



# **BARRIERS AND OPPORTUNITIES FOR GEOHERMAL DEVELOPMENT IN THE PHILIPPINES**

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# Outline

- I. Philippine Geothermal Energy Situation
- II. Modes of Awarding Geothermal Service Contract
- III. Consolidated RE Roadmap
  - Geothermal Sector Roadmap
- IV. Barriers and Challenges
- V. The Way Forward



# Geothermal Energy Situation

Geothermal Energy Potential > 4,000 MW

	2010	2011	2012
<b>Installed Capacity</b>	1,972 MW	1,902.69 MW	1,848 MW
<b>Generation</b>	10,279 GWh	10,494 GWh	10,249.99 GWh
<b>Fuel Oil Displacement (MMBFOE)</b>	17.13	17.49	17.08
<b>Foreign Savings in MM US\$</b>	1,349.31	1,377.51	1,861.74

NOTE: no official data yet for 2013

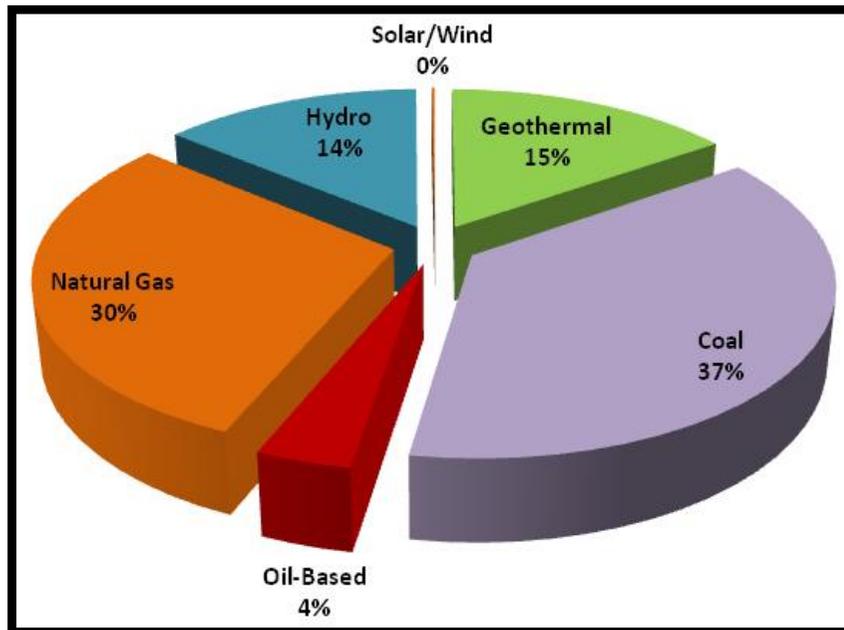




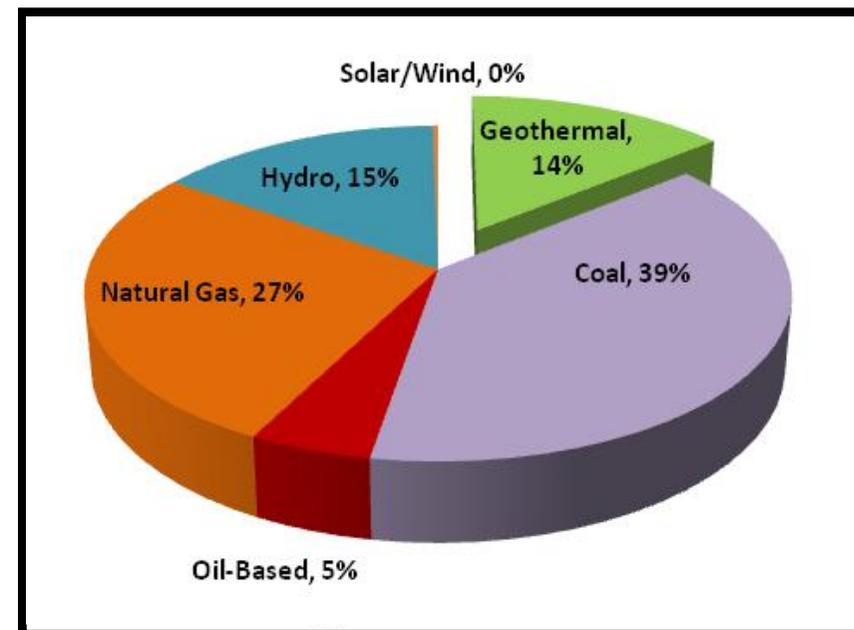
# Geothermal Energy Situation

## POWER GENERATION MIX

2011



2012





# Geothermal Energy Situation

## □ Geothermal

- A total of nine GRESCs under Open and Competitive Selection Process (OCSP), five GREOCs/GOCs and 22 GRESCs/GSCs under Direct Negotiation for frontier areas and seven conversions of Geothermal Service Contracts under P.D. 1442 into GRESCs under R.A. 9513 were signed.
- To date, the country has 43 GRESCs/GSCs, seven (7) of which are producing fields with total installed capacity of 1,868 MW, while the remaining are under pre-development/exploration. Among the major islands, Visayas has the highest installed capacity with 915 MW. Luzon has 844 MW and Mindanao has 108 MW of geothermal energy.

Note:

GRESC – Geothermal RE Service Contract/  
GSC – Geothermal Service Contract

GREOC – Geothermal RE Operating Contract/  
GOC – Geothermal Operating Contract



