



**Asia-Pacific
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**Session 6: Energy Efficiency Investment
Case Studies**

Energy Efficiency Management in the Russian Public Sector

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1



Perspectives of the Russian Economy

- Since 2000 after a decade of recession the Russian economy indicates a steady economic growth followed by higher energy demand
- National forecast envisages 4-5% average annual economic growth that would result to 2,5 -3,3 GDP growth by 2020 against 2000
- The Russian energy sector – as the major economic driver contributing 28% value added to GDP and 50% budget income-must be very efficient for meeting growing energy demand

2



The Main Targets of the Russian Energy Strategy by 2020

The strategy envisages by 2020 changes in TPES:

- > Share of natural gas will decrease from current 50% to 42-45%
- > Coal will gain share from 16% to 21-23%
- > Nuclear energy will rise from 5% to 6%
- Energy investments needed during 2002-2020 range from \$550 billion to \$700 billion

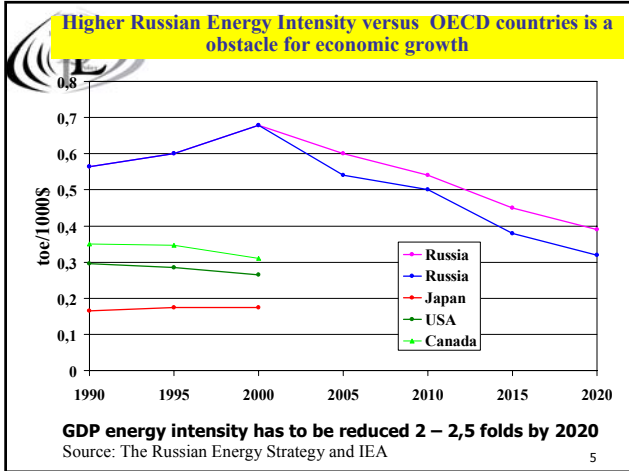
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The challenges of energy sector

- High energy losses and low energy efficiency at both supply and demand sides in the all economic sectors
- The shortage of investment, limiting the scale of compensating for the loss of productive assets in the FEC, modernizing and refurbishing the basic plants and equipments, and EE implementation
- Inefficient functioning of the energy monopolies, namely gas and power utilities
- Slow pace of market reforms and restructuring

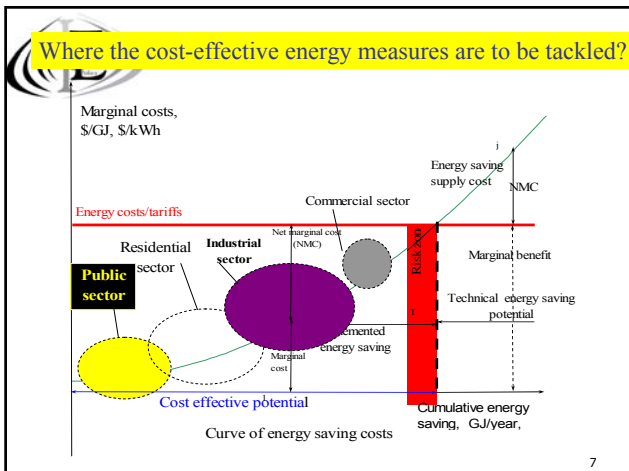
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Energy conservation technical potential

Sector	Power, bln kWh	Heat, mln Gcal	Fos. Fuel, Mtoe	TPES	
				Mtoe	%
Energy supply	29-35	70-80	69-77	84-94	33-31
Industry	110-135	150-190	34-44	77-98	31-37
Resident&public	70-74	120-135	36-42	66-77	27-26
Transport	7-11	-	15-18	16-21	6-7
Agriculture	4-5	5	6-8	8-10	3
Total	220-260	345-410	160-189	251-300	100

Source: The Russian Energy Strategy 6



- ### Heating efficiency is a prior cost-effective measure in public and residential sectors
- > Heat supply in Russia represents more than 30 percent of total energy demand (excluding transport)
 - > Large set of cost effective measures to save 25– 40% of heat consumption payments in buildings is available by:
 - Better metering and accounting
 - Installation of individual heating boilers
 - CHP deployment
 - Installation of controlling and regulating systems
 - Improvements of building's envelope through insulation of walls, roof and basement
- 8



Energy Efficiency Legislation

The Federal Law "On Energy Conservation" of 1996:

- Called for more accountability of producers and consumers and the inclusion of EE requirements in federal standards for equipment, materials, buildings and vehicles
- Requested the introduction of standardization, certification, and labeling of energy consuming technology and equipment
- Made energy audits obligatory for large companies and set a target for metering energy consumption
- Identified some mechanisms to promote EE investments
- Called for differentiated energy tariffs
- Relieved consumer of obligatory payment for contracted energy supplies if it due to EE consumed actually less

