A FEASIBILITY STUDY OF GREEN TECHNOLOGY IN INDONESIA

GREEN POWER FOR MOBILE WORKING GROUP

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INTRODUCTION

- Statistical data showed that Indonesia run into a rapid growth of ICT sector, and it gives a positive impact on economic growth;
- Geographically, Indonesia is an archipelago country, and faces problems due to increasing cost, scarcity, and environment impacts of energy to power ICT equipments;
- Meanwhile, Indonesia has abundant of natural resources such as renewable energies, which are not used optimally;
- Applications of green technology is one of the solutions to support ICT developments in Indonesia.

WHAT IS GREEN TECHNOLOGY?

- Green Technology is the application of the environmental science to conserve the natural environment and resources, and to curb the negative impacts of human involvement;
- Criteria of the green technology:
  - *It minimizes the degradation of the environment;*
  - *It has a zero or low green house gas (GHG) emission;*
  - *It is safe for use and promotes healthy and improved environment for all forms of life;*
  - *It conserves the use of energy and natural resources; and*
  - *It promotes the use of renewable resources.*

Goals of Green Technology

- **Sustainability** - meeting present needs without compromising the ability of future generations to meet their own needs.
- **"Cradle to cradle" design** - ending the "cradle to grave" cycle of manufactured products, by creating products that can be fully reclaimed or re-used.
- **Source reduction** - reducing waste and pollution by changing patterns of production and consumption.
- **Innovation** - developing alternatives to technologies - whether fossil fuel or chemical intensive agriculture.
- **Viability** - economic activity around technologies and products that benefit the environment, speeding their implementation and creating new careers that truly protect the planet.

Green Technology Subject Areas

- **Green Energy**
  Perhaps the most urgent issue for green technology, this includes the development of alternative fuels, new means of generating energy and energy efficiency.
- **Green Building**
  Green building encompasses everything from the choice of building materials to where a building is located.
- **Green ICT**
  A concept of reduced energy consumption and other resources, from the effects of emissions and waste generated by the activities of ICT
- **Environmentally preferred purchasing**
  This government innovation involves the search for products whose contents and methods of production have the smallest possible impact on the environment, and mandates that these be the preferred products for government purchasing.
- **Green chemistry**
  The invention, design and application of chemical products and processes to reduce or to eliminate the use and generation of hazardous substances.

NATIONAL ENERGY RESOURCES

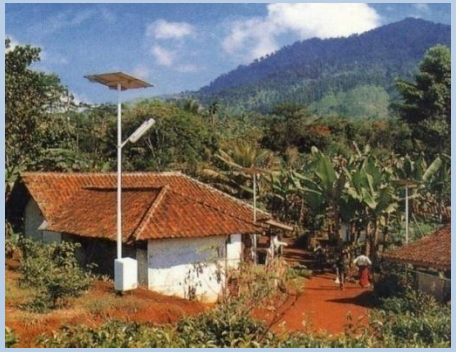
JENIS ENERGI FOSIL	SUMBER DAYA	CADANGAN	PRODUKSI (per tahun)	RASIO CAD/PROD (tanpa eksplorasi) Tahun
Minyak	56,6milliar barel	8,2 miliar barel	357 juta barel	23
Gas	334,5 TSCF	170 TSCF	2, 7 TSCF	62
Batubara	104,8 milliar ton	21,0 milliar ton	229,2 juta ton	92

ENERGI NON-FOSIL	SUMBER DAYA	SETARA	PEMANFAATAN (per tahun)	KAPASITAS TERPASANG
Tenaga Air	845,0 juta BOE	75,67 GW	6.851,0 GWh	4.200,0 MW
Panas Bumi	250,0 juta SBM	27,67 GW	2,593,5 GWh	1052,0 MW
Mini/Mikro Hidro		500 MW		86,1 MW
Biomassa		49,81 GW		445 MW
Tenaga Surya		4,8 kWh/m^2/hari		12,1MW
Tenaga Angin		9,29 GW		1,1 MW
Uranium	24,112 ton*	33 GW*		

