

Clean Energy Systems

2016
CES REPORT

CSSC KMUTT

Testing laboratory according to ISO/IEC 17025:2005

TLAS accredited testing laboratory

Accreditation No.: TESTING 0343

CES Solar Cells Testing Center (CSSC) King Mongkut's University of Technology Thonburi

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CES 2016 REPORT

Provided by CSSC

November 2016



1. Introduction – The Clean Energy Systems (CES) Group



In the 1990s a number of academic staff of King Mongkut's University of Technology Thonburi (KMUTT) working in the energy field formed an energy cluster focusing on renewable energy, namely, photovoltaic (as the main thrust), hydrogen and fuel cells technology, wind energy, solar thermal technology, and energy and engineering in agricultural systems. The group has become collectively known as the "Clean Energy Systems (CES)" Group. These academic staff are of various disciplines from the School of Energy, Environment and Materials (SEEM), the Faculty of Engineering and the Pilot Plants Development and Training Institute (PDTI).



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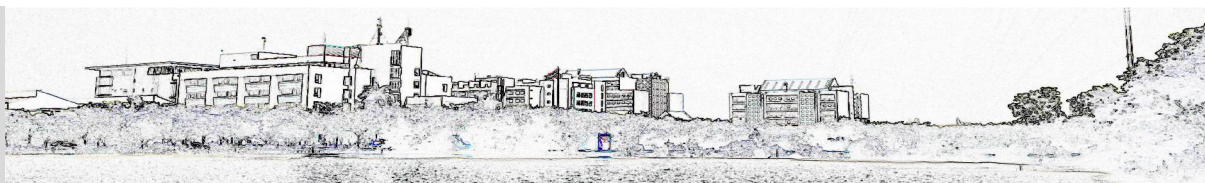
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The CES Group is one of many research groups in the University working in the "energy, environment and clean technology" area. Major ones are the Drying Group, the Combustion and Engine Research Laboratory (CERL), the Agro-industrial Waste Management and Utilization Group (recently elevated to a center of excellence called ECO Wastes under the National Center on Biotechnology and Genetic Engineering), Building Energy, and under the Joint Graduate School of Energy and Environment (JGSEE) the Energy Policy Group, the Green House Gases Study and the Atmospheric and Oceanic Circulations Study Group. In 2006, a new research and education thrust on "Earth Systems Science" is launched whereby clean and green energy will be closely linked through mitigation of greenhouse gas emissions.

The origin of the CES Group can be traced back nearly four decades earlier on graduate programs and research works in energy technology founded in 1977 after the oil crises in late the 1970s. This had come about through the vision and pioneering efforts of Professor Prida Wibulswas – a distinguished scientist who has been widely acclaimed for his contribution to Thailand in the energy field.

The School of Energy and Materials (SEM) was set up in the early 1980s by the University as a graduate school offering masters programs in energy technology. SEM, with addition of the environment emphasis had later been renamed SEEM, is the first multidisciplinary school in Thailand offering programs in energy.



Initial focus of the program was on heat and mass transfer, physics of energy conversion, electromechanical energy conversion, instrumentation and renewable energy. Later on, energy conservation and management in industry and buildings, energy policy and economics were added. Since its inception, SEEM has received strong technical supports from the other 2 faculties of the University, namely, the Faculty of Engineering and the Faculty of Science. With these three schools and faculties, energy education and research at KMUTT greatly expanded in the 1980s and 1990s.

Two other KMUTT multidisciplinary graduate schools and one research institute, namely, the School of Bioresources and Technology (spinning off from SEEM in mid 1990s), the JGSEE and the PDTI, have added a larger repertoire of energy research and human resources development to KMUTT. Now energy education and research at the University is closely entwined with the environment field and clean technologies. Nearly 200 academic staff have engaged in a large group collectively called “energy, environment and clean technologies”. These energy groups have few hundred master and doctoral students under research supervision. The University has become prominent in Thailand and the region in energy research and education. Core capabilities, evolving over three decades, of the University in this broad area cover the following:



- *Thermal technology*
- *Combustion (fuels, including biomass, furnaces, engines, emission)*
- *Drying (especially rice and cereal grains)*
- *Renewable and clean energy : photovoltaic systems, solar thermal systems, industrial biogas, wind electric power systems, hydrogen technologies, fuel cells (molten carbonate, PEMS)*
- *Engineering, energy and environment in agricultural systems (environment-control green houses and aquaculture, uses of renewable energy in rural areas)*
- *Energy conservation and management in industries (waste heat recovery, co-generation, DSM of electricity, micro gas-turbine)*
- *Building technology and energy in buildings (day lighting, building envelope, smart control)*
- *Built environment*
- *Wastes management and utilization, especially agro-industry wastes for biogas production)*
- *Life cycle analysis and externalities (focusing on paper and plastics production)*
- *Carbon cycle*
- *Ecology and biodiversity*
- *Energy and energy-related environment policies*
- *Energy Policy*

Photovoltaic systems :

Research in photovoltaic systems are most extensive and engage the largest number of academic staff and researchers, within the CES Group. Works undertaken encompass a wide range of photovoltaic technology spectrum, mostly system levels. Areas cover are static and dynamic characterization of solar cells modules, BOS development, PV standalone systems for pumping and battery charging, hybrid systems for remote area power supply (REPS) and PV-grid interactive systems, especially islanding protection. Design, installation, and modeling of stand-alone, REPS and grid-connected systems are covered. Recent works include development of white and color LED-based solar simulators, and intensive development of REPS (PV, wind, generators with battery banks) for islands and remote locations.



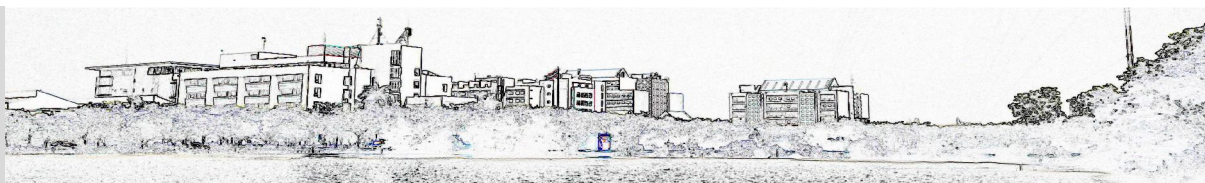
The country has witnessed rapid increase of solar rooftop units and PV power plants since the beginning of 2000s, with the cumulative wattage installation of over 1,300 MW in 2014. National PV test facilities have been set up with financial supports from the Department of Alternative Energy Development and Efficiency (DEDE), the Ministry of Energy, described in the next section. Coverage of PV activities have greatly been expanded to Thai industrial standards development for PV modules and balance of systems (BOS) , advices to financial institutions on solar PV power plants, and PV power plants on-site testing.

National PV test facilities and solar energy test rigs

Outdoor test rigs for solar thermal collectors and PV modules, and a 4 m² solar simulator, using quartz-halide lamps, for testing of solar thermal collectors and solar dryers were firstly constructed over two decades ago. This was the first and only solar test facility in the region. In the early 2000s, the Group, in conjunction with researchers from other universities and agencies and PV module manufacturers, developed national guidelines for PV modules and BOS testing for the Energy Policy and Planning Office (EPPO). BOS, battery, grid-interactive inverters and power conditioning units were tested. Test rigs on PV water pumping and PV grid interactive systems using various types of modules and inverters were operated for long-term monitoring.

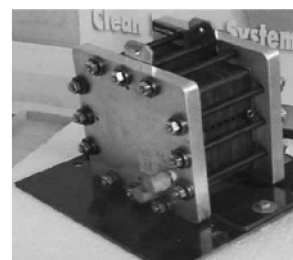


With supports of DEDE, the Ministry of Energy and Energy Conservation Fund, test facilities for PV modules and BOS have been set up for testing based on Standards of the Thai Industrial Standards Institute (TISI) and the IEC. The facilities are named the CES Solar Cells Testing Center - CSSC. The facilities are the only one of its kind in ASEAN. Major facilities are a Xe-lamp pulse solar simulator, a steady state solar simulator, a thermal cycling and humidity freeze test chamber, a damp heat test chamber, rigs for battery testing and inverter (up to 30 kW) testing. Most of PV modules installed in Thailand in solar PV power plants and solar rooftop units in 2000s have been tested at the CSSC. Linkages with testing labs in Asia, Europe and the US have been established.



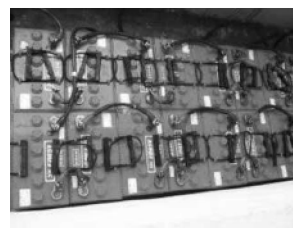
Electrochemical energy storage, hydrogen technologies and fuel cells:

Characterization of various types of batteries and studies on molten carbonate and proton exchange membrane fuel cells and hydrogen reform are undertaken. Both imported systems and locally fabricated fuel cells are tested. The major focus is on using hydrogen and natural gas as fuels.



Biomass and Clean Technology:

Initial focus was on characterization and promotion of efficient biomass stoves. Recently, work has included water and waste recycling in rural areas.



Energy Use Evaluation and Monitoring:

Evaluation of effectiveness and impact of clean energy technologies, in particular, renewable energy, is the thrust. The research takes a holistic approach on addressing technical, economic, social and environmental dimensions, including sustainability. Workshops are run on operation and maintenance of renewable energy systems for public workers promoting renewable energy and also for villagers.



Energy Instrumentation and Software:

Focus is on the design of instruments used by the Group, especially its field operation in rural and remote areas. Examples are solar integrators, DC watt-hour meter, data loggers and telemetering units for wind power measurement. Software for renewable energy system design is also developed.

Wind Turbines and Wind Maps

KMUTT was pioneering in developing low speed horizontal and vertical axis wind turbines in 1980s-1990s for water pumping and electricity generation. As interests in wind energy was low in 1990 and the first half of 2000s, little research work was done in the intervening period. With support from DEDE and the National Research Council of Thailand (NRCT), and encouragement of Professor Prida Wibulswas, wind speed measurement towers up to 120 meter height are installed throughout Thailand and wind potential estimated. Work of KMUTT, support by DEDE and NRCT, on wind potential has contributed to interest and investments since early 2000s on wind turbines of hundreds of kilowatts and few megawatts. Recent research is on relationship between stochastic nature of wind energy and electrical power quality.





Energy and Engineering in Agricultural Systems:

This is the most recent field covered by the CES based on support from the Royal Project Foundation and the KMUTT's work with rural communities for over two decades. The aim is to introduce efficient uses of energy, renewable energy and environmental controls for crop production and aquaculture to agricultural research scientists and extension worker for subsequent promotion to farmers.

In addition, post-harvest and agro-processing equipment for field researchers and at village and SME levels are developed. Examples of projects are design and modeling of greenhouses. Modular and local production of greenhouse parts are emphasized. REPS based on photovoltaic, wind and small water turbines, rapid cooling of fruit and vegetables, and energy conservation of refrigeration and cold storage facilities of the Royal Project Foundation stations introduced in 2000s.

