution should also be evaluated and additional information should be gathered to evaluate how this new infrastructure can hamper the penetration of RES-HC technologies. Therefore, it is not just the geographical availability of the energy resources that should be considered but also all relevant elements relating to energy usage in a particular region. This evaluation becomes a very important element whenever RES heat networks schemes are to be considered.

Apart from the design aspects of the schemes, an evaluation of how the schemes were controlled was also looked at. Some of the analysed schemes

considered certified equipment as an essential requisite and most did consider that only certified professionals could take part in their implementation. Again, a reference should be made to the MCS in which installation companies have to make sure that they sell their products and services to consumers appropriately, without miss selling or misleading a consumer. Installer certification includes assessing the supply, design, installation, set-to-work, and commissioning of renewable microgeneration technologies. These two aspects, the quality of products and competence of installers in the renewable technology sector are vital to assure consumer protection. Certification of equipment and professional constitutes the basic of such guarantees and it is recommended that any implemented scheme should integrate them. If the RES-HC industry is to grow, installers and products that they offer must be seen as the preferred options in the market place.

In contrast to the UK schemes, inexistence of professional structures to execute the RES installations was detected in some of the analysed schemes. Considering that for some renewable technologies there is little or no evidence to demonstrate the real-life performance of working systems, and the fact that RES technologies are to compete with established technologies, it is important that a certain guarantee is provided to end-users of these technologies.

In fact, some recently concluded IEE projects such as QualiCert[21], Install+RES[22] or GEOTRAINET[23] provide a vast array of training material, showing that training is an essential element in the drive for better penetration of RES-HC technologies in the market. Low number of trained professionals in the market can be a significant barrier to the rapid penetration of RES-HC technology.

4.2.3 Transparency and measurability

Schemes should consider, whenever appropriate, the possibility of integrating a random audit of installations. It should be noted that most of the analysed schemes did not consider this possibility. In addition to random audit checks on installer standards, schemes should consider lessons learnt from in-situ trials. In situ trials are critical in helping to build consumer confidence in RES technologies and therefore helping to foster a virtuous circle of understanding, trust and growth within the sector. In-situ trials are important elements to ensuring that consumers can access in-depth advice and support founded on robust evidence.

Random audit is a different form of evaluating not only the quality of the installations but also the performance of the installers. It can be directed to a particular technology or to a particular region so that specific industry weaknesses can be identified and addressed, increasing confidence amongst industry participants and consumers.

It should be noted that incorporating random audits into a scheme may not be economically viable for smaller scale installations, such as single home installations.

Metering and monitoring services are may also important elements that when effectively incorporated in a particular scheme can help the RES-HC gain a better foothold in the market. In fact some schemes analysed do incorporate metering and monitoring. Just as the schemes supporting RES-E, RES-HC could also use metering and monitoring, when-ever adequate, to account for the energy been delivered by the system. Moreover, metering and monitoring are consider robust factors that only reward the correct quantity of heat or an equivalent energy being delivered. Therefore, metering allows a scheme to support renewable heat where the heat generated is usable, therefore avoiding the heat need that would otherwise have

[21] www.qualicert-project.eu
[22] www.resinstaller.eu
[23] www.geotrainet.eu

been met through fossil fuels. In tariff based systems such as the RHI in UK, Metering metering also allows support of useful heat and would not incentivize the deliberate wasting of heat or heat generated simply to meet a heat load which would not otherwise have existed had the incentive not been in place. Such cases can include when heat is unnecessarily vented into the atmosphere, where a heat require-ment has been created artificially in order to claim the incentive.

Care should be taken so that the metering process is not allowed to provide double incentives for the same unit of energy/heat. This can happen when the meter reading re-use condensates in a process to make the system more efficient. This is made easier since the Directive 2004/22/EC of the European Parliament and of the Council of 31 March 2004 on measuring instruments details the performance specifications for heat, gas and electric meters. Monitoring can also be achieved by conducting online surveys in which applicants will answer concrete questions about their equipment performance. This information could complement any metering and allows the institution in charge of the scheme to learn more about RES technologies.

The efficiency of the support schemes must be monitored to be sure it works properly and to adpot corrective measures when necessary. The final goal being to end this SS as the market barriers identified is removed.

4.2.4 Financial adequacy and flow support rate

Although we try to answer the issue of financial adequacy in the analysed schemes, it was not possible to collect information that will allow for the comparison of economic incentives provided for specific RES technologies and the average generation costs to monitor whether financial support levels are well suited to the actual support requirements of a given technology. The analysis revealed that low funding was the characteristics of about 8 analysed schemes. In any case, the most important aspect is that the funding level should not drive up the installation costs.

