



KEMENTERIAN ENERGI
& SUMBER DAYA MINERAL

CENTER OF EXCELLENCE (COE) FOR CLEAN ENERGY IN INDONESIA

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DECEMBER 2015



- Increasing pressure on the supply and access of energy to accommodate its economic and social development of Indonesia
- National necessity for utilization of the country's vast available renewable-energy sources
- Establishment of a separate Directorate General for Renewable Energy and Energy Conservation under the MEMR in 2010 as part of institutional development to support the acceleration of NRE contribution on energy sector
- The Ministry of Energy and Mineral Resource (MEMR) will establish a Centre of Excellence (COE) to support the national clean-energy programme
- COE will be established to bring together national and international expertise and public-and private-entities to assist in the transfer and deployment of technologies through innovative financing and business models

3 INDONESIA'S ENERGY MIX

(Government Regulation NO. 79/2014 on National Energy Policy)

YEAR→	2015		2020		2025		2030		2040		2050		
	UNIT→	MTOE	%	MTOE	%								
Biofuel		6	2.8%	9	3.1%	19	4.7%	22	4.6%	44	5.9%	78	7.7%
MSW		4	1.9%	7	2.4%	20	5.0%	25	5.2%	52	7.0%	64	6.4%
Geothermal		9	4.2%	23	7.9%	28	7.1%	31	6.5%	36	4.9%	58	5.8%
Hydro		2	0.9%	5	1.7%	11	2.6%	12	2.5%	13	1.8%	20	2.0%
Ocean		0	0.0%	0	0.0%	0	0.0%	1	0.2%	2	0.3%	4	0.4%
Solar		0	0.0%	0	0.0%	0	0.0%	1	0.2%	11	1.5%	17	1.7%
Other RE (Wind)		0	0.0%	0	0.0%	0	0.0%	0	0.0%	1	0.1%	1	0.1%
New Energy (Nuclear, CBM etc)		0	0.0%	5	1.7%	13	3.2%	27	5.6%	48	6.5%	68	6.8%
Oil		84	39.3%	93	32.1%	100	25.0%	106	22.1%	155	20.9%	200	20.0%
Gas		47	22.0%	64	22.1%	88	22.0%	110	23.0%	178	24.1%	240	24.0%
Coal		62	29.0%	84	29.0%	120	30.0%	144	30.1%	200	27.0%	250	25.0%
TOTAL		215	100.0%	290	100.0%	400	100.0%	479	100.0%	740	100.0%	1000	100.0%
SUB TOTAL FOSSIL		193	90.2%	241	83.1%	308	77.0%	360	75.2%	533	72.0%	676	69.0%
SUB TOTAL NON FOSSIL (NRE)		21	9.8%	49	16.9%	92	23.0%	119	24.8%	207	28.0%	310	31.0%

2015: 215 MTOE

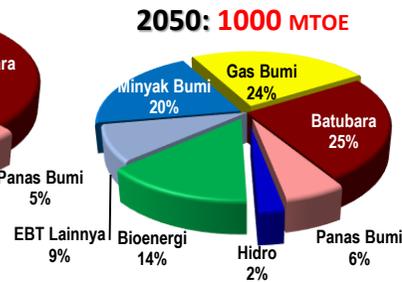
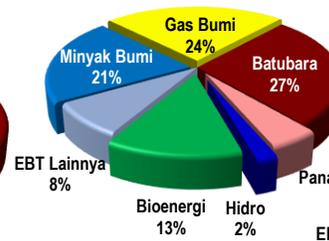
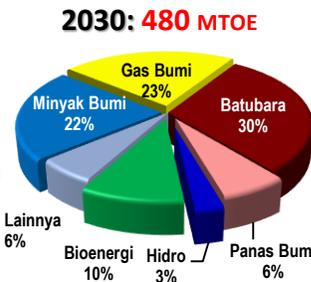
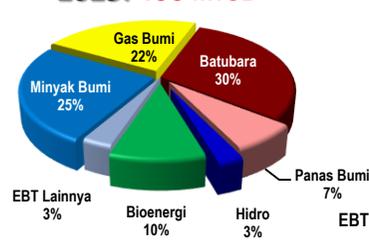
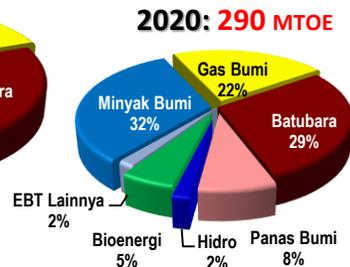
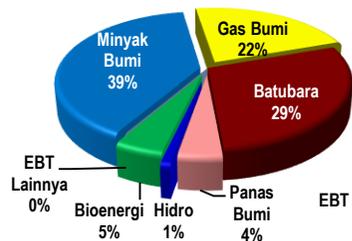
2020: 290 MTOE

