FINANCING LARGE SCALE ENERGY EFFICIENT (EE) LIGHTING PROGRAMS: GLOBAL EXPERIENCES

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Types of Financing for Efficient Lighting Programs

- Public Investments (by Government and electric utilities)
- Support from Development Finance Institutions such as the World Bank (through low interest loans and grants)
- Support from Global Climate Finance Mechanisms
  - Carbon Finance – Clean Development Mechanism
  - Nationally Appropriate Mitigation Actions (NAMAs)
  - Clean Technology Fund (CTF)
  - GEF

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Large-Scale Programmatic Deployment of CFLs

- Replacing Incandescent Lamps with High Efficiency CFLs for Grid-based DSM (Distribution – Free or Subsidized)
- **Era of 1990s thru' mid-2000s (Demonstration/Pilots)** -- Poland, Mexico (1995-1998, GEF support), Continued with IFC – GEF in Argentina, Czech Republic, Hungary, Latvia, Peru, Philippines, South Africa (2002-2005, Efficient Lighting Initiative http://www.efficientlighting.net), Sri Lanka (1995), Vietnam (2001-07), w/GEF.
- **Era of mid- 2000s onwards (Large Scale Deployment) -** Uganda, Rwanda, Senegal, Morocco, Uruguay, Argentina, Pakistan, Bangladesh, Mexico, Mali, Ethiopia, etc. (with World Bank funds, blended along with GEF, Carbon Finance and/or CTF funds)
- Many other large scale CFL programs in recent years: China, Ghana, Cuba, Venezuela, India, Philippines, Malaysia, Russia, and South Africa.
- **MW savings could be as low as 1/40th the cost of supply sources (diesel)**
- **Dramatic Fall in CFL Price – from >$7 (1995) to <$1 (2009-10)**
- **Significant GHG emissions reduction and lowering of consumer utility bills, with <1 year payback periods.**

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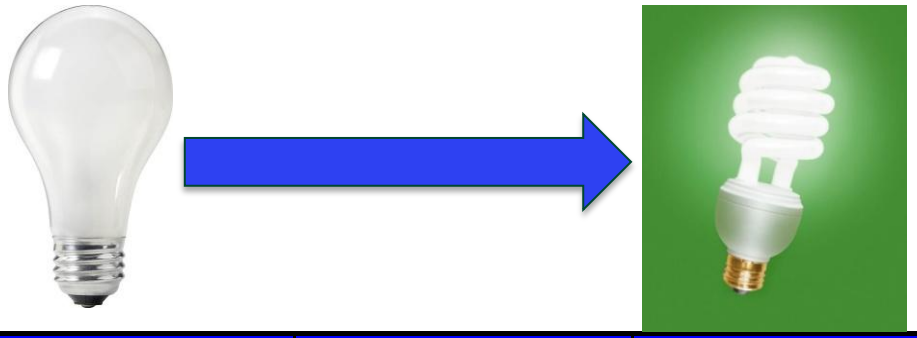
Examples of Large Scale CFL Programs
Costs & Impacts

Program	Year	Procurement Size	Bulk Price
Vietnam - Phase 1	2004	300,000	1.07
Vietnam - Phase 2	2005	700,000	0.98
Uganda	2006	800,000	1.10
Rwanda	2008	200,000	1.00
Ethiopia	2009	4,500,000	0.87
Bangladesh*	2009	10,500,000	0.94 for 13-14W, 1.04 for 20-23 W
Philippines	2009	5,000,000	0.87

**Note - Bangladesh procured 3.3 million 13-14W and 2.2 million 20-23W CFLs.*

Additional 5 million CFL to be procured in 2010.



Country	No. of CFLs Installed	Reported Peak Load Reduction
Vietnam	1,000,000	33 MW
Uganda	800,000	30 MW
Sri Lanka	600,000	34 MW
South Africa	2,700,000	90 MW
India-BELP	300,000	11 MW

Source: World Bank CFL Toolkit: **http://www.esmap.org/esmap/cfltoolkit**

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Approach for CFL Program Designing, Financing & Implementation -Key Steps

Program Design Steps

- Conduct Residential Consumer Survey
- Design and initiate consumer awareness program
- Design of CFL Distribution System (through either utility or private channels)
- Design of Procurement/ Bidding Package (eg., numbers, sizes of bulbs, phasing issues, technical specs, etc.)
- Project finance and integration of other financial incentives (CDM, GEF, etc.)

Program Implementation Steps

- Bulk procurement (eg., thru' ELI specifications/vendors)
- Distribution through either utility or private channels
- Dedicated DSM cell within utility (eg. in commercial department)
- Continued consumer awareness program
- Monitoring and impact evaluation
- Provision for enhancing CFL testing facilities
- Environmental Safeguards and Recycling Issues

Integrating Carbon Credits into Financing Large Scale CFL Deployment Programs

- CFL deployment programs driven mainly by energy security objectives
- Both project and programmatic CDM are applicable to large scale CFL programs
- Carbon prices are currently low, and have relatively little impact on economics of investment
- CDM Methodology is limited to CFLs only
- Post-2012 CDM limited to very low income countries
- Integration of CDM has implications on increasing transaction costs due to stringent CDM methodological requirements (baseline, additionality, monitoring and verification, etc.)
- CDM (especially project based) could delay the implementation (as processing requirements are intensive)
- New approaches such as programmatic CDM and broader climate finance instruments like NAMAs, CTF, etc help reduce transaction costs

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A Closer Look at Five Large Scale Efficient Lighting Projects in the Developing Countries

