Geothermal in Indonesia Low Carbon Development

Profile, Status and Role of Market Mechanism

Ministry of Energy and Mineral Resources - Indonesia

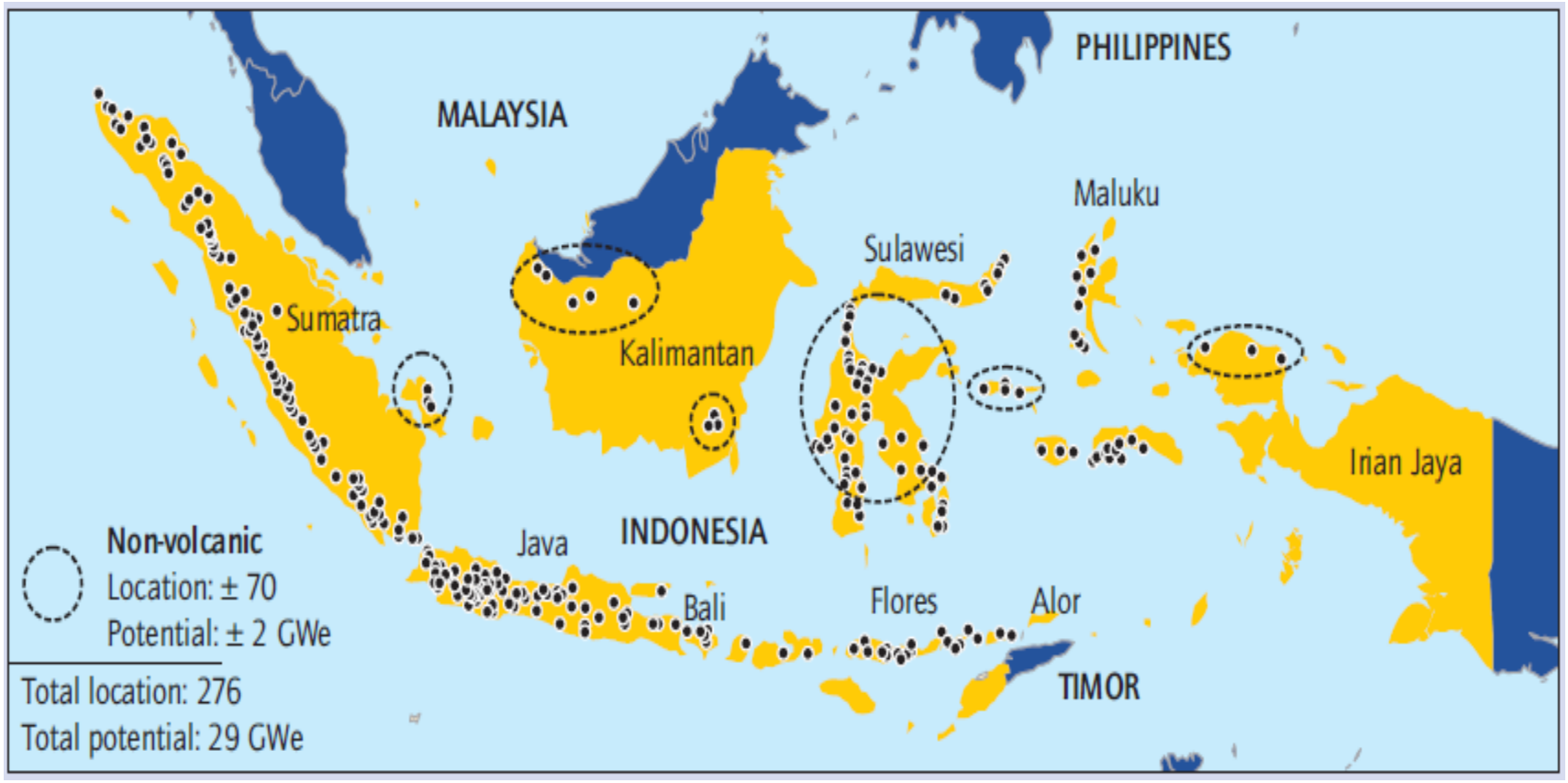
National Council on Climate Change - Indonesia

Outline:

- Indonesian geothermal profile and status
- Geothermal in Indonesian energy policy
- Geothermal in Indonesian climate change mitigation & role of market mechanism
- Concluding remarks