2025: 400 MTOE

2030: 480 MTOE

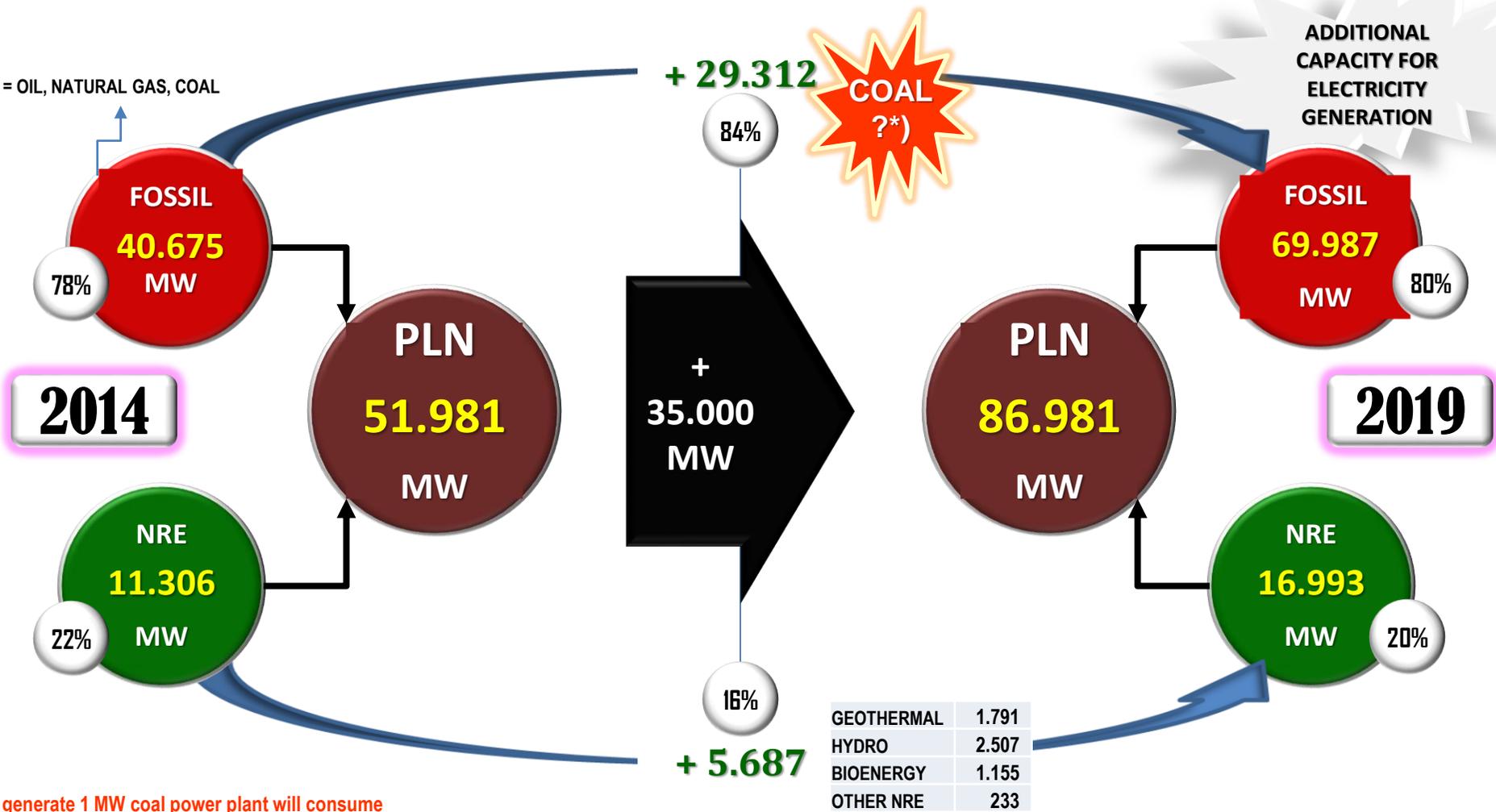
2040: 740 MTOE

2050: 1000 MTOE



Strategic Planning For Power Plant Development 2015 – 2019

FOSSIL = OIL, NATURAL GAS, COAL



*) To generate 1 MW coal power plant will consume 3000 Ton/year, and 1 million US\$/MW investment, and need 3.0-3.5 years from FC→COD.

GEOHERMAL	1.791
HYDRO	2.507
BIOENERGY	1.155
OTHER NRE	233

INVESTMENT: 20 Mbillion US\$ atau sekitar Rp. 260 Triliun (for NRE power plant.)



POTENTIAL OF NRE RESOURCES

NO	NEW RENEWABLE ENERGY	RESOURCES	INSTALLED CAPACITY (IC)	RATIO OF IC/RESOURCES (%)
1	2	3	4	5 = 4/3
1	Hydro	75,000 MW	7,572 MW	10.1 %
2	Geothermal	28,910 MW	1,403.5 MW	4.9 %
3	Biomass	32,654 MW	1,717.9 MW	5.4 %
4	Solar	112.000 GW(4.80 kWh/m ² /day)*****	48.05 MW	-
5	Wind	3 – 6 m/s	1.87 MW	-
6	Ocean	61 GW ***)	0.01 MW ****)	-
7	Uranium	3,000 MW *)	30 MW **)	-

*) Only in Kalan – West Borneo

***) As a center of research, non-energy

****) Source: R&D Agency of EMR

*****) BPPT's Prototype *****) Source R&D A of EMR

POTENTIAL OF ENERGY CONSERVATION

NO	SECTOR	ENERGY CONSUMPTION PER SECTOR 2012 (MBOE) *)	POTENTIAL OF ENERGY CONSERVATION	TARGET OF SECTORAL ENERGY CONSERVATION (2025)
1	Industry	305 (39,7%)	10 – 30%	17%
2	Transportation	311 (40,4%)	15 – 35%	20%
3	Household	92 (12%)	15 – 30%	15%
4	Commercial	34 (4,4%)	10 – 30%	15%
5	Others (Agriculture, Construction, and Mining)	26 (3,4%)	25%	-

