Energy Policy
and Planning Office
MINISTRY OF ENERGY

Research Infrastructure Supporting LCS: Energy Sector

By

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at the "Low Carbon Society" Seminar
Pullman King Power Hotel, Bangkok
17-19 November 2010

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Thailand's Energy Policy

Policy 1

Secure Energy Resources

- Oil
- Natural Gas
- Electricity
- Alternative Energy

Policy 2

Set Renewable Energy as National Agenda

- Gasohol: E10, 20, 85
- Bio-diesel
- NG
- Wind /Solar/Biogas/ Biomass/ Small Hydro energy

Policy 3

Encourage Energy Conservation

- Conservation Measures
- Efficiency Standards
- Promote Private Investment

พลังไทย ลดใช้ พลังงาน

รวมพลัง 2 คิดก่อนใช้

Policy 4

Ensure Fair Energy Prices

- Price structure to reflect genuine costs
- Improve services quality
- Safety in energy-related business

Policy 5

Preserve Environment along with Energy Development and Consumption

- Reduce Greenhouse Gas Emission
- Support CDM Projects

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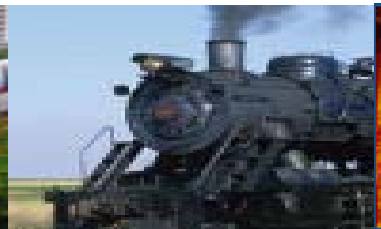
Approach to GHG Reduction: Energy Sector

- Renewable Energy Development
- Energy Efficiency Improvement
- Others Measures in support of Environment Protection


ENCON Program, Phase 3* – revised (2008-2011)

1 Renewable Energy Development Program

Ethanol, Bio-diesel, Solar, Wind, Hydro, Biomass, Waste Heat

- Technical R&D
- Development & Demonstration

To increase NRE share to 15.6 %
(including NGV)

2 Energy Efficiency Improvement Program

Transport, Industry, Residential, Others

- Technical R&D
- Development & Demonstration

To reduce energy use by 10.8 %

3 Strategic Management Program

Management & Review of the Plan

- Administration & Management
- Human Resource Development
- Public Relations
- Others

* **Phase 3 began in 2005 & was revised to correspond with the changing situations. The Revised Plan (2008-2011) was approved by the National Energy Policy Council (NEPC) on 16 November 2007 and by the Cabinet on 18 December 2007.**

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Renewable Energy Development Plan (REDP) 2008-2022

Promotional Measures

- ESCO Fund
- BOI / Financial Facilities
- Adder cost
- R&D
- CDM

2.4 %	Mini Hydro, Wind, Solar, Biomass, Biogas, Waste, Hydrogen	Power Generation
7.6 %	Solar, Waste, Biomass, Biogas	Heat / Thermal
4.1 %	Ethanol, Bio-Diesel	Bio-Fuel
6.2 %	NGV	NGV

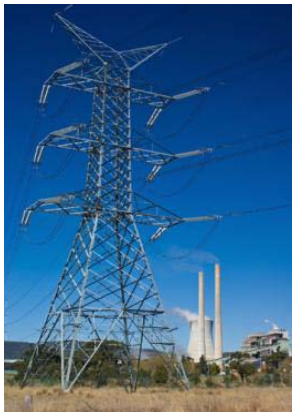
6.4 % → 15.6 % → 19.1 % → **20.3 %**

Substitution 4,237 ktoe/Yr
Reduce Import 99,500 M Baht/Yr
GHG Reduction 13 $MTCO_{2e}$/Yr

Substitution 19,700 ktoe/Yr
Reduce Import 461,800 M Baht/Yr
GHG Reduction 42 $MTCO_{2e}$/Yr

