



Formulating a Geothermal Energy Policy, Legal and Regulatory Framework for Uganda



Dr. Paul Zakkour

Carbon Counts

6th ARGeo Conference, Addis Ababa, 03.11.2016

Background



- Uganda does not have any policy or law dedicated to geothermal energy:
 - Energy Policy / Renewable Policy limited consideration (REFiT of US¢7.7/kWh)
 - Mining Law (2003) presents some issues
- Current framework inadequate for promoting investment and efficiently managing resources
- New Policy & Legal Framework could help address many issues and barriers
- TA request sent to UN **Climate Technology Centre and Network** (CTCN) in early 2015. Project team mobilised in late 2015

Project Team



Team Lead: expertise in energy & climate policy, including regulation of subsurface exploration & development, including in Africa



Energy economists: expertise in energy finance and electricity trading arrangements, including geothermal energy in Africa



Stakeholder engagement: experts in supporting investment and development in the utility sector in Uganda



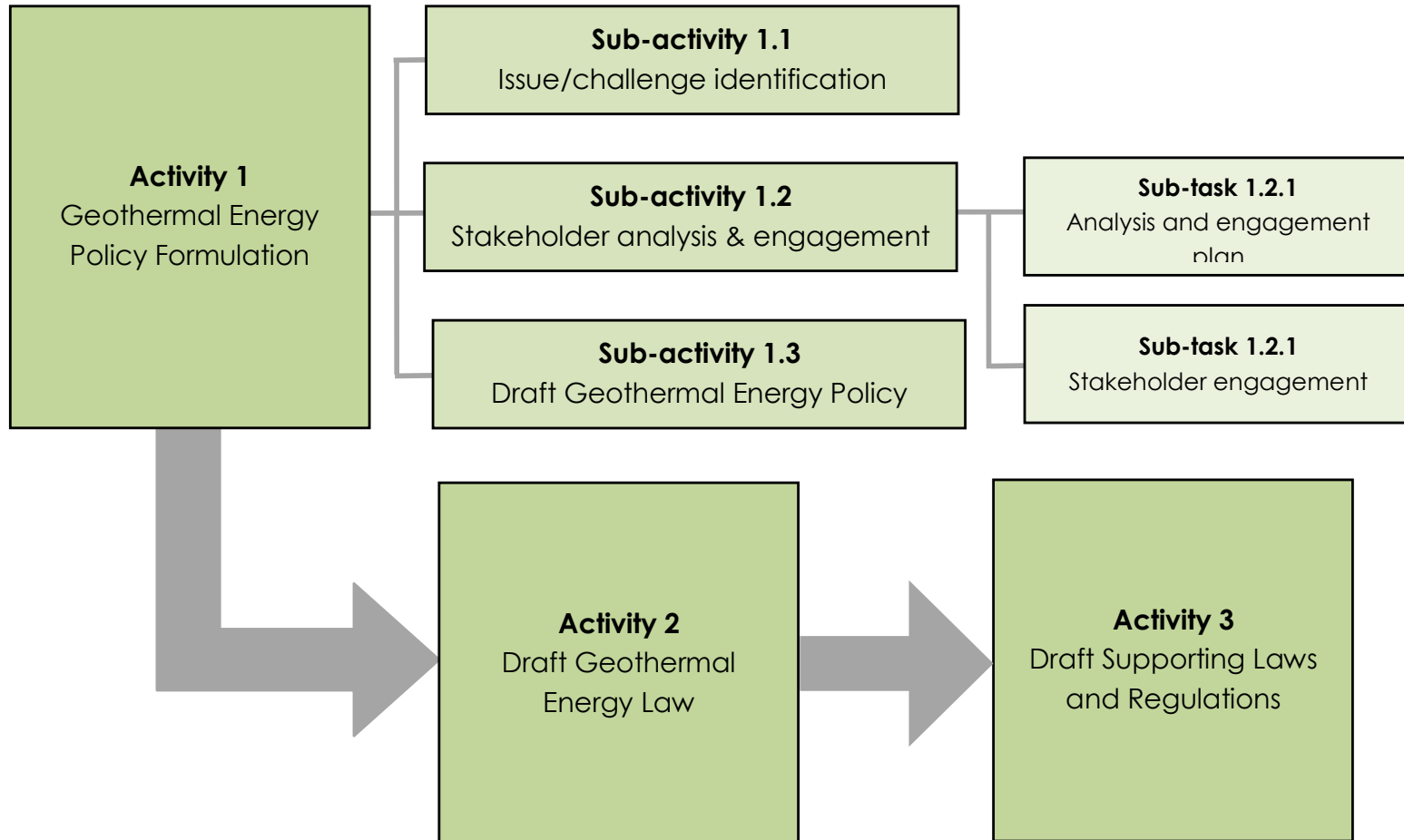
Lawyer: experts in Ugandan utility law and regulation