# Geothermal Service/Operating Contracts (Development Stage)



**Mount Makiling-Banahaw Geothermal Power Plant,  
Laguna/Quezon**

GREOC No. No. 2009-10-007  
Total Installed Capacity - 458.53 MWe

**Mount Makiling-Banahaw Geothermal Field**  
GSC No. 2013-04-045

**Maibarara Geothermal Power Project,  
Laguna/Batangas**

GRES No. No. 2010-02-012  
Total Installed Capacity - 20 MW

**Bacon-Manito Geothermal Power Plant,  
Sorsogon/Albay**

GOC No. 2012-04-027  
Total Installed Capacity - 151.5 MWe

**Bacon-Manito Geothermal Production Field**  
GRES No. 2009-10-003

**Northern Negros Geothermal Production Field, Negros  
Occidental**  
GRES No. 2009-10-005

**Palinpinon Geothermal Power Plants, Negros  
Oriental**

GOC No. 2012-04-025  
Total Installed Capacity - 192.5 MWe

**Southern Negros Geothermal Production Field,  
Negros Oriental**

GRES No. 2009-10-002

**LUZON**

\* Baguio City

\* Manila

**Tiwi Geothermal Power Plant, Albay**

GREOC No. 2009-10-006  
Total Installed Capacity - 284 MWe

**Tiwi Geothermal Field**  
GSC No. 2013-04-044

**VISAYAS**

\* Cebu City

**Tongonan I Geothermal Power Plant, Tongongan, Leyte**

GOC No. 2012-04-026  
Total Installed Capacity - 722.68 MWe

**Leyte Geothermal Production Field**  
GRES No. 2009-10-001

**MINDANAO**

\* Davao City

**Mindanao Geothermal Production Field,  
North Cotabato/Davao**

GRES No. 2009-10-004  
Total Installed Capacity - 108.48 MWe

**LEGEND**



Producing Fields

GRES - Geothermal RE Service Contract/  
GSC - Geothermal Service Contract

GREOC - Geothermal RE Operating Contract/  
GOC - Geothermal Operating Contract  
(for Power Plant operation only)



