



# East Africa Geothermal Energy Facility

GRMF East Africa Donors' Coordination and  
Collaboration Meeting – 14 June 2016

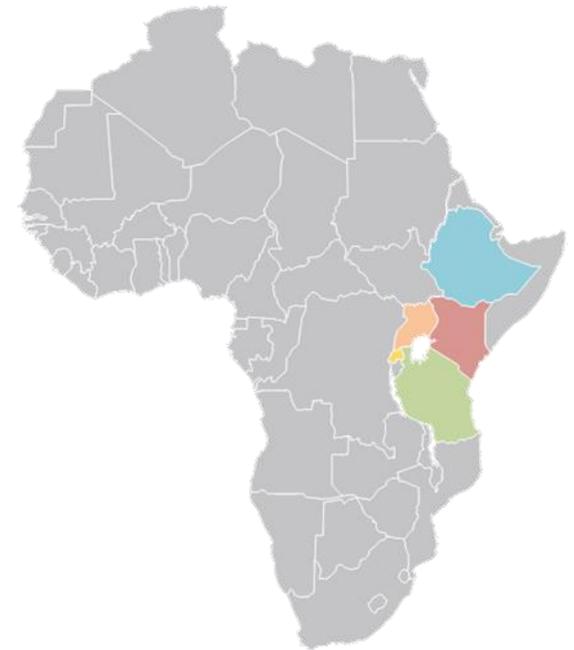


East Africa Geothermal  
Energy Facility

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# What is EAGER?

- **Funded by DFID**
- Regional Technical Assistance programme running for 3.5 years from May 2015
- GBP 6 million and covering 5 countries (Ethiopia, Kenya, Rwanda, Tanzania, Uganda)
- Seeks to cover gaps in Government role to support geothermal development by removing barriers and speeding progress
  - No duplication with other donors



# Key Attributes of EAGER

- **Flexibility**
  - Looking at current issues not covered by others
  - Quick response, where possible
- **Large Pool of Expertise**
  - Able to draw on a wide range of expertise:
    - Geothermal technical; legal; regulatory; finance; business strategy; electricity markets and power planning; tariffs and PPAs
  - Focus on decision support and removing barriers to progress
  - Reports on international experience



# People

- **DFID:** Gareth Martin (UK)
- **Programme Management:** Adam Smith International
- **Team Leader:** John Heath (UK)
- **Programme Managers:**
  - Laura Rizzotto (UK)
  - Matt Blythe (Nairobi)



# Work Programmes: Key Issues Emerging

1. Role of Geothermal in Electricity Markets:
  - Market Risks for Geothermal
  - Power Purchase Agreements and Negotiation
2. Geothermal Development – Business Models
3. Regulatory Mandates and Frameworks