Lawyer: experts in international energy law and regulation

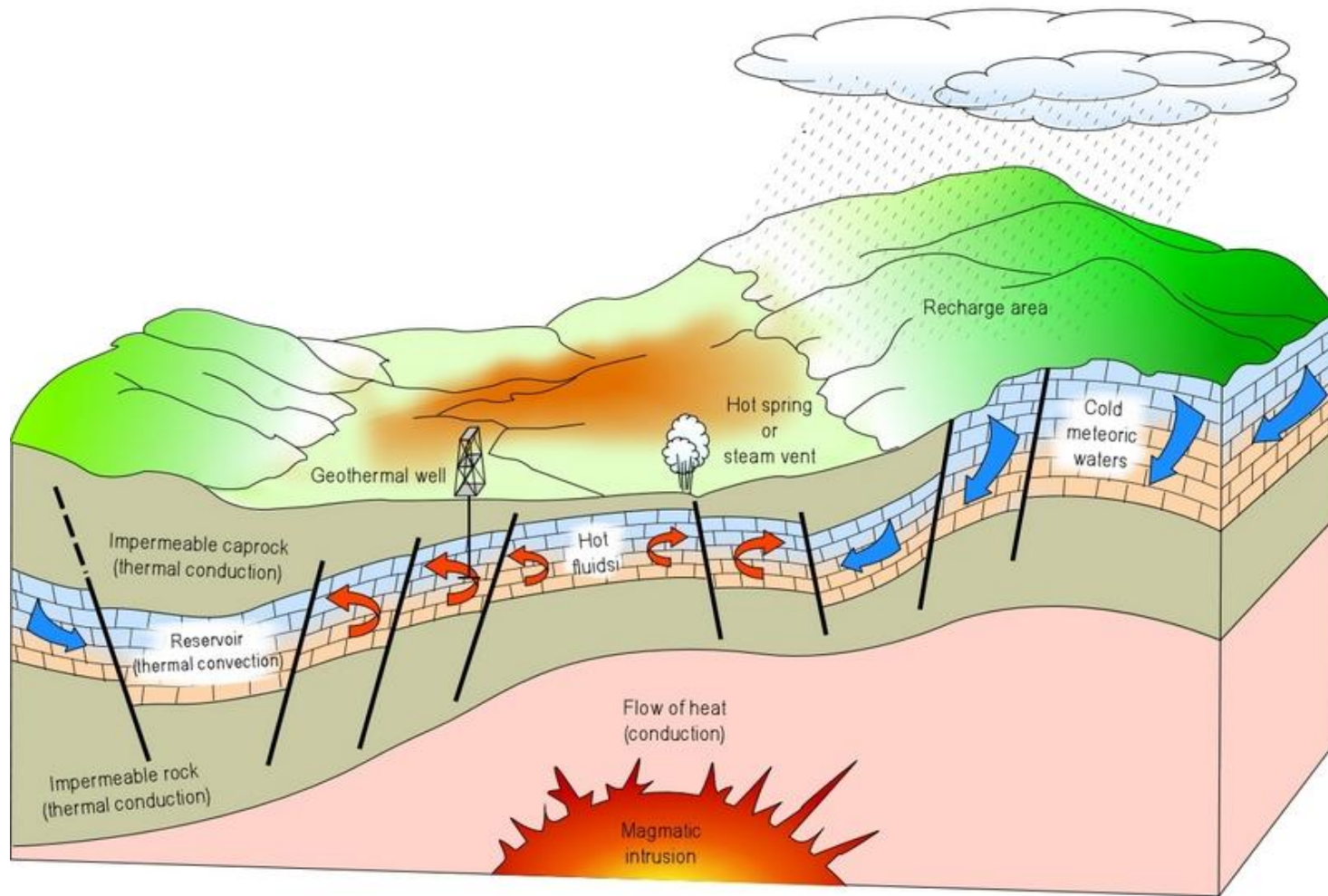


Project Methodology

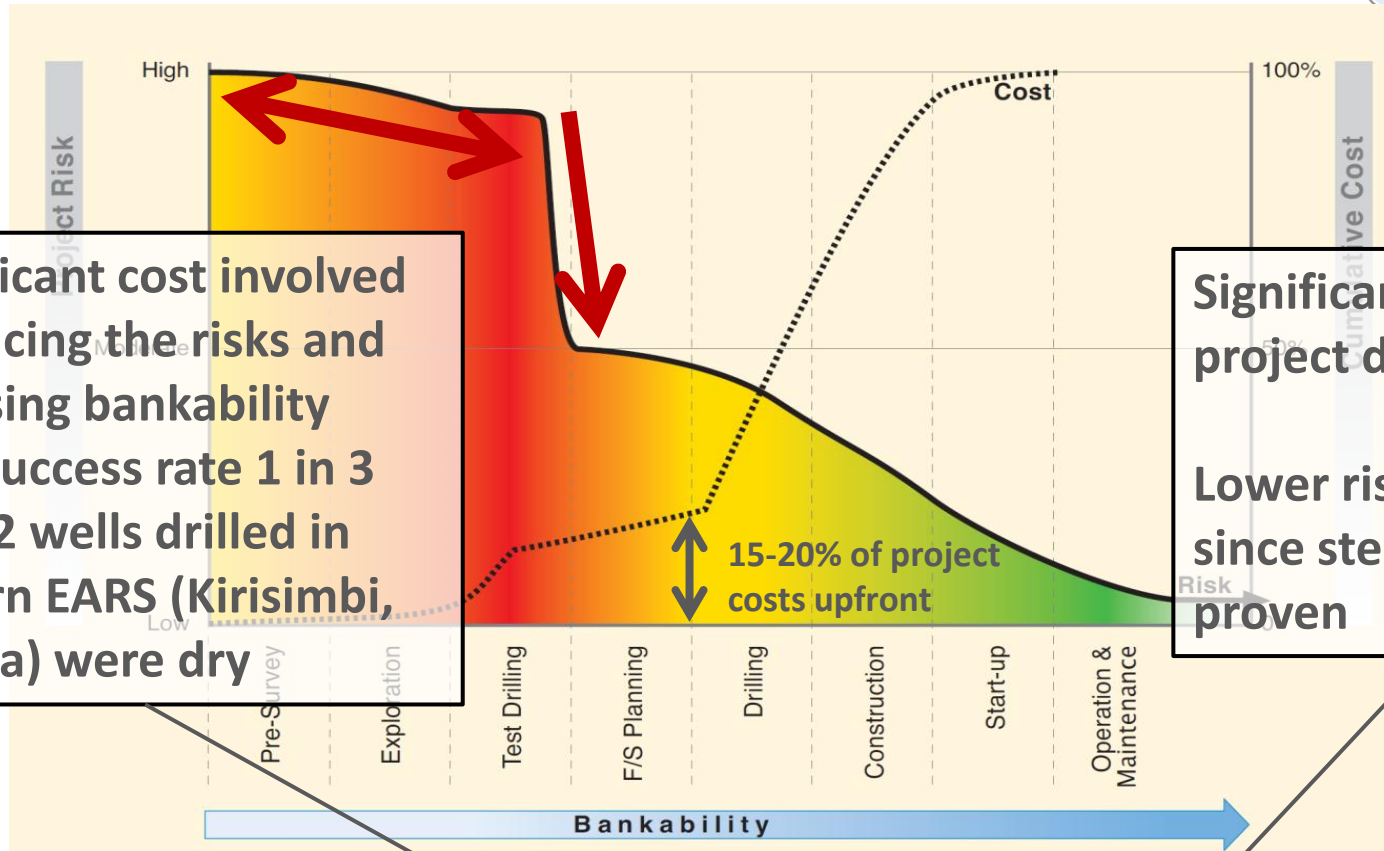


ACTIVITY 1.1 – BACKGROUND ANALYSIS

The opportunity: free renewable energy



The challenge: risks & cost

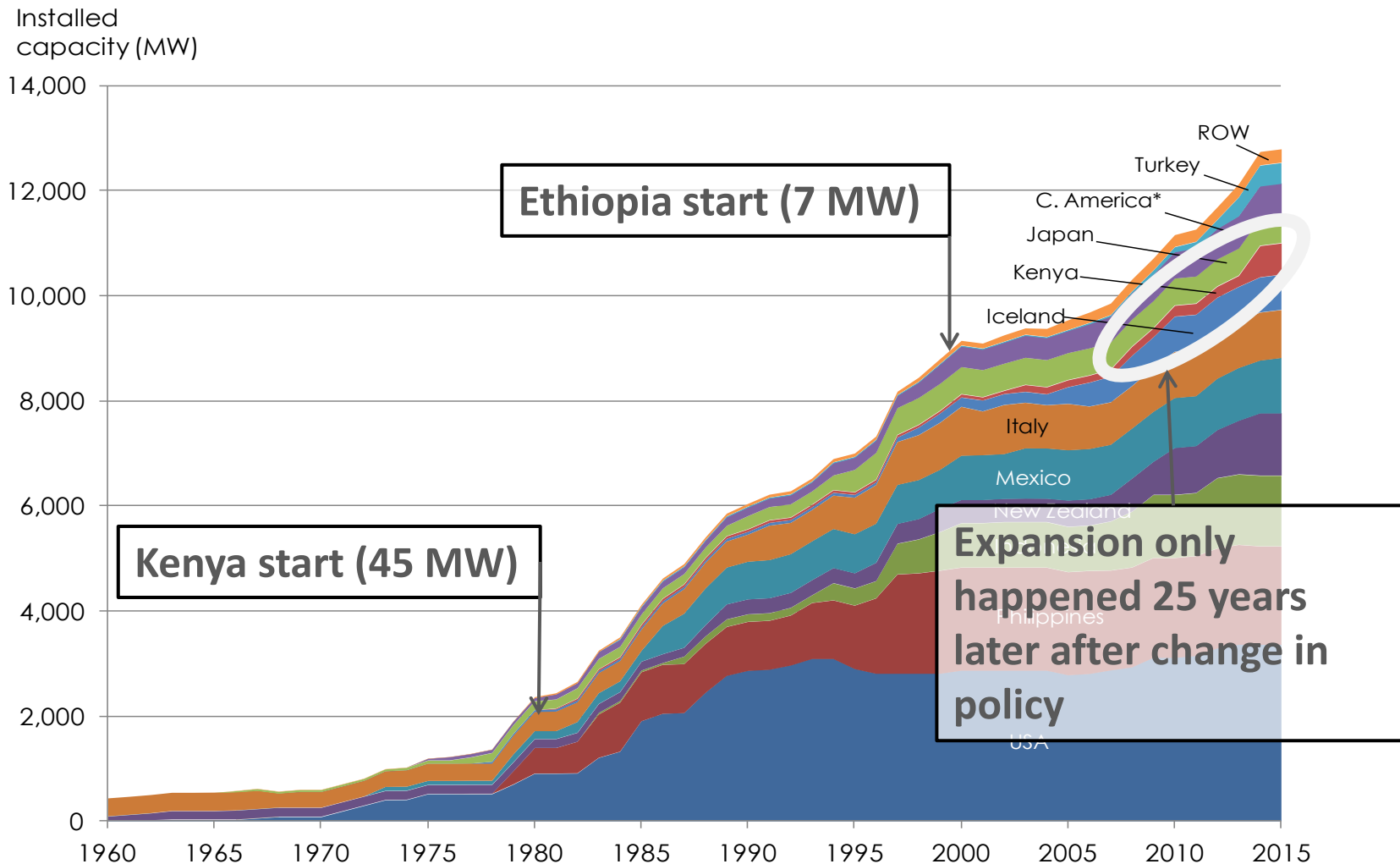


- Significant cost involved in reducing the risks and increasing bankability
 - Drill success rate 1 in 3
