

出國報告審核表

出國報告名稱：參加 IERE 第三屆 SC/TC 及 GTC 會議預備會議		
出國人姓名	職稱	服務單位
崩光陸	綜合研究所一般工程監	台灣電力公司
出國期間：98 年 10 月 5 日至 98 年 10 月 9 日		報告繳交日期：98 年 12 月 4 日
出國計畫主辦機關審核意見	<p>■1.依限繳交出國報告</p> <p>■2.格式完整（本文必須具備「目地」、「過程」、「心得」、「建議事項」）</p> <p>■3.內容充實完備.</p> <p>■4.建議具參考價值</p> <p>■5.送本機關參考或研辦</p> <p><input type="checkbox"/>6.送上級機關參考</p> <p><input type="checkbox"/>7.退回補正，原因：<input type="checkbox"/> 不符原核定出國計畫 <input type="checkbox"/> 以外文撰寫或僅以所蒐集外文資料為內容以 <input type="checkbox"/> 內容空洞簡略 <input type="checkbox"/> 電子檔案未依格式辦理 <input type="checkbox"/> 未於資訊網登錄提要資料及傳送出國報告電子檔</p> <p><input type="checkbox"/>8.本報告除上傳至出國報告資訊網外，將採行之公開發表： ■辦理本機關出國報告座談會（說明會），與同人進行知識分享。 <input type="checkbox"/>於本機關業務會報提出報告</p> <p><input type="checkbox"/>9.其他處理意見及方式：</p>	
層轉機關審核意見	<p><input type="checkbox"/>1.同意主辦機關審核意見<input type="checkbox"/>全部 <input type="checkbox"/>部分_____（填寫審核意見編號）</p> <p><input type="checkbox"/>2.退回補正，原因：_____</p> <p><input type="checkbox"/>3.其他處理意見：</p>	

說明：

- 一、出國計畫主辦機關即層轉機關時，不需填寫「層轉機關審核意見」。
- 二、各機關可依需要自行增列審核項目內容，出國報告審核完畢本表請自行保存。
- 三、審核作業應於報告提出後二個月內完成。

報告人

單位
主管：

主管處
主管：

總經理
副總經理：

出國報告（出國類別：開會）

參加 IERE 第三屆 SC/TC 及 GTC 會議預備會議

服務機關：台灣電力公司

姓名職稱：蒯光陸 一般工程監

派赴國家：馬來西亞、印尼

出國期間：98 年 10 月 5 日~10 月 9 日

報告日期：98 年 12 月 4 日

行政院及所屬各機關出國報告提要

出國報告名稱：參加 IERE 第三屆 SC/TC 及 GTC 會議預備會議

頁數 21 含附件：是否

出國計畫主辦機關/聯絡人/電話：

台灣電力公司人事處/陳德隆/2366-7685

出國人員姓名/服務機關/單位/職稱/電話：

蒯光陸 /台灣電力公司/綜合研究所/一般工程監/ 2360-1007

出國類別：1 考察2 進修3 研究4 實習5 開會

出國期間：98 年 10 月 6 日~10 月 9 日 出國地區：馬來西亞、印尼

報告日期：98 年 12 月 4 日

分類號/目

關鍵詞：IERE、國際技術交流、發電效率、淨煤發電、再生能源

內容摘要：(二百至三百字)

第三屆 IERE SC/TC Meeting 將於 2010 年在馬來西亞舉行，為充分準備該會議，IERE 總部於 98 年 10 月 6-8 日舉辦該項會議的會前溝通會議，本項會議分別在馬來西亞吉隆坡及印尼雅加達舉行。

除前項會議前溝通會議外，亦討論到 GTC 未來 2-3 年的活動。本公司為 IERE 高級會員且本所費所長為目前 GTC 主席，IERE 亦極力邀請本所派員參加該項討論。

第一、二屆 GTC 會議已分別在 2008 年 12 月及 2009 年 5 月在印尼雅加達和巴里島舉行，為能更深入瞭解 GTC 會員當前及未來的技術需求，本所設計一套針對新 GTC 活動問卷，請各會員填寫。本項問卷亦已回收、統計、分析完成，將藉由本次會談機會，提出報告。

本文電子檔已傳至出國報告資訊網

(<http://open.nat.gov.tw/reportwork>)

代號：C09803608

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壹、出國任務

1. 第三屆 IERE SC/TC Meeting (International Electric Research & Exchange, Steering Committee / Technical Committee) 將於 2010 年在馬來西亞舉行，為能有充份之會議準備，IERE 於 98 年 10 月 6-8 日舉辦該項會議的會前會，本項會議分別在 (1) 馬來西亞國吉隆坡市與 TNB 高階人員，及 (2) 在印尼國雅加達市與 PLN/Hapua 等機構高階層人員討論相關可能議題。
2. 除前項會議內容外，會中亦討論到 GTC 未來 2-3 年的活動。本公司為 IERE 高級會員且本所費所長為目前 GTC 主席，IERE 亦極力邀請本所派員參加該項討論。
3. 第一、二屆 GTC 會議已分別在 2008 年 12 月及 2009 年 5 月在印尼雅加達和巴里島舉行，為能更深入瞭解 GTC 會員當前及未來的技術需求，本所設計一套針對新 GTC 活動問卷，請各會員填寫。本項問卷亦已回收、統計、分析完成，將藉由本次會前會機會，提出報告。

貳、出國行程

本次行程如下：

時間	工作內容
98/10/5 (一)	往程 (台北—吉隆坡)
98/10/6 (二)	參加 IERE 第三屆 SC/TC 及 GTC 會議預備會議
98/10/7 (三)	行程 (吉隆坡—雅加達)
98/10/8 (四)	與 PLN/Hapua 等機構研究人員討論相關議題
98/10/9 (五)	返程 (雅加達—台北)

[應用 98 年度出國計畫第 58 號預算，實際支出新台幣 86,020 元]