** Hanya di Daerah Kalan - Kalbar*

SOLAR ENERGY

- Indonesia has an abundance solar energy potential, approximately 4.8 KWh/m^2 or equivalent to 112.000 GWp;
- To utilize such potential of solar energy, two technologies have been applied, namely thermal solar energy and photovoltaic solar energy.
- Photovoltaic (PV) systems have emerged to be the cost effective and a suitable approach for rural electrification in the rural areas of the developing countries.
- Many PV systems have been installed in different parts of Indonesia during the last decade. Current installed capacity is about 12 MW
- Target of Indonesian road map is 880 MWp (2025)

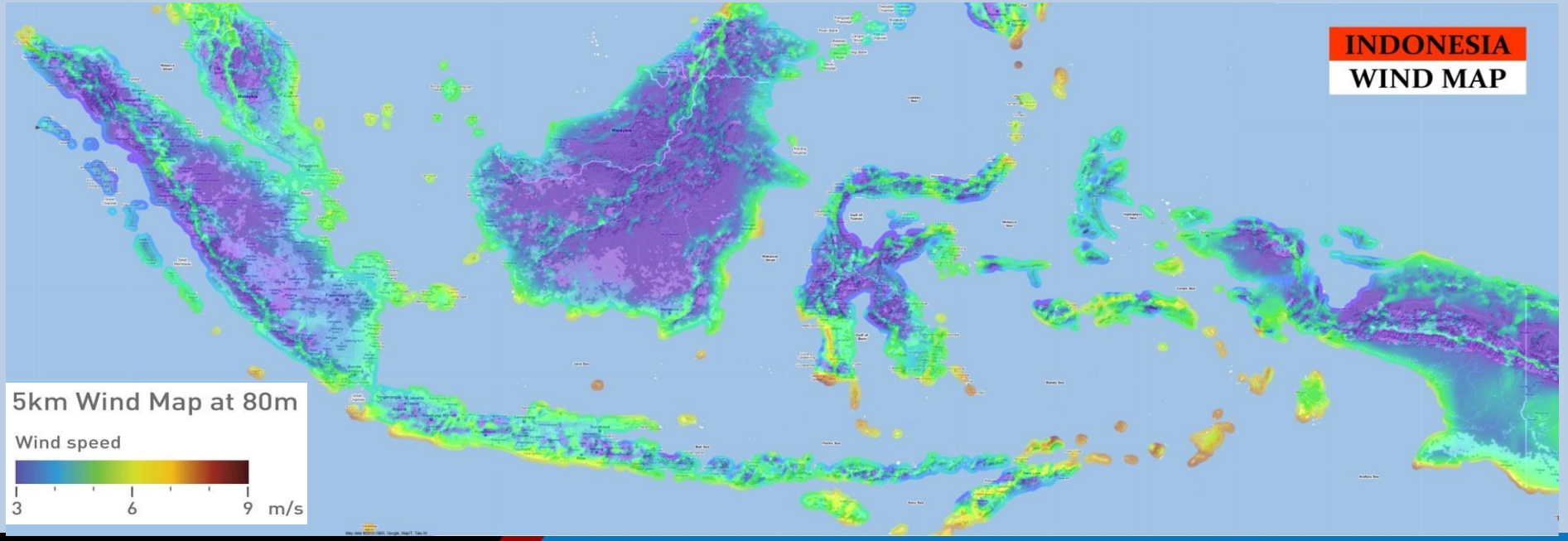






WIND ENERGY

- The potential of wind energy in Indonesia is relatively low with the average of wind speed around 3-6 m/second. However, in certain areas, especially in the Eastern Regions of Indonesia, wind velocity is more than 5 m/second.
- Around 2 MW has been installed and operated for lighting, water pumping and battery charging.