*) Preliminary figures up to December 2013 excluding biomass and the use of non-energy

Source: Draft on National Energy Conservation Master Plan 2011

Geothermal Potency In Indonesia

NOT YET IN PRODUCTION: 3.370 MW

INDONESIA GEOTHERMAL POTENTIAL : 28.910 MW

No	Island	The number of location	Total	Attached
1	Sumatera	93	12.886	122
2	Jawa	73	9.795	1189
3	Bali-Nusa Tenggara	33	1.907	12,5
4	Kalimantan	14	162,5	-
5	Sulawesi	76	3.229	80
6	Maluku	32	1.421	-
7	Papua	3	75	-
Total		324	29.475,5	1.403,5



No.	WKP (Geothermal Work Area)	Development Planning (MW)	COD Planning
1	Sibual-Buali	3 x 110	2016, 2017, 2018.
2	Hululais - Tambang Sawah	2 x 55	2018, 2019.
3	Lumut Balai	4 x 55	2016, 2018, 2019.
4	Sungai Penuh	2 x 55	2019
5	Karaha-Cakrabuana	1 x 30, 2 x 55	2016, 2019.
6	Buyan Bratan (Bedugul)	1 x 10	2018
7	Kotamobagu	2 x 20	2019
8	Iyang-Argopuro	1 x 55	2019
9	Tulehu,	20	2018
10	Cibuni	10	2017
11	Ciater	30	2019
12	Liki Pinangawan Muaralaboh	220	2017, 2018.
13	Gn. Rajabasa	220	2018, 2019
14	Jaboi	10	2018
15	Sorik Marapi-Roburan-Sampuraga	240	2018, 2019.
16	Cisolok Cisukarame	45	2017
17	Gn. Tangkuban Perahu	110	2017
18	Gn. Tampomas	40	2018
19	Gn. Ungaran	55	2017
20	Sokoria	6 x 5	2017, 2018, 2019.
21	Atadei	10	2016
22	Jailolo	10	2019
23	Suoh Sekincau	220	2018, 2019.
24	Hu'u Daha	20	2018, 2019.
25	Kaldera Danau Banten	110	2019
26	Rantau Dedap	220	2018
27	Blawan - Ijen	130	2019
28	Telaga Ngebel	165	2019
29	Baturaden	220	2018, 2021.
30	Guci	55	2019
31	Seulawah Agam	55	2020
32	Ciremai	110	2020

GEOTHERMAL POWER PLANT HAS BEEN OPERATION : 1.403,5 MW

No.	PLTP (Geothermal Power Plant)	Total Capacity (MW)
1	Sibayak	12
2	Salak	377
3	Wayang Windu	227
4	Patuha	55
5	Kamojang	200
6	Darajat	270
7	Dieng	60
8	Lahendong	80
9	Ulubelu	110
10	Ulumbu	10
11	Mataloko	2,5

- Has been producing
- Not yet producing
- Will Auction

GEOTHERMAL POWER PLANT PREPARATION AUCTION : 1.425 MW

No.	Work Area	Capacity Planning (MW)	No.	Work Area	Capacity Planning (MW)	No.	Work Area	Capacity Planning (MW)
1.	Bonjol	60	10.	Songgoriti	20	19.	Oka-Ile Ange	10
2.	Gn. Talang – Bukit Kili	20	11.	Gunung Lawu	165	20.	Marana	20
3.	Way Ratai	55	12.	Sipoholon Ria-Ria	20	21.	Bora Pulu	40
4.	Gunung Endut	40	13.	Kepahiang	110	22.	Gunung Hamiding	2 x 5
5.	Candi Umbul Telomoyo	55	14.	Simbolon Samosir	110	23.	Telaga Ranu	2 x 5
6.	Gunung Wilis	20	15.	Danau Ranau	110	24.	Songa Wayaua Gn.	2 x 2,5
7.	Gunung Arjuno Welirang	110	16.	Graho Nyabu	110	25.	Geureudong	2 x 55
8.	Gunung Bawak	40	17.	Gunung Bawak	40	26.	Gunung Bawak	40





BIOMASS POTENTIAL FOR ELECTRICITY

No	Potential (MWe)	Unit	Sumatera	Kalimantan	Jawa-Bali-Madura	Nusa Tenggara	Sulawesi	Maluku	Papua	Total
1	Palm oil	MWe	8.812	3.384	60	-	323	-	75	12.654
2	Sugar cane	MWe	399	-	854	-	42	-	-	1.295
3	Rubber	MWe	1.918	862	-	-	-	-	-	2.781
4	Coconut	MWe	53	10	37	7	38	19	14	177
5	Rice husk	MWe	2.255	642	5.353	405	1.111	22	20	9.808
6	Corn	MWe	408	30	954	85	251	4	1	1.733
7	Cassava	MWe	110	7	120	18	12	2	1	271
8	Wood	MWe	1.212	44	14	19	21	4	21	1.335
9	Cow dung	MWe	96	16	296	53	65	5	4	535
10	MSW	MWe	326	66	1.527	48	74	11	14	2.066
	Total potential	MWe	15.588	5.062	9.215	636	1.937	67	151	32.654