If the financing is not adequate, most likely RES-HC schemes will not help the technology gain foothold within the market. In some cases low financing will exacerbate the investment that the industry might mobilize for the scheme. When this happens, a new planning system will have to be put in place costing money and other resources, further inhibiting industry from displacing finances to other areas of economic activity.

On the other hand, if the level of support is way above the required, two things might happen. The final cost of equipment might be fixed at higher level, compromising the uptake of RES-HC solutions in the general market and, a reduced number of total installations. Moreover, additional finances to fix eventual problems that might come up during the implementation of the scheme might not be available.

Whenever a support scheme contemplates multiple technologies, it becomes useful for support levels to be differentiated so that individual barriers-requirements of each technology can be best addressedmatched. In doing so, care should be taken not to make the scheme too complex or to increase its management costs and reduce efficiency.

Apart from financial adequacy, the flow support rate can also be an important factor in analysing a particular scheme. The flow support should be looked at in order to evaluate the level of support during different period of the running scheme. The flow support has to be modulated as to take into consideration the possibility of bigger expenditure on the first year or a constant support along the running of the scheme. It can also be modulated in such a faction that there is a constant decrease along the years of the program. It should also be calibrated to avoid abrupt interruption of the support program. It should be calibrated in function of a well study scenario in order to reduce the chances of defrauding expectations on the part of potential candidate. Usually the evaluation of previous or other programs implemented in a given geographical area will help on the setting up of the flow support.

4.2.5 Predictability, stability and time frame

Complementing the financial adequacy feature is the predictability of a support scheme. Considering that the main objective of the financial incentive is to mitigate the risks and provide more certainty about their return, projects that may last several years, e.g. grid construction for district heating, need to have mechanisms for payment levels adjustments clearly communicated so that investors can more easily assess their risks. Investors will feel more comfortable with their investment decisions if they are provided more information about financial incentives over a long period of time. In other words, long term incentives should be stable so that the decision making process can be captured in formulas, allowing investors and developers to know when and how an incentive may be altered.

It was clear that some of the implemented schemes have a time frame for support that, if not followed by new schemes, could lead to a potential stop-and-go policy, creating uncertainty for potential investors. This is clearly the case of Portugal, where Medida Solar 2009 was not followed by any other important RES-H, due to financial difficulties that the country has been facing for the last 5 years. The case of RHI can also be highlighted: it was announced but implemented only 1 year after, so investors had to face one year of uncertainty.

In general, most schemes analysed do run beyond the 5 years period. This might be the time frame that most suits the RES-HC investor, considering that some are new solutions to potential investors who will have to evaluate other components of the solution, such as return of investment, before making a final decision.

4.2.6 Consultation and validation of KSF

Apart from the consultation done with the European Advisory Comity members, EAC, during various project meetings, a two track consultation was implemented for the validation of the findings of the project, namely the 5 Key Success Factors, KSF.

For the first track, national meetings were organised by the energy agencies participating in the project in which National Consultation Platform members were able to discuss the KSF and make recommendations on them. The second track was pursued through an inquiry placed on the project website. RES-HC professionals and other stakeholders from different countries were invited to login and fill out the inquiry.

The definition of the KSF presented by the project was widely accepted through the consultation process. As for the 5 KSF, a summary of suggestions and considerations can be made:

Contribution of different stakeholders

It was considered an important element in the design of a support scheme. It was not always clear which format this consultation should take and who should participate on it. In certain cases, however, it was highlighted the need to go beyond a 'tick box' exercise, whereby wider industry views cannot be expressed, and to include less traditional entities, such as: private sector consultancies, specialist financial organisations, academic institutions, consumer protection and community groups. It became also clear that the consultation timings may have a deterrent (restraining) effect on the RES-HC market, as it might inhibit people from making purchasing decisions during the consultation period, considering that potential buyers would likely wait for the scheme to be implemented so that they can eventually seek some benefit from it.

Quality and performance assurance

It was suggested that quality control through metering system performance could help avoid creating perverse incentives to oversize systems (especially in the case of operating aid like the UK RHI) and create 'artificial' needs for heat in order to claim increased financial support. On the other hand, it was also underlined that metering small-scale RES systems may impact on the cost effectiveness of a scheme as well as of the technology. It was also referred that consumer confidence can be boosted if the supply chain can deliver systems with quality and good performance.

Transparency and measurability

A desire to implement some form of verification of the performance of installed systems was widely accepted. Two views were presented, on which supports a verification before the implementation of the scheme and, a different approach which seeks to implement a random verification during the course or at the end of the scheme. Whatever the option there are some benefits and drawbacks. Verification before the implementation of the scheme will be good to seek technical data on the system been implemented. However, it cannot be conclusive since it becomes difficult to relate the load with consumption patterns in the measurements been conducted. Implementing verification after the scheme will be useful to collect valuable data but might not provide required time to correct problems that the scheme might present.