9



Federal Energy Conservation Programme

- In 1998 the the Government adopted the federal programme "Energy Conservation in Russia" that:
- Calls for reducing GDP energy intensity by 13.4% by 2005
- Refocuses the energy efficiency management efforts to regions and municipalities and calls their administrations to develop local programmes and projects
- Recognizes \$9.2 billion investment needs to be funded by private equity financing (47%), bank credits (30%), local budgets (20%) and only remaining 3% by the federal budget
- Focuses on voluntary energy-efficiency investment

However due to existing barriers in particular lack of funding and motivation of all the players the program's goals have not been fulfilled

10



The Federal Program "Energy Efficient Economy"

- The "Energy Efficient Economy" is the latest EE federal programme to be implemented up to 2010
- It has sub-programmes focused on various sectors, both supply and demand sides, public sector in particular
- Programme facilitates EE implementation through:
 - Managements and monitoring mechanism
 - Legal and institutional frameworks
- Programme investment needs amounts \$3 - \$5 billion in 2001- 2005 with very low budget funds allocated for end-use efficiency, in particular in public sector

11



Why energy in public buildings is used so inefficiently?

- Imperfection of legal and regulation frameworks
- Weakness of administrative structures
- and financial mechanisms
- Lack of incentives at both suppliers and consumers sides
- Aged and deteriorated of energy equipment used
- Lack of qualified specialists on EE

12

What is lacking for EE promotion in public sector?

- Metering, accounting and controlling systems
- Motivation of energy conserving and thereby saving public expenditures
- Means to control quality of provided energy services (e.g. inadequate heat supply at lower outdoor temperatures, and in contrary excess heat provision at warm days)
- Low price elasticity
- Public and private investment sources
- Guarantees for investments reimbursement, in particular in case of third party financing
- Guaranties for fulfilling legislations and regulations
- Justified and consistent energy pricing and tariff policy

13

Prospects of EE in federal public buildings

- Federal expenditures on energy and water supply amount to around \$2 billion
- The mayor public energy consumers are Ministries for:
 - > Defense,
 - > Education and Science
 - > Health Care
 - > Internal Affairs
- EE implementation would be allowing to reduce energy and water supply expenditures up to \$1 billion
- According to available experience and assessments the pay back period of budget investments in the most cost-effective EE measures is around 1-2 years

14

Regional and Municipality buildings


- High energy supply budget overburden is a common problem not only at the federal but at the regional and municipal levels
- For instance, Rostov regional budget expenditures for energy and water provision amounts to \$ 35 M, and for Norilsk city – \$2 M
- Many regional and municipality programs are targeted at public sector

15

What should be done for EE implementation in the public buildings?

- Establishment of the justified limits and norms for public energy and water consumption
- Strict government observance of obligations regarding public payments for energy services consumed
- Obligatory instrumentation of all public buildings with meters and controlling devices
- Allocation of public funds (federal, regional, municipal) for financing efficiency investments
- Motivation of consuming organizations in reducing energy payments, in particular allowing them using saved public expenditures for further EE implementation

16



What is done for energy management at the public building so far?.

Consumption Limitation:


By the governmental decree № 5 of 5 01 1998 “On provision on energy carriers and power of public organizations funded from the federal budget” **a limitation of energy consumption is imposed**

Thus, each budgetary entity should justify its annual energy demand based on average consumption of the last years taking into account result of energy audits of the similar type buildings and using available norms for energy consumption

Budget ensures funding the energy bills according to established limits

Hence, energy and water consumption that exceed the prescribed limits have to be paid from non-budgetary sources


17



Results of limitation

- For justification of energy limits a wide series of energy audits were conducted at the some representative buildings of various public sectors
- Limitation invokes a large scale company for installation of heat and water meters at the public buildings at the public expenses
- As a result of the limitation and meters installation substantial nominal saving in energy expenditures was achieved since factual heat and water consumptions were much less than established norms
- Reduced energy expenditures allows to fulfill the ongoing budgetary payment commitments and to refund previous non-payments

18




Motivating energy efficiency

By the governmental decree № 588 of 15 06 1998 “ On additional energy efficiency measures in Russia” incentives for energy efficiency implementation were ensured through development of sectoral, regional and municipal programmes

In particular, the federal authorities were prescribed:

- After the establishment of energy limits in physical and monetary terms **setting up** for public organizations energy saving targets to be fulfilled
- **Sustaining** the basic level of public funding of energy provision during a period one year exceeding the investment payback time since EE measures are implemented

