ECPA Energy and Climate Partnership of the Americas

FIU

ENERGY DYNAMICS Ltd.
DYNAMIC ENERGY EFFICIENT SOLUTIONS

Energy Efficiency Project Buildings Municipality of Port of Spain

AGENDA

- 1.0 ECPA Project Introduction
- 2.0 Project Results
- 3.0 Project Take Aways
- 4.0 What Next?

1.0 PROJECT INTRODUCTION

1.0 Project Introduction

- **ECPA Project Purpose:**
  - To support work to lower electricity consumption in municipal building through the development and implementation of sound energy efficiency and policies.
- ECPA Municipalities:
  - Goiania, Brazil;
  - Valdivia/Los Rios in Chile;
  - and Port of Spain, Trinidad and Tobago.
- **Executing Agencies**
  - **Florida International University (FIU)**
  - **Energy Dynamics Limited (EDL)**
  - **University of the West Indies (UWI)**

Project Objectives

- Conduct an energy efficiency policy analysis and baseline assessment of municipal building energy use;
- Develop relevant recommendations for improved energy efficiency standards and codes for municipal buildings in line with analysis finding;
- Create energy efficiency action plans to recommend to willing partner governments and stakeholders the necessary action to successful implement these building standards and codes;
- Monitor and evaluate project results to demonstrate project outcomes and provide a benchmark for future interventions.

2.0 PROJECT RESULTS

Developing a locally adapted building rating system

- Analysis of ASHRAE 90.1 Building Codes and Florida Building codes were performed
- The team developed the rating system utilising the frame work of the Green Building Council LEED V4 Document
- EDL having over ten years experience performing energy audits throughout the Caribbean islands adapted the LEED V4 document to ensure that the targets being set were achievable for the Caribbean Region

Developing Baseline Standards

- The Trinidad team categorised buildings into three main grouping
  - **Office Buildings**
  - **Health Centres**
  - **Schools**
- **Bill analysis were performed for different locations to develop baseline energy consumption values for each category.**
- **ASHRAE Level II energy audits were performed at the building location.**
- **Utilising the data collected during the energy audits pilot projects were designed for three locations**
- **A benchmarking tool was selected to measure the energy savings achieved.**

Establishing Baselines

Ministry of Public Utilities	City Hall
Tranquility Secondary School	Tranquility Primary
Health Centre 1	Health Centre 2