Financial adequacy and flow support rate

As for financial sustainability and adequate flow of financing for schemes, it was highlighted the importance of avoiding incentives leading to equipment oversizing and operational inefficiencies. On the other hand, financial adequacy of a scheme is always in comparison to other programmes in place, which can be translate into competition between different programmes and technologies, especially condensing oil and gas boilers. Finally, it was highlighted that implemented schemes, when supporting different RES-HC technologies, should be structured to avoid conflict between them. The schemes should be designed to secure mutual benefits for the technologies been supported.

Predictability, stability and time frame

Predictability and stability are recognised as important features as they provide a much needed clarity for any potential investor. Long period of continuity, at least 5 years, was recommended for a scheme to avoid stop-and-go phenomenon. It was recognised that changes within a scheme should be clearly communicated in reasonable time frame so that potential investors will know exactly what would happen as they plan investment in RES-HC technologies.

Additional factors

Communication and advertising of the scheme were also considered of major important for the success of support schemes. It was also stressed that apart from setting a viable communication strategy, it is important that potential buyers understand RES-HC technologies and their impact on the economy, environment, and other aspects related to energy conversion. Finally, it was recommended that administrative burden and associated costs, both in time and personnel, for a scheme be kept to a minimum.

4.3 Additional elements

4.3.1 Flanking measures

Market study carried out in WP4 of the FROnT project refers that 68% of the respondents in the residential sector identified reliability and security as the main criterions when selecting renewable heating and cooling systems. Th findings suggest that RES-HC systems need to offer the same level of reliability as carbon base technology so that they can have the same level of acceptance from a potential buyer. Considering that RES-HC are most of the time deprecated over carbon base HC systems, additional effort has to be made to promote them, focusing at consumer still outstanding misunderstandings and doubts about their performance and the persistence claim that RES-HC are still unproven technologies. It would be interesting if the structure of support schemes can integrate or use other mechanisms, financing models and innovative business models.

It appears that setting a support scheme for RES-HC will require additional support measures to be put in place for the supply chain to ensure they can deliver. The additional support measures will help the supply chain deliver affordable, robust, reliable and efficient installations. If this is to happen the support scheme has to be complemented with verification system such as certification of installations. In fact there are existing European Norms for the certification of some of the RES-HC custom made systems. The certification of custom made

system might be more important for some markets than others. For instance, markets with low RES-HC up take, probably indicating barriers related to low consumer knowledge and confidence in these technologies, will most likely require that support scheme be coupled with some type of certification in order to beef up confidence on the systems been implemented. Markets with high uptake might require less or no certification and probably less support schemes.

In fact the 2009 EU Renewables Directive requires that certification mechanisms be established in EU Members States. The same Directive singles out solar thermal equipment and systems since it is the technology which alredy has mature testing and certification standards for equipment and systems.

For some markets, there is also a clear need to create some sort of registration mechanism for professionals and installations that support scheme can use. The registration will allow the consumers to register their complaints and someone to attend to their claims and ensure that they are resolved. Registration of complaints empowers consumers to participate in demand response, thus saving them money. With such a structure in place, it is expected that the consumer confidence in the technology will likely suffer some improvement.

On the other hand, a well designed and implemented custom made certification system will help reduce the number of complaints fed into the registration system. By reducing the number of complaints, the number of contentious verification of installations will be reduced and so the related costs. In other words, the lesser the complaints fed into the system, the fewer the need for certification and the lower the cost.

The registration of RES-HC systems can be done in such a faction that it will allow the establishment of communication lines between the institution in charge of its implementation and the consumer. This communication line will allow consumers to receive short notice on the time frame for equipment maintenance and will permit the registration of maintenance details been carried out in a particular system.

Consumers will have a reliable source not only to identify the installer closer to their area of residence but also to have access to a list of installers who have no outstanding claims from clients. It will allow the production of reliable indicators such as number of RES-HC systems that are working properly with no reported problems, number of systems that were subject to maintenance, typical maintenance cost, cost per installed power, cost per thermal heat generated, typical maintenance operation per RES-HC technology, time duration per maintenance act and per RES-HC options, and components most likely to be substituted per RES-HC technology. This information can be available to help consumer select heating/cooling option. The acquire information will also help deterred practices of over-selling, since reliable and structured information will be available for any potential HC buyer. In fact, the EU strategy on Heating and Cooling refers “Setting up a website with price comparison tools on the lifetime costs and benefits of heating and cooling systems” as one of the measures in pursue of its Heating and Cooling Strategy.