# Geothermal Service Contracts (Pre-Development Stage)



- 1 Sal-Lapadan-Boliney-Bucloc-Tubo, Abra**  
Potential Capacity to be determined  
GSC No. 2011-12-029
- 2 Mainit-Sadanga, Mt. Province (80 MW)**  
GRES No. 2010-03-023
- 3 Kalinga, Kalinga Province (60 MW)**  
GRES No. 2010-03-024
- 4 Cagua-Baua, Cagayan (40 MW)**  
GRES No. 2011-12-028
- 5 Buguias-Tinoc, Benguet/Ifugao (60 MW)**  
GRES No. 2010-03-022
- 6 Cervantes, Ilocos Sur/Mt. Province/Benguet**  
Potential Capacity to be determined  
GSC No. 2011-12-030
- 7 East-Mankayan, Ifugao/Benguet/Mt. Province**  
Potential Capacity to be determined  
GRES No. 2013-11-041
- 8 Daklan, Benguet/Nueva Ecija (60 MW)**  
GRES No. 2010-02-017
- 9 Negron-Cuadrado, Zambales/Pampanga**  
Potential Capacity to be determined  
GRES No. 2013-02-040
- 10 Mariveles, Bataan**  
Potential Capacity to be determined  
GRES No. 2013-02-042
- 11 Natib, Bataan (40 MW)**  
GRES No. 2010-02-016
- 12 San Juan, Batangas (20 MW)**  
GSC No. 2011-12-031
- 13 Mabini, Batangas (20 MW)**  
GSC No. 08
- 15 Puting Lupa, Laguna (40 MW)**  
Potential Capacity to be determined  
GSC No. 2014-01-349
- 15 Montelago, Oriental Mindoro (40 MW)**  
GRES No. 2010-02-013
- 16 Tayabas-Lucban, Tayabas/Quezon**  
Potential Capacity to be determined  
GSC No. 2011-12-032
- 17 Tiaong, Laguna/Quezon/Batangas**  
Potential Capacity to be determined  
GSC No. 2011-12-033
- 18 Camarines Sur, Camarines Sur (70 MW)**  
GRES No. 2010-02-019
- 19 Labo, Quezon/Camarines Norte and Sur (65 MW)**  
GRES No. 2010-02-020



- 20 Southern Bicol, Sorsogon (40 MW)**  
GRES No. 2010-02-015
- 21 West Bulusan, Sorsogon**  
Potential Capacity to be determined  
GSC No. 2013-11-048
- 22 Iriga, Albay and Sorsogon**  
Potential Capacity to be determined  
GSC No. 2013-02-043
- 23 Cabalian, Southern Leyte (40 MW)**  
GSC No. 07
- 24 Mandalagan, Negros Occidental (20 MW)**  
GSC No. 2012-01-036
- 25 Biliran, Biliran (50 MW)**  
GRES No. 2010-02-010
- 26 Mainit, Surigao del Norte (30 MW)**  
GRES No. 2010-02-021
- 27 Lakewood, Zamboanga del Sur/Zamboanga del Norte/Zamboanga Sibugay (40 MW)**  
GSC No. 2012-01-038
- 28 Ampiro, Misamis Occ./Zamboanga del Norte/Zamboanga del Sur (30 MW)**  
GSC No. 2012-01-035
- 29 Balingasag, Misamis Or./Bukidnon (20 MW)**  
GSC No. 2012-01-039
- 30 Mt. Zion, North Cotabato/Davao del Sur (20 MW)**  
GSC No. 2012-01-037
- 31 Mt. Talomo-Tico, North Cotabato/Davao del Sur**  
Potential Capacity to be determined  
GSC No. 2013-11-046
- 32 Mt. Sibulan-Kapatagan, Davao del Sur**  
Potential Capacity to be determined  
GSC No. 2013-11-047

**LEGEND**

- GRES - Geothermal RE Service Contract/  
GSC - Geothermal Service Contract  
under RA 9513
- GSC under PD 1442

# Geothermal Energy Situation

## Newly Commissioned Geothermal Power Plant



20 MW Maibarara Geothermal Power Project commissioned on February 08, 2014



# MODES OF AWARDING GEOTHERMAL SERVICE CONTRACT (GSC)

## DEPARTMENT ORDER NO. DO2013-08-0011

Adopting Policies in relation to the Processing of Renewable Energy Service Contracts and Mandating the Adoption of the Revised Templates for Renewable Energy Service Contracts

- this applies for DIRECT NEGOTIATION





# MODES OF AWARDING CONTRACT

## SALIENT FEATURES OF GEOTHERMAL SERVICE CONTRACT UNDER RA 9513 AND DO2013-08-0011

Automatic Cancellation of the Geothermal Service Contract (GSC), if:

Under Pre-Development Stage

- Failure of the RE Developer to comply with its first Annual Milestone under the approved Work Program; and
- Failure of the RE Developer to disburse the cost equivalent of at least eighty per cent (80%) of the total financial cost of its first annual Milestone which is set by the DEPARTMENT at Six Million Five Hundred Thousand Pesos (Php 6,500,000.00)