1) Based on MEMR survey in 2011 – 2012

2) Biofuel resources are palm oil, molasses, cassava, etc

POTENTIAL LANDS FOR INTENSIVE BIOFUEL PLANTATIONS IN INDONESIA

1. EX MINING AREAS

NO	YEAR	AREA PROPOSED (Ha)	LAND AREA OPERATIONING (Ha)					RECLAMATION ARAE (Ha)			LAND POTENTION TO CULTICATION CANDLE NUT (Ha)	NOTE	
			MINING AREA		HOARDING AREA		OTHERS USE	SUM (4+5+7+8)	REVEGE TASI	OTHERS SHAPE			TOTAL
			ON GOING	FINISH	EX MINING	OUTSIDE EX MINING							
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	2010	1.438.685,03	35.204,66	40.910,59	38.163,46	48.808,08	64.390,66	189.313,99	55.110,09	7.596,94	62.707,03	126.606,96	
2	2011	1.644.540,68	46.745,92	46.647,63	41.617,84	199.084,29	67.538,39	360.016,23	64.777,95	7.158,64	71.936,59	288.079,64	
3	2012	1.839.721,54	48.927,06	60.634,73	52.515,49	87.056,66	73.403,94	270.022,39	88.002,03	8.919,80	96.921,83	173.100,56	
4	2013	94.742,79	736,32	594,24	431,92	1.569,83	321,24	3.221,63	1.360,14	468,44	1.828,58	1.393,05	
JUMLAH		5.017.693,04	131.617,96	148.792,19	132.734,71	336.525,86	205.662,23	822.583,24	209.260,21	24.154,82	233.406,03	589.193,21	

SUMBER : DIOLAH DARI SIM REKLAMASI TAMBANG, DJ MINERBA KESDM, 2013

2. FOREST FOR INDUSTRIAL PLANTATIONS : 14,7 juta Ha. (APHI, 2013)

3. CRITICAL LANDS : 27,2 Juta Ha (Statistik Kehutanan, 2011)

NO	KEY ISSUES	CHALLENGES	PROPOSED SOLUTIONS
1.	Technology	<ul style="list-style-type: none"> • Relatively immature technology and high costs • Value chain has not been established • Limited expertise 	<ul style="list-style-type: none"> • Capacity building for local human resources • Fiscal and tax incentives for NRE technology • Significant improvement on budget allocation for NRE R&D
2.	Economic of feedstock	<ul style="list-style-type: none"> • Frequently higher of biofuel feedstock prices than petroleum ones • Limited allocation land for bioenergy feedstock 	<ul style="list-style-type: none"> • Implementation of energy forest and plantations • Mandatory use of NRE policy
3.	Funding	<ul style="list-style-type: none"> • NRE investment is not attractive • Requirement of significant amount of working capitals 	<ul style="list-style-type: none"> • Special fund from national financial institution for supporting NRE projects • Special state budget allocation for initial project development on NRE
4.	Regulation	<ul style="list-style-type: none"> • Various regulation related constraints • Lack of law enforcement • Legal uncertainty on the implementation of regulation for feed in tariff 	<ul style="list-style-type: none"> • Implementation of cost related pricing policy • Harmonization of various NRE related regulations • Legal certainty • Simplifying license procedure for land acquisition

1. CREATING MARKET

- Through the activities of provisioning (supplying) and utilization of bio-fuel, obligating National Electric Company (PT PLN) to buy electricity, the application of Indonesian National Standard (SNI), biofuel mandatory;
- Intensive large scale NRE development: bioenergy forest and plantations
- Development of cluster economy based on NRE utilization
- Integrated NRE and rural regional development