19



Energy Saving Program of the Russian Ministry of Education for 1999-2005

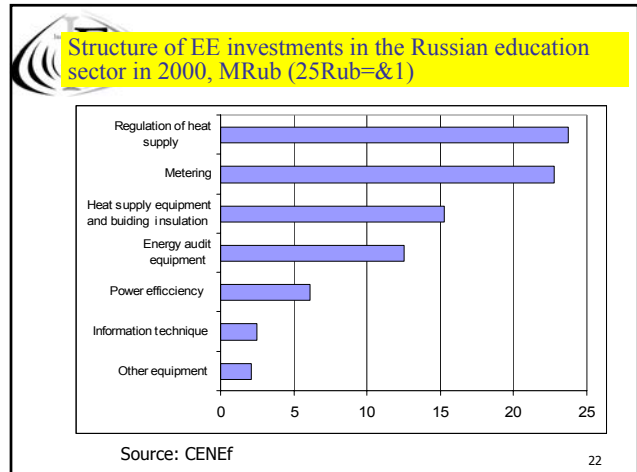
- The first large scale energy management program in public sector is under implementation by the Ministry of Education with participation of Ministry of Fuel and Energy, regional authorities and educational organizations
- The program covers 307 organization of 1000 total ones publicly funded while targets all levels of educational organizations - primary, secondary and high schools, colleges, universities and institutes
- Higher education institutions took the lead as downstream promoters of the Energy Saving Program

20

Major directions of EE program in educational sector

1. Developing legislative and normative documents facilitating realization of program
2. Developing typical accounting and reporting forms for energy consumption
3. Conducting energy audits, justification of consumption limits, identification of cost-effective measures
4. Preparing guidelines and recommendations on EE implementation based on the best practice and available experience
5. Manufacturing effective energy metering, accounting and controlling means and equipments
6. Creating centers for EE, certification and exploitation of energy equipment
7. Educating and preparing personnel, capacity building
8. Disseminating information

21



Results of energy management in the educational sector: lessons learned

- Limits become corresponding to established norms
- Budgetary energy non-payments trends to diminishing
- EE investments during 1999-2001 grows up from \$1 to 9B
- Budgetary EE financing attracts additional non-budgetary and private investments in a ratio 1 to 2,5
- Each Ruble of budgetary investment results to 5 Rubles saving of budgetary energy expenditures during the first five years of implementation only
- Reliability of energy system has been improved
- Saved financial sources allows to enhance a salary of employees and improve material and equipment provision

23

EE project for the Health Care Sector

- Under a grant of the UN ECE and with support of the Ministry for Energy an EE project have been launched in 2000-2001
- 13 hospitals of the federal, regional and municipal subordination were identified as a case objects to demonstrate EE prospects
- NGO Centre for Energy Policy and private ESCO “Negawatt” were nominated by ECE secretariat to be in charge of the project

24

Objectives of the ECE EE project in HCS

The mayor objective of the project were the following:

- Identifying a range of the typical no-cost and low-cost EE measures in the Health Care organizations based on result on the conducted audits and feasibility studies
- Developing EE investment project proposals in the HCS
- Demonstrating health care officials and senior hospital managers perspectives and benefits of EE
- Providing hospital managers a basic knowledge of technical and financial engineering features of EE project development and business planning
- Introducing mechanisms of using public budgets and attracting external third party funds for financing EE investments in the HCS

25

List of investigated hospital of federal regional and municipal subordination

1. The Moscow Medical Academy after Sechenov
2. The Moscow City Clinic Hospital N1
3. The Central district hospital in the Asino City of the Tomsl Oblast
4. Central medical and sanitarian department N 15 in the City of the Snezhinsk
5. The Russian State Medical University in the MC
6. The Moscow City Clinic Hospital № 4
7. The "Sevryba" Hospital in the Murmansk City
8. Republican Hospital for War Veterans in the Ulan-Ude (Bashkiria)
9. Regional Clinic Hospital after Semashko in the Nizhny Novgorod
10. The Central Medical and Sanitarian Department of the Zheleznogorsk City of the Krasnoyarsk Region
11. The R&D Institute for Physiopulmonology in the St-Petersburg
12. The Russian Cardiology Centre of the MC
13. The Research Centre for Cardiovascular Surgery after Bakulev, MC

Case of Moscow Medical Academy

	Heat, TJ	Power, MWh	Water, tcm
Consumption, 1997	445	5600	405
Share in payment, %	74	19	7
Saving cost-effective potential, %	40%	2	13

