

# Full Steam Ahead for Philippine Geothermal Energy

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# Presentation Outline

- Historical Development
- Legal Framework pre-Renewable Energy Law
  - Philippine Constitution of 1987
  - Presidential Decree No. 1442
- Renewable Energy Law
- Challenges

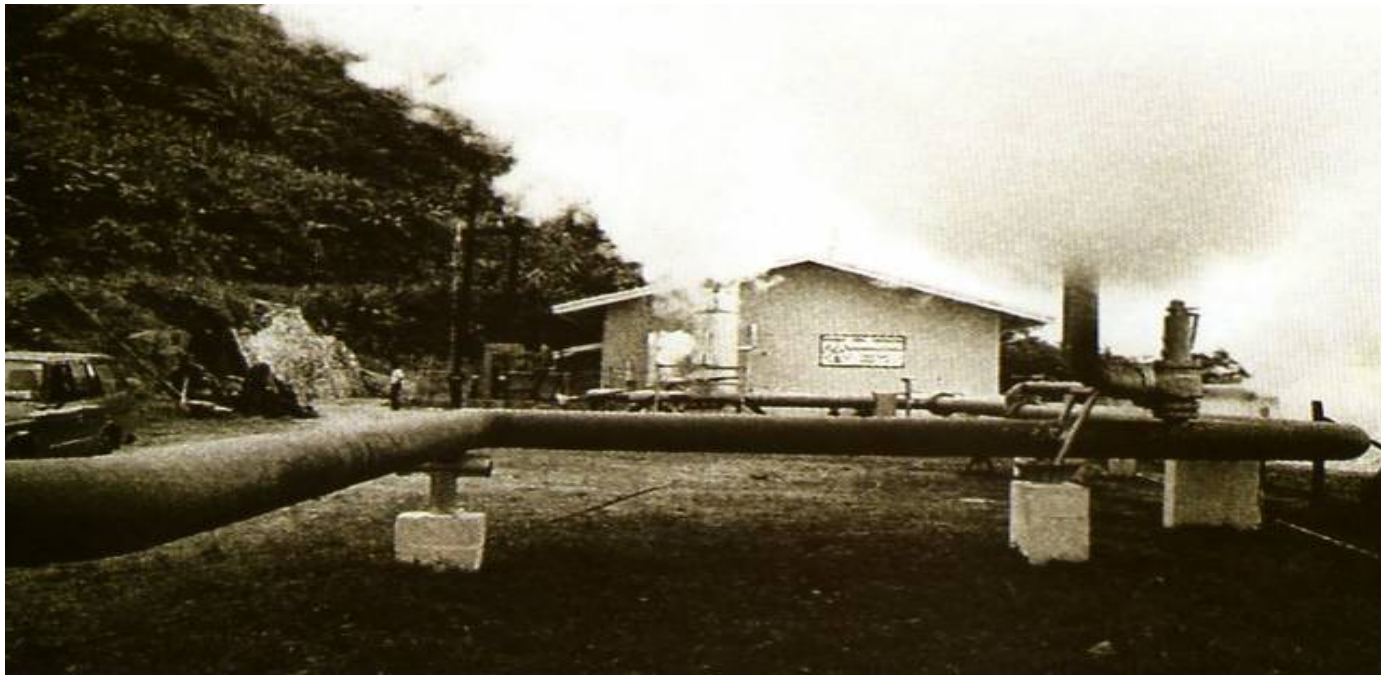


# Historical Development

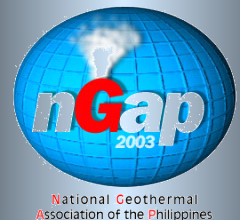
- 1964 - The then Philippine Commission on Volcanology (COMVOL) did an inventory of hot springs in the country and investigated Tiwi, Albay to determine the country's capability to produce geothermal energy.
- 1967 – Phil. gov't installed a 2.5kw pilot plant in Barangay Cale, Tiwi, Albay.