2. SUBSIDY

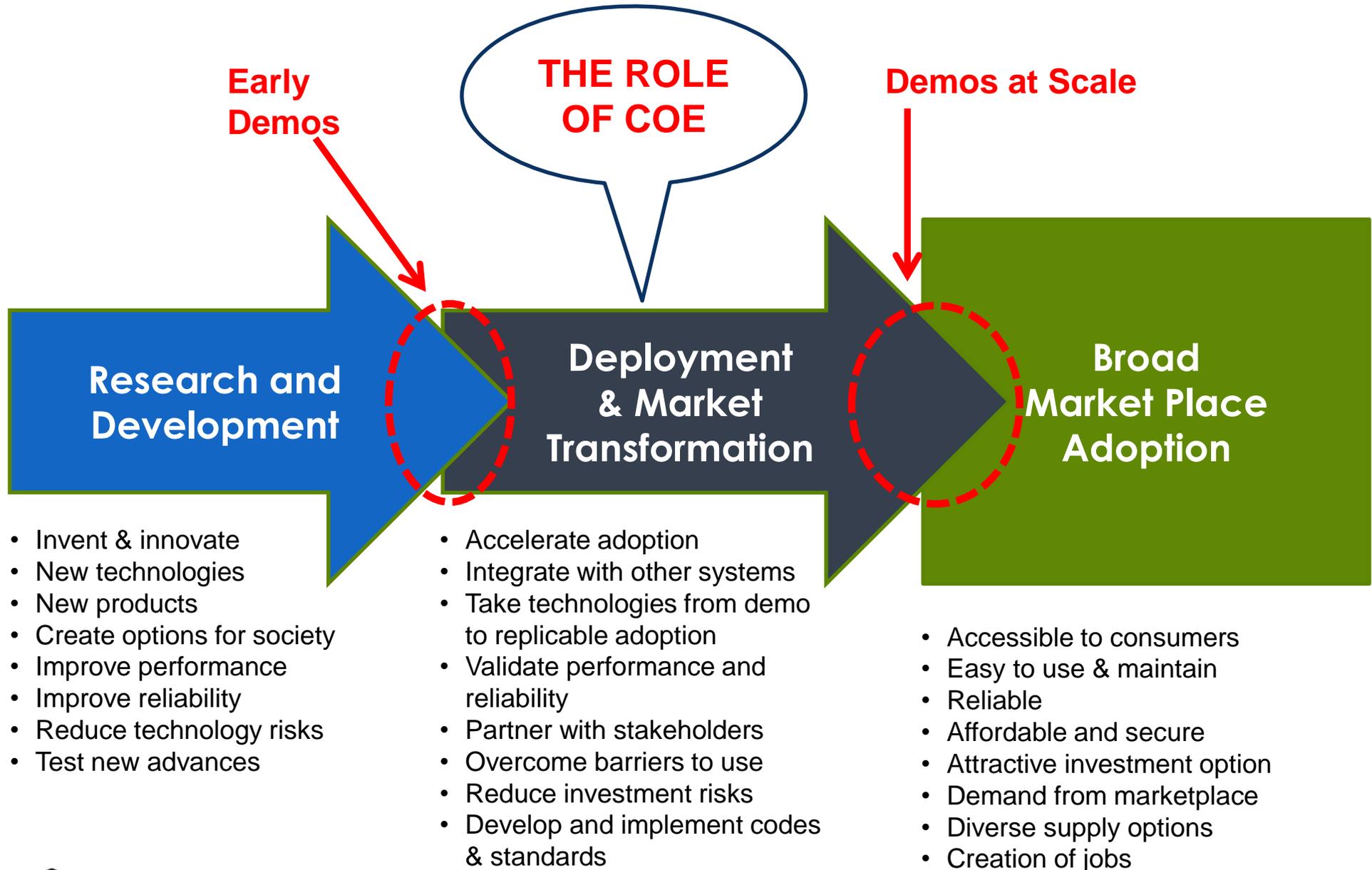
- The subsidy program for bio-fuel has been running since 2009. Subsidies are provided on the difference between fuel prices and bio-fuel prices, distributed through Pertamina;
- Subsidy is also provided for plantation

3. FEED-IN TARIFF

- Declared through the Minister of Energy and Mineral Resources Regulation, regulates the selling price of electricity from renewable energy purchased by National Electric Company. There should be no negotiations;

4. PROVIDING INCENTIVES AND FACILITIES

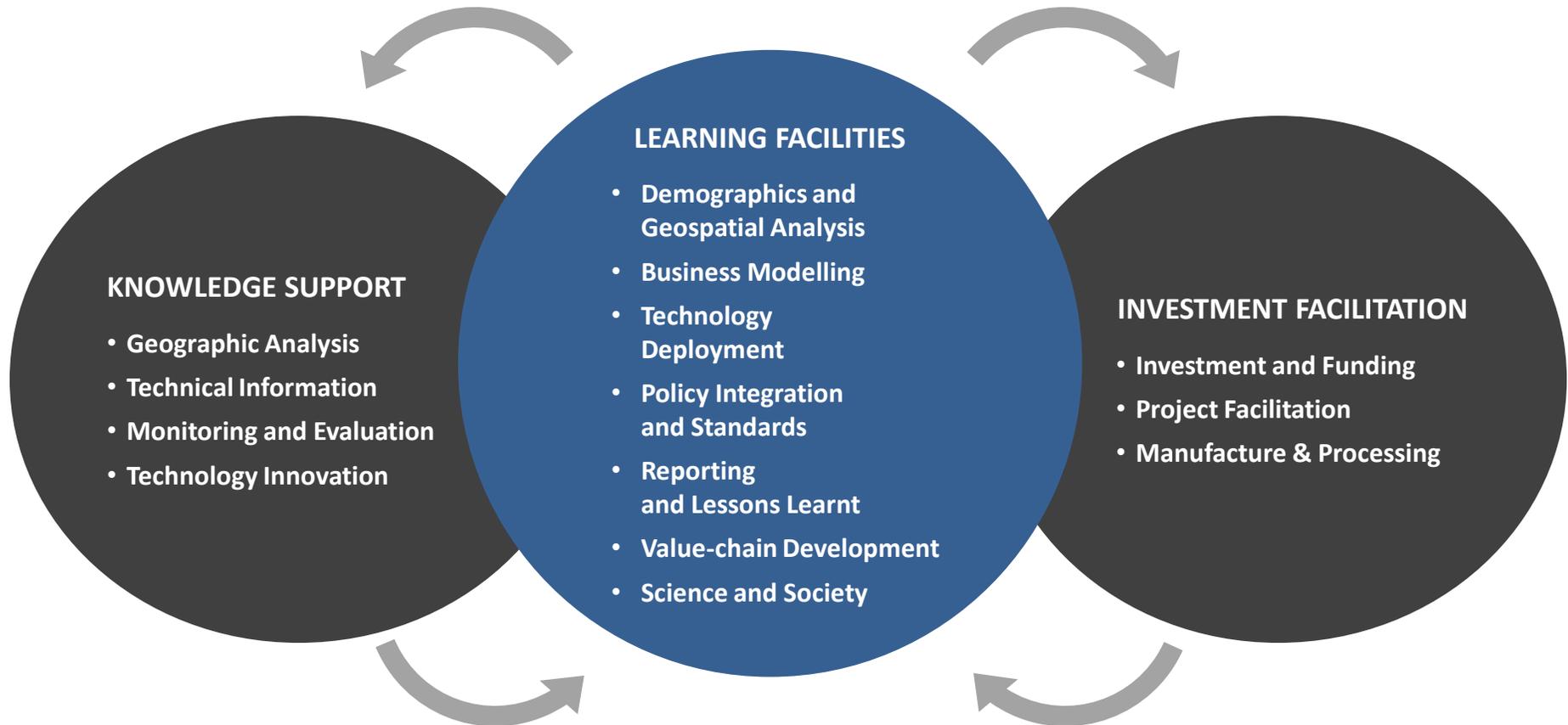
- Reduction of taxes and customs duties, licensing procedures to be simplified;
- Electricity produced by power plants up-to 10 MW will be sold to PLN; no signing of Power Purchase Agreement is needed.