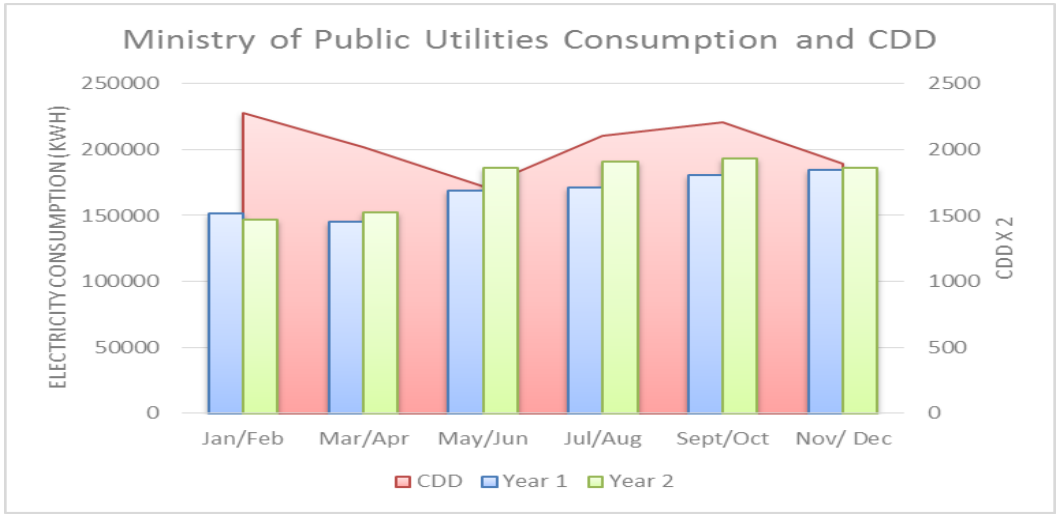
ECPA & FIU Energy Efficiency Project

In **Trinidad and Tobago**, meanwhile, FIU partner Energy Dynamics Limited (EDL) has been working on developing a local LEED green building code for new construction. This localized code—in line with the principles of Leadership in Energy and Environmental Design—will be presented for endorsement to a variety of building professionals and government employees. Since Trinidad and Tobago does not have a national or regional building code, the proposed green codes will be recommended as voluntary guidelines for new municipal buildings. In time, some of these guidelines could form the basis for national energy or sustainable development regulations.

Example of Findings made from Bill analysis

Bill Analysis

ELECTRICAL ENERGY	Monthly Energy Consumption	EUI Index	Monthly Energy Cost	Energy Cost
	(kWh)	kWh/m²	US$	US$/kWh
Annual Year 1	1,002,282	259	$75,172	
Average/month	83,524		$11,219	$0.075
Annual Year 2	1,104,161	286	$82,812	
Average/month	92,013		$12,360	$0.075



The electricity consumption was 1,104,161 kWh in Year 2 at a cost of US$ 82,812 (US$ 0.075/kWh). The energy consumption of MPU appears to have increased by 10.2 % from the previous year, the Energy Usage Index (EUI) increased from 259 kWh/m² in Year 1 to 286 kWh/m² in Year 2.