# Historical Development

- 1977 - PNOC-EDC (Philippine National Oil Company – Energy Development Corporation) installed a 3 Mw pilot plant in Tongonan, Leyte followed by another 3 Mw pilot plant in Palinpinon, Negros Occidental



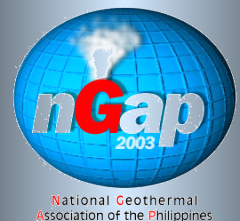
The 1.5 Mw Pilot Plant at Negros Occidental installed in 1977



# Geothermal Reservations

for the purpose of exploration, development, exploitation and utilization of geothermal energy and maintenance of watersheds within the reservation

- *Proc. No. 739 (Aug. 14, 1970)* - Province of Albay, Luzon
- *Proc. No.1111 (Feb. 21, 1973)* - Province of Laguna, Quezon, Batangas, Luzon
- *Proc. No. 1112 (Feb. 21, 1973)* - Province of Leyte, Visayas
- *Proc. No. 1412 (Apr. 8, 1975)* - Parcel of land in the Province of Leyte, Visayas
- *Proc. No. 1413 (Apr. 8, 1975)* - Province of Negros, Visayas
- *Proc. No. 2036A (Nov. 11, 1980)* - Provinces of Albay and Sorsogon, Luzon



# IEA Top Geothermal Producing Countries, Electricity and Heat 2009

Geothermal electricity production		Geothermal direct use	
Country	GWh/yr	Country	GWh/yr*
United States	16 603	China	20 932
Philippines	10 311	United States	15 710
Indonesia	9 600	Sweden	12 585
Mexico	7 047	Turkey	10 247
Italy	5 520	Japan	7 139
Iceland	4 597	Norway	7 000
New Zealand	4 055	Iceland	6 768
Japan	3 064	France	3 592
Kenya	1 430	Germany	3 546
El Salvador	1 422	Netherlands	2 972
Costa Rica	1 131	Italy	2 762
Turkey	490	Hungary	2 713
Papua New Guinea	450	New Zealand	2 654
Russia	441	Canada	2 465
Nicaragua	310	Finland	2 325

\* 1 000 GWh = 3.6 PJ



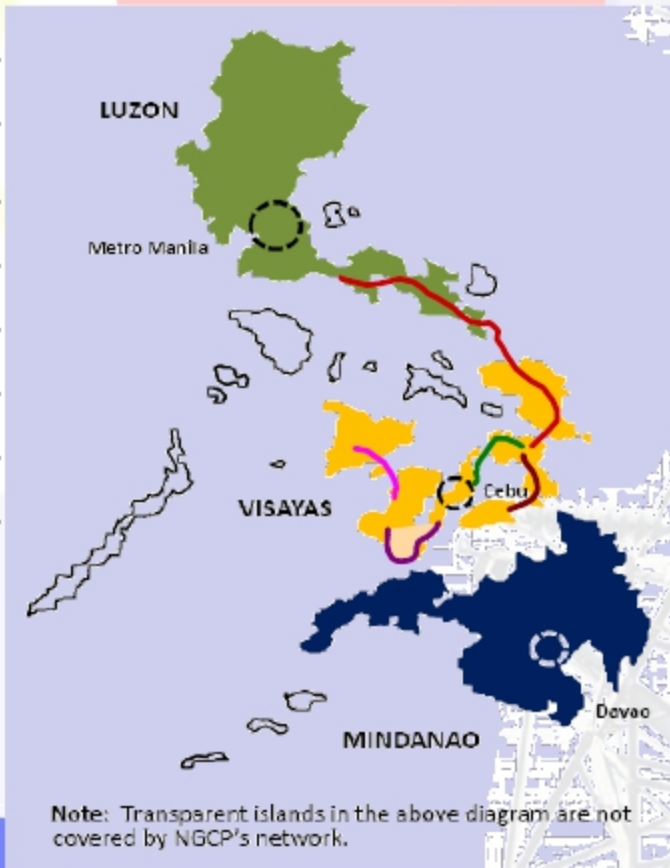
# POWER SECTOR SITUATIONER



## Capacity By Plant Type

PLANT TYPE	CAPACITY (MW)		PERCENT SHARE (%)	
	Installed	Dependable	Installed	Dependable
Coal	4,523	3,980	28.48	29.48
Oil-Based	3,193	2,528	20.11	18.72
Natural Gas	2,831	2,700	17.83	20.00
Geothermal	1,936	1,321	12.19	9.78
Hydro	3,333	2,930	20.99	21.70
Wind	33	33	0.21	0.24
Solar	1	1	0.01	0.01
Biomass	30	10	0.19	0.07
<b>TOTAL</b>	<b>15,881</b>	<b>13,502</b>		