Function:

To enable concerted effort in developing and deploying NRE by bringing together national and international expertise and public-and private-entities to assist in the transfer and deployment of technologies through innovative financing and business models, and to provide a collaborative learning and training environment of NRE.

1. NRE technology integration and knowledge development at micro through to medium enterprise and industry levels;
2. Research, development and demonstration activities in controlled environments and as pilot projects;
3. Project development and implementation support in cooperation with MEMR, related sector ministries and provincial governments;
4. Optimising policy and regulatory frameworks to enhance private-sector investment and participation; and
5. Innovative solutions to mitigate costs and risks for the public- and private-sector in the deployment of NRE.





The development of the COE will require partnering with, or establishing, field stations that will function as support centres for ground truthing, project implementation support and monitoring and evaluation. These stations, the location of which are to be determined and demand driven, will provide an interface with local governments and communities and report on potential or emerging bottlenecks which can be relayed to the appropriate authorities through mechanisms to be established by the Centre.

- Located at Jembrana, on apprx 30 hectare of land
- Main Building \pm 2000 m²
- Supporting facilities: Renewable Energy Lab, Computation Lab, Meeting room, Information center etc.

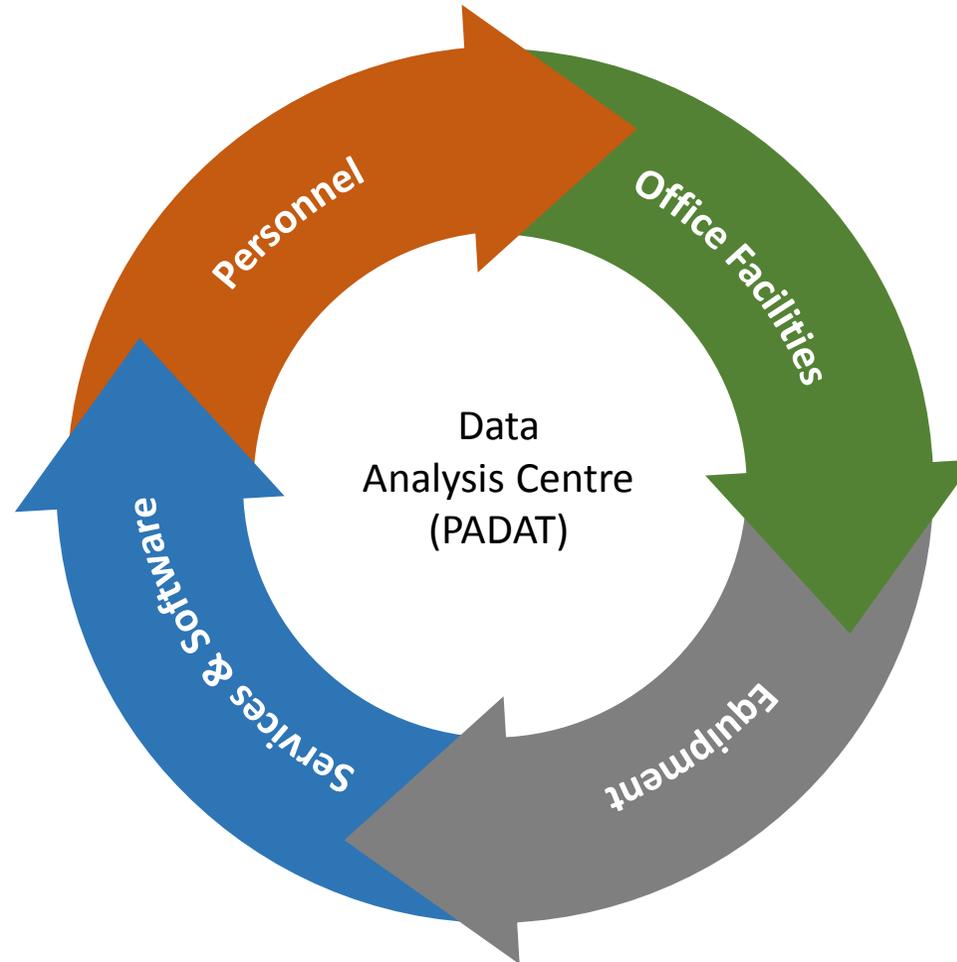
- Energy analysis and decision support
- Data and information
- Information clearing house
- Networking and cooperation