Indonesian Geothermal Profile and Status

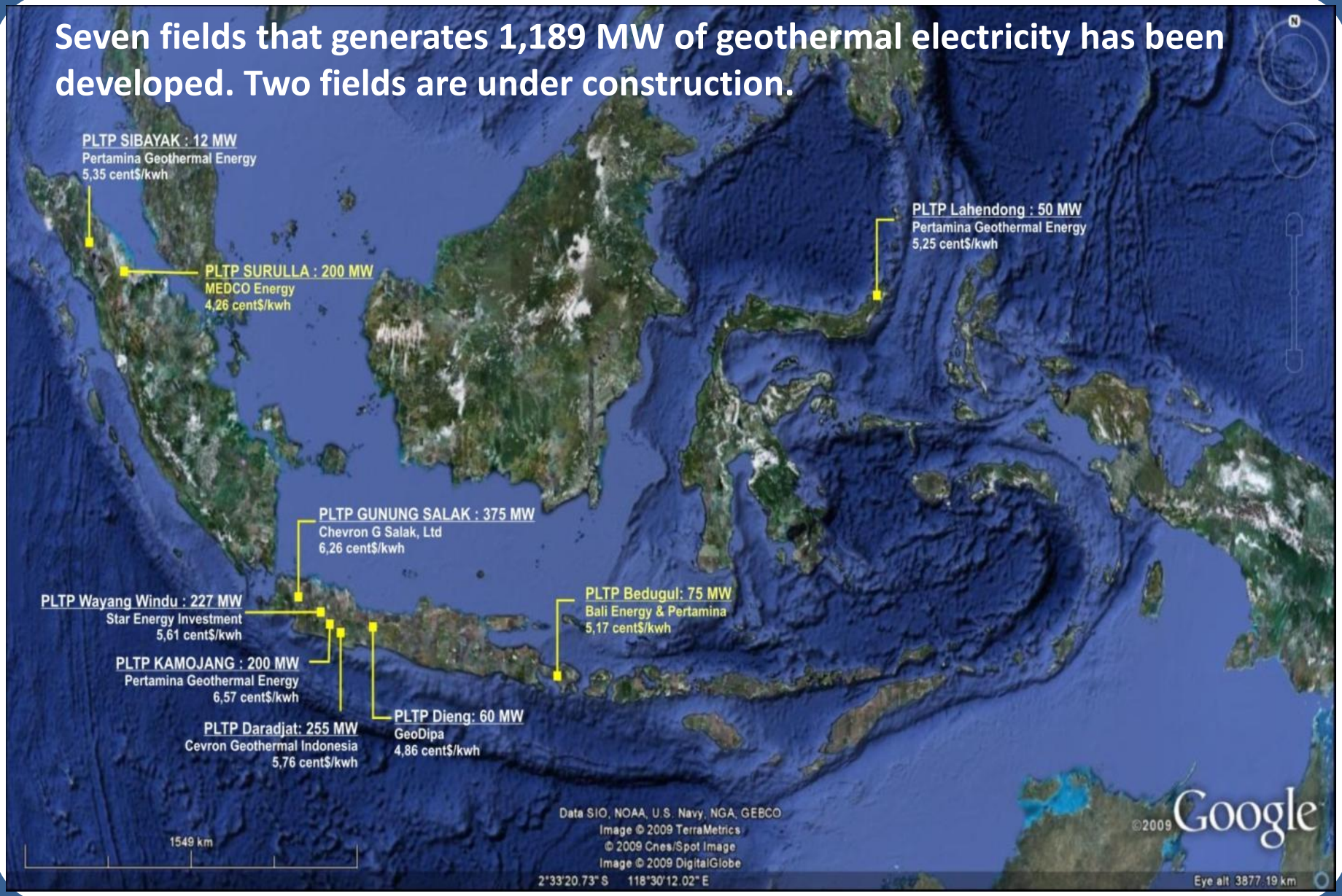
Geothermal Potential in Indonesia



Source: Geological Agency, 2010

Indonesia position to the Ring of Fire gives big potential of geothermal energy. 276 locations with geothermal energy potential had been identified that is estimated to have resources sufficient to generate 29 GW of electricity, which equates to 40 per cent of the world's geothermal reserves.

Existing and Underdevelopment Geothermal Fields



Existing Geothermal Power Plants

Sibayak ’95
Reserve: 170 MW
Production: 12 MW

Dieng ‘02
Reserve: 580 MW
Production: 60 MW

Lahendong ’01
Reserve: 175 MW
Production: 60 MW

Gunung Salak ‘94
Reserve: 600 MW
Production: 375 MW

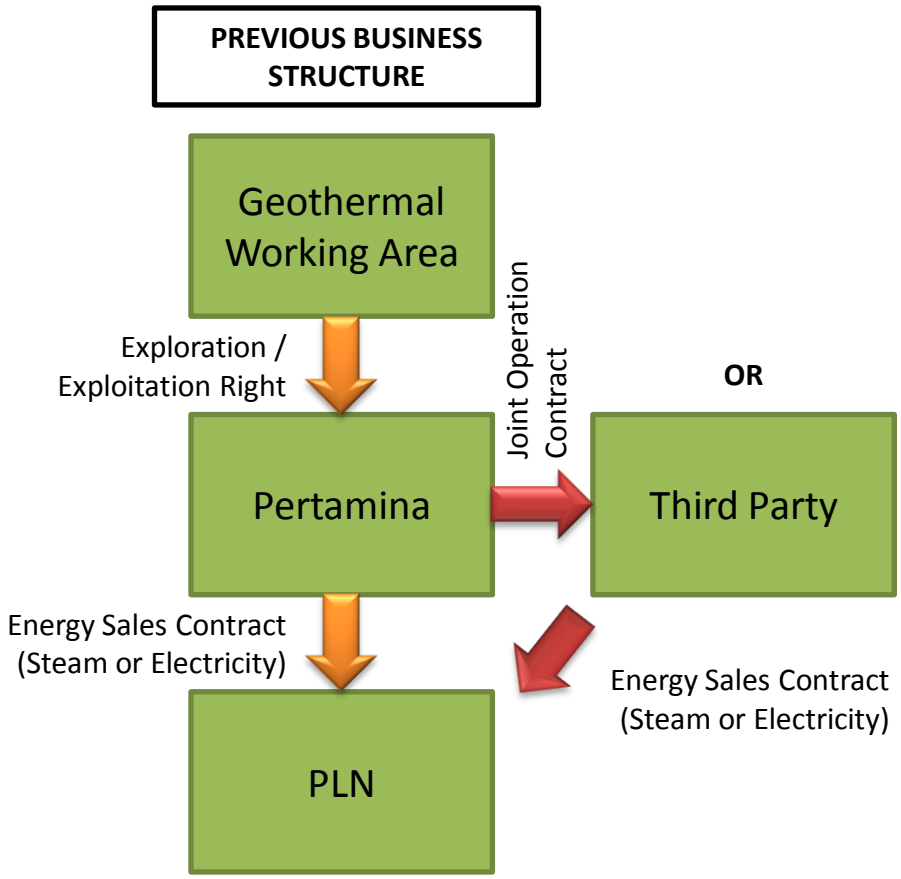
Wayang Windu ‘99
Reserve: 385 MW
Production: 227 MW

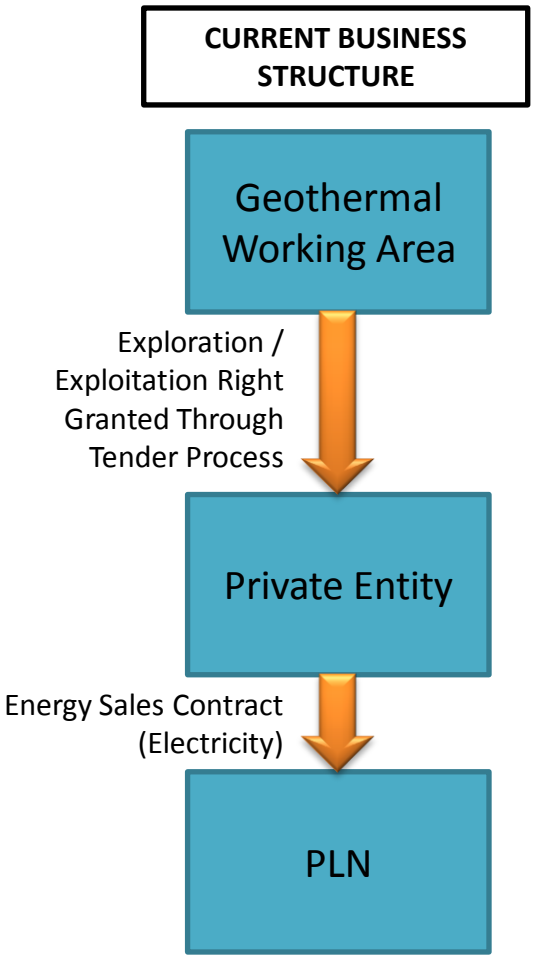
Darajat ‘94
Reserve: 432 MW
Production: 255 MW