參、IERE 第三屆 SC/TC 及 GTC 會議預備會議

一、會議目的與議程安排：

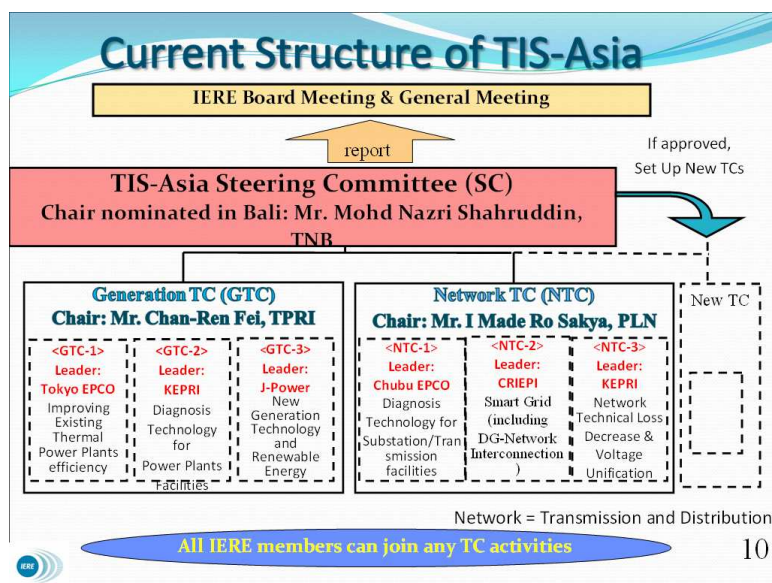
IERE 第三屆 SC/TC 及 GTC 會議預定在西元 2010 年中期在馬來西亞召開，本次預備會議之目的在擬定該會議之主題及討論會之時間地點等細節之安排，於 2009 年 10 月 6 日在馬來西亞國吉隆坡市 TNB 電力公司 (Tenaga Nasional Berhad) 總部舉行，分簡報與座談會兩部分來進行。TNB 電力公司與會人員：Dr.Badrol Bin Ahmad (會議主席，TNB 之 Chief Technology Officer)，Mohd Yusof Rakob (聯絡窗口，系統規劃與開發)，Alwa Abdul Rahman, Amaruddin Mahmood, Muhammad Dzulkifli Bin Md Daud, Mohd Nor Mohammed, …等，照片見圖十一~十三。

二、簡報部分：

本會議簡報部分共三篇，

(1) IERE TIS-Asia 現況綜合報告：

由 IERE 中央辦公室 (位在日本東京) 副秘書長 Mr.Norihisa Sakurai 報告 IERE TIS-Asia 沿革、組織分工、現況及展望未來，詳圖一~五。目前 TIS-Asia 兩大技術委員會為發電類(GTC)及電網類(NTC)，分別由台電公司綜合研究所費所長昌仁及印尼 PLN 電力公司副總 I Made Ro Sakya 擔任主席，參考圖一。



圖一


發電類技術委員會(GTC)，目前分三個小組進行活動，即(1)現有火力發電機組之效率提昇，由日本東京電力公司[TOKYO EPCO]主導推動，研究標的為印尼 PAITON 發電廠兩部 400MW 機組；(2)現有火力發電機組之壽命評估與延壽工程，由韓國電力研究院[KEPRI] 主導推動，研究標的為馬來西亞 JANA MANJUNG 之發電廠 4 第二號 760MW 燃煤機組，進行汽輪機及管路之可靠度評估；(3)新發電技術與再生能源之網頁建置，由日本 J-POWER 電力公司主導推動，參考圖二~四。

TIS-Asia: Output (1/4)

TIS-Asia Generation TC-1 “Improvement of Thermal Efficiency of Existing Thermal Power Plants”

Reference Plant: Indonesia PT-PJB ,Paiton PS (2 x 400 MW)
 <On site Investigation, December 2008>
 Problems: Insufficient Plant Performance
 Major Cause: Mainly by the use of low-level coals in a standard boiler as well as minor O&M issues
 Outcomes of TC: Problem Analysis and Recommendation
 (Menu of Solutions)

Next Plan discussed:
 Energy conservation technologies in end use such as heat pump technologies.



圖二

TIS-Asia: Output (2/4)

GTC-2: Diagnosis / Life Extension Technologies, RBI for Generation Equipments

1. Workshop: KEPRI RBI Technology and Power Plant Maintenance (June 2, 2008, TNB Headquarter)
2. Inspection of Turbine & Piping for Jana Manjung plants Unit 2 (760MW, Coal-fired) (June 3 – 6, 2008, Lumut, Malaysia) : Summary report





Next Venue: Suralaya No.3 & No.4 Power Plant in Indonesia

圖三

TIS-Asia: Output (3/4)

GTC-3: A New WEB Menu about Generation Technologies

Generation Technology

- Hydro Power
- Nuclear Power
- Thermal Power
- Renewable Energy

Transmission Technology

- Transmission
- Substation
- Distribution

Demand Side Technology

- Office Building
- Residences

Basic Technology

- Power Electronics

- 1) IGCC
- 2) Advanced Combined Cycle
- 3) A-USC
- 4) Zero CO2 Emission Plant

- 5) Hydro Power
- 6) Wind Power
- 7) Solar Panel
- 8) Biomass

- 9) Nuclear Power
- 10) PBMR (Pebble Bed Modular Reactor)

- 11) Smart Grid
- 12) Power Electronics
- 13) Power Storage

- 14) High Performance Heat Pump

IERE collects data from Members and develop WEB.
 <1> Outline, Figures
 <2> Installed/Demonstrated Site, or Project
 <3> Technical Files, Contact Information, URL.