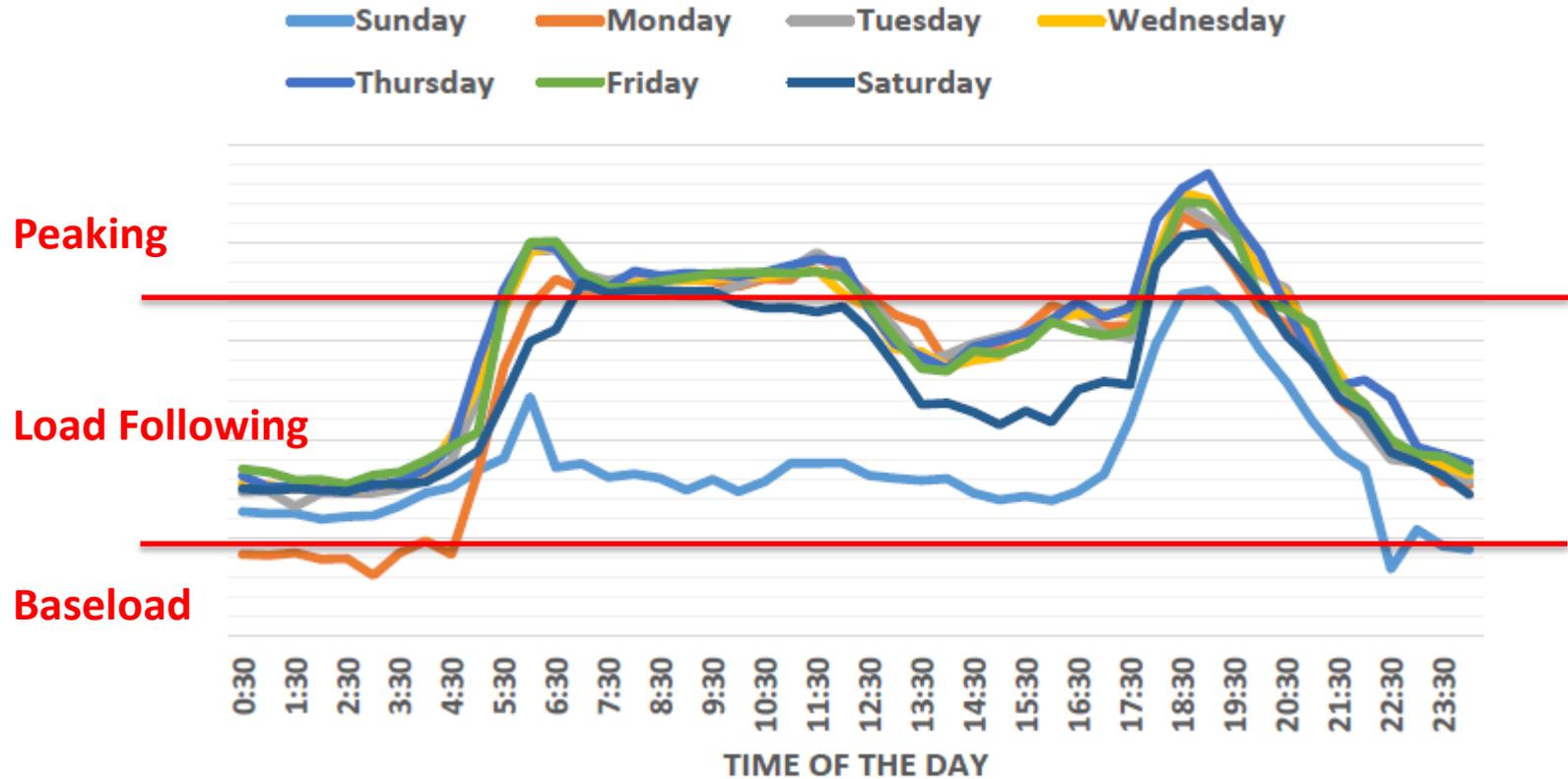


# Market Risks for Geothermal

- To date the general assumption has been that there will always be demand for any additional power generation in East Africa
- But this is changing....
  - Over the period of a geothermal development starting today a number of countries may move to having a surplus in generation at some times or in some years
  - There will be competition for baseload generation
  - Large scale intermittent renewables change the marketplace



# Typical Daily Load Profile



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# Competition for Baseload

- Geothermal
- Combined Cycle Gas Turbine
- Coal fired generation
- Intermittent renewables – seasonal or daily
  - Run of river hydro, wind
- Intermittent renewables displacing other baseload in the day because of “must run” priority:
  - Run of river hydro, wind, solar
- Exporters of baseload



# What Will Happen as the Baseload Market Gets Crowded?

1. Economic despatch rules should apply, but:
  - May be overridden by PPA terms
  - Government policy decisions may allocate losses
2. “Take or pay” and “must run” IPPs will be paid to switch off:
  - Power purchase costs will exceed PPA prices
  - Who will carry the stranded costs?