2008* | 2011 | 2013 | 2022

Avg. Crude Price Y 2008 = 94.45 US$/Barrel




Target under Each Phase of the 15-Year REDP

Electricity	Current (MW)	2008-2011	2012-2016	2017-2022	Total	%
Mini-Hydro	59.0	165	281	324		
Wind	5.7	115	375	800		
Solar	56.5	55	95	500		
Biomass	1,544.0	2,800	3,220	3,700	5,608 (2,290 ktoe)	2.4%
Biogas	103.4	60	90	120		
Waste	13.0	78	130	160		
Hydrogen	-	0	0	3.5		
Heat/Thermal	Current (ktoe)					
Solar	2.14	5	17.5	38		
Waste	1.10	15	24	35	7,433	7.6%
Biomass	3,136.00	3,660	5,000	6,760		
Biogas	311.00	470	540	600		
Bio-fuel	Current (M. Litres/day)					
Ethanol	1.20	3.00	6.20	9.00	9.00 (2,447 ktoe)	4.1%
Biodiesel	1.74	3.00	3.64	4.50	4.50 (1,415 ktoe)	
Natural Gas (transport)	Current (MMSCFD)					
NGV	172	393	596	690	690 (6,090 ktoe)	6.2%
						20.3%

(As of September 2010)

Support for R&D on RE Technology Development 2010

ENCON Fund Budget: 200 Million Baht

Request for Proposals: 1 Apr 2010 – 31 May 2010; 9 Categories

R&D Plan in 2010

1. Economic and social benefit
2. Energy benefit ratio and LCA
3. Carbon Tax
4. Energy Crop
5. Improve Efficiency of Renewable Energy Production and Utilization
6. Renewable Energy Safety Standards
7. Market Development & Standard of RDF
8. Municipal wastewater treatment
9. Others (REDP 15 yr.)

- LCA Biomass-GEMIS*, Short-rotation Plants, Biofuel
- Solving fouling problem in boilers using EFB*
- Power generation from flue gas using ORC*
- Charcoal briquette mixed with biomass and grease waste
- Development market/ standard of MSW RDF

Biofuel
- Biodiesel Algae
- Biodiesel Yeast from Waste
- Vernicia species data collection
- Ethanol Yeast from paper pulp
- Ethanol (ED95) for diesel-engine buses

Biogas
- Latex Industry (Co-digest & H_2S Remover)
- MSW (Dry ferment)
- Cell Immobilization Technique

Solar
- Dye Sensitized Solar Cell

Policy
- Smart Grid
- E85 expansion
- Gasifier NIA (pilot)

* GEMIS: Global Emission Model for Integrated Systems
EFB: Empty Fruit Bunches (of oil palm)
ORC: Organic Rankine Cycle)

Support for R&D on RE Technology Development

Consultations made with experts, DEDE, TRF, NRCT and NSTDA.

2010 R&D Plan

1. Economic and social benefit
2. Energy benefit ratio และ LCA
3. Carbon Tax
4. Energy Crop
5. Improve Efficiency of Renewable Energy Production and Utilization
6. Renewable Energy Safety Standard*
7. Market Development and Standard of RDF
8. Municipal waste water treatment
9. Others (REDP 15 yr.)

(* Being monitored by DEDE and Dept. of Industrial Works)

2011 R&D Plan of EPPO

(ENCON Fund Budget: 150 M Baht)

1. Economic and social benefit
2. Energy benefit ratio และ LCA
3. Carbon Tax
4. Energy Crop
5. Improve Efficiency of Renewable Energy Production and Utilization
6. Market Development and Standard of RDF
7. Municipal wastewater treatment
8. Others (REDP 15 yr.)

To be in line with 15-year REDP Action Plan

Support for R&D on RE Technology Development
15-yr REDP Action Plan vs. Current Implementation (1)

1. Wind
2. Solar
3. Hydro
4. Biomass
5. Biogas
6. MSW
7. Ethanol
8. Biodiesel

DEDE
EPPO

Wind

- Survey areas with low wind speed potential
- Develop Low Wind Speed turbine & related components, and cost-reduction approach
- Set standards of wind turbines & components
- Develop manufacturing of low wind speed turbines & components

- Revise wind-map
- Improve measuring stations
- Demon of various sizes of wind turbines

Solar

- Revise solar energy database & solar map
- R&D on high-efficient/low-cost solar cells, e.g. A-Si, Dye Sensitized Solar Cell
- Develop Hybrid system – power & hot water
- Develop CSP system
- Develop Solar Tracking system
- R&D on cost reduction of Solar Collector, Hot-water Tank & related components