Policy Makers will be supported on robust and sound evidence of market needs and constraints. By knowing where the installations are sited at, Policy Makers will have an important element to help decide how the funds of the support schemes are distributed per region and technology. The information on the performance of the installers will help on the design of training materials based primarily on information gathered on the field.

In fact lack of trained professionals has been mentioned as one of the challenges and barriers in the implementation of the EU Heating and Cooling Strategy. Moreover, training of professionals (architects, installers and builders) was referred as one of the tools for the advance of the strategy in the building sector. The EU Heating and Cooling Strategy refers the intention to “extend the work of the BUILD UP skills campaign to improve training for building professionals”.

The support schemes coupled with certification and registration of installations will help consumer access in-depth advice based on robust evidence

and provide evidence to demonstrate the real-life performance of working systems.

In addition, for some of these technologies, for instance for solar thermal systems, there are already existing European certification norms that can be usefull to the support scheme.

Installers with strong performance record that have invested in their training would prefer to be differentiated from the ones that do not see qualification as an importante tool to improve their performance. For installers with good track record, it becomes a matter of justice that they be differentiated from the rest.

The design and implementation of a scheme should also include information on "break away time", defined as the time when the market uptake of a given technology attains levels of maturity that will permit the lowering of incentive levels and finally its termination, supporting the claim that support schemes cannot be maintained indefinitely.

Additionally, the design of new support schemes should consider the integration of new financing models and innovative business models.

The primary objective of support schemes is to compensate for market failures and unfair competition. They are also intended to favour the deployment of a given technology by creating a secure investment environment catalysing an initial round of investment and thereby allowing the technology to progress along its learning curve. Hence, support schemes should be temporary and can be phased out as this technology reaches full competitiveness in a (then) complete and open internal market where a level playing field is fully established.

Today, however, market conditions in the EU heat sector prevent RES H&C from fully competing with conventional technologies developed historically under protected, monopolistic market structures where costs reduction and risks were borne by consumers rather than by plant suppliers and operators. The internal market is still far from being perfect and transparent. Firstly, in many countries electricity and gas prices are regulated, thus they do not reflect the full costs of the heat generation. Secondly, there is lack of market transparency, including lack of information provision to customers and tax-payers and a clear billing.

Support measures for RES H&C technologies are therefore needed to favour the progress towards cost-competitiveness of a key source in the future European energy mix and to compensate for current market-failures.

4.3.2 Differenciated approach in line with maturity and special characteristics

On of the main findings of the IEE project "RES-H Policy" is that "[e]ffective policy must consider many factors, addressing multiple barriers and requiring different instru-ments to be applied simultaneously whilst avoiding overspending" (Connor P. et al, 2013: p. 14). Therefore "[t]here is a need to be able to identify and satisfy the particular support needs of disparate technologies (ibidem) varying in terms of size, applications, as well as market and technology maturity. In other words, each policy measure should address a specific market failure/barrier and aim to achieve a pre-determined result. This should always be considered by policy-makers when designing support schemes, including for RHC technologies. The portfolio of policy measures should be designed to ensure the ef-ficiency of the support, which implies to have a coordination of the policy measures and a consistency between them.

5. Acronmys

BAFA - the Federal Office for Economic Affairs and Export Control

CHP – Combined heat and power

EIA - The Energy Investment Allowance

ESA - Energy Savings agreements

ESCO – Energy service company

ESIF - the European Structural and Investment Funds

FROnT – Fair Renewable Options and Trade

KSF – Key success factors

LCBP - Low Carbon Buildings Program

MCS – Microgeneration Certification Scheme

PV – photovoltaic

RES – Renewable energy resources

RES – Renewable energy resources electricity

RHPP - Renewable Heat Premium Payment

ROC - renewable obligation certificates

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CONCLUSIONS

Although the factors considered contribute to the success of the schemes, some are crucial and should be stressed, qualification of professionals and audit of installations. In fact, qualification questions have to be addressed before the launching of a scheme and they should be continually adjusted during different phases of the implementation, which is only possible by carrying out a follow up of the installations.

Apart from qualification issues, it is important to implement some form of performance control. This can be achieved through a system of audits, which can be done randomly or in any other format that best fits the scheme. As already referred, audit evaluates the quality of the installations and, at the same time, the performance of the installers. The all process can be considered confidence building in which, at the end, the end user will be comfortable with the solution been considered.

It is also crucial that any KSF to integrate a scheme should stimulate market penetration of RES-HC and, if possible, help generate competion, leading to cheaper RES-HC solutions. The environmental concerns are only part of the equation and, as such, they should only add to consumer confidence in the RES-HC technology and not be taken as the only consideration.

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