 - Only 2 wells drilled in Western EARS (Kirisimbi, Rwanda) were dry

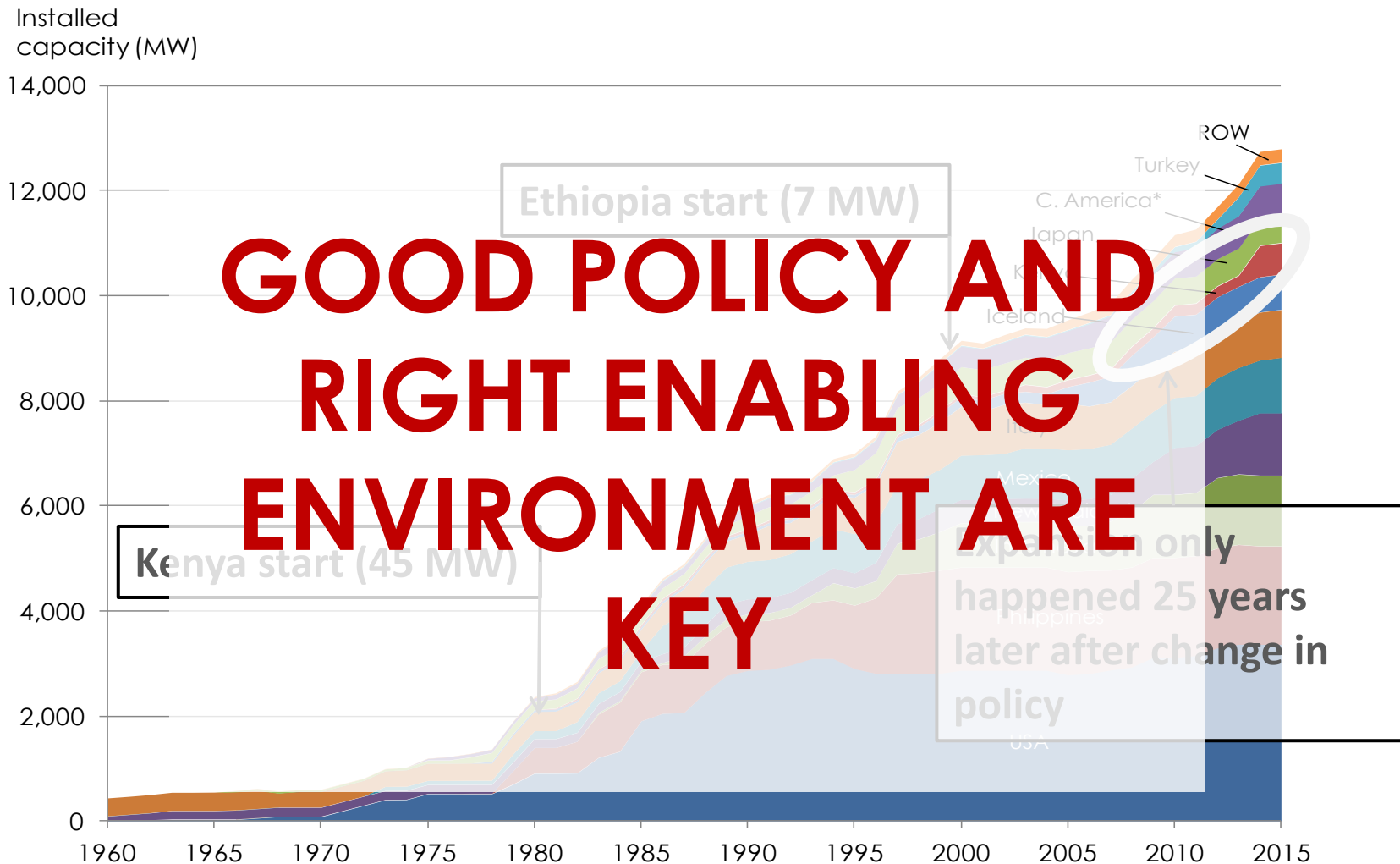
Significant cost in project development
 Lower risk profile since steam resource proven

		Pre-survey	Explor	Test drill	Plan	F/dev	Steam field	Power plant	O&M	Total
Low	(US\$ M)	0.5	1	11	5	45	10	65	3	142
Medium	50 MW power plant	1	2.5	18	7	70	16	75	5	196
High		5	4	30	10	95	22	95	8	274

But not impossible....



But not impossible....