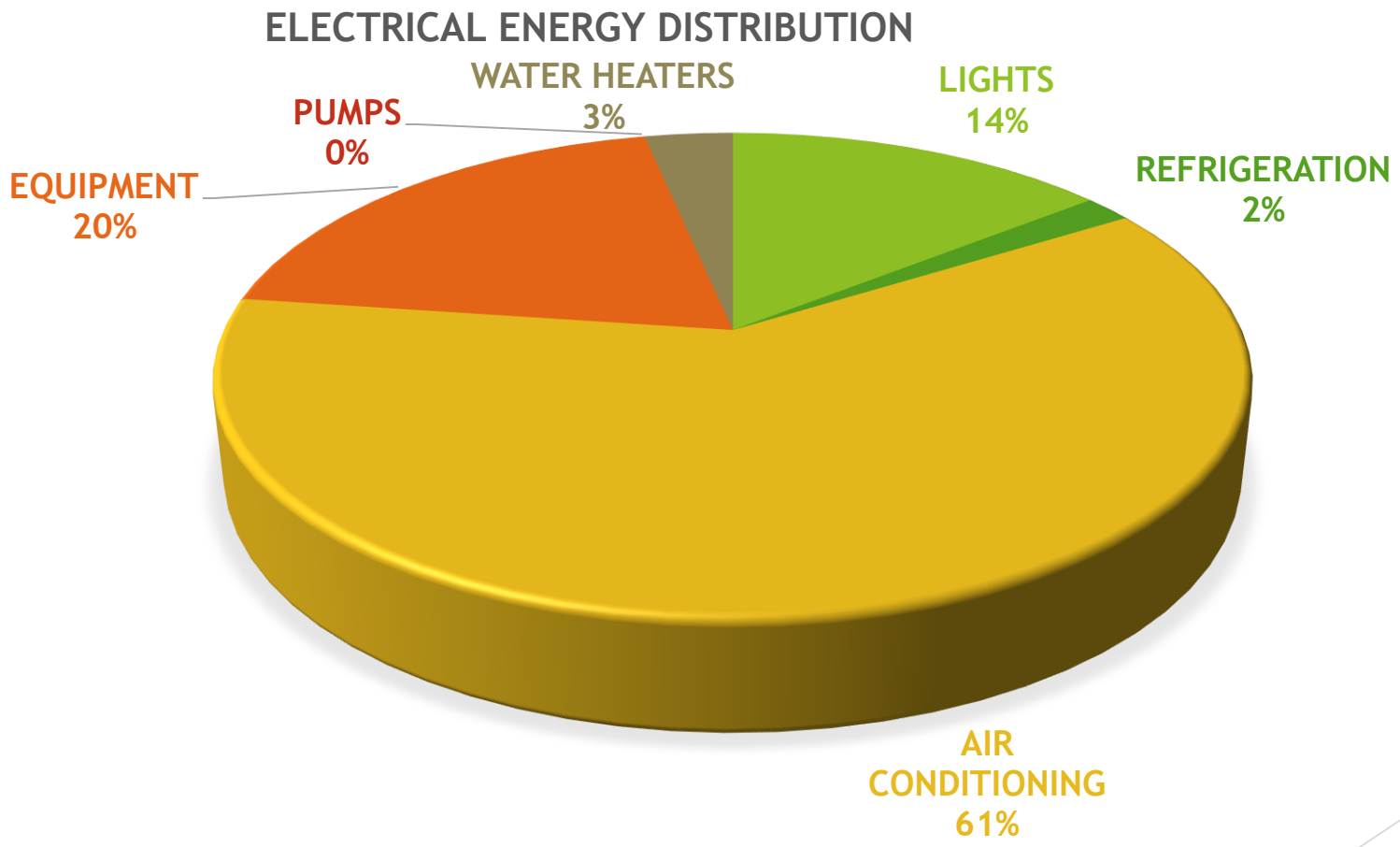
Bench Marking tool

- Energy Usage Index (EUI) is typically expressed as being the energy used per square meter of the conditioned building space.
- Unit of measurement for EUI:

$$EUI = \frac{\text{Total Annual Energy Consumption}}{\text{Conditioned Building Space Area}}$$

$$= kWh/m^2$$

Energy distribution developed with data collected during the energy audit process



Item	ESO Description	Simple Payback (years)
1	Retrofit of T12 lamps to T 5 lamps	0.9
2	Timers on lamps	1.4
3	Timers and Programmable thermostats on A/C Systems	0.2 to 1.5
4	Raise A/C thermostat set point from 72F to 76F	0.1 to 0.4
5	Retrofit Incandescent Lamps to CFL or LED Lamps	0.4 to 0.8
6	Timers on Appliances	0.3 to 1.5
7	Computer Power Management	0.75
8	Effective Air Conditioning Maintenance	≤ 1
9	Seal Building Leaks	≤ 1


Honeywell
69
HOLD


3:34
Saturday, March 7
DELL


IMPORTANT

National Renewable Energy Laboratories (NREL) Retro-Commissioning

Energy Savings and Cost Effectiveness

- **LBNL analysis of 624 buildings**
- **The median cost to retro-commission existing buildings was $0.30/ft².**
- **The analysis revealed over 10,000 energy-related problems.**
  - Resulting in 16% median whole-building energy savings in existing buildings
  - Payback time of 1.1 years in existing buildings