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圖四

電網類技術委員會(NTC)之活動主題為「輸配電設備之維護與診斷技術」，由 IERE 的 35 個會員共同參加，已於 2008 年 9 月 9-10 日在泰國舉辦過一次研討會，參考圖五。

TIS-Asia: Output (4/4)

TIS-Asia-NTC-1

“Maintenance and Diagnosis Technologies for Transmission & Substation Facilities”

2nd TF Seminar (Substation)
At EGAT on 9-10 September 2008

(1) Participants

35 IERE members from Thailand(EGAT, MEA, PEA), Indonesia(PLN), Malaysia(TNB), Singapore(SP PowerGrid), Korea, Japan

(2) Result

Various methods were introduced/shared and discussed “How to reduce Substation Equipment Failures”

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圖五

(2) TIS-Asia 發電技術委員會(GTC)之問卷調查結果報告：

費所長擔任 TIS-Asia 發電技術委員會(GTC)主席，於 2009 年 5 月在印尼巴里島舉行第二次 GTC 會議之後，要求綜合研究所同仁草擬一份問券並寄送給所有 GTC 會員填寫，問卷內容如下(圖六及圖七)：

IERE TIS-Asia GTC questionnaire
A SURVEY ON NEW GTC ACTIVITIES

From GTC Chairman Mr. Chang Ren Fei (Aug. 2009)

1. What kind(s) of new technologies would you identify to be essential for your company (or party) within 10-15 years and wish to be promoted by IERE TIS-Asia GTC on both the supply & demand sides of generation technologies?

(1-1) For existing units :

- Thermal efficiency improvement (the original GTC-1 scope),
- Diagnosis/Life extension technologies (the original GTC- 2 scope),
- Your recommended technologies other than the above two. Please specify:

(e.g. plant availability improvement, coal ash utilization, ...etc.)

(1-2) For "New Generation Technologies & Renewable Energy (the original GTC-3 scope)" :

- USC Technologies : (please specify details)
- IGCC Technologies : (please specify details in the following)
 - IGCC without CO2 capture
 - IGCC with CO2 capture
 - Advanced IGCC with CO2 capture & H2 production
 - Other types of IGCC (like Chemical looping with CaCO3/CaO), please specify:
- Oxyfuel, Pre & Post combustion CO2 capture, please specify (could be a combination):
- CO2 transportation & storage after its capturing:
- Renewables : (please specify details in the following)
 - PV
 - CSP
 - Wind (Onshore)
 - Wind (Offshore)
 - Geothermal (Steam or Hot Water)
 - Geothermal (Hot Rock)
 - Biomass
 - Ocean
 - Other Renewables or additional information : (please specify)
- Distributed Energy Resources (other than Renewables mentioned above) :
 - Fuel Cells (specify any particular types) :
 - Battery (to cope with massive wind power generation or for other purposes)
 - Micro Combustion Turbine Generator
 - Others (please specify)



- Other New Generation Technologies (please specify)

2. Are you willing to exchange information and to cooperate with other IERE TIS-Asia members in the following areas, and in what form(s) :

- Yes (please proceed to the rest of this question item)
- No

(2-1) For existing units : area(s) of interest include :

- Thermal efficiency improvement (the original GTC-1 scope),
- Diagnosis/Life extension technologies (the original GTC- 2 scope),
- Your recommended technologies other than the above two. Please specify:

(2-2) For "New Generation Technologies & Renewable Energy (the original GTC-3 scope)" :

- USC Technologies : (please specify details)
- IGCC Technologies : (please specify details)
- Oxyfuel, Pre & Post combustion CO2 capture, please specify:
- CO2 transportation & storage after its capturing:
- Renewables : (please specify details)
 - PV
 - CSP
 - Wind (Onshore)
 - Wind (Offshore)
 - Geothermal (Steam or Hot Water)
 - Geothermal (Hot Rock)
 - Biomass
 - Ocean
 - Other Renewables or additional information : (please specify)
- Distributed Energy Resources (other than Renewables mentioned above) :
 - Fuel Cells (specify particular type(s)) :
 - Battery :
 - Micro Combustion Turbine Generator :
 - Others (please specify)
- Other New Generation Technologies (please specify)

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圖六

(2-3) What kind of cooperative work(s) you wish to participate in and which members you specially wish to work with?

- Information Exchange (Based on Knowledge Management Scheme) (if yes, please specify details as you may like)
- Promote GTC-3 Website continuously for the dominant knowledge : (This site is now accessible to all IERE members http://www.iere.jp/) (if yes, please specify details as you may like)
- Link experts (Recessive knowledge) (if yes, please specify details as you may like)
- Technology Cooperation (if yes, please specify details as you may like)
- Joint Research (if yes, please specify details as you may like)
- Members you specially wish to work with : (please specify)

(Candidates include: CRIEPI, J-Power, Kansai EPCO, KEMA Netherlands, KEPRI/KEPCO, PLN Indonesia, Tokyo EPCO, TPRI of TaiPower, ...etc.)

3. Your recommended Mechanism(s) to increase GTC members :

- Introduce the demand side first (if yes, please specify details as you may like)
- Drive the supply side (if yes, please specify details as you may like)
- Others



4. Other Recommendation(s) to GTC of IERE TIS-Asia (such as your recommendation(s) on the improvement of "Linkage among individual GTC activities" and "Mechanisms to support activities" among members, how to expand the GTC-3 Website mentioned in item (2-3) above...etc.)

5. Information of Member :

Name of company (or party) _____

Address _____

Contact person _____

Tel _____

Fax _____

Email _____

Remark :
 Please fill in the above questionnaire and send a reply e-mail to Dr. Hany Cheng (e-mail: u552911@taipower.com.tw) of this Institute (Taiwan Power Research Institute/Chairman of GTC Mr. Chang Ren Fei is the General Manager) for further processing. If you have any question, please feel free to contact him too...
 Or please mail to the following address :
 Kwang-Lin Kooi, Ph.D.
 Deputy General Manager
 TPRI (Taiwan Power Research Institute),
 Taiwan Power Company
 193 Roosevelt Road, Sec. 4,
 TAIPEI, TAIWAN 10091.
 TEL: 886-2-23601007.
 FAX: 886-2-23689533.
 E-mail: u683969@taipower.com.tw

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圖七

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- What kind(s) of new technologies would you identify to be essential for your company(or party) within 10~15 years and wish to be promoted by IERE TIS-Asia GTC on both the supply & demand sides of generation technologies?
- Are you willing to exchange information and to cooperate with other IERE TIS-Asia members?
- Your recommended Mechanism(s) to increase GTC members?
- Other Recommendation(s) to GTC of IERE TIS-Asia?

