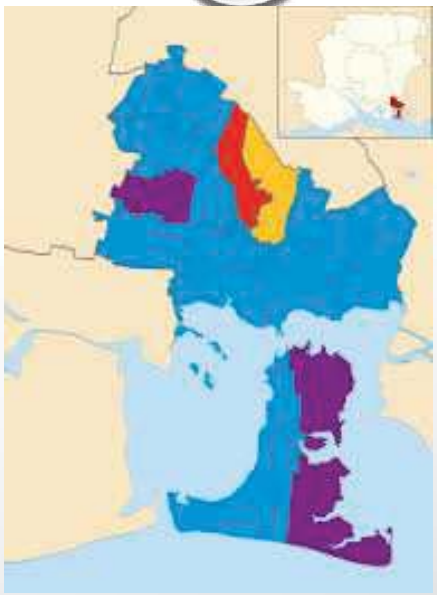
Havant



Geothermal Energy Project, Hampshire

"……..a project for the people and the planet!"

Four Key Questions

1. What.... is this project and what is Geothermal Energy?

2. Why..... is it so important for Havant & simply must happen?

3. How..... will the implementation process be initiated?

4. When... can it happen & what resources will be required?

What?

"Renewable energy enthusiasts typically speak of 'wind and solar' without including in their litany one of the most promising potential sources of all: GEOTHERMAL".

"The amount of geothermal energy is effectively unlimited – roughly 280,000 times the annual consumption of primary energy in the world".

