Energy4Health

A Strategic Policy Roadmap to Improve the Framework Conditions that Influence the Demand for and Market Uptake of Innovative Energy Solutions in the Healthcare Sector

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1. Executive Summary

The Energy4Health project was funded to support the EU Demand-Side Action Plan[1], and was one of six projects aimed at 'Building and Implementing Strategic Roadmaps of Demand-Side Policy Measures to Boost Demand for Industrial Innovation'.

The aim of the Energy4Health project was to develop, and secure stakeholder commitment for, a strategic policy roadmap to improve the framework conditions that influence the demand for and market uptake of innovative solutions in the healthcare sector. The focus had a high degree of overlap with the grand challenges relating to energy efficiency, energy security, climate change and renewable energy targets. The policy roadmap presented in this document sets out a number of objectives, which if met will strengthen the demand for such innovative energy solutions.

The healthcare sector is a major energy consumer, with infrastructure alone accounting for some 1.6% of total EU energy consumption. At the level of individual healthcare facilities, this amounts to nearly 10% of facility budgets. Many hospitals in different Member States continue to rely heavily on fossil fuels for their power and heating needs and, with costs forecasted to increase, this will lead to an ever increasing share of budgets going towards meeting energy demand. Furthermore, this reliance on fossil fuels contributes significantly to the EU's greenhouse gas (GHG) emissions and local air pollution.

At the same time, the healthcare sector is facing major restructuring challenges across the EU. In part this is a response to overcoming the significant legacy of under-investment in healthcare facilities, but also in anticipation of a strategic shift towards delivering more health and social care in the community; dictated by the growing needs of an ageing population and better ways of responding to the rise of life-style chronic diseases. However, the relative lack of capital finance will mean an emphasis is placed on refurbishment and reconfiguration rather than replacement of hospitals that in turn will influence the scale and scope of investment in energy systems. This restructuring therefore provides an opportunity to transform energy infrastructures in a way that will meet the long-term requirements of the healthcare sector, while at the same time demonstrating leadership in sustainability.

The EU Member States have committed to the EU's 2020 energy and climate action plan to reduce GHG emissions by 20% (compared to 1990 levels), improve energy efficiency by 20% and deliver 20% of energy needs from renewable sources. In a separate initiative (the Parma Declaration on Environment and Health[2]), the Member States have committed to increase the healthcare sector's contribution to climate and sustainability targets. Together, these commitments should be driving forward action at the level of healthcare facilities. The reality is, however, that this is a relatively low priority for the wider healthcare sector, despite there being several examples of individual healthcare facilities, regions and even Member States taking initiatives to support progressive investment in more sustainable energy systems.

The Energy4Health project engaged with a broad spectrum of stakeholders to understand why the healthcare sector was not implementing energy efficiency (EE) and renewable energy system (RES) solutions more widely. This highlighted six main issues:

- Limited access to conventional finance and investment, and lack of awareness of the potential of EU Commission funding and innovative funding solutions. The healthcare sector makes good use of public and private funding to improve clinical services, but with few exceptions does not do so for energy.
- Lack of comparable energy benchmarking data, which limits the ability of individual healthcare facilities to identify the most effective solutions for energy improvements for their particular setting and needs.
- Lack of knowledge transfer and skills development for energy, which in turn can limit the capability, capacity and desire of healthcare management to understand and implement innovative energy solutions.
- Lack of recognition of the health impacts of energy choices. While the effect of burning fossil fuels on human health and the environment is widely acknowledged, there is little data on the extent of fossil fuel use across the EU healthcare sector, and, it follows, recognition of the contribution that the healthcare sector is making to these health and environmental impacts.
- Lack of strategic direction and incentives to address energy in healthcare. The healthcare sector is in the process of a strategic shift from the provision of acute healthcare to healthcare in the community, and as a result the future format and function of many facilities is uncertain.
- Risk aversion limiting adoption of innovative solutions. The healthcare sector requires that the services it adopts are tried and tested, however, many of the energy issues facing the healthcare sector will need innovative solutions.

[1] http://ec.europa.eu/enterprise/policies/innovation/policy/lead-market-initiative/#h2-1

[2] http://www.euro.who.int/en/health-topics/environment-and-health/Climate-change/publications/2010/protecting-health-in-an-environment-challenged-by-climate-change-european-regional-framework-for-action/parma-declaration-on-environment-and-health

Each of these issues can be addressed through improving the framework conditions that together are limiting the uptake of innovative energy solutions by the healthcare sector; and in so doing can directly contribute to the remit of the EU's Demand-side Action Plan. A number of drivers and barriers were identified which, if addressed, would stimulate the healthcare sector's adoption of innovative energy solutions. Successful delivery of these, and other, activities would position the healthcare sector as an energy leader, and demonstrate to the market the high replication potential for solutions across the EU. These activities are divided across a series of eight operational objectives that comprise the Energy4Health roadmap:

1. Encourage and facilitate the development of sector-level NEEAPs and NREAPs. The healthcare sector is a major consumer of energy and thus could contribute significantly to national energy efficiency and renewable energy action plans (NEEAPs and NREAPs). This could be achieved through voluntary or mandatory targets and supported by financial incentives.
2. Provide evidence of the scale of fossil fuel use in the European healthcare sector. A major survey of EU healthcare facilities should be performed, to provide evidence of the scale and geographic distribution of fossil fuel use. This then supports further targeted intervention to reduce fossil fuel use where it is most intensive.
3. Improve knowledge exchange on sustainable energy management in the healthcare sector. Healthcare management should be supported to understand the benefits to be gained from sustainable energy solutions. This could be achieved through web-based information and tools, networking and formal training.
4. Raise awareness of alternative funding options for transformation of energy infrastructures. Healthcare sector use of public and private funding has naturally focused on delivering clinical solutions, however there are sources that could be used to improve energy infrastructures, and awareness of these should be raised.
5. Encourage community and district level energy partnerships. Some sustainable energy opportunities may be too large or complex for individual healthcare facilities to consider and in such cases community partnerships could be the solution.
6. Raise awareness of the link between energy efficiency and patient well-being. Healthcare facilities may simply not consider what impact their use of energy has on patient well-being. They should be supported to do so through raising awareness of the evidence supporting the wider benefits of energy efficient practices.
7. Develop a European benchmarking database of energy consumption and production. Access to harmonised energy performance data across the EU healthcare sector would allow individual healthcare facilities to compare themselves with peers, identify opportunities for improvement and design solutions that best meet their particular operational requirements and aspirations.
8. Encourage the sustainable energy technology sector to consider the healthcare sector as a lead market for new and improved solutions. The healthcare sector tends to be regarded as conservative and risk-averse, however by nature of its size and ubiquity has the potential to be a lead market for the sustainable energy technology sector.

A number of different stakeholders have been identified whose active participation will be required to realise these objectives. This pivotal group, termed the Stakeholder Leadership Group (SLG), comprises networks and associations whose organisational objectives align closely with the operational objectives of the Energy4Health roadmap. These include health and environment organisations, organisations representing healthcare professionals, and national energy agencies. Their involvement will be required to perform the activities necessary to achieve the roadmap's operational objectives, and importantly to engage with: policymakers at the EU and Member State level (who establish and control the regulatory and fiscal frameworks affecting EE and RES uptake); healthcare sector management (who are responsible for developing strategy and implementing plans at local and individual facility levels); and Energy Service Companies (ESCOs) and energy technology providers (who provide the technical and, in many cases, financial solutions). Recommended actions for each of these three stakeholder groups are described, which can be achieved through delivering the roadmap in partnership with the SLG.

An implementation plan to deliver the roadmap's operational objectives through a series of actions over a five year period has been developed and is appended to this document. This also identifies a number of external activities that the Energy4Health roadmap can contribute to and which can in turn influence the outcomes of this roadmap. These include follow-on activities from the Parma Declaration and the implementation of EU Energy Directives.

Five first order outcomes from the Energy4Health roadmap are expected if it is delivered as described:

1. Transparent national and/or regional healthcare sector targets and strategies for EE and RES are adopted in some countries, thus directly contributing to NEEAPs and NREAPs.
2. Many healthcare facilities set voluntary targets for the reduction of fossil fuels, thus reducing environmental impacts and improving patient well-being.
3. There is a significant increase in the number of European hospitals joining the Global Green and Healthy Hospitals (GGHH) network to share data, knowledge and experience.
4. Many hospitals adopt new EE and RES measures, thus contributing to NEEAPs and NREAPs and reducing operating costs.
5. Increase in collaborative H2020 research and innovation projects with innovative energy technology suppliers, demonstrating solutions that could be replicated across the EU's healthcare sector, and the potential for the sector to be a lead market.

Further outcomes are anticipated and would be more significantly influenced by external activities. These are expected over a ten to fifteen year period and include the wider adoption of sustainable energy measures across the EU healthcare sector (and beyond); a situation that could lead to the healthcare sector attaining zero carbon status, and eventually zero net energy costs.

2. Glossary

CEN	European Committee for Standardization
CoM	Covenant of Mayors
CPD	Continuing Professional Development
CPME	Standing Committee of European Doctors
DG	Directorate General
E4H-SLG	Energy4Health Stakeholder Leadership Group
EC	European Commission
ECHAA	European Centre for Healthcare Assets and Architecture
EE	Energy Efficiency
EEA	European Economic Area
EED	Energy Efficiency Directive
EHMA	European Health Management Association
EHMB	European Environment and Health Ministerial Board
EHTF	European Environment and Health Task Force
EIB	European Investment Bank
EnR	European Energy Network
EPBD	Energy Performance of Buildings Directive
ESCO	Energy Service Company
ESIF	European Structural and Investment Funds
ETS	Emissions Trading System
EU	European Union
eu.ESCO	European Association of Energy Service Companies
EuHPN	European Health Property Network
FCP	Forward Commitment Procurement
GDP	Gross Domestic Product
GGHH	Global Green and Healthy Hospitals
GHG	Greenhouse Gas
H2020	Horizon 2020
HCWH	Health Care Without Harm
HEAL	Health and Environment Alliance
HSE	Health Services Executive (IE)
IDAE	Institute for Energy Diversification and Savings (ES)
IFHE	International Federation of Hospital Engineering
KIT	Karlsruhe Institute of Technology
KPI	Key Performance Indicator
MS	EU Member State
NEEAP	National Energy Efficiency Action Plan
NHS SDU	National Health Service Sustainable Development Unit (UK)
NREAP	National Renewable Energy Action Plan
R&D	Research and Development
RES	Renewable Energy System
ROI	Return on Investment
RTDI	Research and Technology Development and Innovation
SEAI	Sustainable Energy Authority of Ireland
UN	United Nations
UNFCCC	United Nations Framework Convention on Climate Change
WG	Working Group
WHO	World Health Organization

3. Introduction

The Energy4Health project is one of six[3] that are being carried out in support of the EU Demand-Side Action Plan[4]. The purpose of Energy4Health is to develop a strategic policy roadmap to improve the main factors (framework conditions) that influence the demand for sustainable energy solutions in the healthcare sector.

3.1 Why is Energy Important to the Healthcare Sector?

The European healthcare sector is a significant consumer of energy, with infrastructure alone accounting for some 1.6% of total EU energy consumption. This is estimated at 206,000GWh per annum, or equivalent to the total annual energy consumption of Portugal[5].

It appears that healthcare activities account for between 3-8% of the climate footprint in developed countries[6]. There is no available aggregate data on the carbon footprint of the European healthcare sector, however according to a 2011 estimate[7], the approximately 15,000 European hospitals are responsible for some 250 million tonnes of CO_2 per annum (including procurement of services and products, infrastructure, and transport), which is around 5% of EU CO_2 emissions – a figure similar to the international aviation and maritime transport in the (then) EU27. In the context of infrastructure, many facilities continue to use fossil fuels to generate onsite heating, cooling and electrical energy.

Energy prices have been increasing significantly. In 2013 the international price of oil and natural gas was around 2.5 times higher than in 2000[8]. While prices have fallen in recent months, over the longer term these are projected to continue rising. A study by the European Commission uses a baseline scenario of a 31% increase in post-tax electricity prices between 2010 and 2020 and a 41% increase in the wholesale natural gas price over the same period[9].

European countries are spending a growing proportion of GDP on healthcare. Public health expenditure in the EU28 was 5.9% of GDP in 1990 and 7.2% of GDP in 2010, projections show that expenditure may grow to 8.5% of GDP in 2060 only on account of demographic ageing – and to higher levels when other push factors are accounted for[10]. In many cases the healthcare sector is spending nearly 10% of its facilities' budget on energy[11].

For example, a typical hospital in Germany spends around €500,000 per annum on energy costs, which equates to between 2 and 3% of its total costs[12].

There are, however, limited sources of healthcare energy consumption data to allow comparison of the absolute and relative performance of healthcare sectors in different European countries. Eurostat data reports energy consumption at the level of 'Services' (of which 'Health' is one of several contributing sectors). The lack of available data is an issue in understanding the trends in healthcare energy consumption, and therefore identifying opportunities for improvement.

Energy intensity in different healthcare facilities is dependent on what services it provides (e.g. numbers of operating theatres, wards, laboratories) and the intensity or level of demand for these activities. According to the International Finance Group (a member of the World Bank), the global energy consumption benchmarks are around 400 kWh/m2 for hospitals and 275 kWh/m2 for clinics[13]. The German programme 'Klinergie' has analysed this further and estimates that, per hospital bed, hospitals consume as much electricity and heating as two households[14], and that in 2012 there were about 2.7 million available hospital beds[15] in the European Union. However, there is a general lack of energy consumption data for many healthcare facilities and in particular for units within them. This makes comparison difficult if not impossible between facilities based on activities, intensity and relative energy expenditure. Furthermore, it is important to recognise the different ways in which healthcare is delivered across Europe. The service remains predominately hospital-centred, however this is changing. In Scandinavian countries there is a marked shift towards more primary care and ambulatory based provision within the community, including home care. In Western and Southern Europe there is a growing consensus to move in this direction, but progress is

[3] The other five are concerned with electric vehicles, energy efficient renovation of residential property, energy producing buildings, ICT in transport and PV products

[4] http://ec.europa.eu/enterprise/policies/innovation/policy/lead-market-initiative/#h2-1

[5] Estimate derived through combining Eurostat data (http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search_database) on EU28 final energy consumption and service sector proportion of this (13%) with outputs of the EU funded ODYSSEE-MURE project (http://www.odyssee-mure.eu/publications/efficiency-by-sector/services/Services-profile-16.pdf), that provides an estimate of the composition of EU service sector energy use (with the Health sector being 12.3%)

[6] WHO (2011) Policy briefings: Health in the green economy. Co-benefits to health of climate change mitigation. Health care facilities: Preliminary findings – initial findings. Available at: http://www.who.int/hia/hgebrief_health.pdf?ua=1. Accessed 2 February 2015.