- Interconnection Line Capacity
- Leyte-Luzon (440 MW)
  - Leyte-Cebu (400 MW)
  - Cebu-Negros (200 MW)
  - Negros – Panay (100 MW)
  - Leyte-Bohol (100 MW)



### Notes:

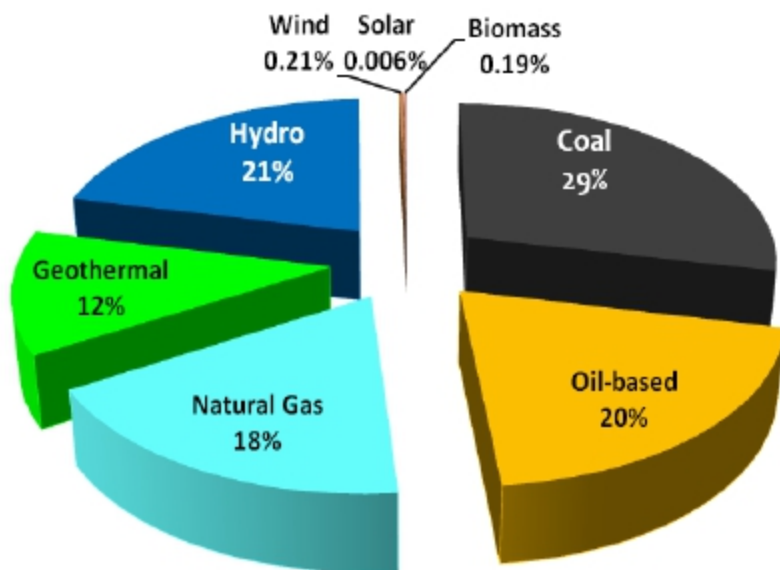
1. Assuming all units of power plants are in operation.
2. CEDC Coal (3 x 72 MW) and Sibulan Hydro 42 MW under Testing and Commissioning Stage



# POWER SECTOR SITUATIONER

## 2010 Gross Generation & Capacity, Philippines

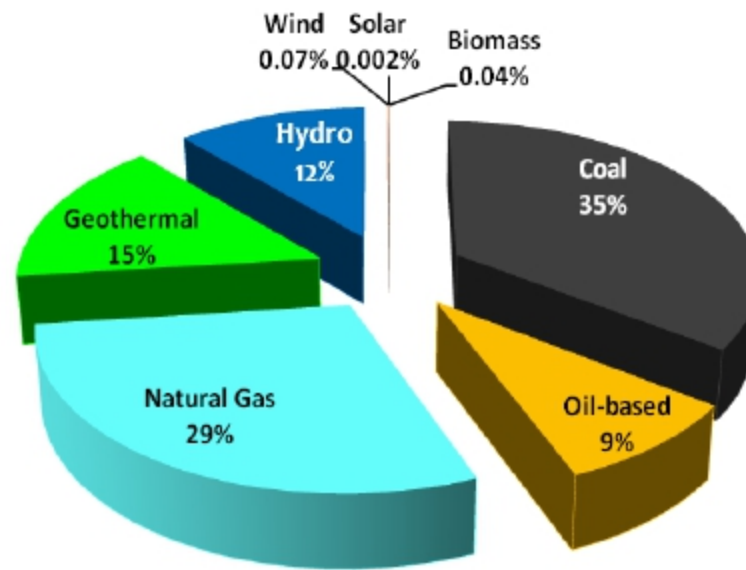
### INSTALLED CAPACITY



15,881 MW

Includes embedded generator

### GROSS GENERATION



65,795 GWh

Excluding off-grid generation

- NOTE:
- 42 MW Sibulan Hydro in Davao on Testing and Commissioning stage
  - 3 x 72 MW CEDC Coal-fired plant in Cebu, 2 Units on Testing and Commissioning stage
  - 2010 Preliminary Gross Generation