Under Development Stage

- Non-compliance with the Milestone for the succeeding years under the approved Work Plan and failure to disburse the cost equivalent of Two Hundred Million Pesos (Php 200,000,000.00) per megawatt shall result in the termination of the GSC





# MODES OF AWARDING CONTRACT

## SALIENT FEATURES OF GEOTHERMAL SERVICE CONTRACT UNDER RA 9513 AND DO2013-08-0011

### HIGHLIGHTS OF FINANCIAL TERMS

Signature Bonus	Php 100,000.00
Development Assistance	
•Pre-Development	•Php 200,000.00
•Development	•Php 500,000.00
Training Assistance Program	
•Pre-Development	•Php 200,000.00
•Development	•Php 500,000.00
<p>The RE Developer shall undertake corporate social responsibility projects in Host LGUs focused on education and training of qualified and deserving beneficiaries, as the RE Developer.</p>	





# MODES OF AWARDING CONTRACT

## SALIENT FEATURES OF GEOTHERMAL SERVICE CONTRACT UNDER RA 9513 AND DO2013-08-0011

### MILESTONE APPROACH MATRIX (under Pre-Development Stage)

Milestone Activity	Milestone Period (from effective date)	Milestone Cost (at 100%)	Remarks
Completion of Reconnaissance Geological/Geochemical Surveys	12 months	Php 6,500,000.00	Pre-Development at 5 years
Mandatory Activities* 1. LGU Endorsements 2. Licenses/Permits Acquisition			

\* *Mandatory activities are those activities that are indispensable during the Pre-Development Stage and common to all RE Applicants regardless of type of technology*



# MODES OF AWARDING CONTRACT

## Work Program Template for Geothermal Service Contract Under Pre-Development Stage

ACTIVITIES	YEAR 1				YEAR 2			
	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q
1. Review and Evaluation of Existing Data								
2. Engagement with technical personnel/group who will handle the technical aspects of the project								
3. Secure permits/clearance								
a. LGU endorsement								
b. DENR (CNC)								
c. NCIP (CNO/CP)								
d. Social Acceptability Program/IEC								
4. Reconnaissance Geological and Geochemical surveys								
5. Detailed Surface Exploration								
a. Geological survey and report submission								
b. Geochemical survey and report submission								
c. Geophysical survey and report submission								
6. Pre-Feasibility Study								
a. Integrated Resource Assessment								
b. Preliminary Conceptual Modelling								
7. Submission of Report								



# MODES OF AWARDING CONTRACT

## Work Program Template for Geothermal Service Contract Under Pre-Development Stage

ACTIVITIES	YEAR 3				YEAR 4			
	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q
1. Permitting/Licensing and Accreditation								
a. ECC for drilling								
b. DENR Special Land Use Permit								
2. Exploration Drilling Preparation								
a. Civil and logistics Works (Roads and Pads Construction)								
b. Mobilization of drilling equipment								
3. Drilling of exploratory well (3 wells)								
4. Well Testing								
5. Documentation and Data Collation								
6. Submission of Report								

ACTIVITIES	YEAR 5			
	1Q	2Q	3Q	4Q
1. Post-Exploratory Drilling Evaluation and Report Submission				
2. Feasibility Study				
a. Grid System Impact Study				
b. Grid Connection/RE Purchase Agreement				
d. Risk Assessment/				
e. Environmental Impact Study				
f. Final conceptual Modelling				
g. Economic Modelling				
3. Declaration of Commerciality				
4. Submission of Report				



# MODES OF AWARDING CONTRACT

## SALIENT FEATURES OF GEOTHERMAL SERVICE CONTRACT UNDER RA 9513 AND DO2013-08-0011

### MILESTONE APPROACH MATRIX (under Development Stage)

Milestone Activity	Milestone Period (from effective date)	Milestone Cost (at 100%)	Remarks
1. Site preparation and civil/structure works 2. Drilling of production and reinjection wells 3. Flow Test and Bore Output Measurement 4. Construction of Fluid Collection and Disposal System 5. Power Plant and Cooling Tower site preparation and construction 6. Construction of switching station to connect to the Transmission Lines of NGCP 7. Commissioning/Commercial Operations	Year 6 to 8	Php200,000,000.00/MW	