First of a kind geothermal projects

PUBLIC SECTOR & DONORS KEY TO FOAK GREENFIELD DEPLOYMENT

Cerro Prieto, 1973, 75 MW

- CFE (State Electric Utility) led and financed project
- Built on earlier efforts of CEG (Geothermal Energy Commission)

Ahuachapan, 1976, 61 MW

- CEL (Comision Ejecutiva Hidroelectrica) El Salvador state utility led
- UNDP funded field exploration, World Bank funded power plant

Miravalles, 1994, 60 MW

- Instituto Costarricense de Electricidad (ICE) led and funded project

Kizilidere, 1984, 20 MW

- Mineral Research & Exploration Co. (parastatal) led
- Funded by State Electric Co.

Tiwi, 1979-80, 230 MW

- UNOCAL /PGI led
- Public & Private finance, incl. state utility NAPOCOR
- PNOC-EDC formed 1976 to reduce costs

Kamojang, 1978-83, 30 MW

- Dutch (1920s), then NZ govt with local partner led
- Funded by Pertamina (NOC)

Olkaria I, 1980-81, 30 MW

- KPC (KenGen predecessor) led project
- Funded by World Bank grant and EIB loan

Aluto-Langano, 1999, 7.3 MW

- Ethiopia Electric Power Corporation (EEPCCO) led and funded project

Wairakai, 1958-63, 193 MW

- NZ Govt & UK Atomic Energy Authority led
- Public financed

Examples of private sector activity

RECORD OF PRIVATE DEVELOPMENT OF GREENFIELD PROJECTS IS POOR

Honduras, 1994, 0 MW

- *Plantares* field acquired in 2013 by ORMAT
- 35MW plant commenced production in 2016 for state power company

Ethiopia, 2013, 0 MW

- Rekyavik Geothermal signed PPA with EEPSCO in 2015 for *Corbetti* field for 1000 MW
- Promise US\$4bn investment
- Trying to renegotiate PPA
- Cluff Geothermal trying to develop *Fantale* field

Philippines, 2008, 20 MW + (repowering of existing)

- 43 contracts in place – only 2 new exploration contracts
- Maibarara started 2014
- Kalinga – 120 MW under development by JV incl. Chevron. Complete maybe 2019-20

Nicaragua, 2002, 72 MW (expansion of existing)

- 3 fields extensively explored by various entities, but no new power plants built (or close to being built)

Indonesia, 2003, 67.5 MW (expansion of existing)

- >65 geothermal working areas tendered
- Only major plan is 330 MW plant at Sarulla (almost 30 years in planning)

Chile, 2000, 0 MW

- 76 Exploration licenses (2012)
- 6 Exploitation licenses (2012)
- 48 MW plant at *Cerro Pabellon* announced in 2015 by LaGeo

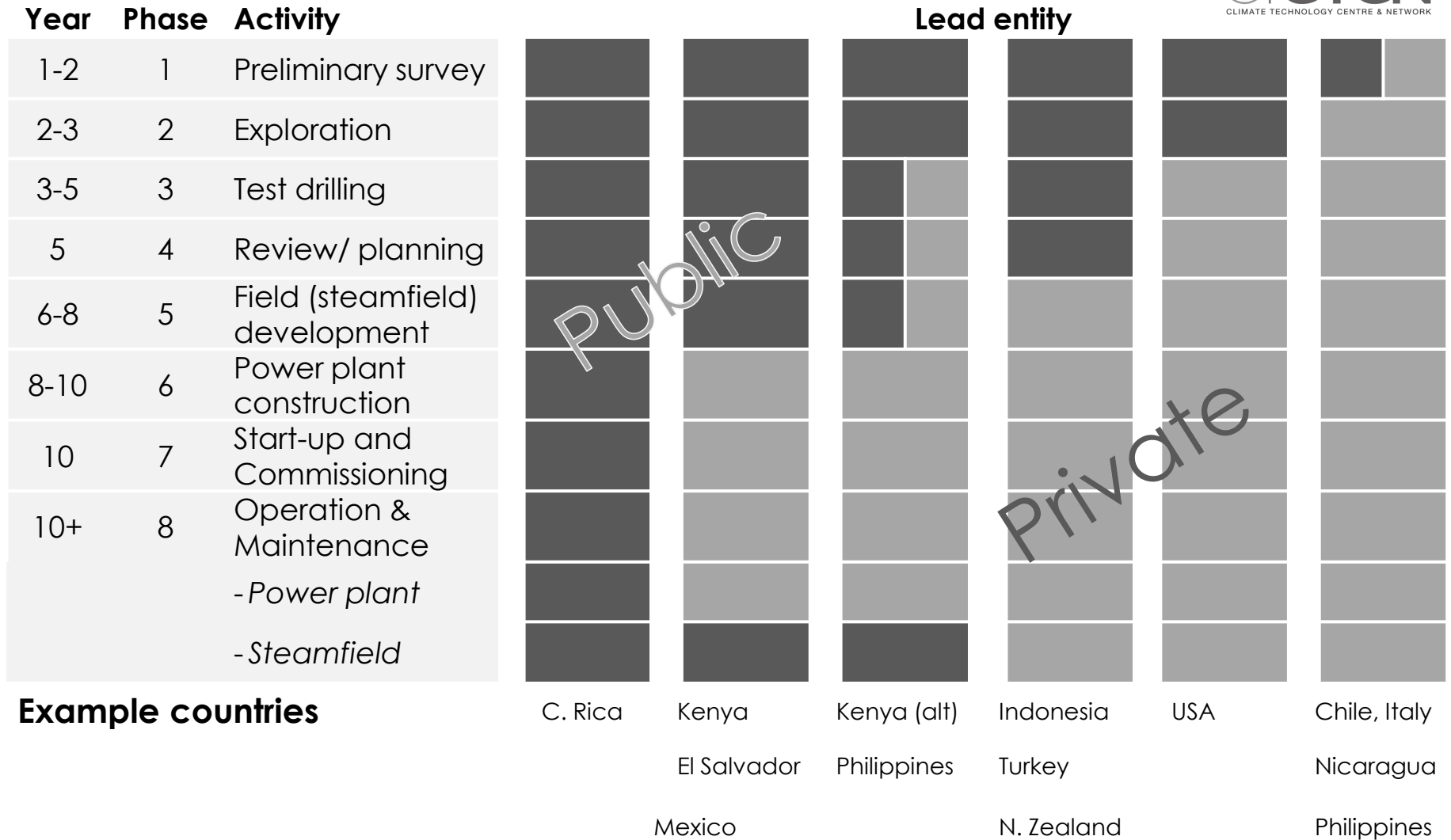
Uganda, 2010, 0 MW

- 14 exploration licenses issued
- PPA signed with AAE Systems for *Katwe* in 2013. Promised 100-200 MW plant at US\$1.2bn
- Limited activity since

Kenya, 1982, 48 MW

- Law passed 1982
- Only private plant is ORMAT at *Olkaria III* in 2000 (3 wells donated by KenGen)
- Various under development

Project structuring



A word of caution

“There is little appetite from the private sector to fund projects where the nature and extent of the resource are unknown. The private sector only financed all stages of the project in 7.5% of the utility-scale projects in our database. 58.5% of projects had the costs entirely borne by the public sector, while 34% projects had the private sector bear costs at later stages in the development chain once the resource had been proved.”

and that:

“private financiers are not willing to provide financing until all or at least 70% of the MW capacity has been drilled”

Source: Micale et. al. (2014). Report for Climate Investment Funds (CIF)

Geothermal policy globally

- Two main drivers apparent for geothermal globally:
 1. **Necessity.** lack of other obvious sources of energy, and an over-reliance on variable hydro-power, have given rise to the importance of geothermal energy for baseload generation (e.g. in NZ, Kenya, C. America) →
 - significant government efforts to get the industry off-the-ground;
 2. **Opportunity.** the quality of the resource has tended to be manifest using information acquired as from other activities e.g. exploration (such as in Philippines and Indonesia, where NOCs and IOCs have led).
 - Interest emerged in response to the **clear opportunity** presented.
- In reality, often a mixture of the two, but useful to note

Geothermal policy globally (2)

- Nearly every first-of-a-kind (FOAK) geothermal project around the world has been publically-led and funded
- Risks too high for private financing
- But, policies tend to be *evolutionary*:

Public-sector (and dev partners) leads efforts for FOAK

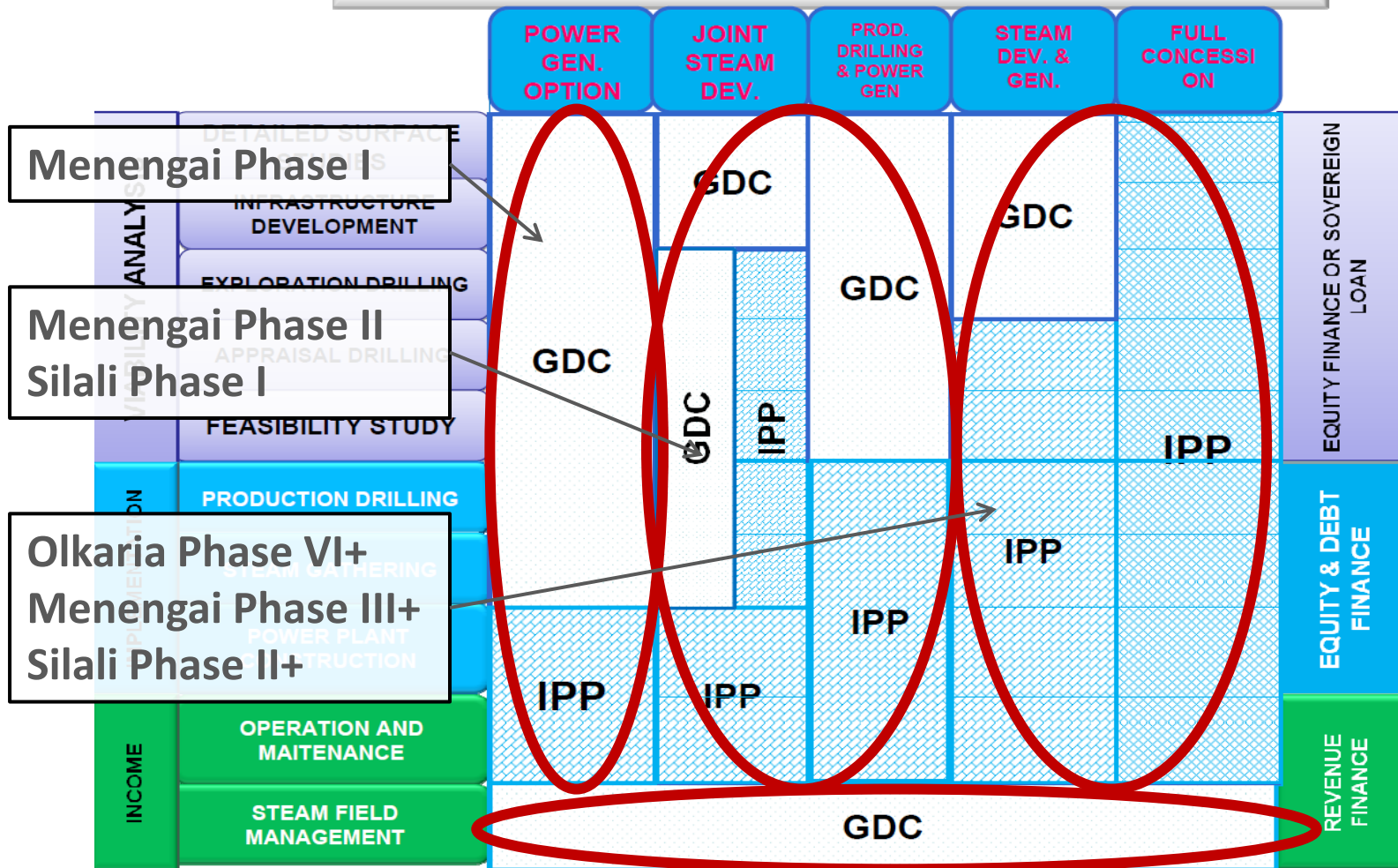
Move towards PPP models for other *greenfield* development

Opening up *brownfield* production to 100% private sector led development

Time/Experience

Kenya GDC vision

GDC PUBLIC PRIVATE PARTNERSHIP - OPTIONS



Policy situation in Uganda today

- No policy supporting geothermal energy development
- GOU is *passive*, relying on the organic evolution of the industry based on 100% *private sector* led investment, incentivised by geothermal REFiT
- Concessions are held by *passive speculators*
 - Poorly capitalised
 - Lacking technical competencies needed to develop such complex and long-term projects
- GRD mandate is unclear:
 - Research and data management unit?
 - Centralised point of contact for coordination of private sector-led development? or
 - Empowered to take projects forward itself?

Choices for Uganda today

1. The *opportunistic* approach. Carrying on with the current strategy of *private sector led* development. Possibly enhance the enabling environment for *private sector led* development:
 - A revised Concession allocation process, greater role of government in compiling resource information, better safeguards against passive speculation etc;
 - Clearer rights over tenure and land access, perhaps with government guarantees over supporting permits;
 - A new set of enhanced incentives for geothermal energy (e.g. enhanced tax breaks etc.).
2. The *necessity* approach. Creating enhanced *public sector led* arrangements, e.g., through GRD or a parastatal company approach similar to Kenya or Tanzania. Take either fully-public or PPP approach to development of steamfield and power plants

Summary of options

	Description	Pro's	Con's
A	Carry on with business as usual, relying on the private sector to develop the resource	Limited exposure of GOU to full project costs and risks.	Experiences to date in Uganda, as well as examples of successful deployment around the world, suggest low chance of projects being built. High LCOE.
B	As Option A, but increase GOU-led resource exploration with a view to bringing in private sector to develop when more resource certainty is achieved	Could accelerate deployment compared to Option A Exposure of GOU to full project costs is still limited.	Higher cost than Option A. Limited control over rate and scale of development – uncertain if private sector will respond effectively to the incentive provided Potentially high LCOE.
C	As Option B, but also provide new set of enhanced incentives for private sector to develop geothermal energy	Could accelerate deployment compared to Options A and B Lower LCOEs than Option A or B Exposure of GOU to full project costs is still limited	Potentially high cost to GOU Limited control over rate and scale of development – uncertain if private sector will respond effectively to the incentive provided
D	GOU leads on project development, through either: - GRD - New parastatal agency (“UGDC”) - An existing parastatal agency (e.g. UEGCL; NOC) Include PPP approaches.	Greater control over rate and scale of development. Able to access to donor grants and concessional loans. Lower LCOEs than Option A, B or C (assuming concessional finance) Private sector could lead on power plant development as PPP approach.	GOU takes on significant debt. GOU needs to provide core funding to responsible agency Full exposure to project costs and risks.