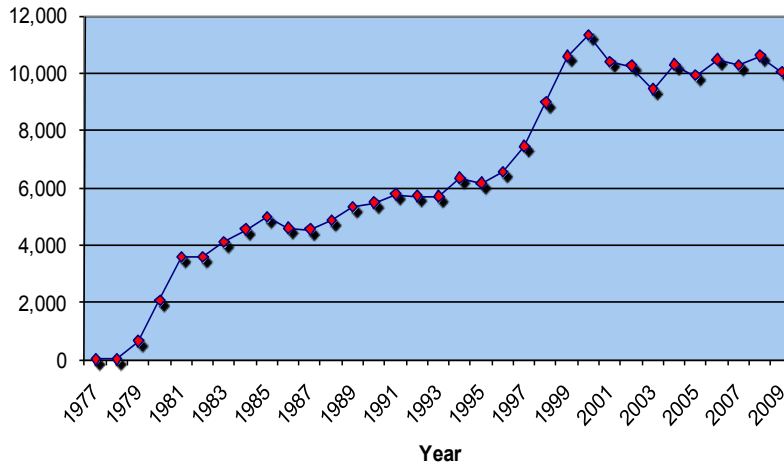




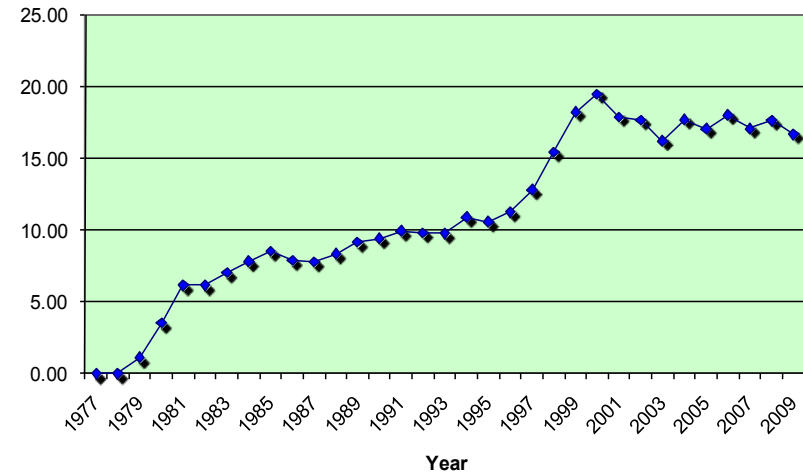


# Historical Performance

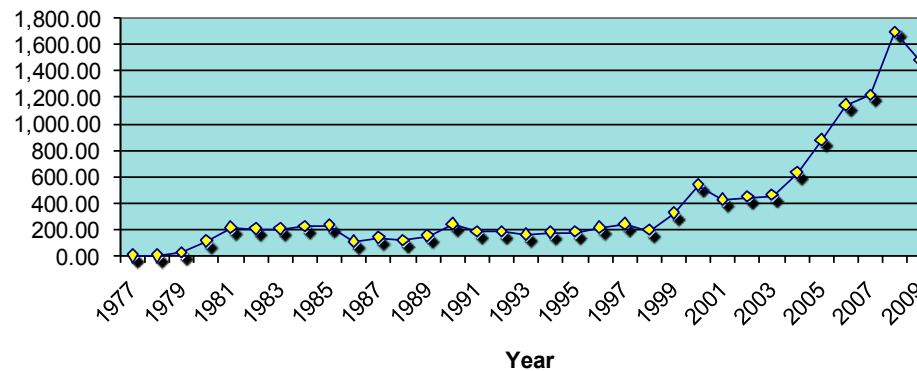
**Geothermal Energy Generation in GWh  
(1977 - 2009)**

