



**Asia-Pacific
Economic Cooperation**

**APEC Training Workshop
Energy and Water Efficiency in Water Supply:
Practical Training on Proven Approaches**

**Workshop Report
Hanoi, Vietnam
9-10 March, 2010**

APEC Energy Working Group

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Workshop on Water and Energy Efficiency in Water Supply, March 9-10, 2010, Hanoi, Vietnam

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Background

There are large opportunities for energy and water savings in water supply and wastewater treatment systems. These opportunities remain largely untapped, especially those relating to the energy use in the supply of municipal water and wastewater services. Introducing energy efficiency programs can help reduce energy and water consumption, improve water services, and provide more revenue for system upgrades and new customer connections. These programs repay themselves rapidly, often within 1-3 years.

The Alliance coined the term “Watergy” to describe the strong link between water and energy in municipal water systems. Over the past 13 years, the Alliance’s Watergy Program has helped more than 100 cities in 9 countries realize significant energy, water, and monetary savings through technical and managerial changes in water supply systems—providing consumers with quality water while using a minimum of water and energy. The program helps municipal water utilities evaluate and implement appropriate interventions, such as optimizing pumping systems, improving motor efficiency, reducing leakage through pressure management, automating system controls, improving hydraulic operations using hydraulic modeling, and developing the metering and monitoring protocols needed for effective operations and maintenance. The accrued savings result in immediate improvements in water service, increased water delivery, reduced water and energy consumption, reduced greenhouse emissions, and more revenue for system upgrades and new customer connections.

Objective

The Alliance to Save Energy carried out a training program to introduce water utilities and municipalities in APEC economies to the benefits of improved energy efficiency in water supply and

wastewater treatment systems, and to build capacity in the developing member economies to carry out energy efficiency programs. The objectives were met through a training course and distribution of reference training materials.

Workshop on Energy and Water Efficiency in Water Supply

The *Workshop on Energy and Water Efficiency in Water Supply* was carried out on 9-10 March, 2010 in Hanoi, Vietnam. Invitations were sent to more than 100 water utilities/associations and energy services companies (ESCOs) from all 21 APEC economies. (A full list of APEC economies and invited organizations is provided in Annex 1.) 27 participants from 4 APEC economies—Vietnam, Philippines, Indonesia and Thailand—traveled to Hanoi to participate in the workshop (see Participants List, Annex 2). There was significant interest in attending from numerous other APEC economies, but attendance was limited by financing constraints.



The Workshop was carried out over two days (see Workshop Agenda, Annex 3). The first day consisted of a classroom-style training session covering the following topics:

- Introduction to Water and Energy Efficiency in Water Supply
- Energy Audit Methodology in Water Supply
- Energy Management in Water Supply Systems
 - Pumping Systems, Electrical Motors, Electrical Systems, Cost Analysis and Life-Cycle Costing
- Financing Options for Water and Energy Efficiency Projects and an Overview of Carbon Financing and Carbon Trading
- Energy Accounting, Metering & Monitoring
- Importance of Measurement & Verification (M&V)

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During the second day, the participants visited Hanoi Water Corporation's pumping station in Gia Lam. The participants toured the water treatment plant and then participated in a sample energy audit hands-on exercise. During the second half of the day, the data collected during the field study were analyzed and suggestions for efficiency improvements were discussed with the participants. At the end of the two-day workshop, all of the participants were issued a 'Certificate of Accomplishment' for successfully completing the training.



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Understanding the Pumping System



Water Flow Measurement

Training Reference Materials

All of the participants were given reference toolkits in the form of a printed booklet and a CD. The booklet contains copies of all of the presentations made during the two-day workshop and a life-cycle cost analysis spreadsheet. [The presentations are available at <http://ase.org/content/article/detail/6664>.]