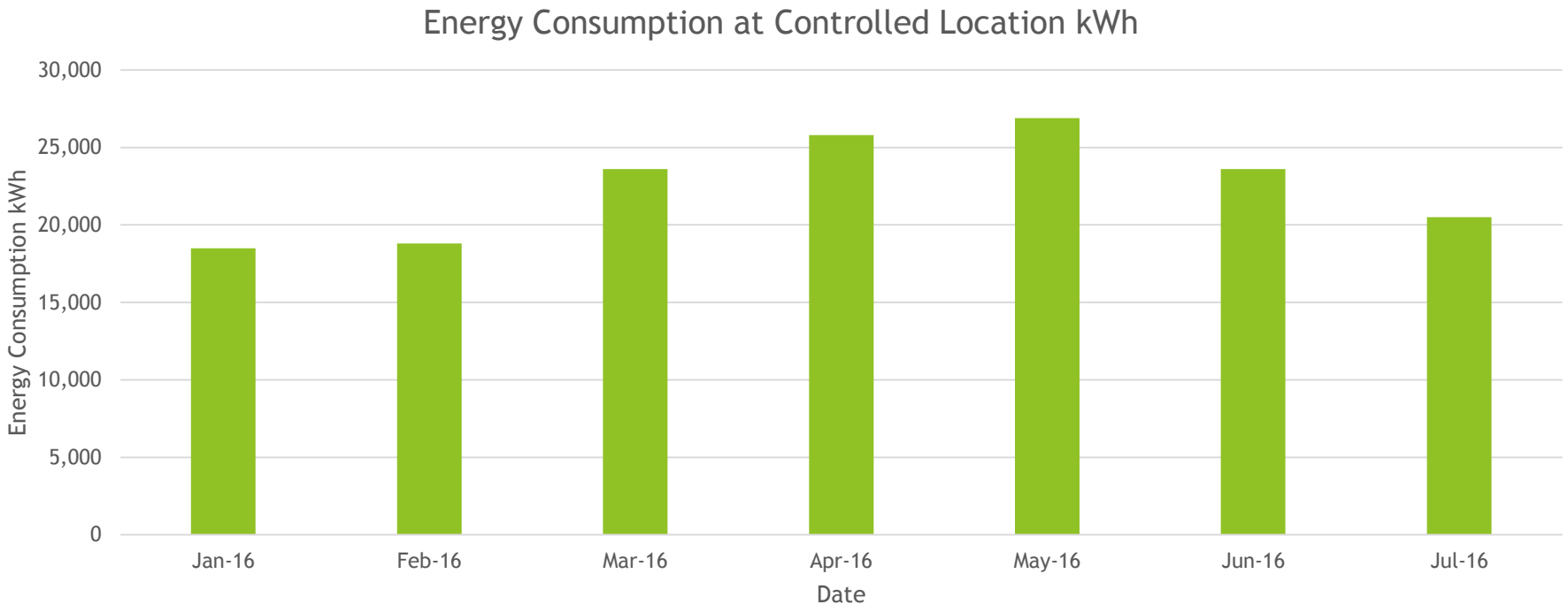
Reference: A Golden Opportunity for Reducing Energy Costs and Greenhouse Gas Emissions, LBNL 2009

