

# **P2E2: Pollution Prevention & Energy Efficiency, a Stimulus to Emissions Reduction and Growth**

## **Asia Clean Energy Forum**

**June 26-27, 2007**

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# **P2E2 Business Model: Key Concepts**

- Pollution Prevention and Energy Efficiency (P2E2)
- Closer Economic Partnership Agreement (CEPA)
- Environment Energy Service Company (EESCO)
- Performance Contract (PERC)
- P2E2 Technology
- Measurement and Verification (M&V)
- Financing
- Guarantee

# **P2E2 Business Model: Benefits**

- No upfront extra capital cost to end user for P2E2 technology upgrades
- Outsourcing of environmental compliance to EESCO
- More production from E2 technology upgrade
- Outsourcing of energy conservation to EESCO
- New revenues from shared cost savings
- Higher returns from P2E2 EESCO's for investors
- Enhanced corporate reputation for environmental protection
- Do P2E2 work in China, Get paid in Hong Kong

# P2E2 Business Model: Structure

- Parties:
  - EESCO (Environment Energy Service Company)
  - Suppliers of P2E2 Equipment & Technology
  - M&V (Measurement & Verification) Firm
  - End User (e.g., Factory, Power Plant or Real Estate Development)
  - Commercial Bank
  - Multilateral Development Bank  
(Asian Development Bank or International Finance Corporation)
  - Export Credit Agency (e.g., U.S. Export-Import Bank)
  - Investors (e.g., Private Equity Funds or Corporations)

*Continuation...*

## **P2E2 Business Model: Structure**

- Contracts
  - Guarantee Agreement
  - Performance Contract
  - Measurement & Verification
  - Firm Engagement Contract
  - Completion Support Contract
  - Equipment Supply Contract
  - Technical Performance Guarantee
  - Loan Agreement
  - Equipment Lease Agreement

*Continuation...*

## **P2E2 Business Model: Structure**

- Services
  - P2E2 Services
  - P2E2 Project Screening Advisory Services
  - Banking Services  
(Working Capital Loans, Trade Finance, Equipment Leasing)
  - Legal Services
- Control
  - M&V Services
- Payment
  - Third Party Escrow Account Management

# **P2E2 Business Model: EESCO Revenue**

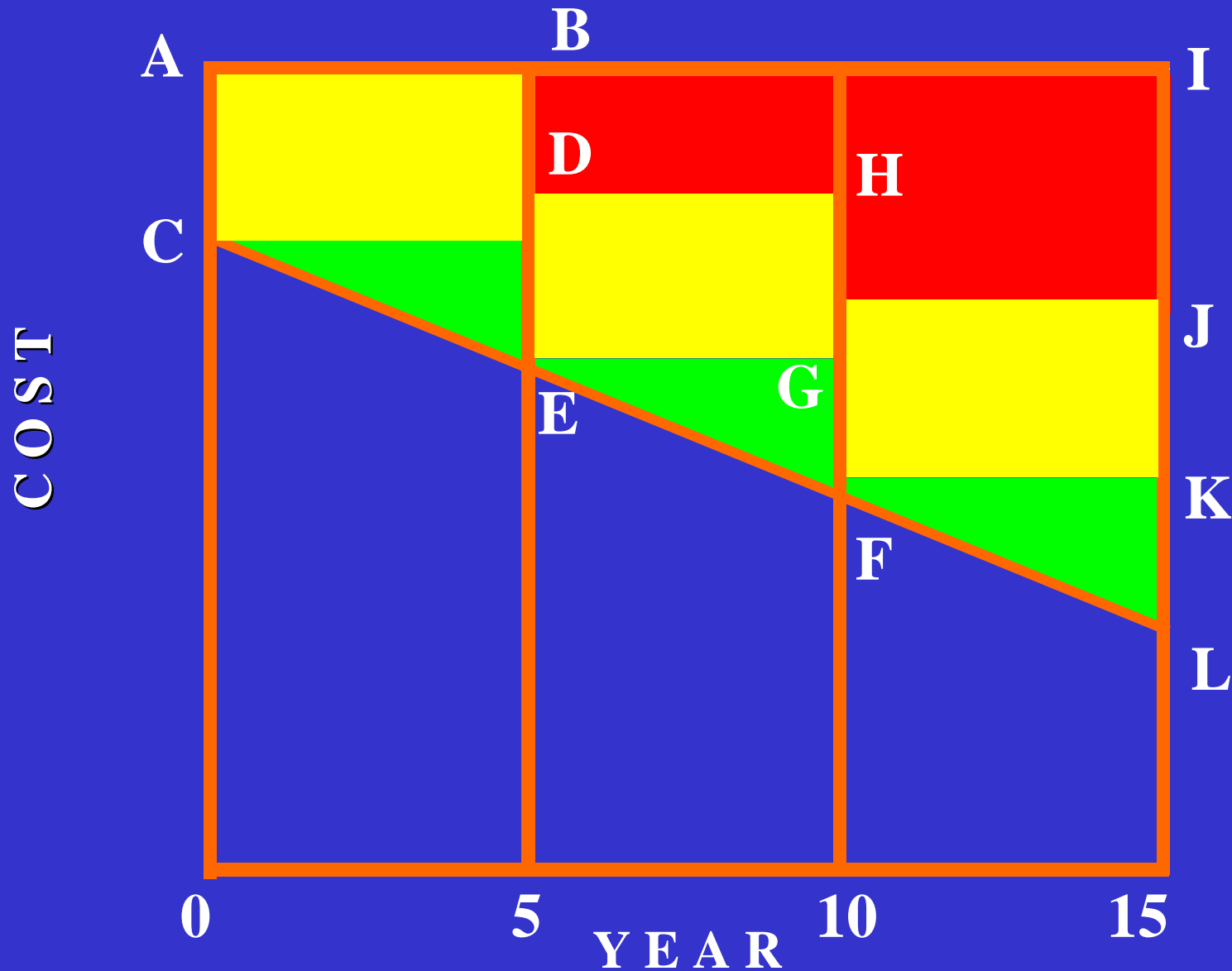
## **Cost Savings under a Performance Contract**

- Raw Materials
- Water
- Fuel
- Electricity
- Waste Treatment
- Resource Recovery
- Streamlined Operations
- Reduced Maintenance
- Healthcare Costs