- Mexico
- Rwanda
- India
- Bangladesh
- Bahrain

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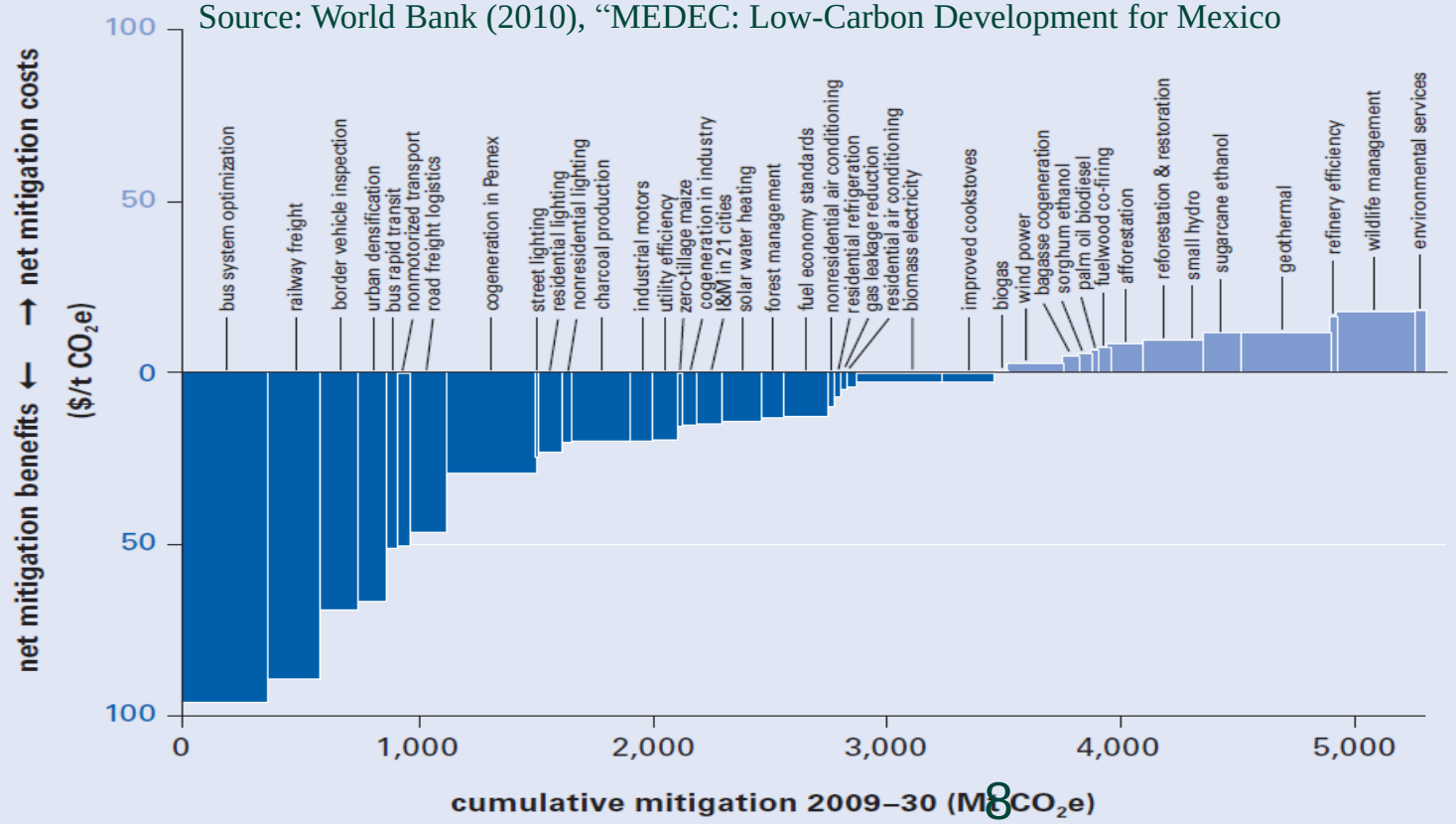
Mexico Residential Sector CFL Program…1

- Residential sector - 26 % of total electricity use.
- Substantial energy efficiency improvement potential:
  - Lighting - 19.2 TWh
  - Household equipment - 6.6 TWh

Mexico has embarked on an aggressive program of energy efficiency that is integrally linked to its climate change agenda.

Figure 2 Marginal Abatement Cost Curve

Source: World Bank (2010), "MEDEC: Low-Carbon Development for Mexico



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Mexico Residential Sector CFL Program…2

Government of Mexi
(SENER)

Source: Mexico EE Lighting and Appliances project of the World Bank

In urban areas, a turnkey bundled procurement implementation scheme will be used initially, targeting low-income families identified by electricity consumption data.**

In rural areas, **SENER** will work with an **operator** (FIDE/FIPATERM) to bulk procure the CFLs, and work with **DICONSA** (store that reaches these areas) for CFL distribution and IL collection.