- Revise solar-map
- Project on Thai solar cell development
- Testing Center
- Demon of hot water production using hybrid system (solar & heat pump)

- Study on small SLC system & R&D on Chiller and high-temperature radiation collector for SLC
- R&D on industrial-scale dryer system
- Set testing standards of cells & radiation collector

Hydro

- Survey & selection of potential sites
- Develop water turbine and power generator standards

- Formulate the village-scale hydropower development plan
- Develop mini-hydro, community/village-scale projects

Support for R&D on RE Technology Development
15-yr REDP Action Plan vs. Current Implementation (2)

1. Wind
2. Solar
3. Hydro
4. Biomass
5. Biogas
6. MSW
7. Ethanol
8. Biodiesel

DEDE
EPPO

* LAOs: Local Admin. Organizations
AD: Anaerobic Digestion
MBT: Mechanical Biological Treatment

Biomass

- Set measures supporting heat generation
- Collection of non-commercial biomass
- R&D on small-scale gasifier systems
- R&D on bio-oil production
- RD&D of Green City management
- Promote domestic gasifier applications
- Develop new technology for energy production from biomass, e.g. BIGCC
- Set standards of small biomass
- Support biomass technology & component industry
- LRD in the production industry

- 3-stage Gasifier
- Prototype community-based biomass energy production
- R&D on short-rotation plants
- Non-commercial biomass
- Gasifier in place of LPG in communities/industry

Biogas

- Biogas production from biomass /Co-digestion
- H_2S Removal
- Biogas /Bio-Methane Compression
- Standards of biogas equipment and engines
- Support biogas equipment manufacturing industry

- Biogas from cassava/ biomass residues
- Demon Bio-CH_4 production
- Demon biogas: small farms
- Demon Biogas: large farms, industry, food waste
- RD&D compressed Bio-CH_4
- Biogas from waste/residues

MSW

- Prototype of biogas from market wastes/LAOs*
- RDF & oil production from plastic waste
- Set standards of MSW RDF &oil from plastic waste
- R&D to increase efficiency of energy production from MSW

- Demon RDF production
- AD* in fresh markets
- Demon energy production from MSW/ in schools
- Demon MBT*

Support for R&D on RE Technology Development
15-yr REDP Action Plan vs. Current Implementation (3)

1. Wind
2. Solar
3. Hydro
4. Biomass
5. Biogas
6. MSW
7. Ethanol
8. Biodiesel

DEDE
EPPO

Ethanol

- R&D to increase feedstock yields
- R&D to increase ethanol production efficiency
- Study & testing E85
- R&D on FFV
- Ethanol application to diesel engine ED95

- Logistics of ethanol
- LCA of ethanol production from cassava/ sugarcane
- Demon of E85 application to motorcycles
- Demon of ED95

Biodiesel

- R&D to increase oil palm yields
- 2nd Generation, e.g.
- BTL *
- BHD*
- Value added to by-products from production process
- Biodiesel production from other plants:
- algae
- jatropha
- R&D on biodiesel application >10%

- Testing of biodiesel application to common rail engines of fishing boats
- Waste reduction in biodiesel production process
- Prototypes of various scales of biodiesel production
- R&D on oil palm plantation in the northern region
- R&D on algae biodiesel
- Testing of B100 application >10%

* BTL: Biomass to Liquid
BHD: Bio Hydrogenated Diesel

Support for R&D on RE Technology Development

R&D Focus by EPPO in 2011

1. Wind
2. Solar
3. Hydro
4. Biomass
5. Biogas
6. MSW
7. Ethanol
8. Biodiesel

DEDE

EPPO

Biomass

- Collection of non-commercial biomass
- Small-scale Gasifier
- Biomass supply chain
- Biomass production in arid areas
- Crops with high yields for use as biomass

Biogas

- Biogas generation from biomass/Co-digestion
- H_2S Removal
- Biogas /Bio-Methane Compression
- Standards of biogas-related equipment & engines
- Develop manufacturing industry of biogas-related equipment