Sources of Research Funds.

Apart from the annual budget of KMUTT grants of substantial sizes for energy research in the 1980s, were from the Electricity Generating Authority of Thailand (EGAT) through their pilot study on electricity production from wind electric power systems (WEPS) and solar thermal power systems (STEPS) using parabolic troughs, culminating in construction of pilot WEPS and STEPs, low speed AC and DC electricity generators, spectrally selective surfaces (black chrome) for STEPS absorbing surfaces at elevating temperatures of over 200C, and eutectic salt energy storages . Later on the bilateral US–Thai Renewable Energy Project, focusing on rural uses, through the National Energy Administration (NEA) of Thailand in early the 1990s. KMUTT undertook works on solar drying and water distillation, solar drying, absorption refrigeration, calorimetric study on charcoal stoves, and wind potential analysis.



In the 1980's and 1990's grants were obtained from the ASEAN Sub Committee on Non-Conventional Energy Research of the ASEAN Committee on Science and Technology cooperative projects with Australia, the EU, Canada, the US and New Zealand. This was made possible by the National Research Council of Thailand and the Ministry of Science and Technology, under the leadership of Professor Sanga Sabbhasri, a prominent scholar, and later on a permanent secretary and minister of science. In 1990s large funding from Thai agencies are from the 3 national centers under the National Science and Technology Development Agency-NSTDA, Department of Energy Development and Conservation (later on becoming DEDE), the Thailand Research Fund (TRF) and the National Energy Policy Office-NEPO), later on the Energy Policy and Planning Office (EPPO), the Royal Project Foundation. EPPO and DEDE are now the major funding source for energy research and development in the country. With national PV test facilities, testing fees are another revenue source of the CES.

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The CES Research Group





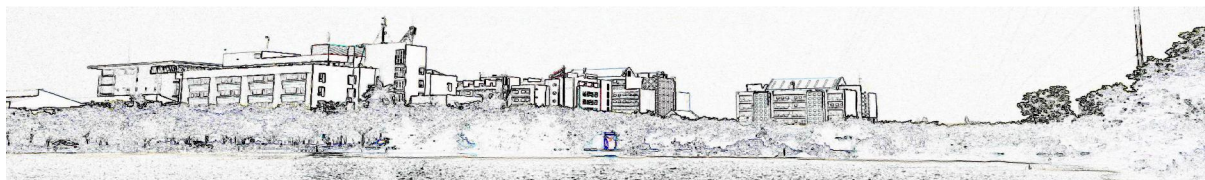
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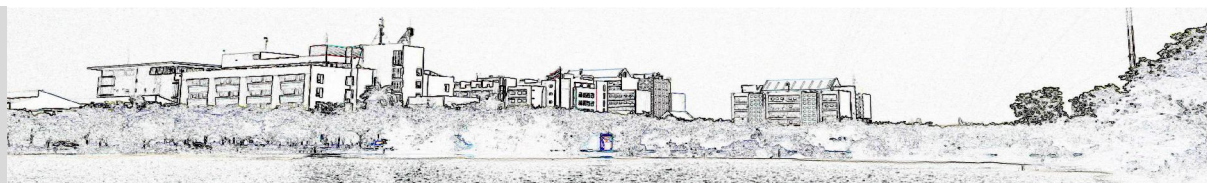
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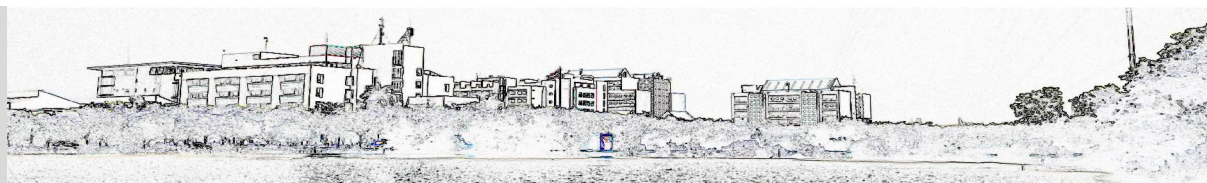
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CESA	Clean Energy Systems Applications
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Dept. of ChE	Department of Chemical Engineering
Dept. of EE	Department of Electrical Engineering
Dept. of ETE	Department of Electrical Technology Education
L I	Learning Institute
RMUTL	Rajamangala University of Technology Lanna
RMUTI	Rajamangala University of Technology Isan
RSC	Royal Project Foundation and King's Recommended Supporting Center
SEEM	School of Energy, Environment and Materials

3

Publications





1977

1. S. Hanchalay and K. Kirtikara, "Automatic sun tracking unit" (in Thai), Research report submitted to the National Research Council of Thailand (1977).

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3. K. Kirtikara, "Introduction to solar cells" (in Thai), Proceedings of the First Symposium on Solar Energy and Applications, Technological Promotion Association (Thai-Japan) and KMITT, 12-16 December 1978, Bangkok.
4. K. Kirtikara, "Solar radiation and measurement" (in Thai), Proceedings of the First Symposium on Solar Energy and Applications, Technological Promotion Association (Thai-Japan) and KMITT, 12-16 December 1978, Bangkok.

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5. P. Wibulswas and K. Kirtikara, "Research and development of solar energy in Thailand," J. Sci. Soc. Thailand, Volume 5 (1979), pp. 110-116.
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11. P. Wibulswas and K. Kirtikara, "Status of renewable energy," Proceedings of the ESCAP Symposium on Solar Science and Technology, 24 November-4 December 1980, Bangkok, Thailand.
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18. K. Kirtikara, "Long-term energy prospects of Thailand" (in Thai), Proceedings of the Seminar on Prospects of Energy Conservation and Non-Conventional Energy Development in Thailand, Technological Promotion Association -TPA (Thai-Japan), 17 September 1981, Bangkok, Thailand.
19. K. Kirtikara, P. Namprakai and T. Siriprayuk, "Interrelationship between total radiation, diffuse radiation and direct radiation" (in Thai), Proceedings of the Third Symposium on Non-Conventional Energy and Applications, Technological Promotion Association-TPA (Thai-Japan) and KMITT, 3-5 November 1981, Bangkok, Thailand.
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- 321. Ballang Muenpinij, Sittichai Mungkornrit and Anawach Sangswang, "Over/Under Voltage Protection Testing for Grid-Connected Inverters in Thailand", The 26th International Photovoltaic Science and Engineering Conference (PVSEC-26), Sands Expo and Convention Centre, October 24 - 28, 2016, Singapore.

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Student Theses

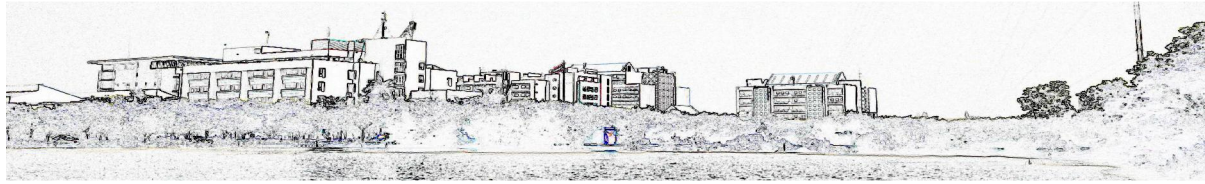




List of Student Theses

Name	Title of Thesis /Special Study*	Supervisor/Examiner*	Program
<u>1978</u> Mr. Tanongkiat	Kiatsiriroat	Dr. Krissanapong Kirtikara*	M.Eng., ME, KMUTT
<u>1979</u> Mr. Sunan	Saranganit	Dr. Krissanapong Kirtikara*	M.Eng., ME, KMUTT
Mr. Suwat	Thaina	Dr. Krissanapong Kirtikara*	M.Eng., ME, KMUTT
<u>1980</u> Mr. Pichai	Namprakai	Dr. Krissanapong Kirtikara*	M.Sc., ET, KMUTT
Mr. Polsup	Boonvanit	Dr. Krissanapong Kirtikara*	M.Eng., ET, KMUTT
Mr. Roonsrang	Pirecksataparn	Dr. Krissanapong Kirtikara*	M.Eng., ME, KMUTT
<u>1981</u> Ms Jongjit	Hirunlabh	Dr. Krissanapong Kirtikara*	M.Sc., ET, KMUTT
Mr. Narin	Supiratana	Dr. Krissanapong Kirtikara*	M.Eng., ME, KMUTT
Ms Nonglak	Jitnomrut	Dr. Krissanapong Kirtikara*	M.Eng., ET, KMUTT
Mr. Somjet	Thongkumwong	Dr. Krissanapong Kirtikara*	M.Eng., ET, KMUTT
Ms Supanee	Naewchampa	Dr. Krissanapong Kirtikara*	M.Sc., ET, KMUTT
Mr. Sukon	Ajlithi	Dr. Krissanapong Kirtikara	M.Eng., ET, KMUTT

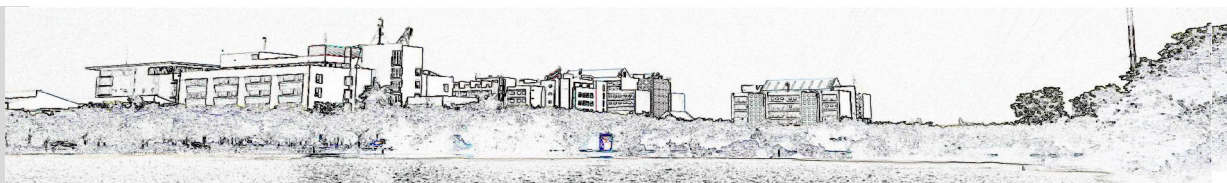
Note: ET = Energy Technology, ME = Mechanical Engineering



List of Student Theses (Cont.)

Name	Title of Thesis /Special Study*		Supervisor/Examiner*	Program
1981 (cont.)				
Mr. Anusak	Intiyanaravut	Cabinet solar dryer with rock-bed storage.	Dr. Krissanapong Kirtikara *	M.Sc., ET, KMUTT
Mrs. Jintana	Yamchareonwong	Parabolic trough collector with anodized aluminum reflective surface.	Dr. Krissanapong Kirtikara *	M.Sc., ET, KMUTT
Mr. Niyom	Apipan	Solar vertical cylindrical crops dryer performance test.	Dr. Krissanapong Kirtikara *	M.Eng., ET, KMUTT
1982				
Mr. Pravit	Teetakeaw	Performances of flat-plate collectors with double glazing.	Dr. Krissanapong Kirtikara *	M.Sc., ET, KMUTT
Ms Supapan	Visitserngtrakul	Determination of optimum condition for electroplating of blackchrome selective surface.	Dr. Krissanapong Kirtikara	M.Sc., ET, KMUTT
Mr. Vinai	Yanisrangkul	Reversed flat plate collector with two anodized absorbing sur-faces.	Dr. Krissanapong Kirtikara *	M.Sc., ET, KMUTT
1983				
Mr. Sirichai	Thepa	Measurement of sky temperature and the feasibility of refrigerationing and air condition by radiation cooling.	Dr. Krissanapong Kirtikara, Mr. Tanongkiat Kiatsiriroat	M.Sc., ET, KMUTT
Mr. Sungseng	Liengjindathaworn	Determination of total radiation on inclined planes and cylindrical surface and testing of isotropic model.	Dr. Krissanapong Kirtikara	M.Sc., ET, KMUTT
Mr. Thongbai	Attaseth	Vertical surface solar still.	Prof.Dr. Prida Wibulswas, Dr. Krissanapong Kirtikara	M.Eng., ET, KMUTT
Mr. Vinai	Yanisrangkul	Reversed flat plate collector with two anodized absorbing sur-faces.	Dr. Krissanapong Kirtikara *	M.Eng., ET, KMUTT
Ms Visa	Tia	The development of techniques for solar radiation analysis and a solar radiation map for Thailand.	Dr. Krissanapong Kirtikara *	M.Sc, Statistics, CU

Note: ET = Energy Technology



List of Student Theses (Cont.)