Personnel

- 1 x Data Research Coordinator
- 2 x Geospatial Specialist and Analyst
- 2 x Web Operations Programmer and Database Specialist

Services & Software

- Internet
- Web services
- Google Apps
- ArcGIS (desktop)



Office Facilities

- Minimum 60m² partitioned 35m² (meetings) and 25m² (operations)
- Specialised electrical wiring and cabling
- 24-hour access to premises for operations and maintenance

Equipment

- 1 x Server
- 2 x Desktop Computer
- 4 x Laptop
- 7 x Monitor 27"
- 3 x LCD Screen 70"
- 2 x Wi-Fi Projector and Screen.

Cooperation on Human Resources Development

- Capacity building on policy, planing and technical issues
- Exchange of experiences and sucess stories
- Conducting joint seminar, conference and exhibition
- Graduate and post graduate studies on NRE

Cooperation on tecnological development and deployment

- Research and development of NRE
- Research and development of second generation of biofuel with focusing on macro algae and cellulosic based bioethanol
- Development and deployment of technologies on hybrid energy system
- R&D on smart system and other NRE

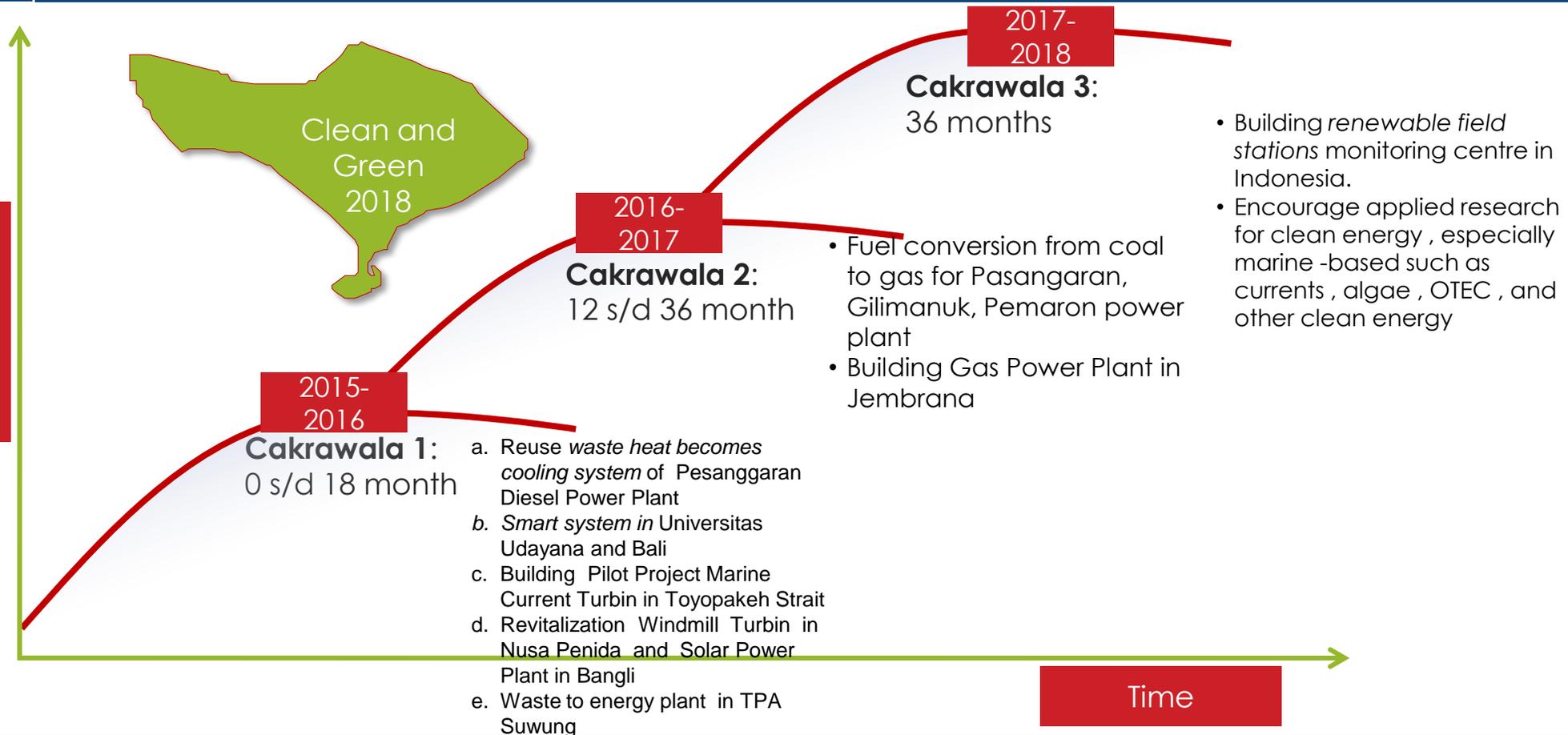
Cooperation on Business Development

- Model project for nre
- Feasibility study on nre projects for investment
- Investment on nre based project, such as bioenergy, MSW, waste of agroindustry, biomass, biogas, wind energy, ocean energy, solar, and other NRE
- Utilization of NRE
- Trading

The COE will begin immediately to assist national programmes as a “virtual” Centre. This involvement will support the Centres development.