MSW

- Develop RDF & oil production from plastic waste
- Set standards of MSW RDF and oil from plastic waste
- R&D to increase efficiency of energy production from MSW

Ethanol

- R&D to increase yield of feedstock
- R&D to increase ethanol production efficiency
- Research on the use of E85
- Research on FFV
- Application of ethanol to diesel engine (ED95)

Biodiesel

- R&D to increase oil palm yield
- Increase value of by-products from production process
- Biodiesel production from other sources, e.g. algae, jatropha, etc.
- 2nd Generation, e.g. BTL, BHD

Energy Efficiency Improvement in Thailand

Focus is placed on **3 key economic sectors.**

Economic Sectors	% of Thailand's 2009 Total Final Energy Consumption*
Industrial	36.6%
Transportation	35.7%
Residential & Commercial	22.5%
Agricultural	5.2%

* Source: DEDE 2009

Energy Efficiency Improvement = 32.3 $MtCO_2/yr$	Projected Energy Demand in 2011 (ktoe)		Target Saving	
	BAU Case	With ENCON Plan	ktoe	%
Energy Efficiency Improvement Program	**80,331**	**72,511**	**7,820**	**10.8**
(1) Industrial Sector	31,847	28,658	3,190	4.4
(2) Transportation Sector	28,781	25,367	3,413	4.7
(3) Residential and Commercial Sector	19,704	18,486	1,217	1.7

Promotion of Energy Efficiency

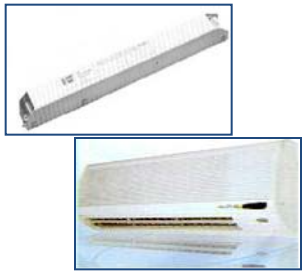
Legal Measures:

Determination of

- **Standards, criteria, procedures of designing energy-saving buildings**

- **Standards, criteria, procedures of energy management in designated factories / buildings**

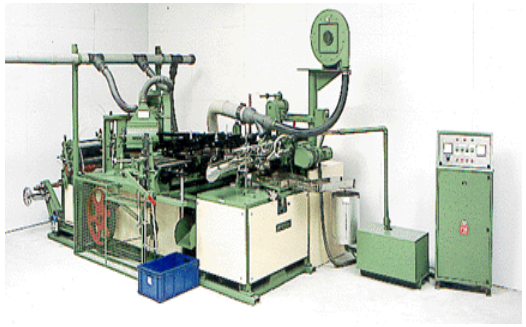
- **Standards of energy-efficient electrical appliances (e.g. Ministerial Regulations / MEPS / energy efficiency labeling)**



Promotion of Energy Efficiency

Management Measures:

- **Revolving Fund to promote energy conservation**
- **ESCO Fund**
- **Tax Incentives – Cost & Performance**
- **DSM Bidding**
- **BOI Privileges**



Promotion of Energy Efficiency

Social Measures:

- Change incandescent light bulbs to energy-saving fluorescent tubes
- Use No. 5 “Energy-saving” electrical appliances
- Standby -1 watt

Support for R&D on EE Improvement

2010

ENCON Fund Budget: 80 Million Baht

Request for Proposals: 1 Apr 2010 – 30 Jun 2010; 7 Categories

Category	R&D Theme
1	Application of foreign standards of fuel consumption for vehicles to the context of Thailand
2	Approach to increase energy efficiency in land transportation, via the use of energy-saving equipment/accessories
3	Guidelines on efficient management of land transport, including development of related policy
4	Study on the economic, social & environmental impact of energy efficiency policy
5	Study and demonstration of car-pool management
6	Study and formulation of national energy policy to address climate change
7	Other aspects related to energy efficiency improvement

Approved R&D on EE Projects: 2010

ENCON Fund Budget:
80 M Baht

Policy-oriented:
2 projects
18.18 M Baht

Budget for R&D Funding via Request for Proposals:
61.82 M Baht

1) **Study Project on the development of 15-year Energy Efficiency Plan* (8.37 M Baht)**
2) **Study Project on the formulation of Thailand's policy and 15-year action plan for GHG emission reduction in the energy sector (9.81 M Baht)**