Name	Title of Thesis /Special Study*		Supervisor/Examiner*	Program
1984				
Mr. Apichit	Therdyothin	Plant growth analysis in relation to environmental variables.	Assoc.Prof.Dr. Morakot Tanticharoen, Dr. Krissanapong Kirtikara	M.Eng., ET, KMUTT
Mr. Chan	Saeneenun	Performance test of tracking parabolic troughs.	Dr. Krissanapong Kirtikara*	M.Eng., ME, KMUTT
Mr. Kriengsak	Kunchai	Wind electric power system(dyro-rotor wind turbine : phase II	Dr. Krissanapong Kirtikara, Assist.Prof. Banterng Suwantragul, Assist.Prof. Udomsak Yungyeun	M.Eng., ET, KMUTT
Ms Nandh	Thavarungkul	Preparation and evaluation of black chrome selective surfaces on low carbon steel and aluminium substrate.	Dr. Krissanapong Kirtikara	M.Sc., ET, KMUTT
Mr. Panya	Yord-ovart	Performance of a direct coupling 720 Wp photovoltaic water pumping system at Ban Tha Yiem Sakon Nakorn.	Dr. Krissanapong Kirtikara, Dr. Oran Ratanaprakarn, Assist.Prof. Banterng Suwantragul	M.Eng., ET, KMUTT
Ms Sumalee	Wattanaprakornkul	Biogas production from solid pineapple cannery waste at elevated temperature.	Dr. Morakot Tanticharoen, Dr. Krissanapong Kirtikara	M.Sc., ET, KMUTT
Mr. Thanee	Utitham	Photosynthesis and carbondioxide fixation in relation to environmental variables.	Dr. Krissanapong Kirtikara*	M.Eng., ET, KMUTT
1985				
Mr. Jinda	Keawkew	Study on spectral characteristics and distribution of diffused radiation at Bangkok.	Dr. Krissanapong Kirtikara	M.Sc., ET, KMUTT
Mr. Prasertsilp	Adtharmest	Electrical energy audit in a auto-part manufacturing plant.	Dr. Krissanapong Kirtikara*	Grad. Diploma, ET, KMUTT
Mr. Sountron	Veranoraphanich	Prism concentrators.	Dr. Krissanapong Kirtikara*	M.Sc., ET, KMUTT

Note: ET = Energy Technology, ME = Mechanical Engineering

List of Student Theses (Cont.)

Name	Title of Thesis /Special Study*		Supervisor/Examiner*	Program
1985 (cont.) Mr. Yongyuth	Chartchaowalit	Energy audit and energy conservation in a coating industrial plant and a commercial building.	Dr. Krissanapong Kirtikara*	M.Eng., ET, KMUTT
1986 Mr. Montri	Pojanardlawarn	Effects of solar radiation flux, temperature and solar cell orientation on solar cell performance in Bangkok.	Dr. Krissanapong Kirtikara, Dr. Apichit Terdyothin	M.Sc., ET, KMUTT
Ms Patcharee	Pitaksinpanich	Effect of substrate surface textures on optical properties and microstructure of black chrome selective surface.	Dr. Krissanapong Kirtikara*	M.Sc., Chem, KMUTT
Mr. Teradit	Doungmusig	Vertical surface solar still with acrylic plastic covers.	Prof. Prida Wibulsawas, Assist. Prof. Sirichai Thepa, Dr. Krissanapong Kirtikara*	M.Sc., ET, KMUTT
1987 Mr. Choochat	Nitipanyawong	Preparation and evaluation of AMCRO selective surfaces on copper substrate.	Dr. Krissanapong Kirtikara*	M.Sc., Chem, KMUTT
Mr. Prachan	Phetwaikun	Stress analysis of kinked blades of vertical axis wind turbine.	Dr. Krissanapong Kirtikara, Assist.Prof. Banterng Suwantragul, Assist.Prof. Somyot Chankasem	M.Eng., ET, KMUTT
Mr. Werasak	Surareungchai	Development of microbial sensor for the determination of ethanol.	Dr. Krissanapong Kirtikara*	M.Sc., ET, KMUTT
Mr. Yuthana	Tirawanichakul	A technical and economic study of paddy-drying-storage solar hut.	Dr. Krissanapong Kirtikara*	M.Sc., ET, KMUTT
1988 Mr. Tawatchai	Suwannakam	Performance of a direct coupling photovoltaic water pumping system from deep wall	Dr. Krissanapong Kirtikara, Dr. Apichit Terdyothin, Ms. Tassanee Orachundecha	M.Sc, ET, KMUTT

Note: ET = Energy Technology, Chem = Chemistry





List of Student Theses (Cont.)

Name		Title of Thesis /Special Study*	Supervisor/Examiner*	Program
1988 (cont.)				
Mr. Wirachai	Soontornrangson	Study of spectral characteristics and distribution of flux from a solar simulator at King Mongkut's Institute of Technology Thonburi.	Dr. Krissanapong Kirtikara, Mr. Sirichai Thepa	M.Sc., ET, KMUTT
1989				
Mr. Apirak	Planmongkol	Energy input for biomass production in Thailand case study for corn (Zea mays).	Dr. Krissanapong Kirtikara*	M.Sc., BT, KMUTT
Mr. Pornpimol	Srikamta	Improvement of stability and sensitivity of ethanol microbial electrode.	Dr. Krissanapong Kirtikara*	M.Sc., BT, KMUTT
1990				
Mr. Somchai	Stakulcharoen	Performance of a direct coupling photovoltaic water pumping system from a reservoir for agricultural uses : case study on an experimental plantation – Royal Food Processing Factory- Lahanasai.	Dr. Krissanapong Kirtikara, Mr. Sirichai Thepa, Mr. Tawatchai Suwannakum	M.Eng., ET, KMUTT
Mr. Wootipong	Sritongkum	The measurement of ethanol concentration in alcoholic fermentation using microbial sensor.	Dr. Krissanapong Kirtikara, Dr. Morakot Tanticharoen, Mr. Werasak Surareungchai	M.Sc., BT, KMUTT
1991				
Mr. Panya	Yord-ovart	Performance of PV arrays in PV-hydro hybrid system at Klong Chong-Klam Prachinburi.*	Dr. Krissanapong Kirtikara	D.Eng., ET, KMUTT
Mr. Pichai	Namprakai	Utilizability functions for solar flat plate collector on a horizontal plane at Bangkok.*	Dr.Tanongkiat Kiatsiriroat, Dr. Krissanapong Kirtikara	D.Sc., ET, KMUTT
Mr. Sirichai	Thepa	Study on calibration of a reference solar cell.*	Dr. Krissanapong Kirtikara	D.Sc., ET, KMUTT
1994				
Mr. Dhirayut	Chenvidhya	Optimal control for solar tracking system.	Dr. Krissanapong Kirtikara*	M.Eng., EE, KMUTT

Note: ET = Energy Technology, BT = Building Technology

List of Student Theses (Cont.)

Name	Title of Thesis /Special Study*		Supervisor/Examiner*	Program
1994 (cont.)				
Mr. Jerasorn	Santisirisomboon	Assessment of solar radiation for Thailand.	Dr. Krissanapong Kritikara*	M.Sc., ET, KMUTT
Mr. Pharos	Vicharnrathakan	Preparation of heat mirrors by spray pyrolysis.	Dr. Krissanapong Kritikara*	M.Eng., ChE, KMUTT
1995				
Mr. Buntoon	Wiengmoon	Photovoltaic module outdoor testing in accordance with the Australian standard AS 2915-1987.	Dr. Krissanapong Kirtikara, Mr. Sirichai Thepa, Mr. Tawatchai Suwannakum	M.Sc., ET, KMUTT
Mr. Cherdchai	Uttakit	Spring onion drying by using waste heat from geothermal power plant.	Dr. Krissanapong Kritikara*	M.Eng., ET, KMUTT
Mr. Roongrojana	Songprakorp	Comparative study of direct coupled and battery connected photovoltaic water pumping systems.	Dr. Krissanapong Kirtikara, Mr. Tawatchai Suwannakum	M.Sc., ET, KMUTT
Mr. Somchai	Suvarawan	Techno-economic analysis of direct-coupling photovoltaic water pumping systems for irrigation.	Dr. Krissanapong Kirtikara, Assist.Prof. Sirichai Thepa, Mr. Tawatchai Suwannakum	M.Sc., ET, KMUTT
1996				
Mr. Payungsak	Boonthaworn	Measurement of electrical properties of SnO ₂ doped In ₂ O ₃ heat mirrors by Van der Pauw technique.	Dr. Krissanapong Kirtikara, Dr. Supattanapong Dumrongrattana	M.Eng., MT, KMUTT
Mr. Pichai	Namprakai	Study of heat and mass transfer in ethanol basin solar still.	Dr. Krissanapong Kirtikara*	D.Sc., ET, KMUTT
Mr. Rangsit	Sarachitti	Estimation of solar radiation from satellite data in Thailand.	Dr. Krissanapong Kritikara*	M.Sc., ET, KMUTT

Note: ET = Energy Technology, ChE = Chemical Engineering, MT = Materials Technology

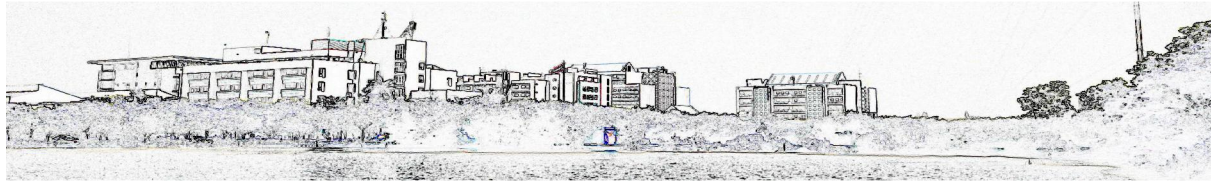




List of Student Theses (Cont.)