## **Revenue Increases**

- Emissions Credits Sales
- Waste-To-Energy Tariffs
- Waste Treatment Products Sales
- Increased Output Sales

# PERFORMANCE CONTRACTING



# PERFORMANCE CONTRACTING: EESCO REVENUE

## Total Cost Savings

EESCO's debt service and EESCO's revenue: ACIL (red, yellow & green areas)

## Guaranteed Cost Savings

EESCO's savings guarantee customer's debt service and EESCO's revenue: ABCD, DHEG, GJFK (yellow rectangles)

Excess savings shared by customer & EESCO: CDE, EGF, FKL (green triangles)

## Shared Cost Savings

EESCO's debt service: ABCD, DHEG, GJFK (yellow rectangles)

Customer savings share and EESCO's revenue: CDE, EGF, FKL (green triangles)

## Declining Baselines

Years 0-5, 5-10, 10-15: AB, DH, GJ

Financial guarantees to secure EESCO's revenue: ABCE, DHEF, GJFL

## Energy Efficiency (E2) Cost Savings

Examples of energy savings possible in various sectors are:

U.S. Cement Industry 45%

California Cement Industry 22%

China Iron & Steel Industry 45%

Mexico Iron & Steel Industry 34%

U.S. Iron & Steel Industry 24%

U.S. Pulp & Paper Industry 37%

Source: Lawrence Berkeley National Laboratory, U.S.A.

# E2 Costs

<b>Industrial Facility</b>	<b>Annual Electricity Consumption GWh (Mn kWh)</b>	<b>Annual Electricity Costs – Guangdong</b>	<b>Annual Electricity Costs - China</b>
Medium steel plant (400-600 tons/year production)	800	RMB 600 Mn USD 72.64 Mn	RMB 360 Mn USD 43.58 Mn
Large cement plant (1.3 Mn tons/year production)	Over 100	RMB 75 Mn USD 9.08 Mn	RMB 45 Mn USD 5.45 Mn
Medium cement plant	50	RMB 37.5 Mn USD 4.54 Mn	RMB 22.5 Mn USD 2.72 Mn
Medium textile factory (raw cloth production)	20	RMB 15 Mn USD 1.82 Mn	RMB 9 Mn USD 1.09 Mn
Food processing plant	10	RMB 7.5 Mn USD 0.91 Mn	RMB 4.5 Mn USD 0.54 Mn
Metal / Electrical plant	10-50	RMB 7.5-37.5 Mn USD 0.91-4.54 Mn	RMB 4.5-22.5 Mn USD 0.54-2.72 Mn

RMB 8.26 = USD 1.00

Average electricity tariff in China:

RMB 0.40-0.50 / kWh

Average electricity tariff in Guangdong:

RMB 0.70-0.80 / kWh

# E2 Costs

<b>Industrial Facility</b>	<b>Annual Electricity Consumption GWh (Mn kWh)</b>	<b>Annual Electricity Costs – Guangdong</b>	<b>Annual Electricity Costs - China</b>
Toy plant	10-40	RMB 7.5-30 Mn USD 0.91-3.63 Mn	RMB 4.5-18 Mn USD 0.54-2.18 Mn
Electronics plant	10-30	RMB 7.5-22.5 Mn USD 0.91-2.72 Mn	RMB 4.5- 13.5 Mn USD 0.54-1.63 Mn
Plastics plant	5-20	RMB 3.75-15 Mn USD 0.45-1.82 Mn	RMB 2.25-9 Mn USD 0.27-1.09 Mn
Paper / printing plant	5-20	RMB 3.75-15 Mn USD 0.45-1.82 Mn	RMB 2.25-9 Mn USD 0.27-1.09 Mn
Textile factory (finished clothing production)	4-6.67	RMB 3-5 Mn USD 0.36-0.45 Mn	RMB 1.8-3Mn USD 0.22-0.36Mn
Footwear plant	1-5	RMB 0.75-3.75 Mn USD 0.09-0.45 Mn	RMB 0.45-2.25 Mn USD 0.05-0.27 Mn

RMB 8.26 = USD 1.00

Average electricity tariff in China:

RMB 0.40-0.50 / kWh

Average electricity tariff in Guangdong:

RMB 0.70-0.80 / kWh

# E2 Costs = EESCO Revenue

<b>Industrial Facility</b>	<b>% E2 Cost Savings</b>	<b>EESCO Revenue (Guangdong)</b>	<b>EESCO Revenue (China)</b>
Medium steel plant (400-600 tons/year production)	45%	RMB 270 Mn USD 32.68 Mn	RMB 162 Mn USD 19.61 Mn
Large cement plant (1.3 Mn tons/year production)	50%	RMB 37.5 Mn USD 4.54 Mn	RMB 22.5 Mn USD 2.72 Mn
Medium cement plant	50%	RMB 18.75 Mn USD 2.27 Mn	RMB 11.25 Mn USD 1.36 Mn
Medium textile factory (raw cloth production)	35%	RMB 5.25 Mn USD 0.63 Mn	RMB 3.15 Mn USD 0.38 Mn
Food processing plant	25%	RMB 1.87 Mn USD 0.22 Mn	RMB 4.5 Mn USD 0.13 Mn
Metal / Electrical plant	35%	RMB2.62-13.12 Mn USD 0.31-1.58 Mn	RMB1.57-7.87 Mn USD 0.18-0.95 Mn

# E2 Costs = EESCO Revenue

<b>Industrial Facility</b>	<b>% E2 Cost Savings</b>	<b>EESCO Revenue (Guangdong)</b>	<b>EESCO Revenue (China)</b>
Toy plant	25%	RMB 1.87-7.5 Mn USD 0.22-0.90 Mn	RMB 1.12-4.50 Mn USD 0.13-0.54 Mn
Electronics plant	35%	RMB 2.62-7.87 Mn USD 0.31-0.95 Mn	RMB 1.57- 4.72 Mn USD 0.18-0.57 Mn
Plastics plant	35%	RMB 1.31-5.25 Mn USD 0.15-0.63 Mn	RMB 0.78-3.15 Mn USD 0.09-0.38 Mn
Paper / printing plant	35%	RMB 1.31-5.25 Mn USD 0.15-0.63 Mn	RMB 0.78-3.15 Mn USD 0.09-0.38 Mn
Textile factory (finished clothing production)	25%	RMB 0.75-1.25 Mn USD 0.09-0.11 Mn	RMB 0.45-0.75 Mn USD 0.05-0.09 Mn
Footwear plant	25%	RMB 0.18-0.93 Mn USD 0.02-0.11 Mn	RMB 0.11-0.56 Mn USD 0.01-0.06 Mn