(* Later extended to 20 years)

As of Aug 2010:
11 projects approved, with total funding of 55.28 M Baht

Balance:
6.55 M Baht

Thailand's 20-Year Energy Efficiency Plan

20-Year
Energy Efficiency
Plan

2011 - 2030

Phase 3

2005-2011

Phase 2

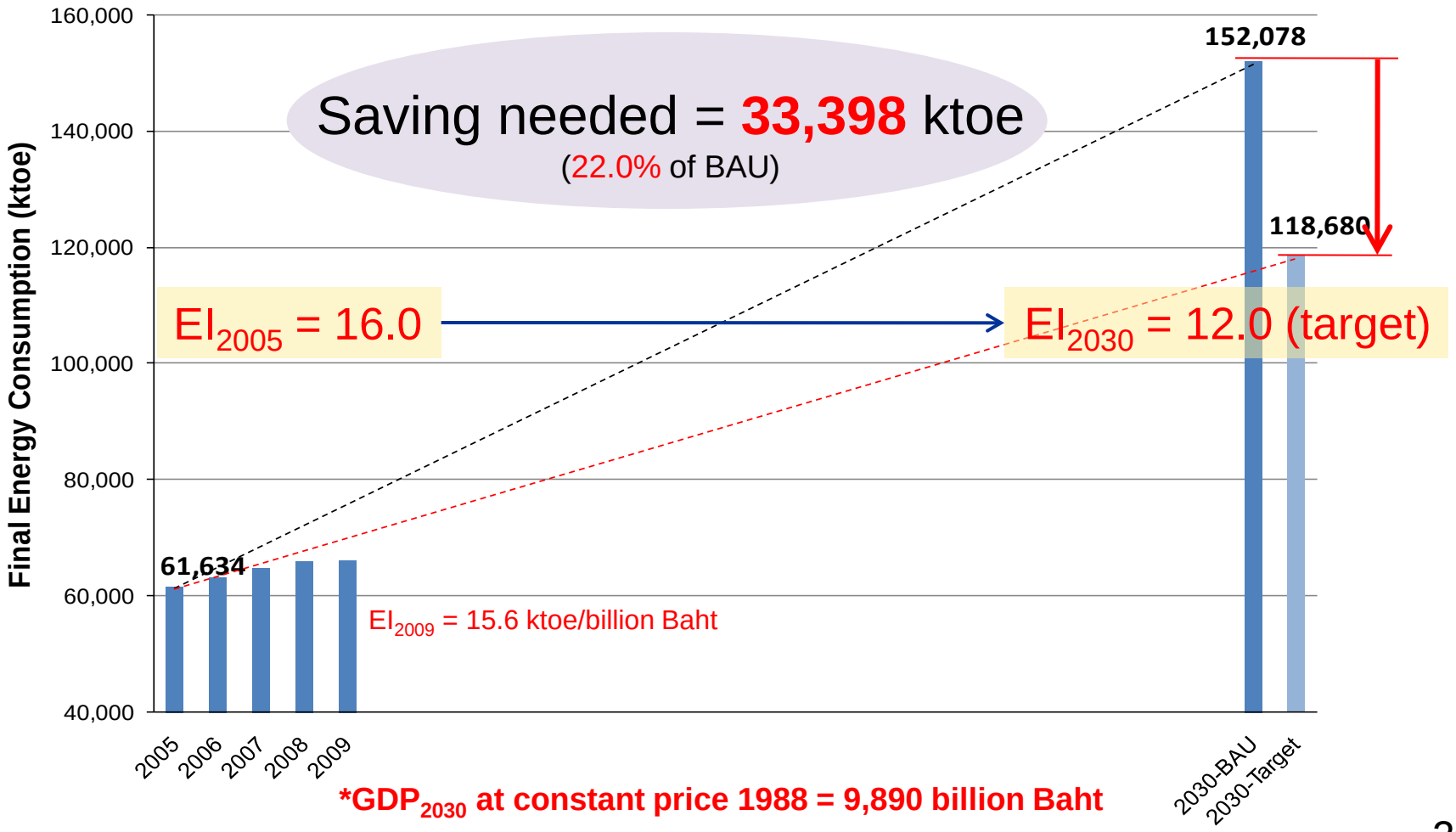
2000-2004

Phase 1

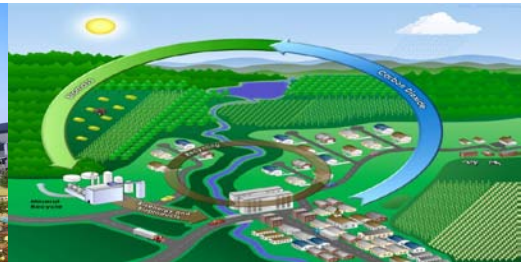
1995-1999

Target of 20-Year Energy Efficiency Plan

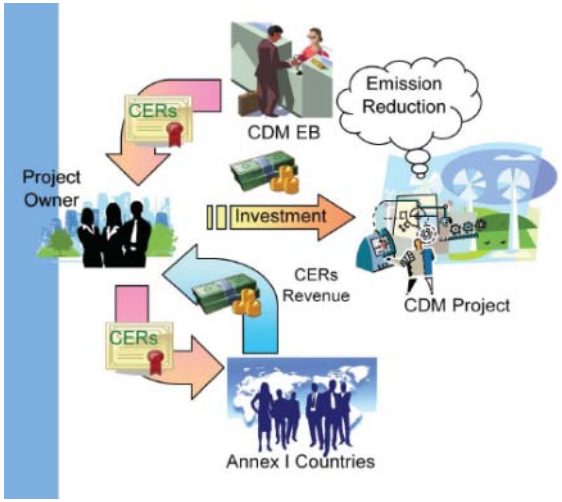
To reduce Energy Intensity by 25% within the year 2030, compared with Base Year 2005



Energy & Environmental Protection



Thailand's GHG Reduction Target in the Energy Sector



- **Voluntary Targets**

Renewable Energy: REDP 2008-2022 - 42 Mt CO_2e/Yr

Energy Efficiency - 30 Mt CO_2e/Yr

*** Excluding Transportation Sector**

CDM Projects in Thailand

Projects contributing to GHG emission reduction in Thailand

- **Clean Development Mechanism (CDM) Projects, which have already received Letter of Approval (LoA):**

	No. of Projects (as of 13 Oct 2010)
Power generation: biogas	47
biomass	15
waste heat	9
solar energy	2
hydropower	5
Heat generation:	biogas 7
biomass	2
Power & heat generation: biogas	26
biomass	1
Energy Efficiency improvement:	2
Production of bio- fertilization:	1
Nitrous oxide emission reduction:	1

Biogas	69.50%
Biomass	18.95%
Others	11.55%

Total: 118 projects, with expected CER = 7.38 $MtCO_2e$/year

- **38 projects already registered with CDM EB, with expected CER = 2.16 $MtCO_2e$/year**

Biogas	65.65%
Biomass	23.04%
Others	11.31%

Source: www.tgo.or.th

Other Measures to Support Clean Fuel for Environment

❖ Oil Vapor Recovery System

- Petrol stations, oil depots and oil trucks in Bangkok, Nontaburi, Pathumtani and Samutprakarn areas must install the vapor recovering units (VRU).
- Ministerial Regulation issued and effective since 26 January 2007.
- 23 April 2007: extension of enforcement to 7 major provinces, effective 23 May 2010 (postponed from 23 May 2009 to allow more lead time for small operators to comply with the requirements).