Background briefing materials

Geothermal development risks & cost



- Significant cost involved in reducing the risks increasing bankability
 - Drill success rate 10-20%
 - Only 2 wells drilled in Western EARS (Kiris Rwanda) were dry

Low	(US\$ M)	0.5
Medium	50 MW power plant	1
High		5

Cost of geothermal power

Note: * US\$/kW/installed (fixed O&M cost)

Plant type	Construction (US\$/kW)	Operation and Maintenance (US\$/kW/yr)	Levelised cost of electricity (US\$/kWh)
All			
Flash			
Dual flash			
Binary			
Flash			
Binary			
All			
Average			

30 MW power plant in the range US\$90-110 million

© 2014, Carbon Counts

Project structuring

Year Phase Activity

Year	Phase	Activity
1-2	1	Preliminary
2-3	2	Exploration
3-5	3	Test drilling
5	4	Review/feasibility
6-8	5	Field (steep) development
8-10	6	Power plant construction
10	7	Start-up & Commissioning
10+	8	Operation & Maintenance

Example countries

© 2014, Carbon Counts

First of a kind geothermal projects

PUBLIC SECTOR & DONORS KEY TO FOAK GREENFIELD DEPLOYMENT

Caro Pileto, 1973, 75 MW
 • CFE (State Electric Utility) led and financed project
 • Built on earlier efforts of CEG (Geothermal Energy Commission)

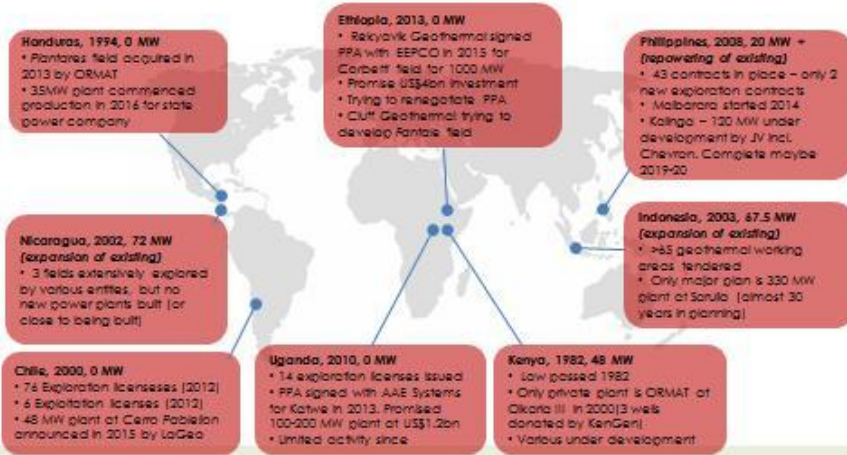
Ahuachapan, 1976, 61 MW
 • CEL (Comision Ejecutiva Hidroelectrica) El Salvador state utility led
 • UNDP funded field exploration, World Bank funded power plant

Miravalles, 1994, 60 MW
 • Instituto Costarricense de Electricidade (ICE) led and funded project

© 2014, Carbon Counts

Examples of private sector activity

RECORD OF PRIVATE DEVELOPMENT OF GREENFIELD PROJECTS IS POOR



© 2014, Carbon Counts

Background briefing materials

Geothermal development risks

- Significant increase in reducing the increasing barrier
- Drill success
- Only 2 wells (Western EARS Rwanda) were

Climate Technology Centre and Network (CTCN)

Formulation of Geothermal Energy Policy, Legal and Regulatory Framework in Uganda


CTCN Request: 2015-022/UGA

GEOHERMAL POLICY & REGULATION ANALYSIS REPORT

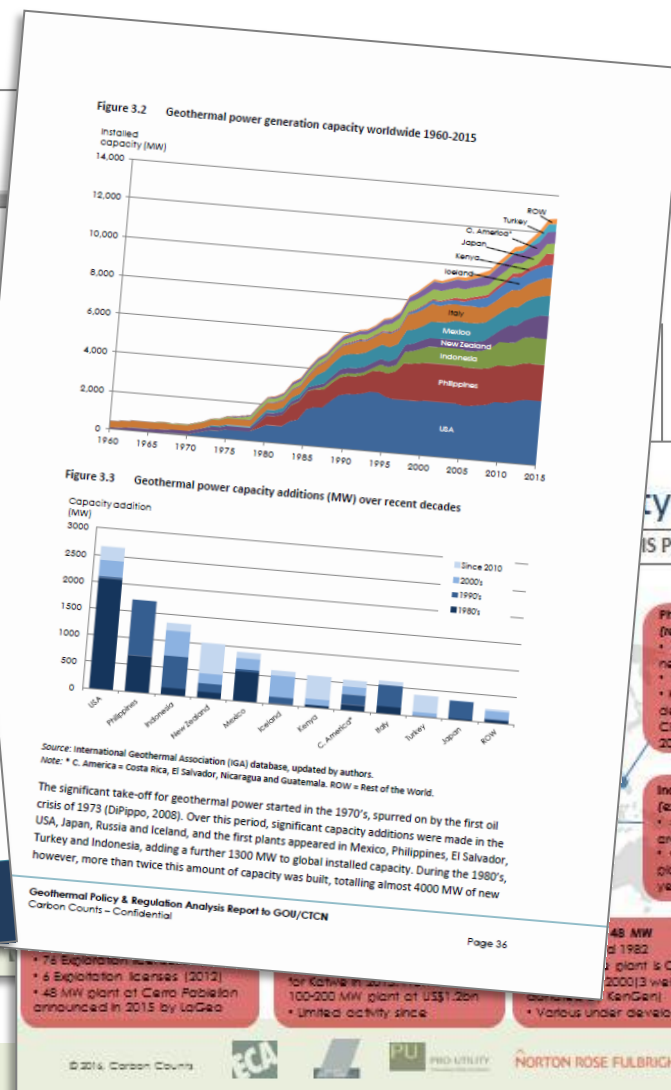
Carbon Counts Company (UK) Ltd
22 June 2016

Prepared by:
Paul Zakkour, Gregory Cook (Carbon Counts), Miles Evans and Paul Lewington (ECA)


Our Ref: 073



NORTON ROSE FULBRIGHT



IS POOR



Philippines, 2008, 20 MW + (depowering of existing)

- 43 contracts in place - only 2 new exploration contracts
- Malabrera started 2014
- Kalinao - 120 MW under development by JV incl. Chevron. Complete maybe 2019-20

Indonesia, 2003, 47.5 MW (expansion of existing)