Recommended Energy Management Opportunities for Office Spaces

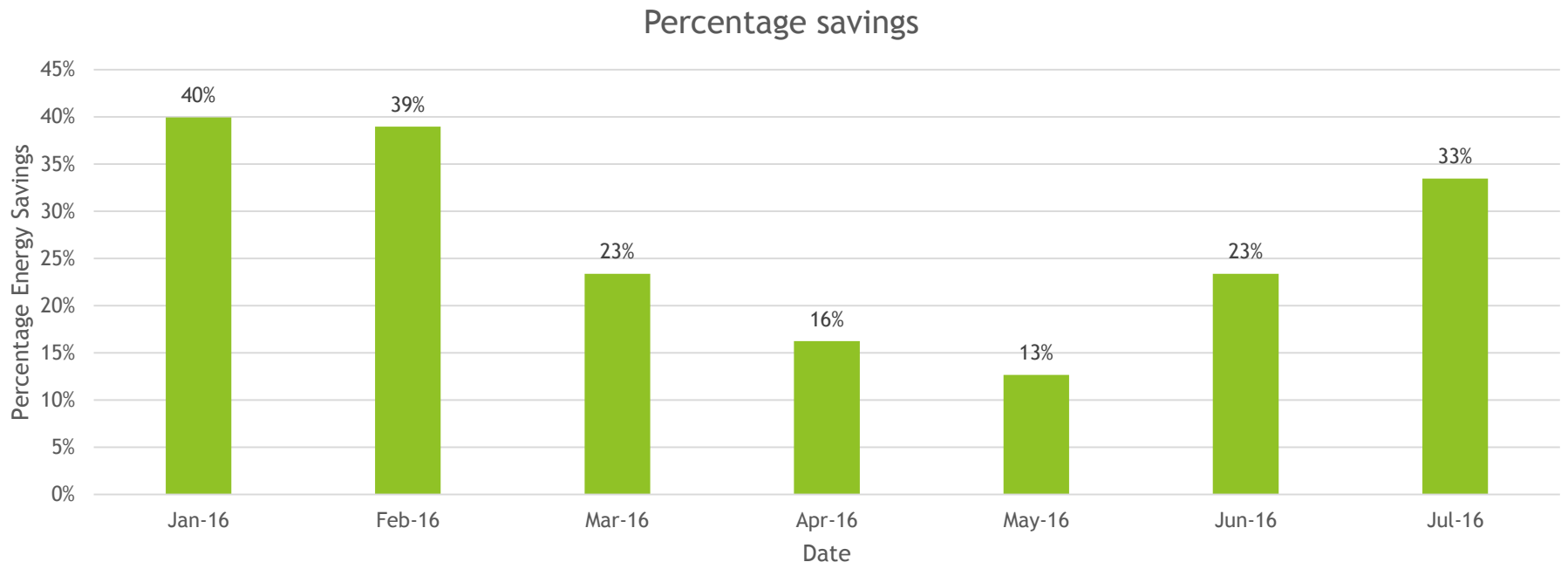
ESO	Energy Management Opportunity	Initial Cost (TT$)	Annual Cost Savings (TT$)	Payback (years)	Annual Electrical Energy Savings (kWh)	Annual CO_2 Savings (Tons/ year)	Natural Gas Savings (MMBtu)
1	EMO 1	6,000	21,130	0.28	44,214	36	431
2	EMO 2	3,000	5,365	0.56	11,242	9	110
3	EMO 3	10,000	153,199	0.65	320,642	262	3,125
4	EMO 4	3,000	3,023	1	6,334	5	62
5	EMO 5	-	-	0	-	-	
TOTAL		**22,000**	**182,717**	**0.12**	**382,432**	**312**	**3,728**

Pilot Project Findings Controlled / Uncontrolled

Total Energy Consumption at Controlled location



Savings Achieved at Controlled Location



3.0 PROJECT TAKEAWAYS

ECPA Project Take Aways

- Need Building Codes: LEED v4
- Very difficult process in getting buy-in from various agencies
  - Unlike major cities where the Mayor controls all buildings, in T&T each Ministry have control of their buildings
  - Securing energy bills from various buildings is very difficult
- Baseline EUI (kWh/m2 yr) can indicate the potential for EE in buildings
- EE savings between range of 25% to 40% can be obtained
- Not Just Technology
  - Behaviour change in users
  - Operation and Maintenance – Retro-commissioning
- Continuous Energy Management is KEY