Kamojang ‘83
Reserve: 333 MW
Production: 200 MW

Geothermal Business Structure

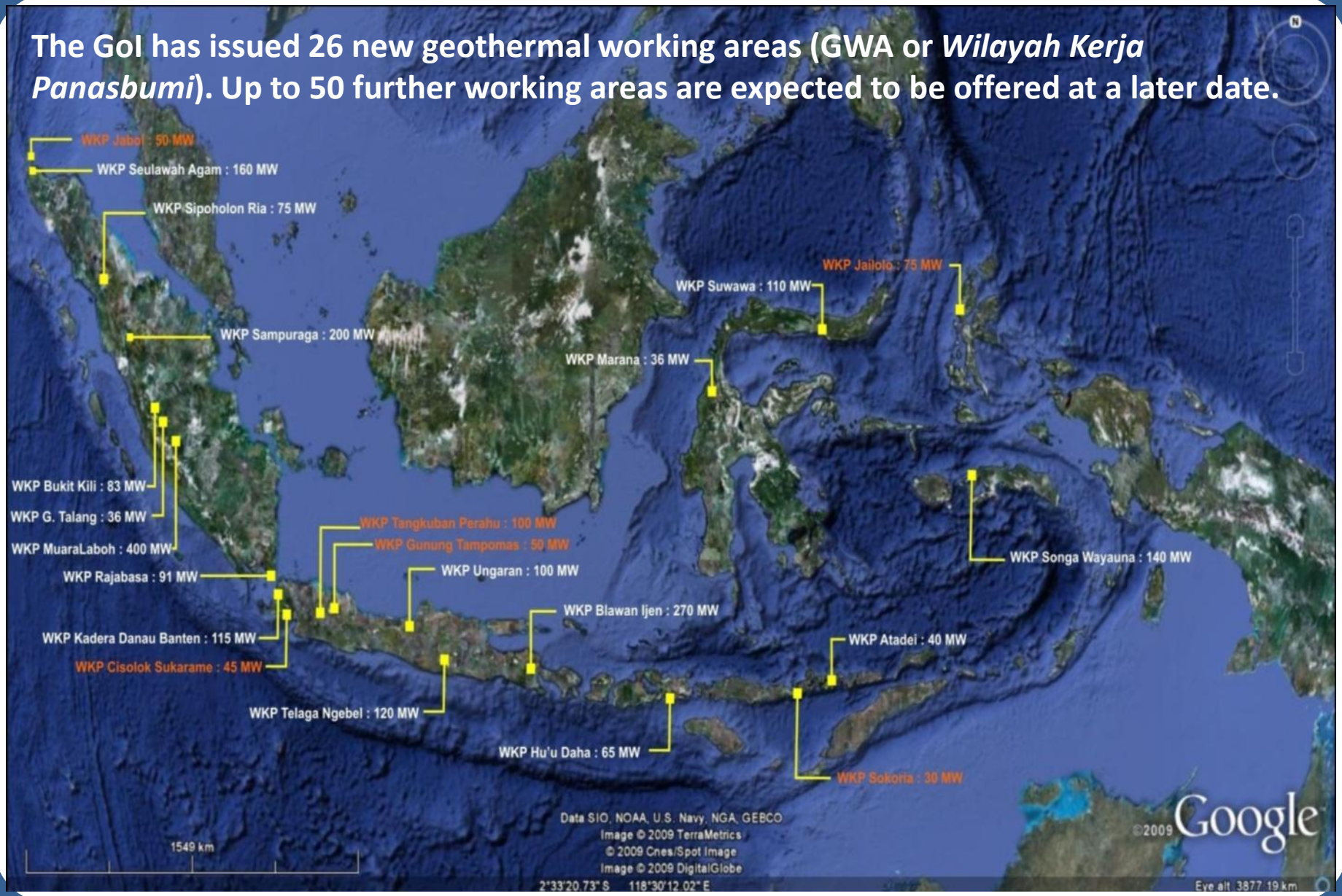
Previously, all geothermal working areas (GWA) are exclusive to be managed by National Oil Company (Pertamina). Now, GWAs can be managed by private entities through tender process.





New Geothermal Working Areas

The GoI has issued 26 new geothermal working areas (GWA or *Wilayah Kerja Panasbumi*). Up to 50 further working areas are expected to be offered at a later date.

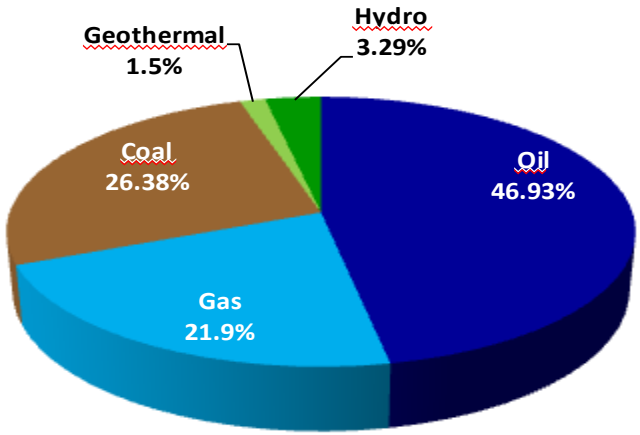


Summary of GoI Policies on Geothermal

- **GoI will speed up the development of 3,977 MW new geothermal power until year 2014 which will require total of US$ 12 Billion and provides some incentives** (Presidential Regulation No. 04/2010 jo. MEMR Regulation No. 15/2010 of 2nd Stage of 10,000 MW Fast Track Program)
- **GoI provide fiscal incentives for geothermal:**
  - **Income Tax Facilities**
  - **Custom Duties Exemption**
  - **Value Added Tax**
- **GoI provide support in reducing downstream geothermal risk** (MoF Decree No. 77/PMK.01/2011 and its revision)
- **GoI established the ceiling price for geothermal power as 9.7 cents$/kWh and mandatory off-take by PLN** (MEMR Regulation No. 32/2009, revised by MEMR Regulation No. 2/2011)
- **To accelerate the development, GoI offers preliminary survey assignment to be conducted on third party's (investor) expense which then GoI will provide "first right refusal" to such investors**