The CD contains electronic copies of the presentations as well as the following technical reference materials:

Energy and Water Efficiency in Water Supply paper, revised edition, February, 2010

The paper includes the following key sections:

- Introduction: Challenges and Opportunities
- Technical and Managerial Approaches to Watergy
- Financing Watergy with Performance Contracting
- Watergy Case Studies

Manual for the Development of Municipal Energy Efficiency Projects

This manual, developed by the Alliance to Save Energy, serves as a practical tool for anyone interested in the development, financing, and/or implementation of a municipal energy efficiency project using a performance-based contract. The primary audiences for this manual are municipalities, water utilities, ESCOs and other efficiency service providers, and financial institutions. The manual is intended for public sector decision makers and lay audiences who want to better understand the project design process as a whole, as well as for those who need a detailed reference to guide them through the project development process. It provides a step-by-step methodology for developing and packaging a municipal energy efficiency project for performance contracting. Section A of the manual consists of a set of guidelines for the project development process, and Section B provides examples of procurement and contracting forms that can be used as templates in the preparation of documents necessary for identifying an efficiency service provider and securing financing.

Training Videos

1. Optimization of Municipal Water Pumping System Water & Energy Audits
2. Leak Detection Training

Feedback

After the two days of training, the trainers circulated a feedback form among the participants. The feedback results are shown in Figure 1 below. Overall, the participants were very satisfied with the workshop: 67 percent rated it as excellent and the remaining 33 percent rated it as good. A common suggestion for improving the workshop was to add more days (for a total 3-4 days) to enable the trainers to cover the material in more detail.