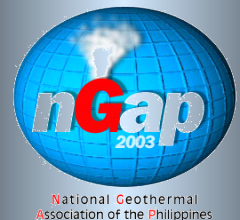


**Fuel Oil Displacement (MMBFOE)  
(1977 - 2009)**



**Foreign Savings in MM US\$  
(1977 - 2009)**





# DOE Energy Reform Agenda

- **Increase RE-based capacity by 100% within the next 20 years (2010-2030)**
- **Increase non-power contribution of RE to the energy mix by 10 MMBFOE in the next ten years**
  - **Be the number one geothermal energy producer in the world (additional 1,475 MW)**
  - Be the number one wind energy producer in Southeast Asia
  - Double hydro capacity (additional 3,400 MW)
  - Expand the contribution of:
    - Biomass – 200 MW
    - Solar – 30 MW
    - Ocean Energy – 120 MW



# Industry Reform

Sale/privatization of National Power Corp., government-owned geothermal generating assets under the provisions of the Electric Power Industry Reform Act of 2001 (EPIRA):

- Makban Geothermal Steamfield and Power Plants in Laguna/Batangas
- Tiwi Geothermal Steamfield and Power Plants in Albay
- Palipinon I and II Geothermal Power Plant in Negros Oriental
- Tongonan I Geothermal Power Plant in Tongonan, Leyte

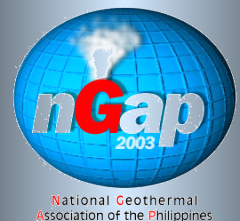


# Industry Highlights

- Take-over by Chevron Geothermal Philippines Holdings, Inc. of Unocal Philippines in 2005
- Sale/privatization of PNOC-Energy Development Corp., the national geothermal GOCC, to First Gen Group in late 2007
  - Paved the way for the entry of new players in the exploration industry



# Legal Framework



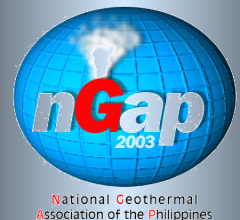
# Constitution

- All water, minerals, all forces of potential energy, and other natural resources are owned by the state. The exploration, development and utilization of these natural resources are under the full control and supervision of the State.
- The State has the option of entering into co-production, joint venture or production sharing agreements with Philippine citizens or Philippine corporations or associations (at least 60% of the capital owned by Filipinos).
- If an investor wishes to acquire the right to extract or develop natural resources, he must enter into an agreement with State.



# Presidential Decree 1442

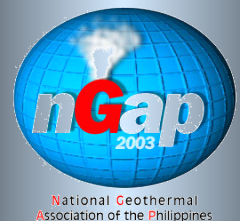
- Introduced production sharing in geothermal resource development
- “service contractor” shall furnish technical and financial services subject to direct supervision of the gov’t
- Profit sharing of 60-40 of net proceeds
- Cost recovery of 90% of gross income; capital expenditures depreciated over 10 years
- 35% income tax paid out of gov’t share



# Legislative Reform

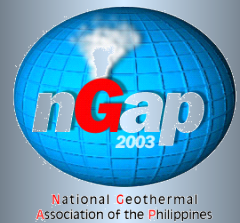
- Passage of Renewable Energy Act and its implementing rules and regulations
- Open and competitive selection process for geothermal exploration projects
- Setting up a system that will allow consumers to choose green sources of energy and providing for the establishment of a Renewable Portfolio Standard (“RPS”) system and feed-in-tariff rates





# Renewable Energy Act of 2008

- geothermal defined as mineral resource paving the way for the entry of 100% foreign-owned corporation
- RE declared as a priority investment sector that will regularly form part of the Philippine investment priority plan;
- streamlining of the environmental compliance certificate process for RE projects; and
- institutionalizing government share on existing and new RE development projects.



# Renewable Energy Act of 2008

- Seven (7) years income tax holiday, corp. tax rate of 10% after 7 year ITH
- Duty-free importation of RE machinery, equipment and materials
- 1.5 % Special Realty Tax Rates on Equipment and Machinery on original cost
- Net operating loss carryover (NOLCO)
- Accelerated Depreciation
- Zero percent VAT rate



# Renewable Energy Act of 2008

- Tax exemption on carbon credits
- 100% tax credit on VAT and custom duties on domestic capital equipment and services
- Tax incentives to manufacturers, fabricators and suppliers of locally produced RE equipment
- Exemption from Universal Charge
- Financial assistance from Gov' t Financial Institutions