*** SENER** did international tendering for the supply and distribution of 22 million CFLs in January 2011.*

$$$ World Bank

$$$ Carbon Finance

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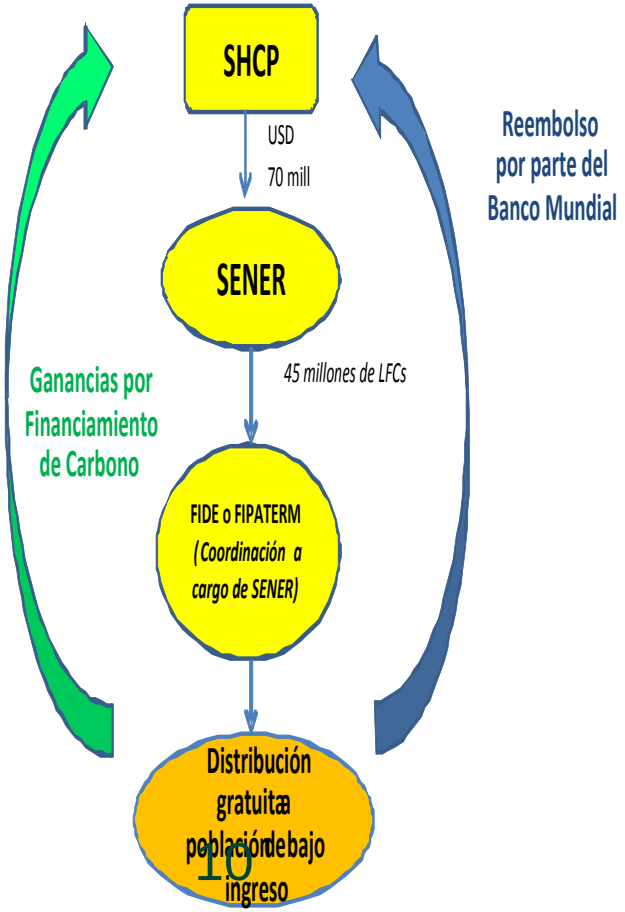
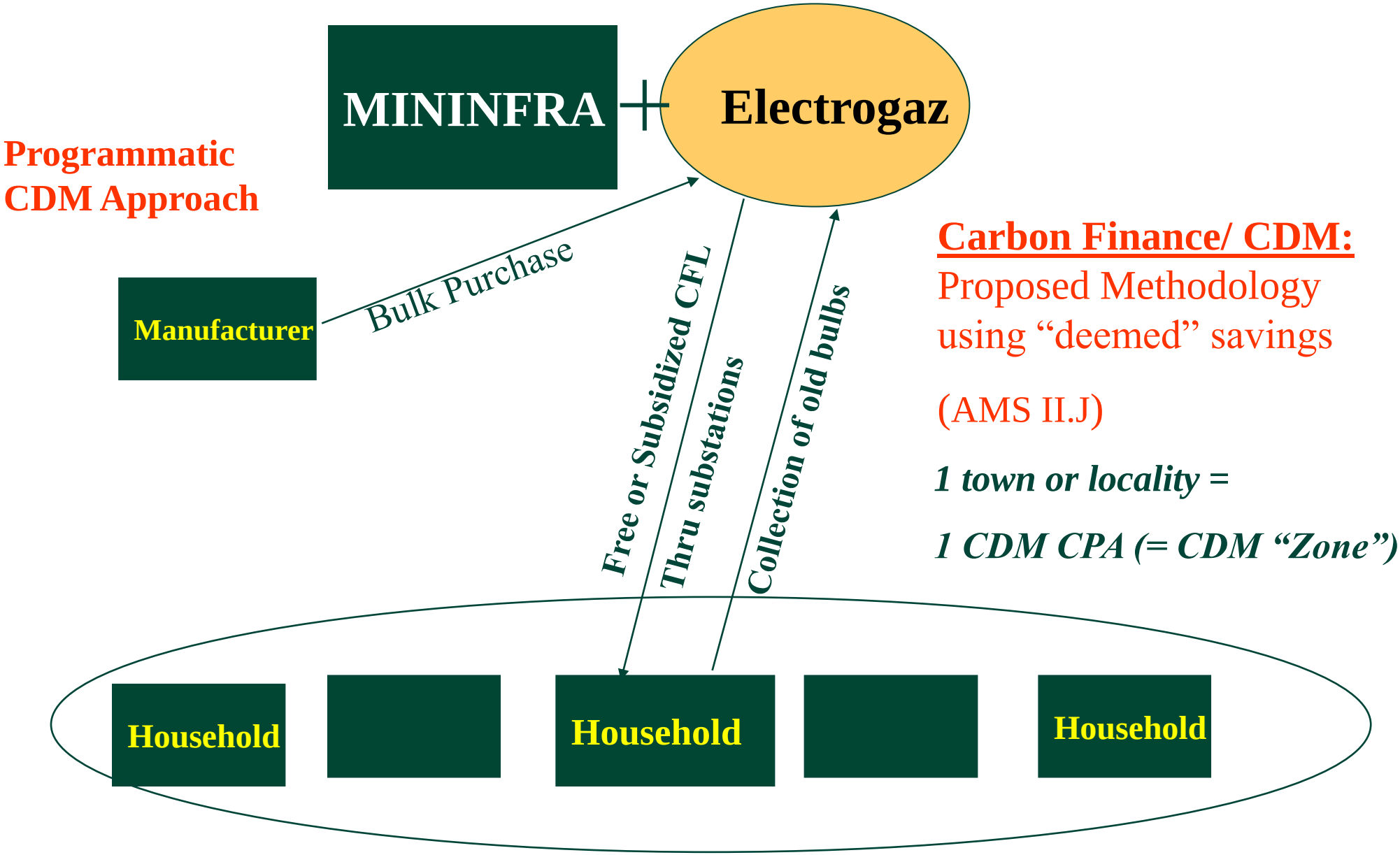
Mexico Residential Sector CFL Program…3

- 45 million CFLs, free distribution
- 1.4 million CFL pilots successful
- CDM funds along with World Bank funds (plus GEF and CTF support)
- Exchange of ILs for CFLs at approved retail stores (coupons)
- 10 million carbon credits - CERs (through 2021) to be generated
- First CFL CDM PoA already registered
- Target of 11 million low income households, including 2 million in rural areas (4 CFLs each)



Rwanda CFL Project: Integrating Carbon Finance 1



Carbon Finance/ CDM:

Proposed Methodology using "deemed" savings

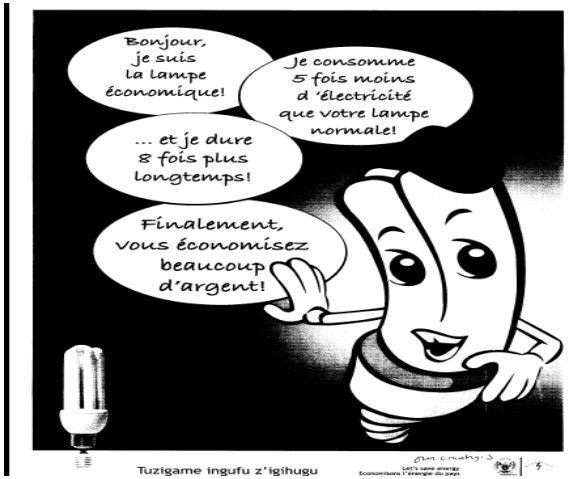
(AMS II.J)