Name	Title of Thesis /Special Study*		Supervisor/Examiner*	Program
1996 (cont.) Mr. Sarayuth	Lorsrichandr	Development of heat mirrors preparation for tin oxide thin films by sol gel process.	Dr.Jongjit Hirunlabh, Dr. Krissanapong Kirtikara	M.Eng., ET, KMUTT
Mr. Smas	Suthateeranut	Development of a spray pyrolysis coating process for tin oxide film heat mirrors.	Dr.Jongjit Hirunlabh, Dr. Krissanapong Kirtikara	M.Eng., ET, KMUTT
1997 Mr. Sirichai	Thepa	Feasibility of evaporative cooling applications for a lentinus edodes (Berk.) sing house.	Dr. Krissanapong Kirtikara, Dr.Jongjit Hirunlabh	D.Sc., ET, KMUTT
Mr. Usa	Boonbumrung	Performance of a PV-generator hybrid system at Chachoengsai wild life research station.	Dr. Krissanapong Kirtikara, Assist.Prof. Sirichai Thepa, Mr.Tawatchai Suwannakum	M.Eng., ET, KMUTT
1999 Mr. Banpot	Prapasiri	Energy saving of air conditioning system using high precision thermo stats and house keeping	Assist.Prof. Sirichai Thepa	M.Sc., EMT, KMUTT
Mr. Poolsak	Puwavichrenchai	Evaluation of a photovoltaic to AC conversion unit for grid connection.	Dr. Krissanapong Kirtikara, Dr. Veerapol Monyakul, Mr.Tawatchai Suwannakum	M.Eng., ET, KMUTT
Mr. Saharat	Ingkawanich	Design of a simple PV system to enhance the role of roof solar collector.	Dr. Krissanapong Kirtikara*	M.Eng., ET, KMUTT
Mr. Wanchart	Supheng	Designing of a multi-purpose PV-window.	Dr. Krissanapong Kirtikara*	M.Eng., ET, KMUTT

Note: ET = Energy Technology



List of Student Theses (Cont.)

Name	Title of Thesis /Special Study*		Supervisor/Examiner*	Program
2000				
Mr. Adisak	Panyasim	The study of concrete solar collector performance.	Assist.Prof. Sirichai Thepa	M.Eng., ET, KMUTT
Mr. Adisak	Wangnub	Characterization of car battery suitable for PV applications.	Assist.Prof. Sirichai Thepa Mr. Roongrojana Songprakorp Dr.Krissanapong Kirtikara*	M.Sc., ET, KMUTT
Mr. Jirasak	Prechaveeraku	Study of evaporative cooling efficiency resulting from change in water temperature.	Assist.Prof. Sirichai Thepa	M.Eng., EMT, KMUTT
Mr. Narongsak	Songkhapitak	Study in evaporative cooling media for agricultural applications.	Assist.Prof. Sirichai Thepa, Dr.Krissanapong Kirtikara *	M.Eng., TT, KMUTT
Mr. Panya	Yodovard	Thermoelectric power generation.	Dr. Krissanapong Kirtikara*	D.Eng., ET, KMUTT
Mr. Prakorn	Chaivatameseth	Feasibility study of used aluminum can recycling in Thailand.	Assist.Prof. Sirichai Thepa	M.Sc., EMT, KMUTT
Mr. Somporn	Tiacharoen	Energy flow control for solar car.	Dr. Kosin Chamnongthai, Dr. Krissanapong Kirtikara	M.Eng., EE, KMUTT
Ms Sugunya	Pengma	Technology assessment for the application of PV/diesel hybrid system at Huay Kha Khang wildlife sanctuary	Dr. Veerapol Monyakol*	M.Sc, RD, MU
Mr. Teerasak	Somsak	Techno-economic evaluation and social impacts assessment of photovoltaic battery charging stations.	Dr. Krissanapong Kirtikara, Mr. Tawatchai Suwannakum	M.Eng., ET, KMUTT
Mr. Theerapat	Klaimukh	The technology assessment of PV/wind/diesel hybrid system: A case study at Tarutao marine national park.	Dr. Veerapol Monyakol*	M.Sc, RD, MU
Mr. Veerachai	Lertsathapornsuk	Feasibility study of PV-thermoelectric vaccine refrigerator.	Assist.Prof. Sirichai Thepa	M.Eng., ET, KMUTT
Mr. Withaya	Puangsombut	Cooling system using underwater pipe for transparent plastics greenhouse.	Dr. Krissanapong Kirtikara*	M.Eng., TT, KMUTT

Note: ET = Energy Technology, EMT = Energy Management Technology, EE = Electrical Engineering, TT = Thermal Technology



List of Student Theses (Cont.)

Name	Title of Thesis /Special Study*		Supervisor/Examiner*	Program
2001				
Mr. Arun	Intasara	PV-wind-diesel generator hybrid system for power generation at the Tarutao National Park.	Dr. Krissanapong Kirtikara, Mr. Tawatchai Suwannakum, Mr. Roongrojana Songprakorp	M.Eng., EMT, KMUTT
Mr. Bantid	Noochniyom	Mathematical model of soil solarization on soil-microorganism.	Assist.Prof. Sirichai Thepa	M.Sc., ET, KMUTT
Mr. Chamnan	Pangiag	Cooling system using under water pipe for transparent plastics greenhouse.	Assist.Prof. Sirichai Thepa	M.Sc., MT, KMUTT
Mr. Charnwit	Udomsakdikul	Development of a solar incubator	Assist.Prof. Sirichai Thepa	M.Eng., ET, KMUTT
Mr. Sungseeng	Liengjindathaworn	Study of a solar water pumping with bubble pump technique.	Dr. Krissanapong Kirtikara, Prof. Tanongkiat Kiatsiriroat, Dr. Pichai Namprakai	D.Sc., ET, KMUTT
Mr. Thammasak	Suwanthep	A comparative study on cooled water generating system through heat loss to a sky.	Assist.Prof. Sirichai Thepa	M.Eng., ET, KMUTT
Mr. Veerawat	Peerawanitkul	Development in mathematical model of temperature and humidity change in solar incubator.	Assist.Prof. Sirichai Thepa	M.Eng., ET, KMUTT
Mr. Wanchai	Chimchavee	Controlling of thermoelectric modules: application for air conditioner and thermal apparatus.	Dr. Krissanapong Kirtikara*	M.Eng., ET, KMUTT
Mr. Wanlop	Sumranbumrung	The control of temperature and humidity in plastic greenhouse.	Assist.Prof. Sirichai Thepa	M.Eng., ET, KMUTT
Mr. Winai	Naknam	Technical and economic evaluation of a battery energy storage (BES) system in Thailand.	Dr. Veerapol Monyakol, Dr. Krissanapong Kirtikara*	M.Eng., ET, KMUTT
Mr. Witsanuphan	Khrutmuang	A Comparative study of heat flux reduction through a poultry farm.	Assist.Prof. Sirichai Thepa, Mr. Roongrojana Songprakorp	M.Sc., TT, KMUTT

Note: ET = Energy Technology, EMT = Energy Management Technology, MT = Materials Technology, TT = Thermal Technology

List of Student Theses (Cont.)

Name	Title of Thesis /Special Study*		Supervisor/Examiner*	Program
2002				
Mr. Arkhom	Suvannakita	Water management and the dynamic response of proton exchange membrane fuel cell stack.	Dr. Apichai Therdtianwong, Dr. Krissanapong Kirtikara	M.Eng., ET, KMUTT
Ms Juthamas	Klinchune	Efficiency improvement of CPC solar photovoltaic-thermal system.	Assist.Prof. Sirichai Thepa	M.Sc., ET, KMUTT
Mr. Nat	Kasayapanand	Computation of electrohydrodynamic motions of fluid flow through tube banks.	Dr. Krissanapong Kirtikara*	Ph.D., TT, KMUTT
Mr. Suphasak	Kitisartkajon	Developing a mathematical model foran evaporative cooling system utilizing desiccant dehumidifier.	Assist.Prof. Sirichai Thepa	M.Eng., ET, KMUTT
Mr. Suttinun	Tonpho	Development of a direct evaporative cooling model.	Assist.Prof. Sirichai Thepa	M.Eng.,EMT, KMUTT
Ms Uraivan	Poolsin	Energy conservation in two non-designated buidings.	Assist.Prof. Sirichai Thepa	M.Sc., EMT, KMUTT
Mr. Dhirayut	Chenvidhya	PV grid-connected systems for residential distribution system: dynamic impedance characterization of solar cells and PV modules	Dr. Krissanapong Kirtikara, Mr. Chaya Jivacate	D.Eng., ET, KMUTT
2003				
Mr. Anusorn	Rattanathanaopat	Improving in efficiency of evaporative cooling in poultry house.	Assist.Prof. Sirichai Thepa	M.Eng, TT, KMUTT
Mr. Charnwit	Sombutthaveekul	Application of channel configurations of hydroponics system inside a modified environment plastic house.	Assist.Prof. Sirichai Thepa	M.Eng., ET, KMUTT
Mr. Nutthapon	Wongyao	Study of the effect of clouds on photovoltaic grid connected systems.	Dr. Krissanapong Kirtikara Mr.Chaya Jivacate	M.Eng., ET, KMUTT
Mr. Prayut	Neamtang	Reduction of heat load through poultry house roof.	Assist.Prof. Sirichai Thepa	M.Eng., ET, KMUTT
Ms Sansanee	Sansiribhan	Development of dryer using combined solar energy and condenser heat waste.	Assist.Prof. Sirichai Thepa	M. Sc., ET, KMUTT
Ms Umarin	Sangpanich	Study of moving cloud effects on the power quality of grid-connected photovoltaic system.	Dr. Krissanapong Kirtikara Assist.Prof. Sirichai Thepa	M.Eng, ET, KMUTT

Note: ET = Energy Technology, EMT = Energy Management Technology, TT = Thermal Technology.





List of Student Theses (Cont.)