Geothermal Role in Indonesian Energy Policy

Summary of Current Energy Condition



Energy Elasticity = 1.60
Non Fossil Energy Share < 5%

1. People access to energy is still limited :
   a. Electrification ratio in 2010 is 67,2% (32,8% of household is not yet have access to electricity);
   b. Development of the infrastructure (rural area and outer island commonly is not yet have access to energy);
2. Energy consumption growth is 7% per year, not yet balance with the energy suppy;
3. The dependence to fossil energy is high, besides the energy reserve is limited;
4. Fossil fuel subsidy is increasing;
5. Renewable energy utilization and energy conservation implementation is not yet optimized;
6. Link with environmental issues:
   a. Climate change mitigation;
   b. Clean energy initiative: national commitment to reduce emission by 26% in 2020;
7. Funding for energy development is limited

Energy Sector's Vision, Mission and Policy Direction

Vision :

- **Energy security with optimum energy conservation and diversification measures.**

Mission :

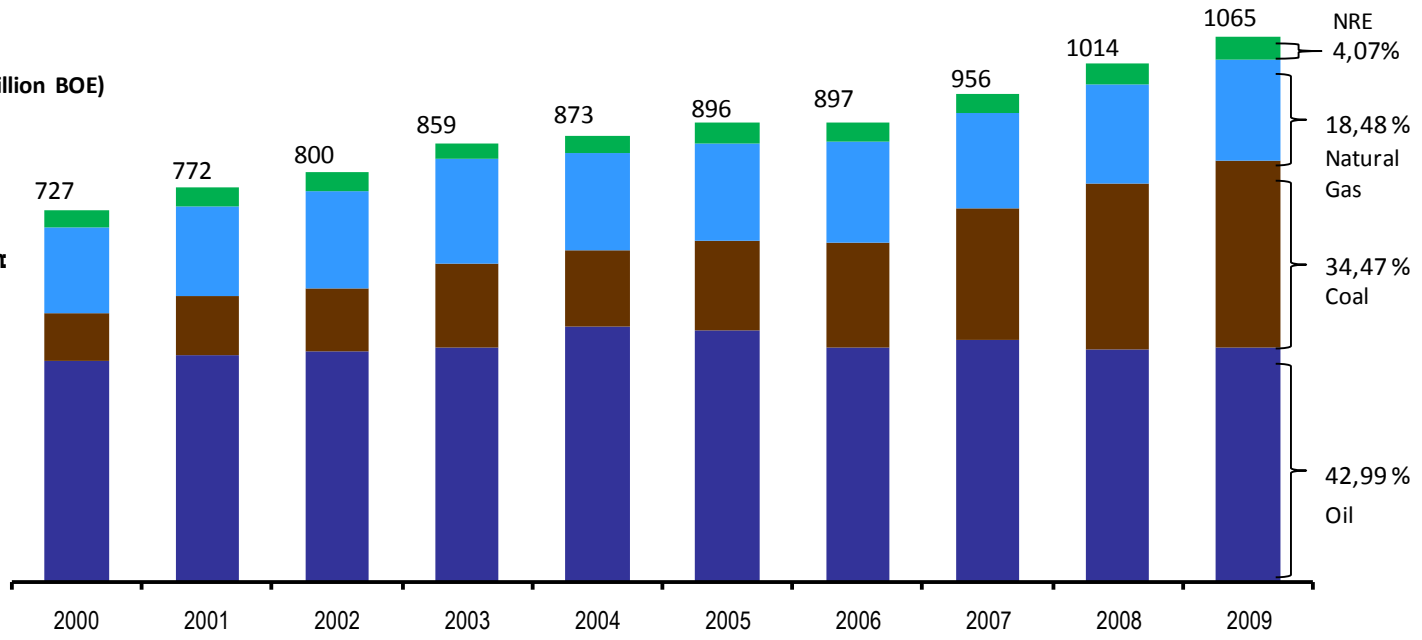
- **Implementing energy conservation for household, commercial, industry, and transportation sector in amount of 33,85% on 2025.**
- **Share of renewable energy in amount of 25% on 2025.**

Policy Direction

- **President's commitment at G-20 Forum Pittsburgh, USA (2009) to reduce emission by 26% in 2020 and up to 41% with the international support.**
- **Policy Directives at Bali Retreat (2010) to achieve energy security and Green Economy**
- **Need to reframe the low carbon energy industry.**

Growth of Share and Fossil Fuel Subsidy 2000 – 2009

A. Growth of Total Share (inmillion BOE)



The last 10 years average growth:

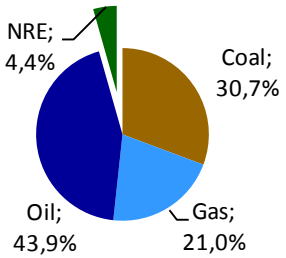
1. Oil : 0,52 %/year
2. Coal : 13,70 %/year
3. Natural Gas : 1,81 %/year
4. Total : 4,33 %/year

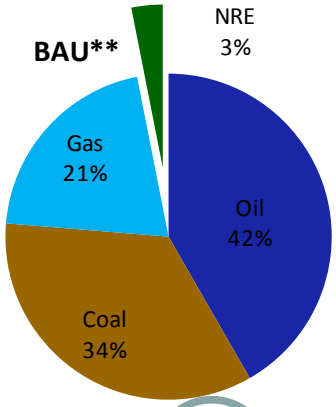
B. Growth of Fossil Subsidy (in trillion Rupiah)

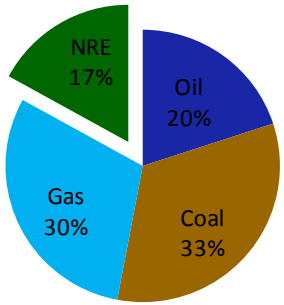
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
1. Electricity Subsidy	3,93	4,30	4,10	3,36	3,31	10,65	33,90	37,48	78,58	53,72
2. Fossil Electricity Subsidy *)	3.30	3.55	3.49	2.92	2.86	9.20	29.75	32.63	68.16	46.14
3. Fuel Subsidy	55.64	63.26	31.75	30.04	59.18	103.35	64.21	83.79	139.03	45.04
4. LPG Subsidy	0	0	0	0	0	0	0	0.15	3.84	7.78
Total Fossil Subsidy	**58.94**	**66.81**	**35.24**	**32.96**	**62.04**	**112.55**	**93.96**	**116.57**	**211.03**	**98.96**