Total E&W payments in 2000 \$50 M. Source: ESCO Negawatt

27

EE third party financing case at the MMA

- ESCO "Negawatt" in 1999-2001 has implemented in the MMA a series of low cost energy saving measures using its own capital under an energy performance contract
- Following \$ 200 000 third party investments during a heating period of 2000-2001 has ensured savings of 190 000 USD in heat supply payment only
- Invested capital was reimbursed by the MMA administration from its lease revenues

28

EE Measures at the MMA to be Implemented			
	Measures	Investment need, USD	Annual saving, USD
Central Clinical Building	Installation of heat meters and plate heat exchangers Equipping operation and reanimation facilities with EE appliances	280 000	90 000
Central Heat Supply Unit	Installation of a heat metering unit and automated heat management system	85 000	100 000
Central control point	Control and management for heat consumption	50000	15000
Total		415 000	205 000

29

ECE' EE Project of Sevryba Hospital, Murmansk		
Measure	Investment, USD	Savings, USD/year
Installation of double glazed windows	56 000	14 500
Modernization of heating system	44 800	9 500
Reconstruction of the hot water supply system	25 400	8 500
Reconstruction of the ventilation system	13 800	3 500
Total	138 000	27500

30

Case of the Russian Academy of Sciences
<ul style="list-style-type: none"> ■ RAS is a core of the Russian R&D ■ Total staff 7500 ■ Floor area – 3, 6 M sq.m ■ Heat consumption – 2,2 Million GJ ■ Power consumption – 225 BWh

31

EE activity in the RAS
<ul style="list-style-type: none"> ■ Since 1999 EE program is under implementation ■ In 1999-2004 series of audits were conducted to adjust limits and identify cost-effective measures to be implemented ■ Since 1999 a database on energy consumption and EE potential is functioning for energy management of 250 institutes involved ■ Based on identified potential the RAS each FY allocates funds for implementing EE measures

32

Leasing scheme for decentralized heating and CHP

- Assessments justified the feasibility of installation of decentralized heating and CHP systems based at the modular gas boilers as a real tool for saving public expenditures
- Payback of investments into autonomous heating boilers is 4-5 years
- Boiler leasing scheme is promoted due to lacking own budget sources
- The first 9 MW boiling house financed by a leasing company is under implementation in the Pushino academic center 100 km far from MC

33

Energy management project in Petrozavodsk city

A project for energy management in public buildings is under implementation comprising 3 phases:

- I. Installation of 113 meters in all the schools and kindergartens with \$ 190k investments and \$163k annual budget saving due to nominal energy saving
- II. Heat supply control and regulation with \$ 30k investments and \$11 k annual saving
- III. Implementation of energy conservation measures financed through revolving fund with initial equity capital of \$220k and total 10 years investments of \$740k

34

Conclusion

- The “Energy Efficient Economy” programme and the New Russian Energy Strategy up to 2020 identify EE as a key priority for all economic sectors for securing future sustainable socio-economic development
- However in general a little is done to fulfill the EE targets established in both documents, in particular regarding public sectors
- Some positive results and experience gained at some sectors (e.g. Ministry of Education, Russian Academy of Science) have to be disseminated with extended scale of EE implementation

35

Conclusion (cont)

- Following the Ministry of Education there is a need to create in the other Russian sectors (Health Care, Defense, Foreign Affairs, the RAS) EE revolving funds and to attract additional third party financing
- A strong government will is needed to realize EE potential available in public sectors and thereby save budgetary expenditures
- More substantial public funding is necessary to trigger EE implementation and demonstrate that EE is not a declared but a real national priority
- Development and implementation of new EE investment financing schemes with involvement of local authorities and financial institutions are needed

36

Revolving Energy Funds: Experiences from Australia

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ICLEI Summary: International and Regional

- Focused on building capacity of local governments to achieve practical environmental improvements
- Headquarters is based in Toronto; offices in Melbourne, Tokyo and Seoul in the Asia Pacific region
- In ANZ, four offices (Melbourne, Adelaide, Perth and Wellington, NZ) totalling 32 staff
- International base of nearly 500 members with 76 member Local Governments and their associations in Australasia



Local Greenhouse Action in Australia

- 190 Councils in Australia with almost 60 at Milestone 5
- 7 years of Australian Federal government support
- 75% of the Aust population
- In Australia, 95 Councils involved in Cities for Climate Protection™ from July 99 - June 03 have:
 - Saved a cumulative total of 1.8 million tonnes of greenhouse gas emissions (equivalent)
 - Invested \$3.3 million in greenhouse jobs
 - Invested \$67 million in greenhouse abatement
- Through such projects as building retrofits, purchase of green -energy, methane gas extraction, changes to vehicle fleets, street lighting measures, energy efficiency in new sub-divisions and walking school buses.