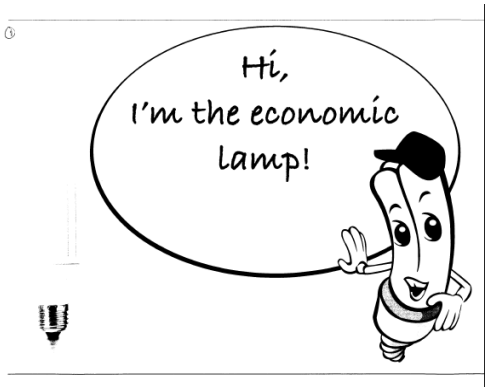
1 town or locality =

1 CDM CPA (= CDM "Zone")

Source: World Bank Carbon Finance (2008)

Rwanda CFL distribution project (2007-2010)…2





- Electrogaz (National electricity utility) and Mininfra (Ministry of Infrastructure) objectives:
- **To address power shortages** (at peak load)
  - → Reduce/mitigate the electricity consumption by replacing/ banning the incandescent lamps in the residential sector

Project design

- 400,000 CFLs to existing customers in exchange of IBs
  - 50,000 CFLs free-of-cost as a pilot phase
  - Then sold for the equivalent price of an IB ($0.37/lamp)
- 400,000 CFLs as a "welcome package" with the electricity meter to new customers
  - Part of the national electricity access program which aims to increase the electrification rate from 7% to 15% by 2012
- 4 phases from 2007 to 2010
- Distribution through 21 Electrogaz distribution centers
- Intensive awareness campaign
- Storage and destruction of the incandescent lamps collected, controlled by a third party

Rwanda CFL distribution project (2007-2010)…3

Project costs (2007-2009):

- 800,000 CFL purchase = US$1.2 million
- Project implementation costs = US$250,000

Project revenues:

- Lamp sale = up to US$120,000
- Carbon revenues = US$2.25 million (over 10 years, starting in 2010**)

Funding:

- WB project (IDA): US$800,000
- US$500,000 ERPA advance payment to finance the last 400,000 CFLs
- Electricity savings: up to 54GWh per year
- Emission reductions (ERs): 260,000 tCO2e over 10 years (EF=0.7)

**The cost is higher than in other regions due to specific technical specifications (especially large voltage tolerance)*

*** CDM registration pending*

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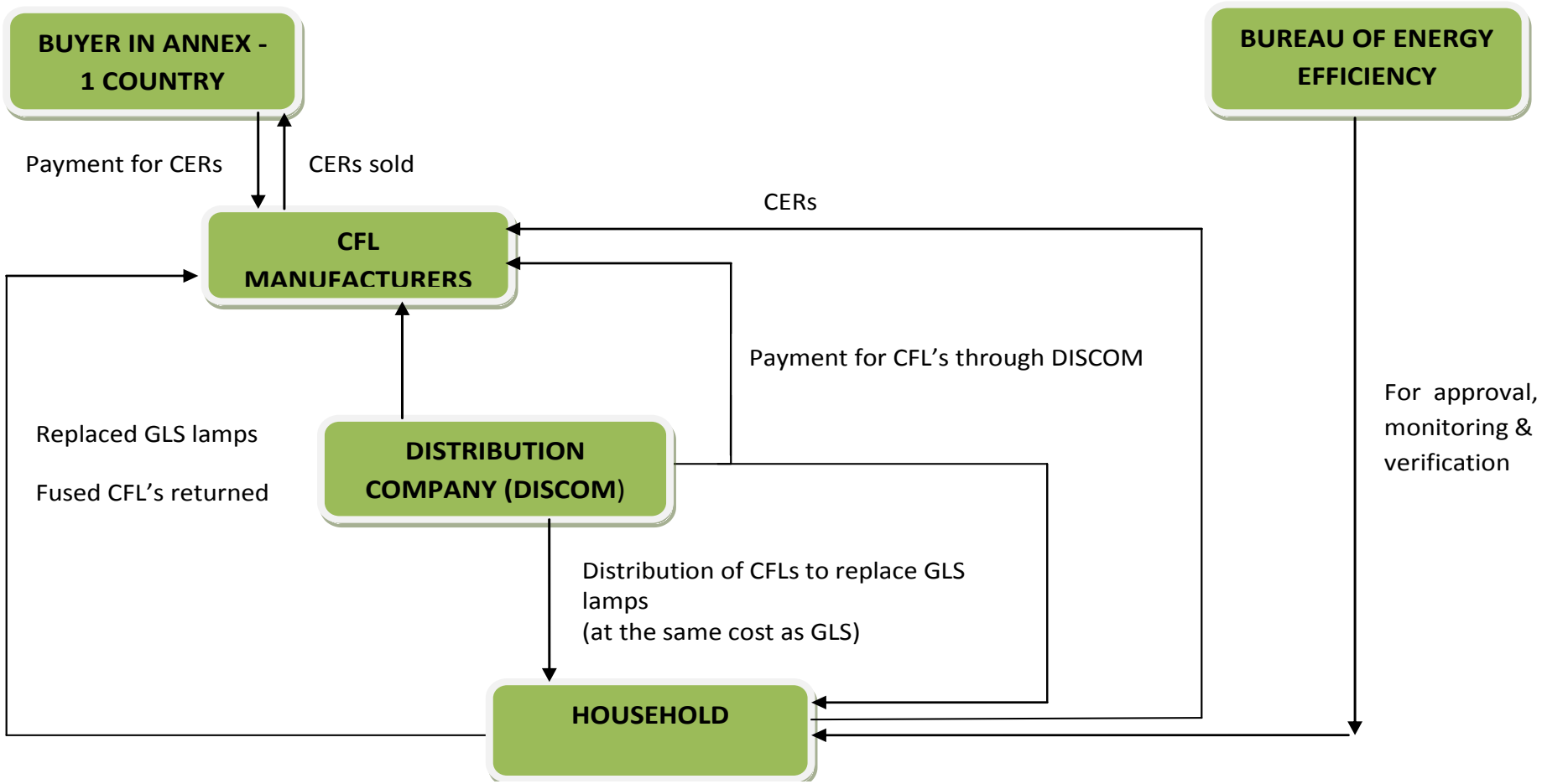
India – Large Scale CFL Program (Bachat Lamp Yojana- BLY)…1