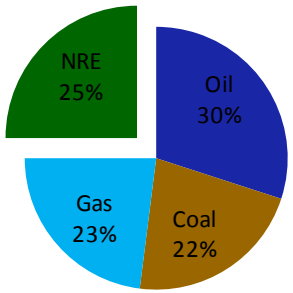
*) Proportionate to the role of fossils in the composition of primary energy for electricity supply

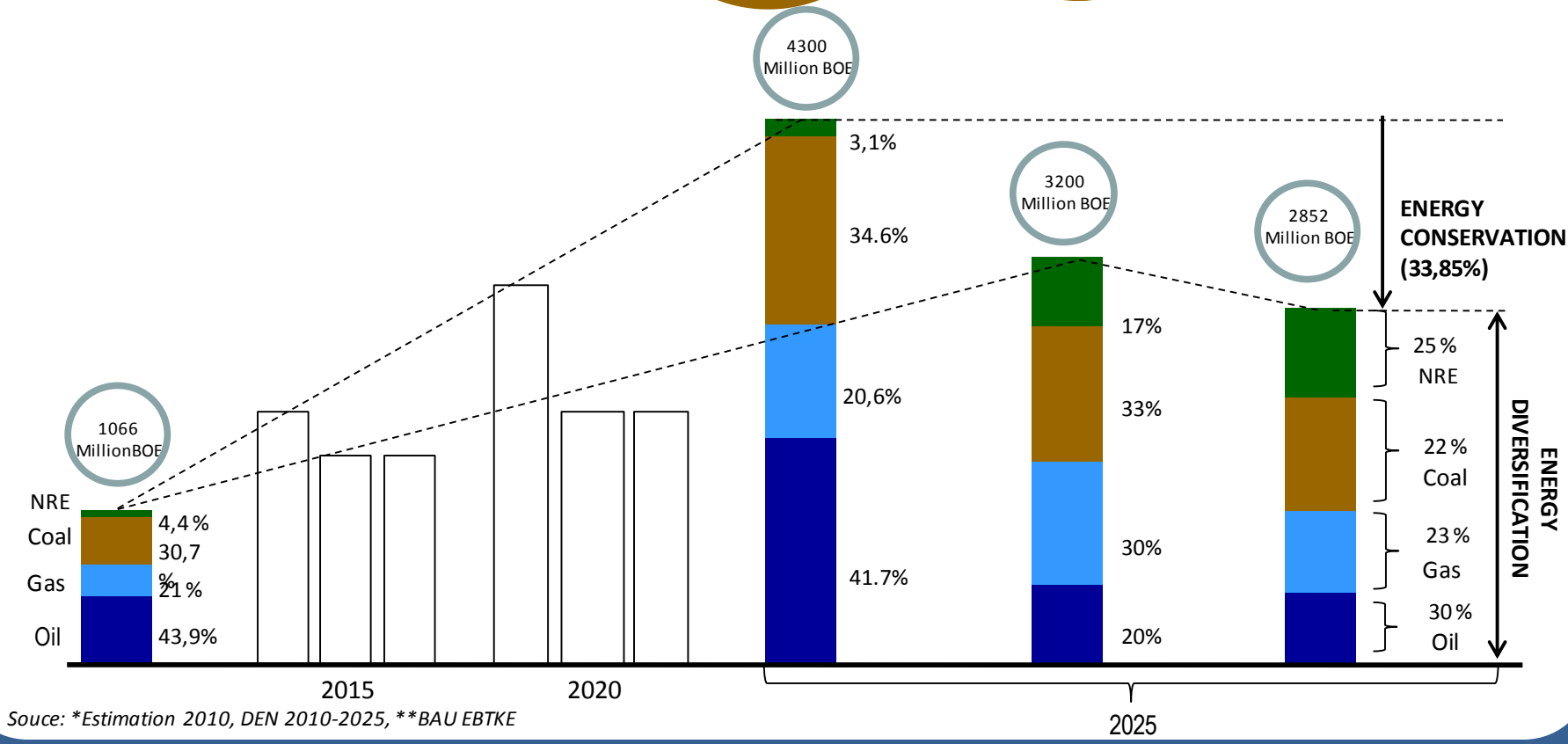
Energy Policy Direction











*Souce: *Estimation 2010, DEN 2010-2025, **BAU EBTKE*

Geothermal in Indonesian Energy

Potential:

- **Hosts 40% of total world's potential, Al Gore said that Indonesia is likely to be a 'geothermal superpower' in the future**
- **Optimum utilization will significantly reduce dependence on fossil fuel, reduce GHG emission and improve national energy security**
- **Geothermal utilization would reduce energy subsidy by avoided oil consumption**

Barriers:

- **Higher price compared to the least-cost-options (e.g. coal power plant)**
- **High upfront risk in exploration stage:**
  - ✓ **Reflected in higher energy cost lowering competitiveness to the least-cost-options**
  - ✓ **Big owner-investment needed, limiting the playing field**
- **Land-use issues e.g. when situated in protected forest, cultural site, water availability, etc.**

Geothermal in Indonesian Energy

Adopted Measures:

- Various policies and incentives including tariff scheme, fiscal incentives, tender incentives, land policy, etc.
- Government guarantee, provided by Ministry of Finance's decree, to mitigate investment risks
- Encourage developers to take carbon revenue, i.e. CERs
- Plan to deploy Rp 1.2T as revolving fund to support exploration stage in eastern Indonesia