# GEOTHERMAL SERVICE CONTRACT AREAS (Producing Fields)



Mt. Makiling-Banahaw, Laguna/Quezon  
*Total installed capacity: 458.53 MWe*

Tiwi, Albay  
*Total installed capacity: 289 MWe*

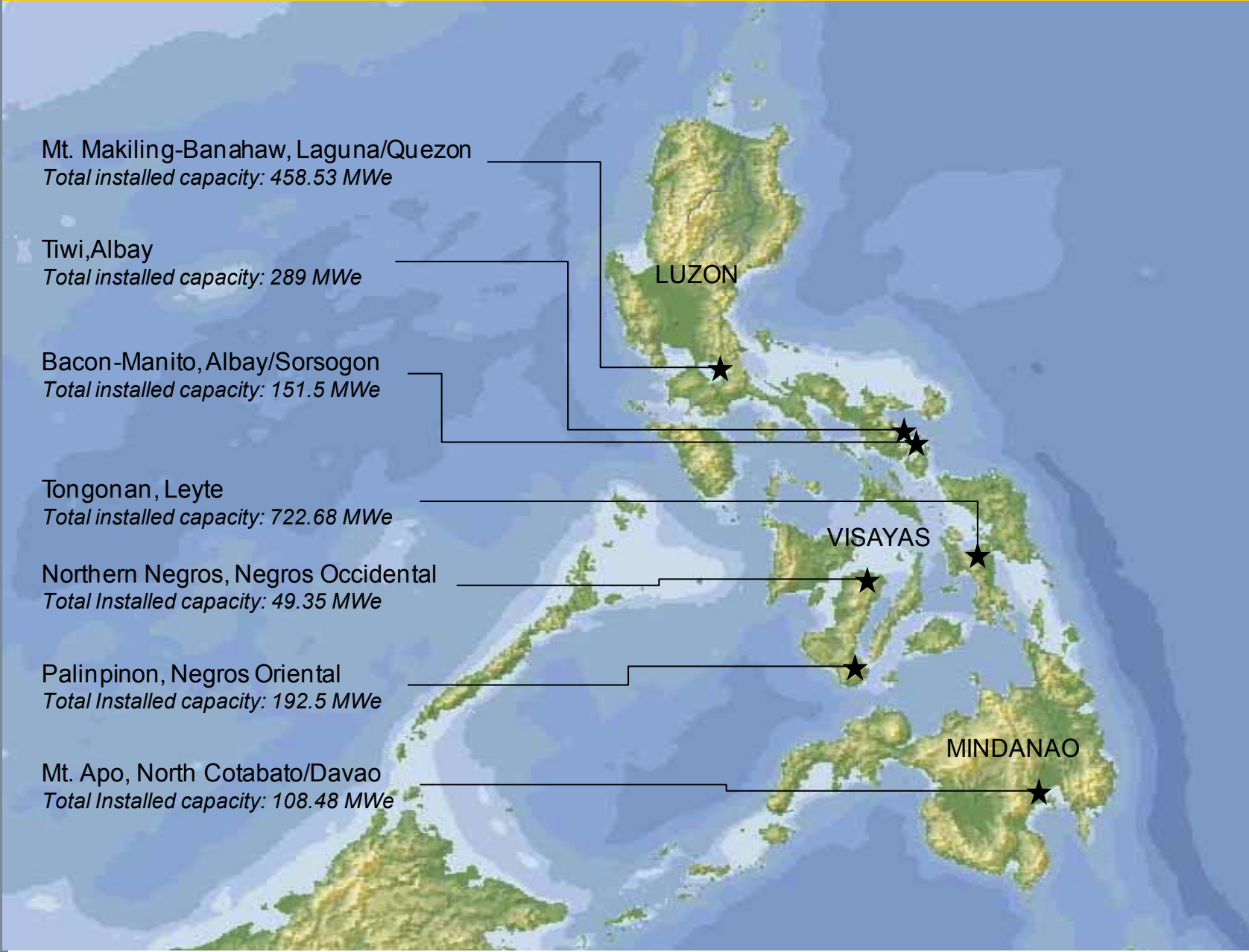
Bacon-Manito, Albay/Sorsogon  
*Total installed capacity: 151.5 MWe*