# MODES OF AWARDING CONTRACT

## FOR OPEN AND COMPETITIVE SELECTION PROCESS (OCSP)

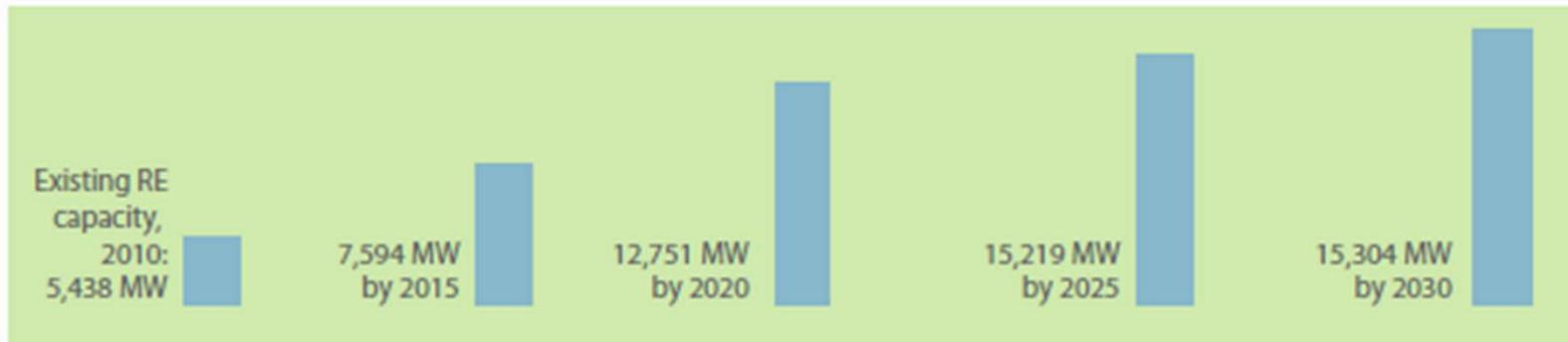
- The DOE is now finalizing the Guidelines and Terms of Reference (TOR) for the geothermal areas to be offered under OCSP
- Target launching is on 3<sup>rd</sup> quarter of 2014