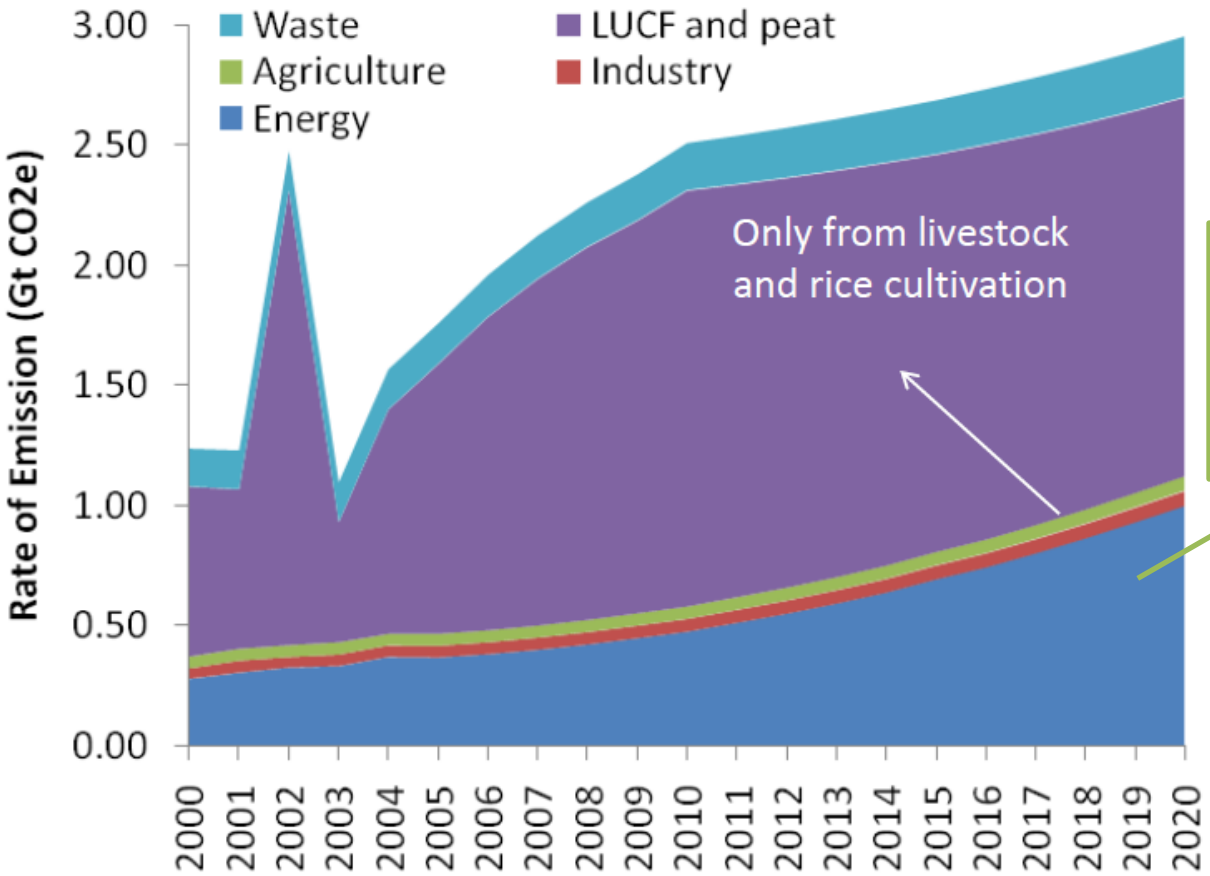
Recent Updates:

- 5 PPAs (Power Purchase Agreement) for legagy GWA and 1 PPA for new GWA, Atadei 2x2.5MW, was signed. Total 460 MW covered.
- 5 SPAs (Steam Purchase Agreement) for legagy GWAs was signed. Total 430 MW covered.
- 9 additional new GWAs going to be tendered in near future

Geothermal in Indonesian Climate Change Mitigation & Role of Market Mechanism

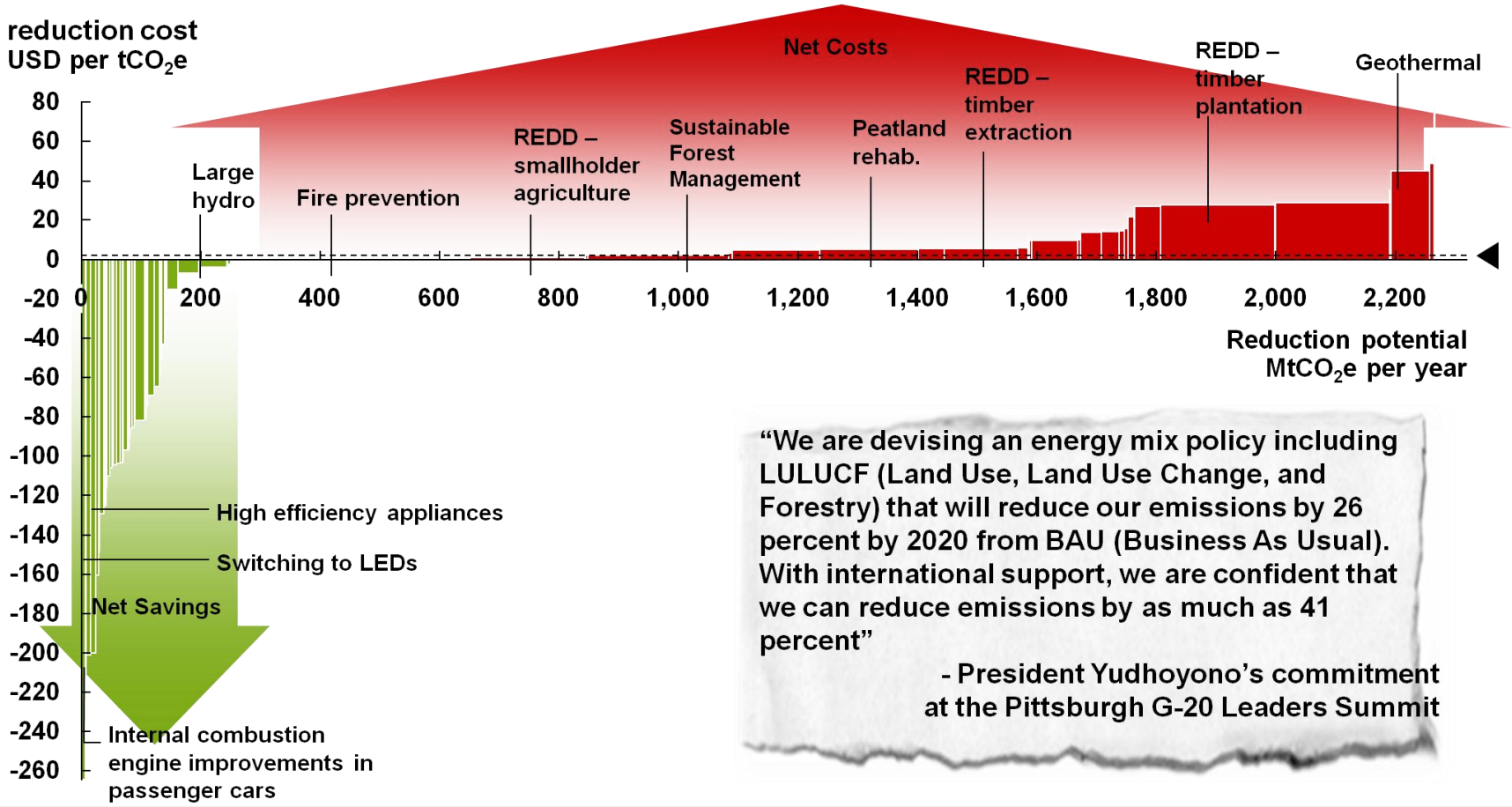
Emissions Growth Issues

Historical and projection of GHG emission under BAU scenario by sector (2000-2020)