[7] LCB HEALTHCARE (2011) Low Carbon Buildings in the Healthcare Sector. State of the Art Report, LCB HEALTHCARE Consortium, April 2011, p.10.

[8] ODYSSEE/ Enerdata - http://www.odyssee-mure.eu/publications/efficiency-by-sector/macro/overall02.pdf

[9] 'EU energy trends to 2030 – update 2009', European Commission DG Energy, 2010, p.30

[10] 2012 Ageing Report – Economic and budgetary projections for the 27 EU Member States (2010-2060), European Commission, 2012

[11] Personal email communication from NHS SDU (05.01.15)

[12] EnergieAgentur.NRW (http://www.energieagentur.nrw.de/unternehmen/energieeffizienz-in-krankenhaeusern-4058.asp)

[13] http://www.ifc.org/wps/wcm/connect/fcf8d4804ada12b8b151fb888d4159f8/Green+Buildings+-+Opportunities+for+Healthcare.pdf?MOD=AJPERES

[14] In 2012 a hospital bed in Germany consumed 24,670 kWh heating and 17,786 kWh electricity. Source: Dickhoff, A. (2014) "Climate Projects in German Hospitals" Presentation for Webinar on Cleaner Energy Strategies in Hospitals. HCWH Europe, 18 December 2014.

[15] Eurostat (2014) Eurostat Regional Yearbook 2014: Health Eurostat Regional Yearbook 2014, European Union, Luxembourg, p.67.

relatively slow due to the impact of public funding austerity measures that are constraining investment potential. Central and Eastern Europe continues to struggle to overcome the legacy of outmoded hospitals (with an oversupply of beds) and progress towards new integrated models of care (social/community with hospital) and investment is proving difficult to gain traction due to issues of knowledge, capacity and funding. This all has a significant influence on relative reported energy consumption and the speed at which progress will be achieved. These differences in framework conditions across Member States can lead to challenges in comparing energy intensity measures.

In addition to these headline figures, there is a high level policy driver for the healthcare sector to focus on energy efficiency and renewable energy systems. In 2010 the Member State Ministries for both Health and the Environment, in the WHO European region, met in Parma (at the 5th Ministerial Conference on Environment and Health) and committed to 'increase the health sector's contribution to reducing greenhouse gas emissions and strengthen its leadership on energy and resource efficient management'[16]. As a result of this 'Parma Declaration' a European Environment and Health Task Force (EHTF) was formed to be the 'leading international body for implementation and monitoring of the European Environment and Health Process'[17]. This has wide membership amongst government agencies and non-governmental organisations and is mandated to exchange knowledge, review scientific evidence, facilitate collaboration amongst relevant stakeholders, and establish ad hoc working groups to address specific needs and issues. It also collaborates closely with another body established after the 5th Ministerial Conference on Environment and Health, the European Environment and Health Ministerial Board (EHMB) which comprises representatives from Member State Ministries for Environment and for Health, WHO and UN. This is the driving force for 'international policies in environment and health for implementation of the commitments made in the European environment and health process'[18]. Despite these activities and commitment there seems little evidence that changes are being implemented widely across Member States at the level of healthcare facilities. At the international level, the Global Climate and Health Alliance used the United Nations Framework Convention on Climate Change (UNFCCC) 17th Conference of the Parties to call upon governments and the healthcare sector to take positive action to limit healthcare sector contribution to climate change[19].

Each of these aspects could be addressed through the more strategic application of innovative energy efficiency (EE) and/or renewable energy systems (RES). However, implementing these solutions is not a straightforward task. Drivers may not be fully formed, or of sufficient strength to overcome existing barriers. In turn the barriers faced by different MS vary considerably. Overcoming these issues would allow the healthcare sector to 1) make a greater contribution to EU and national energy efficiency and renewable energy targets, 2) reduce operating costs through procuring innovative solutions, and as a result 3) demonstrate energy and environmental leadership in line with the Ministerial commitments within the Parma Declaration.

[16] Parma Declaration on Environment and Health (Fifth Ministerial Conference on Environment and Health, Parma, Italy, 10–12 March 2010) http://www.euro.who.int/__data/assets/pdf_file/0011/78608/E93618.pdf?ua=1

[17] http://www.euro.who.int/en/health-topics/environment-and-health/pages/european-environment-and-health-process-ehp/governance/european-environment-and-health-task-force-ehtf

[18] http://www.euro.who.int/en/health-topics/environment-and-health/pages/european-environment-and-health-process-ehp/governance/european-environment-and-health-ministerial-board-ehmb

[19] http://www.climateandhealthalliance.org/news/protecting-public-health-from-climate-change-a-global-call-to-action

4. Understanding the Framework Conditions that Influence the EU Healthcare Sector

The Energy4Health project considered situational factors, trends and policies that have an influence on the exploitation of innovative energy technologies in the healthcare sector. It studied nine contrasting European countries: Finland, Germany, Hungary, Ireland, The Netherlands, Norway, Poland, Spain and the UK (specifically NHS England). These were chosen as they represent examples of the two broad healthcare system structures within the EU. The Beveridge model is used in the UK and in most Nordic countries, and relies on direct taxation at the level of central government (in some Nordic Countries inclusive of local municipal taxation), with the national healthcare budget redistributed to provider organisations at regional or local level. The Bismarck, or social insurance model, is used in most other European countries. Bismarck-type funding typically involves a mix of payments to healthcare insurance companies from individual citizens, employers and local or central government, with differing balances between these payers in different parts of Europe. The insurance companies – which vary in nature from small, regionally-based companies to larger private corporations, and publicly-owned institutions – then negotiate services for their clients from the available range of healthcare providers.

Short case studies were prepared for each country[20], which illustrate the different healthcare systems and national energy policies, and how these have an impact on investment in energy-related infrastructure within the healthcare sector. This highlights some interesting similarities and differences between these countries. It also provides examples of demand side measures that could be replicated by other countries or regions in order to better support both EU and national/regional policies for both healthcare and energy.

4.1 Healthcare Sector Trends

Demographic and epidemiological trends and more demanding citizens (in the context of improved quality and greater accessibility to care) have increased the pressure for health and social care services at the same time as the economic crisis has constrained public sector spending. Whilst the demographic ratios and epidemiological forecasts may vary, the underlying trend of ageing societies and the related problems of rising levels of chronic illness is common to all. The sector is now in the early stages of facing up to a long term transformation from traditional hospital centric healthcare to a more integrated model of health and social care in the community that will also have a strong emphasis on prevention. The challenge is the same for all healthcare systems in Europe, but the current national/regional governance, delivery and funding structures vary widely between countries and even regions of the same country. For example, most of the hospitals in The Netherlands are operated by the private (predominantly charitable) sector, through an insurance-based market system, except for a small number of large university hospitals. In other countries, the public sector ownership model is still apparent but there are also a number of mixed models, such as in Ireland where the private and voluntary sector hospitals receive public funding. England, unlike the rest of the UK regions, is seeking to increase the level of private sector involvement. Finland is moving from a highly decentralised model to a more integrated, five region system.

The current situation in many countries is quite turbulent and the future landscape is uncertain. What is clear is that the number of hospital beds has been at best static, if not decreasing, in most European countries. Refurbishment and rationalisation of existing facilities is much more common and represents the future face of most capital investment. It is very unlikely that Europe will see the scale of new hospital building, experienced over the past decade, repeated in coming years.

In spite of its growing strategic importance in terms of escalating prices, operational service risk, patient comfort and environmental sustainability, it seems that 'energy' is well down the priority list for most health ministries and local healthcare management (even with the Ministerial commitments made via the Parma Declaration). The transformation of delivery infrastructures should be regarded as an opportunity for community energy systems that are fit-for-purpose, resilient, self-financing and demonstrate leadership in how to reduce the negative impacts of fossil fuels. The reality is that, without further co-ordinated action, the most likely scenario for 2020 is one of continuing healthcare sector investment in unsustainable energy systems.

[20] The Energy4Health country case study report can be downloaded from the EcoQUIP website: http://www.ecoquip.eu/uploads/pdfs/Appendix%20D.pdf

4.2 The Influence of Energy Policy

It is clear that national energy policy is influenced by three main factors:

- The current energy supply mix;
- EU Directives and regulations;
- National climate change policies/targets.

The energy supply mix and cost of energy is quite variable across Europe. Germany has been investing in renewables whilst moving out of nuclear. The UK has become more pro nuclear as has Hungary. Ireland, Netherlands and Spain are all quite dependent on imported gas. Poland is still very dependent on coal. Norway exports most of its oil and gas production and uses hydropower and district heating systems for the majority its energy needs.

The energy related policies of the Member States have been influenced by transposition of the various Directives to support the EU 2020 climate and energy package with its 20 20 20 targets for energy reduction, renewable energy production and greenhouse gas (GHG) emission reduction. This also has an influence in Norway, where particular EU Directives are also included in EEA agreements. It is not always clear how these are implemented at the national level due to the scope and timing of different national implementation instruments, including specific regulations and building standards, but all Member States had to submit National Renewable Energy Action Plans (NREAPs) to the Commission by June 2010. Much of what has been implemented in the past few years is related to the EU Directives that were introduced from 2009 onwards to support the achievement of the mandatory 2020 targets. More recent examples include the 2010 Energy Performance of Buildings Directive (EPBD) and the 2012 Energy Efficiency Directive (EED).

Of current relevance is the new EU EED, which had to be implemented by Member States no later than June 2014. One of the requirements is that National Energy Efficiency Action Plans (NEEAPs) have to be submitted to the Commission every three years starting in 2014. Also, large enterprises must carry out an energy audit at least every four years starting no later than December 2015. The public sector is expected to lead by example through renovating buildings and including energy efficiency considerations in public procurement. Indeed there is a requirement for each Member State to refurbish at least 3% (by floor area) of building stock owned and occupied by Central Government each year in line with energy efficiency targets. While this does not at present apply to all public bodies, there is an expectation in the Energy Efficiency Directive that Member States will "encourage public bodies… to adopt an energy efficiency plan"[21].

A new 2030 framework for climate and energy policies was proposed by the Commission and accepted by EU leaders on the 23rd October 2014. Although this no longer stipulates Member State targets, it commits Member States to collectively contribute to the reduction of GHG emissions to 40% of their 1990 levels by 2030, increasing the share of renewable energy to at least 27% and making energy savings of at least 27% by 2030[22]. The EC is currently reviewing energy policy as part of the Energy Union Package[23], which aims, amongst other things, to place greater emphasis on energy efficiency, including new strategies for improving energy efficiency within buildings. In 2015 and 2016 the EC will review existing legislation and propose any necessary revisions to ensure that 2030 EE targets are met. Similarly, a new package for RES will be proposed in 2016-17 to ensure that 2030 targets are met.

Some countries have already introduced more ambitious policies, regulations and targets than required by the EU Directives. For example, Ireland's 2020 targets are to improve energy efficiency by 33% and produce 40% of its energy from renewable sources. Finland, Germany and the UK are also aiming for 2020 renewable energy targets that are well above the EU norm. Norway is considering accelerating its 2050 carbon neutral target to achieve this goal by 2030. Whether these aspirations will be realised or not is uncertain as there is political pressure in some countries to scale back green energy policies, which are being blamed for rising consumer energy prices.

Health Care Without Harm (HCWH) Europe has performed a detailed analysis of the impact of existing and planned EU climate and energy legislation on the healthcare sector.[24] In addition to EED and EPBD, the HCWH report assesses the impact of other legislation governing energy efficiency and sustainability that in some cases is mandatory and in other cases could be applied voluntarily to the procurement of products and services by the healthcare sector, such as Green Public Procurement[25], the Energy Labelling Directive[26] and the Ecodesign Directive[27]. This report also underlines the need to "improve Member States' transposition and implementation of relevant legislation, with the EU Commission taking a more proactive role in using its enforcement authority" and raises concerns over the lack of MS-specific targets within the 2030 framework for climate and energy.

In effect many European countries are simply reacting to EU Directives and doing the minimum required for compliance or even not meeting these targets.

[21] Energy Efficiency Directive 2012/27/EU

[22] Conclusions of the European Council (23 and 24 October 2014) http://ec.europa.eu/clima/policies/2030/index_en.htm

[23] Energy Union Package COM(2015) 80 final (http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52015DC0080&from=EN)

[24] Climate action in the EU healthcare sector. Legal framework and possibilities. Published by HCWH Europe, March 2015

[25] http://ec.europa.eu/environment/gpp/index_en.htm

[26] http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32010L0030&from=EN

[27] http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32009L0125&from=EN

4.3 Energy related Impacts in the Healthcare Sector

There are four main drivers for investment in more sustainable energy solutions in the healthcare sector:

- Economic pressure to save costs by reducing energy consumption.
- Modernisation of healthcare infrastructures.
- Progressive national/EU regulations, standards and targets that apply to the service sector.
- National or regional commitments for public sector organisations to be exemplars in reducing environmental impacts.

It is difficult to judge the impact of these as there is a general lack of current and historical data on energy consumption or CO_2 emissions from the healthcare sector. In some countries, one off surveys have been carried out and this gives indicative values. An exception to the rule is the UK, which has established a systematic process for gathering and reporting energy and carbon related data from hospitals. This is apparent not only in England but also in Scotland, which has full delegated autonomy over healthcare matters. It may be that the requirements of the EED will improve the quantity and quality of data, but this appears unlikely without some health sector specific intervention.

Certainly, there is a long term evolutionary trend towards better energy efficiency in hospitals, but that has sometimes been offset by investment in more energy intensive equipment. Some actions taken by hospitals are due to available funds (EU, national/regional environmental funds, and ESCOs). Although energy prices have been rising, they are still a relatively small proportion of the overall operating costs for healthcare systems and so the issue tends to be delegated to the technical management level.

4.4 Examples of Demand-side Measures in the Healthcare Sector

Desk research carried out within the Energy4Health project and including analysis from previous projects, has highlighted a number of interesting demand-side measures that could be more widely replicated. Illustrative examples are provided below:

Mandatory sector targets and/or requirements

- Requirement on the public sector to play an exemplary role with new hospital developments demonstrating public accountability for energy efficiency (e.g. Finland).
- Specific mention of hospitals in the 2009 National Renewable Energy Action Plan for Hungary (in contrast, healthcare is not even mentioned in some countries' NREAPs).
- The new Operational Programme for Society Infrastructure in Hungary has identified energy savings as a target for cost reduction.
- Large energy users in The Netherlands (including hospitals) have a mandatory obligation to invest in energy efficiency measures that have a payback time of less than five years (unless there is a voluntary agreement with their sector).
- The regional and municipal authorities (which operate most of the healthcare facilities) in Norway are required to prepare and implement local climate and energy plans.
- NHS England Carbon Reduction targets (34% and 80% reductions in CO_2 by 2020 and 2050 respectively), which are based on the UK Climate Change Act of 2008.