Nobel Peace Prize Laureate, Al Gore

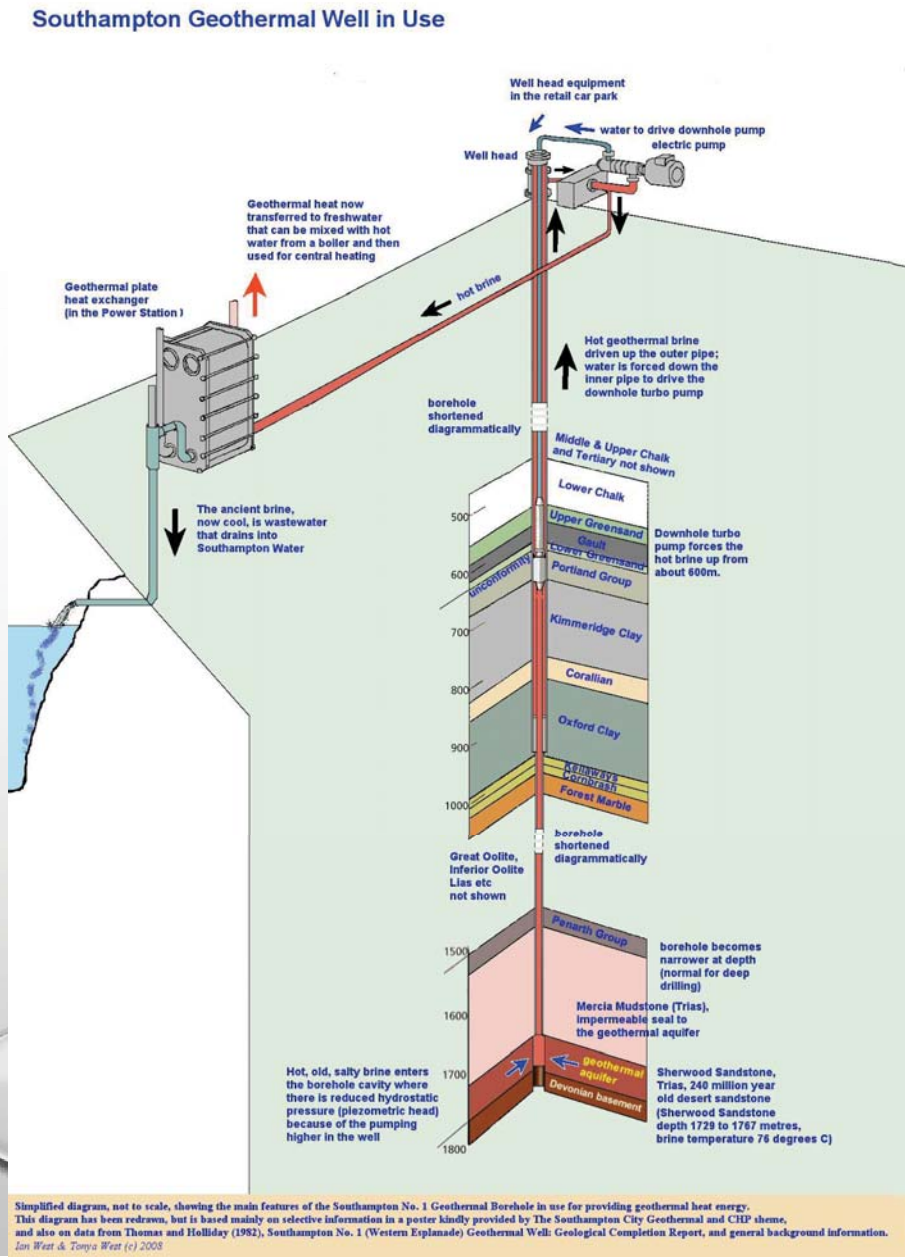
Havant - Introduction & Context

- Geothermal energy is clean, renewable and available in vast quantities; it is the natural heat that exists within our planet
- **Geothermal is an energy source with huge potential for renewable heat & power production in southern Hampshire**
- Generally there is no direct evidence at the Earth's surface
- **This vast reservoir of energy has remained largely ignored and untapped in most parts of the UK**
- It's potential is increasingly recognised – not least because of Southampton's Geothermal District Heat & Power Scheme.
- **Havant has one of the most accessible proven geothermal resources in England**

SOUTHAMPTON DISTRICT ENERGY SCHEME

Southampton No.1 Geothermal Borehole in 1981. The target formation, the Sherwood Sandstone (Triassic) was encountered at 1729m., higher than expected. Thus, unfortunately, water at boiling point was not found. However, hot, concentrated brine at about 76 degrees C. has proved useful as a supplementary geothermal energy source.
Ian West & Tonya West (c) 2008.

SOUTHAMPTON DISTRICT ENERGY SCHEME



Since the pioneering launch of the initial geothermal project in 1986, Southampton's district heating and cooling scheme has employed up-to-the-minute technology and a host of ground-breaking features.

It is now a Combined Heat and Power hub for city-wide housing, hotels, recreation, commerce, Universities, hospitals and the vast passenger and container port.

Housing

Barratt Homes redeveloped the Polygon Hotel site into 108 flats with Geothermal heat - not only because of the environmental benefits on offer, but also the significant cost savings

Hotels

Five-star De Vere Grand Harbour Hotel is connected to Southampton's Geothermal system. It was also the first customer of the district chilling system

Recreation

The Quays, Swimming & Diving Complex benefits from Southampton Geothermal Energy

Shopping

West Quay, John Lewis and Marks & Spencer, agreed to take heating and chilling supplies. ASDA superstore is also served by the scheme. More recently, IKEA has also signed up.

Port

All of the electrical power from the scheme (26 million kWh) is used by Associated British Ports via a private electrical connection to the docks.

Hospital and University

Southampton Geothermal district heating scheme also serves Royal South Hampshire Hospital and Southampton Solent University.

Why?

"Geothermal energy is potentially the largest – and presently the most misunderstood – source of energy in the world today".

"Geothermal energy could – if properly developed – match all of the energy available from coal, oil, and gas combined".

Former U.S. Vice President
Al Gore

Geothermal Energy & Havant

- In Havant, geothermal energy would have many applications:
  - **District heating,** systems which provide hot water to multiple units
  - **Heating and cooling of individual buildings,** including offices, shops and residential houses, by using geothermal heat pumps
  - **Industrial application,** for industrial processes, horticulture, agriculture, aquaculture etc.
- **Enhanced Geothermal Systems** (Combined Heat & Power) enables sustainable electricity generation
- Clean, renewable, constant - geothermal energy is being used in a large number of thermal & electric power plants worldwide

Benefits of Geothermal Power

- Provides clean and safe energy using little land
- Is reliable and sustainable
- Can generate continuous, reliable, “Baseload” power
- Is cost-competitive
- Conserves fossil fuels and contributes to diversity in renewable energy sources
- Avoids importing energy and benefits local economies
- Offers modular, incremental development and ‘village power’ to remote sites

"Unlike solar and wind power, it is not intermittent. Once in place, a geothermal electricity plant provides power 24 hours a day".