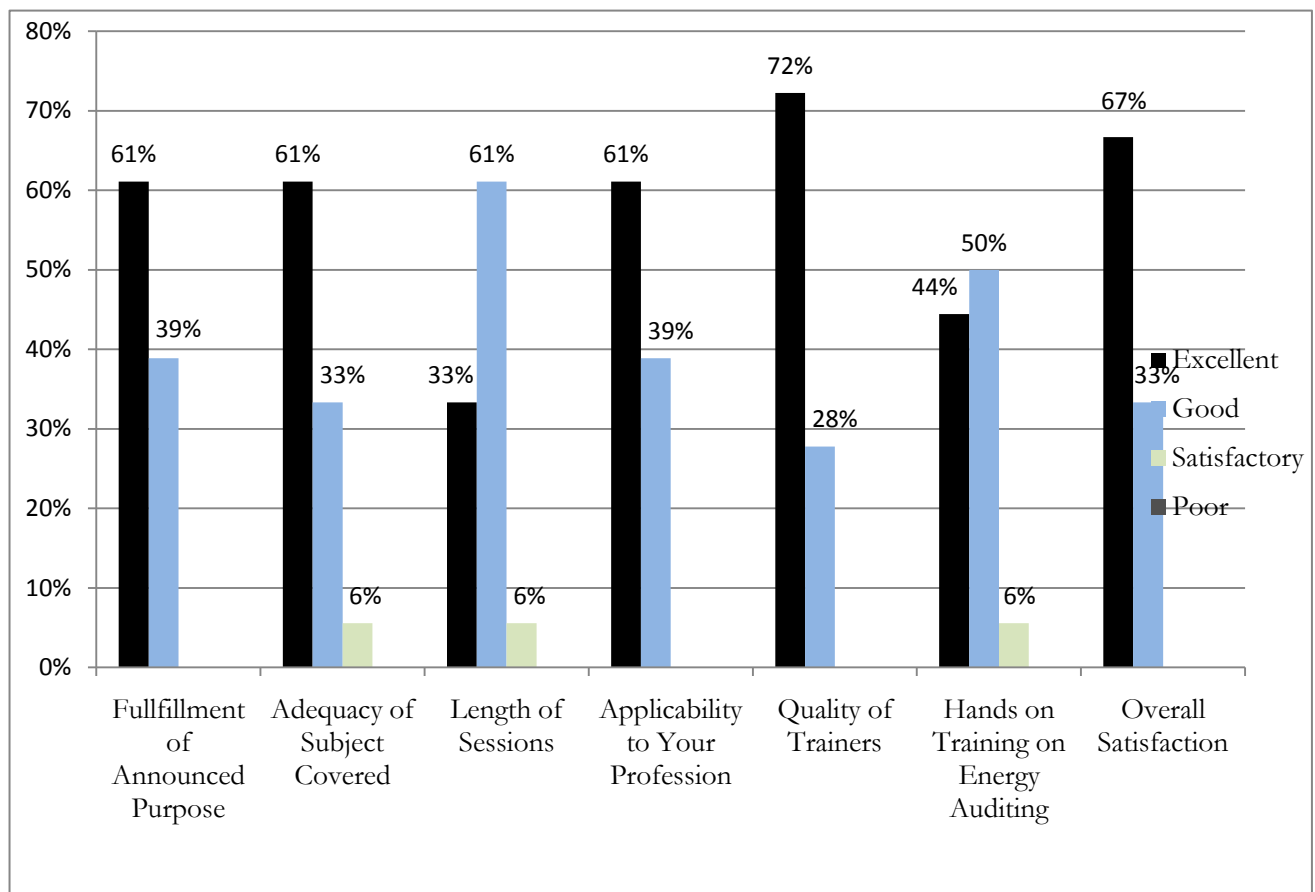


Figure 1. Workshop Feedback

Trainers' Profiles

Pradeep Kumar, Senior Technical Specialist, Alliance to Save Energy/India

Mr. Pradeep Kumar has more than 14 years of experience in the field of public and private sector energy efficiency, renewable energy and climate change mitigation programs. His expertise covers energy efficiency and Clean Development Mechanism (CDM) programs in buildings, water supply, and street lighting systems, small and medium enterprise clusters, and energy efficient equipment

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procurement. His technical expertise includes preparation of techno-economic feasibility studies, project assessment, and design and development of performance-based contract projects; investment grade energy audits; preparation of energy efficiency bid documents; and evaluation of proposals. He is also an expert in M&V of energy savings and greenhouse (GHG) emissions reductions, and has created replicable financing models for implementation of energy efficiency projects.

Mr. Kumar has conducted various energy efficiency and M&V training programs for decision makers and policymakers, engineers, managers, finance personnel, and energy efficiency project implementers. He is a Certified M&V Professional (CMVP) by AEE, USA and has published many papers on energy efficiency, M&V and carbon financing. He has developed energy efficiency manuals and guidelines, a road map, an M&V plan for ESCO projects, toolkits, tip sheets, and a best practices guide.

Sudha Setty, Senior Program Manager, Alliance to Save Energy/India

Ms. Sudha Setty has been instrumental in planning, coordinating, and implementing the Alliance to Save Energy's Watergy program in India and Sri Lanka since 2002. She is a senior energy efficiency professional who has worked effectively to advance the cause of efficiency at the highest levels of state government and is a highly respected member of the energy community in India.

Annex 1: Invitation List

Economy	Organization	E-mail/ Contact Info
Australia		
	City West Water	mgiesemann@citywestwater.com.au
Brunei Darussalam		
	Public Works Department	PWD Building, Old Airport Road, Bandar Seri Begawan BB3510, Brunei Darussalam
Canada		
	Canadian water and wastewater association	itsui@cwwa.ca
Chile		
	ESVAL	fottone@esval.cl
	National Association of Water and Sanitation Service Providers	www.andess.cl
People's Republic of China		
	Shanghai China Water Solutions Limited	cwc@chinawater.com.hk
	The Macao Water Supply Co., Ltd	oscar.chu@macaowater.com
	Yancheng China Water Company	davidjgao@gmail.com
	Zhengzhou Water Supply Corporation	shidongwen@sina.com
Hong Kong, China		
	Water Supply Department of Hong Kong	to_lee@wsd.gov.hk
	CLP	eddiewu@clp.com.hk
Indonesia		
	Palembang Water Supply Company	syaiful@tirtamusi.com
	Surabaya Water Supply Company	selim@pdam-sby.go.id
	PDAM Tirtanadi Medan	tirtanadi@pdamtirtanadi.co.id
	PDAM Tirta Pakuan Kota Bogor	pdam.pel@pdamkotabogor.go.id
	PDAM "Tirta Musi" Kota Palembang	tirtamusi@telkom.net
	PDAM Tirta Mayang Jambi	humas@pdamtirtamayang.com
	PDAM Tirta Benteng Kota Tangerang	am_kodri@tirtabentang.com
	PDAM Bandarmasih Kota Banjarmasin	Contact@pdambandarmasih.com
	Jakarta Water Supply	amie_gunawan@yahoo.com