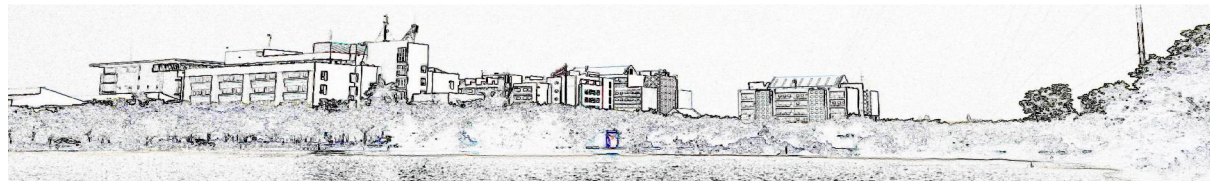
Name		Title of Thesis /Special Study*	Supervisor/Examiner*	Program
2004				
Mr. Jutturit	Thongpron	Study of parameters affecting power quality of PV- grid connected systems	Dr Krissanapong Kirtikara Lect. Chaya Jivacate	D. Eng., ET, KMUTT
2005				
Mr. Chamnan	Limsakul	Solar cells dynamic impedance characterization in frequency and time domains	Dr. Dhirayut Chenvidhya Dr. Krissanapong Kirtikara Lect. Nattavut Chayavanich*	M. Eng., EE, KMUTT
2006				
Mr. Niwat	Ruangrotsin	Power quality study of a PV grid-connected system due to load.	Dr. Krissanapong Kirtikara Dr. Dhirayut Chenvidhya	M. Eng., ET, KMUTT
Mr. Panom	Parinya	Solar cell performance evaluation and analysis: study of solar cell characteristics by temperature observation.	Dr. Krissanapong Kirtikara Dr. Dhirayut Chenvidhya	M. Eng., ET&M, JGS-EE, KMUTT
Ms. Piyatida	Trinurak	Electricity generation and heat gains on photovoltaic roof in Thailand.	Asst. Prof. Dr. Chumnong Sorapipatana Dr. Dhirayut Chenvidhya	M. Phil., ET, JGSEE, KMUTT
Ms Yaowanee	Sangpongsanont	Study of PV module deterioration by using IEC61215 Standard.	Dr. Krissanapong Kirtikara Dr. Dhirayut Chenvidhya	M. SC., ET, KMUTT
Mr. Socheath	Sou	The Design of a Hybrid Renewable Energy System for Rural Electrification in Cambodia	Prof.Dr. R.H.B. Exell Dip.-Ing.Werner Stiemers	M.Phil., ET, JGSEE, KMUTT
2007				
Mr. Ekkachai	Pakpairote	Study on Impacts of PV Grid-connected System	Dr. Dhirayut Chenvidhya Dr. Krissanapong Kirtikara Asst. Prof. Tasanee Chayavanich	M. Eng., EE, KMUTT

Note: ET = Energy Technology, EE = Electrical Engineering, ET&M = Energy Technology and Management, JGSEE = the Joint Graduate School of Energy and Environment

List of Student Theses (Cont.)

Name	Title of Thesis /Special Study*		Supervisor/Examiner*	Program
2008				
Mr. Chokechai Sridowruang	Analysis of solar cell characteristics under partial shading conditions		Dr. Dhirayut Chenvidhya Dr. Krissanapong Kirtikara Asst. Prof. Nattavut Chayavanich	M. Eng., EE, KMUTT
Mr. Manit Seapan	Study on Impedance of PV Modules and Measurement of IV Characteristics by Pulse Solar simulator		Asst. Prof. Nattavut Chayavanich Dr. Dhirayut Chenvidhya	M. Eng., EE, KMUTT
2009				
Mr. Arbeedean Jilao	Using Computational Fluid Dynamics (CFD) for Wind Energy Resource Map: A Case Study of Chaiyaphum Province		Dr. Krissanapong Kirtikara Mr. Chaya Jivacate Dr. Dusadee Sukawat Dr. Tanokkorn Chenvidhya	M. Eng., ET, KMUTT
2011				
Mr. Nopporn Patcharaprakiti	Dynamic Modeling of Grid-Connected Photovoltaic System		Dr. Krissanapong Kirtikara Dr. Dhirayut Chenvidhya Mr. Chaya Jivacate Dr. Anawat Sanswang	D.Eng., ET, KMUTT
2012				
Mr. Anon Numin	Study of Dynamic Characteristic of Solar Cells under Illumination and Dark Conditions		Dr. Dhirayut Chenvidhya	D.Eng., ET, KMUTT
Mr. Setawish Areesakulkij	A comparative study of measures to promote solar cell electrification in Thailand		Dr. Dhirayut Chenvidhya Dr. Pattana Rakkwamsuk	M.Sc., ET, KMUTT
Mr. Chanchai Dechthummarong	Diagnosis of Dielectric Propoties by Applying Electric Fields for Nondestructive Testing of PV Modules		Dr. Krissanapong Kirtikara Dr. Dhirayut Chenvidhya	D.Eng., ET, KMUTT
2013				
Mr. Thossaporn Pongklang	Study on Dynamic Characteristics of Dye-sensitized Solar Cells		Dr. Dhirayut Chenvidhya Dr. Krissanapong Kirtikara	M.Eng., ET, KMUTT
Mr. Buntoon Wiengmoon	Analysis of Solar Cells Deterioration		Dr. Krissanapong Kirtikara Dr. Dhirayut Chenvidhya	D.Eng., ET, KMUTT

Note: ET = Energy Technology, EE = Electrical Engineering





List of Student Theses (Cont.)

Name	Title of Thesis /Special Study*		Supervisor/Examiner*	Program
2014				
Mr. Nitikorn	Silsirivanich	Study on Dynamic Characteristics of Amorphous Thin Film Silicon Solar Cell	Dr. Dhirayut Chenvidhya Dr. Krissanapong Kirtikara Dr. Kobsak Sriprapha	D.Eng., ET, KMUTT
2016				
Mr. Natapol	Jirarungsatian	Estimation of Electricity from PV System Using Geographic Information Systems	Dr. Tanokkorn Chenvidhya* Dr. Krissanapong Kirtikara Dr. Roongrojana Songprakorb Asst.Prof.Dr. Jutturit Thongpro and Mr. Chaya Jivacate	M.Eng., ET, KMUTT
Mr. Adolph Joseph Kigombola		Analysis of Grid Code Requirements for Integration of Wind Power Generation Systems in Transmission System in Tanzania	Dr. Dhirayut Chenvidhya Asst. Prof. Dr. Anawach Sangswang	M. Sc., ET&M, JGS-EE, KMUTT
Mr. Andrew Enock Wajama		Assessment of Reaction Capability on Voltage Support and Loss Reduction in Medium Voltage Network with High PV Penetration	Dr. Dhirayut Chenvidhya Asst. Prof. Dr. Anawach Sangswang	M. Sc., ET&M, JGS-EE, KMUTT

Note: ET = Energy Technology, ET&M = Energy Technology and Management, JGSEE = the Joint Graduate School of Energy and Environment

5

Research Grants





Research Grants (Records after 1986)

Research Title	Researchers	Sources of Fund / Amount Million Baht
<u>1986</u>		
1. 1.5 m ² solar simulator (Phase V-VI: 1986-1987)	Dr. Krissanapong Kirtikara, Mr. Sirichai Thepa, Mr. Udomsak Yuangyuen, Ms. Gannaga Satittada and Mr. Kanate Wanachote	KMUTT Annual Budget/ 0.345
2. Selective surfaces for solar energy technology and energy conversation (Phase I- V: 1986-1990)	Ms. Nandh Thavarangkul, Ms. Supapan Visitserngtrakul, Dr. Krissanapong Kirtikara, Ms. Panthip Monthachitra, Mr. Chayant Koompai and Mr. Choochat Nitipanyawong	KMUTT Annual Budget/ 1.192
<u>1987</u>		
3. Photovoltaic water pumping system (Phase I-II: 1987-1988)	Dr. Krissanapong Kirtikara and Ms. Tassanee Unchundecha	KMUTT Annual Budget/ 0.576
<u>1989</u>		
4. Energy balance analysis for the uses of biomass as energy and food	Dr. Morakot Tanticharoen, Dr. Solot Suwanayuen, Dr. Krissanapong Kirtikara, Mr. Chaiyawat Piladaeng, Mr. Somsak Ploypanicharoen and Ms. Nandh Thavarangkul	KMUTT Annual Budget/ 0.140
5. Indoor collector testing system (Phase I-III: 1989-1991)	Mr. Tanongkiet Kiatsirirote, Mr. Sirichai Thepa and Mr. Pichai Namprakai	KMUTT Annual Budget/ 0.684
6. Photovoltaic lighting system for rural area (Phase I-II : 1989-1990)	Ms. Tassanee Unchundecha, Dr. Krissanapong Kirtikara, Mr. Nattavut Chayavanich, Mr. Sirichai Thepa and Mr. Tawatchai Suwankham	KMUTT Annual Budget/ 0.670
7. Photovoltaic rural lighting systems: centralized battery charging stations	Dr. Krissanapong Kirtikara, Mr. Sirichai Thepa, Ms. Tassanee Unchundecha and Mr. Nattavut Chayavanich	KMUTT Annual Budget/ 0.138
<u>1990</u>		
8. Study on performance deterioration and efficiency improvement of solar cell systems (Phase I-III: 1990-1992)	Dr. Krissanapong Kirtikara, Ms. Tassanee Unchundecha, Mr. Tawatchai Suwankham, Ms. Panthip Monthachitra, Mr. Choochat Nitipanyawong, Mr. Chayant Koompai, Mr. Veera Laha and	KMUTT Annual Budget/ 0.876



Research Grants (cont.)

Research Title	Researchers	Sources of Fund / Amount Million Baht
1990 (cont.)		
9. Energy balance analysis for the uses of biomass as energy and food (Phase I-IV: 1990-1993)	Dr. Morakot Tanticharoen, Dr. Solot Suwanayuen, Dr. Krissanapong Kirtikara, Mr. Chaipayat Piladaeng and Mr. Somsak Ploypaniharoen	KMUTT Annual Budget/ 0.782
1991		
10. Design of drying systems for fruits using solar assisted energy	Mr. Sirichai Thepa, Mr. Pichai Namprakai and Dr. Jongjit Hirunlabh	KMUTT Annual Budget/ 0.168
11. Photovoltaic balances of system (BOS)	Mr. Tawatchai Suwankham, Mr. Sirichai Thepa, Ms. Tassanee Unchundecha and Mr. Nattavut Chayavanich	KMUTT Annual Budget/ 0.145
12. Heat mirror coatings by spray pyrolysis (Phase I-III : 1991-1994)	Dr. Krissanapong Kirtikara, Dr. Jongjit Hirunlabh, Mr. Chayant Koompai, Mr. Choochat Nitipanyawong, Mr. Somchai Chinsakoltanakorn, Ms. Panthip Monthachitra, Mr. Mongkol Rajaniyom, Mr. Anurak Pitiraksakul and Ms. Kanda Wongwailikhit	KMUTT Annual Budget/ 0.413
13. Selective surfaces for energy conservation : heat mirrors by physical vapour deposition (Phase I-VII: 1989-1995)	Ms. Somchai Chinsakoltanakorn, Dr. Krissanapong Kirtikara, Mr. Chayant Koompai, Mr. Mongkol Rajaniyom, Mr. Choochat Nitipanyawong, Mr. Anurak Pitiraksakul and Dr. Supattanapong Dumrongrattana	KMUTT Annual Budget/ 4.000
1992		
14. Design of solar assisted drying systems for fruits	Mr. Pichai Namprakai, Dr. Jongjit Hirunlabh, Ms. Warunee Tia and Mr. Sirichai Thepa	KMUTT Annual Budget/ 0.148
15. Village water supply systems using photovoltaic units	Dr. Krissanapong Kirtikara, Ms. Tassanee Unchundecha, Mr. Sirichai Thepa, Mr. Tawatchai Suwankham and Mr. Somchai Sathakulcharoen	Green Esarn Project (GEP)/ 1.868



Research Grants (cont.)