Preliminary Observation of the Questionnaire Investigation Results

Kwang-Lu Koai
(Proxy of GTC Chair Mr.C.R.Fei)

Taiwan Power Research Institute
Taiwan Power Company

for the Preparatory IERE SC-TC- GTC Meeting
Kuala Lumpur on 10/06/2009



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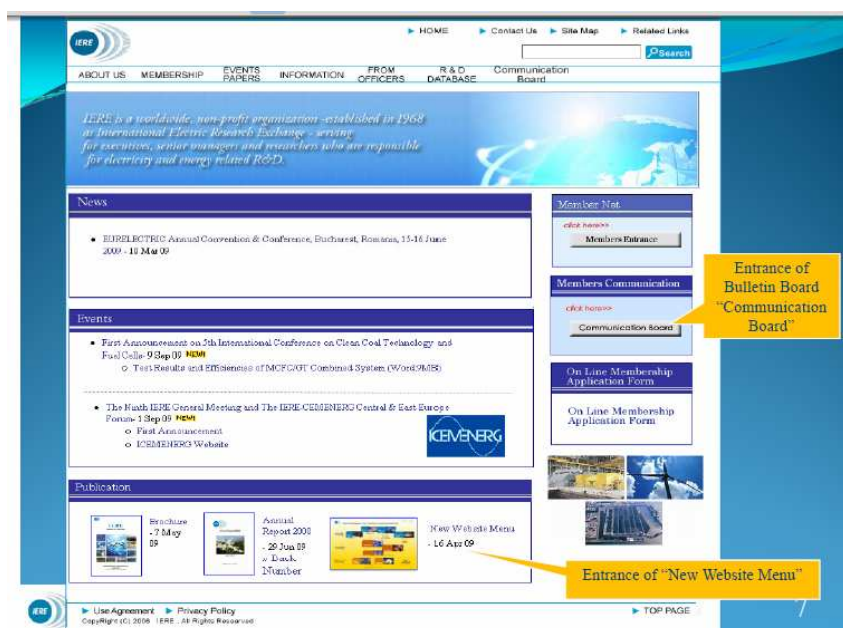
圖八

問卷調查結果報告，詳如附錄，要點如下：(a) GTC 現有
三個小組活動，仍有需要，須繼續運作； (b) GTC 第三小組
之網頁建置活動，以 IGCC 搭配 CO2 capture、再生能源
Renew- ables 及分散式電源 Distributed Energy Resources 被
認為最值得加強研究；(c) 資料互換是 GTC 認為最佳合作互
動之模式；(d) 問卷調查提供給 GTC 極有價值之資訊，可作
為明年召開第三次 GTC 會議時，訂定後續運作方式之依據。

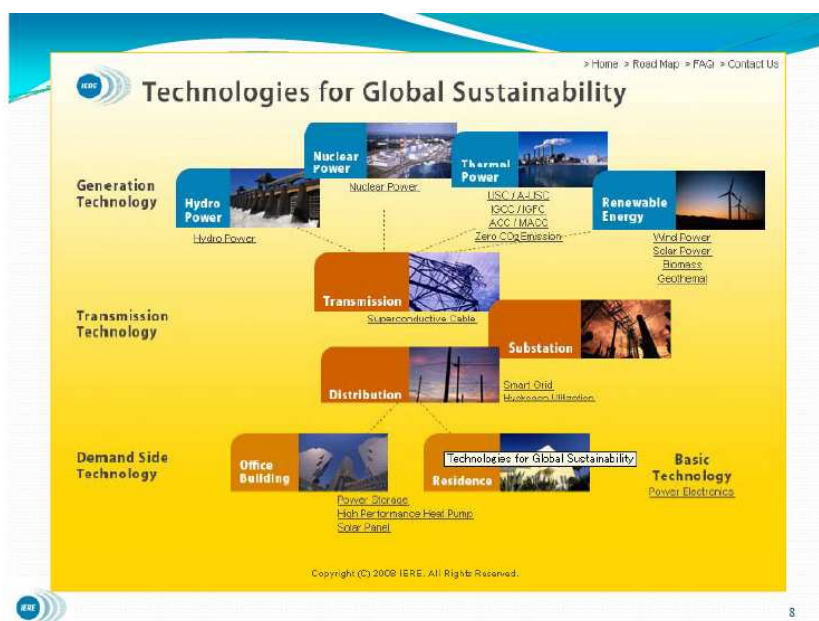
(3) 發電技術委員會第三組(GTC-3)業務報告：

由日本 J-Power 電力公司 Mr.Masahiro Oonishi 簡報 GTC-3
業務，網頁建設部分因遵循 2009 年 5 月中旬巴里島第二次

GTC 會議之決議，從原先 GTC 範圍擴大到整個技術委員會範圍(包括 GTC 發電及 NTC 電網)，目前運作已經能夠順利上線，參考圖九及圖十。



圖九



圖十

三、座談會部分：

座談會主題為”討論 2010 年 IERE 第三屆 SC/TC 及 GTC 會議籌備事宜”，由 Crieipi 的 Nishimura 先生引言，座談內容以會議籌備細節(LOGISTICS)為主，未討論技術議題，故不在本報告中詳述，照片見圖十一~十三。