The challenge: funding energy projects

- Internal competition for funds
- Bias against efficiency
- One year budgeting systems
- Often not seen as “core” business for local governments



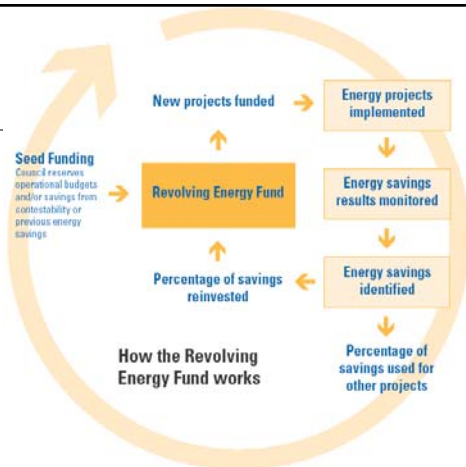
Financing Projects through Revolving Energy Funds

- Numerous councils have established Revolving Energy Funds including
 - Newcastle (NSW),
 - Rockingham (WA)
 - Manly (NSW),
 - Moreland, (Vic) and
 - Melville (WA)



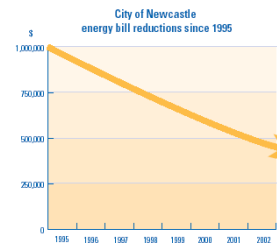
Rationale for Revolving Energy Funds

- Provides a long term stable fund
- Reduces internal competition for funds
- Provides an incentive for staff involvement in energy conservation if some funds are reinvested in the area that made the saving
- Focuses on data management systems which can have a powerful impact on energy reduction



City of Newcastle, New South Wales

- reduced its annual bill from \$1 million in 1995 to \$597 000 by June 2001 and placed the savings into REF



Manly

- Developed an internal loan that was paid back through energy savings
- Froze 1998 energy expenditure for five years and used real savings for new projects



Moreland

- Council resolved to invest \$250,000 saved in the contestability process for public lighting
- Operational savings are re-invested, with a proportion to the business unit involved
- Finance department manages the Fund



Melville

- 80% of all energy savings are allocated to this fund
- Actual savings are calculated after the fact
- Tend to focus on projects with a longer than one year payback



Corporate Actions

- Lighting retrofits
- LPG passenger fleet
- Dual fuel heavy vehicle fleet
- Lighting timing and sensors
- Water heating – reduced temperatures
- Air conditioning – temperature adjustments
- Water audits
- Staff awareness and training programs



Retrofitting of fluorescent light fittings in the City Administration Centre (CAC).



Corporate actions - Activating Energy Star

Willoughby Council - 55 computers, saved \$8,000 and just under 100 tonnes per year

Adelaide City Council - 370 computers, 45 copiers, 30 printers, saved \$25,000 and 177 tonnes per year



I.C.L.E.I
International Council for
Local Environmental Initiatives

Corporate actions - Public Lighting Efficiency

City of Port Phillip

Hi tech /energy efficiency foreshore and public lighting:

- Cost reduced by \$36 000/yr-3.5 yr payback
- 110 tonnes CO2
- Reduced maintenance costs



I.C.L.E.I
International Council for
Local Environmental Initiatives

Corporate actions - Water Heating

Frankston City Council (Vic) Arts Centre

Renewable energy project through solar hot water heating:

- \$6200 year saved in 1.8 year payback
- 42 tonnes CO2

North Sydney Pool Refurbishment

- Through solar hot water, timers, heat pumps, pool blankets
- Saving \$80 000/ year operating costs
- 500 tonnes CO2/year

I.C.L.E.I
International Council for
Local Environmental Initiatives



Low-Energy Office Building: Ministry of Energy, Water & Communications, Malaysia



Abdul Rahim Bin Mahmood
Energy Manager

Ministry of Energy, Water & Communications, Malaysia
01 August 2003



MALAYSIA'S ENERGY POLICY

The following policies constitute Malaysia's energy policy:-

- i. National Petroleum Policy (1975);
- ii. National Energy Policy (1979);
- iii. National Depletion Policy (1980);
- iv. The Four Fuel/Diversification Policy (1981); and
- v. Fifth Fuel Policy (2001).