# EESCO Revenue: Sales of Credits for Emissions Reductions

## Chinese Coal Thermal Power Plant Emissions:

CO<sub>2</sub>: 920 kg per MWH

SO<sub>x</sub>: 10 kg per MWH

NO<sub>x</sub>: 2.25 kg per MWH

PM: 0.50 kg per MWH

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Total 932.75 kg per MWH

Adj. Total **7.20 metric tons CO<sub>2</sub> per day per MW**  
(= 300 kg/hr x 24 hours x 1/1000)

# **EESCO Revenue: Sales of Credits for Emissions Reductions**

## Sales of Credits for Reductions in CO2 Emissions

<b>Coal-fired Thermal Power Station</b>	<b>CO2 Emissions per Day in Metric Tons</b>	<b>100% CO2 Reduction Annual Revenue at \$22 per Metric Ton of CO2 Reduction</b>
<b>1,200 MW</b>	<b>8,640</b>	<b>\$ 69,379,200</b>
<b>600 MW</b>	<b>4,329</b>	<b>\$ 34,689,600</b>
<b>300 MW</b>	<b>2,160</b>	<b>\$ 17,344,800</b>

# EESCO Revenue: CO2 Emission Credit Sales (Table 1)

Coal-fired Thermal Power Station Size	CO2 Emissions per Day in Metric Tons	CO2 Emissions per Year in Metric Tons	100% CO2 Reduction Annual Revenue at \$3.60 per Metric Ton of CO2 Reduction
<b>1,200 MW</b>	<b>8,640</b>	<b>3,153,600</b>	<b>\$ 11,352,960</b>
<b>600 MW</b>	<b>4,329</b>	<b>1,580,085</b>	<b>\$ 5,688,306</b>
<b>300 MW</b>	<b>2,160</b>	<b>788,400</b>	<b>\$ 2,838,240</b>

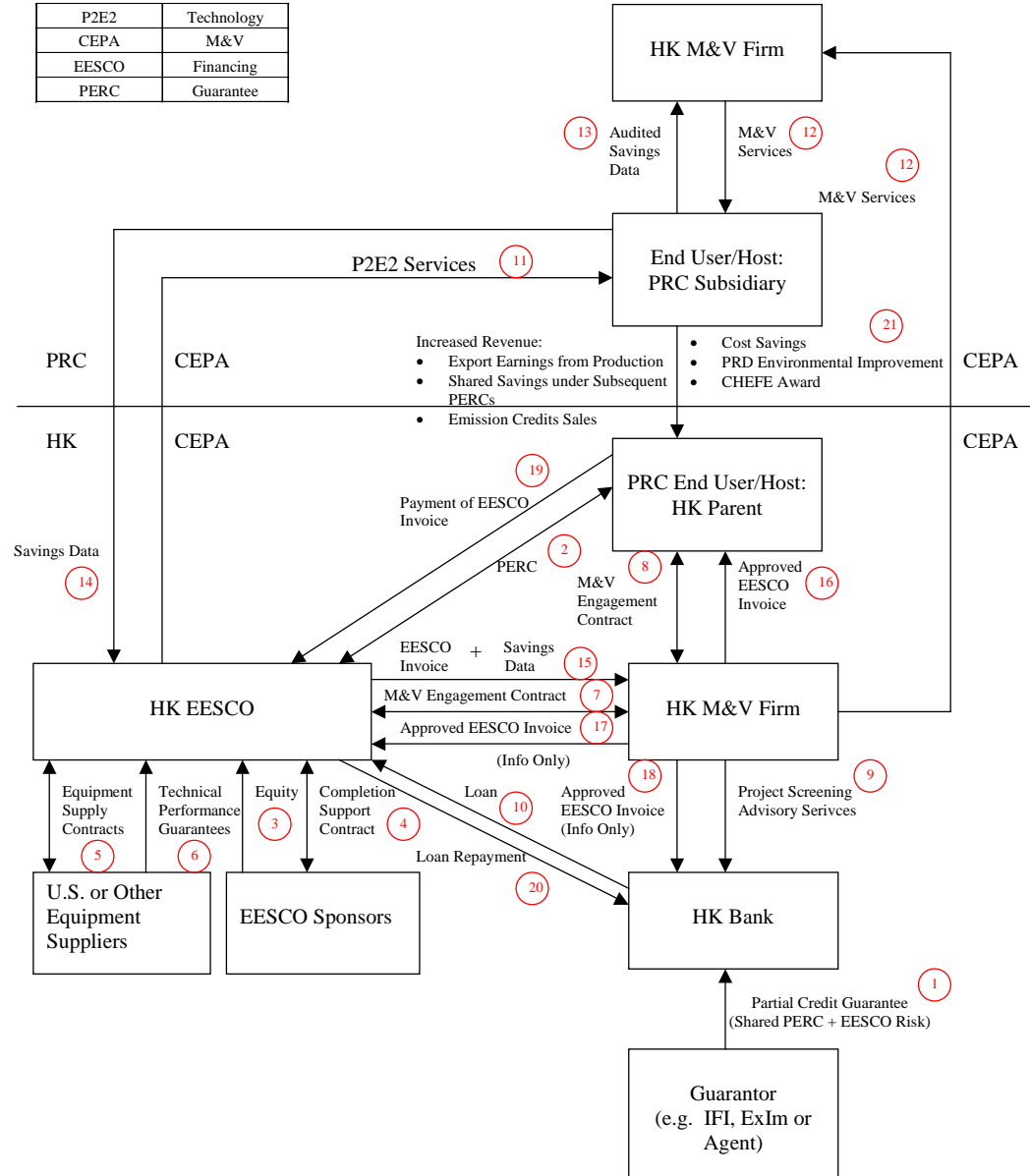
# EESCO Revenue:

## CO2 Emission Credit Sales (Table 2)

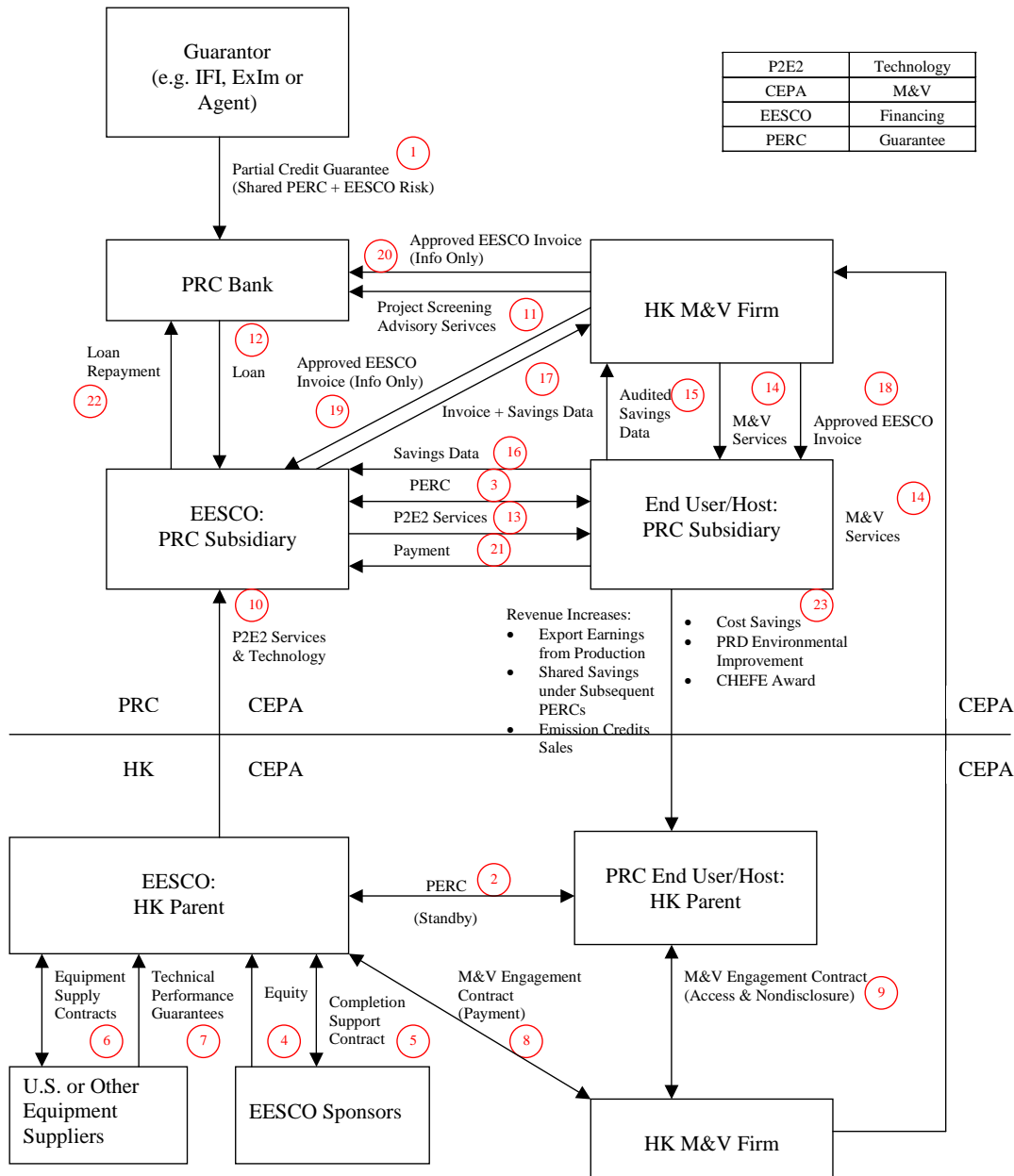
Coal-fired Thermal Power Station Size	CO2 Emissions per Day in Metric Tons (100% Emissions)	CO2 Emissions per Year in Metric Tons (85% Reduction)	85% CO2 Reduction Annual Revenue at a Price per Metric Ton of CO2 Reduction Adequate to Lease FGC, ESP & CEMS
<b>1,200 MW</b>	<b>8,640</b>	<b>2,680,560</b>	<b>\$ 37,527,840</b> (@ \$14/Ton) > \$36.3 Mn
<b>600 MW</b>	<b>4,329</b>	<b>1,343,072</b>	<b>\$ 22,832,224</b> (@\$17/Ton) > 21.7 Mn
<b>300 MW</b>	<b>2,160</b>	<b>670,140</b>	<b>\$ 14,743,080</b> (@ \$22/Ton) > \$14.2 Mn <sup>18</sup>

# PRD P2E2 Scenario : HK Bank

P2E2	Technology
CEPA	M&V
EESCO	Financing
PERC	Guarantee



# PRD P2E2 Scenario: PRC Bank



# Energy Efficiency Project Customers

## Commercial & Retail

- Commercial office buildings
- Shopping centers
- Hotels and resorts

## Industrial

- Aluminum
- Automotive
- Brickmaking
- Cement
- Ceramics
- Chemicals
- Electrical/Electronics
- Food processing
- Iron & Steel
- Metalworking
- Pulp and paper
- Textiles

## Institutional

- Airports
- Correctional facilities
- Government buildings
- Foreign Trade Zones
- Hospitals
- Industrial parks
- Municipal water/wastewater treatment plants
- Nonprofit organizations
- Power plants
- Science & Technology Parks
- Schools
- Telecommunications systems

## Residential

- Universities
- Multiple family housing
- Public housing authorities

# ESCO Services:

- ⇒ **Building Certification**
- ⇒ **Commodity Risk Management**
- ⇒ **Commodity Procurement**
- ⇒ **District Heating and Cooling**
- ⇒ **Energy Consumption Reduction**
- ⇒ **Electric Power & Gas Marketing & Brokering**
- ⇒ **Financing**
- ⇒ **Hazardous Waste Disposal**
- ⇒ **Indoor Air Quality Assessment & Amelioration**
- ⇒ **Installation**
- ⇒ **Measurement & Verification of Energy Consumption & Efficiency Measures**
- ⇒ **New Energy Supply**
- ⇒ **Operations & Maintenance**
- ⇒ **Power Quality Assurance**
- ⇒ **Total Facility & Asset Management**
  - **Training & Consulting**
  - **Water & Sewage Management**

