Deep Geothermal Energy in the UK
Manchester 20/3/13
About GT Energy

- Founded in 2007 to explore and develop deep geothermal energy projects in the UK and Ireland
- GT Energy is a leading developer of deep geothermal heat projects in the UK.
- Carried out full exploration programme for geothermal energy, at Newcastle, Co. Dublin
- First developer to achieve full planning permission for a geothermal electricity project, at Newcastle, Co. Dublin
- Currently developing a portfolio of projects in the UK
- World class technology and service partners
Deep geothermal is ideally suited to supply district heating networks

- Low visual impact
- Long term source of renewable heat
- Not subject to intermittency
- Can provide Electricity, Heat and Cooling
- Ideally suited to decentralised energy generation and distribution
- Supported by the ROC and RHI

“It is suggested geothermal systems have an estimated lifetime of 100-300 years”
Deep Geothermal Development

During construction
Deep Geothermal Plant

Low visual impact
Deep Geothermal Plant

Low visual impact
Deep Geothermal Plant

Urban location
Renewable Heat Deployment

Geothermal energy + Distribution = Low carbon solution for urban areas

- **Benefits**
  - Highly efficient method of heat distribution
  - Flexibility with generation
  - Facilitates the mass transition to a low carbon supply of heat.

- **UK v Europe**
  - Circa 170,000 homes connected to district heating (2%)
  - Denmark (70%), Finland (49%), Sweden (50%)

- **Growth area for utilities in the UK**

District Heating Networks
Deep Geothermal across Europe

European statistics

• Europe
  • Over 200 geothermal district heating systems in operation, equivalent to 4,000MW
  • Additional 4,000MW to be completed by 2016

• Germany
  • Over 30 plants in operation and the deep geothermal industry is estimated to be worth €4bn

• France
  • Paris has 34 operating well geothermal heat plants providing heat to homes and businesses via district heating networks
  • Saving of 350,000t of CO₂ PA
  • The latest system supplies heat to Paris-Orly Airport
UK Geothermal Potential

4,000 MWth of potential growth forecast towards 2030

- Independent analysis highlights significant opportunity:
  - 100,000MW of inferred geothermal resource potential
  - Initial Geothermal resource assessment carried out in the 70’s by Downing and Gray
  - Reassessment carried out by SKM Consultants, a company with direct involvement in over 3,000MW of geothermal development across 20 countries

- Analysis underestimates the resource:
  - Analysis limited to review of previously identified resources
  - Resources proven by Newcastle University in 2011 not included in this report
Key components of geothermal heat projects

- **Financing**
  - Off take Agreement (Thermal Purchase Agreement)
  - Investment grade off-take guarantee
  - Bankable (Project finance)

- **Economics**
  - Heat price
  - Renewable Heat Incentive (RHI)
  - Construction costs

- **Geology**
  - Available data
  - Temp. gradient
  - Geological structures
  - Life of plant

- **Heat Demand**
  - Proximity Single Large Blue chip heat customers
  - Proximity to large other heat users
A simple but effective delivery model...

- Geothermal energy is sold to the utility on a 20 year Thermal Purchase Agreement
- Utility manages distribution, customer acquisition, customer default and billing
Financing geothermal projects

Project Finance
- Re-injection well
- Site completion

Project Developer
- Site acquisition
- Permitting & licensing
- Well design

Project Equity Investor
- Drilling 1st well
- Risk / reward

Construction, 45%
Development Capital, 5%
Exploration Drilling, 50%
Renewable Heat Incentive (RHI)

What is it?

- In November 2011 the UK Government introduced the RHI (world’s first financial support mechanism for renewable heat).
- Similar to the Feed-in Tariff system
- 20 year subsidy index-linked to the Retail Price Index
- The RHI can be claimed by accredited renewable heat technologies including biomass, biogas, heat pumps, solar thermal and deep geothermal.
- The value of the RHI for deep geothermal is currently approximately 3.4p/kWh but DECC are proposing 5.0p/KWh for 2013.
Renewable Heat Incentive (RHI)

Why it was introduced

- RES-H 2020 targets present significant challenges
  - Low level of renewable heat generation
- 80% of heat produced is through gas alone
  - Responsible for 1/3 of the UK’s greenhouse gas emissions
- Part of long term heat strategy
  - “The future of heating: A strategic framework for low carbon heat in the UK”

<table>
<thead>
<tr>
<th>Current level</th>
<th>Target level</th>
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<tr>
<td>2.2%</td>
<td>12%</td>
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5x increase!
Renewable Heat Incentive (RHI)

Chart 3: Proportion of RHI installations by technology type - cumulative

- 0.3% Biogas
- 4.4% Solar Thermal
- 4.8% Ground Source Heat Pump (GSHP)
- 0.3% Water Source Heat Pump (WSHP)
- 0.1% Bio-Methane

Chart 4: Total capacity installed by country - cumulative

Chart 5: Proportion of installations by country - cumulative
Regulatory Framework for Deep geothermal in the UK

- National Planning Policy Framework (NPPF) aiming to streamline planning process to 12 months for determination.

- Draft NPPF states, “local planning authority should have a positive strategy to promote energy from renewable and low carbon sources including deep geothermal.”

- Environmental Agency now issuing abstraction license specifically for deep geothermal prior to drilling once certain criteria are met. This gives security of tenure for investment.

- Initial abstraction license affords the license holder protected rights to that water resource for a period of up to 5 years until they develop the resource.

- Once developed 24 year licences are available.
GT Energy: Manchester Project

Site location within 1.5km of city centre
Over 500GWh of heat energy required over 3km
>90 Degree C @ 3km target

Project has secured GIC and 24 year water abstraction licence

Planning application submitted with decision due on the 11th of April

TPA being finalised
Future of the UK GeoHeat Market

Huge growth prospects

• Significant Geothermal resource

• Significant exploration data availability

• Renewable heat demand

• Potential GeoHeat resource development of 4GW by 2030 (SKM)
  • Equivalent of 15% of 2020 renewable heat target

• Represent circa £4bn investment in UK energy security

• Position GB as the lead developer, supplier and distributor of GeoHeat globally

Source: Geothermal heat and power roadmap, International Energy Association incorporating Geothermal potential in Great Britain and Northern Ireland, SKM & Arup
Achievable development pipeline target of 500MW by 2020

GT Energy Strategy

Site Acquisition

Construction

Pipeline conversion

500 MW
(30-40 projects)

SHORT
• Secure project funding
• Acquire 5 additional sites

MEDIUM
• Complete the construction of the first project

LONG
• Conversion of development pipeline

Progress first project to “ready to build”
• Thank you for your attention

• For more information click on GT Energy
  – www.gtenergy.net

• Fro more information on the Manchester project
  – www.devonshirestreet-gt.co.uk/

• Questions???