"Unlike coal, oil, and gas, geothermal energy has virtually no CO_2 emissions".

Al Gore.

Oscar winner for his documentary film:
'The Inconvenient Truth'.

Havant & EU Funding

- Wider perspective needed to **understand what happens in other places** and **demonstrate the empowering, enriching impact that releasing EU funds can have**, from local government, to local residents to local businesses.

- **EU funds available for feasibility and implementation of Geothermal**, especially in regions which clearly need funding

- **Future Havant success** in securing such funding for renewable energy depends in no small part on the informed lobbying of local environmental campaigners

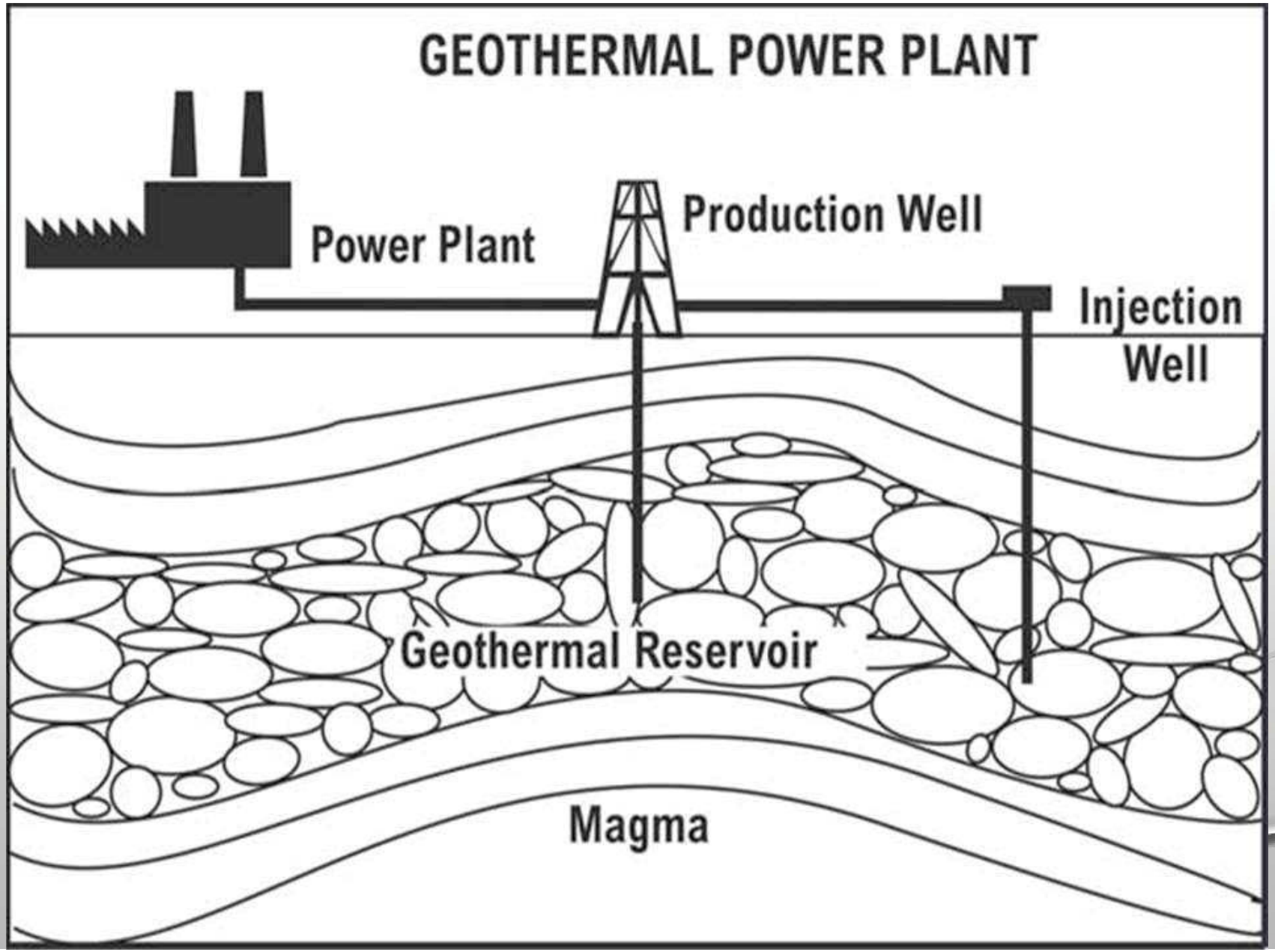
How?