	Regulatory Body (JWSRB)	
Japan		
	Kobe City Waterworks Bureau	makoto_matsushita@office.city.kobe.lg.jp
	Bureau of Waterworks, Tokyo Metropolitan Government	morooka-satoru@waterworks.metro.tokyo.jp
	Public Utility Services Center Co., Ltd	muguruma@puc.co.jp
	Tokyo Waterworks Service Co., Ltd	suzuki-mitsuo@tssk.jp
	Saitama Municipal Waterworks Bureau	shimazakifh@water.saitama.saitama.jp
	Japan water works association	kokusai@jwwa.or.jp
Republic of Korea		
	Daejeon Metropolitan City	jaeyeon@daejeon.go.kr
	Korea water resources association	master@kwra.or.kr
Malaysia		
	Perbadanan Bekalan Air Pulau Pinang Sdn. Bhd. (Penang Water Supply Corporation Sdn Bhd)	customer@pba.com.my
	Syarikat Bekalan Air Selangor Sdn. Bhd. (SYABAS	webmaster@syabas.com.my
	Sibu Water Board (Lembaga Air Sibu)	swbs@swb.gov.my
	Kuching Water Board	juliab@kwb.gov.my
	Jabatan Bekalan Air Negeri Kedah (Kedah Water Supply Department)	aduan@jbakedah.gov.my
	Sabah State Water Department	jans.hq@sabah.gov.my
	Taliworks Corporation Berhad	ars@taliworks.com.my
	Biwater (Malaysia) Sdn.Bhd. (Biwater Shellabear (Malaysia) Sdn.Bhd.)	biwater@po.jaring.my
	Metropolitan Utilities Corporation Sdn. Bhd.	mucsb@muc.com.my
	Indah Water Konsortium Sdn. Bhd.	taufiks@iwk.com.my
	Salcon Engineering Berhad	shhow@salcon.com.my
	Ranhill Utilities Sdn Bhd	zmg1@saj.com.my
	Puncak Niaga (M) Sdn Bhd	hktan@puncakniaga.com.my
	Penang Water Supply	ong@pba.com.my

	Corporation	
	Indah Water Konsortium Sdn Bhd	rashidr@iwk.com.my
Mexico		
	Organismo Operador de Agua Potable, Alcantarillado y Saneamiento de Morelia	enrique.sarmiento@oapas.gob.mx
	Water authority of Guanajuato city	teran_e@hotmail.com
	Guanajuato water commision	jvaron50@prodigy.net.mx
New Zealand		
	Water New Zealand	peter.whitehouse@waternz.org.nz
Papua New Guinea		
	PNG waterboard	enquires@pngwater.com.pg
Peru		
	Svalornas	mattias.niinsaari@svalorna.se
The Republic of the Philippines		
	Dipolog City Water District	pspaluca@dipologwater.gov.ph
	Metro Kidapawan Water District	Metrokidapawan_wd@yahoo.com
	Butuan City Water District	dong-bcwd@yahoo.com
	Cabanatuan City Water District	mariov@mozcom.com
	Mabalacat Water District	mwd@comclark.com,
	Angeles City Water District	rpcalara@acwaterdistrict.com mjnsicat@acwaterdistrict.com
	Leyte Metropolitan Water District (LMWD)	leytemetro@gmail.com
	Baliwag Water District	balwadis@yahoo.com
	Bacolod City Water District	baciwa@hotmail.com mfjarder@yahoo.com
	Davao City Water District	dcwd@davao-water.gov.ph www.davao-water.gov.ph
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	Orani Water District	gmbenni@oraniwd.com.ph www.oraniwd.com.ph
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	Manila Water Company, Inc	perry.rivera@manilawater.com
	Laguna Water District	plltabanao@laguna-water.com
	Davao City Water District	rng4163@yahoo.com
	Pagadian City Water District	eddieyorong@yahoo.com.ph
The Russian Federation		
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	Kaliningrad Regional Committee for Environment and Nature Resources	ecocom@baltnet.ru