Voluntary agreements as an alternative to regulations

- Steering approach in Finland for voluntary agreements, negotiated at local Municipality level, which contributes towards national targets. Municipalities are the owners of most public hospitals.
- The 'Energy Saving Hospital' voluntary labelling scheme in Germany.
- The eight university hospitals in The Netherlands have a self imposed target to reduce their energy consumption by 30% between 2005 and 2015.
- Most healthcare trusts in England have a Board approved sustainability plan.
- Energy efficiency guidance document for the healthcare sector commissioned by the Spanish government.

Integration of targets and/or requirements in procurement specifications

- Nottingham University hospital used a market sounding approach to procure energy solutions that would set it on the pathway towards the UK 2050 target for CO_2 emission reductions.
- The new Espoo Rehabilitation Hospital development in Finland has adopted the requirements of the Environmental Impact Assessment Directive even though this is not a mandatory requirement for hospitals.

Monitoring key performance indicators for energy consumption, renewable energy production and use of fossil fuels

- Annual reporting of energy consumption, uptake of renewables and greenhouse gas emissions has been mandatory for all healthcare facilities in England since 2011/12.

Strategic approach to energy related issues in new build and major renovations

- The new St Olav's hospital in Norway was designed in a way that created distinct centres of care with energy systems designed for different building zones (i.e. offices, hotels) rather than what was previously typical for energy intensive hospitals.

Engagement with well resourced energy agencies that are able to provide both strategic and practical support to health sector organisations and engage with influential stakeholders

- Motiva Oy in Finland (a state owned company to promote the use of renewables) cooperates with local municipalities and the Finnish Association of Architects.
- The Health Services Executive (HSE) in Ireland made a commitment to join the Sustainable Energy Authority of Ireland (SEAI) Energy Partnership.

Centrally coordinated programmes on energy related issues for the healthcare sector

- NHS England has established a Sustainable Development Unit, which is tasked with providing the health service with advice on such aspects as energy, travel, waste, procurement, water, infrastructure adaptation and buildings.
- HSE in Ireland has established a National Health Sustainability Office to support national targets related to energy, waste and water.
- The Research Council of Norway has been funding R&D and commercialisation projects on new climate friendly technologies including one aimed at halving energy consumption in future hospitals.

Incentives to invest in energy saving and/or renewable energy production technologies

- Feed in Tariffs to encourage investment in renewable energy production (e.g. Finland, Germany, Ireland, UK).

Measure to overcome barriers to investment

- Some hospitals in Hungary and Poland exploited the last EU Commission (Cohesion Policy) Operational Programme for Energy and Environment or Structural Funds to support sustainable energy related investments.
- Spain introduced a modification (proposed by IDAE) to the Contract Act in 2010 that allows public organisations to enter into external financing contracts with ESCOs.
- Coordinated approach in Ireland to encourage the use of ESCOs to help public sector bodies (including hospitals) invest in energy saving projects.
- A publicly funded company (Salix Finance Ltd) was set up in the UK in 2004 to provide the public sector with loans for energy efficiency. More recently a Green Investment Bank has been established.

5. Stakeholder Perspectives

The Energy4Health project engaged with a number of stakeholders to build on its initial desk research and understand their perception of the key framework conditions that influence the uptake of innovative energy solutions within the healthcare sector.

The main groups involved in this consultation process were:

- Healthcare sector management, who are ultimately responsible for identifying, adopting and implementing new energy measures. This group includes technical managers of facilities and city/regional health boards.
- Policymakers, who can create the right framework conditions to incentivise the healthcare sector to implement innovative energy efficiency and renewable energy systems. This can be through financial incentives and/or regulatory options. This group includes policymakers at the national and European level that are responsible for healthcare, social care, energy, or environment.
- Energy and technology suppliers, who can provide innovative technology and service solutions to the healthcare sector. This group includes Energy Service Companies (ESCOs) and suppliers of equipment.
- National energy agencies, which provide energy-related advice (particularly on efficiency and sustainability) to a variety of stakeholders. In some cases they are responsible for managing funding programmes for energy RTDI and for implementing national energy efficiency and renewable energy plans.
- Investors, who can provide the finance for longer-term, more strategic developments. This group includes investment banks, such as the EIB.
- Other organisations and associations, which support energy efficiency and sustainability, and have a primary interest in the healthcare sector. This group includes the World Health Organization and healthcare professional bodies.

5.1 Initial Consultation

An initial stakeholder workshop in June 2014 identified the following key issues regarding the adoption of innovative and sustainable energy solutions within the European healthcare sector:

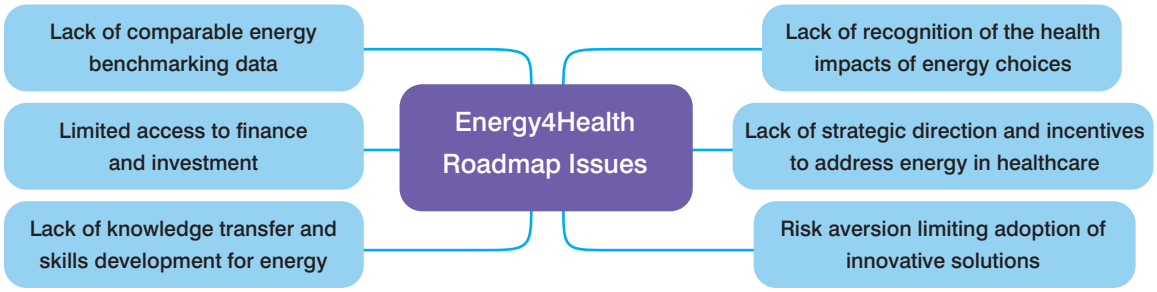

Figure 1. Healthcare sector energy issues identified by workshop participants.

Each of these issues is discussed in greater detail below, and examples provided where individual healthcare facilities or Member States have addressed the issue. These can be regarded as evidence that such issues can be overcome through improving framework conditions.

Lack of comparable energy benchmarking data

There are limited requirements placed on the healthcare sector to report energy consumption. Without this data it is very difficult to identify where the most effective improvements can be made (without undergoing full energy audits). Furthermore, collection of this data would allow audited energy savings to be better quantified (e.g. per healthcare facility unit or zone and by type of intervention) permitting facilities to both benchmark their performance and identify solutions that might best fit with their particular operational environment.

Examples of where such systems are in place or are being developed include the devolved UK region of Scotland, which has an autonomous healthcare system. Within this structure is an agency, known as Health Facilities Scotland, which provides technical support to the sub-regional health boards and also produces an annual performance report on a number of issues including energy and fossil fuel consumption. Each of the sub-regional health boards is required to provide performance related data to an online system every quarter and meet progressive annual reduction targets.

The University hospitals in France have recently embarked on a joint initiative of comparative benchmarking including energy-related indicators to help them identify areas for improvement. The comparative data is reported in an anonymous way.

Limited access to finance and investment

The healthcare sector may be limited by available financial options, because of national regulation (e.g. preventing access to private finance), or investment payback criteria that are too short for substantive developments, or overly complex procedures that inhibit uptake. In some cases financial savings may not accrue to the site (instead going back to the local or regional authorities) which can act as a disincentive to investment. Investors and finance companies may also not realise the intensity of the healthcare sector as far as energy use is concerned and the high replication potential of offered solutions. Overcoming this perception through case studies could increase the availability of finance to healthcare facilities.

The Spanish public sector is a good example of how such barriers have been overcome. Until recently public sector organisations were not allowed to borrow money from commercial sources. This was addressed through a modification of the Contracts Act that was proposed by the Organisation for Energy Saving and Diversification (IDAE). The modification allows public organisations, including hospitals, to enter into public/private contracts with energy service companies (ESCO) to overcome the barriers to capital investment.

The University hospitals in The Netherlands made a joint commitment to reduce energy consumption and one of the strategies adopted was to increase the investment payback period from three to seven years. This opened up a whole new range of options for more radical energy savings and also made some renewable energy investments more feasible. The self-set targets exceeded government aims for the commercial (non-hospital) sector.

Greater awareness of how available instruments can be used to access funding should also be addressed. For example, some Member States were experiencing difficulties in applying for funding for general healthcare sector improvements in the current European Structural and Investment Fund (ESIF) programme. A working group was established to address this by providing a support network to improve knowledge competency through peer interaction, and producing a 'toolbox guide' to ESIF. This approach could be usefully replicated for funding healthcare energy initiatives through ESIF.

Lack of knowledge transfer and skills development for energy

The primary focus of healthcare sector management is on direct clinical and care services with the overriding priority of patient safety and quality of service. As such there may be limited capability, capacity and desire to understand and implement innovative energy solutions. The establishment of networks to facilitate knowledge exchange across the EU would go some way to addressing this issue. Such a platform should involve both supply and demand sides, and actively disseminate best practices.

National Energy Agencies are a good example of how this issue can be addressed. In 2002 the Government in Norway established a new agency (known as Enova) to support energy efficiency and renewable energy objectives. It was given a defined target (TWh/year), stable funding and a high degree of flexibility to achieve the target. The model was deemed successful and renewed in 2012.

The state owned company Motiva Oy in Finland is another good example of providing expert (sponsored) support to hospital managers.

Lack of recognition of the health impacts of energy choices

Inefficient and polluting energy systems have a negative impact on both the environment and the health of local and global populations. For example, it has been estimated that "for every TWh (Terawatt-hour) of electricity produced from coal in Europe, there are 24.5 deaths, 225 serious illnesses including hospital admissions, congestive heart failure and chronic bronchitis, and 13,288 minor illnesses"[28]. It follows that the choice of energy source and energy efficiency measures adopted by hospitals should be an important part of the health agenda. However, with some notable exceptions, this is not the case. Furthermore, there are few examples of changes to energy supply and use being encouraged through a requirement for healthcare facilities to comply with EU 2020 targets, despite the declaration in Parma in 2010 by European Ministries for Health and the Environment 'to increase the health sector's contribution to reducing greenhouse gas emissions and strengthen its leadership on energy- and resource efficient management'. In contrast there are examples of where healthcare facilities are exempted from compliance by their national governments. For example, the UK has the 'Small Emitter and Hospital Opt-out Scheme' which allows UK hospitals to opt out of the Emissions Trading Scheme (ETS) in the period 2013-20[29] through implementing other national measures to compensate for this.

Within hospitals themselves, it has been recognised that patient experience (and therefore recovery) is strongly influenced by their immediate environment[30]. Simple actions such as controlling ventilation, reducing noise, temperature fluctuations, and unnecessary light intrusion (e.g. through shutting doors and turning lights and equipment off when not in use) can promote patient well-being, while at the same time leading to a more efficient use of energy.

Barts Health NHS Trust (the largest in England) has been recognised as an exemplar in this area. Barts has partnered with Global Action Plan, General Electric, and Skanska to introduce behavioural changes amongst staff to implement energy saving measures totalling £105,000[31]. Barts has furthermore looked at the wider issue of domestic fuel poverty to identify those most at risk in the local community (via hospital clinics) and refer them to a utility company (British Gas), which consequently fit measures that improve warmth in individual homes. This not only improves the wellbeing of these individuals, it also lowers the burden on hospital acute care. Barts has developed an integrated plan for more efficient heating, cooling and power plants, improved ventilation and other energy efficiency measures (including working with suppliers). Its strategic vision is to reduce its carbon footprint by 34% by 2020 (based on a 2007 baseline).

Lack of strategic direction and incentives to address energy in healthcare

The healthcare sector as a whole is experiencing / anticipating a strategic shift from the provision of acute healthcare to healthcare in the community, where the focus is on prevention and social care. The reasons for this are two-fold: 1) to improve the overall health of citizens, and 2) reduce healthcare costs. However, this strategy is not yet fully mapped out and in many cases lacks political commitment, which creates uncertainty for future investments (particularly where these rely on the private sector). There are also missed opportunities to incentivise the healthcare sector to meet EU 2020 targets, which could in turn contribute significantly to the NEEAP and NREAP of Member States.

In the case of Hungary, the specific Structural Fund Operational Programme for 'Health' 2007-13 did not incorporate any major energy strategies. However, despite this, there have been 34 energy saving projects implemented in 30 hospitals financed from the generic Operational Programme for Energy and Environment. Under this provision hospitals were encouraged to make applications for building modernisation (e.g. energy conservation measures such as installation of high energy standard windows) and renewable energy production. The total allocation to the hospital sector was €21 million. Although considerable progress was made, nevertheless there remains a lack of overall strategic collaboration on energy strategy within the healthcare sector. Most of the hospitals that received funding did so through taking their own initiative in applying for funds. The lesson here is that there needs to be far better coordination between the healthcare sector and the mainstream government departments responsible for energy and environmental policy.

Slovakia's negotiation of its 2014-20 Structural Fund programme, which contains around €300 million to be allocated to whole systems reform of its health system (€120 million primary care development, €182 million for hospital reconfiguration) will incorporate appropriate energy conservation initiatives and renewable energy strategies in all new infrastructure development. This formed an important element in the case of need for Structural Funding support. It is noteworthy that one important factor in achieving this level of funding success was the high level of political leadership and government commitment for the proposal.

[28] Scientific Evidence of the Health Effects from Coal Use in Energy Generation', Health Care Without Harm/ University of Chicago, 2013

[29] This relates to Article 27 of the EU ETS Directive. https://www.gov.uk/government/publications/uk-small-emitter-and-hospital-opt-out-scheme

[30] Healing environment: A review of the impact of physical environmental factors on users. Huisman et al. Building and Environment 58 (2012)

[31] http://greenhospitals.net/wp-content/uploads/2012/03/Energy-Barts-UK.pdf

Germany offers another example of how Government policy can stimulate investment in energy efficiency measures and the use of renewable energy in the healthcare sector. This has led to many good examples and also a programme known as 'Energy-Saving Hospitals', which was launched in 2001 and has led to dozens of hospitals being labelled as such.

