Deep geothermal power production in Cornwall, UK; technical and economic challenges
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United Downs Project

Geothermal gradient of the Carnmenellis Granite 33-35°C/km

Average UK geothermal gradient = 26°C/km
Concept

- **Injection well** – 2500m
- **Production well** – 4500m
- **Target structure** – the Porthtowan Fault Zone
- **Temperature of water delivered to surface** - 175°C
  - Re-injection temperature - circa 80°C
    - Aim for greater than 20 l/s
- **Net power** 3.15MWe (grid restriction)
  - **Deepest on-shore well in the UK**
  - **First geothermal power plant in the UK**
  - **Geological risk**
Progress

Production well drilled to 5.1km vertical depth
Injection well currently 2km
Excellent geophysical data
System concept very promising
Financing

Risk

- Financial
- Technical
- Reputational
- Security of asset

Reward

- Complex
- Uncertain
Financing stages

Planning/Permitting
- £1-£2m
  - Equity
  - Angel

Drilling
- > £20m
  - Equity
  - Public/Private

Power Plant
- > £10m
  - Debt
  - Bank
Drilling finance

Traditional

Public
- Risk Insurance
- Grant

Private
- Equity
- Match fund equity

U.Downs Project

Public
- Grant
- £10.6m ERDF
- £2.4m LA.

Private
- Early equity
- Match fund - £5m Crowdfund Bond
Revenue streams

- **Subsidies**
  - Political risk
  - Uncertain revenue (UK)
  - No revenue guarantee at start of drilling

- **Private Wire**
  - Increasing appeal (consumer and developer)
  - Contractual issues
  - Practicality

- **Virtual PPA**
  - Increasing appeal (large corporates)
  - Contractual complications

- **Heat**
  - Revenue uplift
  - Contractual issues

- **Other**
  - Mineral extraction
  - Early stage
Summary

• Deep geothermal heat/ power has substantial potential but funding for drilling stage is difficult
• Novel ways of funding may become more prevalent (public interest is substantial) and also tie in the community
  • Peer to peer lending
  • Crowdfunding
  • State backed insurance schemes
• Need creativity around revenue
  • Grid is becoming complex/ expensive
  • More opportunity for private wire/ virtual PPAs
  • Financial products to ensure long term HPAs/ PPAs between entities are bankable
  • Couple system to mineral extraction