# Energy Efficiency Projects

- ⇒ **Lighting projects**
- ⇒ **Reinstating outside air cycles on HVAC systems  
(Cooling commercial buildings)**
- ⇒ **Repairs of faulty equipment**
- ⇒ **Upgrades of equipment and infrastructure**
- ⇒ **Replacement of oil-fired boilers**
- ⇒ **Adoption of an “Energy Star” equipment purchase policy**
- ⇒ **Reducing waste through recycling**
- ⇒ **Adoption of a purchasing policy that minimizes packaging**
- ⇒ **Adoption of a policy of purchasing electricity from renewable services**

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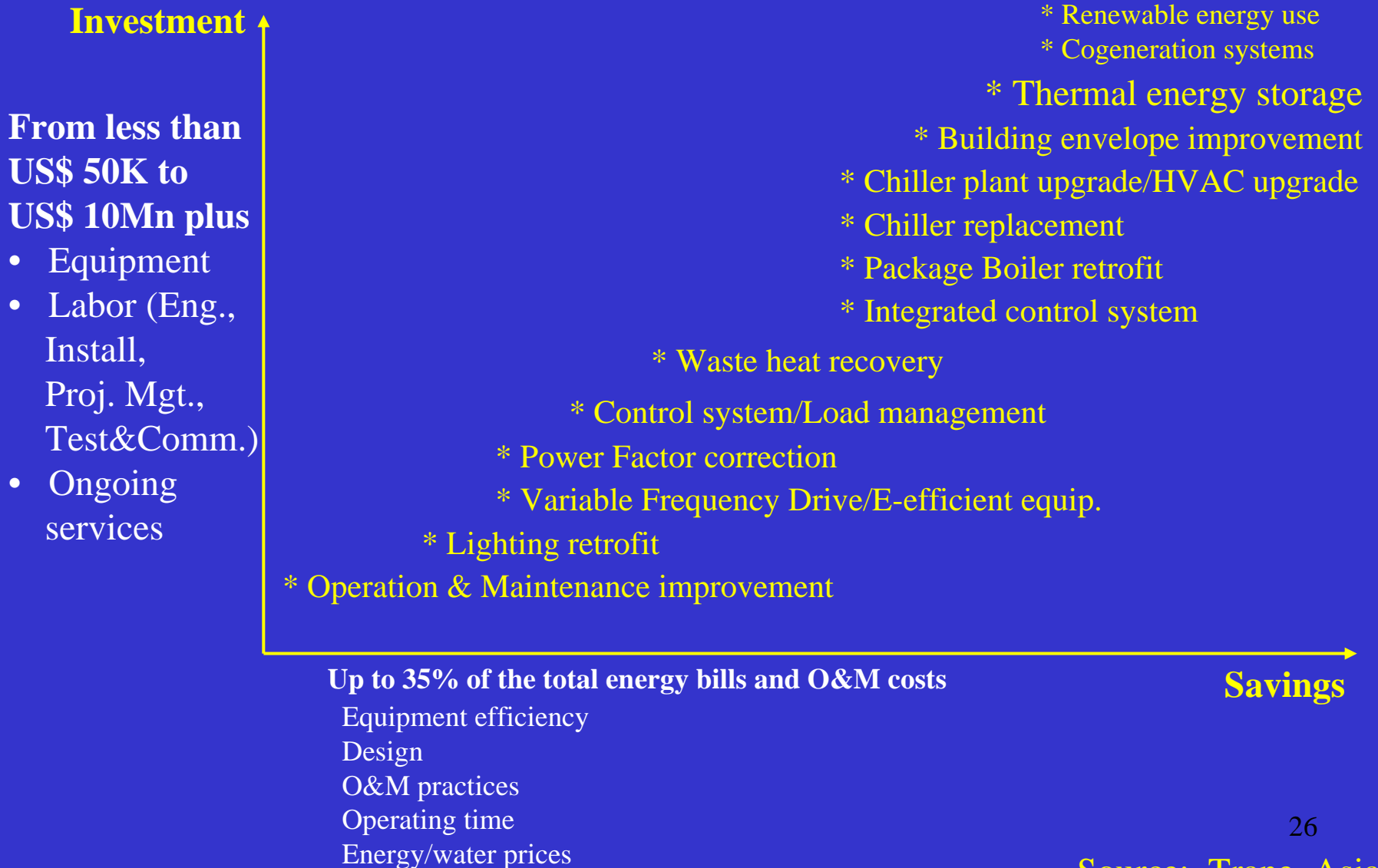
# Energy Efficiency Projects

- ⇒ Offering a largely renewables-based system to off-grid customers
- ⇒ Reducing network losses
- ⇒ Energy auditing, energy management consulting, cooperative GHG reduction challenge agreements and performance contracting
- ⇒ Programs that encourage cogeneration or fuel switching
- ⇒ Use of the International Performance Measurement and Verification Protocol
- ⇒ Upgrades of equipment: lighting, motors, HVAC, controls, engines & cogeneration systems

# Products Used in Energy Efficiency Projects

- Air distribution
- Boilers
- Chillers
- Cogeneration
- Control systems
- Distributed generation technologies
- Distribution transformers
- Electrical metering equipment
- Energy management systems
- HVAC products and services
- Lighting controls
- Lighting and electronic ballasts
- Measurement and monitoring equipment
- Motors, including integral horsepower motors
- Power monitoring equipment
- Power quality products
- Process head recovery
- Recycling
- Reflectors
- Software services
- Thermal storage systems
- Variable speed drives
- Water conservation programs
- Windows, doors & insulators

# PACT Energy Services Solution



## Leasing Costs

- Average 6% - 7% of total equipment cost per year
- EESCO leases equipment for use in P2E2 projects
- Leasing increases P2E2 project size, EESCO profitability and environmental benefits