Risk aversion limiting adoption of innovative solutions

The healthcare sector is conservative about choosing energy technologies, and tends to view energy as an operational and not a strategic issue. In some countries this phenomenon is increased by the organisational culture of the public sector and control / auditing policies of these countries virtually prohibiting innovation. However, many of the issues facing the healthcare sector, such as legacy energy systems and compliance with regulations on EE and GHG emissions will need to be addressed through innovative solutions (both technical and financial). The size of the healthcare sector means it has a strong potential to be a lead market, where innovative solutions could be replicated across different Member States and different sectors. Furthermore, there are opportunities to partner with others to generate energy for the community, and not just the healthcare facility.

There are examples of how healthcare facilities can deliver longer-term, innovative solutions to meet their strategic goals. Nottingham University Hospitals NHS Trust in the UK needed to replace its existing coal-fired boiler and initially considered a biomass-powered boiler that would reduce its carbon footprint in line with the UK climate change target to reduce CO_2 emissions by 80% before 2050. However, it was clear that this approach did not offer the flexibility and reduced exposure to rising fuel and carbon prices for a more sustainable future. The Trust decided to use a market sounding approach to communicate its needs for an ultra-efficient total energy solution, and received more than 65 responses offering a variety of solutions including innovative sources of commercial funding. It has also explored options for technological leadership in the area of hydrogen fuel cells and how this can be realised using funding from the recent established Green Investment Bank that was set up by the UK Government.

In another UK hospital, the Technical Director believed that developments in energy technologies are such that any investment made today will be obsolete within 10 years. This led to an 'off-balance-sheet' approach to investment in energy infrastructure in partnership with an ESCO, which will be required to remove the equipment at the end of the contract period – thus leaving the flexibility to start again with a totally new energy supply contract.

Gundersen Health System in the United States is an example of how an innovative and collaborative approach can lead to energy self-sufficiency for a portfolio of hospitals and clinics. This was achieved by setting up a dedicated unit and investing in a wide variety of sustainable energy projects to both reduce consumption and exploit sources of renewable energy. Through a structured plan it has managed to achieve energy independence and a zero carbon footprint. It continues to work towards zero net energy costs[32].

Three hospitals in The Netherlands took advantage of the RES-Hospitals project and explored a radical zero carbon option based on exploiting deep geothermal energy resources. The feasibility studies indicated that the system would need to be of a scale that was around three times that of the hospital energy demand to be economically viable. A wider, community-based, perspective indicated that there were other high energy users in the locality for two of the hospitals (including a zoo) and therefore the potential for a community energy project led by commercial developers.

5.2 Follow-on Consultation

A roadmap was formulated to address these issues, comprising a number of drivers to be strengthened and barriers to be overcome that, once achieved, would place the healthcare sector in a position of energy leadership. From the workshop a draft Vision Statement for energy in the European healthcare sector in 2025 was elaborated:

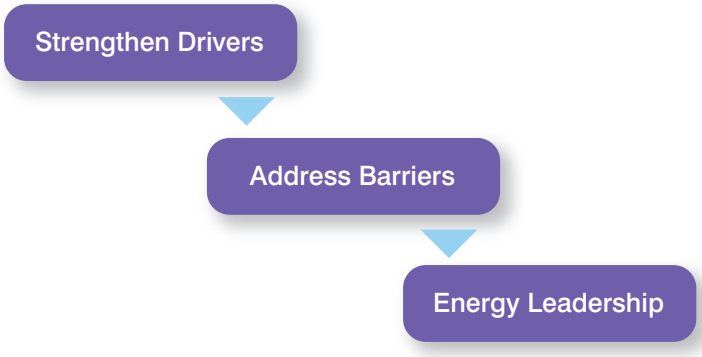

Figure 2. Overview of Energy4Health roadmap and Vision 2025 statement.

Energy4Healthcare VISION 2025

The European healthcare sector has become a global leader in energy efficiency and community renewable energy systems. Many are becoming both carbon and cost neutral. The average cost of energy is less than 1% of healthcare budgets and the sector is well on its way towards reducing its 2050 carbon footprint to less than 20% of 1990 levels.

[32] http://www.gundersenenvision.org/gundersen-reaches-first-days-of-energy-independence

The draft roadmap[33] that outlined potential actions to strengthen drivers, address barriers and create the conditions for energy leadership was circulated within the stakeholder community for comment. In total, 35 qualitative responses to this extended consultation were received. There was broad agreement with the scope of the roadmap, its specific actions and objectives, and understanding of the issues facing the healthcare sector. The following aspects were highlighted as being of major importance by a number of respondents:

1. Ultimately the main drivers and/or barriers for healthcare facility management will be financial and regulatory in nature. The primary concern of healthcare management is delivering patient care (within increasingly stressed and stretched resources); so energy is unlikely to feature high on agendas unless there are regulations to comply with (in terms of EE and RES), or there is a demonstrable, and relatively short-term, cost saving that delivers a surplus for reinvestment in patient care, or there are dedicated funding schemes for energy improvements (that do not detract from clinical investments). Even in the latter case there will be a certain degree of disincentive if these are difficult to access, or manage.
2. Financial aspects need to be explored further. Better financial instruments and support to access these need to be made available to the healthcare sector to improve uptake of EE and RES, especially longer-term or strategic developments. In this regard there should be greater clarity of access to ESIF and other sources of finance, to stimulate bids for innovative energy solutions within the healthcare sector.
3. There is a lack of data on the sources of energy used by the healthcare sector across the EU, as well as energy consumption and performance across different facilities and units within facilities. Following on from this there is a lack of evidence to present to healthcare facilities on the operational savings and the reduction of environmental and health impacts to be achieved through adopting innovative EE and RES. There needs to be concerted action in building a database of energy sources, consumption and performance (against defined facility units) and a portfolio of case studies demonstrating the benefits to be derived from EE and RES across different types of healthcare facilities and in different Member States. This needs to demonstrate that solutions can be translated across the healthcare sector and the EU.
4. The healthcare sector tends to be risk averse; so energy solutions should be based on proven technologies. Innovation could come in the form of the technology mix, or the financial means to deliver and service energy systems, or a combination of these. There is scope for healthcare specific demonstration projects, supported by dedicated funds, such as Horizon 2020. Through this the healthcare sector has the potential to become a lead market.
5. National and local government are key stakeholders to be engaged within this process – they have the authority and power to implement change that would support the adoption of EE and RES initiatives, but they need convinced to do so. There also needs to be a stronger link between EU and Member State policies and initiatives, which could help implement EU Directives at the Member State level (e.g. the EU 2020 energy and climate targets) and at the same time help leverage available EU public funding through targeted MS support.
6. Budget constraints mean there are fewer human resources available to pursue activities that are not seen as core to the healthcare function. Those personnel that are available may not have the necessary skills or knowledge with which to make informed decisions. In other words both capacity and capability for energy improvements may be severely lacking within healthcare management. There needs to be more effort put into training and knowledge exchange to address these issues.

5.3 Improving Identified Framework Conditions

Based on stakeholder feedback, eight operational objectives were identified that together would improve the framework conditions necessary for the uptake of EE and RES solutions within the healthcare sector. These are described under the three strategic objectives below.

Strengthen Drivers

1. Encourage and facilitate the development of sector-level NEEAPs and NREAPs.
   From the top-down perspective of the MS governments, the healthcare sector is a major energy consumer and as such could be a significant contributor to meeting NEEAP and NREAP targets. Contribution could be driven by voluntary or mandatory targets, and supported through financial incentives. These interventions would encourage the healthcare sector to engage with suppliers to identify and implement both proven and innovative EE and RES solutions. To encourage this, separate streams of funding for EE/RES projects could be made available only to the healthcare sector.
2. Provide evidence of the scale of fossil fuel use in the European healthcare sector.
   The connection between burning fossil fuels and the impact on human health and the environment has been established, and EU MS have committed to reducing healthcare GHG and particulates emissions and increasing EE. However, widespread implementation of this at the level of individual healthcare facilities has not yet happened. Raising awareness, and participation in

[33] The Energy4Health draft summary roadmap can be downloaded from the EcoQUIP website: http://www.ecoquip.eu/uploads/pdfs/Energy4Health%20-%20Summary%20of%201st%20draft%20Roadmap.pdf

initiatives that address this, would support greater adoption of EE and RES by healthcare facilities. Furthermore, the true financial cost of fossil fuels, including health care costs, is poorly understood and not taken into account when evaluating energy investment options.

Reduce Barriers

3. Improve knowledge exchange on sustainable energy management in the healthcare sector.
   Capacity and capability within healthcare sector management have been identified as major barriers by stakeholders. However, there are examples of schemes within MS, and outside the EU, where support has been provided to share knowledge and experience. These could be studied to develop appropriate systems for different MS and further developed into professional networks and training programmes.
4. Raise awareness of alternative funding options for transformation of energy infrastructures.
   The healthcare sector has made good use of the EU Structural Funds to implement improvements to, and innovative reform of, clinical and care services, however, it has missed opportunities to access these funds for improvements to energy infrastructure (due to a lack of awareness or capacity, or concern that the competition with other sectors is too high). At the same time access to private finance may be limited because of a lack of awareness, constraints placed by government, or limitations on payback periods. Constructive dialogue between healthcare management and those controlling and supporting access to the Structural Funds and setting rules for access to private finance would help alleviate this.
5. Encourage community and district level energy partnerships.
   As noted above, future healthcare strategies in most countries are moving towards preventive healthcare and social care delivered in the community. In addition, many facilities have the potential to take a lead role in the generation of thermal and/or electrical energy, and as such could partner with other organisations in the community to do so. There is a clear opportunity to consider energy provision over the long-term when developing strategic plans for renovation or new infrastructure build. However, there may be internal or external barriers that prevent this happening. In some countries this may require changes to legal frameworks. Overcoming these could both reduce overall operating costs for facilities, and strengthen their position in the community.
6. Raise awareness of the link between energy efficiency and patient well-being.
   Simple strategies such as regulating lighting, heating, ventilation and noise have been demonstrated to improve patient comfort, while at the same time reducing costs and environmental impacts. While there are some examples of such activities, many facilities are simply not aware of what can be achieved. Raising awareness of this and providing a strong evidence base through dedicated campaigns, will support healthcare management in considering wider options and engaging with suppliers to implement these as necessary.

Demonstrate Energy Leadership

7. Develop a European benchmarking database of energy consumption and production.
   There is an existing project that aims to develop a benchmarking database for European hospitals[34] and a second which is developing relevant design tools for energy efficiency in healthcare buildings[35]. However, there are few examples of centralised data collection on energy consumption and energy sources being carried out by MS. Appropriate, harmonised data collection would allow a benchmark to be developed for healthcare facilities. This would take account of factors such as climate, available energy mix, facility size, intensity of activities, and types of service provided, and support better planning of refurbishments across different MS. Data and benchmarks in turn would allow certification and award schemes to be established. These would create a kind of peer pressure and challenge healthcare managers to explore more ambitious schemes to deliver better performances. As such they can strengthen other drivers (such as reducing operating costs, or complying with EE and RES targets).
8. Encourage the sustainable energy technology sector to consider the healthcare sector as a lead market for new and improved solutions.
   The healthcare sector tends to be conservative regarding energy-related investment, with decisions influenced more by the systems already in place, availability of low risk proven options and requirements set by government. This however, misses an opportunity to consider longer term requirements or needs (e.g. corporate social responsibility statements or to comply with future regulations). Having a strategic view could also reduce long-term operational costs or even generate additional income, to the extent that they could achieve at least a zero net energy cost position. Constructive dialogue between the healthcare sector and those supplying energy technologies could identify solutions that are applicable over much of the healthcare sector, identify means by which these could be delivered, and make recommendations to government regarding improvements to framework conditions that would support such initiatives. This in turn would demonstrate to the supply side the potential of the healthcare sector to be a lead market for sustainable energy solutions.

[34] EuroBench, a project run by IFHE and the Karlsruhe Institute of Technology, aims to develop a European benchmarking database for energy consumption of hospitals (https://www.tmb.kit.edu/1144_2763.php)

[35] The FP7 STREAMER project aims to support the reduction in energy use and carbon emissions from the healthcare sector through a better understanding of the link between building design and purpose, leading to the improved design of new buildings and renovations that maximise energy efficiency (http://www.streamer-project.eu)

6. Implementing a Roadmap for Change in Healthcare Energy Policy

A number of stakeholder groups will need to be involved for the Energy4Health roadmap to be fully realised. This section provides an overview of these groups, the rationale for their involvement, and benefits they can expect through participation. In addition, it summarises specific roadmap activities (the roadmap journey) for key stakeholders and what the outcomes these are expected to achieve.

6.1 Stakeholder Groups

Member State Governments

The Member State Governments are the key stakeholder group in setting the conditions for EE and RES uptake, through for example regulations (requiring public sector organisations to comply with certain targets and reporting schemes) and improving access to finance for implementing change (through, for example, removing barriers to private finance, or providing direct finance or support to access existing finance).

By participating in the roadmap activities and realisation of its objectives, Member State Governments can expect to benefit through:

- A significant contribution to meeting national GHG emission, energy efficiency and renewable energy targets (meeting their NEEAP and NREAP targets).
- Supporting innovation, thus boosting local and national economies.
- Supporting stronger local communities, through community-led projects providing power, heating and/or cooling, and aligning with future healthcare strategies of care in the community.
- Compliance with EU Directives such as the Energy Efficiency Directive (EED) and the Energy Performance of Buildings Directive (EPBD).

Regional and Local Authorities

Regional and local authorities have a key role to play in supporting the implementation of new EE and RES initiatives, through for example regional/local EE and RES targets, and providing support to organisations to access existing funding.

By participating in the roadmap activities and realisation of its objectives, regional and local authorities can expect to benefit through:

- A more efficient use of resources: investing in health combined with energy generation, reinforcing communities and building stronger new ones.
- Security of energy and health provision.
- Local employment.
- Compliance with national regulations driven by EU Directives such as the Energy Efficiency Directive (EED) and the Energy Performance of Buildings Directive (EPBD).

Healthcare Authorities and Management

Healthcare authorities have responsibility to implement healthcare plans at a local level (e.g. within a municipality), whereas facility managers are responsible for transposing these plans onto individual healthcare facilities. Together they form the link between what is decided on a Member State level and how this is translated to local healthcare delivery.

By participating in the roadmap activities and realisation of its objectives, healthcare authorities and management can expect to benefit through:

- Revenue saving, which can be reinvested in patient care.
- Ensuring economic sustainability of infrastructure through local generation and avoiding fluctuating prices of fossil fuels.
- Reinforcing the community aspects of the healthcare sector and thus looking towards a role of care in the community and prevention, rather than acute treatment.