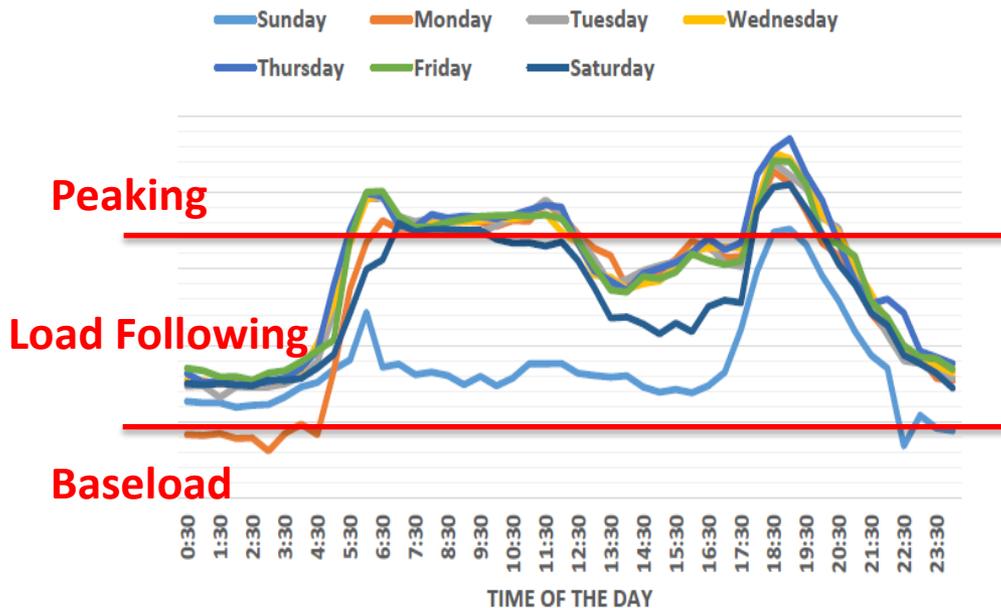


# **This Raises Significant Questions for Geothermal Development Projects, Whether Public or Private Sector...**

- Where will geothermal sit in economic despatch rules, compared with run-of river hydro, wind, even solar?
- How will Government policy makers respond?
- Will competition for baseload squeeze prices down?
- How can geothermal developers influence the market?
- What will the market look like by the time a geothermal project reaches commissioning? Will demand rise to meet supply?
- Could this impact on off-taker viability?
- What sort of PPA will be best in the future?



# Can Geothermal Operate as Load Following rather than Baseload?



- Longer term the load following market should become more valuable
- Flexible generation has to compensate for intermittent renewables
- Demand will always have uncertainty



# Will Regional Markets Provide an Answer?

- Most countries seem to expect to sell rather than buy in the regional markets
- Most seem to want to sell baseload apart from day ahead balancing trades
- Buyers are more likely longer term to want peaking and load following power
- The daily peak does vary in time across the region, but enough to cover baseload operation?



# Geothermal Position – is this reflected in market prices?

- Despatchable
- Reliable
- Low operating costs
  - Competitive once capital recovered
- Insurance against drought risk
- Exploration cost and risk to cover
- High capex to cover
- Local community benefits
- Direct use options
- No energy price volatility
- Can offer ancillary services
- No emissions
- PPA structure may lead to non-despatch
  - e.g. steam supply treated as an avoidable energy charge



# Power Purchase Risks and Negotiation

- Buyers will become more precise as to their needs:
  - Overall cost and risk will become more important than lowest price
- Flexibility will have a premium, and therefore the load following market will become attractive but also more competitive
- Ancillary services will have a clear value
- The optimal allocation of risks between buyers and sellers will change, but how?
- EAGER has prepared “Guidance for a Geothermal Specific PPA” which starts to cover some of these points (available upon request)