Energy sector's emissions is predicted to grow with highest rate

Indonesia Carbon Abatement Potential



"We are devising an energy mix policy including LULUCF (Land Use, Land Use Change, and Forestry) that will reduce our emissions by 26 percent by 2020 from BAU (Business As Usual). With international support, we are confident that we can reduce emissions by as much as 41 percent"

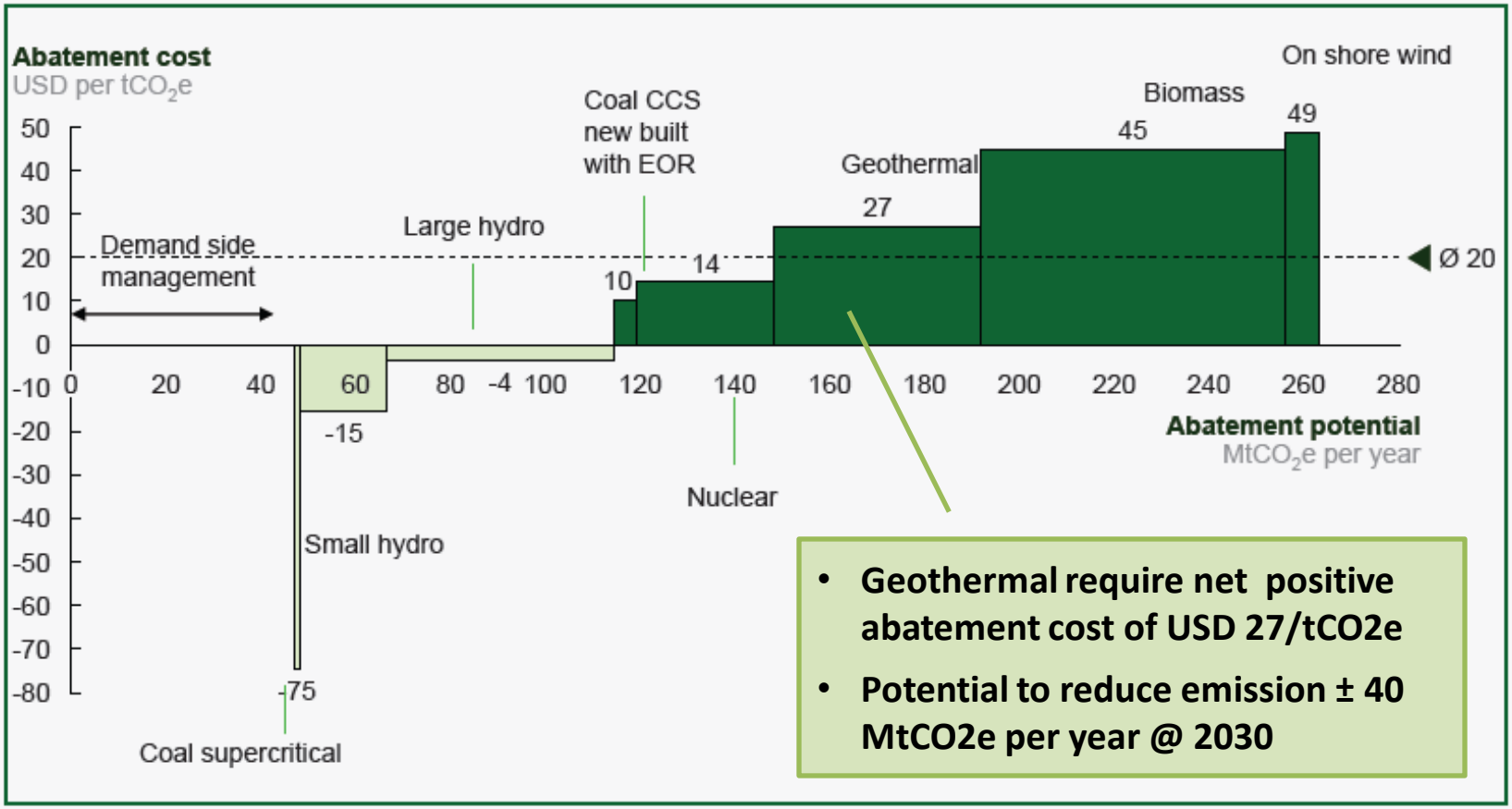
- President Yudhoyono's commitment at the Pittsburgh G-20 Leaders Summit

SOURCE: Indonesia GHG Abatement Cost Curve

Carbon valuation could help in realization of the mitigation potential !

Emission Reduction Potential from Geothermal

The power sector could provide approximately 260 $MtCO_2e$[1] of reduction potential in 2030



1 Inclusive of demand side reductions in other sectors; currently estimated at 57 TWh

SOURCE: Indonesia GHG Abatement Cost Curve

Geothermal in Indonesian Emission Reduction Commitment

President Commitment on G-20 Pittsburgh and COP15

To reduce the GHG Emission in 2020

Own efforts

26%
(767 mio. ton)

41%

Own efforts and international support

Forestry, Peat Land, Agriculture	680 million Ton
Energy Sector	30 million Ton
Waste	48 million Ton
Industry dan Transportation	9 million Ton

The activities are the development of renewable energy and implementing energy conservation by all sectors.

Geothermal power plant are not included in the activities, thus still open for market mechanism, but policy support for geothermal development are included as supporting activities.