Suppliers (Energy Service Companies [ESCO] and Energy Technology Providers)

Suppliers comprise those providing energy technology solutions and those providing integrated services (ESCOs) which can include technical solutions based on the client's circumstances and objectives, and financial solutions to enable the technical implementation. However, suppliers tend to perceive the healthcare sector as conservative and risk averse, with the result that engagement of suppliers with the healthcare sector is variable across the EU.

By participating in the roadmap activities and realisation of its objectives, suppliers can expect to benefit through:

- Greater understanding of healthcare sector needs and confidence in supplying to the sector.
- Developing lead market opportunities, due to the large number of healthcare facilities across the EU.
- High replication potential of solutions both within the healthcare sector and other public sectors.
- Larger scale projects, due to the large energy requirements of healthcare facilities, and the potential for collaborative and community-led projects.
- Security of return on investment, due to the nature of healthcare funding.

European Commission (EC)

The EC (and in particular DG REGIO and DG SANTE) has a key role to facilitate dialogue between different stakeholder groups and provide clarity on some of the framework conditions that influence (or could influence) the uptake of EE and RES. This includes the various directives (such as EED and EPBD) and the ESIF, which as noted previously tend to be accessed by the healthcare sector to support predominantly the provision of clinical modalities.

By participating in the roadmap activities and realisation of its objectives, the EC can expect to benefit through:

- Stimulating demand-side procurement of innovation, which will in turn boost Member State economies, create skilled jobs, and motivate technology and service innovation within the EU.
- A significant contribution to the EU 2020 targets of energy efficiency, cutting greenhouse gas emissions and increasing renewable energy supply.

European Investment Bank (EIB)

The EIB provides investment for a large number of public and private infrastructure projects across the EU. It has a significant role to play in developing innovative financial solutions for the healthcare sector that will stimulate best practice in EE and RES, including incentivising facilities to consider the social and economic benefits of EE and RES when undertaking any refurbishment or new build.

By participating in the roadmap activities and realisation of its objectives, the EIB can expect to benefit through:

- Securing better investment proposals from the public sector that have a long-term view and payback (securing ROI).
- Building a portfolio of relevant case studies to advise other clients on best practice approaches, thus securing better investment proposals.

Energy Agencies

Member State Energy Agencies and their umbrella network, the European Energy Network (EnR), have various roles to play including advising Member State governments on energy strategy and policy, administrating funding programmes, and advising on the implementation of EE and RES schemes to a variety of clients. As such they can play a pivotal role in engaging both supply and demand side to address the energy challenges faced by the healthcare sector and stimulate new solutions.

By participating in the roadmap activities and realisation of its objectives, Energy Agencies can expect to benefit through:

- Improving sustainable energy practices in one of the largest energy consuming sectors.
- Generate new opportunities for funding and support schemes to improve the implementation of EE and RES.
- Contribute to national and European policy development on the implementation of EE and RES.

World Health Organization (WHO) Europe

WHO Europe has taken a lead position in reducing the impact of energy choice within the healthcare sector including reducing GHG emissions. At present it is developing policy and technical proposals as to how this might be achieved within the WHO Europe region. This aligns closely with the objectives of the Energy4Health roadmap.

By participating in the roadmap activities and realisation of its objectives, WHO Europe can expect to benefit through:

- Strengthening its own message to policymakers.
- Supporting the principles of the Parma Declaration.
- Encouraging healthcare facilities to take steps to implement EE and RES from the bottom up, without necessarily having new policy at the Member State level.

Stakeholder Networks and Associations

There are a number of other organisations which are highly relevant to the roadmap objectives. These include:

- Health Care Without Harm (HCWH) Europe which is part of an international initiative that coordinates the Global Green and Healthy Hospitals (GGHH) network, and has commitment from over 470 hospitals across the globe (around 75 in the European region) to implement energy efficiency measures and clean, renewable energy generation;
- The European Health Property Network (EuHPN), a network of European governmental and research organisations responsible for the strategic asset planning and management of all forms of health property, and which supports members to share knowledge and keep abreast of new practices.
- The European Centre for Healthcare Assets and Architecture (ECHAA) which is an organisation affiliated to EuHPN that provides support for the strategic planning of healthcare infrastructure to the EC, MS, and healthcare facility management.
- The European arm of the International Federation of Hospital Engineering (IFHE) whose purpose is to encourage and facilitate exchange of information and experience in the broad field of hospital and healthcare facility design, construction, engineering, commissioning, maintenance, and estate management.
- The European Health Management Association (EHMA), whose objective is to improve health and healthcare by raising standards of health management (through research and education) and to influence government policy to have a positive impact on healthcare provision within the EU.
- Health and Environment Alliance (HEAL), which is a membership organisation that aims to ‘promote public health through a healthy environment in Europe and beyond’ through influencing government policy.
- Covenant of Mayors (CoM), which is a voluntary initiative of local and regional authorities established after the adoption of the EU 2020 climate and energy policy, to increase EE and use of RES.

- Clinical associations such as Standing Committee of European Doctors (CPME) and national associations (e.g. British Medical Association), which have an interest and in some cases official positions on replacing fossil fuels as an energy supply in the healthcare sector.

The benefits to be accrued through participation in the roadmap activities and realisation of its objectives, vary depending on the organisation, however, each can expect to influence the key decision makers who have the power and authority to facilitate the realisation of their organisational objectives.

Other Organisations

Other organisations that have a role to play in the realisation of this roadmap include:

- The professional and popular media, which can raise the profile of the roadmap objectives and generate wider interest and support through the public and professional communities, thus applying pressure on the key stakeholders to drive forward change.
- Other EU-funded projects which can implement some of the actions through their own initiatives. For example, EcoQUIP which has been funded to improve the efficiency, quality and environmental sustainability of healthcare through innovation procurement.

6.2 Stakeholder Leadership Group

An analysis of these stakeholder groups, in terms of their interest in EE and RES for the healthcare sector and their relative power or authority to influence the framework conditions that would support EE and RES uptake in the healthcare sector, is presented in the matrix below:

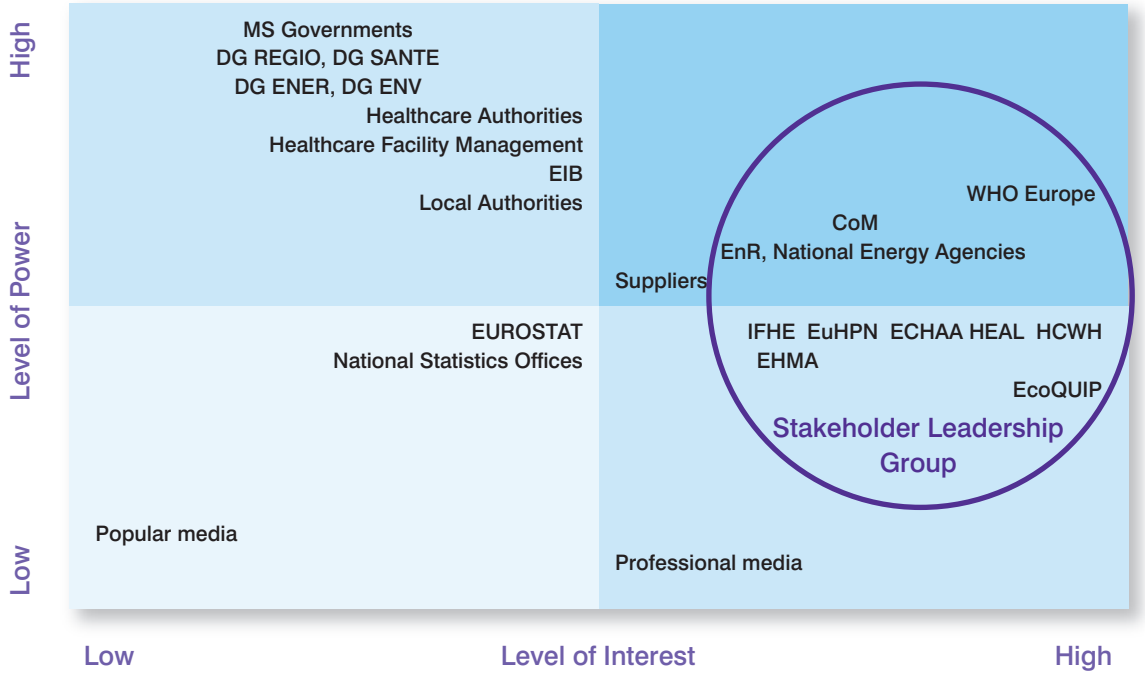

Figure 3. Stakeholder matrix for energy in the healthcare sector.

The main objectives of this roadmap are to create the conditions that raise the level of interest in those stakeholder groups in the top left quadrant. These have the power and authority to make the necessary changes that will improve the framework conditions for the implementation of innovative energy solutions in the healthcare sector. This is best achieved through the actions of those groups with a high level of interest and a degree of influence over the powerful decision makers. These are circled in the matrix above and include, but are not limited to, the following: WHO Europe, EnR, HCWH, EuHPN, ECHAA, IFHE, EHMA, HEAL, and CoM. Each of these organisations has a vested interest in the uptake of sustainable energy solutions within the healthcare sector – due to the alignment with their strategic objectives.

Together these organisations (and others like them) constitute the Stakeholder Leadership Group (SLG), which could provide the initial impetus to drive the roadmap activities forward, following the end of the Energy4Health project. Collectively, the SLG could coordinate engagement with MS Government Ministries, the EC, and other stakeholder groups in the top left quadrant of the matrix, to ensure that the necessary actions required by these stakeholders to fully implement the roadmap are realised. This would ensure activities on an EU-wide scale also filter down to the MS level. Without their involvement, the roadmap actions will become more fragmented, and have a far lower impact. An initial workshop involving representative organisations of the SLG was held in April 2015 under the auspices of the EcoQUIP project (and its Thematic Group on Energy) to discuss the detailed implementation of the Energy4Health roadmap and agree on priorities and shared responsibilities. Feedback from this workshop was positive with several organisations committing to follow through on activities via a proposal to Horizon 2020.

6.3 Delivering the Energy4Health Roadmap for Different Stakeholder Groups

The different stakeholder groups described above exhibit different levels of engagement and each is motivated by different objectives. In reality there are three key stakeholder groups which will need to be fully engaged for the overall objectives of the Energy4Health roadmap to be achieved. These are policymakers, healthcare management (healthcare authorities and facilities), and suppliers (technology providers and ESCOs). The SLG is essential to engage with these key stakeholders, to lead change in their opinion and ultimately the framework conditions that are impeding the uptake of innovative EE and RES solutions within the healthcare sector. In addition to activities driving forward engagement of (and commitment from) these three key stakeholder groups, there are two broad cross-cutting actions supporting the roadmap evolution: bottom-up approaches to collect energy consumption and performance data from healthcare facilities and support knowledge exchange; and top-down approaches to improve access to finance and investment for healthcare facilities. The roadmaps for each of these three key stakeholder groups are summarised in Figures 4 and 5. Specific recommendations follow in Section 7.

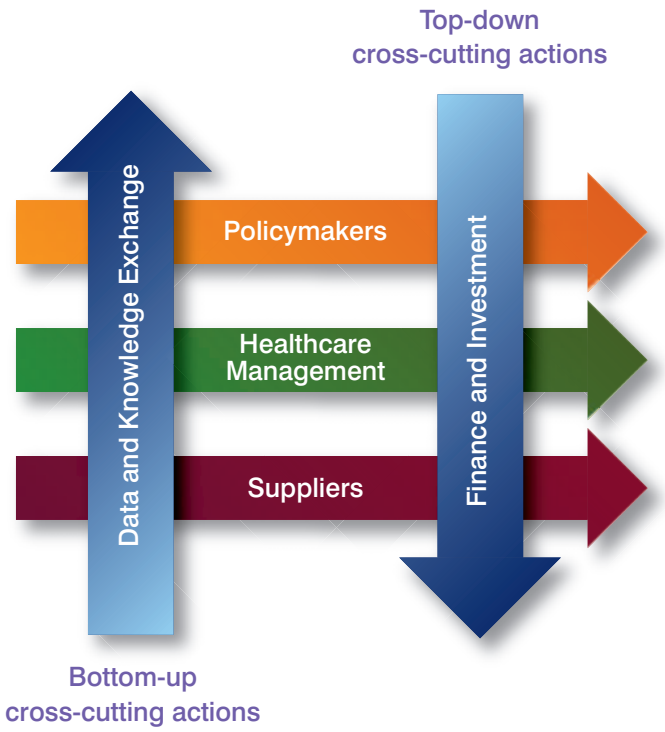

Figure 4. Overview of the Energy4Health roadmap for policymakers, healthcare management, and suppliers, and cross-cutting activities.

Policymakers

Start

Energy is not seen as priority area for healthcare. Healthcare sector contribution is not considered in NEEAP & NREAP.

Roadmap Journey

- Survey on healthcare sector fossil fuel use provides focus for the implementation of the Parma Declaration.
- Support pilot projects to investigate contribution of healthcare sector to NEEAPs and NREAPs.
- Create policy conditions that target and support healthcare adoption of innovative EE & RES.

Finish

Understand the large opportunity for the healthcare sector to contribute to NEEAP & NREAP, the wider economy and skilled workforce.

Healthcare Management

Start

Energy is seen as an operational, not a strategic issue. Limited knowledge of sustainable energy options or how they could be funded.

Roadmap Journey

- Engage with existing and develop new initiatives to improve knowledge of sustainable energy systems amongst management.
- Understand the impacts of fossil fuel vs sustainable energy solutions on operational costs and patient well-being.
- Engage with policymakers to identify how framework conditions could be improved to support uptake of innovative energy solutions.

Finish

Recognise the strategic importance of energy decisions and understand the funding and investment mechanisms to implement these.

Suppliers

Start

Healthcare sector seen as risk averse to innovation.

Roadmap Journey

- Engage with healthcare sector and intermediates (e.g. EnR) to identify future energy needs that will be required by the healthcare sector as a whole.
- Participate in joint demonstration projects, and feed data into case study and energy performance database.

Finish

Recognise the lead market potential of the healthcare sector, the types of solutions that will be required and their replication potential.

Data and Knowledge Exchange

Start

Limited exchange of energy data and knowledge in the healthcare sector.

Roadmap Journey

- Pool existing data, identify best practice data collection and engage necessary stakeholders.
- Collect data, build case studies (e.g. through new projects) and share knowledge across networks.
- Benchmarking available, best practice recognised through awards/certification.

Finish

Comprehensive data and strong collaboration between facilities and across MS.

Replication of best practice.

Finance and Investment

Start

Limited knowledge of financial instruments, barriers to access.