Research Title	Researchers	Sources of Fund / Amount Million Baht
1993		
16. System of solar cell modules testing under solar simulator and natural sunlight for industrial standards (Phase I-III : 1993-1995)	Dr. Sirichai Thepa, Prof. Tanongkiet Kiatsirirote, Ms. Tassanee Unchundecha, Mr. Tawatchai Suwankham, Mr. Somchai Sathakulcharoen and Dr. Jongjit Hirunlabh	KMUTT Annual Budget/ 0.595
1994		
17. Feasibility of evaporative cooling application for a lentinus Edodes (BERK) shing house	Mr. Sirichai Thepa, Dr. Jongjit Hirunlabh, Mr. Somsak Ploypaniharoen, Prof. Tanongkiet Kiatsirirote and Mr. Tawatchai Suwankham	NRCT/ 0.105
18. Development of electronic balance of systems (BOS) for photovoltaic system	Mr. Tawatchai Suwankham and Dr. Dhirayut Chenvidhya	NECTEC/ 0.670
1995		
19. Preparation of heat mirror selective surfaces by sol-gel process (Phase I-II : 1995-1996)	Dr. Jongjit Hirunlabh, Mr. Choochat Nitipanyawong, Dr. Krissanapong Kirtikara, Mr. Chayant Koompai, Ms. Panthip Monthachitra, Mr. Joseph Khedari and Mr. R. D. Pynn	KMUTT Annual Budget/ 0.718
20. Prototype hybrid PV-wind-diesel generating unit (Phase I : 1995-1997)	Mr. Tawatchai Suwankham, Mr. Sirichai Thepa, Dr. Krissanapong Kirtikara, Ms. Tassanee Unchundacha, Mr. Somchai Sathakulcharoen, Mr. Roongrojana Songprakorp, Mr. Nattawut Chayawanich and Mr. Kriengsak Khunchai	KMUTT Annual Budget/ 1.410
21. Geothermal energy for fruits and vegetables drying in rural industry	Dr. Jongjit Hirunlabh, Dr. Krissanapong Kirtikara, Mr. Joseph Khedari, Mr. Adisak Nathakaranakule and Mr. Rattanachai Pairint	NRCT/ 0.307
22. Feasibility of evaporative cooling application for a lentinus Edodes (BERK) shing house	Mr. Sirichai Thepa, Dr. Jongjit Hirunlabh, Mr. Adisak Nathakaranakule, Mr. Somsak Ploypaniharoen, Prof. Tanongkiat Kiatsirirote and Mr. Twatchai Suwankham	NRCT/ 0.210



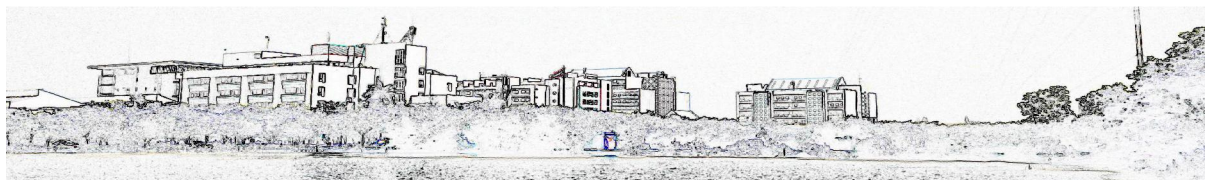
Research Grants (cont.)

Research Title	Researchers	Sources of Fund / Amount Million Baht
1996		
23. Satellite assessment of solar radiation (Phase I-II : 1996-1997)	Mr. Pichai Namprakai, Dr. Jongjit Hirunlabh , Ms. Warunee Tia, Mr. Sirichai Thepa and Dr. Krissanapong Kirtikara	KMUTT Annual Budget/ 1.010
24. Technical economic and social evaluation of photovoltaic water pumping in Thailand (Phase I-III : 1996-1998)	Mr. Sirichai Thepa, Mr. Tawatchai Suwankham, Dr. Krissanapong Kirtikara, Dr. Wattanapong Rakwichian, Mr. Somchai Suwarawan, Mr. Kriengsak Khunchai, Mr. Sungseeng Liengjindathaworn and Ms. Mareena Nuithmem	KMUTT Annual Budget/ 0.856
1997		
25. Battery test system (Phase I-III) : 1997-1999)	Dr. Krissanapong Kirtikara, Mr. Sirichai Thepa, Mr. Tawatchai Suwankham and Mr. Roongrojana Songprakorp	KMUTT Annual Budget/ 1.154
1998		
26. Design of an adapted passive solar roof Thailand climate with respect to traditional Thai style house	Dr. Jongjit Hirunlabh, Mr. Joseph Khedari, Mr. Pichai Namprakai, Mr. Sirichai Thepa, Mr. Narit Pratinthong and Ms. Janijra Jeraboot	KMUTT Annual Budget/ 0.405
27. Utilizations of clean energy and nature conservation at Royal Recommended Project sites and wildlife sanctuaries (1998-1999)	Dr. Suvit Tia, Mr. Tawatchai Suwannakum, Mr. Usa Boonbumrung, Mr. Dokrak Pongchawee, Ms. Sugunya Pengma, Mr. Arun Intrassara, Mr. Siwakorn Kumsri, Ms. Dutsadee Nilubol and Mr. Theerapat Klaimukh	NEPO/ 24.944
28. Pilot study on the feasibility of rehabilitation and sustainable operation of PV water pumping units in the North East	Mr. Sumate Tanchareon, Ms. Kunnika Ungsutanasombat, Mr. Preecha Khunmuang, Mr. Teerasak Somsak, Ms. Sugunya Pengma, Mr. Surain Thapanangkun, Mr. Ayut Jaingam, Ms. Dutsadee Nilubol and Mr. Theerapat Klaimukh	NEPO/ 0.530
29. Investigation of electric generation using molten	Dr. Solot Suwanayuen, Dr. Apichai Therdthianwong, Dr. Supaporn Therdthianwong, Dr. Suvit Tia, Mr. Roongrojana Songprakorp,	NEPO/ 4.999



Research Grants (cont.)

Research Title	Researchers	Sources of Fund / Amount Million Baht
1998 (cont.)		
30. Feasibility of establishing energy technology industrial parks and its management	Dr. Solot Suwanayuen, Dr. Suvit Tia, Mr. Tawatchai Suwannakum and Mr. Surain Thapanangkun	NEPO/ 0.340
31. Testing of solar to AC (STAC) unit : Power conditioning unit cover ting DC output from PV array to AC signal	Mr. Roongrojana Songprakorp, Mr. Veerapol Monyakul, Dr. Dhirayut Chenvidhya, Mr. Pulsak Phuwawicheanchay and Mr. Peera Tachamungkalap- iwat	NEPO/ 3.665
32. Technical, socio-economic assessment of village-level centralized PV battery charging stations	Dr. Sirichai Thepa, Mr. Roongrojana Songprakorp, Mr. Preecha Khunmuang and Mr. Teerasak Somsak	DEDE/ 4.340
1999		
33. Prototype of PV grid-connected system (Phase I-II : 1999-2000)	Mr. Tawatchai Suwankham, Dr. Krissan- apong Kirtikara, Dr. Sirichai Thepa, Mr. Roongrojana Songprakorp, Mr. Nattawut Chayawanich, Mr. Somchai Satakulcharoen and Mr. Sutham Teerawatanachai	KMUTT Annual Budget/ 0.909
34. Utilizations of clean energy and nature conservation at Royal Recommend Project at Kaeng Krachan : Study and planning	Mr. Tawatchai Suwankham, Dr. Dhirayut Chenvidhya, Mr. Niwat Jitwongwisawa, Mr. Kittu Puikhaow, Mr. Ayut Jai-ngam, Mr. Narongsak Sangkhapituk and Mr. Ralph Pynn	NEPO/ 4.986
35. Solar cars contest : Malaysia	Mr. Kosin Chamnongthai, Dr. Sirichai Thepa, Mr. Roongrojana Songprakorp, Dr. Dhirayut Chenvidhya, Mr. Veerachai Lertsathapornsuk and Mr. Somporn Tiajaroen	NEPO/ 0.530
36. Improvement of evaporative cooling systems in poultry houses.	Mr. Sirichai Thepa and Mr. Roongrojana Songprakorp	KMUTT Annual Budget/ 0.143



Research Grants (cont.)

Research Title	Researchers	Sources of Fund / Amount Million Baht
1999 (cont.)		
37. Development of renewable energy hybrid power system.	Mr. Dokrak Pongchawee and Mr. Usa Boonbumroong	KMUTT Annual Budget/ 0.067
38. Clean energy projects in the Royal recommended projects: Monitoring and assessment.	Dr. Suvit Tia, Dr. Sirichai Thepa, Mr. Roongrojana Songprakorp, Dr. Dhirayut Chenvidhya and Mr. Surain Thapanangkun	NEPO/ 1.059
2000		
39. Charcoal stoves : efficiency improvement, promotion and dissemination.	Mr. Chatree Homwongs, Mr. Surain Thapanangkun, Mr. Preecha Khunmuang, Mr. Eakkanut Krajangthimaporn, Ms. Sugunya Pengma, Ms. Dutsadee Nilubol, Mr. Narongsak Sangkapitak, Mr Nipon Cheenkhawkhum, Mr. Kasian Jantorn and Mr. Doangjun Kaewmano	NEPO/ 2.790
40. Development of PV standards for Thailand	Dr. Veerapol Monyakul, Mr. Roongrojana Songprakorp, Mr. Sirichai Thepa, Mr. Tawatchai Suwannakum and Mr. Sangop Khumsopa	NEPO/ 3.200
41. Prototype of wind turbine generation for low wind speed area	Mr. Usa Boonbumroong, Mr. Dokrak Pongchawee and Mr. Arun Intrasara	KMUTT Annual Budget/ 0.750
2002		
42. Development of a renewable energy hybrid power system	Mr. Dokrak Pongchawee, Mr. Usa Boonbumroong and Mr. Arun Intrasara	KMUTT Annual Budget/ 0.123
43. Evaporative cooling for poultry huts	Dr. Sirichai Thepa	KMUTT Annual Budget/ 0.130
44. Study and measurement of photovoltaic cell spectral responses	Dr. Dhirayut Chenvidhya, Mr. Kiti Peawkhaw, Mr. Sathit Vanichchaikitand and Mr. Nuttawut Chayavanich	KMUTT Annual Budget/ 0.640
45. Development of a low wind speed electrical generation system	Mr. Usa Boonbumroong, Mr. Dokrak Pongchawee and Mr. Arun Intrasara	KMUTT Annual Budget/ 0.725



Research Grants (cont.)