圖十一（中坐者 Dr.Badrol Bin Ahmad，其右為 Mohd Yusof Rakob）



圖十二



圖十三

肆、與印尼 PLN/東南亞國協 Hapua 等機構人員討論相關議題

一、簡報與座談會部分

2009 年 10 月 8 日於印尼 PLN 總部，IERE 一行三人（Norihisa Sakurai，Kwang-Lu Koai，Yoshiaki Nishimura）拜訪 PLN 公司規劃與技術總監 Bambang Praptono，東南亞國協 Hapua 機構執行秘書 Syaiful B. Ibrahim，PLN 研究發展副總 I Made Ro Sakya 及聯絡員 Bambang Hermawanto。

簡報部分由 Norihisa Sakurai，Kwang-Lu Koai，Yoshiaki Nishimura 分別提出，內容與馬來西亞部分相同，包括：IERE TIS-Asia 現況綜合報告、發電技術委員會(GTC)之問卷調查結果報告、2010 年 IERE 第三屆 SC/TC 及 GTC 會議籌備事宜。

座談會部分由 I Made Ro Sakya 副總主持，針對（1）韓國 KEPRI 在印尼推動 GTC-2 汽輪機及管路壽命評估之工作進度、（2）GTC 第三次會議合併 GTC-2 期末報告在印尼雅加達舉行、（3）如何促進 IERE 與東南亞國協 Hapua 機構之互動交流、（4）亞太電協技術委員會第二工作組（Working Group 2）針對碳交易之研究現況及邀請 PLN 加入...等議題廣泛交換意見。

座談會後並前往技術總監辦公室與 Bambang Praptono 交談，當面邀請 Mr. Bambang 於本年 10 月 15~16 日來台灣高雄參加亞太電協（AESIEAP）之 CEO Conference.



圖十四（前右 I Made Ro Sakya；前左 Bambang Hermawanto；後左 Norihisa Sakurai；後右 Yoshiaki Nishimura）

二、東協電網簡介

東協 10 國有 16 個電力公司執行供電服務，供電戶數 86.4 百萬用戶、總人口 575.5 百萬，總裝置容量：143,700 MW，總尖峰負載：80,806 MW，總售電量：453 TWh。

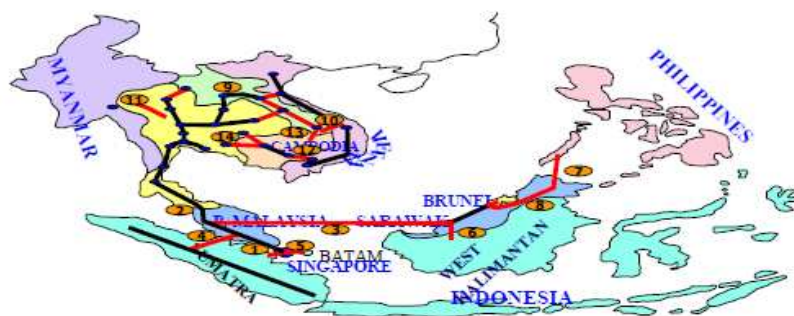
圖十五 為東協地理位置，圖十六為東協電力系統聯網規劃架構。

表 2 為 HAPUA 分工與各組研究重點，其中：馬來西亞負責發電廠運轉最佳化與核能溝通等，泰國則主辦電力系統運轉與財務議題，印尼則負責損失之降低與需求面管理，越南主辦再生能源開發訓練，菲律賓為管制與合約議題主持，新加坡為電力品質與狀態監測議題主持。

表 3 東協 10 國主要供電指標，表 4 為東協電業協會（HAPUA, THE HEAD OF ASEAN POWER UTILITIES/ AUTHORITIES）會員供電服務架構。