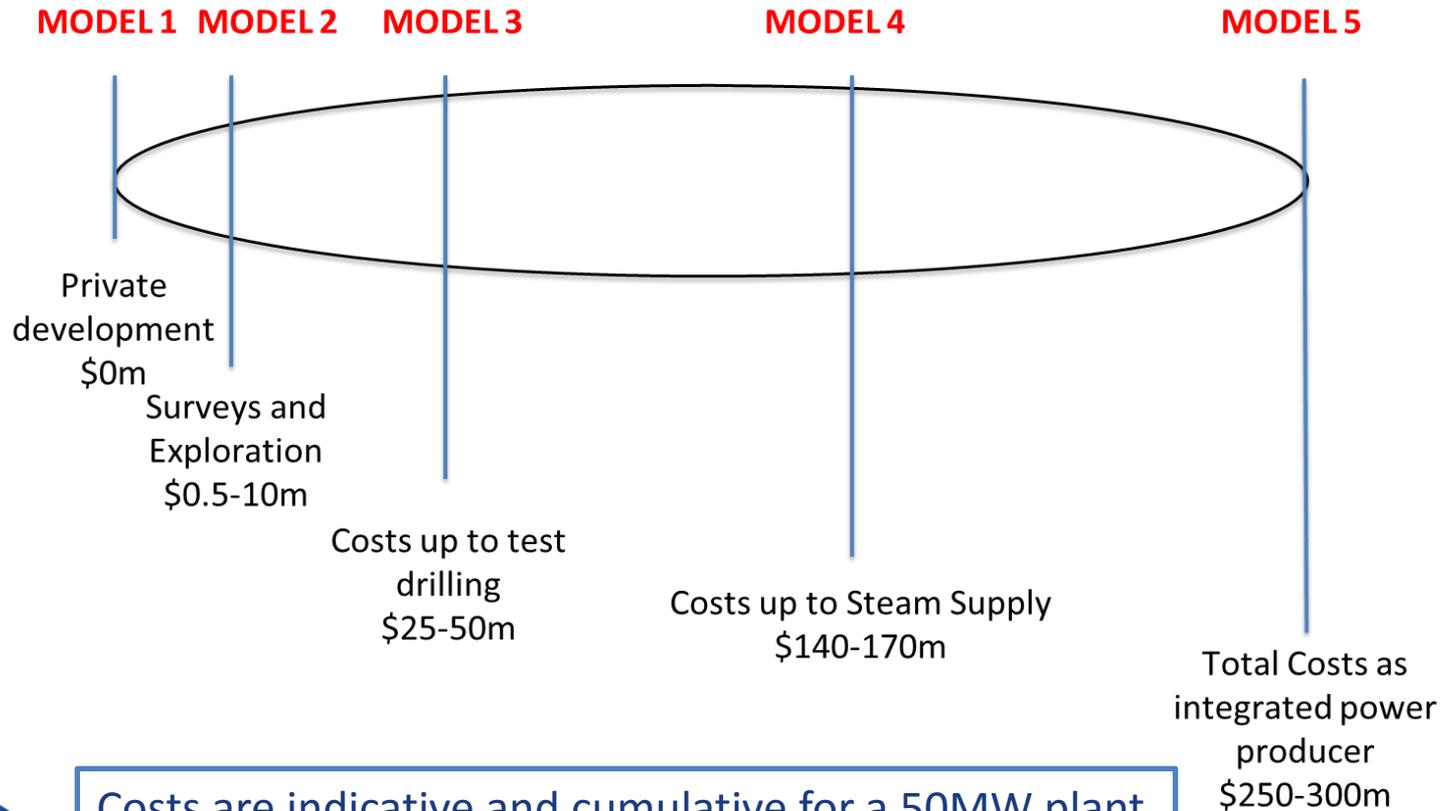


# Geothermal Development – Business Models

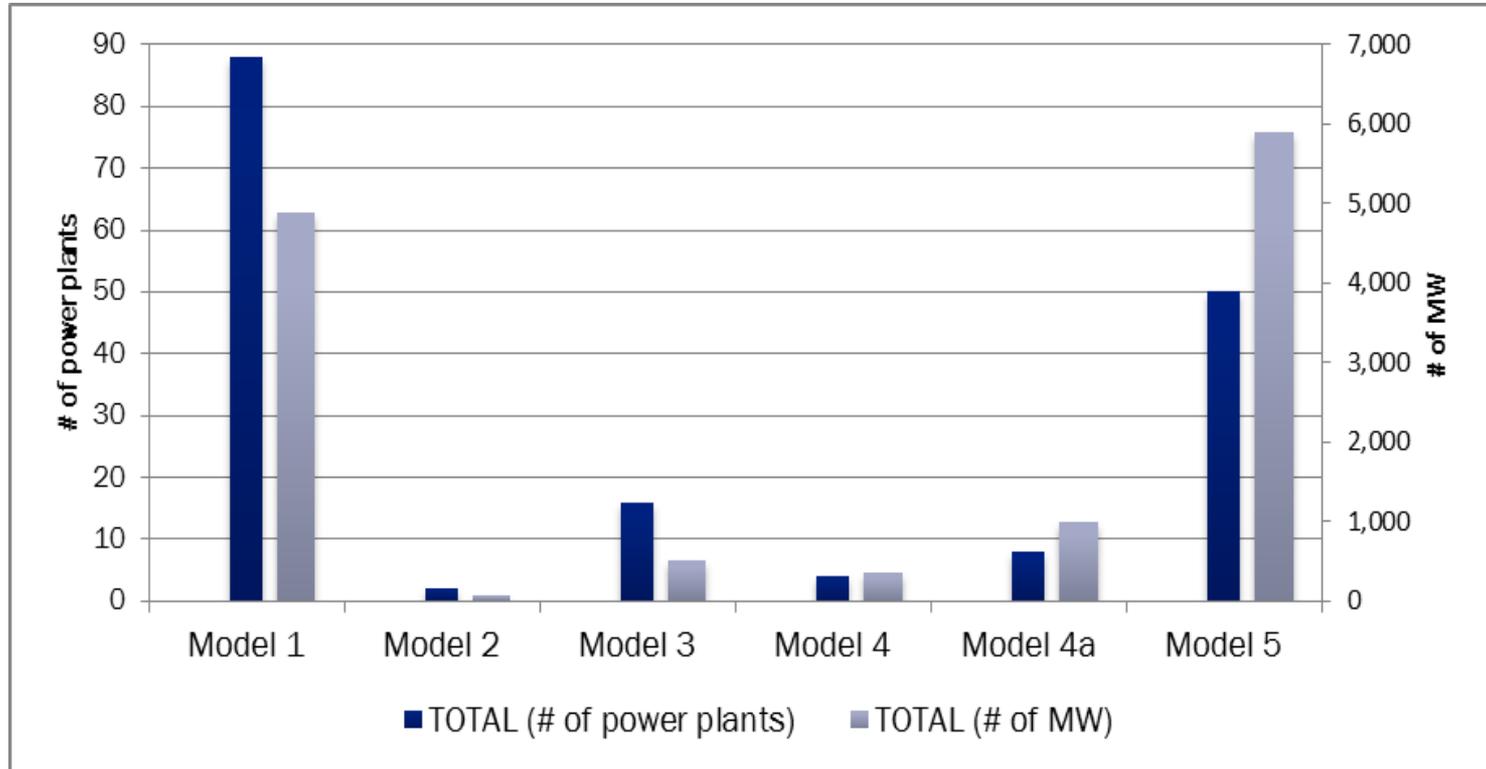
- East Africa is seeing a continuing debate on geothermal development business models:
  - To go public sector or private sector?
  - At which stage in the development process?
- Why are different models chosen in different countries, at different times, and even for different fields?