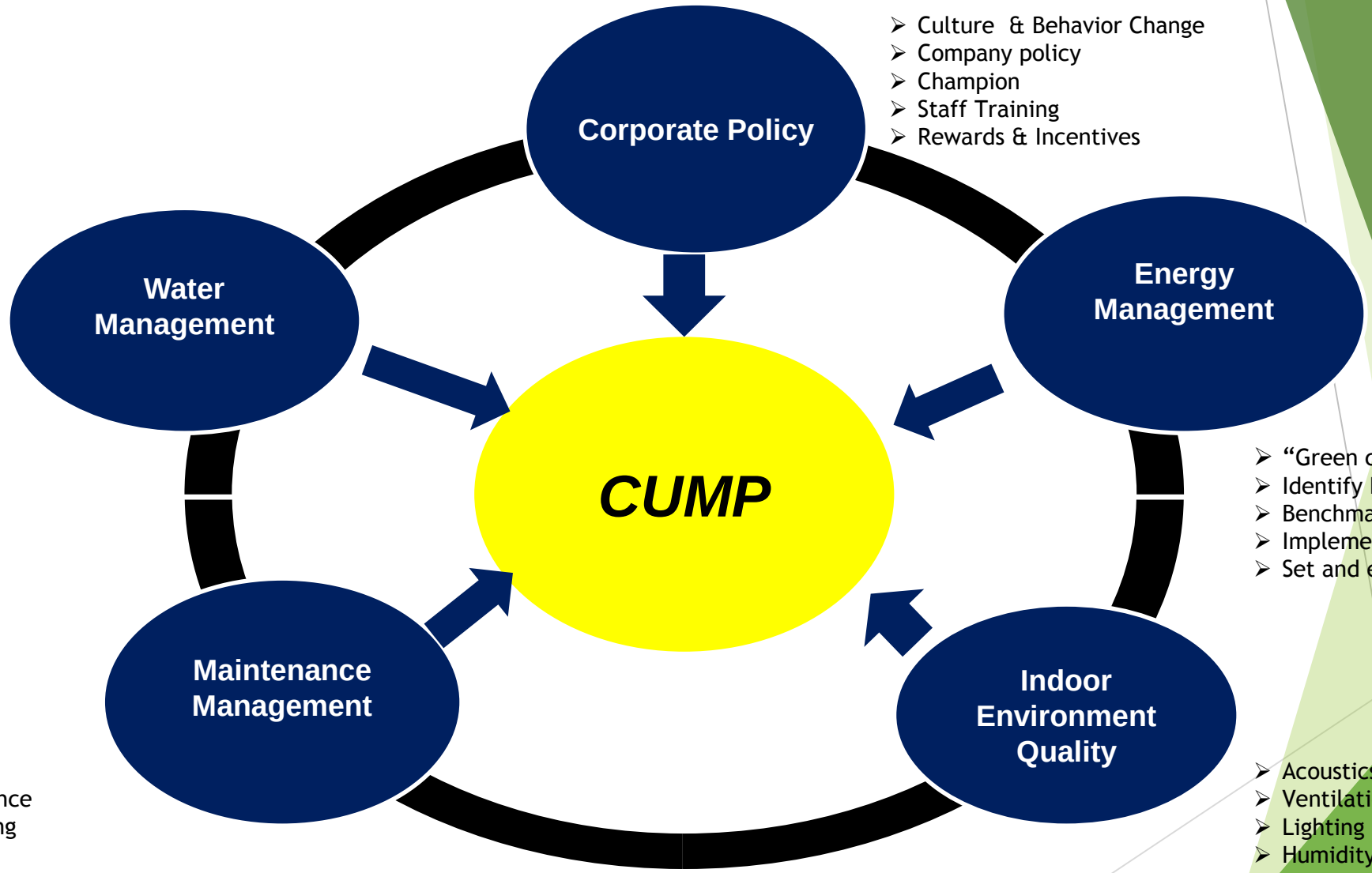
4.0 WHAT NEXT?

A New Business Model for EE

Corporate Utility Management Program (CUMP)

Government Utility Management Program (GUMP)

Corporate Utility Management Programme



- Culture & Behavior Change
- Company policy
- Champion
- Staff Training
- Rewards & Incentives