Roadmap Journey

- Engagement of policy, and finance stakeholders to identify what barriers might be present to healthcare sector access to funds.
- Guidebook produced, and policy recommendations made to EC and MS to assist healthcare sector access to finance.
- New partnerships supported between healthcare sector and local communities and with technology suppliers.

Finish

Increased number of proposals from healthcare sector for public/private funding for EE & RES improvements.

Figure 5. Detail of the roadmap activities for each key stakeholder group and the cross-cutting activities.

7. Recommendations for Action

There is a clear opportunity for the healthcare sector to make significant energy efficiency and renewable energy improvements that will not only reduce operational costs and provide energy security to facilities, but will also contribute directly to wider sustainability targets within the EU. However, it is equally clear that the healthcare sector needs support in order to realise this potential. The recommended actions described below for each of the three key stakeholder groups will enable these objectives to be realised.

7.1 Policymakers (Member State Governments and the EC)

In practice it will be the national governments who will implement actions, however, the EC has an important role to support these actions, through facilitating access to European funding and creating a favourable legislative framework that drives forward change.

MS governments must work with the healthcare sector and the energy supply side to plan the contribution that the healthcare sector can make to NEEAPs and NREAPs, within a defined timetable and identifying what support will be required to do so. MS governments should:

1. Measure the impact of energy choices made by the healthcare sector on national energy consumption and GHG emissions.
2. Calculate the level of contribution the healthcare sector could make to NEEAPs and NREAPs.
3. Engage directly with the healthcare sector to understand the specific barriers to implementing sustainable energy practices, and what drivers could be supported to do so.
4. Formulate detailed healthcare sector-level action plans for energy efficiency and renewable energy production that are staged in terms of targets (the level of activities and/or numbers of facilities engaged over a 5, 10 and 15 year period).
5. Engage directly with the healthcare sector and with other relevant stakeholders (finance and energy supply) to ensure recognition of need and achievability of targets within a specified time period.
6. Determine what framework conditions may need to be changed to support the implementation of the plan (e.g. legislation, financial instruments).
7. Establish the methodology to measure the effectiveness of implemented measures.
8. Implement sector-level plans, and monitor their effectiveness.

The EC, and in particular DG SANTE, DG ENER and DG REGIO, should support the above activities through:

1. Consideration of the contribution that the healthcare sector across the whole of the EU can make to the Energy Efficiency and Renewable Energy Directives, based on energy performance data.
2. Consideration of how the ESIF (and other financial instruments) could be used to support energy efficiency and renewable energy measures within the healthcare sector.
3. Consideration of which Member States may need targeted financial support as a result of their energy mix and the level and type of sustainable energy measures available and already implemented.
4. Formulate an Action Plan that takes account of the above with the purpose of achieving parity amongst Member States within a defined time period.
5. Establish the methodology to measure the effectiveness of implemented measures.
6. Implement the Action Plan, and monitor its effectiveness.

7.2 Healthcare Management

The healthcare sector must be supported to understand the operational benefits and benefits to the environment and human health through choosing sustainable energy options. It must learn from exemplars in the field and seek support from policymakers and suppliers to realise change. Healthcare sector management should:

1. Collate energy performance data in individual facilities for the purpose of defining a baseline and to compare with peers (thus supporting wider action across the EU).
2. Identify priority areas for action – in particular those facilities which still depend heavily on fossil fuels.
3. Engage with peers (ideally through established networks such as the Global Green and Healthy Hospitals) to learn from others' experiences and identify applicable best practice approaches, including the impacts of energy efficiency behaviours.
4. Formulate action plans for individual facilities that realise:

    a. Increased energy efficient behaviours, through linking energy efficiency with improvements to patient, staff and visitor wellbeing, and achieving broad staff buy-in.

    b. Reduction in fossil fuel use, through improved energy efficiency behaviours and substitution with renewable energy sources.

5. Identify what internal resources may be required to implement action plans (e.g. knowledge exchange mechanisms that will support capacity and capability building for energy management within each healthcare facility).
6. Identify what external resources may be required to implement action plans (e.g. finance and/or specific technologies) and engage with external stakeholders (e.g. through a market sounding exercise).
7. Finalise action plans considering all of the above and including a timetable of achieving stage objectives that delivers the overall plan.
8. Implement action plans, monitor and share results with peers.

7.3 Energy Supply-Side

The energy supply-side must be supported and effectively engaged with to ensure it recognises the scale of opportunities to be realised through the healthcare sector; and that barriers are being addressed through the actions of Member State Governments and the healthcare sector itself. The energy supply-side should:

1. Pro-actively engage with the healthcare sector, through realising the scale of opportunity for providing energy solutions, raise awareness within the healthcare sector of the range of financial options available to implement sustainable energy solutions.
2. Identify, in partnership with the healthcare sector, solutions that have a high degree of replication across the sector, either within individual Member States or across the wider EU.
3. Work with government and the healthcare sector to overcome any barriers to the implementation of sustainable energy solutions.
4. Participate in demonstration projects (e.g. through Horizon 2020) with the healthcare sector to develop innovative energy solutions for healthcare facilities.
5. Consider consortia compiled of healthcare facilities and other public sector organisations for larger scale sustainable energy projects,

7.4 Implementing the Recommendations

The recommendations above can be achieved through the successful implementation of the Energy4Health roadmap. Details of the activities, timelines and expected outcomes as they relate to the eight operational objectives of the roadmap, are presented in Appendix A. However, it is clear that none of the three key stakeholder groups is likely to engage in such activities independently – each will need the support of others that have the drive and vision to bring the different elements together to ensure success. Organisations represented by the stakeholder leadership group (SLG) have been driving various aspects of the sustainable energy agenda for many years, but have failed to gain as much traction in the healthcare sector as they might have. It is likely that this is because each is focused on specific outcomes or target groups. Combining their resources and acting in concert, through implementing the objectives of the Energy4Health roadmap, should drive through a fundamental change in behaviour amongst the key stakeholders. This in turn would be expected to elicit similar changes in other stakeholders not directly engaged in roadmap activities.

Achieving these goals will not only support the EU to achieve the reduction in carbon emissions and sustainable energy targets so desperately needed, they will also support the healthcare sector to reach zero carbon status, and eventually zero net energy costs. These and other outcomes are described in the final section.

8. Expected Outcomes from the Energy4Health Roadmap

Achieving the objectives set out in this roadmap will improve the framework conditions across the EU for the uptake of innovative EE and RES solutions by the healthcare sector. These in turn will benefit the wider EU economy. Several outcomes are expected from the successful delivery of the roadmap. Five immediate (or first order) outcomes are described below:

1. Transparent national and/or regional healthcare sector targets and strategies for EE and RES are adopted in some countries, thus directly contributing to NEEAPs and NREAPs.
2. Many healthcare facilities set voluntary targets for the reduction of fossil fuels, thus reducing environmental impacts and improving patient well-being.
3. There is a significant increase in the number of European hospitals joining the Global Green and Healthy Hospitals (GGHH) network to share data, knowledge and experience.
4. Many hospitals adopt new EE and RES measures, thus contributing to NEEAPs and NREAPs and reducing operating costs.
5. Increase in collaborative H2020 research and innovation projects with innovative energy technology suppliers, demonstrating solutions that could be replicated across the EU's healthcare sector, and the potential for the sector to be a lead market.

Figure 6 overleaf maps other expected outcomes from the Energy4Health project, and aligns them with external events that are highly relevant and complementary to the Energy4Health roadmap:

- The 21st session of the Conference of the Parties (COP) to the UNFCCC will take place in Paris in December 2015. This has the goal of achieving a new international climate agreement applicable to all countries that limits global warming to less than 2°C. It is a key objective for the Energy4Health project to influence, and provide supporting evidence for, policy contributions by key stakeholders at this conference.
- In 2016 the 6th Ministerial Conference on Environment and Health in the WHO Europe region will take place. This will review progress following the Parma declaration at the 5th Ministerial conference in 2010. The objectives described within the Energy4Health roadmap are closely aligned with the activities of this Ministerial Group and offers a ready-made strategic roadmap that they could adopt.
- The EPBD requires that by 2018 all new buildings owned or occupied by public authorities are nearly zero-energy, and that by 2020 all new buildings are nearly zero-energy. In addition, buildings undergoing major renovation[36] are required to meet minimum energy performance requirements (set by individual MS), and furthermore, MS are required to develop plans for such renovations to lead to nearly-zero energy buildings. EE and RES solutions implemented as a result of actions taken in the Energy4Health roadmap will directly contribute to these targets.
- By 2020 all MS must comply with the Europe 2020 plan for reduction in GHG emissions and contributions from EE and RES. Outcomes from the Energy4Health roadmap directly support this.
- By 2030 new EU-wide targets for GHG, EE and RES must be met.

[36] EPBD defines major renovation when 'the total cost of the renovation relating to the building envelope or the technical building systems is higher than 25 % of the value of the building'.

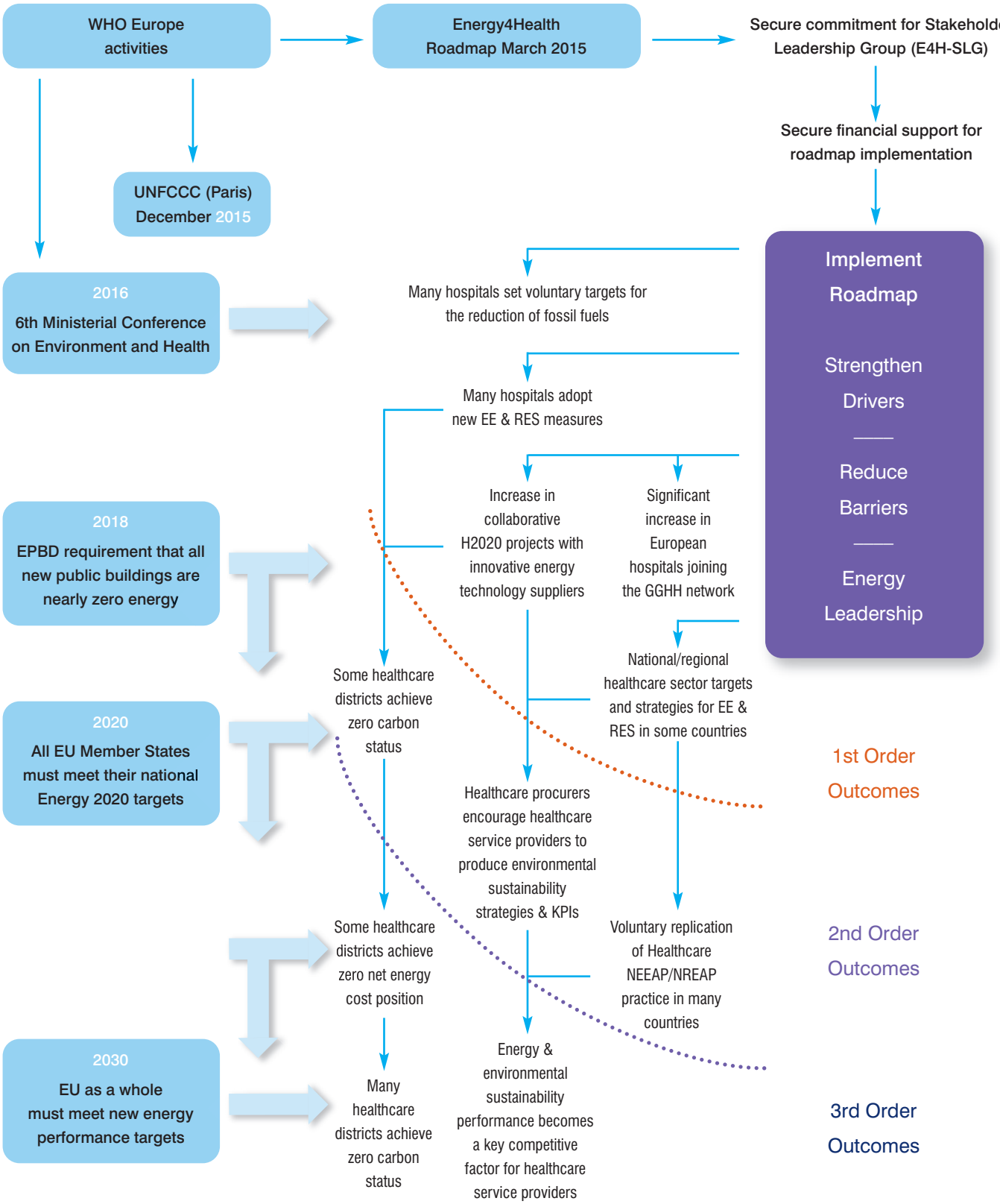

Figure 6. Chart indicating the timelines for expected outcomes from the Energy4Health roadmap. 1st order outcomes are a direct result of roadmap activities and outputs. 2nd and 3rd order outcomes follow on from these and are also influenced by external events (indicated by the larger arrows from the timeline on the left).

Appendix A – Implementation of the Energy4Health Roadmap

The implementation plan for Energy4Health roadmap is described below in terms of activities to realise the eight operational objectives:

1. Encourage and facilitate the development of sector-level NEEAPs and NREAPs.
2. Provide evidence of the scale of fossil fuel use in the European healthcare sector.
3. Improve knowledge exchange on sustainable energy management in the healthcare sector.
4. Raise awareness of alternative funding options for transformation of energy infrastructures.
5. Encourage community and district level energy partnerships.
6. Raise awareness of the link between energy efficiency and patient well-being.
7. Develop a European benchmarking database of energy consumption and production.
8. Encourage the sustainable energy technology sector to consider the healthcare sector as a lead market for new and improved solutions.

We provide a description of the programme of activities in terms of:

1. Rationale – why each objective is necessary, and the current situation.
2. Stakeholders – what types of organisation need to be involved to realise objectives, in each case an organisation from the SLG will be required to lead the activities.
3. Activities – described in terms of the different tasks and stakeholders involved.
4. Milestones – the expected time-frame to complete activities.
5. Assessment – the success criteria by which activities and the roadmap as a whole will be measured.
6. Outcomes – what would be expected if objectives are realised.

It is important to note that most of the operational objectives will not be achieved without access to additional public funding, as they require significant effort by a number of stakeholders. Horizon 2020 has been identified by the Energy4Health consortium as one route to support the delivery of the roadmap. Furthermore, while objectives can be realised independently, most will benefit from the activities or outputs of others.

A Gantt chart follows the description of the operational objectives, providing a timeline for delivery of individual activities over the period 2015 to 2020.