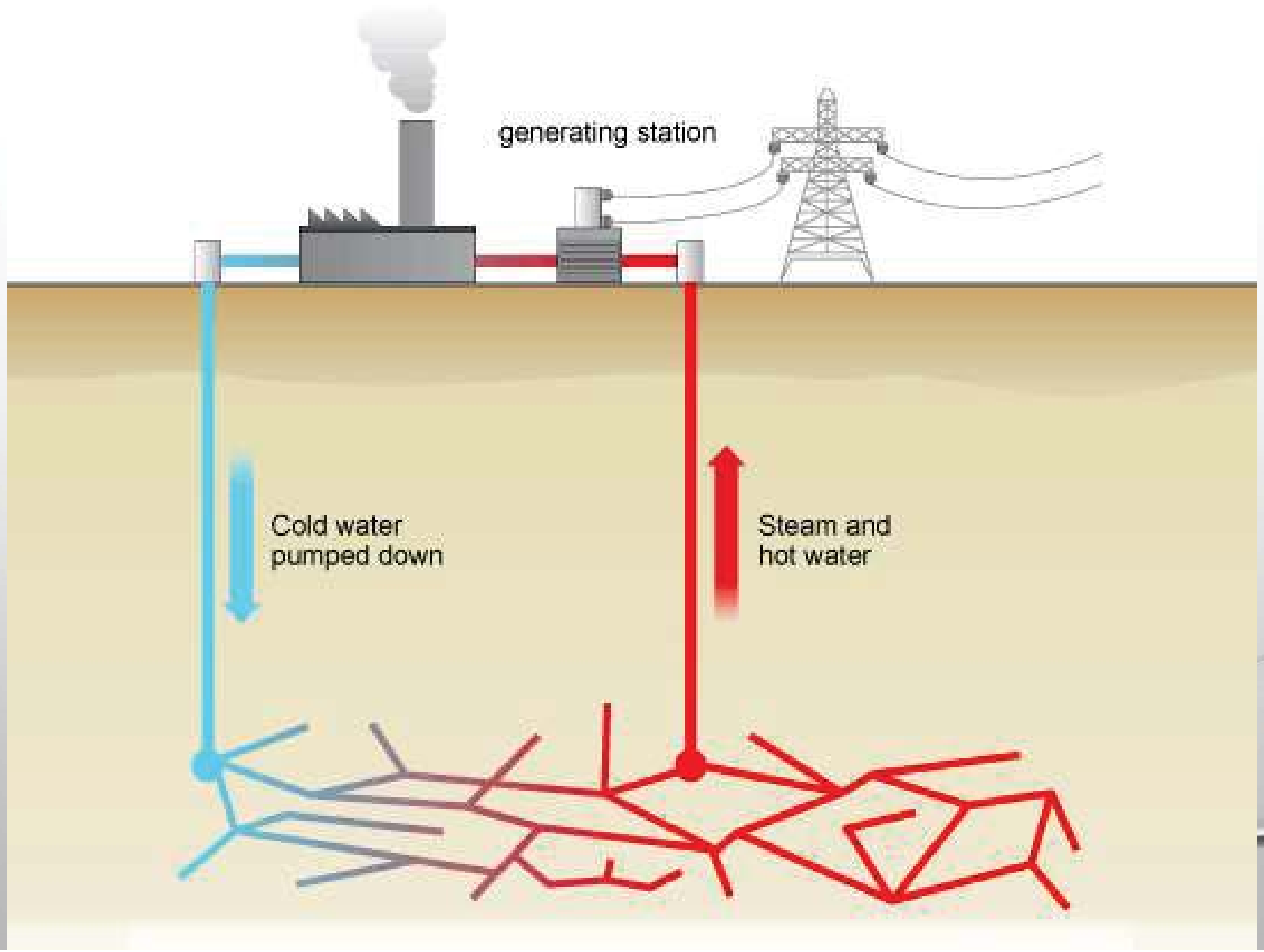
PPP Project Funding: Public, Private, EU