Singapore		
	Public Utilities Board	chong_hou_chun@pub.gov.sg teo_bee_chong@pub.gov.sg
	IWA	Galant.Tanson@iwahq.org
Chinese Taipei		
	Taipei Water Department	twd032@twd.gov.tw
	Taiwan Water Corporation	hunantzer@mail.water.gov.tw
Thailand		
	Provincial Waterworks Authority (PWA), Thailand	pichayac@pwa.co.th wiset@pwa.co.th
	Department of Water Resources	siripong@dwr.go.th
	Metropolitan Waterworks Authority (MWA), Thailand	mwagov@mwa.co.th
	Sahapie Engineering CO.,LTD	sahapie@sahapie.com
United States		
	Contra Costa Water District	wbishop@ccwater.com; mrowan@ccwater.com
	American water works association	www.awwa.org
Vietnam		
	Department of Water Resources Management	cucqltainguyennuoc@hn.vnn.vn
	Phu Tho State-owned One-membered Water Supply Co., Ltd.	143 Tran Phu Street, Tan Dan Ward, Viet Tri City, Phu Tho Province, Vietnam
	Lam Dong Water Supply and Sewerage Co., Ltd.	No. 3 Dinh Tien Hoang, Da Lat City, Lam Dong Province, Vietnam
	Dong Thap Water Supply Company	1A Ton Duc Thang, Ward 1, Cao Lanh, Dong Thap Province, Vietnam
	Can Tho Water Supply and Sewerage Co. Ltd	2A Nguyen Trai Street, An Hoi Ward, Ninh Kieu District, Can Tho City, Vietnam
	Binh Duong Water Supply and Sewerage Company	Ngo Van Tri Street, Phu Loi Ward, Thu Dau Mot District, Binh Duong Province
	Saigon Water Corporation (SAWACO)	No.1, Cong truong Quoc te, District 3, Ho Chi Minh City, Vietnam
	Danang Water Supply Company	45 Ngo Gia Tu, Hai Chau I Ward, Hai Chau District, Danang, Vietnam
	Thua Thien Hue State-owned One-member Construction and Water Supply Co., Ltd.	30 Bui Thi Xuan, Thua Thien Hue, Vietnam
	Vinh Long Water Supply Company	02 Hung Dao Vuong Str., Ward 1, Vinh Long Town, Vinh Long Province, Vietnam

Hanoi Water Works	44 Yen Phu, Truc Bach Ward, Ba Dinh District, Hanoi, Vietnam
Water Supply Company of Ba Ria – Vung Tau Province	No 14, 30/4 Road, Ba Ria – Vung Tau Province, Vietnam
Hai Duong Water Supply Company	No. 8, Hong Quang Road, Quang Trung Ward, Hai Duong City
Nam Dinh Water Supply Company	55B, Cu Chinh Lan Road, Nam Dinh City, Nam Dinh Province, Vietnam
Tra Vinh Water Supply and Sewerage Company	521B, Dien Bien Phu, Ward 6, Tra Vinh Town, Tra Vinh, Vietnam
Ba Ria - Vung Tau Urban Sewerage and Drainage Company	No. 6 - 3/2 Str., Ward 8, Vung Tau City, Vietnam
Ninh Binh Water Supply	Vo Thi Sau Road, Dong Thanh Ward, Ninh Binh Town, Vietnam
Dong Nai Water Supply Construction Company	48 Cach Mang Thang Tam Str., Bien Hoa City, Dong Nai Province, Vietnam
Tien Giang Water Supply and Sewerage Company	4A, 30/4 Street, My Tho City, Tien Giang
Thanh Hoa One member Water Supply Company Ltd.	99 Mat Son, Dong Ve Ward, Thanh Hoa City, Thanh Hoa Province, Vietnam
Hai Phong Sewerage & Drainage Company	No. 1 Ly Tu Trong Street, Hai Phong, Vietnam
Soc Trang Urban Public Works Company	No. 38 Nguyen Hung Phuoc Street, Ward 1, Soc Trang City, Vietnam
Thai Nguyen One Member Water Business Company Ltd.	Ben Oanh Road, Trung Vuong Ward, Thai Nguyen City, Thai Nguyen Province, Vietnam
Water and Environment Joint Stock Company (WACO)	58 Au Co Road, Ward 9, Tan Binh District
Urban Drainage Company Hochiminh City	8 Bis Pham Ngoc Thach Street, District 3, Hochiminh City, Vietnam
RCEE Energy and Environment Joint-stock Company	ha.nguyen@rcee.org.vn
Vietnam Energy Service Joint Stock Company	minh.dinh@vesco.vn