- Launched by the Government's Bureau of Energy Efficiency→ through a "programmatic CDM" approach (Bachat Lamp Yojana), targeted **10,000 MW reduction**.
- To be implemented in all States/ Municipalities: Target of **400 million CFLs** in 4 years
- Electricity distribution companies enter into partnerships with CFL suppliers
- At subsidized (85% subsidy) cost (cost of ILs, ~USD 0.20 per CFL) to utility's customers; Up to 2 CFLs per household.
- Technical specifications (15 and 20 W CFLs, life of 10,000 hrs, power factor=>0.85),
- Revenue obtained from the sale of carbon credits to be shared between the CFL suppliers, their consultants and the distribution utilities
- Buyback mechanisms by which each fused CFL is bought back for about ~5 US cents so that it can be collected and sent to disposal facilities where the mercury contained in them can be safely disposed

India – Large Scale CFL Program (Bachat Lamp Yojana- BLY)…2

Figure 3: Role of different organizations in BEE's CFL- CDM initiative

Source: APP-India Report by IRG



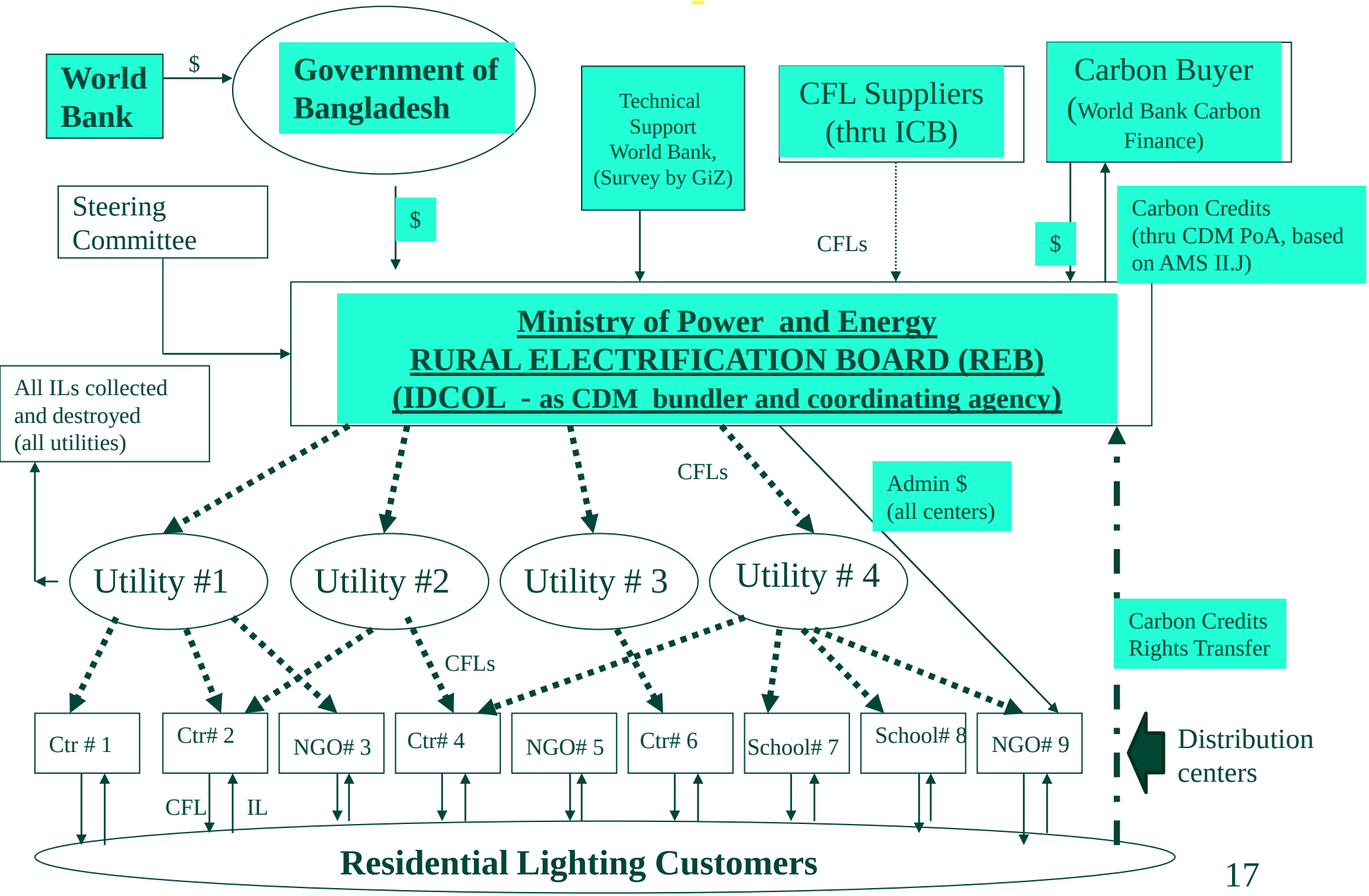
India – Large Scale CFL Program (Bachat Lamp Yojana- BLY)…3

- First 20 million CFLs distributed under this program (in 2011-12).
- Uttar Pradesh Power Company - signed a MoU with two companies (CantorCO2e and Banyan Environmental Innovations) wherein UPPCL will distribute 22 million CFLs at a cost of Rs 10 per lamp. Through this effort, UPPCL hopes to mitigate the current capacity shortage in UP of 2000 MW. The carbon brokers on the other hand hope to recover their investment of Rs 100 per lamp within two years and then make an annual return of Rs 66 per lamp for the life of the CFL.
- Vishakapatnam (and Yamunanagar) 650,000 each – by Osram. 15,000 hour high quality CFLs. The first CDM project (using CDM Methdolology # AMS II C) just registered by the UNFCCC CDM Executive Board (Oct'08). CDM Monitoring and Evaluation by Smart (Hourly) Meters using GSM (Mobile Phone) Technology.