GEOTHERMAL

- Indonesia has the largest geothermal potentials in the world, about 28.1 GW (in 253 locations).
- Current installed capacity is about 1.2GW(2009). Target of the Indonesian Roadmap is 9.5 GWe (2025)



BIOMASS



- Biomass energy has been utilized for a long time and is one of the oldest forms of energy with a rather important role, especially in the rural areas.
- It is estimated that ± 35% of the total national energy consumption comes from biomass.
- Biomass, particularly in form of fuel wood and agriculture waste with its potential is estimated equivalent to 49,81 GW. This potential concentrates particularly in sugar, palm oil and wood industries.
- From total potential only around 445 MW has been installed and operated in waste and sugar industries.

Final product of biomass:

1. ***Biofuels*: biodiesel, bioetanol, *bio-oil*, biogas (biometan), biohidrogen, biobriket.**
2. ***Biomass electricity*.**

Introduction Liquid Biomass

- **Biomass**: 'biomass' means the biodegradable fraction of products, waste and residues. Can be solid or liquid.

- **Biofuels**: biofuels' means liquid or gaseous fuel for **transport** produced from biomass.

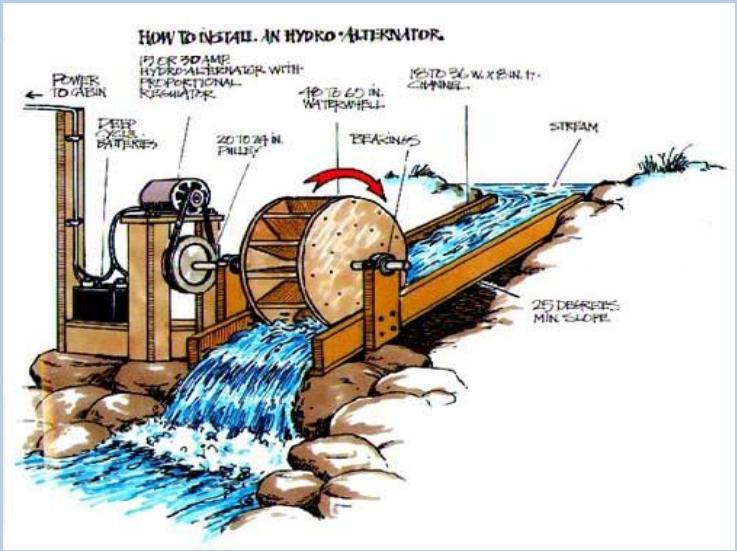
- **Liquid Biomass** or **Bioliquids**: means liquid fuel for energy purposes **other than for transport**, including electricity and heating and cooling, produced from biomass

HYDRO POWER

- The oldest machines for capturing the energy of moving water were waterwheels.
- Utilization of hydropower on a large-scale for power plants until the year 2002 reached 4,208 MW or only around 5.6 % of the existing potential.
- However, hydropower potential in Java has been optimally developed, namely around 2,389 MW or 53% of the total existing potential.
- Potential of mini hydro and micro hydro is around 500 MW, and 84 MW of which has been utilized to support rural electrification.
- Target of the national road map is about 950 MW (2025)







RE DEVELOPMENTS

Prospects:

- Large of potential resources.
- The price tend to competitive following the increase of fossil fuel price and production cost.
- The limited of energy access (electricity or non electricity) especially in remote area/border area.
- Many kind of renewable energy resources, such as solar, wind, hydro, biomass, geothermal, etc