Strengthen Drivers

1. Encourage and facilitate the development of sector-level NEEAPs and NREAPs

Rationale for Action

The 2020 climate and energy package is a set of binding legislation for EU and MS targets on energy efficiency, carbon dioxide emission reduction and renewable energy generation. Energy efficiency targets are established through the Energy Efficiency Directive and renewable energy targets through the Renewable Energy Directive. These are implemented on a national basis via National Energy Efficiency Action Plans (NEEAPs) and National Renewable Energy Action Plans (NREAPs). However, these are typically not translated into requirements for the healthcare sector, nor do they filter down to healthcare system and individual hospital level. If this was done, they could be used as targets to incentivise individual facilities, and at the same time the healthcare sector by nature of its large energy consumption could contribute significantly to meeting the national targets.

A number of activities have produced baseline data on healthcare sector energy usage and how adoption of EE and RES solutions has helped reduce GHG emissions from sites. However, this data is fragmented. Furthermore, the long-term contribution of adopting such solutions in the healthcare sector has not been studied.

Stakeholders

Lead – should be an organisation with a remit to develop and implement NEEAPs and NREAPs such as the European Energy Network (EnR) or one of its members.

Other Stakeholders - MS governments, the EC, and healthcare sector authorities.

Activities

Pilot healthcare NEEAPs and NREAPs should be developed in selected MS (three or four) with the view that methodologies would be adopted by other MS later. Additional public funding will be required to achieve this. This objective will require an initial review of existing healthcare sector initiatives in different MS that contribute to NEEAPs and NREAPs (e.g. NHS Scotland), what issues these have encountered and how these have been overcome. Following this, discussions between SLG members and representatives from the governments and healthcare sector authorities of selected MS should take place and working groups (WGs) for each should be established to review i) what data is already available on healthcare facility energy sources and performance, ii) the best approach to gather new data (see also Objectives 2 and 7), iii) areas which should be targeted for improvement, based on national targets and comparable achievements in other public and private sectors, and iv) to recommend how these targets should be incorporated into NEEAPs and NREAPs (e.g. financial incentives and/or regulatory documentation covering the healthcare sector). The methodologies developed during this process should be made publicly available, to be adapted by other MS for their own healthcare specific EE and RES targets and support mechanisms to allow these to be realised.

Milestones

1. Initial EU review. (Y1)
2. WGs established in selected MS . (Y1-2)
3. Analysis of healthcare energy sources and usage performed for the selected MS. (Y2-3)
4. WGs report their recommendations to be considered by MS for incorporation into NEEAPs and NREAPs. (Y3-4)
5. Methodology for healthcare sector NEEAPs and NREAPs published. (Y3-4)

Assessment

1. Broad participation of relevant stakeholders in initial review process leading to commitment to engage with activities for this objective.
2. WGs contain a suitable mix of expertise and influence to ensure thorough analysis of healthcare energy
   mix and usage.
3. Numbers of healthcare facilities engaging with the process in each of the selected MS.

Outcomes

1. Transparent national/regional healthcare sector targets and strategies for energy reduction and renewable energy production in some countries.
2. Voluntary replication of NEEAPs and NREAPs in other MS.
3. Healthcare procurers (including insurance companies) encourage healthcare service providers to produce environmental sustainability strategies and KPIs.
4. Energy and environmental sustainability performance becomes a key competitive factor for healthcare service providers.
5. Many healthcare districts achieve zero (or near to zero) carbon status.

2. Provide evidence of the scale of fossil fuel use in the European healthcare sector

Rationale for Action

Burning fossil fuels for heating or power has negative impacts on human health and the environment. For example it has been estimated that "for every TWh (Terawatt-hour) of electricity produced from coal in Europe, there are 24.5 deaths, 225 serious illnesses including hospital admissions, congestive heart failure and chronic bronchitis, and 13,288 minor illnesses"[37]. WHO is committed to a 'greening' of the healthcare sector and in 2010 secured commitment from the Member States within its European region to 'collaborate to increase the health sector's contribution to reducing greenhouse gas emissions and strengthen its leadership on energy- and resource efficient management'[38]. However, there is little evidence that this is having an impact at the level of individual facilities, nor is there data on the scale of fossil fuel use by the healthcare sector across the EU.

Stakeholders

Lead – should be an organisation that has a commitment to reducing the environmental impact of the healthcare sector, such as HCWH Europe, HEAL, or WHO Europe.

Other Stakeholders - MS governments, the EC, healthcare sector authorities, and healthcare facility management.

Activities

The first activity will be to engage with policymakers at the UN Climate Summit in Paris Dec 2015 (UNFCCC COP 21), by presenting the Energy4Health roadmap, and specifically the activities related to this objective. The purpose is to raise awareness of the roadmap, to gain support for its objectives, and to connect with those policymakers who will benefit most from the outcomes of other roadmap activities.

The second activity will be a large scale survey of fossil fuel use in the healthcare sector. This will require the extended networks of all organisations in the SLG to improve participation rates. Survey results will be fed back into the WHO Europe 'Greening Health Systems' to support the implementation of the Parma Declaration, by identifying where there is significant dependency on fossil fuels and developing policy to address this. Survey results will also feed into activities in Objectives 1 and 7. Additional public funding will be required to support this survey.

Milestones

1. Energy4Health roadmap presented at UNFCCC COP 21. (Y1)
2. Engagement of MS Governments to consider findings from activities in this roadmap in new policy developments. (Y1)
3. Survey launched. (Y1-2)
4. Data collected and analysed. (Y2-3)
5. Report presented to EHTF and other relevant groups. (Y3)

Assessment

1. Audience at UNFCCC COP 21 – numbers of senior decision-makers, range of MS represented.
2. Energy4Health roadmap referenced by different policymakers.
3. Commitment from MS policymakers to consider data from the healthcare sector fossil fuel survey.
4. Respondents to the fossil fuel survey – numbers, and geographical mix, and level of detail.

Outcomes

1. Many hospitals set voluntary targets for the reduction of fossil fuels.
2. Transparent national/regional healthcare sector targets and strategies for energy reduction and renewable energy production in some countries.
3. Healthcare procurers (including insurance companies) encourage healthcare service providers to produce environmental sustainability strategies and KPIs
4. Voluntary replication of NEEAP/NREAP practice in more countries.
5. Energy and environmental sustainability performance becomes a key competitive factor for healthcare service providers.
6. Many healthcare districts achieve zero (or near to zero) carbon status.

[37] Scientific Evidence of the Health Effects from Coal Use in Energy Generation', Health Care Without Harm/ University of Chicago, 2013

[38] Parma Declaration on Environment and Health (Fifth Ministerial Conference on Environment and Health, Parma, Italy, 10–12 March 2010) http://www.euro.who.int/__data/assets/pdf_file/0011/78608/E93618.pdf?ua=1

Reduce Barriers

3. Improve knowledge exchange on sustainable energy management in the healthcare sector

Rationale for Action

There is limited capability and capacity within the European healthcare sector to address energy management issues. Furthermore, there are no pan-European platforms for healthcare energy management; so opportunities for sharing knowledge and ultimately best practices are limited. This is in contrast to the dedicated US membership network 'Practice Greenhealth'[39]. Creating such opportunities could improve the capability and the influence of all relevant stakeholders, and thus decision-making processes. Building on this, systems should be put in place to develop best practice approaches in order that all healthcare facilities benefit from knowledge and experience within the network. Furthermore, improved knowledge regarding sustainable energy solutions could assist healthcare facilities in implementing operational cost savings.

Stakeholders

Lead – should be an organisation which supports healthcare sector professionals, such as EHMA, IFHE, EuHPN,
or HCWH.

Other Stakeholders - healthcare sector authorities, healthcare facility management, and energy supply-side.

Activities

This will aim to produce an EU-wide knowledge exchange platform for technical managers in the healthcare sector and build on existing initiatives and adapt them to an EU setting if necessary (such as Practice Greenhealth). A virtual network should be established first that collates case studies and other relevant information, and makes these available through web-based systems. Such case studies will also be derived from other actions taking place within this roadmap (in particular under Objective 1).

Further to this, online and physical training opportunities should be provided. This should aim towards continuing professional development (CPD) courses for healthcare facility management. Developments should be reported regularly through professional literature and popular press.

Such a network and training programme could be supported through membership fees, donations or public grants (or a combination of these), with courses paid for from training budgets.

Milestones

1. EU workshop organised with participation of all relevant stakeholders representing different MS. (Y1)
2. Commitment by stakeholders to establish a platform for sharing information across all relevant groups. (Y1-2)
3. Web-based reference material on best-practices in energy management available. (Y2 onwards)
4. Regular opportunities for practitioners to meet and discuss developments and new experience (such as themes within annual conferences). (Y2 onwards)
5. Validated best-practice approaches identified (evaluated using existing standards or peer-reviewed methodology). (Y3-4)
6. Training available (including CPD). (Y4 onwards)

Assessment

1. Numbers of stakeholder groups and MS participating in the initial workshop.
2. Level of commitment to the goals of the initiative in terms of numbers of organisations and geographic spread.
3. Variety and applicability of reference material and online tools available to practitioners in different MS (and available in different languages).
4. Numbers of individual practitioners engaged in the network.
5. Opportunities for networking - in different locations and online.
6. Availability of CPD courses in different MS.

Outcomes

1. Significant increase in European hospitals joining the GGHH network.
2. Many hospitals set voluntary targets for the reduction of fossil fuels.
3. Many hospitals adopt new EE and RES measures.
4. Surveys of healthcare professionals reveal that year on year, more understand the rationale for adopting innovative energy solutions and best practices for doing so.
5. Healthcare procurers (including insurance companies) encourage healthcare service providers to produce environmental sustainability strategies and KPIs.

[39] https://practicegreenhealth.org/topics/energy-water-climate

4. Raise awareness of alternative funding options for transformation of energy infrastructures

Rationale for Action

Healthcare facilities are naturally focused on delivering treatment to patients, and this largely dictates their interest in and knowledge of financial instruments. However, a number of mechanisms are available outside this sphere that could be accessed to support the implementation of EE and RES solutions. Lack of knowledge about these, lack of capacity within healthcare management to identify and understand different funding options, and, in some cases, barriers to accessing these as a result of national policies or legislation, can severely limit the healthcare sector's use of such funding. For example, EU Structural Funds are used primarily by the healthcare sector to improve direct patient care, little if any is used for improvements to EE and energy supply. However, the healthcare sector is a significant user of energy in the EU and could therefore benefit from access to Structural Funds to support such improvements. Initial discussions with DG REGIO, DG SANTE and EIB during the Energy4Health project, suggested that a document similar to the 'Toolbox for effective structural funds investments in health 2014-2020' published by DG SANTE in 2013[40], should be produced that focuses on investment for energy improvements.

Stakeholders

Lead – should be an independent organisation with the knowledge and capability to analyse and present available public and private funding options that are relevant to the healthcare sector. This could be a national research and technology organisation (RTO), policy institute or a network organisation such as ECHAA, which is affiliated to EuHPN and provides support for the strategic planning of healthcare infrastructure to the EC, MS, and healthcare facility management.

Other stakeholders - MS governments, the EC, financial institutions (such as EIB), healthcare sector authorities, healthcare facility management, and the energy-supply-side.

Activities

A combination of desk research and interviews with selected stakeholders in public and private financial institutions should be used to draft a guidance document for the healthcare sector and a policy document that considers how access could be widened (perhaps through creating specific sub-calls within ESIF for developments in healthcare energy supply and use). Extensive consultation should follow with relevant individuals in the EC, MS governments, financial institutions, the healthcare sector, and other interested and relevant stakeholders to ensure that there is wide support for proposals and recommendations. The financial toolbox should provide guidance on different instruments, supported by case studies, and where possible identify MS-specific framework conditions that could affect access. The policy document should identify framework conditions that limit healthcare sector use of available financial instruments, and make recommendations that address these. Both documents should be widely disseminated by all stakeholders and presented at relevant international events, supported by specific workshops.

Milestones

1. Engagement with a broad range of stakeholders to identify and analyse financial solutions for energy improvements available to the healthcare sector across the EU. (Y1)
2. Report analysing existing funding and investment instruments relevant to the healthcare sector taking account of framework conditions in different MS. (Y2-3)
3. Policy document with recommendations that address barriers to funding for the healthcare sector. (Y2-3)
4. Reports widely disseminated and presented at international events. (Y3)

Assessment

1. Breadth of stakeholders engaged in collecting data and evidence (in terms of MS represented, government, healthcare management, and investor community).
2. Level and breadth of evidence collected from the stakeholder community.
3. Feedback from the stakeholder community on the final report.
4. Take-up by the stakeholder community of the report (evidenced by numbers attending meetings where the report is presented and downloads of the report from websites.

Outcomes

1. Many hospitals adopt new EE and RES measures.
2. Increase in collaborative Horizon 2020 research and innovation projects with innovative energy technology suppliers.
3. Some healthcare districts achieve zero carbon status.

[40] http://register.consilium.europa.eu/doc/srv?l=EN&f=ST%2017871%202013%20INIT

5. Encourage community and district level energy partnerships

Rationale for Action

Long-term healthcare infrastructure strategy is under review in a number of MS as a result of: public service spending cuts, rising demand for health and social care services, and a move towards social care in the community (including preventive health measures). At the same time healthcare facilities are significant energy users and key stakeholders in local communities. This provides an opportunity to consider energy provision at the planning stages of any new builds or major refurbishments. Healthcare facilities are in a prime position to lead new community based initiatives to realise greater EE and RES improvements, but generally consider this as not their business. However, such initiatives could benefit both the healthcare facility and the local community through lower energy costs, greater EE, and reduced GHG emissions, while at the same time aligning with future healthcare in the community strategies.

Stakeholders

Lead – should be an organisation like the Covenant of Mayors (CoM) whose remit is to support EE and RES improvements at the level of local and regional authorities.

Other stakeholders – local and regional authorities, healthcare sector authorities, healthcare facility management, and the energy supply-side.

Activities

An analysis of the barriers to healthcare sector led community energy projects should be performed, following on from previous work in such projects and initiatives as Energy4Health, RES-Hospitals, Green and Healthy Hospitals. A workshop at a relevant CoM conference (e.g. the 'Energy Cities' annual conference) would be the ideal vehicle for this. From this activity, engagement with various stakeholders (including policymakers in the EC and MS, local authorities and healthcare management) should be followed through to collect evidence on MS-specific barriers and drivers and make recommendations. A report of these findings should be published and discussed at a major (CoM) event.