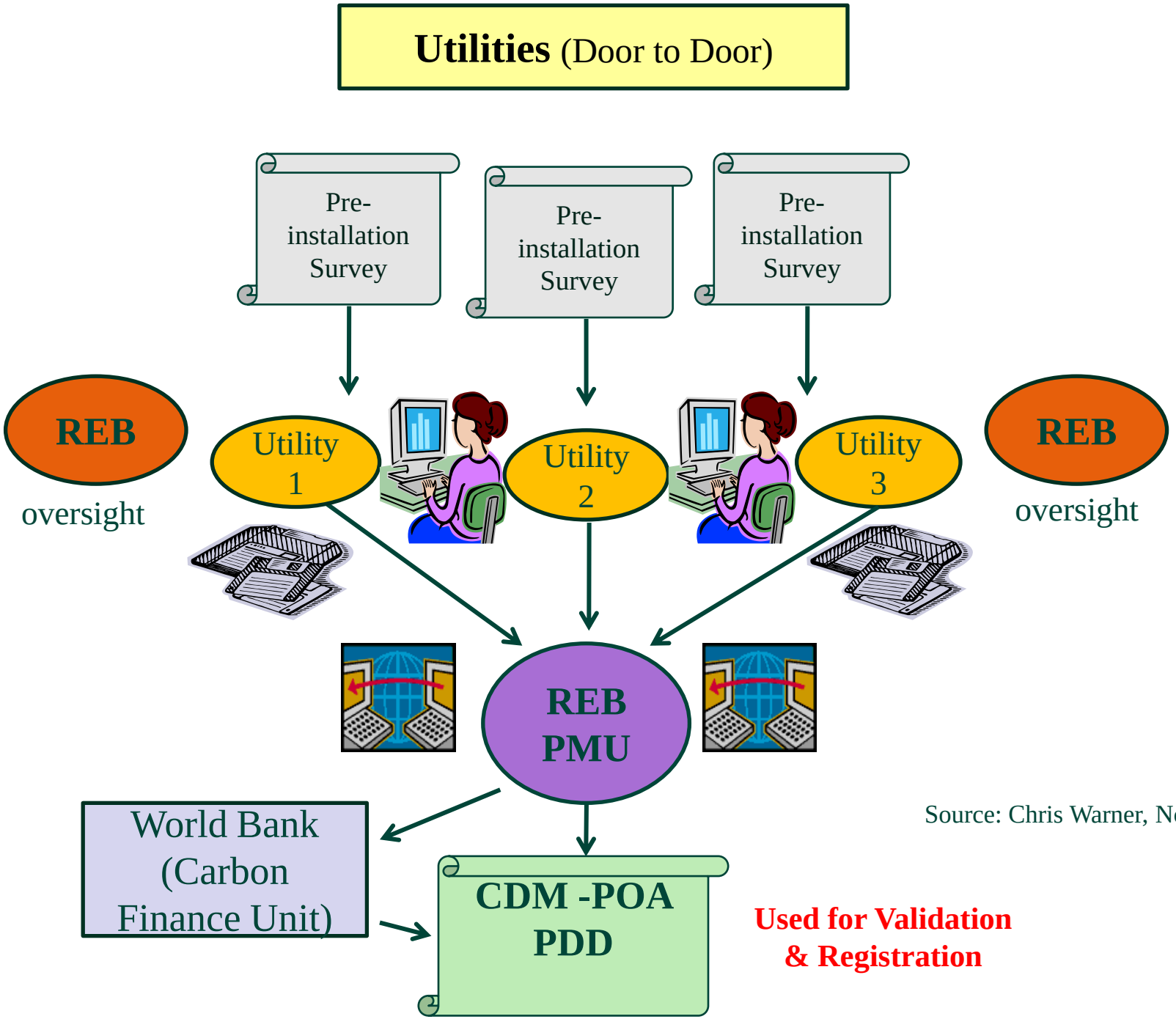
Sources: BEE, IRG, OSRAM, MOP

Efficient Lighting Initiative of BANGLADESH (ELIB) 1

World Bank-funded



Bangladesh ELIB: Pre-Installation Tasks 2



Source: Chris Warner, Nov 2009

Bangladesh ELIB: 3
~ 5 Million CFLs Distributed in One Day…

Collected Incandescent Lamps (at the Distribution center

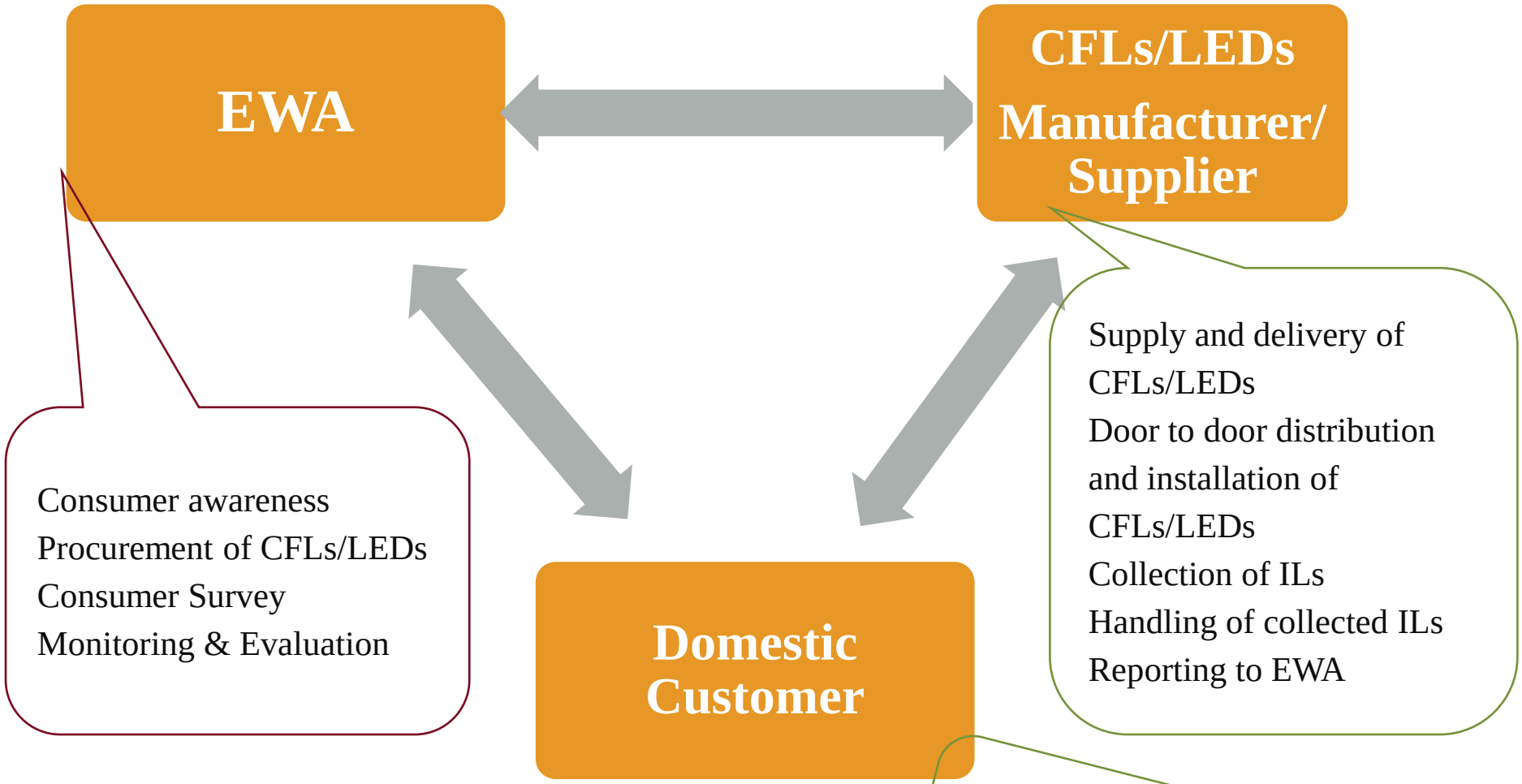
Landlord collecting CFLs on behalf of tenants

Customer signing for receipt of CFLs (for CDM)

Bahrain- Nationwide Deployment of CFLs and LEDs (under preparation)

- Installing 2.2 million CFLs to 200,000 households (~10 CFLs per household free of charge)
- In addition, 50,000 LED based lamps
- Consumer Awareness Campaign
- Consumer Survey (Completed)
- Monitoring and Evaluation of Impacts
- Estimated Savings: ~250 GWh, >80 MW
- High Quality of lamps: CFLs (10,000 hrs) ; LEDs (25,000 hrs)

Bahrain – Large Scale EE Lighting Implementation Mechanism



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Lessons Learned & Key Conclusions
Large Scale EE Lighting Programs…..1