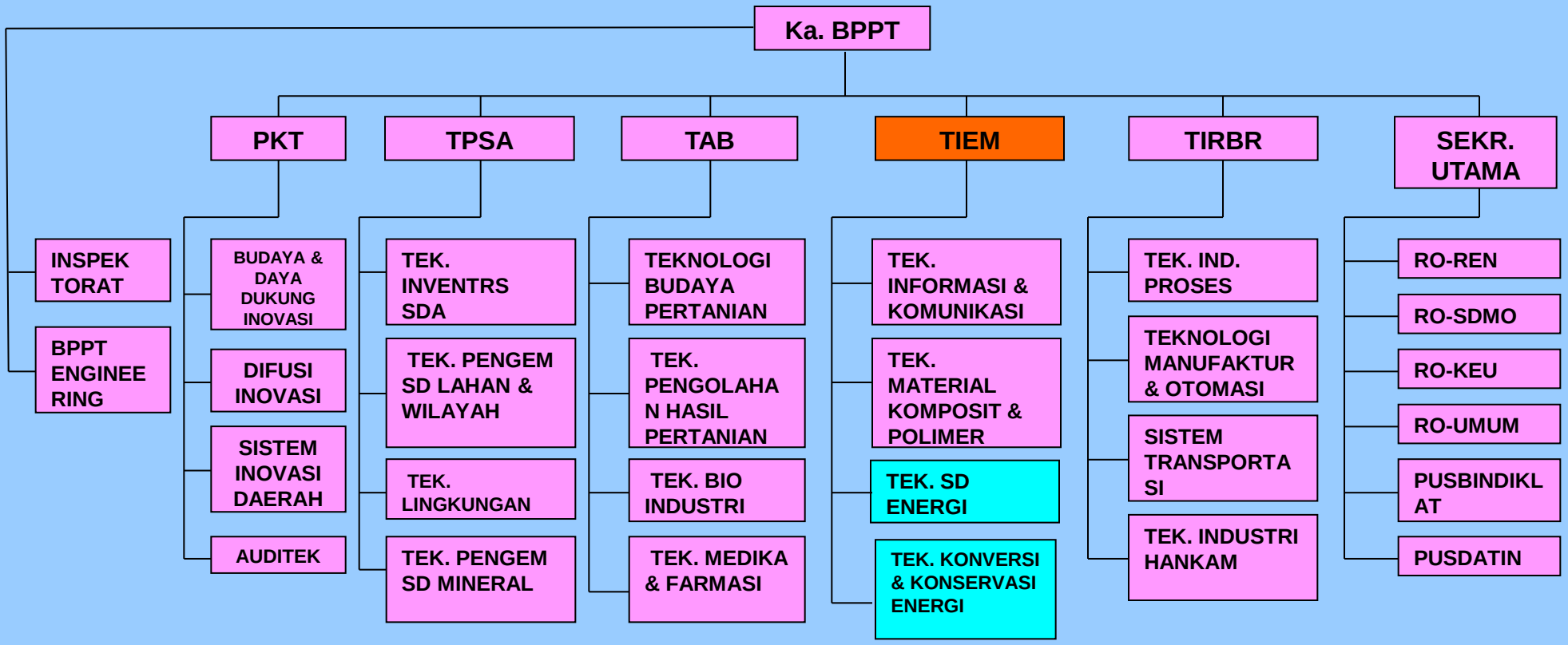
Barriers:

- Government policy to fossil fuel subsidies.
- Renewable Energy generally required high initial investment.
- No long term soft loan from local financial institution/bank.
- Lack of data and supporting infrastructure.
- Renewable Energy Resource is generally intermittent.

GREEN TECHNOLOGY IN BPPT

- BPPT as a technology center of excellence serves to accelerate the achievement of MDGs through the provision of green technology in a five roles of BPPT;
- It includes of energy, food, information and communication technology (ICT), transportation, and advanced materials;
- The green technology is designed to optimize economic growth without undermining the environment function in utilizing natural resources.