# P2E2 Technologies

## For a P2E2 Power Generation Project

- Continuous Emissions Monitoring System
  - USD5 Mn purchase or USD300,000 annual lease
- Electrostatic Precipitator
  - U.S. Origin
    - 300 MW Plant: USD 27 Mn purchase or USD 1.89 Mn lease
    - 600 MW Plant: USD 48 Mn purchase or USD 3.36 Mn lease
    - 1200 MW Plant: USD 84 Mn purchase or USD 5.88 Mn lease
  - Chinese Origin
    - 300 MW Plant: USD 5.5 Mn purchase or USD 382,000 lease
    - 600 MW Plant: USD 9.1 Mn purchase or USD 636,000 lease
- Flue Gas Desulfurization Equipment
  - 300 MW Plant: USD 200 Mn purchase or USD 12 Mn annual lease
  - 600 MW Plant: USD 300 Mn purchase or USD 18 Mn annual lease
  - 1200 MW Plant: USD 500 Mn purchase or USD 30 Mn annual lease

# Sample P2E2 Technologies for a P2E2 Real Estate Project

- Air-Con System – monitoring system and purification system
  - USD 650,000 purchase or USD 45,500 lease
- Central Refuse and Recycling System
  - USD 1.0 Mn purchase or USD 70,000 lease
- Energy Efficient Glass Wall
  - USD 500,000 purchase or USD 35,000 lease
- LED Lighting System
  - USD 300,000 purchase or USD 21,000 lease
- Water Conservation System
  - USD 800,000 purchase or USD 56,000 lease

# **P2 Technologies**

## **For a P2E2 Real Estate Project**

- Water Efficiency Technologies
  - Non-chemical water treatment systems
  - Greywater irrigation systems
  - Rainwater catchment systems
  - Toilets, valves, cisterns & storage tanks
- Recyclables' Collection & Storage Technologies
  - Waste paper, glass, cardboard, plastics, metals

# P2 Technologies

## For a P2E2 Real Estate Project

- Recycled Content Products
  - Low polyethylene insulation
  - Recycled rubber & nylon carpets
  - Recycled content countertops
  - Recycled content ceramic tiles
  - Recycled content plastic shower partitions & toilets
  - Gypsum panels made from power plant waste
  - Fireproofing material made from gypsum, recycled EPS foam and recycled newsprint

# **P2 Technologies**

## **For a P2E2 Real Estate Project**

- Indoor Environmental Quality Products
  - HVAC load management control panels
  - Dehumidification / air filtration systems
  - Photocatalytic oxidation air purification systems
  - Low- or no-VOC adhesives, sealants and paints
  - Formaldehyde-free wheat straw wall paneling

# **P2 Technologies**

## **For a P2E2 Real Estate Project**

- Other P2 Technologies
  - Roof systems combining heat, power & cooling systems
  - Off-peak thermal storage cooling systems
  - Microturbine power systems

# P2E2 Case Studies

1. Power Generation
2. Cement
3. Food Processing (Brewery)
4. Manufacturing (Pharmaceuticals)
5. Manufacturing (Toys)
6. Manufacturing (Textiles and Apparel)
7. Metalworking (Chrome-plating)
8. Real Estate (Supermarket)

# P2E2 Case Study - I

<b>Country:</b>	<b>People's Republic of China</b>
<b>Sector:</b>	<b>Power Generation</b>
<b>Service Company (EESCO):</b>	<b>Focus Energy, Ltd. (Hong Kong)</b>
<b>End User:</b>	<b>Tongzhou, Coal-fired Power Plant and Weigang Gas-fired Power Plant, both in Jiangsu Province</b>
<b>Measurement &amp; Verification (M&amp;V) Firm:</b>	<b>None</b>
<b>Types of P2E2 Financing Used:</b>	<b>EESCO Self-financing plus Cost-sharing with the End User</b>
<b>Performance Contract Term:</b>	<b>4-year Energy Management Contract</b>

## **P2E2 Case Study – I (cont'd)**

<b>Annual Factor Usage Reductions:</b>	<b>6,142,100 Kilowatt-hours (KWh)</b>
<b>Annual Cost Savings:</b>	<b>RMB 3.1 million (\$US 375,303)</b>
<b>P2E2 Technology Potential Purchasing Power Using Hong Kong Leasing (Assuming 70% Cost Savings Carry Annual Lease Costs)</b>	<b>\$US 3,677,969</b>
<b>Annual Emissions Reductions:</b>	<b>5,528 tons of CO2 or 0.9 ton of CO2 per 1,000 KWh</b>
<b>Technology Solutions:</b>	<b>E2 upgrades on fans (forward, induction and cooling tower) and pumps (boiler feed and circulation).</b>

# P2E2 Case Study - II

<b>Country:</b>	<b>People's Republic of China</b>
<b>Sector:</b>	<b>Cement Production</b>
<b>Service Company (EESCO):</b>	<b>Focus Energy Ltd. (Hong Kong)</b>
<b>End User:</b>	<b>Guangzhou, Guangdong Province (1 of 7 cement production lines)</b>
<b>Measurement &amp; Verification (M&amp;V) Firm:</b>	<b>None</b>
<b>Types of P2E2 Financing Used:</b>	<b>EESCO Self-financing plus Cost-sharing with the End User</b>
<b>Performance Contract Term:</b>	<b>4-year Energy Management Contract</b>

## **P2E2 Case Study – II (cont'd)**

<b>Annual Factor Usage Reductions:</b>	<b>5,632,160 Kilowatt-hours (KWh)</b>
<b>Annual Cost Savings:</b>	<b>RMB 2,921,575 per production line</b> <b>(\$US 365,197)</b>
<b>P2E2 Technology Potential Purchasing Power Using Hong Kong Leasing (Assuming 70% Cost Savings Carry Annual Lease Costs)</b>	<b>\$US 3,578,931</b>
<b>Annual Emissions Reductions:</b>	<b>N/A</b>
<b>Technology Solutions:</b>	<b>E2 upgrades of fans (pulveriser and cooler) and draft blower</b>

# P2E2 Case Study - III

<b>Country:</b>	<b>People's Republic of China</b>
<b>Sector:</b>	<b>Food Processing (Brewery)</b>
<b>Service Company (EESCO):</b>	<b>Honeywell Energy Services</b>
<b>End User:</b>	<b>Tsingtao-Asahi Brewery Shenzhen, Guangdong Province</b>
<b>Measurement &amp; Verification (M&amp;V) Firm:</b>	<b>EESCO-End User Agreed M&amp;V Plan</b>
<b>Types of P2E2 Financing Used:</b>	<b>End User Finances EESCO &amp; Recovers Costs from EESCO-guaranteed Cost Savings</b>
<b>Performance Contract Term:</b>	<b>5-year Performance-based Energy Services Contract with Savings Split</b>