- Public budgets everywhere are very tightly stretched
- It is essential to supplement public investment with alternative ways of financing large projects **and** to do this whilst also achieving more efficiency in implementing energy projects
- **Private/Public Partnerships (PPPs),** including EU Funding, are an important model for doing this
- An initial **pre-feasibility study** is a small scale PPP anticipating a subsequent full feasibility study & then project implementation in some kind of PPP/EU vehicle

Project Drivers

- Technologies and concepts for exploiting Geothermal Energy are developing rapidly along two lines:
  1. **Low enthalpy** (low temp) resources, which exploit warm water in the shallow subsurface to provide heat either directly (as warm water) or indirectly (via heat exchange systems); and
  2. **High enthalpy** (high temp) resources, which yield hot water, usually from deeper levels, that can be used to generate electricity
- Major potential for harnessing electricity – min. environmental impact, capacity to contribute continuously to base load electricity supply
- **Geothermal energy is an extremely attractive prospect for Havant – environmentally, technically, socially, politically, commercially**


GEOTHERMAL POWER PLANT
Power Plant
Production Well
Injection Well
Geothermal Reservoir
Magma


generating station
Cold water
pumped down
Steam and
hot water

Why propose PPP in Havant?

- PPP does not mean the privatisation of public resources or the nationalisation of private assets.
- PPPs provide a strong model for the partners to team up to mobilise their respective resources.
- Private sector must take into account the public service obligation, inherent in energy networks, such as fuel poverty in Havant.
- Private sector brings, obviously, private money/capital, but also skills, knowledge and expertise.

Why propose PPP in Havant?

- Risks are **allocated and minimised** appropriately
- Relationship of risk & reward vital to private sector involvement
- Financial, design, construction, risks borne by **private sector**
- Political, legislative, planning risks ,minimised by **public sector**
- All facilitated by regular, fully structured dialogue between the two sectors throughout life of the project (not a political football)
- Private sector competition is the catalyst in developing infrastructure, services, projects… whilst safeguarding the public interest

Some Ref R&D/Feasibility EU Projects

1. GEISER - Geothermal Engineering Integrating Mitigation of Induced Seismicity in Reservoirs
Funding scheme: CP
EC contribution: €5,308,869.00
Duration: 01/2010 - 06/2013 (42 months)
Keywords: renewable energy, geothermal energy, induced seismicity
Abstract: Aims: Improve the concept of Enhanced Geothermal Systems by investigating the role of induced seismicity. The mitigation of induced seismicity to an acceptable level is the major intent of this project. A high quality database of case studies will be assembled.

2. GROUND-MED - Advanced ground source heat pump systems for heating and cooling in Mediterranean climate
Funding scheme: CP
EC contribution: €4,548,944.00
Duration: 01/2009 - 12/2013 (60 months)
Keywords: renewable energy, heating and cooling, geothermal energy, heat pumps
Abstract: GROUND-MED project will demonstrate geothermal heat pump (GSHP) systems for heating and cooling of measured SPF>5,0 in 8 demonstration sites of South Europe. As the SPF is determined not only by the heat pump unit, but by its operating conditions imposed to the heat pump by the ground heat exchanger and the heating/cooling system of the building as well, integrated systems incorporating the following technological solutions will be demonstrated and evaluated.