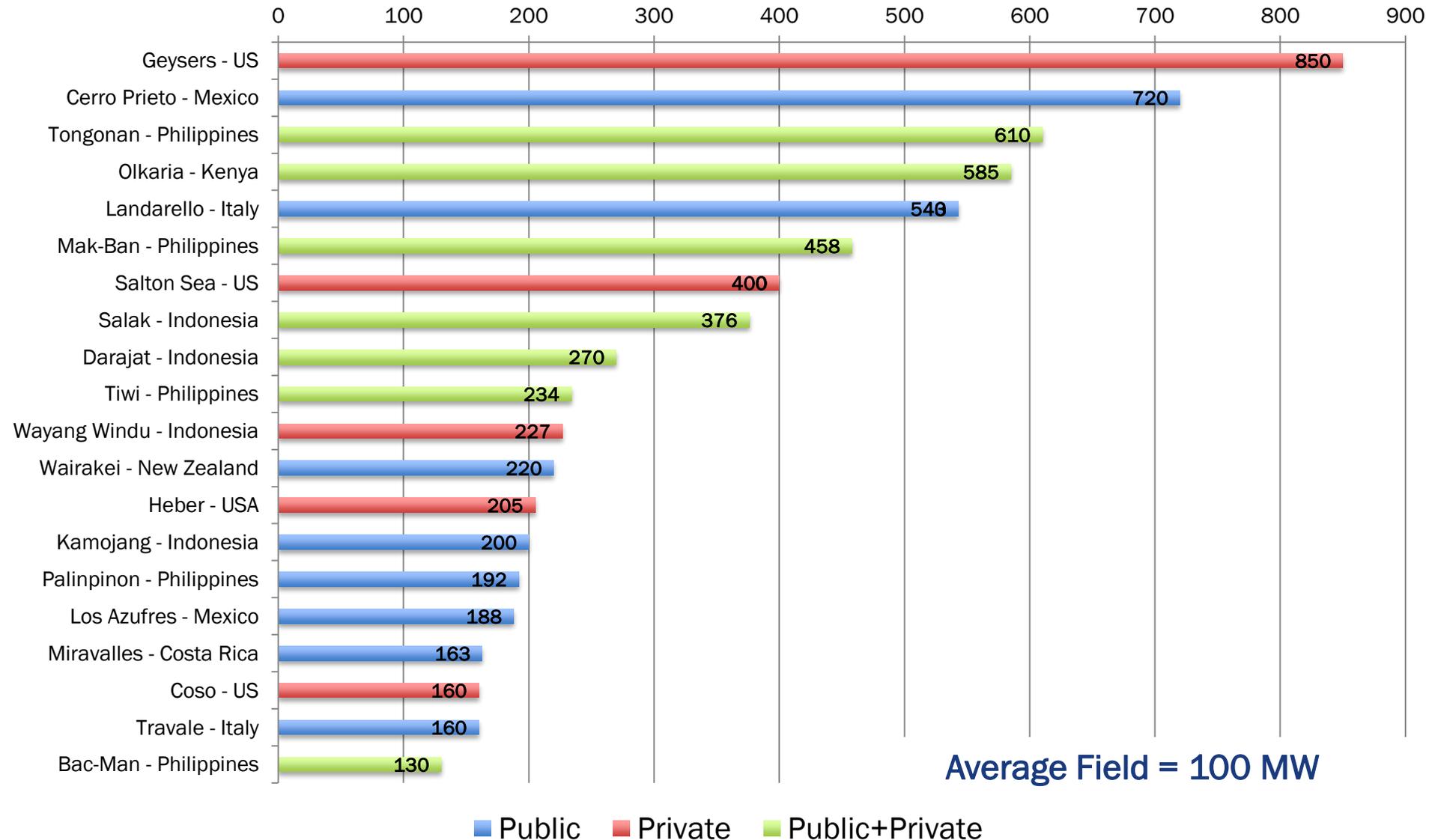
# Different Models at 5 Stages of the Process



# Which Models Have Been Used Historically?



# World's Largest Geothermal Fields (MW), 2016



# Factors Impacting on Choice of Model

Constraint	Model 1	Model 2	Model 3	Model 4	Model 5
Limited country resource	X				X
Limited public funding	X	X			
Limited private capital				X	X
Limited private appetite for risk			X	X	X
Affordability				X	X
Speed to production	X	X	X		
Limited public sector capability	X	X			
Difficult or restricted geography					X
Country culture	X				X

# Implications

- There is no one right answer to the choice of model, and more than one model can apply in the same country
- Even the fully private sector models require Government involvement: enabling environment, regulation, control and monitoring
- The financial analysis is critical for the decision (note differences between volcanic and fault controlled fields):
  - Realistic and detailed
  - Scenarios to understand risks



# Regulatory Mandates and Frameworks

- Starts from the questions:
  - Why regulate?
  - What are the issues of public interest that call for regulation?
  - How should the law and regulation interface?
  - Who should regulate?
- EAGER has reviewed international practice and produced a report



# Public Interest Issues in Geothermal Development

Resource Value

Access to Electricity

Affordability of  
Electricity

Resource Exploitation  
(Construction and  
Operation)