- ❖ KNEB-BALI
- ❖ PETDES, Program Energi Terbarukan Desa, designed to increase the national electrification ratio to 100% by providing renewable off-grid systems
- ❖ Raising Bioenergy Crops on degraded land, programs have already started in Central Kalimantan
- ❖ Field stations, partnering with, or establishing, to function as support centres for ground truthing, project implementation support and monitoring and evaluation
- ❖ Seven economic clusters





Enabling Conditions:

- Data and Information management.
- Government regulation : incentive, gas supply, Public Private Partnership Regulation, financial regulation, etc.
- Local regulation, Bali city planning (RTRW), infrastructure planning, and permission (LULUCF).
- Socialitation and local campaign.

Quick Win:

- Setting up of Virtual CoE at Balitbang (Data Research Laboratory, LAPEDA)
- Smart System at Bali (Bali Governor Office complex) and Udayana University
- Biofuel pilot plan at North Sulawesi/Sam Ratulangi University (as a CoE Field Station)

1. Function, tasks and organization structure of CoE
2. Program and activities of CoE in the short, medium and long terms, especially quick wins of CoE
3. Office of CoE: building and facilities
4. Maximize the benefit of cooperation with various parties: Prospectus financial institutions among others Asian Development Bank (ADB), Korea Trade Investment Promotion Agency (KOTRA), US Agency for International Development (USAID), Australian Indonesian Cooperation (AIC); and internationally reputable R&D institutions such as NREL
5. How does the KNEB Team develop roadmap based on the above items?



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THANK YOU

<http://www.litbang.esdm.go.id>

[http:// www.lemigas.esdm.go.id](http://www.lemigas.esdm.go.id)

<http:// www.p3tkebt.esdm.go.id>

<http:// www.tekmira.esdm.go.id>

<http:// www.mgi.esdm.go.id>



On Going Project:

- a. Smart grid/smart system at Universitas Udayana
- b. Ocean current Pilot Project on Toyopakeh Strait
- c. Waste heat to cooling system utilization on PLTD Pasanggaran.

Short Term Project:

- Reuse waste heat becomes cooling system of Pesanggaran Diesel Power Plant
- Smart system in Bali and Universitas Udayana
- Building Pilot Project Marine Current Turbin in Toyopakeh Strait
- Revitalization Windmill Turbin in Nusa Penida and Solar Power Plant in Bangli
- Waste to energy plant in TPA Suwung

Medium Term Project:

- Fuel conversion from coal to gas for Pasangaran, Gilimanuk, Pemaron power plant
- Building Gas Power Plant in Jembrana

Long Term Project:

- Building renewable field stations monitoring centre in Indonesia.
- Encourage applied research for clean energy , especially marine -based such as currents , algae , OTEC , and other clean energy

No	Kegiatan	Juli				Agustus				Sept				Oktober				November				Desember				Januari			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Sayembara Konsep Desain Center of Excellence 2015																													
1	Persiapan koordinasi (teknis dan budget)	1																											
2	Pendekatan pemangku kepentingan	2																											
3	MoU Bali					3																							
4	Peluncuran kompetisi dan konferensi pers								4																				
5	Pendaftaran dan penyerahan desain									5																			
6	Penutupan pendaftaran													6															
7	Penjurian													7															
8	Pengumuman pemenang & Konferensi Pers																8												
Pengembangan Center of Excellence 2015 - 2016																													
9	Pembuatan FS									9																			
10	Peletakan batu pertama																									10			
11	Mulai pembangunan	** Setelah proses DED selesai – mulai 2016																											



- establishment and operationalization of an Indonesian Centre of Excellence designed to support the acceleration of BLB's renewable energy program;
- development of the Centre's portfolio of research, development, demonstration and deployment programs;
- joint energy-analysis projects focusing on the sustainability of renewable-energy technologies with respect to Indonesia's climate and environment, including land, water and air;
- technology partnerships to facilitate an exchange of knowledge and the development and deployment of renewable technologies within Indonesia and for the broader global context, and
- establishment of education and workforce development programs

- Indonesia's Centre of Excellence enables rapid deployment of renewable energy nation-wide and, through continued cooperation with NREL, contributes to the global shift towards clean energy;
- Scientific advancements in renewable energy for mainly tropical climates and environments continue to provide improved sustainable solutions for national and international clean-energy programs; and
- Established avenues for sharing and exchanging knowledge of, and technologies for, renewable energy that strengthens regional energy security and mitigates climate change.

On going Project: Survey PLT Arus Laut di Selat toyapakeh - Nusa Penida



- ☀ Pulau Nusa Penida mempunyai potensi pariwisata cukup besar, sehingga memerlukan fasilitas listrik yang selama ini menggunakan tenaga diesel
- ☀ Pembangunan Nusa Penida sebagai Kawasan Taman Wisata Energi Terbarukan (Renewable Energy Park) oleh Departemen ESDM (diresmikan tahun 2007)