❖ Implementation of Euro-IV oil specifications

	Present Specification	New Specifications (Effective in 2012)
1. Gasoline/Gasohol		
• Lead	≤ 0.013 g/litre	0.005 g/litre
• Olefin	-	≤ 18% Vol
• Sulphur	≤ 500 ppm	≤ 50 ppm
• Benzene	≤ 3.5% Vol	≤ 1% Vol
2. Diesel		
• Sulphur	≤ 350 ppm	≤ 50 ppm
• Cetane No.	≥47	≥ 50

Consideration on Nuclear Power Development

Future Challenges:

- Energy security in terms of power generation
- Environmental impact from the Electricity Supply Industry
- Increasing price of commercial energy

Advantages:

- Technology proven, especially for Base Load plants
- No environmental impact, with technological advancement in nuclear waste management
- Low power generation cost & stable fuel price

Preparation by the Ministry of Energy

- Speed up public campaigns and create public understanding
- Human resources development
- Establish NPP standards and related laws to create confidence of the public

2007 ⇨ **Pre-project Preparatory Stage** by Ministry of Energy

2011 ⇨ **Critical Point ☞ Decision: GO Nuclear!! or not, based on public consultations**

2014 ⇨ **NPP Construction (6 years)**

2020 ⇨ **Supply to the grid**

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Energy Policy Direction in Thailand

Policy	Policy Direction
1. Energy Security	• Explore additional resources, domestic & overseas • PDP 2010 ➔ "Green PDP" emphasizing fuel diversification
2. Alternative Energy	• Dual Track implementation - National Level, e.g. biofuels, wind, solar, biogas - Local Level, e.g. community-based energy planning
3. Energy Efficiency	• Continuously implement measures in 3 aspects to achieve concrete results: - Legal measures - Management measures - Social measures
4. Energy Price Supervision	• Act pursuant to the government policy to alleviate people's cost of living
5. Environmental Protection	• Promote CDM projects and energy-related activities contributing to GHG emission reduction

Examples of Energy Projects contributing to Mitigation of Global Warming

Promotion of Biogas Technology







3 major feedstock for biogas generation:
- Animal manure & waste
- Wastewater from industrial factories
- Food waste from communities/business facilities

Achievements (Accumulated)	2009	2010 (8 mths)	Target in the 15-yr REDP 2011	% in 2010 vs. Target	Next Target (2022)
1. Power Generation (MW)	79.6	103.4	60	172%	120
2. Heat Utilization (ktoe/yr)	201	311	470	66%	600