- **CFLs are one of the "low hanging" efficient technology options, but transaction costs could be quite substantial**
- **Avoiding electricity shortages (and "power cuts") is the primary objective (and NOT necessarily climate change mitigation) and it drives the expanded CFL use and its application in developing world.**
- **Factors of Developing Country CFL Program Successes:**
  - Strong ownership and commitment of the Government
  - Keeping it as simple design as possible – e.g., free CFLs
  - Strong planning oversight and record keeping
  - Effective coordination and consistency amongst stakeholders
  - Involvement if a variety of level stakeholders (school teachers and local community leaders, and administrators)
  - Conducting a consumer awareness program in advance, by multiple means.
  - Quality technical specs (pertaining to local conditions & power characteristics)
- **Factors to Ensure Continued Use of CFLs:**
  - Assurance of availability of high quality CFLs
  - Assurance of CFLs available at affordable cost.

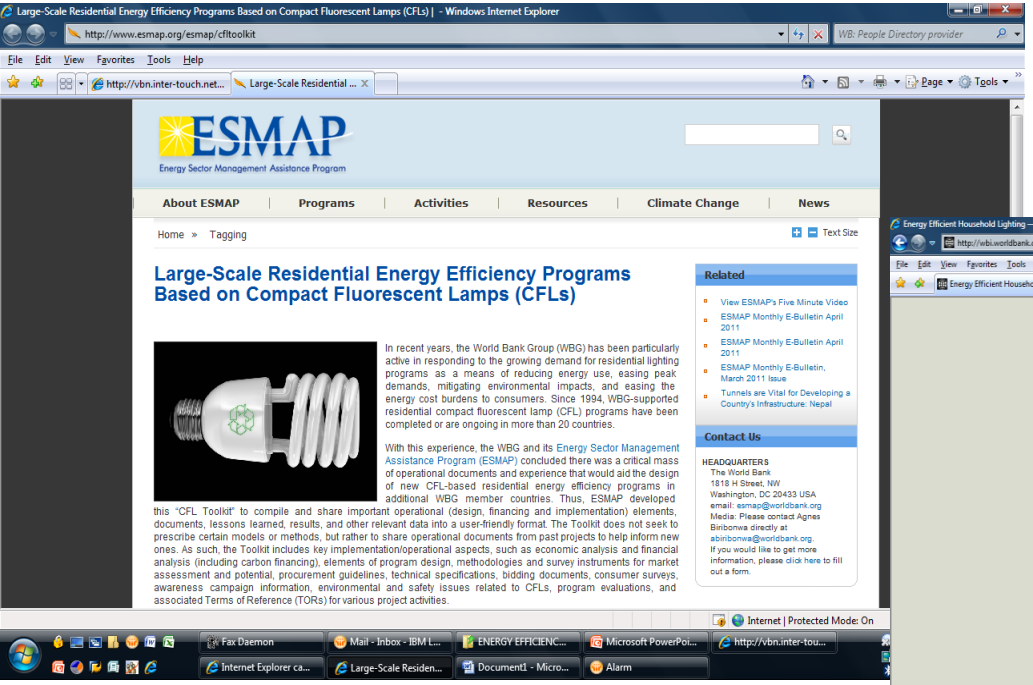
Lessons Learned & Key Conclusions
Large Scale EE Lighting Programs…..2