ORGANIZATION STRUCTURE OF BPPT



GREEN BUILDING

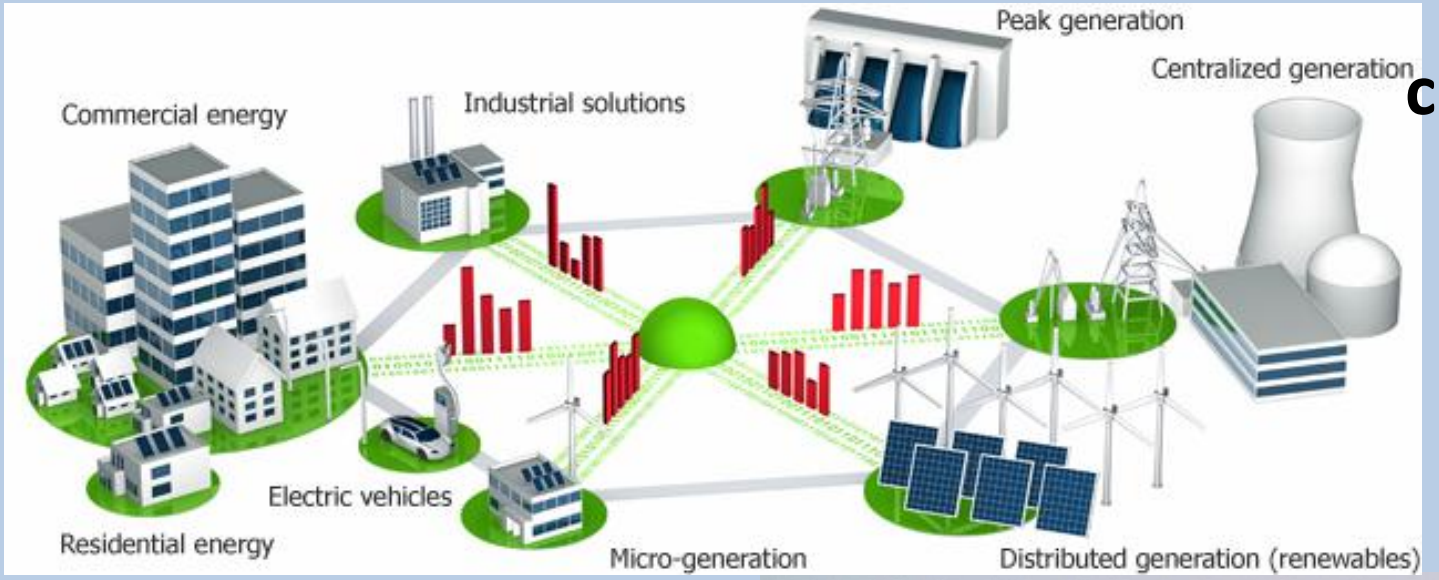


- **Green building** refers to a structure and using process that is environmentally responsible and resource-efficient throughout a building's life-cycle: from sitting to design, construction, operation, maintenance, renovation, and demolition;
- BPPT is currently preparing a LEED green building certification through GBCI;
  - PV roof top demonstration plant at BPPT park building Jakarta;
  - System: PV 10 kWp, grid-tied; inverter 3 x 4.2 kW



GREEN POWER TECHNOLOGY

SMART GRID DEVELOPMENT



Smart grid will change the world of energy management, increasing grid efficiency, reliability and flexibility