NATIONAL ENERGY POLICY OBJECTIVES

- 1. Supply Objective : Adequate, secure & cost-effective supply
- 2. Utilisation Objective: Efficiency and productive use
- 3. Environment Objective: Minimise negative impacts



Main Thrust Under 8MP

Sustainable development of the energy sector aimed at contributing towards enhancing the nation's competitiveness and resilience

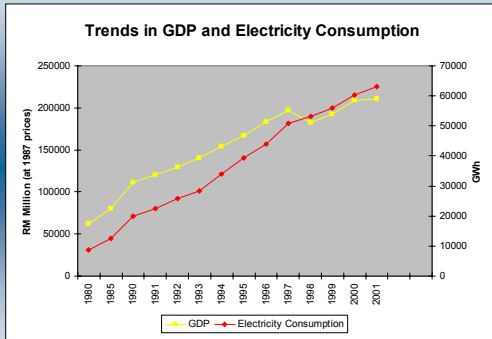
Strategy Under 8MP

Encourage efficient utilisation of energy in industrial and commercial sectors





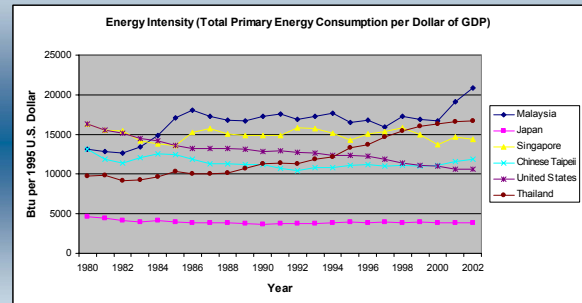
Why Energy Efficiency?



Source : National Energy Balance Malaysia 2001



Malaysia's Energy Intensity vs. Other Countries



Source: Table E1g – World Primary Energy Consumption (Btu), 1980-2002, Energy Information Administration, USA <http://www.eia.doe.gov>

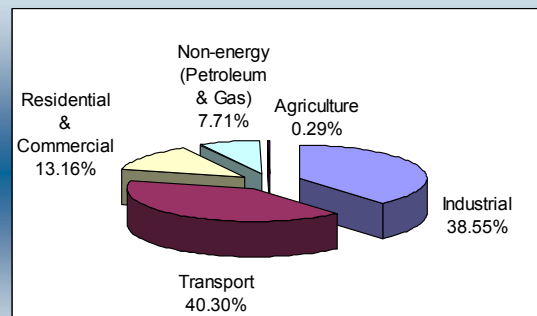


Malaysia's Future Without EE

- Net importer of oil by the end of the decade
- Increase in emission of GHG through burning of fossil fuels for power generation



FINAL ENERGY USE BY SECTORS



Source: National Energy Balance Malaysia, 2002





MEWC-LEO Building Project

Background:

- A demonstration project of **Energy Efficiency in Buildings**
- A project by the Gov. of Malaysia with technical input on Energy Efficiency from **DANIDA** (Danish International Development Assistance)
- Commitment of the Government on **"Leadership by Example"**
- Base Building Cost: **RM 50 Million (USD13.16M)**
- Construction Start Date: **March 2004**
Expected Completion Date: **September 2004**

Initial Constraints in MEWC-LEO Building Project

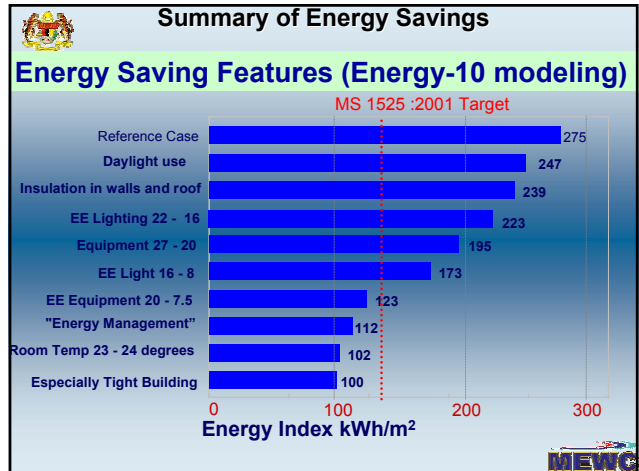
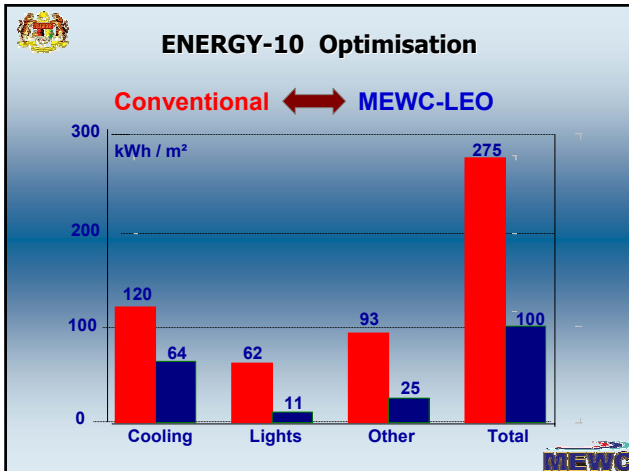
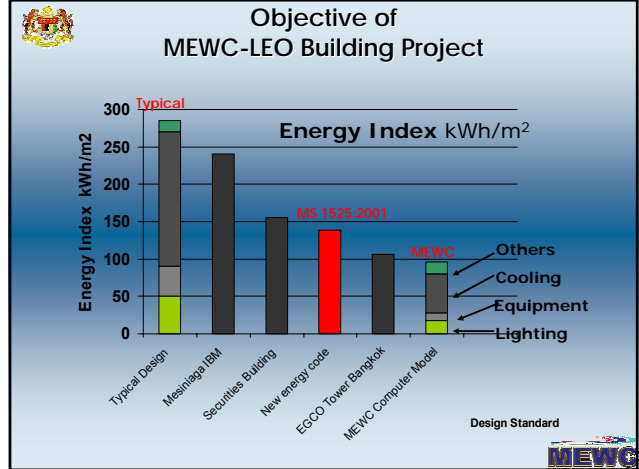
- Energy Efficiency features must be easily replicated in other Malaysian buildings
- Additional investment in Energy Efficiency should not exceed 10% of the base building cost
- Relevant authorities need to be convinced on the estimated cost savings.
 - Using simulations on Energy-10¹ software shows which EE parameters were critical and the estimated ROI.