# CONSOLIDATED RE ROADMAP

## Consolidated Milestones



## Implementation of Sectoral Sub-Programs and the Policy and Program Support Component

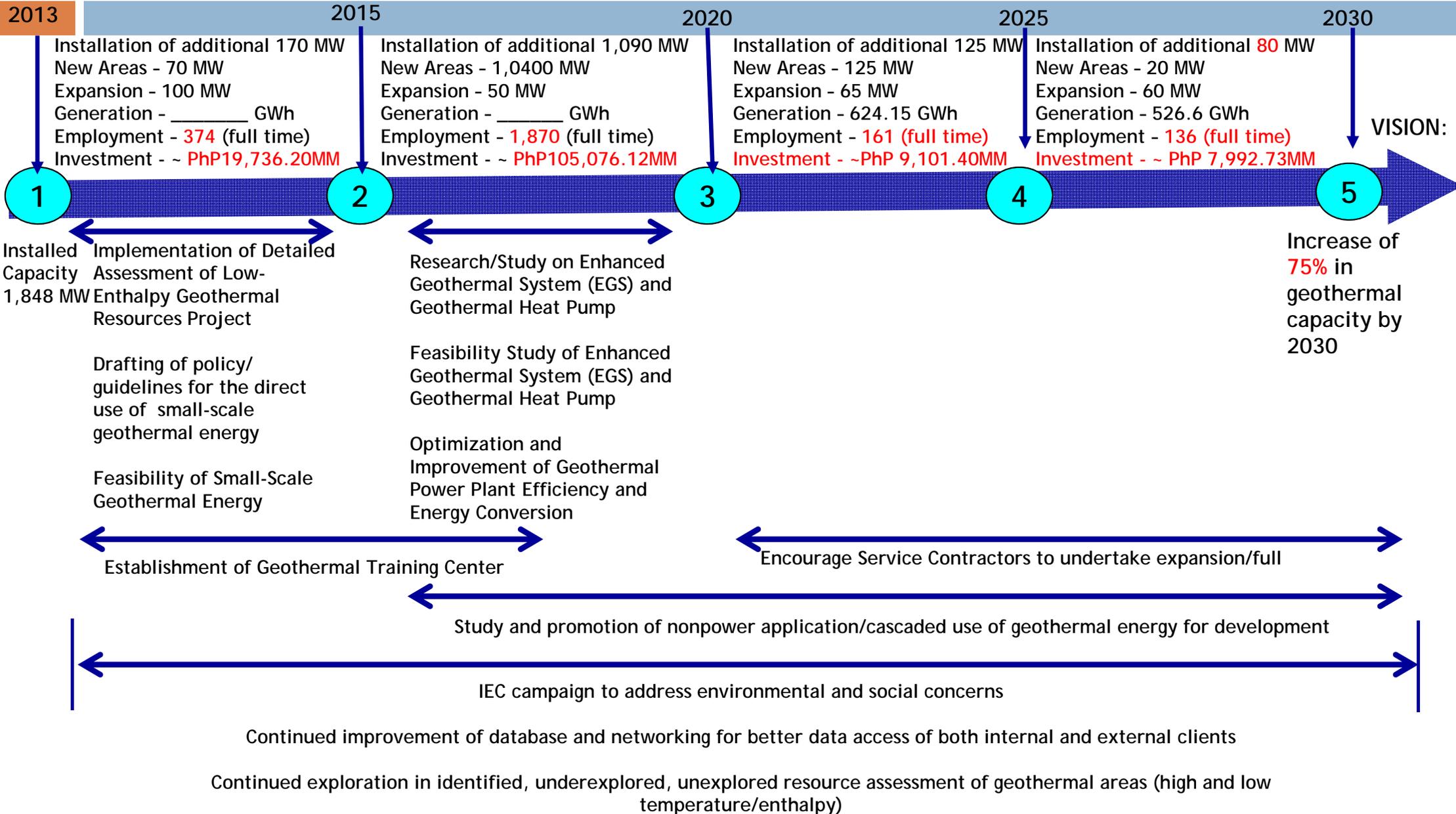


Targeted RE-based Installed Capacity



# ROADMAP for the EXPLORATION, DEVELOPMENT and UTILIZATION of GEOTHERMAL RESOURCES IN THE PHILIPPINES (2013-2030)

Establishment of RPS and FIT





# INVESTMENT OPPORTUNITIES IN GEOTHERMAL DEVELOPMENT

## Targeted Geothermal Capacity Addition (in MW), by Grid

LOCATION	COMMISSIONING YEAR			
	2013-2015	2016-2020	2021-2025	2026-2030
LUZON	20	800	65	-
VISAYAS	30	150	-	60
MINDANAO	-	230	90	30
Total	50	1,180	155	90

**TOTAL Geothermal Capacity Addition (2013-2030): 1,475 MW**



# BARRIERS AND CHALLENGES IN GEOTHERMAL DEVELOPMENT

## Technology

- Development technology that can tap acidic or young geothermal systems
- Lack of permeability in prospect areas
- Optimization of geothermal resource utilization through cascade use and development of low enthalpy geothermal systems
- Enhanced Geothermal System (EGS)

## Environmental

- Utilization of geothermal resources located inside protected areas

## Social Acceptability

- IPs Consent
- LGU Concerns

## Policy

- FIT for emerging technology on geothermal energy
- RPS approval



# BARRIERS AND CHALLENGES IN GEOTHERMAL DEVELOPMENT

- Capacity building and enhancement of geothermal technical expertise
- Continuous Inventory of geothermal resources
- Development and utilization of geothermal energy in off-grid and missionary areas
- Integration of climate change mitigation to energy policies, plans and programs



# THE WAY FORWARD

- Formulation of guidelines for the direct use of small-scale geothermal energy
- Continued Resource Inventory and continued improvement of Geothermal RE Database
- Capacity Building / Information, Education and Communication Campaigns
- Establishment of Geothermal Training Center in coordination with RE Stakeholders
- Ongoing study on the exploration, development and market of low enthalpy, acidic reservoir and enhance geothermal system



**THANK YOU ! ! !**

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