圖十五 東協地理位置



圖十六 東協電力系統聯網規劃架構

表 1 東協電業協會分工架構

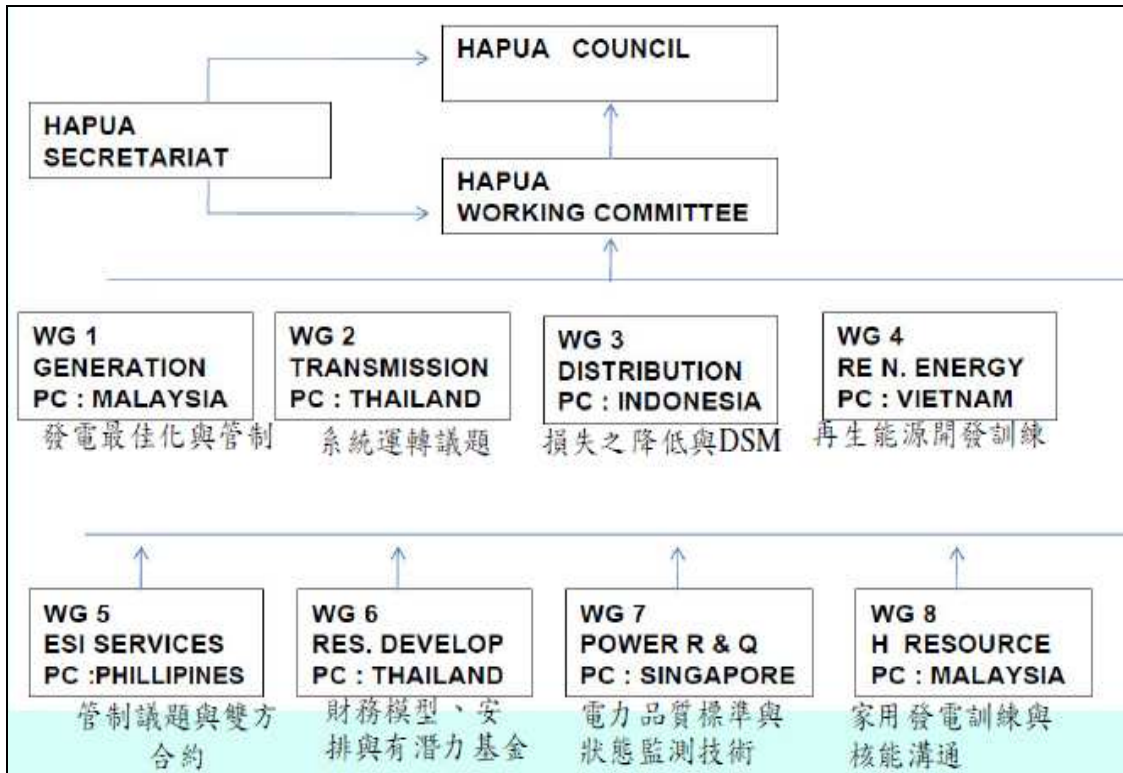


表 2 東協 10 國主要供電指標

國家 Country	裝置容量 Installed Cap. [MW]	尖峰負 Peak Load [MW]	售電量 Energy Sales (TWh)	用戶數 Customers
1 Brunei 汶來	803.5	454.7	2.9	112 163
2 Cambodia 柬埔寨	479	291	1.2	286 660
3 Indonesia 印尼	26 015	19 263	111.3	34 559 253
4 Lao PDR 寮國	271.6	350	1.4	523 285
5 Malaysia 馬來西亞	17 622	12 990	75.4	6 447 281
6 Myanmar 緬甸	1 761	1 140	4.3	1 269 004
7 Philippines 菲律賓	38 318	8 766	45.6	21 000 000
8 Singapore 新加坡	8 919	5 711	31.8	1 250 000
9 Thailand 泰國	34 335	22 586	134	13 000 000
10 Vietnam 越南	15 716	9 255	45.1	8 000 000

表 3 HAPUA 會員供電服務架構

國家	電力公司	備註
1. Brunei Darussalam	Departement of Electrical Services (DES)	Vertical Integrated Utility (VIU)
2. Cambodia	Electricite Du Cambodge (EDC)	VIU
3. Indonesia	PT PLN (persero)	VIU
4. Lao PDR	Electricite Du Laos	VIU
5. Malaysia	Tenaga Berhad SESCO SESB	VIU Peninsular Malaysia VIU Serawak State VIU Sabah
6. Myanmar	Ministry of Electric Power (MEPE) 1 MEPE (2)	Transmission and Distribution Hydro Power Generation
7. Philippines	National Power Corporation Trans Co	Power Generation Company Transmission Company
8. Singapore	SP Power Grid	Gencos, T & D
9. Thailand	EGAT MEA & PEA	Generation, SO & Transmission Distribution/Retail Supply
10. Vietnam	Electricity of Vietnam (EVN)	VIU

三、 印尼電力部門目前狀況

- 電力系統:
 - 聯網系統: Java-Madura-Bali (JAMALI) and Sumatera Island
 - 其餘為獨立系統
- 電力需量年成長率: 9-10 %
- 總裝置容量 30,345 MW
 - State Own Enterprise's (PLN's) : 24,925 MW(82%)
 - Independent Power Producer's (IPP's): 4,044 MW (13%)
 - Private Power Utility's (PPU's) : 916 MW (3%)
 - 再生能源 (水力與地熱發電除外): 460 MW (2%)
- 供電普及率：約 65%

印尼電力需求快速成長，假設印尼的 GDP 成長率為 6.1%，人口成長率：1.3%，負載年成長率： 9.2%，彈性係數：1.5，則 2009 至 2027 年的電力負載曲線如圖十七所示，電力負載由 2009 年之 153 TWh，2027 年達 813 TWh，成長 5.3 倍，因此印尼需要大量投資興建電廠、輸配電等設施。

電力部門政策包括：優先使用再生能源及 CCS，偏遠地區使用再生能源，以及當地自產能源增加供電普及率，需求面管理與老舊電廠延壽。



圖十七 2009-2027 印尼電力需求成長曲線

伍、結語與建議：

結語：

1. 本公司為 IERE 高級會員且本所費所長為目前 GTC 主席，為規劃 GTC 未來 2-3 年的活動，IERE 總部極力邀請本所派員參加本會議。本項會議分別在馬來西亞吉隆坡與 TNB 高階人員及在印尼雅加達與 PLN/Hapua 等機構人員討論相關議題。
2. 為能更深入瞭解 GTC 會員當前及未來的技術需求，本所設計一套針對新 GTC 活動問卷，請各會員填寫。本項問卷亦已回收、統計、分析完成，將藉由本次會前會機會，提出報告。
3. 參訪兩國國營電力公司及東南亞國協 HAPUA 組織，積極參與國際事務級進行技術研討，對發展公司自主性技術及提昇公司國際形象頗有助益。。

建議：

1. 藉由參加國際組織來瞭解先進國家電力技術發展現況及發表研究發展成果，可以互相觀摩學習，並藉以提昇本公司之良好形象與技術水準，故應積極參與。
2. 東南亞許多國家天然資源豐富而電力技術尚在成長，本公司電源開發規劃、電廠運轉維護、研究開發新技術等可考慮透過 IERE、AESIEAP 等國際組織提供技術支援或協助，例如印尼供電率約 65%，設備自動化程度低，但其電力負載成長率約 9%，具有發展潛力，其他東協電業(HAPUA)亦有多個國家供電普級率與自動化程度尚低，目前政府推動外國友邦之技術服務援助，對東協電業亦可探討合作可能。

附錄

Preliminary Observation of the Questionnaire Investigation Results

Kwang-Lu Koai
(Proxy of GTC Chair Mr.C.R.Fei)
Taiwan Power Research Institute
Taiwan Power Company

for the Preparatory IERE SC-TC- GTC Meeting
Kuala Lumpur on 10/06/2009

- A. Brief Introduction of the Questionnaire Investigation
- B. Observation of the Questionnaire Investigation Results
- C. Conclusions (Preliminary)

===== Preliminary Observations & Recommendations=====

Part 1: Demands of New Technologies

(1-1) For existing units (Preliminary Observations)

1. GTC-1(Thermal efficiency improvement): still in demand and wish to be promoted by IERE TIS-Asia GTC. We suggest the GTC-1 leader to discuss with the interested members about the future projects.
2. GTC-2(Diagnosis/Life extension technologies): still highly demanded. 80 % of the members who responded to the questionnaire wish to see new progress in this area. We suggest the GTC-2 leader to discuss further with these interested members.
3. Other than GTC-1 &2 : Energy Conservation (KEMA), Repowering of old power plants (NRI), Clean Coal Technology (IERE). May be merged into GTC-1 &2?