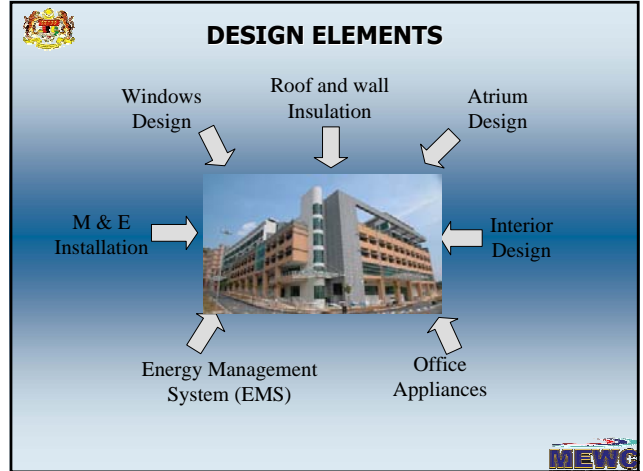
¹ developed by U.S. NREL

Objectives of MEWC: LEO Building Project

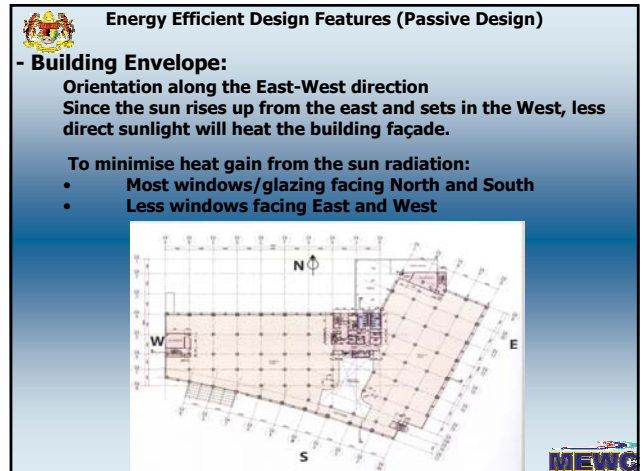
- An Energy Efficient, Intelligent Showcase Building Without Compromising User Comfort
- A Study and Research Opportunity for Professionals and Academics
- Enhance awareness on EE building design
- Increase local capacity in EE building design
- A Demonstration on the feasibility of EE design standards as stated in MS1525 :2001 Code of Practice on EE & Use of RE for Non-residential Buildings*, 136kWh/m² vs. 200-300 kWh/m²

* with reference to Guidelines for Energy Efficiency in Buildings, MEWC (1989)



-
- Energy Efficient Design Features**
- > **Passive Design Elements.**
 - Building Orientation.
 - Building Envelope.
 - Natural Air Ventilation.
 - Interior Space Layout Design.
 - > **Active Elements**
 - Air Conditioning & Mechanical Ventilation.
 - Innovative Lighting System.
 - Energy Efficient Office Appliances
 - Plug loads.
 - Comprehensive Energy Management System.



Energy Efficient Design Features (Passive Design)
Building Envelope:

INSULATIONS OF WALLS AND ROOF

Concrete Roof
 Above - metal deck canopy
 Under - 100 mm mineral wool (normal 25 mm.)