Tongonan, Leyte  
*Total installed capacity: 722.68 MWe*

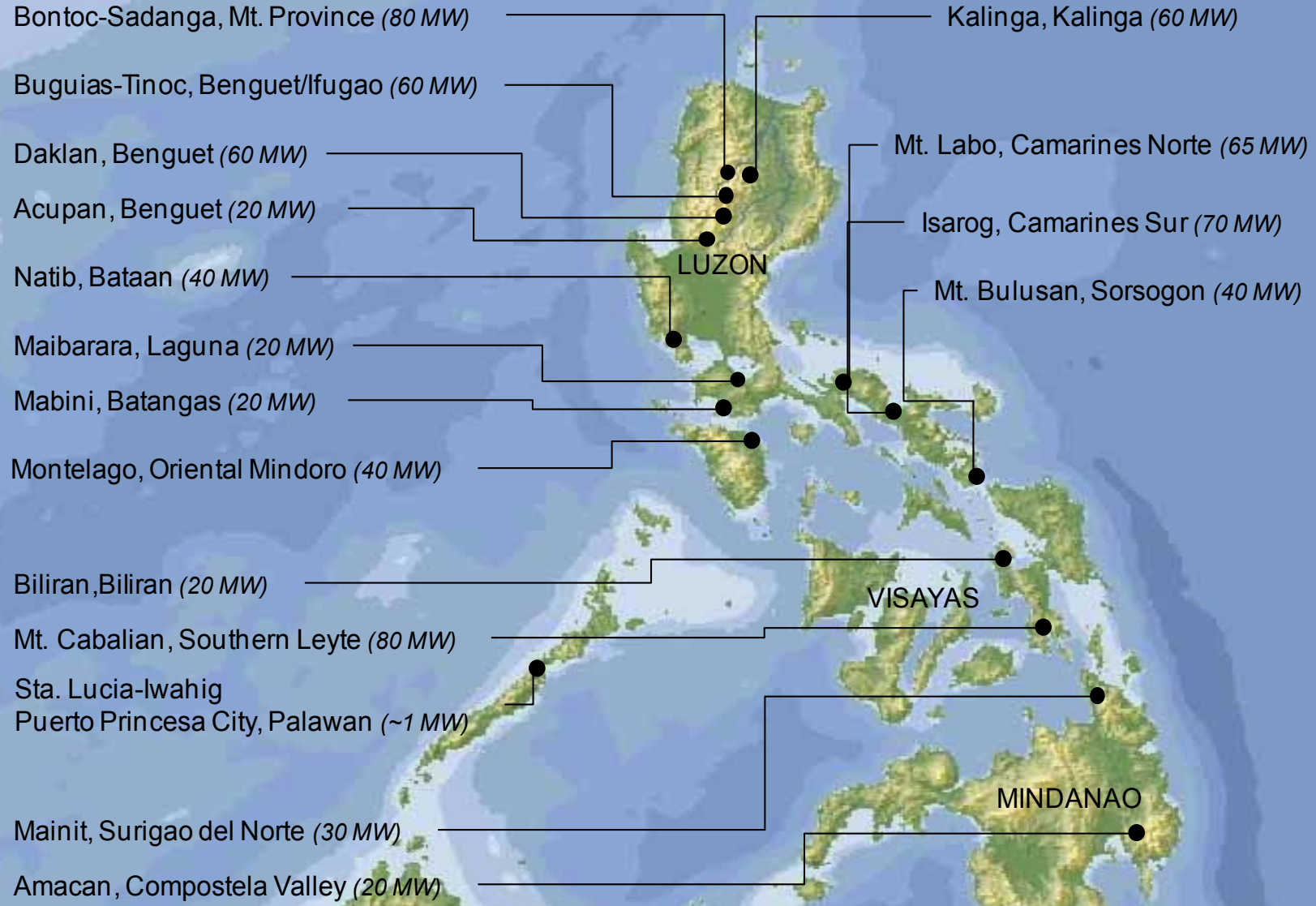
Northern Negros, Negros Occidental  
*Total Installed capacity: 49.35 MWe*