## **P2E2 Case Study – III (cont'd)**

<b>Annual Factor Usage Reductions:</b>	<b>17% Reduction in Site-wide Energy Use</b>
<b>Annual Cost Savings:</b>	<b>N/A</b>
<b>P2E2 Technology Potential Purchasing Power Using Hong Kong Leasing (Assuming 70% Cost Savings Carry Annual Lease Costs)</b>	<b>N/A</b>
<b>Annual Emissions Reductions:</b>	<b>N/A</b>
<b>Technology Solutions:</b>	<b>E2 upgrade, including heat recovery, biogas recovery, motor efficiencies, compressed air system &amp; refrigeration system efficiencies</b>

# Tsingtao-Asahi Brewing Company Shenzhen



August 21, 2006 , Shenzhen

## Background:

•Tsingtao upgraded their facilities with Honeywell's *performance contracting* model.

**The program included** a centralized control system to optimize energy management across the facilities including these specific measures:

- Heat recovery,
- Cooling and HVAC system,
- Biomass gas generation,
- Motor controller, and
- Refrigerant controller.

17% guaranteed energy reduction even though the customer had previously reduced energy usage by 10%

# P2E2 Case Study – IV

<b>Country:</b>	<b>People's Republic of China</b>
<b>Sector:</b>	<b>Manufacturing (Pharmaceuticals)</b>
<b>Service Company (EESCO):</b>	<b>Ventronics (HK) Ltd. (Hong Kong)</b>
<b>End User:</b>	<b>Guangdong Province</b>
<b>Measurement &amp; Verification (M&amp;V) Firm:</b>	<b>None</b>
<b>Types of P2E2 Financing Used:</b>	<b>EESCO Proposal</b>
<b>Performance Contract Term:</b>	<b>5 years</b>

## **P2E2 Case Study – IV (cont'd)**

<b>Annual Factor Usage Reductions:</b>	<b>N/A</b>
<b>Annual Cost Savings:</b>	<b>RMB 3,570,000 (\$US 446,250)</b>
<b>P2E2 Technology Potential Purchasing Power Using Hong Kong Leasing (Assuming 70% Cost Savings Carry Annual Lease Costs)</b>	<b>\$US 4,373,250</b>
<b>Annual Emissions Reductions:</b>	<b>N/A</b>
<b>Technology Solutions:</b>	<b>E2 upgrades of heating, refrigeration and air conditioning systems plus water recycling</b>

# P2E2 Case Study - V

<b>Country:</b>	<b>People's Republic of China</b>
<b>Sector:</b>	<b>Manufacturing (Toys)</b>
<b>Service Company (EESCO):</b>	<b>Inergi Corporation Ltd. (Hong Kong)</b>
<b>End User:</b>	<b>Shenzhen, Guangdong Province</b>
<b>Measurement &amp; Verification (M&amp;V) Firm:</b>	<b>None</b>
<b>Types of P2E2 Financing Used:</b>	<b>EESCO Self-financing</b>
<b>Performance Contract Term:</b>	<b>None</b>

## **P2E2 Case Study – V (cont'd)**

<b>Annual Factor Usage Reductions:</b>	<b>Electricity usage reduction</b>
<b>Annual Cost Savings:</b>	<b>RMB 946,180 (\$US 118,273)</b>
<b>P2E2 Technology Potential Purchasing Power Using Hong Kong Leasing (Assuming 70% Cost Savings Carry Annual Lease Costs)</b>	<b>\$US 1,159,075</b>
<b>Annual Emissions Reductions:</b>	<b>N/A</b>
<b>Technology Solutions:</b>	<b>E2 upgrade of plastic injection molding machines with “Intelligent Motor Controllers”</b>

# P2E2 Case Study - VI

<b>Country:</b>	<b>People's Republic of China</b>
<b>Sector:</b>	<b>Textiles and Apparel Manufacturing</b>
<b>Service Company (EESCO):</b>	<b>Inergi Corporation Ltd. (Hong Kong)</b>
<b>End User:</b>	<b>Guangdong Province</b>
<b>Measurement &amp; Verification (M&amp;V) Firm:</b>	<b>None</b>
<b>Types of P2E2 Financing Used:</b>	<b>EESCO Self-financing</b>
<b>Performance Contract Term:</b>	<b>None</b>

## **P2E2 Case Study – VI (cont'd)**

<b>Annual Factor Usage Reductions:</b>	<b>3,335 fewer fluorescent lamps in one factory</b>
<b>Annual Cost Savings:</b>	<b>RMB 456,206 (\$US 57,026)</b>
<b>P2E2 Technology Potential Purchasing Power Using Hong Kong Leasing (Assuming 70% Cost Savings Carry Annual Lease Costs)</b>	<b>\$US 558,855</b>
<b>Annual Emissions Reductions:</b>	<b>N/A</b>
<b>Technology Solutions:</b>	<b>E2 upgrade to production line lighting</b>

# P2E2 Case Study - VII

<b>Country:</b>	<b>People's Republic of China</b>
<b>Sector:</b>	<b>Metalworking (Chrome-plating)</b>
<b>Service Company (EESCO):</b>	<b>Focus Energy Ltd. (Hong Kong)</b>
<b>End User:</b>	<b>Shenzhen, Guangdong Province</b>
<b>Measurement &amp; Verification (M&amp;V) Firm:</b>	<b>None</b>
<b>Types of P2E2 Financing Used:</b>	<b>EESCO Self-financing plus Cost-sharing with the End User</b>
<b>Performance Contract Term:</b>	<b>10-year Savings Plan</b>