(1-2) New Generation Technologies & Renewable Energy (Preliminary Observations)

1. IGCC with CO₂ capture, Renewables and Distributed Energy Resources are the three major areas which most members (70~80 %) expressed their wishes to be promoted by IERE TIS-Asia GTC.
2. Among all Clean Coal Technologies, the IGCC with CO₂ capture drew the highest

- attention of GTC members (as high as 80 %) as compared to other IGCC designs (10~30 %). This indicates that GTC members view the CO₂ abatement as an essential design consideration for the future coal-fired power plants.
3. Among all Clean Coal Technologies, “Carbon Capturing Technology” (80 %) was more emphasized than “Oxyfuel, Pre & Post combustion” (50 %) and “CO₂ transportation & storage” (30 %) most likely due to their different extents of technology maturity and expectation of commercialization within 15 years.
 4. Only 30 % of members wish to promote the USC technologies further, probably due to their relatively high technical maturity at present. Not so highly needed to be promoted any more.
 5. The current GTC-3 study scope is very broad and not easy to be managed efficiently. It may be more practical at this moment to split the original GTC-3 study scope into two subgroups, namely GTC-3 (Clean Coal Technologies & CCS) & GTC-4 (Renewables and Distributed Energy Resources).
 6. Discussion on the other New Generation Technologies recommended to be promoted for GTC-3:
 - a) NRI (CHP technology for thermal power plants),
 - b) KANSAI (①CO₂ utilization after capturing CO₂ by CCS, ② Solidification of CO₂ after capturing CO₂ by CCS, ③ Next generation nuclear power).
 - 7 Among the renewable energy applications, the Off Shore Wind was best recommended to be promoted (70% vote). On Shore Wind & Photovoltaics (PV) obtained 50% vote each. Biomass & Geothermal (Steam or Hot Water) obtained 40% vote each. These are the areas we should bring focus on.
 - 8 Co-firing a Biomass material with Coal for power generation was recommended by KANSAI and could be promoted if other interested members can be identified later on by the GTC-3 leader.
 - 9 Among the Distributed Energy Resources , the Battery technology for electricity storage within the grid system was highest recommended to be promoted (60% vote). Fuel Cell and Micro Combustion Turbine Generator obtained 30% and 20% vote each.
 - 10 NRI recommended to add ① Expansion turbines, ② CHP(Combined Heat and Power Genration) for gas engines to the list.
 - 11 Based on the above observations, it is clear that IGCC with CO₂ capture, Renewables and Distributed Energy Resources are the three major areas we should place our focus on. Spitting GTC-3 into two subgroups may be required.
 - 12 The Investigation has provided a very valuable information for IERE to plan for their future. Further discussion among IERE Central Office, GTC Chair & current GTC-3 leader and all related members of GTC may be required to set the targets and

make a detailed plans for the new GTC activities in the coming third GTC meeting and/or in future.

Part 2: Willingness to exchange information and cooperate with other IERE TIS-Asia members

(2-1) For existing units (Preliminary Observations)

- 1 Among the nine(9) members who returned their effective answer sheets, four(4) of them expresses willingness to exchange information and to cooperate with other IERE TIS-Asia members in both GTC-1 (Thermal efficiency improvement) and GTC-2 (Diagnosis/Life extension technologies) areas.
- 2 Since these two areas are still in demand (50 % & 80 % votes respectively based on the previous observation 1-1.1 & .2) and wish to be promoted by IERE TIS-Asia GTC, we suggest the IERE staff (including GTC-1 & GTC-2 leaders) should discuss with the interested members for the detailed planning of future projects.
- 3 Other than GTC-1 & 2 : Suggestions of New Activities about the following should be taken into account.
 - a)Energy Conservation (KEMA),
 - b)Repowering of old power plants (NRI),
 - c)Low Nox Combustion & Coal Ash Utilization(CRIEPI) ,
 - d)Clean Coal Technology & Optimal Replace UNIT Planning (IERE).

(2-2) New Generation Technologies & Renewable Energy (Preliminary Observations)

- 1 IGCC with CO₂ capture (50 %), Renewables (70 %) and Distributed Energy Resources (60 %) are the three major areas which most members expressed their wish to exchange information and to cooperate with other IERE TIS-Asia members.
- 2 “Oxyfuel, Pre & Post combustion” (40 %) and “CO₂ transportation & storage” (40 %) are next highest. USC technology (30 %) is the last one.
- 3 The above observation is consistent with the previous one (observation 1-2.1 ,.3 & .4) .
- 4 On the IGCC with CO₂ capture, CRIEPI further identify ①On IGCC-Diversification of Coal, ② Simulation technology as the two areas to be emphasized.
- 5 Among the renewable energy applications, the On Shore Wind (60% vote) and Off Shore Wind (50%) were selected as the highest interested areas where GTC members wish to exchange information and to cooperate with other IERE TIS-Asia members. Biomass & PV obtained 30% vote each.
- 6 CRIEPI explained the Grid Integration issues are their major concern about Wind &

PV Power. CRIEPI also identified Combustion & Gasification as two concerns about Biomass technology

- 7 Co-firing a Biomass material with Coal for power generation was recommended by KANSAI in Item 1.2.
- 8 Among the Distributed Energy Resources, the Battery technology for electricity storage within the grid system was highest item (50% vote) where GTC members wish to exchange information and to cooperate with other IERE TIS-Asia members. Fuel Cell and Micro Combustion Turbine Generator obtained 30% and 20% vote each. This is consistent to the previous observation in item 1.2 too.
- 9 CRIEPI identified “Control methods for batteries with renewable and evaluation technology” as their concern. TPRI identified Flow Battery as a concern.
- 10 On the Fuel Cell Area, TPRI and CRIEPI identified SOFC and MCFC respectively.