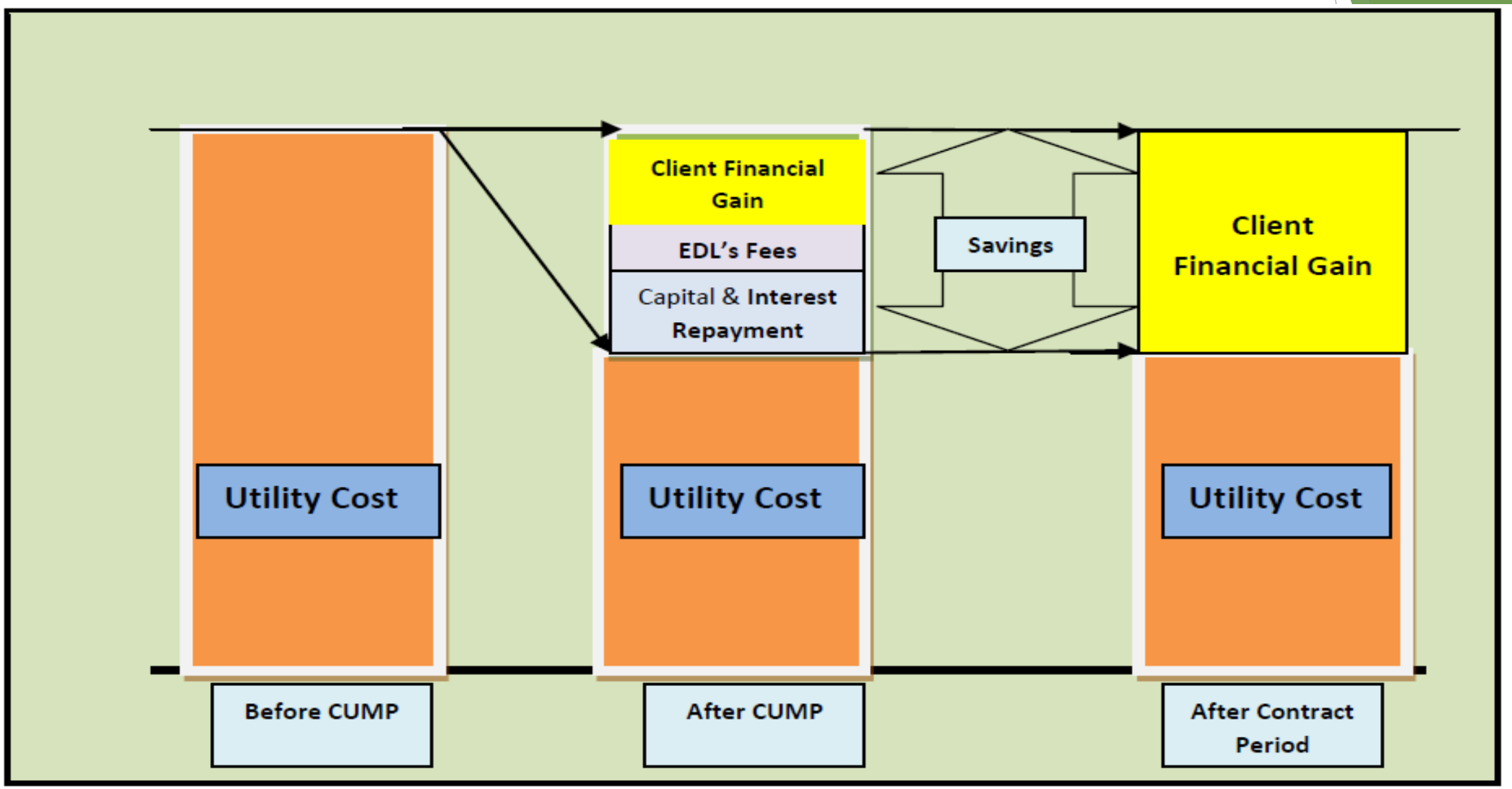
- Identify WSM
- Benchmark
- Implement WSM
- Set and exceed targets