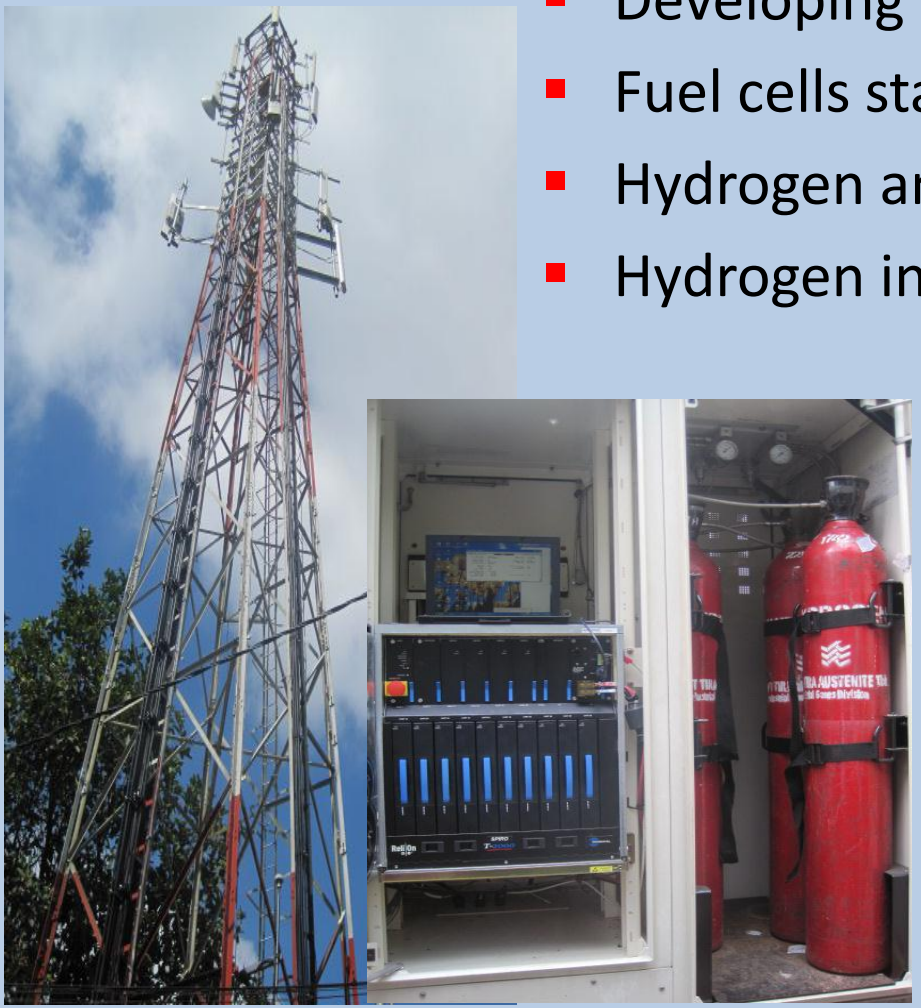


PV SMART MICRO-GRID 500 kWp, SUMBA-NTT

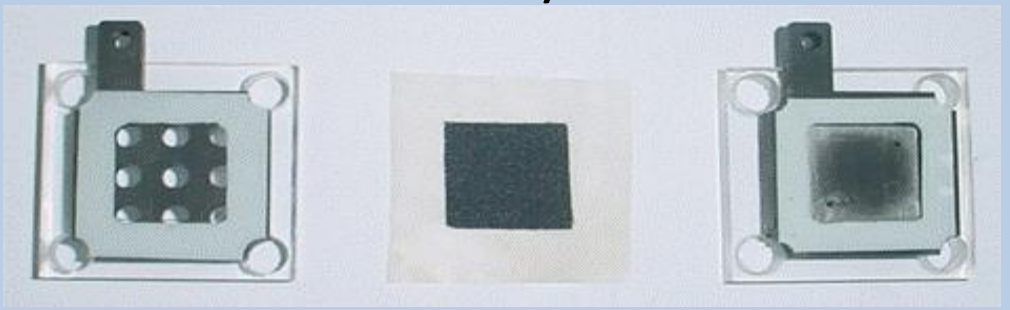
ADVANCED MATERIAL

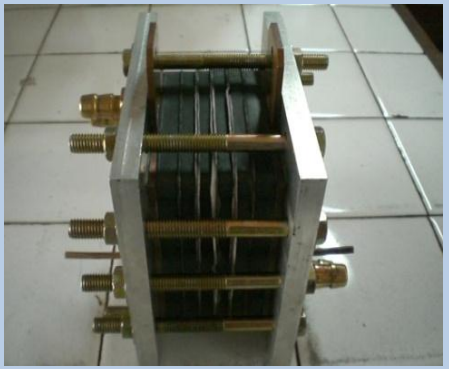
DEVELOPMENT OF HYDROGEN FUELCELL APPLICATIONS

- Developing MEA, electrode, and separator;
- Fuel cells stacking;
- Hydrogen and fuelcell applications; and
- Hydrogen infrastructure and safety



Fuelcell as backup power applications in BTS







Fuelcell stacking and transport applications

BIOFUEL DEVELOPMENT

RDEO Teknologi Proses Pengolahan Biodiesel

2001



Lab scale biodiesel production (400 L)

2002



Engineering design and fabrication of 1.5 ton/day capacity biodiesel plant (Modularised, skid mounted and movable)