Milestones

1. Session organised at a relevant CoM conference to discuss opportunities for closer collaboration and community based action in EE and RES. (Y1-2)
2. Engagement with the wider community to examine the evidence for barriers and drivers in different MS. (Y2)
3. Report published describing opportunities for community partnerships and associated barriers and drivers. (Y2-3)
4. Presentation of report at major event. (Y3)

Assessment

1. Attendance of different stakeholders at the initial conference session.
2. Commitment from stakeholders to explore barriers and drivers to collaborative opportunities at a local level.
3. Response of stakeholders to the report, in terms of commitment to explore new partnerships.

Outcomes

1. Many hospitals adopt new EE and RES measures.
2. Increase in collaborative Horizon 2020 research and innovation projects with innovative energy technology suppliers.
3. Some healthcare districts achieve zero carbon status.
4. Some healthcare districts achieve a zero net energy costs position.

6. Raise awareness of the link between energy efficiency and patient well-being

Rationale for Action

There is evidence that patient experience (and therefore recovery) is strongly influenced by the healthcare environment[41]. This includes building design and the internal environment of hospitals. Simple actions such as controlling ventilation, reducing noise, temperature fluctuations, and unnecessary light intrusion (e.g. through shutting doors and turning lights and equipment off when not in use) can promote patient well-being, while at the same time leading to a more efficient use of energy. This in turn can stimulate further EE and RES measures.

Stakeholders

Lead – should be an organisation that has a remit to improve the impacts of healthcare facility on patient welfare, such as EuHPN, HCWH, EHMA or CPME.

Other stakeholders - healthcare sector authorities, healthcare facility management, and patient associations.

Activities

A review of the scientific literature should be performed in addition to a survey of SLG organisations' members for data connecting energy efficiency practices with patient well-being. Each organisation should also encourage their members to engage with HCWH and the Global Green and Healthy Hospitals network (GGHH) – to share their experiences (in the form of data and/or case studies). This wealth of information can be used to guide facilities in making EE choices that improve building environments (and ultimately patient care). At the same time new data can be fed back into GGHH to encourage replication across other facilities.

Milestones

1. Commitment from the members of SLG organisations such as EuHPN, EHMA and CPME to engage with the review, and support initiatives established in GGHH. (Y1)
2. Survey of members. (Y2)
3. Report on the effect different energy efficient measures have on patient well-being. (Y2-3)

Assessment

1. Level of commitment from SLG organisation members.
2. Increased numbers of EU hospitals engaged through the GGHH.

Outcomes

1. Significant increase in European hospitals joining the GGHH network.
2. Many hospitals adopt new EE and RES measures.
3. Healthcare procurers (including insurance companies) encourage healthcare service providers to produce environmental sustainability strategies and KPIs.
4. Energy and environmental sustainability performance becomes a key competitive factor for healthcare service providers.

[41] Healing environment: A review of the impact of physical environmental factors on users. Huisman et al. Building and Environment 58 (2012)

Energy Leadership

7. Develop a European benchmarking database of energy consumption and production

Rationale for Action

At present there are few examples of MS or health sector authorities requiring healthcare facilities to record energy consumption and its source, and in some cases where data is collected, it is not made publicly available. Furthermore there can be differences in what is recorded, e.g. whether this is at the level of units within a facility or the whole facility, and whether data on intensity of use is available, e.g. number of patients being treated. Lack of this data and differences in reporting makes it impossible to determine with any accuracy where and how improvements to energy systems will have the greatest financial and environmental benefits. Furthermore, it does not incentivise healthcare facilities to consider energy performance and source of supply. Developing a benchmarking, and certification and award scheme will validate achievements and raise the profile of the healthcare sector as a leader in EE and RES.

Stakeholders

Lead – should be an organisation that has a solid knowledge and understanding of energy performance data, and how these relate to the EU healthcare sector, such as IFHE and the Karlsruhe Institute of Technology (KIT) which have recently completed a project that aims to develop a benchmarking database of energy consumption in hospitals[42],
or TNO (a member of EuHPN) which analysed hospital energy consumption as part of the RES-Hospitals project and coordinates the FP7 STREAMER project, that has the objective of reducing the energy use and carbon emissions of healthcare districts in the EU by 50% in the next 10 years through better building design.

Other stakeholders - MS governments, the EC, healthcare sector authorities, and healthcare facility management.

Activities

Activities should align with those undertaken in Objective 2, build on previous work by others, and initially make use of available data (to identify parameters that can be used to establish a benchmark, and to develop appropriate methodologies to analyse and compare the performance of different hospitals). They should consider the Energy Efficiency Directive (EED) and Energy Performance of Buildings Directive (EPBD) in terms of whether their implementation by different MS has led to recording and reporting of baseline energy data in the healthcare sector. In addition, mechanisms to collect and collate energy performance data from other MS should be developed (building on exiting initiatives, such as annual reporting of energy use by all UK hospitals). These should be aligned with the International Greenhouse Gas Protocol[43], European Energy Performance Standards (CEN) that are being developed under Mandate M480, and the voluntary Certification Scheme for non-residential buildings (DG ENER).

Online systems should be created and maintained that allow healthcare facilities to compare their own energy data with counterparts in the same MS or at a European level. Later on these would provide a list of certified sites (that have met required standards).

The initial establishment of such systems could be publicly funded (as supporting public benefit), with ongoing costs supported by annual fees. Subscription would be ensured by a combination of MS guidelines (encouraging uptake), energy and sustainability leadership (by the healthcare facilities), and opportunities to reduce operating costs (thus aligning with earlier Objectives).

Costs to support the certification process could be covered through annual fees (part of or separate to those described above). An annual competition could recognise those facilities which have performed best in their category, and this could be supported by sponsorship. Results would be reported in the professional and popular media, thus raising the profile and market reputation of individual facilities.

Milestones

1. WG established comprising SLG organisations and other relevant stakeholders. (Y1)
2. WG produces draft benchmark based on available energy performance data. (Y1-2)
3. WG produces draft guidelines for energy performance reporting by facilities. (Y2-3)
4. Action Plan implemented to report healthcare facility energy performance and energy source. (Y3)
5. WG considers certification and award process. (Y3)
6. Online tools created allowing EU healthcare facilities to compare their energy usage with peers and identify areas for improvement. (Y4 onwards)
7. Certification process is established. (Y4)
8. Launch of public register and first competition. (Y5 onwards)

[42] EuroBench project (https://www.tmb.kit.edu/1144_2763.php

[43] http://www.ghgprotocol.org/

Assessment

1. The membership and authority of the WG (and the numbers of MS represented in it), and their skills to develop reporting, benchmarking, and certification schemes.
2. Agreement of WG on an Action Plan for reporting including its breadth and scope.
3. Numbers of healthcare facilities reporting energy usage, and how this energy is supplied.
4. Compliance of healthcare facilities with reporting requirements.
5. Numbers of healthcare facilities using the online benchmarking system and participating in the certification scheme (and their geographical spread).
6. Numbers of healthcare facilities registered on the certification scheme (i.e. meeting required standards) and their geographical spread.

Outcomes

1. Transparent national/regional healthcare sector targets and strategies for energy reduction and renewable energy production in some countries.
2. Many hospitals set voluntary targets for the reduction of fossil fuels.
3. Many hospitals adopt new EE and RES measures.
4. Significant increase in European hospitals joining the GGHH network.
5. Some healthcare districts achieve zero carbon status.
6. Healthcare procurers (including insurance companies) encourage healthcare service providers to produce environmental sustainability strategies and KPIs.
7. Energy and environmental sustainability performance becomes a key competitive factor for healthcare service providers.

8. Encourage the sustainable energy technology sector to consider the healthcare sector as a lead market for new and improved solutions

Rationale for Action

The healthcare sector tends to be conservative regarding energy generation and supply, with decisions influenced more by the systems already in place, availability of low risk proven options and requirements set by government. However, replacing like with like fails to consider opportunities to specify solutions that can lead to greater, but longer term, operational cost savings (perhaps even income generation); meeting future regulatory requirements; and displaying leadership in sustainable energy. There are opportunities to reassess this scenario through constructive dialogue between supply and demand sides. As a result, innovative solutions that address long-term, strategic needs could be developed for individual sites that select different technologies, different mechanisms of funding and different partnerships with others in the community. These types of initiative could be supported initially by demonstration projects, which if successful could be widely replicated across the healthcare sector and/or in other sectors.

Stakeholders

Lead – the EcoQUIP project will initiate activities through its Energy Thematic Group. It includes some of the partners of Energy4Health and runs until late 2016. EcoQUIP aims to improve the efficiency, quality and environmental sustainability of healthcare through innovation procurement.

Other stakeholders - healthcare sector authorities, healthcare facility management, energy-supply-side, and financial institutions.

Activities

This builds on previous activities, such as in RES-Hospitals, and aims to extend this work by identifying future energy needs that are relevant across the wider EU healthcare sector, and how these might be satisfied through innovative solutions. Initial activities will focus on a consultation process with the healthcare sector and supply-side to discuss: i) existing case studies and whether these can be replicated more widely, and ii) unmet needs that will require new solutions. Responses to interviews and to an online survey will be collated and analysed for commonalities across different MS. This analysis will be presented to demand and supply-side stakeholders at a workshop, for the purpose of elaborating a joint statement of future needs. This will serve two purposes: i) the basis for further discussion between individual healthcare facilities and technology suppliers to develop and implement solutions that meet that facilities' strategic energy objectives and ii) a submission to the EC and MS to consider how EU and national framework conditions could be improved to strengthen innovative approaches to energy provision in the healthcare sector. Further activities will support discussions between healthcare facilities and suppliers (through signposting to available funding opportunities and other support), and a series of case studies will be produced from these. This will further strengthen partnerships between supply and demand sides, and demonstrate the potential for the healthcare sector to be a lead market for sustainable energy.

Milestones

1. Consultation process with healthcare sector and supply-side. (Y1)
2. Analysis of needs and barriers to implementing innovative energy solutions. (Y1-2)
3. Joint statement of future needs for innovative energy solutions produced. (Y1-2)
4. Case studies of individual projects initiated as a result of the joint statement. (Y3-4)

Assessment

1. Participation and commitment of relevant stakeholders to the consultation process.
2. Delivery of a joint statement of future needs that has a wide range of signatories (demand and supply-sides and different MS).
3. Numbers of individual projects between healthcare facilities and suppliers that are initiated as a result of the joint statement.
4. Commitment by EC and MS to consider the statement and improve framework conditions.

Outcomes

1. Many hospitals adopt new EE and RES measures.
2. Increase in collaborative Horizon 2020 research and innovation projects with innovative energy technology suppliers.
3. Some healthcare districts achieve zero carbon status.
4. Some healthcare districts achieve a zero net energy costs position.

Specific Activities	Q3 / 2015	Q4 / 2015	Q1 / 2016	Q2 / 2016	Q3 / 2016	Q4 / 2016	Q1 / 2017	Q2 / 2017	Q3 / 2017	Q4 / 2017	Q1 / 2018	Q2 / 2018	Q3 / 2018	Q4 / 2018	Q1 / 2019	Q2 / 2019	Q3 / 2019	Q4 / 2019	Q1 / 2020	Q2 / 2020	Q3 / 2020	Q4 / 2020
Strengthen Drivers																						
1. Encourage and facilitate the development of sector-level NEEAPs and NREAPs																						
Initial review of healthcare sector initiatives that contribute to NEEAPs and NREAPs					•																	
WGs established in selected MS to review and analyse energy data from healthcare facilities							•															
Reports from WGs recommending healthcare targets for NEEAPs & NREAPs											•											
Methodology for healthcare sector NEEAPs and NREAPs published											•											
2. Provide evidence of the scale of fossil fuel use in the European healthcare sector																						
Energy4Health roadmap presented at UNFCCC COP 21		•																				
Survey of fossil fuel use by healthcare sector							•															
Data collected and analysed									•													
Report presented to EHTF and other relevant groups										•												
Reduce Barriers																						
3. Improve knowledge exchange on sustainable energy management in the healthcare sector																						
Workshop to discuss best practice for knowledge exchange in energy management					•																	
Establishment of a knowledge exchange network to share best practice							•															
Web-based reference material on developing and implementing EE and RES solutions										•												
Validated best-practice approaches in developing and implementing EE and RES solutions														•								
CPD training in developing and implementing EE and RES solutions														•								
4. Raise awareness of alternative funding options for transformation of energy infrastructures																						
Stakeholder engagement to assess financial solutions for healthcare energy improvements						•																
Report analysing funding and investment instruments relevant to the healthcare sector									•													
Policy document with recommendations that address barriers to healthcare sector funding									•													
Reports widely disseminated and presented at international events											•											

Specific Activities	Q3 / 2015	Q4 / 2015	Q1 / 2016	Q2 / 2016	Q3 / 2016	Q4 / 2016	Q1 / 2017	Q2 / 2017	Q3 / 2017	Q4 / 2017	Q1 / 2018	Q2 / 2018	Q3 / 2018	Q4 / 2018	Q1 / 2019	Q2 / 2019	Q3 / 2019	Q4 / 2019	Q1 / 2020	Q2 / 2020	Q3 / 2020	Q4 / 2020
5. Encourage community and district level energy partnerships																						
Session at CoM conference to discuss community energy partnerships			■	■	■	•																
Engagement with the wider community to examine the evidence for barriers and drivers					■	■	■	■	•													
Report published describing opportunities for community partnerships									■	■	■	•										
Presentation of report at major event												■	•									
6. Raise awareness of the link between energy efficiency and patient well-being																						
Commitment from members of SLG organisations to collaborate and share data			■	•																		
Survey of SLG members				■	■	■	•															
Report on the effect different energy efficient measures have on patient well-being							■	■	■	•												
Energy Leadership																						
7. Develop a European benchmarking database of energy consumption and production																						
WG established comprising SLG organisations and other relevant stakeholders				■	■	•																
Draft benchmark produced				■	■	■	■	•														
Draft guidelines produced for energy performance reporting						■	■	■	■	•												
Action plan implemented to report healthcare facility energy performance and source										■	■	•										
Healthcare energy performance data submitted to National Statistics Offices													■	■	■	■	■	•				
Online tools for benchmarking energy performance													■	■	■	■	■	•				
Certification and award scheme launched for EE and RES																		■	■	■	•	
8. Encourage the sustainable energy technology sector to consider the healthcare sector as a lead market for new & improved solutions																						
Consultation with healthcare sector and energy technology suppliers			■	■	■	•																
Analysis of needs and barriers to implementing innovative energy solutions						■	•															
Joint statement of future needs for innovative energy solutions produced							■	•														
Case studies of individual projects initiated as a result of the joint statement								■	■	■	■	■	■	•								