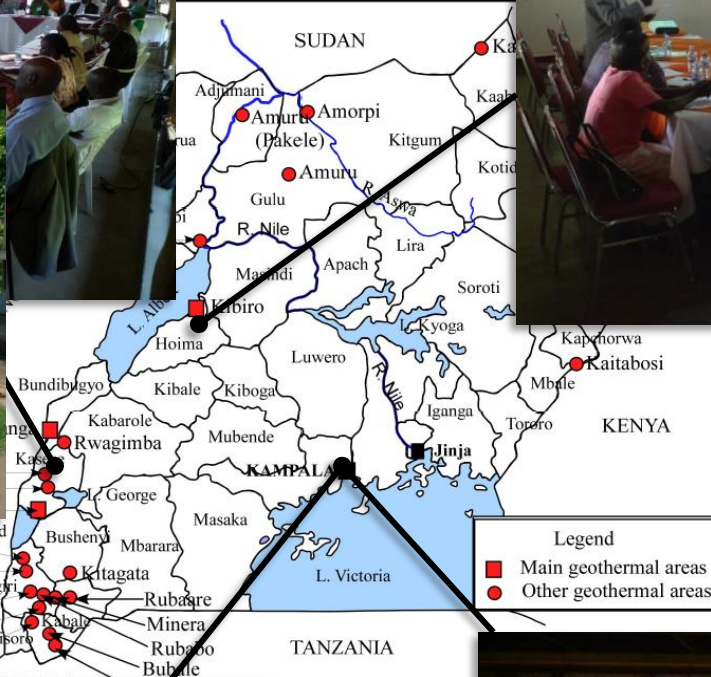
- >65 geothermal working areas identified
- Only major plan is 330 MW plant at Sorulu (almost 30 years in planning)

48 MW in 1982

- plant is ORMAT at 200013 wells
- KanGanti
- Various under development.

ACTIVITY 1.2 – STAKEHOLDER ENGAGEMENT

Stakeholder Meetings



Key Findings

- Need to better understand geothermal resource potential in Uganda and accelerate development. The government needs to take a lead. New dedicated policy is warranted.
- The mandate of the Geothermal Resources Department needs clarifying;
- Development partners reiterated number of programs to support to develop geothermal development. New policy will help in making progress;
- Private sector has a role to play. Need to promote new means of cooperation between government and the private sector;
- Local communities are supportive of geothermal development, but there is a need to ensure it's sympathetic of local activities
- Direct uses of geothermal heat as a catalyst for local industrial development must be in policy.
- Need to better coordinate academic research and educational aspects of geothermal energy.

Approaches to structuring

Year	Phase	Activity	Lead entity						
1-2	1	Preliminary survey	OPTION D (with UEGCL)						
2-3	2	Exploration							
3-5	3	Test drilling							
5	4	Review/ planning							
6-8	5	Field (steamfield) development				OPTION D			
8-10	6	Power plant construction							
10	7	Start-up and Commissioning							
10+	8	Operation & Maintenance							
		- Power plant							
		- Steamfield							

Approaches to structuring

Year	Phase	Activity	Lead entity
1-2	1	Primary level	
2-3	2	Exploration	
3-5	3	Test drilling	
5	4	Review/ planning	
6-8	5	Feasibility study Development	
8-10	6	Power plant Construction	
10	7	Start-up and Commissioning	
10+	8	Operation & Maintenance - Power plant - Offshore	

OPTION A

PRETTY MUCH UNANIMOUS AGREEMENT AMONGST ALL STAKEHOLDERS THAT ALL APPROACHES ARE NEEDED TODAY AND IN THE FUTURE
- are some nuances to this

ACTIVITY 1.3 – POLICY DEVELOPMENT

Purpose of the Geothermal Policy

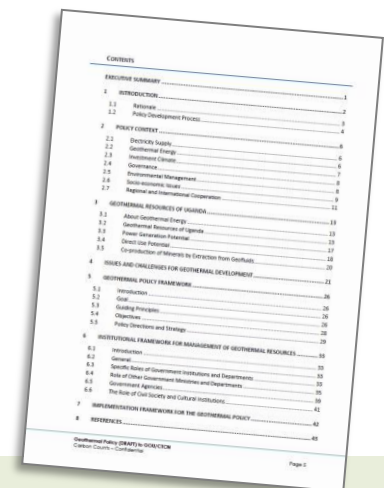
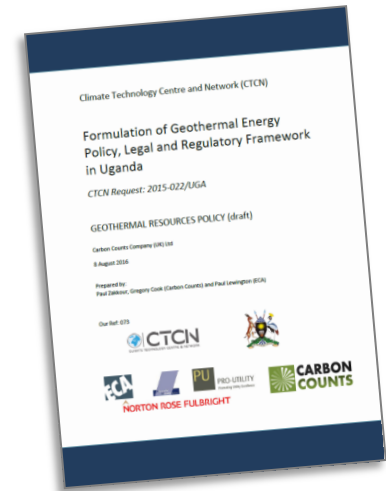


- The new, dedicated, geothermal policy will help to give clearer direction as to:
 - how geothermal energy projects should be developed
 - by whom
 - over what time frame
 - using which sources of finance and support mechanisms
- Defines the objectives and ambitions of government in pursuing geothermal technology, thus setting target in terms of the urgency. Firm commitments included regarding resource development activities
- Raises awareness about the technology, the benefits and risks, and providing assurances to local communities about the safety of developments;

Policy outline

Foreword & Executive Summary

1. Introduction
2. Policy Context
3. Geothermal Resources Status
4. Issues and Challenges for Geothermal Resource Development
5. Geothermal Policy Framework
6. Implementation Framework



CONTENTS	
EXECUTIVE SUMMARY	1
1 INTRODUCTION	
1.1 Rationale	2
1.2 Policy Development Process	4
2 POLICY CONTEXT	
2.1 Geothermal Supply	6
2.2 Geothermal Energy	6
2.3 Investment Climate	6
2.4 Governance	6
2.5 Environmental Management	6
2.6 Socio-economic Issues	6
2.7 Regional and International Cooperation	6
3 GEOTHERMAL RESOURCES OF UGANDA	
3.1 About Geothermal Energy	10
3.2 Geothermal Resource of Uganda	13
3.3 Power Generation Potential	17
3.4 Direct Use Potential	19
3.5 Contribution of Geothermal to Emissions from Ge/Fuels	20
4 ISSUES AND CHALLENGES FOR GEOTHERMAL DEVELOPMENT	
5 GEOTHERMAL POLICY FRAMEWORK	
5.1 Introduction	26
5.2 Goals	26
5.3 Guiding Principles	26
5.4 Objectives	26
5.5 Policy Directions and Strategy	26
6 INSTITUTIONAL FRAMEWORK FOR MANAGEMENT OF GEOTHERMAL RESOURCES	
6.1 Introduction	30
6.2 General	30
6.3 Specific Roles of Government Institutions and Departments	30
6.4 Role of Other Government Institutions and Departments	30
6.5 Government Agencies	30
6.6 The Role of Civil Society and Cultural Institutions	30
7 IMPLEMENTATION FRAMEWORK FOR THE GEOTHERMAL POLICY	
7.1 Introduction	42
8 REFERENCES	
8.1	48