Research Title	Researchers	Sources of Fund / Amount Million Baht
2003		
46. Mini-grid system for rural electrification from clean energy systems (Kho-Jik Village)	Mr. Tawatchai Suwankham, Mr. Usa Boonbumrung, Mr. Dokrak Pongchawee, Ms. Sugunya Pengma and Ms. Wassana Kaewkam	EPPO/ 9.990
47. Study of electrode catalyst preparation for proton exchange membrane fuel cells	Dr. Apichai Therdthianwong and Dr. Supaporn Therdthianwong	MTEC/ 0.200
48. Prototype of wind farm for low speed wind area.	Mr. Usa Boonbumroong and Mr. Dokrak Pongchawee	KMUTT Annual Budget/ 0.358
49. Reform of hydrogen from biogas	Dr. Apichai Therdthianwong and Dr. Supaporn Therdthianwong	KMUTT Annual Budget/ 0.313
2004		
50. GIS –based maps of southern Thailand : Economic and cultural capital	Mr. Usa Boonbumrung, Mr. Dokrak Pongchawee, Ms. Sugunya Pengma and Ms. Wassana Kaewkam	TRF/ 0.250
51. Energy strategic planning of Rachburi province	Dr. Apichit Therdyothin, Assoc. Prof. Warunee Tia, Mr. Sumate Tanchareon, Mr. Teerasak Somsak, Mr. Eakanut Krajangthimaporn and Assoc. Prof. Dr. Kaorakot Wattanawichian	Ministry of Energy/ 1.000
52. Energy strategic planning on Saraburi province	Dr. Apichit Therdyothin, Assoc. Prof. Warunee Tia, Mr. Sumate Tanchareon, Mr. Teerasak Somsak, Mr. Eakanut Krajangthimaporn and Assoc. Prof. Dr. Kaorakot Wattanawichian	Ministry of Energy/ 1.000
53. Development of electrodes & electrolytes for proton exchange fuel cells	Dr. Apichai Therdthianwong, Dr. Supaporn Therdthianwong, Mr. Anawach Sangkhapet, Mr. Jatuphon Wutikanokana, Mr. Weerasak Surareungchai, Ms. Panchan Lonpradit, Dr. Dhirayut Chenvidhya, Ms. Yapadee Fuprasert and Mr. Nutthapon Wongyao	MTEC/ 6.155



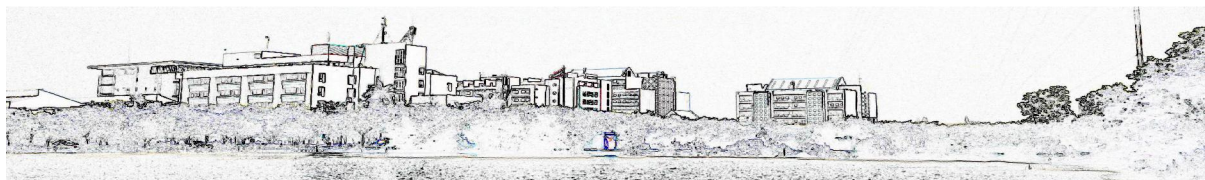
Research Grants (cont.)

Research Title	Researchers	Sources of Fund / Amount Million Baht
2004 (cont.)		
54. Sustainability and improvement of management skills in energy & natural resources of remote area communities: Case study of Boklua and Chalermprakiat District, Nan Province	Mr. Sumate Tanchareon, Mr. Surain Thapanangkun, Mr. Eakanut Krajangthimaphorn and Mr. Bovornsak Peiranonda	EPPO/ 5.164
55. Field current-voltage measurement of PV arrays	Dr. Dhirayut Chenvidhya, Mr. Chamnan Limsakul, Mr. Manit Seapan, Mr. Niwat Ruangrotsin, Mr. Panom Prarinya, Ms. Sirintip Prinyopas, and Mr. Kittu Puikhaow	EPPO/ 1.374
56. PV systems for a small cold storage van	Dr. Dhirayut Chenvidhya, and Mr. Chamnan Limsakul	RPF/ 0.264
2005		
57. Preparation of catalyst to produce hydrogen from ethanol	Asst. Prof. Dr. Supaporn Therdthianwong, Dr. Supaporn Therdthianwong, Mrs. Panchan Lonpradit and Mr. Boonsong Thiepipim	NRCT/ 0.305
58. Design and production of fuel cells using Zinc-dic	Mr. Nattaphol Wongyaow, Dr. Apichai Therdthianwong, Dr. Apichai Therdthianwong and Mr. Nutthapon Wongyao	NRCT/ 15.000
59. Micro hydro energy with local wisdom: Case study of Kerewong Village, Nakon Si Thammaras	Mr. Dokrak Pongchawee and Mr. Usa Boonbumroong	NRCT/ 0.728
60. Projects under Royal Project Foundation 2005	Mr. Sumate Tanchareon, Mr. Bovornsak Peiranonda and Mr. Eakanut Krajangthimaphorn	RPF/ 4.650
61. Evaluation of electricity generation by solar cell technology	Assoc. Prof. Dr. Kaorakot Wattanawichian, Mr. Chaya Jivacate, Dr. Dhirayut Chenvidhya, Mr. Eakchai Pakpairot and Mr. Kittu Puikhaow	JGSEE/EPPO/ 0.440



Research Grants (cont.)

Research Title	Researchers	Sources of Fund / Amount Million Baht
<u>2005</u> (cont.)		
62. Study on possible impacts of grid-connected system (PV rooftop) on local distribution-grid	Dr. Dhirayut Chenvidhya, Mr. Nattavut Chayavanich, Ms. Tassanee Chayavanich, Dr. Anawach Sangswang, Dr. Cherdchai Prapanawarat, Mr. Jutturit Thongpron, Mr. Chamnan Limsakul, Mr. Niwat Ruangrotsin, Ms. Yaowanee Sangpongsanont, Mr. Mani Seapan and Mr. Setawish Areesakulkij	DEDE/ 2.999
63. Study of potential of installing PV grid-connected systems on roof areas of government buildings	Dr. Dhirayut Chenvidhya, Mr. Nattavut Chayavanich, Ms. Tassanee Chayavanich, Mr. Eakanut Krajangthimaporn, Mr. Setawish Areesakulkij, Ms. Yupadee Fuprasert, Ms. Yaowanee Sangpongsanont, Mr. Chamnan Limsakul, Mr. Ballang Muenpinij, Ms. Sirintip Prinyopas, Mr. Mani Seapan and Mr. Panom Prinya	DEDE/ 2.480
<u>2006</u>		
64. Centre for Development on Testing and Standardization of PV Systems: Phase 1	Dr. Dhirayut Chenvidhya, Mr. Nattavut Chayavanich, Ms. Tassanee Chayavanich, Dr. Anawach Sangswang, Mr. Chamnan Limsakul, Ms. Yupadee fuprasert, Ms. Yaowanee Sangpongsanont, Mr. Ballang Muenpinij, Mr. Mani Seapan, Ms. Premrudee Homon, Mr. Setawish Areesakulkij, Ms. Sirintip Prinyopas, Dr. Cherdchai Prapanavarat and Assoc. Prof. Sirichai Thepa	EPPO, DEDE/ 15.000
65. Design, installation and evaluation of PV systems using local PV modules	Dr. Dhirayut Chenvidhya, Mr. Nattavut Chayavanich, Ms. Tassanee Chayavanich, Mr. Eakanut Krajangthimaporn, Mr. Setawish Areesakulkij, Ms. Yupadee fuprasert, Mr. Chamnan Limsakul, Mr. Mani Seapan, Mr. Nitikorn Silsivanich, Ms. Yaowanee Sangpongsanont, Mr. Ballang Muenpinij, Ms. Sirintip Prinyopas, Mr. Panom Prinya, Dr. Anawach Sangswang and Dr. Cherdchai Prapanavarat	DEDE/ 19.850



Research Grants (cont.)

Research Title	Researchers	Sources of Fund / Amount Million Baht
2007		
66. Centre for Development of Testing and Standardization of PV Systems: Phase 2	Dr. Dhirayut Chenvidhya, Mr. Nattavut Chayavanich, Ms. Tassanee Chayavanich, Dr. Anawach Sangswang, Mr. Chamnan Limsakul, Ms. Yaowanee Sangpongsanont, Mr. Ballang Muenpinij, Mr. Nitikorn Silsirivanich, Mr. Mani Seapan, Mr. Setawish Areesakulkij, Ms. Sirintip Prinyopas, Dr. Cherdchai Prapanavarat and Assoc. Prof. Sirichai Thepa	DEDE, EPPO/ 30.000
67. Testing and evaluation of the Vanadium Redox flow batteries	Mr. Nattavut Chayavanich, Dr. Dhirayut Chenvidhya, Dr. Cherdchai Prapanavarat, Dr. Sumate Netiluddanont, Dr. Anawach Sangswang, Mr. Chamnan Limsakul, Mr. Niwat Ruangrotsin, Ms. Sirintip Prinyopas and Mr. Ballang Muenpinij	DEDE/MTEC/ 2.119
68. Study of potentials of wind resources by micro siting	Mr. Nattavut Chayavanich, Dr. Dhirayut Chenvidhya, Dr. Cherdchai Prapanavarat, Dr. Dusadee Sukawat, Dr. Wuttipong Moungrnoi, Mr. Panom Prinya, Ms. Tanokkorn Banjongla-iad, Mr. Chamnan Limsakul and Mr. Nitikorn Silsirivanich	DEDE/ 12.800
2008		
69. Development of solar pumping system prototypes using domestically available parts	Dr. Dhirayut Chenvidhya, Dr. Cherdchai Prapanavarat, Mr. Nattavut Chayavanich, Asst. Prof. Tassanee Chayavanich, Dr. Sumate Netiluddanont, Dr. Anawach Sangswang, Mr. Chamnan Limsakul, Dr. Tanokkorn Banjongla-iad, Ms. Yaowanee Sangpongsanont, Mr. Ballang Muenpinij, Mr. Nitikorn Silsirivanich, Mr. Mani Seapan, Mr. Thanawit Srisaksomboon, Mr. Abidean Jilaod, Mr. Setawish Areesakulkij, Mr. Panom Parinya and Ms. Sirintip Prinyopas	DEDE/ 3.000



Research Grants (cont.)