2003



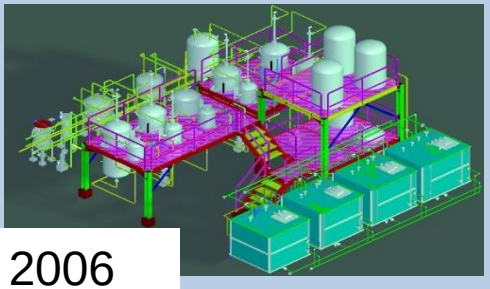




2004



EPC of Biodiesel Pilot, Capacity of 8 ton/hari



2006



EPC of Biodiesel Pilot Plant I Capacity of 3 ton/day



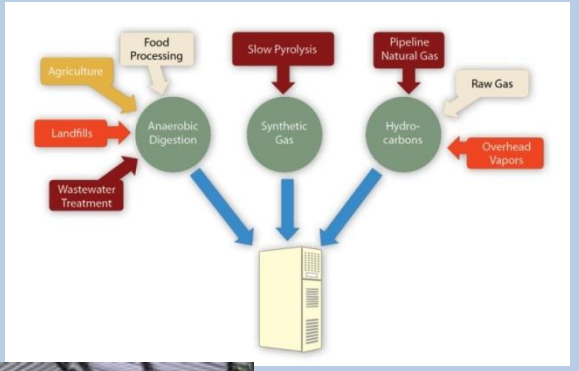
Source : Lurgi

Basic Design and Engineering of Biodiesel Plant Cap. 30.000 ton/year

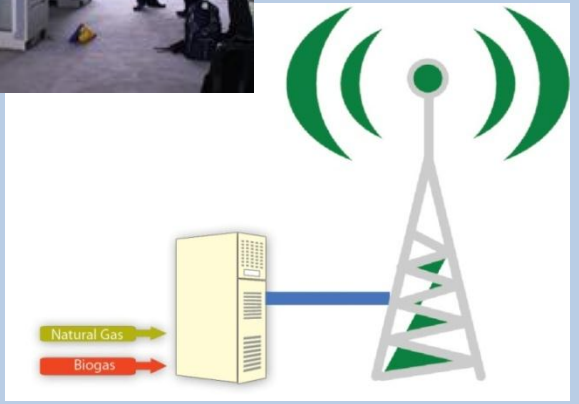
Micro Cogeneration Turbine Application Project (MCTAP)

Empowered lives.
Resilient nations.

- MCT terbukti sebagai Power Generator yang sangat ramah lingkungan;
- Memiliki fleksibilitas dalam menerima jenis gas untuk bahan bakarnya*, natural gas, biogas/biomass* dll
- Telah terpasang di 3 lokasi, dengan efisiensi dari aplikasi MCT sebesar ***70%-80%***
- Total pengurangan emisi CO2 dari aplikasi MCT sebesar***1,3 ton/kW per bulan*** atau ***16,3 ton/kW per tahun***
- *Green BTS* dengan mengganti Diesel Engine dengan *Gas Power Generation*, baik bahan bakar *natural gas* maupun *biogas*







Wind Hybrid System For BTS



Hybrid Wtg+PV+grid for BTS (Base Transciever Station)

Note :

- Wind-PV Hybrid for powering the BTS
- 2.5 kW wind turbine install capacity
- 4.8 kWp PV install capacity
- Existing PLN grid for back-up.
- Energy demand 36.00 kWh/ day
- Average wind speed for 4 month : 3.66 m/s
- Energy mix :
  - WTG 24.4 %,
  - PV 58.1 % and
  - from grid 17.5 %

ENERGY CONSERVATION

NATIONAL ISSUES:

- **Intensitas dan elastisitas** energi yang masih tinggi, target pemerintah di tahun 2025:
  - elastisitas energi < 1,
  - penurunan intensitas energi 1% per tahun.
- Perlu **strategi penurunan elastisitas** energi secara rinci, khususnya tentang teknologi apa saja yang harus dikembangkan dan diterapkan untuk mencapai target tersebut
- UU No 30 tahun 2007 dan PP No 70 tahun 2009: kewajiban pengguna energi di atas 6000 ToE per tahun untuk **menerapkan manajemen energi** dan peneraan **label tanda hemat energi** untuk peralatan energi
- Standar atau panduan baku yang berlaku untuk **pedoman penerapan** manajemen energi di Industri dan Bangunan
- Standar **tingkat efisiensi energi** untuk peralatan rumah tangga sebagai acuan peneraan label tingkat hemat energi
- Meningkatkan **kemampuan industri lokal** untuk menyediakan teknologi hemat energi di Industri.
- **Pengelolaan tata ruang kawasan** yang memenuhi kaidah hemat energi untuk menghindari pemborosan energi yang luar biasa

GREEN ICT

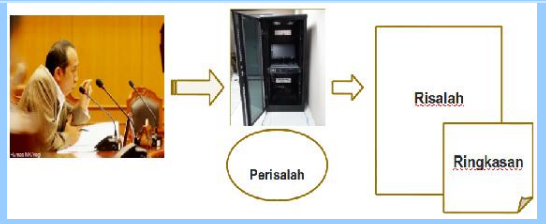
- Green ICT (information & communication technology) is a concept of reduced energy consumption and other resources, from the effects of emissions and waste generated by the ICT activities;
- For example:
  - The use of e-mail and fast data transmission, reduce the use of paper, reduced logging, and finally can reduce carbon emissions;
  - Usage teleconference; may reduce travel costs, and finally. carbon emissions reduction.

ICT Industry Potential In Indonesia

Topik TIK berskala Nasional	Potensi Pasar	Keterangan
e-KTP	170 juta	Jumlah penduduk wajib KTP
BWA	10 juta	Substitusi 3G
Migrasi TV digital	60 juta	Jumlah TV analog yg beredar
Komputer Personal (PC)	3,5 juta	Data IDC
Industri Kreatif	Sangat besar	

Dari berbagai potensi industri TIK ini, kita dapat mendorong pengembangan produk yang hemat energi dan ramah lingkungan

Green ICT Related Programs

No	Kegiatan	Gambar	Poin 'TIK Hijau'
1	Pemilu Elektronik (e-Voting)		• Sistem Pemilihan secara Elektronik; mengurangi kertas • Menggunakan e-KTP sebagai pengganti DPT dan kartu pemilih
2	E-KTP Generasi kedua		• Transaksi Data secara Elektronik; mengurangi kertas • Harus memperhatikan bahan yang ramah lingkungan
3	Perisalah		• Meringkas waktu kerja pembuatan risalah • Mengurangi konsumsi kertas
4	Multimedia Digital Network		• Efisiensi penggunaan kanal frekuensi (penghematan sumberdaya) • Peningkatan kualitas : Peningkatan efektifitas informasi

BPPT as *INDUSTRIAL TECHNOLOGY SUPPORT CENTER*

- FISIK
- KONTEN
  - ***DESIGN CENTER***
    - LAYANAN DISAIN
    - DISAIN PERANGKAT ATAU PRODUK BARU/MAJU
    - PENGEMBANGAN MEREK NASIONAL
  - PENGEMBANGAN
    - R&D
    - MODIFIKASI PATEN
  - PENGUKURAN & PENGUJIAN
    - LAYANAN PENGUJIAN & PENGUKURAN
    - SEWA ALAT UJI / UKUR
  - KOLABORASI INDUSTRI
    - SEWA RUANG KOLABORASI
    - PENGGUNAAN FASILITAS R&D BERSAMA
    - INKUBASI INDUSTRI
  - VERIFIKASI / LS-PRO
    - VERIFIKASI PRODUK
    - AUDIT TEKNOLOGI
    - VERIFIKASI TKDN

Lab BPPT dapat diarahkan untuk mendukung produk industri elektronika dan telematika yang hemat energi dan ramah lingkunagn

CONCLUSION

- A rapid growth of ICT sector gives a positive impact on economic growth, but producing CO2 emissions which could worsen to the environments;
- Green technology is one of ICT solutions that may help to reduce the CO2 emissions;



Terima Kasih

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