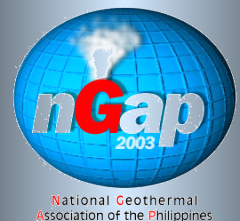
Palinpinon, Negros Oriental  
*Total Installed capacity: 192.5 MWe*

Mt. Apo, North Cotabato/Davao  
*Total Installed capacity: 108.48 MWe*



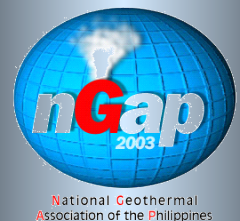
# GEOTHERMAL SERVICE CONTRACT AREAS (Pre-Development Stage)





# Policy Directions

- Drafting of policy and guidelines on Enhanced Geothermal System (EGS)
- IEC campaign to address environmental and social concerns
- Establishment of Geothermal Training Center
- Detailed Assessment of Low-Enthalpy Geothermal Resources Project
- Capacity additions:
  - 2011-2015 - 220 MW**
  - 2016-2020 - 1,100 MW**
  - 2026-2030 - 80 MW**



# Technology

- 2011-2015:
  - Technical cooperation on EGS & Geothermal Heat Pump
  - Optimization and improvement of geothermal power plant efficiency and energy conversion
  - Research/Study on acid utilization geothermal resources
- 2016-2020:
  - Feasibility study on EGS & Geothermal Heat Pump, low-enthalpy geothermal resources, small-scale geothermal energy
  - Optimization and improvement of geothermal power plant efficiency and energy conversion
- 2021-2030
  - Commercialization on EGS and Geothermal Heat Pump/ small-scale geothermal energy



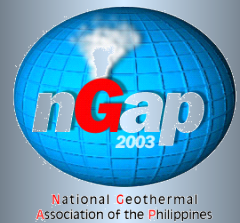
# Challenges for the Philippine Geothermal Industry





# Technical barriers

- While some high temperature hydrothermal are competitive, many geothermal technologies are more expensive than fossil plants (but may be less expensive than other RE sources like solar and wind)
- Large differences and cost ranges per technology make it difficult for project finance
- New technologies have yet to be developed and tested commercially
  - According to the International Energy Agency, EGS will only become commercially available after 2030
  - Data from unconventional geothermal and EGS geothermal heat deployment are scarce



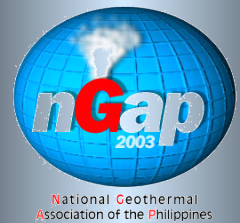
# Risk Factors

- Foreign equity ownership
- Availability of geo-scientific information and professionals
- Area status and clearance, conflict with other land use, surface/land ownership
- Procedural efficiency and clarity between DOE and DENR
- Judicial intervention and opposition by NGOs
  - Rules of Procedure for Environmental Cases



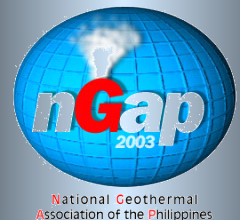
# Market facilitation and transformation

- Development of more competitive drilling technology
- Introduction of guarantee schemes
- Development of publicly available database protocols and tools for geothermal resource assessments



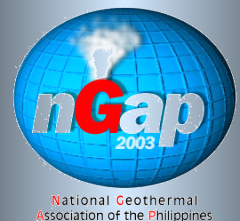
# Development of guidelines for the following mechanisms

- Renewable Portfolio Standard
- Inclusion of the following technology for Feed-in Tariff Rates
  - Acid well utilization
  - Enhanced geothermal systems
  - Low enthalpy
- RE Financial Program – geologic risk insurance, facilitate access to risk capital



# Conclusion

- Regulatory framework should be long term, transparent, predictable and independently administered
- As long as costs are higher than fossil fuel plants, economic and financial incentives are appropriate
- Public-private partnerships must foster private sector investments in new technologies



# About the Speaker

- *BS Geo, Bachelor of Laws (UP), Master of Laws (Univ. of Melbourne)*
- *Director, International Geothermal Association*
- *Trustee and Secretary, Philippine Mineral Exploration Association*
- *Trustee, National Geothermal Association of the Philippines*
- *Director, Clean Rock Renewable Energy Resources Corp. (Natib and Daklan areas)*
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