5. Policy Framework - GOAL

“To accelerate development of Uganda’s geothermal energy resources in order to realise its benefits for all”

To be achieved by fostering and establishing a safe, secure, socially and environmentally responsible geothermal industry through increased investment that:

- enhances understanding of the resource;
- reduces risk and increases bankability of projects; and
- ultimately, unlocks and accelerates the potential of the technology so that it makes a substantial contribution to Uganda’s mix of renewable energy supply over the medium- to long-term”

5. Policy Framework - OBJECTIVES

1. To accelerate progress in geothermal resource exploration and exploitation
2. To optimise geothermal resource exploration and exploitation activities
3. To establish an effective and transparent regulatory regime for geothermal resource management
4. To ensure safe and environmentally-sound development of geothermal energy
5. To promote a sustainable geothermal industry for the future

ACTIVITY 2 – LEGAL FRAMEWORK

Example dedicated geothermal laws

Turkey

2007 Law No. 5686 of 2007 on Geothermal Resources and Mineral Waters
2007 Regulation No. 26727 of 2007 on Geothermal Resources and Mineral Water Law Implementation

Mexico

2014 Geothermal Energy Act and Regulations

Philippines

1978 Presidential Decree 1442 (Geothermal Service Contract Law)
2008 Republic Act 9513 (Renewable Energy Act)

Nicaragua

2002 Law 443 on Exploration and Exploitation of Geothermal Resources
2010 Decree 45-2010, Implements Regulation of Law 443

Indonesia

2003, Geothermal Energy Law 27-2003 (old)
2014, Geothermal Energy Law 21-2014 (new)

Chile

2000, Law 19.657 of 2000 on Geothermal Concessions

Kenya

1982, Geothermal Resources Act, 1982 + amendments
1990 Geothermal Resources Regulations

Example dedicated geothermal laws

Turkey

2007 Law No. 5686 of 2007 on Geothermal Resources and Mineral Waters
2007 Regulation No. 26727 of 2007 on Geothermal Resources and Mineral Water Law Implementation

Mexico

2014 Geothermal Energy Act and Regulations

Nicaragua

2002 Law 443 on Exploration and Exploitation of Geothermal Resources
2010 Decree 45-2010, Implements Regulation of Law 443

**DETAILED REVIEW
CARRIED OUT AND
NORMS & STANDARDS
ADOPTED WHERE
RELEVANT**

Philippines

1978 Presidential Decree 1442 (Geothermal Service Contract (GSC))
2008 Republic Act 9513 (Renewable Energy Act)

Indonesia

2003, Geothermal Energy Law 27-2003 (old)
2014, Geothermal Energy Law 21-2014 (new)

Chile

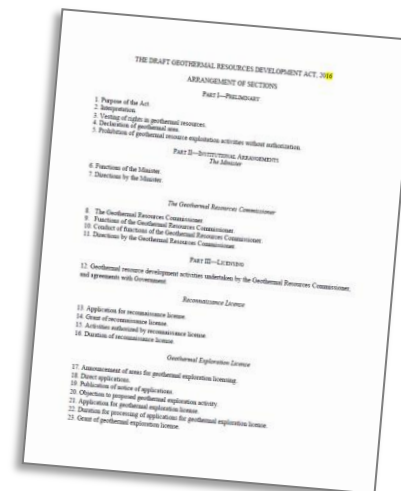
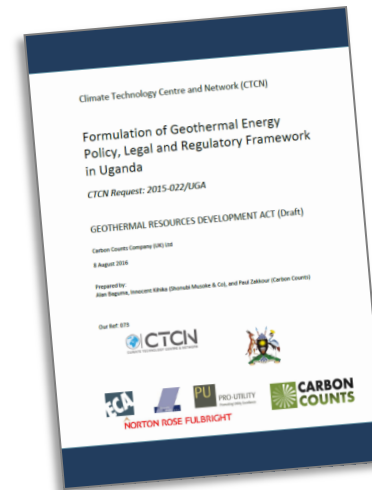
2000, Law 19.657 of 2000 on Geothermal Concessions

Kenya

1982, Geothermal Resources Act, 1982 + amendments
1990 Geothermal Resources Regulations

Act outline

- I. Preliminary
- II. Institutional Arrangements
- III. Licensing
- IV. Cessation of Geothermal Activities
- V. State Participation and National Content
- VI. Use of License as a Security
- VII. Restrictions and Surface Rights
- VIII. Health and Safety
- IX. Liability for Damage Due to Pollution
- X. Information and Documentation
- XI. Payments and Royalties
- XII. Offences
- XIII. Miscellaneous
- XIV. Transitional Arrangements



Main features

- Clarifies tenure of geothermal resources
 - Vests ownership in the state and citizens
 - Defines role and powers of Minister & Commissioner
 - Declaration of Geothermal Resource Areas
 - Unitisation method. Allows for competitive tendering
 - Geothermal Resource Agreements to facilitate PPP
 - Three part Licensing system:
 - Reconnaissance – small scale surveys
 - Exploration – extensive surveys, test drilling
 - Production (exploitation) – produce & use/sell steam
- Deters speculation:*
- Time limits reduced
 - Financial instruments (bond/guarantees required)
 - Renew/bond release only on measurable progress of work



More info
here:

Thank you

Paul Zakkour

Carbon Counts

www.carbon-counts.com

Carbon Counts | Uganda: X
www.carbon-counts.com/uganda-geothermal

CARBON COUNTS Energy & Climate Change Consulting

CTCIN CLIMATE TECHNOLOGY CENTRE & NETWORK

Uganda Geothermal Information Portal

Portal Home | ABOUT GEOTHERMAL ENERGY | ABOUT THE PROJECT

Technology | Globally | In Uganda | Background | Stakeholders | Status | Contact

Welcome to the web portal for the project: *Formulation of Geothermal Energy Policy and Law in Uganda*. The portal has been created as a source of information about the project and geothermal energy technology in general. Further information can be accessed using the menu above. Please sign up/Login to access the information pages and receive updates on activity.

Hello paul.zakkour@yahoo.co.uk
Log out

The technical assistance project has been sponsored by the CTCIN, and implemented by a team led by Carbon Counts. The team worked closely with the **Geothermal Resources Department** at the Ministry of Energy and Minerals Development, Uganda, as well as a range of other Departments and Directorates in developing the background information presented here, as well as the draft geothermal policy and draft geothermal law as the main outcomes of the project.

Carbon Counts' partners for the project were: Shonubi Musoke & Co. Advocates, Pro-Utility Ltd, ECA Ltd, and Norton Rose Fulbright LLP

ECA | **Shonubi Musoke & Co.** | **PU** PRO-UTILITY Promoting Utility Excellence | **NORTON ROSE FULBRIGHT**

5 Dalby Road
London
E20 1JW
Registered in England & Wales: 6711518

+44 20 8870 3330
+44 1279 610 147
enquiries@carbon-counts.com

© 2016, Carbon Counts Company (UK) Ltd

www.carbon-counts.com/uganda-geothermal