Environmental  
Protection

Use of Land for  
Exploration and  
Access

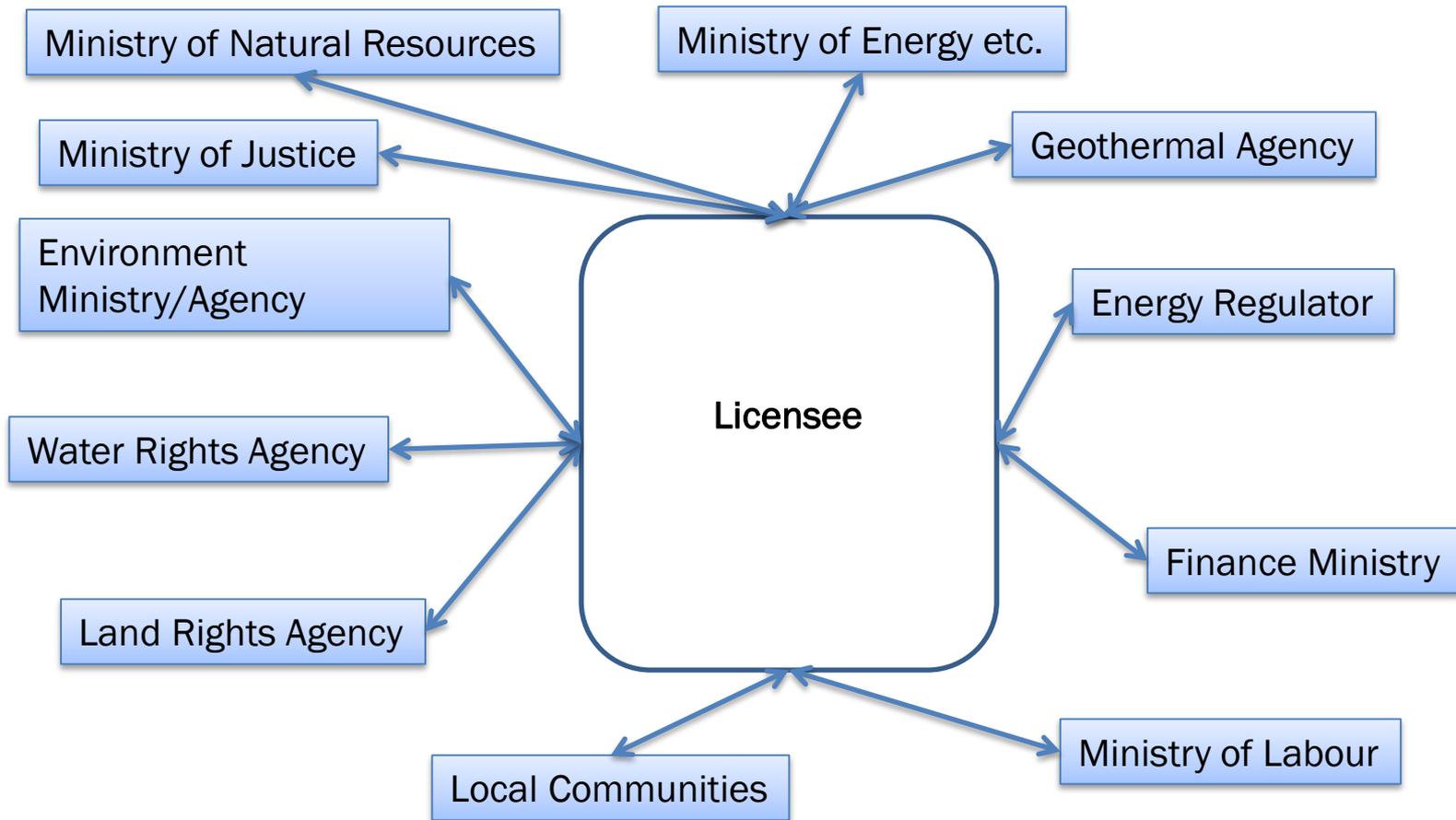
Labour

Concession/Licensee  
Performance

Community and Social  
Protection

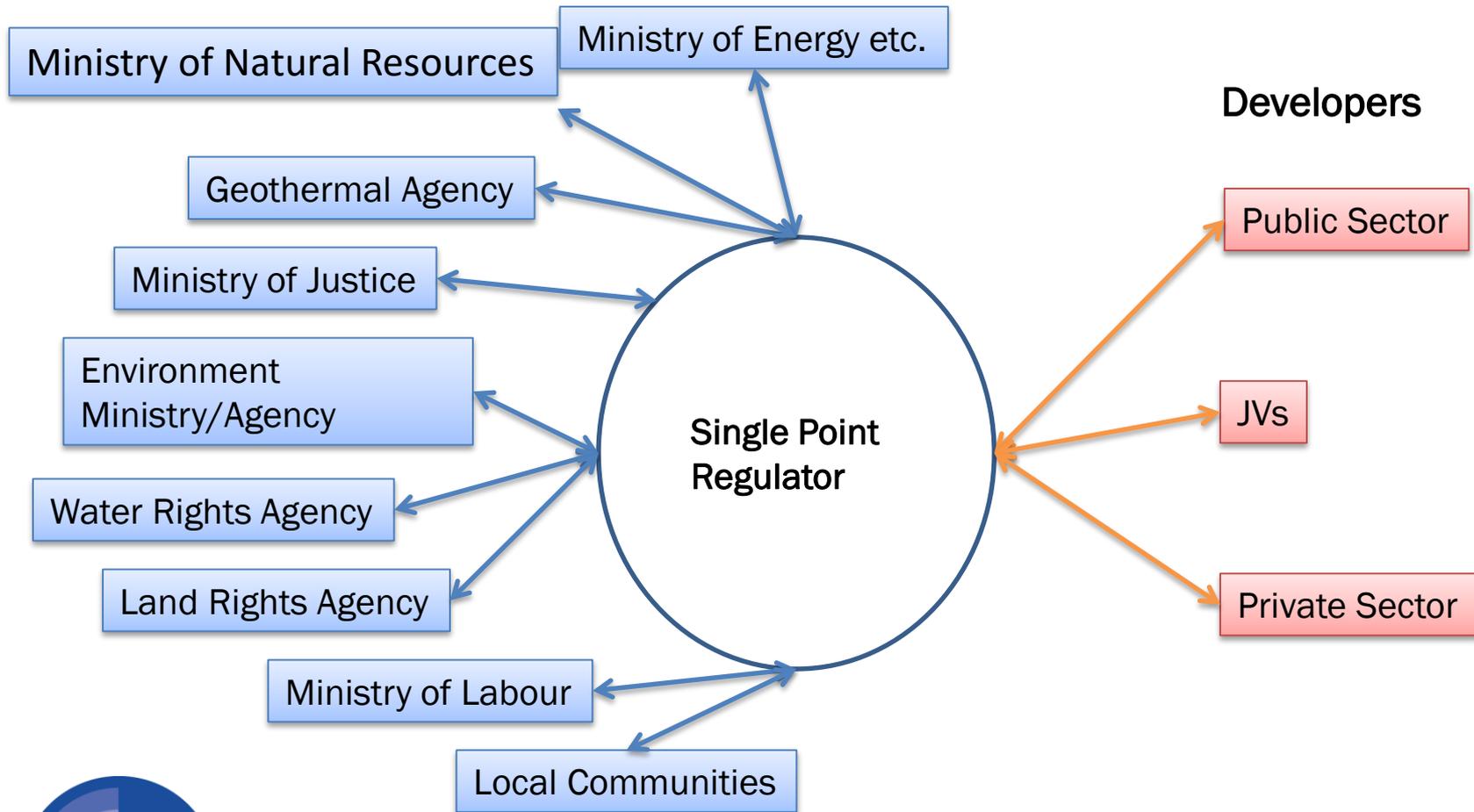


# Typically the Geothermal Developer Has to Deal with Each Agency Separately



**And each agency will have its own interfaces with other agencies**

# Single Point Regulator: Skills and Interface Issues



# Key Points

- Is there a conflict of interest where the geothermal developer is also custodian of the resource and may award concessions?
- How can scarce skills and experience be best utilised?
- Single-point or multi-point regulation?
- What is the best balance between detailed laws or regulation and flexibility to encourage innovation?



# Can EAGER Help You?

- We can do many things in geothermal...
- But only want to help with what Government and their agencies need...
- And what others are not doing...
- And what helps progress geothermal development
- Just contact us to discuss!!



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