## **P2E2 Case Study – VII (cont'd)**

<b>Annual Factor Usage Reductions:</b>	<b>420 M3/day of water supply and 420 M3/day of wastewater treatment and related electricity usage reductions</b>
<b>Annual Cost Savings:</b>	<b>RMB 907,200 (\$US 113,400) per year in years 1-3 and RMB 3,758,040 (\$US 469,755) per year in years 4-10</b>
<b>P2E2 Technology Potential Purchasing Power Using Hong Kong Leasing (Assuming 70% Cost Savings Carry Annual Lease Costs)</b>	<b>\$US 1,111,320 per year in years 1-3 and \$US 4,603,599 per year in years 4-10</b>
<b>Annual Emissions Reductions:</b>	<b>N/A</b>
<b>Technology Solutions:</b>	<b>Industrial wastewater recycling system and recovery of saleable silver and nickel</b>

# P2E2 Case Study - VIII

<b>Country:</b>	<b>People's Republic of China</b>
<b>Sector:</b>	<b>Real Estate (Supermarket)</b>
<b>Service Company (EESCO):</b>	<b>Cinotech Solutions Ltd. (Hong Kong)</b>
<b>End User:</b>	<b>Guangzhou, Guangdong Province (45,900 sq. meter supermarket, office, car park and cold storage area)</b>
<b>Measurement &amp; Verification (M&amp;V) Firm:</b>	<b>None</b>
<b>Types of P2E2 Financing Used:</b>	<b>Consultancy Proposal</b>
<b>Performance Contract Term:</b>	<b>None</b>

## **P2E2 Case Study – VIII (cont'd)**

<b>Annual Factor Usage Reductions:</b>	<b>1,232,255 Kilowatt-hours (KWh) (Estimate)</b>
<b>Annual Cost Savings:</b>	<b>RMB 1,173,183 (\$US 146,648) (Estimate)</b>
<b>P2E2 Technology Potential Purchasing Power Using Hong Kong Leasing (Assuming 70% Cost Savings Carry Annual Lease Costs)</b>	<b>\$US 1,437,150</b>
<b>Annual Emissions Reductions:</b>	<b>N/A</b>
<b>Technology Solutions:</b>	<b>E2 upgrades of lighting and air-conditioning systems</b>

# Pamela Youde Nethersole Eastern Hospital

## Contract Period

❖ 1997 – 2005

## Main Energy Saving Strategies

- ❖ Building automation optimization
- ❖ Demand controlled ventilation
- ❖ Lighting retrofit
- ❖ Dehumidification by heat pump units (in Pathology Block)
- ❖ Variable speed drive implementation



Annual Saving  
HK\$7,000,000



CO<sub>2</sub> Reduction  
5,800tons

# Hong Kong University of Science and Technology

## Contract Period

❖ 1998 – 2007 (Phases I to III)

## Main Energy Saving Strategies

- ❖ Building automation optimization
- ❖ Demand controlled ventilation
- ❖ Lighting retrofit
- ❖ Chiller plant sequencing upgrade
- ❖ Variable speed drive implementation
- ❖ DDC control for lightings and fan coil units



CO<sub>2</sub> Reduction  
6,100tons

# Kwong Wah Hospital

## Contract Period

❖ 2000 – 2008 (Phases I to II)

## Main Energy Saving Strategies

- ❖ Heat pumps for domestic hot water
- ❖ Thermal storage
- ❖ New electric steam generators
- ❖ Dedicated Honeywell DDC controls
- ❖ Lighting retrofit
- ❖ Variable speed drive for heating plant pumps
- ❖ Heat pump dehumidifier
- ❖ Power factor correction for switch board



SINCE 1875

Annual Saving  
HK\$3,800,000



CO<sub>2</sub> Reduction  
3,800tons

# Citibank Plaza

## Contract Period

❖ 2003 - 2006

## Main Energy Saving Strategies

- ❖ Chiller plant control equipment upgrade
- ❖ Chiller sequencing modification



Annual Saving  
HK\$900,000



CO<sub>2</sub> Reduction  
750tons

# HACTL

## Contract Period

❖ 2006 - 2008

## Main Energy Saving Strategies

- ❖ Chiller sequencing modification
- ❖ Integration of chiller plants
- ❖ Heat pump for domestic hot water
- ❖ Flow optimization of sea water cooling
- ❖ Modification of spot cooling system at no-man zone

Annual Saving  
HK\$2,680,000



CO<sub>2</sub> Reduction  
2,700tons

# St. Teresa's Hospital

## Project Completion

❖ 2006

## Main Energy Saving Strategies

❖ Heat pump for  
dehumidification of OT rooms

Annual Saving  
HK\$500,000



CO<sub>2</sub> Reduction  
510tons



# Westin Resort, Coloane, Macau

## Cost Savings Achieved from Energy Management:

- electricity cost savings
- fuel (LPG cooking gas) cost savings
- fuel oil cost savings in the water heating system, which supplied the hotel's kitchen, laundry and guestrooms
- fuel (diesel) cost savings from the hotel's shuttle bus



Total Carbon Credits: 16,800 tons of CO2 annually

Energy Service Company: Energy Resources Management Hong

# P2E2:

## Obstacles to Implementation

- Lack of Hong Kong End User (Parent or Subsidiary)
- Lack of Hong Kong Performance Contract
- Lack of Financing from IFI's and Banks
- Lack of Familiarity with CEPA
- EESCOs' Lack of Familiarity with P2 Technologies
- End Users' Perceptions of Low Cost Savings
- End Users' Perceptions of Small Project Size
- End Users' Lack of Familiarity with Latest P2E2 Technologies
- Suppliers' Fear of Loss of Intellectual Property

# P2E2: Your Next Steps

- Talk to the U.S. Commercial Service in Hong Kong
- Assemble a Consortium (EESCO, M&V, Bank & Law Firm)
- Confirm Applicability of CEPA
- Meet Investors
- Meet End Users
- Carry Out Technical Assessments
- Obtain Suppliers' Technical Performance Guarantees
- Negotiate Performance Contracts
- Obtain Bank Financing (Working Capital Loans & Trade Finance)

## **P2E2: Your Next Steps**

- Obtain Lease Financing
- Start Work under the Performance Contract
- EESCO Invoices End User Based on Cost Savings
- M&V Firm Verifies EESCO's Invoice
- EESCO Receives Payment from Third-Party Escrow Account
- EESCO Repays Banks, Leasing Companies and Investors
- EESCO Monitors Actual Cost Savings, Revenue Increases and Environmental Benefits
- EESCO Upgrades P2E2 Technologies Supplied Over Time



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