Research Title	Researchers	Sources of Fund / Amount Million Baht
2008 (cont.)		
70. Development of training courses in solar cell applications for trainers	Mr. Nattavut Chayavanich, Asst. Prof. Tassanee Chayavanich, Dr. Sumate Netiluddanont, Dr. Anawach Sangswang, Assoc. Prof. Dr. Sirichai Thepa, Dr. Tanokkorn Banjongla-iad, Mr. Chamnan Limsakul, Ms. Yaowanee Sangpongsanont, Mr. Ballang Muenpinij, Mr. Nitikorn Silsirivanich, Mr. Mani Seapan, Mr. Thanawit Srisaksomboon, Mr. Setawish Areesakulkij, Mr. Panom Parinya and Ms. Sirintip Prinyopas	DEDE/ 3.050
71. Expert sponsorships for the development of the photovoltaic standard development and testing facilities	Dr. Dhirayut Chenvidhya, Mr. Nattavut Chayavanich, Asst. Prof. Tassanee Chayavanich, Dr. Sumate Netiluddanont, Dr. Anawach Sangswang, Dr. Tanokkorn Banjongla-iad, Mr. Chamnan Limsakul, Ms. Yaowanee Sangpongsanont, Mr. Ballang Muenpinij, Mr. Nitikorn Silsirivanich, Mr. Mani Seapan, Mr. Thanawit Srisaksomboon, Mr. Setawish Areesakulkij, Mr. Panom Parinya and Ms. Sirintip Prinyopas	DEDE/ 1.289
72. Centre for Development on Testing and Standardization of PV Systems: Phase 3	Dr. Dhirayut Chenvidhya, Mr. Nattavut Chayavanich, Asst. Prof. Tassanee Chayavanich, Dr. Anawach Sangswang, Dr. Sumate Netiluddanont, Dr. Tanokkorn Banjongla-iad, Mr. Chamnan Limsakul, Ms. Yaowanee Sangpongsanont, Mr. Ballang Muenpinij, Mr. Nitikorn Silsirivanich, Mr. Mani Seapan, Mr. Thanawit Srisaksomboon, Mr. Setawish Areesakulkij, Mr. Panom Parinya, Ms. Sirintip Prinyopas, Dr. Cherdchai Prapanavarat and Assoc. Prof. Dr. Sirichai Thepa	DEDE/ 30.000
73. An assessment of large wind turbines for utility- interfaced applications.	Asst. Prof. Nattavut Chayavanich, Dr. Cherdchai Prapanavarat, Assoc. Prof. Banterng Suwantragul, Dr. Chawin Chantharasenawong Dr. Dusadee Sukawat, Mr. Panom Prinya, Asst. Prof. Tassanee Chayavanich, Dr. Tanokkorn Banjongla-iad, Mr. Chamnan Limsakul	PEA/ 6.525



Research Grants (cont.)

Research Title	Researchers	Sources of Fund / Amount Million Baht
<u>2009</u>		
74. Wind Energy Resource Assessment in western the Gulf of Thailand to Chumporn province	Mr. Nattavut Chayavanich, Dr. Cherdchai Prapanavarat, Dr. Dusadee Sukawat, Mr. Panom Prinya, Asst. Prof. Tassanee Chayavanich, Assoc. Prof. Dr. Sirichai Thepa and Ms. Wacharakorn Ketren	NRCT/ 6.530
75. Technology and Innovation White Paper : Photovoltaic Technology	Dr. Dhirayut Chenvidhya, Mr. Panom Parinya, Ms.Yaowanee Sangpongsanont, Mr. Chamnan Limsakul and Dr. Tanokkorn Chenvidhya	STI/ 0.090
<u>2010</u>		
76. The Study of Service Quality Standard in Electricity of Thailand	Dr. Dhirayut Chenvidhya, Asst. Prof. Dr. Anawach Sangswang, Asst. Prof. Dr. Sumate Netiluddanont, Asst. Prof. Dr. Supakit Chotigo, Asst. Prof. Mongkul Konghirun, Asst. Prof. Nattavut Chayavanich, Asst. Prof. Tassanee Chayavanich, Dr. Cherdchai Prapanavarat, Dr. Tanokkorn Chenvidhya, Mr. Chamnan Limsakul, Ms.Yaowanee Sangpongsanont, Mr. Ballang Muenpinij, Mr. Mani Seapan, Mr. Thanawit Srisaksomboon, Mr. Setawish Areesakulkij, Mr. Panom Parinya, Ms. Sirintip Prinyopas and Ms. Wacharakorn Ketren	ERC/ 16.400
<u>2011</u>		
77. Training of Photovoltaic Applications	Dr. Dhirayut Chenvidhya, Dr. Roongrojana Songprakorp, Asst. Prof. Dr. Anawach Sangswang, Dr. Tanokkorn Chenvidhya, Mr. Chamnan Limsakul, Ms.Yaowanee Sangpongsanont, Mr. Ballang Muenpinij, Mr. Mani Seapan, Mr. Thanawit Srisaksomboon, Mr. Setawish Areesakulkij, Mr. Panom Parinya, Ms. Wacharakorn Ketren and Ms. Sirintip Prinyopas	DEDE/ 1.39



Research Grants (cont.)

Research Title	Researchers	Sources of Fund / Amount Million Baht
<u>2012</u>		
78. Training of Photovoltaic Technology	Dr. Dhirayut Chenvidhya, Dr. Roongrojana Songprakorp, Asst. Prof. Dr. Anawach Sangswang, Dr. Tanokkorn Chenvidhya, Mr. Chamnan Limsakul, Ms. Yaowanee Sangpongsanont, Mr. Ballang Muenpinij, Mr. Mani Seapan, Mr. Thanawit Srisaksomboon, Mr. Setawish Areesakulkij, Mr. Panom Parinya and Ms. Wacharakorn Ketren	Panya Consultant Co. Ltd./ 0.174
<u>2013</u>		
79. Assessment of Photovoltaic Power Plant	Dr. Dhirayut Chenvidhya, Dr. Roongrojana Songprakorp, Asst. Prof. Dr. Anawach Sangswang, Dr. Tanokkorn Chenvidhya, Ms. Yaowanee Sangpongsanont, Mr. Ballang Muenpinij, Mr. Mani Seapan, Mr. Thanawit Srisaksomboon, Mr. Setawish Areesakulkij, Mr. Panom Parinya and Ms. Wacharakorn Ketren	ERC/ 0.960
80. Supporting for the sustain of PV standard testing facilities	Dr. Dhirayut Chenvidhya, Dr. Roongrojana Songprakorp, Asst. Prof. Dr. Anawach Sangswang, Dr. Tanokkorn Chenvidhya, Ms. Yaowanee Sangpongsanont, Mr. Ballang Muenpinij, Mr. Mani Seapan, Mr. Thanawit Srisaksomboon, Mr. Setawish Areesakulkij, Mr. Panom Parinya and Ms. Wacharakorn Ketren	DEDE/ 4.10
81. Thailand's PV status report in 2012 – 2013	Dr. Dhirayut Chenvidhya, Dr. Roongrojana Songprakorp, Asst. Prof. Dr. Anawach Sangswang, Dr. Tanokkorn Chenvidhya, Ms. Yaowanee Sangpongsanont, Mr. Ballang Muenpinij, Mr. Mani Seapan, Mr. Thanawit Srisaksomboon, Mr. Setawish Areesakulkij, Mr. Panom Parinya and Ms. Wacharakorn Ketren	DEDE/ 0.99



Research Grants (cont.)

Research Title	Researchers	Sources of Fund / Amount Million Baht
2013 (cont.)		
82. Assessment of Photovoltaic Power Plant	Dr. Dhirayut Chenvidhya, Dr. Roongrojana Songprakorp, Asst. Prof. Dr. Anawach Sangswang, Dr. Tanokkorn Chenvidhya, Ms. Yaowanee Sangpong-sanont, Mr. Ballang Muenpinij, Mr. Mani Seapan, Mr. Thanawit Srisaksomboon, Mr. Setawish Areesakulkij, Mr. Panom Parinya and Ms. Wacharakorn Ketren	CMU/ 0.27
2014		
83. Thailand's PV status report in 2014- 2015	Dr. Dhirayut Chenvidhya, Dr. Roongrojana Songprakorp, Asst. Prof. Dr. Anawach Sangswang, Dr. Tanokkorn Chenvidhya, Ms. Yaowanee Sangpong-sanont, Mr. Ballang Muenpinij, Mr. Mani Seapan, Mr. Thanawit Srisaksomboon, Mr. Panom Parinya and Ms. Wilawan Seekaew	DEDE/ 0.90
84. Wind Energy Resource Assessment in western the Gulf of Thailand to Chumporn province (Phase II)	Asst. Prof. Nattavut Chayavanich, Dr. Cherdchai Prapanavarat, Dr. Dusadee Sukawat, Mr. Panom Parinya, Asst. Prof. Tassanee Chayavanich, Assoc. Prof. Dr. Sirichai Thepa	NRCT/0.60
85. PV Modules Long-term Evaluation of NED power plant	Dr. Dhirayut Chenvidhya, Dr. Tanokkorn Chenvidhya, Ms. Yaowanee Sangpong-sanont, Mr. Ballang Muenpinij, Mr. Mani Seapan, Mr. Thanawit Srisaksomboon, Mr. Setawish Areesakulkij, and Mr. Panom Parinya	NED/ 0.50
2015		
86. 200 kW of PV rooftop system of King Mongkut's Technology Thonburi under campus power project	SEEM/EESH/CSSC	DEDE/ 15.0



Research Grants (cont.)

Research Title	Researchers	Sources of Fund / Amount Million Baht
2015 (cont.)		
87. Assessment of Solar PV rooftop system project	Dr. Dhirayut Chenvidhya, Dr. Roongrojana Songprakorp, Asst. Prof. Dr. Anawach Sangswang, Dr. Tanokkorn Chenvidhya, Ms. Yaowanee Sangpong-sanont, Mr. Ballang Muenpinij, Mr. Mani Seapan, Mr. Thanawit Srisaksomboon, Mr. Panom Parinya and Ms. Wilawan Seekaew	DEDE/ 3.62
2016		
88. Feasibility Study on Cleaning Technologies for PV Arrays	Dr. Dhirayut Chenvidhya, Dr. Roongrojana Songprakorp, Asst. Prof. Dr. Buntoon Wiengmoon , Dr. Tanokkorn Chenvidhya, Asst. Prof. Dr. Surawut Chuangchote , Asst. Prof. Dr. Wandee Onreabroy , Dr. Panita Chinvetkivanich , Asst. Prof. Dr. Amporn Wiengmoon , Asst. Prof. Dr. Vorapoch Angkasith, Dr. Kanda Boonthonsatit and Dr. Eakkachai Pengwang	TRF/ 1.78

Notation :

CMU	Chiang Mai University
DEDE	Department of Energy Development and Promotion
DEDE	Department of Alternative Energy Development and Efficiency (Since 2012)
ECON	Fund Energy Conservation Promotion Fund
EPPO	The Energy Policy and Planning Office (formerly NEPO)
ERC	Energy Regulatory Commission
GEP	Green Esarn Project
KMUTT	King Mongkut's University of Technology Thonburi
MTEC	The National Metals and Materials Technology Center
NCGEB	The National Center for Genetic Engineering and Biotechnology
NECTEC	The National Electronics and Computer Technology Center
NED	Natural Energy Development Co., Ltd.
NEPO	The National Energy Policy Office
NRCT	The National Research Council of Thailand
RPF	Royal Project Foundation
STI	National Science Technology and Innovation Policy Office
TRF	Thailand Research Fund

Clean Energy Systems



CSSC KMUTT

Testing laboratory according to ISO/IEC 17025:2005

TLAS accredited testing laboratory

Accreditation No.: TESTING 0343

CES Solar Cells Testing Center (CSSC) King Mongkut's University of Technology Thonburi

ศูนย์พัฒนามาตรฐานและทดสอบระบบเซลล์แสงอาทิตย์ มหาวิทยาลัยเทคโนโลยีพระจอมเกล้าธนบุรี