Geothermal Projects in Carbon Market

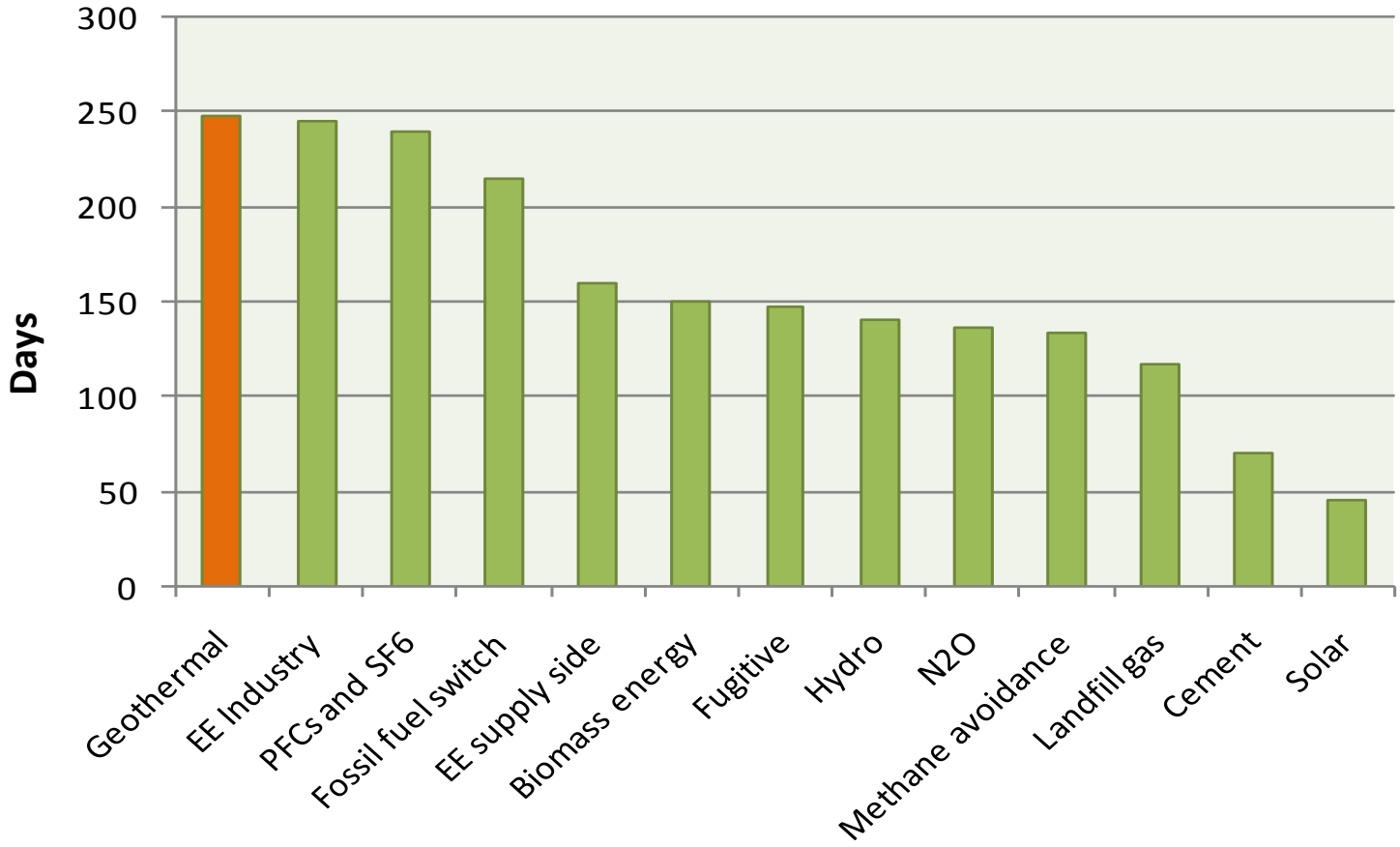
- **Registered:**
  - Darajat Unit III Geothermal Project 110 MW (*CERs issued*)
  - Lahendong II-20 MW Geothermal Project
  - Kamojang Geothermal 60 MW
  - Wayang Windu Phase 2 Geothermal Power Project 117 MW

- **In validation:**
  - Sibayak Geothermal Power Plant 11.3 MW
  - Project Ulubelu Unit 3 – 4 PT. Pertamina Geothermal Energy 110 MW
  - Project Lumut Balai Unit 1 – 2 PT. Pertamina Geothermal Energy 110 MW

- **Registered in Voluntary Carbon Standard (VCS):**
  - Wayang Windu Phase 2 Geothermal Power Project 117 MW (*pre-CDM only*)
  - Capacity Upgrade of Gunung Salak Geothermal Power Plant Project, Indonesia

Geothermal Projects Performance in CDM

Average Days Needed by Indonesian Projects from Registration Request to be Registered as CDM Projects (by project type):



Geothermal seems to have more difficulties compared to other project types !

Additionality Issues of Geothermal Projects in CDM

No.	Project Name	Demonstration Of Additionality	Remarks	Request Review Items
1	Darajat Unit III 110 MW	Barrier Analysis	-	-
2	Lahendong II-20 MW	Barrier Analysis	-	-
3	Kamojang 60 MW	Investment Analysis using Benchmark	IRR w/ CDM: 19.87% IRR w/o CDM: 16.04% Benchmark: 18.15%	Values to conduct investment analysis; Clarification on barrier and common practice analysis
4	Wayang Windu Ph-2 117 MW	Investment Analysis using Benchmark	IRR w/ CDM: 20.48% IRR w/o CDM: 17.62% Benchmark: 18.96%	Calculation of benchmark; Values to conduct investment analysis; Clarification on common practice analysis

Way Forward

Reducing Emissions from Fossil Fuel Burning (REFF-Burn)

A. **Pre-Fossil Combustion** to avoid using more fossil energy :
   1. Efficient Energy Technologies (High Efficiency Light, Efficient Appliances, etc)
   2. Renewable Energy Technologies (Geothermal, Hydro, Solar, Wind, etc)
   3. Fossil Pre-Treatment (Coal Upgrading)

B. **During Fossil Combustion** to reduce greenhouse gases emitted from fossil fuel burning:
   1. Efficient Technologies (Co-generation)
   2. Low Carbon Electricity Generation (High Efficiency Low Emission, IGCC, etc)
   3. Clean Fuel Technology (Fuel Switching)

C. **Post Fossil Combustion** to capture and store the greenhouse gases from fossil fuel burning :
   1. Carbon Capture and Storage Technologies (CCS & Algae)
   2. Utilization of CO_2

- The framework for energy sector's NAMAs
- Further policy support for geothermal development and compatibility to future market mechanisms can be developed under this framework

Concluding Remarks

- ✓ **Whilst some supporting policies are in place, acceleration of geothermal development in Indonesia is still needed and possible.**
- ✓ **Carbon revenue can play significant role in leveraging geothermal investment in Indonesia by mitigating associated risk and/or covering incremental cost gap to the least-cost-options.**
- ✓ **Development of standardized sectoral baseline for geothermal could be beneficial to simplify the market process without compromising environmental integrity. Not only for current mechanisms, but also for readiness to participate in possible future mechanisms, e.g. sectoral crediting mechanism & creditable NAMAs.**
- ✓ **Consensus and policy support related with risks and benefit distribution of carbon revenue among stakeholders should be seek, e.g. used of CR as source of revolving exploration fund, etc.**


Thank You For Your Kind Attention