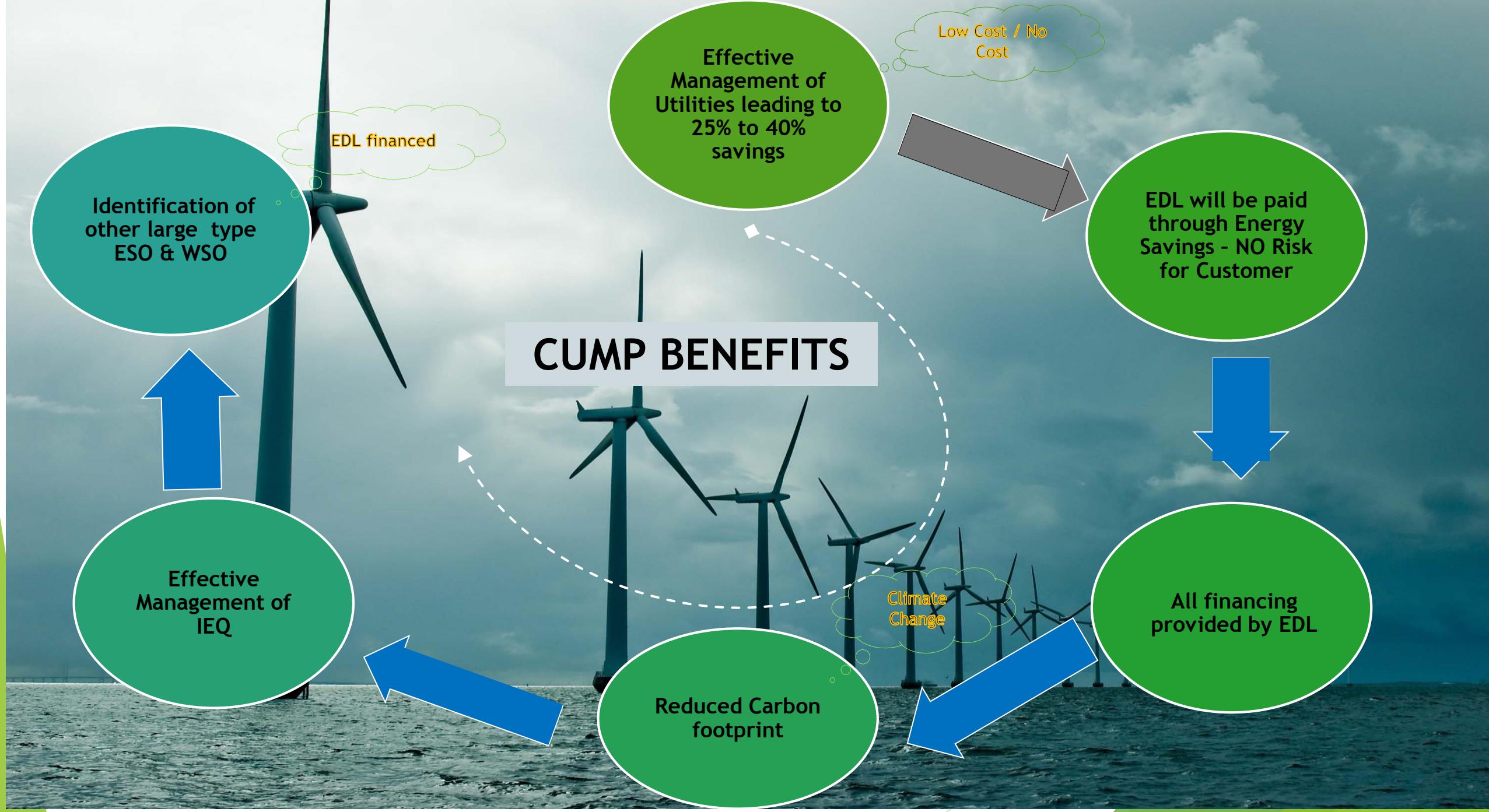
- "Green consciousness"
- Identify ESM
- Benchmark
- Implement ESM
- Set and exceed targets

- Acoustics
- Ventilation / CO2 levels
- Lighting levels
- Humidity / Moisture

- Preventive Maintenance
- Reliability Engineering
- CMMS
- Retro-Commissioning
- Duct Cleaning

Shared Savings Illustration




Effective Management of Utilities leading to 25% to 40% savings
Low Cost / No Cost
EDL will be paid through Energy Savings - NO Risk for Customer
All financing provided by EDL
Reduced Carbon footprint
Climate Change
Effective Management of IEQ
Identification of other large type ESO & WSO
EDL financed
CUMP BENEFITS

THANK YOU!