Annex 2: Participants List

Workshop on Water and Energy Efficiency in Water Supply

Participants List

Participant	Organization
Dr. Firdaus Ali	Jakarta Water Supply Regulatory Body (JWSRB)
Ms. Rusdiati Utami	Jakarta Water Supply Regulatory Body (JWSRB)
Mr. Artemio F. Baylosis	Baliwag Water District
Mr. Roberto D. Estrella	Baliwag Water District
Mr. Edilberto E.Yorong,	Pagadian City Water District
Mr. Ramil A. Condez	Metro Kidapawan Water District
Dir. Susana A. Serquiña	Metro Kidapawan Water District
Mr. Genesis Garganian Tan	Manila Water Company, Inc.
Mr Thanit Laotrakoon	Sahapie Engineering CO.,LTD
Mr. Sikharin Tussanavisut	Sahapie Engineering CO.,LTD
Mr. Nguyen Vo Khoa	Ba Ria – Vung Tau Urban Sewerage and Development Company
Ms. Le Thi Thanh Thai	Ba Ria – Vung Tau Urban Sewerage and Development Company
Mr. Nguyen Than Ha	RCEE Energy and Environment Joint-stock Company
Mr. Dinh Thanh Minh	Vietnam Energy Service Joint Stock Company
Mr. Pham Quoc Toan	Vietnam Energy Service Joint Stock Company
Ms. Chi Thúy	South East Asia Water Utility Network
Mr. Tran Viet Cuong	Hai Phong Water Supply Company
Mr. Vu Van Tung	Hai Phong Water Supply Company
Mr. Tran Kim Thach	Sai Gon Water Corporation
Mr. Phung Chi Hieu	Gia Lam Water Treatment Plant
Mr. Ho Nhu Dat	Gia Lam Water Treatment Plant
Ms. Dao Thi Thu Thao	Ba Ria – Vung Tau Urban Sewerage and Development Company
Ms. Adelaida S. Yorong	Philippines
Hoang Anh	Hanoi University, Vietnam
Ngu Quyen	Hanoi University, Vietnam
Nguyen Xuan	Vietnam
Tran Van Thanh	Vietnam

Annex 3: Workshop Agenda

Workshop on Water and Energy Efficiency in Water Supply Agenda

Day 1- Tuesday, March 9, 2010	
Venue: Hotel Hilton Hanoi Opera	
8:00 am to 8:30 am	Registration
8:30 am to 8:35 am	Welcome Address <i>-Therese Näsman, Program Associate, Alliance to Save Energy</i>
8:35 am to 9:05 am	Introduction to Water and Energy Efficiency in Water Supply - Challenges and Opportunities <i>-Sudha Setty, Senior Program Manager, Alliance to Save Energy</i>
09:05 am to 10:00 am	Energy Audit Methodology in Water Supply <i>-Pradeep Kumar, Senior Technical Specialist, Alliance to Save Energy</i>
10:00 am to 10:30 am	Coffee Break
10:30 am to 12:30 pm	Energy Management in Water Supply Systems Pumping Systems, Electrical Motors, Electrical Systems, Cost Analysis and Life-Cycle Costing <i>-Pradeep Kumar, Senior Technical Specialist, Alliance to Save Energy</i>
12:30 pm to 01:30 pm	Lunch
1:30 pm to 2.45 pm	Financing Options for Water and Energy Efficiency Projects and an Overview of Carbon Financing and Carbon Trading <i>-Sudha Setty, Senior Program Manager, Alliance to Save Energy</i>
2:45 pm to 3:15	Energy Accounting, Metering & Monitoring <i>-Pradeep Kumar, Senior Technical Specialist, Alliance to Save Energy</i>
3:15 pm to 3:45 pm	Coffee Break
3:45 pm to 4.30 pm	Importance of Measurement & Verification (M&V) <i>-Pradeep Kumar, Senior Technical Specialist, Alliance to Save Energy</i>
4:30 pm to 5:00 pm	Q&A Session

Day 2- Wednesday, March 10, 2010	
Venue: Hanoi Water Works	
9:00 am	Bus Leaving from Hotel Hilton Hanoi Opera
10:00 am to 1:00 pm	Energy Audits in Water Utilities Brief Introduction on Energy Audit in Water Utilities Understanding Water Supply Operations as a "System" Energy Audit Instruments Demonstration Sample Data Measurement - <i>Bhaskar Mandalam and Pradeep Kumar</i>
1:00 pm to 2:00 pm	Lunch
2:00 pm to 4:00 pm	Data Analysis Sample Data Analysis "How to Arrive at Energy Conservation Measures" Investment Grade Energy Audit Report Contents Q&A - <i>Bhaskar Mandalam and Pradeep Kumar</i>