3. TERRA THERMA - Terrestrial Energy Recovery using Advanced Stirling Heat-pumps for Residential temperature Management
Funding scheme: STP
EC contribution: €1,248,223.00
Duration: 12/2007 - 12/2010 (36 months)
Keywords: renewable energy, geothermal

Some Ref R&D/Feasibility EU Projects

4. LOW-BIN - Efficient low temperature geothermal binary power
Funding scheme: STP
EC contribution: €1,878,812.00
Duration: 03/2006 - 02/2009 (36 months)
Keywords: renewable energy, geothermal
Abstract: The LOW-BIN project aims in improving cost-effectiveness, competitiveness and market penetration of geothermal electricity generation schemes, targeting both hydrothermal resources for immediate market penetration and future hot dry rock systems.

5. ENGINE - Enhanced Geothermal Innovative Network for Europe
Funding scheme: CA
EC contribution: €2,302,289.00
Duration: 11/2005 - 04/2008 (30 months)
Keywords: renewable energy, geothermal
Abstract: The main objective of the ENGINE project is co-ordination of ongoing research and development initiatives for Enhanced Geothermal Systems and other Unconventional Geothermal Resources, from resource investigation and assessment stage through to exploitation monitoring.

6. I-GET - Integrated Geophysical Exploration Technologies for deep fractured geothermal systems
Funding scheme: STREP
EC contribution: €2,699,993.00
Duration: 11/2005 - 10/2008 (36 months)
Keywords: renewable energy, geothermal
Abstract: The project I-GET is aimed at developing an innovative geothermal exploration approach based on advanced geophysical methods. The objective is to improve the detection, prior to drilling, of fluid bearing zones in naturally and/or artificially fractured geothermal reservoirs. This new approach will be tested in three European geothermal systems with different geological and thermodynamic reservoir characteristics.

Some Ref R&D/Feasibility EU Projects

7. HITI - High Temperature Instruments for supercritical geothermal reservoir characterization and exploitation
Funding scheme: STREP
EC contribution: €2,499,999.00
Duration: 08/2004 - 07/2007 (36 months)
Keywords: renewable energy, geothermal
Abstract: To provide geophysical/geochemical sensors; methods to evaluate deep geothermal wells up to supercritical conditions, explore supercritical wells, enhance production, to develop, build, field test new surface/downhole tools & approaches for deep high-temp boreholes.

8. GROUNDHIT - Ground coupled heat pumps of high technology
Funding scheme: STP
EC contribution: €1,677,182.55
Duration: 06/2004 - 05/2008 (48 months)
Keywords: renewable energy, geothermal
Abstract: The project GROUNDHIT aims at improving cost-effectiveness, competitiveness and market penetration of ground coupled heat pumps. The project focusses on - Borehole Heat Exchanger (BHE) research, - Ground Coupled Heat Pumps research focusing on the theoretical design and laboratory experimentation, - Prototypes development and demonstration of the above technologies, - Innovation related activities.

9. EGS PILOT PLANT: European geothermal project for scientific pilot plant construction (Enhanced Geothermal System (EGS PILOT PLANT)
Funding scheme: STREP
EC contribution: €5,000,000.00
Duration: 04/2004 - 09/2008 (54 months)
Keywords: renewable energy, geothermal
Abstract: Part of the ongoing Hot-Dry-Rock or Enhanced Geothermal Systems (EGS) experiment. Objective is technical and economic design of large industrial units based on multi-well systems – testing, evaluating, improving properties of reservoir/heat exchanger deep wells systems.

When?

EU Funding: 2015 →

- **FP8 (Horizon 2020)** has allocated a budget of **€5.931 billion** to non-nuclear energy research for period 2014-2020
- EU has 3 top priorities; second of which is **Low Carbon Technologies:**
  - Developing/bringing to market affordable, cost-effective, resource-efficient technology solutions
  - Solutions that decarbonise the energy system in a sustainable way, secure energy supply & complete energy internal market
  - Inc. **Geothermal**, Photovoltaics, Solar, Wind, Ocean, Hydro etc.