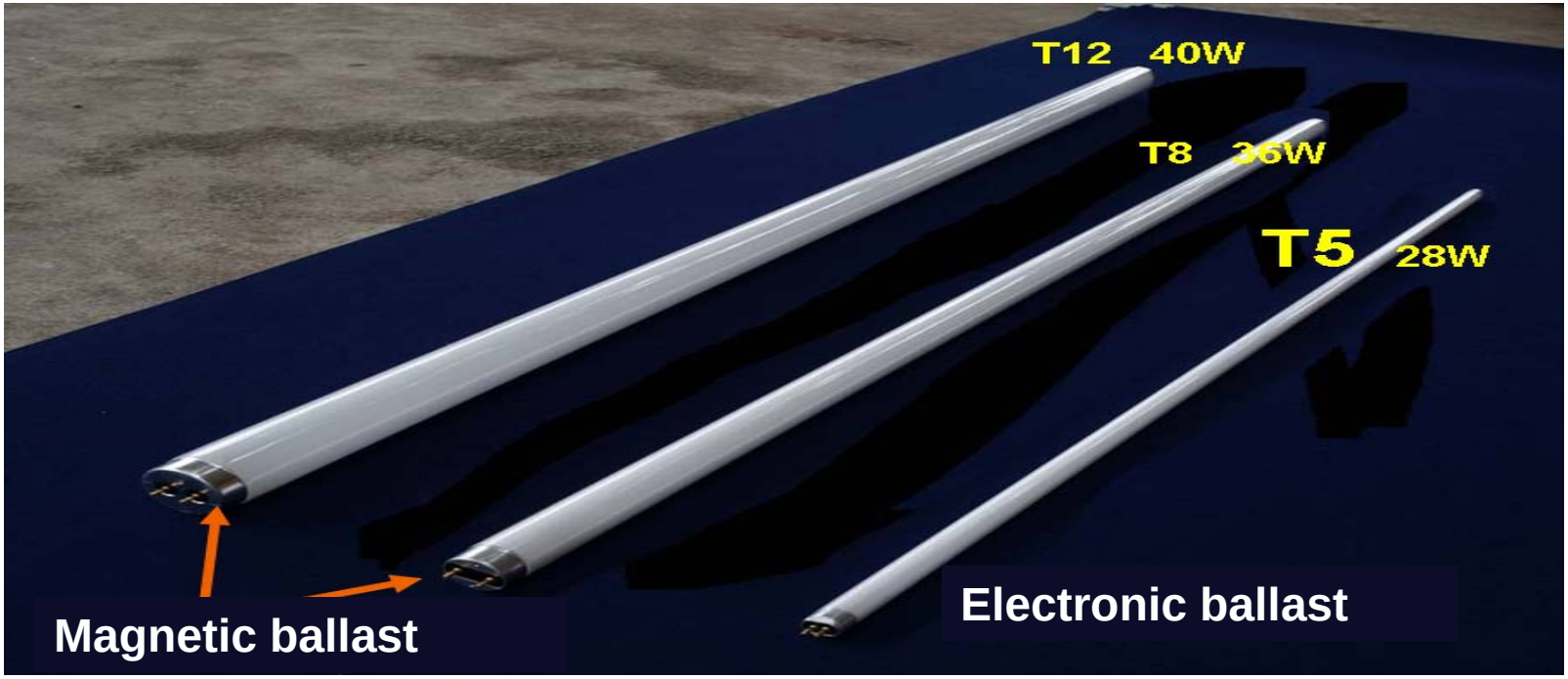



EE Improvement in SMEs

- Assistance in energy auditing and advice for SMEs using techniques such as value engineering.
- Information and training for engineers, technicians and energy managers of SMEs.
- Provision of grants for the replacement of equipment by 9 standard (energy-efficient) equipment.
- Provision of grants for SMEs for the replacement of existing production processes and technologies by proven high-efficiency ones.

Replace T8 with T5 Fluorescent Lamps (2008 – 2013)

- Implemented by Electricity Generating Authority of Thailand (EGAT), with 1.58 billion Baht funding from the ENCON Fund



Target: Pilot replacement of 18.5 million fluorescent lamps with T5, with expected electricity saving of 805.5 GWh/year and reduction of peak demand by 174.8 MW.

Demand Side Management by Bidding Mechanism (2008-2010)

- Provide financial support to encourage business operators to invest in higher energy efficiency machines/equipment.
- Subsidy is based on actual units of energy saving achieved in a year.
  (subsidy = annual energy saving x subsidy rate (as bid by each company))
- Max. subsidy rate for each energy type is shown in the table:

Energy Type	Maximum Subsidy Rate
Electricity	**1 Baht / kWh**
Heat from liquid and gas fuels e.g. fuel oil, LPG, natural gas, etc.	**75 Baht / MMBtu**
Heat from solid fuels e.g. coal, wood, rice husks, sawdust, bagasse and other agricultural waste	**15 Baht / MMBtu**

MMBTU = Million British Thermal Unit = 1,055 MJ

- **Planned 8 bidding rounds completed** (Dec09-Jun10). Through the bidding mechanism , companies requesting lower weighted subsidy rates will be subsidized first.
- **Outcome: 271 project participants**

	Heat Saving (Million MMBtu/yr)	Electricity Saving (GWh/yr)	Value of Saving (M Baht)	ENCON Fund Support (M Baht)
Achievement	3.88	373.96	1,842.50	551.65
Target	1.70	375.00	-	1,037.5
Compared with Target	228.42%	99.72%	-	53%

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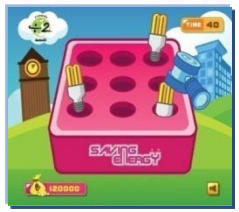
Public Awareness Campaigns

- Target Group: General Public
- Aim: To create energy conservation awareness and to change energy consumption behavior by introducing simple energy saving methods
- Implemented via such media as:
  - Activities for youths
  - TV spots
  - Booklets
  - PA campaigns

Energy Youth Camp

รวมพลัง
คิดก่อนใช้

Energy Activities with leading department stores



Energy Games

turn off lights during lunch break

Thank you
for your kind attention.

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