(2-3) What kind of cooperative work(s) you wish to participate in and which members you specially wish to work with?

(Preliminary Observations)

- 1 Information Exchange is the most favorable form of cooperation chosen by GTC members (80% vote) .
- 2 Promote GTC-3 Website continuously for the dominant knowledge (30%) , Link experts (40%) , Technology Cooperation (20%) and Joint Research (20%) were selected by relatively few members.
- 3 Specific areas of the cooperative work(s) were recommended by NRI, TPRI, CRIEPI and IERE Central Office as listed in the remarks of the previous few slides.

Part 3: Recommended mechanism(s) to increase GTC members

B. Observation of the Questionnaire Investigation Results (Part 3)

Part 3: Recommended mechanism(s) to increase GTC members (demand+supply)

Part 3: Recommendation(s) on the Mechanism(s) to increase GTC members	Suggested by:	Actions to be taken:
1. Introduce both sides through the IERE website	J-Power	Category A: GTC-3 leader to take care of this item.
2. Both sides should be introduced and driven more intensively.	TPRI- Taiwan Power	Category A: GTC-3 leader to take care of this item.
3. Introduce TIS-Asia-GTC activities in the IERE Forum in Romania in Nov 2009 or IERE Workshop in 2010	KANSAI	Category A: GTC Chair or IERE C.O. to take care of this item. (TPRI may not attend 2009 Forum)

Action to be taken (categorized into groups as follows) :
 (A) Category A : May be done right away or in the very near future without too much difficulty. Need someone to take actions. Need to discuss with IERE Central Office & GTC Chair to finalize the working plan.



TIS-Asia-GTC



B. Observation of the Questionnaire Investigation Results (Part 3)

Part 3: Recommended mechanism(s) to increase GTC members (demand+supply)

Part 3: Recommendation(s) on the Mechanism(s) to increase GTC members	Suggested by:	Actions to be taken:
4. Encourage other IERE members to participate in TIS-Asia GTC activities (Especially IERE members from the other continents –other than South-east and South Asia)	KANSAI	Category B: IERE C.O. to take care of this item (GTC & NTC are in same situation).
5. Promote demand side technologies such as “Heat Pump” and “Electric Vehicle” to decrease CO2 and increase Electricity Demand / Company Profit	KANSAI	Category B: IERE C.O. to take care of this item (need to evaluate how much resources we have).
6. Develop technology of using low quality coal in IGCC - good to corporate in developing and developed country for mutual benefits	KANSAI (NTPC in India once mentioned)	Category B: IERE C.O. to take care of this item (same as the above one).



TIS-Asia-GTC



Action to be taken (categorized into groups as follows) :

(A) Category A : May be done right away or in the very near future without too much difficulty. Need someone to take actions. Need to discuss with IERE Central Office & GTC Chair to finalize the working plan.

(B) Category B: Might be done in the near future if an agreement among the IERE Central Office and the GTC leaders(GTC Chair & leaders of GTC-1,2,3) can be made. Need someone to take actions. Probably need to discuss with IERE SC & TC to finalize the working plan.

(C) Category C: May be too difficult to carry out thoroughly at this time. Although some work can be done toward the goal, the completion of it may take many years without a guaranty of success. This item demands in-depth discussions among all GTC members and consultation with IERE SC & TC.

Part 4: Other recommendation(s) to GTC (such as your recommendation(s) on the improvement of “Linkage among individual GTC activities” and “Mechanisms to support activities” among members, how to expand the GTC-3 Website mentioned in item (2-3) above,··etc.)

B. Observation of the Questionnaire Investigation Results (Part 3)

Part 4 : Other Recommendation(s) to GTC

Part 4 : Other Recommendation(s) to GTC	Suggested by:	Actions to be taken:
1. For more effective activation of GTC in the future, IERE should introduce a plan to promote positive participation in GTC activities of IERE members. For example, IERE will award members contribution points, based on their level of participation in GTC activities and provide with a commendation to IERE members from IERE based on their annual contributions.	J-Power	Category B: J-Power to work out examples in the web-site contribution credit first and present to the next SC/ TC meeting.

Part 4 : Other Recommendation(s) to GTC

Part 4 : Other Recommendation(s) to GTC	Suggested by:	Actions to be taken:
2. Discuss with next TIS-Asia-SC chair, TNB Mr. Mohad Nazri Bin Suahruddin, Vice President (Generation), HAPUA-WG1(Generation) Project Coordinator and cooperate with HAPUA on the contact person or exact TIS-Asia-GTC member in Southeast Asia.	KANSAI	Category A: IERE C.O. to take care of this item.
3. Hold Seminar in TIS-Asia event or the other IERE event about some of technologies to gather information or discuss critical R&D point	KANSAI	Category B: IERE C.O. & GTC Chair & with GTC- 1/2 /3 leaders to discuss the details and take actions.
4. Establish Data Base to find the Advanced Technologies and who has this technology	KANSAI	Category C: IERE C.O. & GTC Chair to take care of this item.



C. Conclusions (Preliminary)

- 1 10 out of 17 of the GTC members responded to questionnaire sent by TPRI of Taiwan Power Co. Nine of them plus the IERE Central Office sent back their answer sheets (total number=10).
- 2 The goal of this questionnaire investigation (to invite suggestions and promote cooperative works of common interest) has been achieved successfully due to members' enthusiasm.
- 3 To set targets and make detailed plans for the new GTC activities in the coming third GTC meeting and in future, further discussions among IERE Central Office, GTC leaders (Chair and GTC-1,2,3 leaders) and related members are required.

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