- **Horizon 2020 (Full Feasibility) & Structural Funds (Project Development & Implementation) – key project enablers & drivers**
- **The time is right for Havant to utilise its own Geothermal Resources**

Geothermal Energy & EU Funding

- **2002 (FP6)** funded c10 projects with total budget of €20 million+
- Geothermal Energy further supported under **7th Framework Programme (2007-2013)**
- Research & technology played a key role, particularly in the development of Enhanced Geothermal Systems (EGS)
- EU also funded programmes to achieve an advancement in the knowledge of understanding and mitigating the induced seismicity associated with geothermal field development

European Investment Bank

Co-funded by the Intelligent Energy Europe Programme of the European Union

EGEC European Geothermal Energy Council

Guiding Rationale re Project Delivery

- To achieve **common understanding** between Havant/County & the consultant/PFA team carrying out the pre-feasibility assignment (PFA)
- To work within **relationship of cooperation,** sharing, trust & openness
- To deliver a **pre-feasibility of high quality and positive impact**
- To strongly position Havant/County for the follow on **full feasibility** and ultimately the **project realisation**
- To create and position an **economic development model** that will
  - **shape the Regional Developmen**t Plan, and
  - **improve lives** within the local community, at all levels

Outline Project Delivery Plan (5 Phases)

	12/01/2015	15-22 Jan-15						28/02/2015						27/03/2015		
Pre-feasibility activities (Project Weeks 1- 13)	**Proj Start**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**Proj End**	**Total Days**	**Key Project Deliverables and Outputs**
1. Project Launch and Development																• Project kick off meeting • Initial site visit and familiarisation • Understanding local priorities, economic/strategic objectives • Relationship development • Mentoring and advising local/City staff • Interviewing and positioning local expert • Preparing project work plan • Agreeing key goals and milestones
Alastair Clyne Project Director		5													5	
Key Expert															0	
Local Expert															0	
External Input															0	
2. Project research, analysis, site visits																• In depth site visit • Local interviews and information gathering in Arad, • Meeting with beneficiaries to gain agreement for planned Learning Journey/Study Tour to ○ Best Practice sites for Geothermal Energy. and/or ○ EU Structural Funded/Supported Projects, and/or ○ Best practice PPPs in the energy and possibly other sectors within the EU
Alastair Clyne Project Director					3										3	
Key Expert					3										3	
Local Expert					3										3	
External Input			2												2	

Outline Project Delivery Plan (5 Phases)

3. Plan Development & Recommendations															
Alastair Clyne Project Director			3			3	3		3	3	3				18
Key Expert				2				2			2				6
Local Expert						3	3		3	3	3	3			18
External Input							2					2			4
4. Draft Final Plan presentation and report															
Alastair Clyne Project Director													5		5
Key Expert													3		3
Local Expert													2		2
External Input															0
5. FinalPresentation/Review/Forward Plans															
Alastair Clyne Project Director														3	3
Key Expert														2	2
Local Expert														2	2
External Input													1		1

- Analysis of existing data – charts, models etc.,
- Mapping best EU and International practice
- Evaluating and defining:
  - EU Horizon 2020 funding options (for full feasibility) **
  - Structural Funds (for full project implementation) **
- Refining approach/concept]
- Developing pre-feasibility model and content
- Preparing and submitting Interim Report

- Acknowledging and incorporating comments and requests from Interim Report
- Consolidating all assimilated data, interviews, reports
- Preparing Draft Final Report and Recommendations
- Creating all accompanying Data and Reference materials
- Submitting draft Final Report
- Receiving all comments and any requested revisions from the key beneficiaries

- Revising and then incorporating comments, requested revisions etc. into the final Pre-Feasibility report
- Creating PPT presentation for the beneficiaries
- Delivering the PPT presentation in Arad
- Meeting with external parties & enablers for full project
- Structuring post presentation meetings to agree next steps and forward actions
- Preparing agenda for Learning Journey/Study Tours

Alastair Clyne

Geothermal Project Consultant

Key Project Dates

Project Start Date:

Project Kick Off Meeting

Research/Site Visit Southampton District Heating Project

Interim Report

Draft Final Report

Presentation & Round Up Meeting

Payment Phasing:

40% of total Project Fees and Costs due at Inception/Start Date

20% of total Project Fees and Costs due on delivery of Interim Report

40% of total Project Fees and Costs due on completion of Project

The Earth needs all the Friends it can get!