Walls:
 200 mm aerated concrete brick (normal 115 mm brick)
 OTTV - 34 W/m² (normal: 43 W/m²)

Punch Hole Windows: (600 - 1000 mm)
 -Better shading effect - deeper penetration of daylight

All glazing near facade- 12 mm light green glass.
 Provides more diffuse daylight but less heat -
 Visible light trans. = 65%.
 Solar Heat only 51% pass through

Energy Efficient Design Features (Passive Design)
Building Envelope – cont'd

Overall Thermal Transfer Value (OTTV)
 OTTV is a calculation to measure the level of heat absorb into the building

- Max. Base Building OTTV : 45 W/m² (Malaysian Standard - MS1525)
- Max. tender spec., OTTV : 35 W/m²
- Actual calculated OTTV : 31.4 W/m²


Energy Efficient Design Features (Passive Design)

Use of Natural Ventilation at the Atrium:


- ✓ Natural Ventilation Assisted by a Solar Chimney
- ✓ Provides Daylight Deep into the Building
- ✓ Computer simulation of air change of 6 to 10 ach


Energy Efficient Design Features (Passive Design)
-Interior Space Layout Design:

- Less intensive work area at the centre floor area.
- Most intensive work area near the façade.
- To maximise penetration and utilisation of daylight
- Effective zoning of interior spaces to minimise energy consumption
- Creating a comfortable ambience – bright and spacious interiors


 **Energy Efficient Design Features (Active Design)**


- Innovative Lighting Design:
 - Two circuit lighting system (room near the façade),
 - All lights in the room controlled by occupancy sensor.
 - Lights near the windows controlled by photo sensor which maximise the use of daylight
 - System integrated with Building Energy Management system.
 - Design luminance level in Offices : 350 lux
 - Proposed by MS 1525:2001* : 300 – 400 lux.
 - Base design requirement : 500 lux.



 **Energy Efficient Design Features (Active Design)**

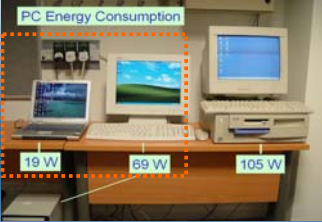

- Air conditioning System:
 - Zoning of cooling and control according to occupancy and load.
 - VAV boxes.
 - Variable speed drives (VSDs)
 - Room temperature control sensors
 - CO2 Sensors & Heat Recovery Heat Wheel
 - Helps to reduce cooling load of fresh air intake.
 - Temperature control set point : 24°C. (Acceptable comfort level)
 - Base design requirement : 22°- 23°C.
 - Proposed by MS 1525:2001* : 23°C – 26°C
 - Low Friction Losses design
 - Reduce installed CHW pump and Fan capacity and less energy consumption.




 **Energy Efficient Design Features (Active Design)**


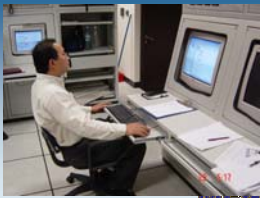

- Energy Efficient Office Equipment:
 - Plug Loads
 - Computer, Monitor, Printer
 - Copier, Fax
 - Advantages with EE equipment :
 - Reduced electricity load.
 - Reduced cooling load
 - Achieved Total Small Power Density,
 - Base design requirement = 20.0 W/m²
 - Calculated small power density = 11.5 W/m²

Recommended by **“Energy Efficient Office Equipment Procurement Guideline”** by DANIDA

 **Energy Efficient Design Features**

- Building Energy Management System:
 - A comprehensive Energy Management System
 - Individual Monitoring of cooling, Lighting, Equipment per floor
 - Continuous monitoring and optimization
 - An Energy Manager has been employed



Conclusions

- The building and the system design were analyzed and optimized using ***Building Integrated Design Concept***.
- A comprehensive list of EE features were integrated in the project tender
- Seminars have been successfully conducted to promote the awareness of EE in Buildings using the MEWC-LEO building as a reference
- Increased interest on EE among the Professionals and Academia due to MEWC-LEO building as many visits have been conducted while the building is still being constructed



Conclusions (cont'd)

- Low Energy Offices (based on the Malaysian Standard, MS1525 : 2001) is economically feasible as proven by the MEWC-LEO building project. It is estimated that with **10% extra cost investment on the EE features, 50% energy savings** and less than **10 years payback** can be achieved.
 - Base Building Costs: RM50 Million
 - Investments : RM 5.0 mil. (10% of building costs)
 - Costs Net Savings : RM 0.60 mil. /year
 - Pay-back : 8 years
 - *Equipment life : 15+ years
 - *Building life : 50+ years
- Thus, energy-efficient buildings make sense not only in terms of savings on bills but also on the environments which is priceless.



For more details, visit our website:

<http://www.ktkm.gov.my/>

or

<http://www.mecm-leo.gov.my/>

THANK YOU