- **Parallel <u>Regulatory and Policy Efforts</u> are Important**
  - Removal of disincentives (e.g. higher VAT and customs duties on CFLs)
  - Formulating IL "Phase Out" or "Ban" Policies (has to follow a phased approach over several years)

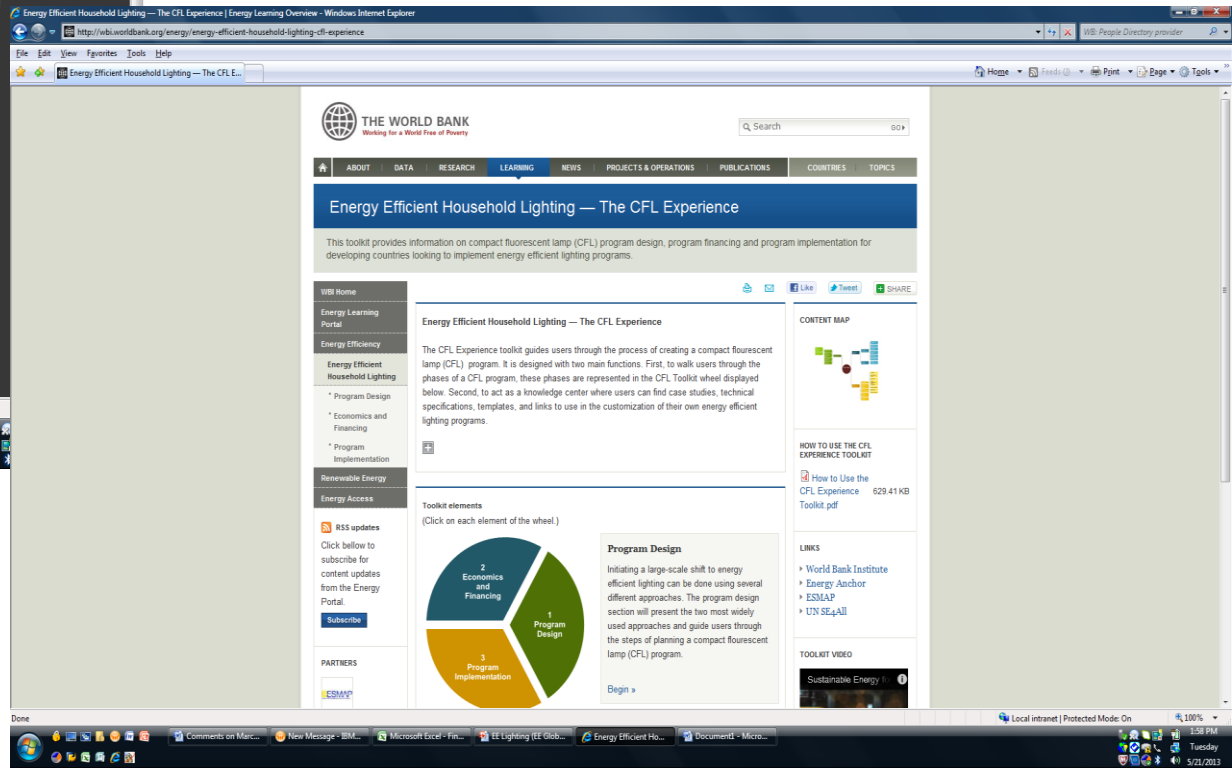
- **Provide Support for <u>Improving Sustainability</u> by:**
  - Strengthening Existing or Establishing New Domestic CFL performance testing laboratories
  - Establishing CFL Waste Recycling and/or End-of-Life Management Programs
  - Strengthening or Establishing Local CFL Manufacturing Base (switch over from IL production)

Residential EE Lighting Program Design & Implementation Toolkit (CFL Toolkit)

World Bank's **"CFL Toolkit" ,**
http://www.esmap.org/esmap/cfltoolkit
(originally developed with ESMAP support, 2010)



Updated CFL Toolkit (2013)
http://wbi.worldbank.org/energy/energy-efficient-household-lighting-cfl-experience



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World Bank Project on Catalyzing Sustainable EE Market Transformation

Sustainable Market Transformation for EE Lighting

This project seeks to complement global efforts by focusing on:

Technical Aspects

- Standard setting
- Defining specifications
- Quality testing
- Local capacity

Sustainability

- Legislations on hazardous waste
- Waste Collection & Recycling infrastructure

Leapfrogging

- Innovative financing mechanisms
- New sources of finance
- Focus on supply-side and private sector

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Resources Available for EE Lighting Programs (Including Support through the World Bank)

- Traditional financing mechanisms working mainly with the Government (IBRD and IDA loans, GEF)
- Integrating other sources of finance (such as Carbon Finance, CTF, NAMAs
- Technical Assistance and Capacity Building
- Innovative Mechanisms (with focus on supply-side and private sector, such as manufacturers and ESCOs)

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Thank you

FOR MORE INFORMATION

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