



# Republic of Sudan

## Ministry of Water Resources & Electricity

Sudanese electricity distribution company

# Rural electrification with Solar Home Systems Project



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# INTRODUCTION

- Sudan population is estimated 36 millions, **56%** of them lives in rural areas.
- Electrification Rate:  $\approx$ **40%**, including generation by the localities. **55%** of urban people and only **29%** of rural people have access to electricity;
- Some remote rural areas are **sparsely** populated thus the cost of local power supply or grid connection is too high
- Energy is a major tool for poverty alleviation, income generation, health, and other developmental agendas.



# Initiating of the rural electrification Program

**SPECIAL SOLAR ENERGY PROGRAM (1982 - 1998)** A grant from the Government of Denmark \$ 13 million (DKK) to Supply and installation of refrigerators vaccines, solar pumps for irrigation, rehabilitation of energy Research Institute and training local cadres

**SUDAN RENEWABLE ENERGY PROJECT (1983 - 1987)**, A grant of US , 5 million Supply and installation of solar energy pumps, solar thermal energy applications and the establishment of a program for Master of renewable energies at the University of Khartoum

**COLD STORAGE SYSTEM ((1984 - 1988)** A grant from the Dutch government ,5 million (FLOREN) for the work of cooling store to save 13 tons of agricultural crops operates solar thermal power system

**RURAL SOLAR ENERGY DEVELOPMENT PROJECTS (1991 - 1997)** Grant from the United Nations , 930,000 \$ to bring solar power to 130 villages from generality of Sudan (Lighting schools and health centers, Refrigerators vaccines, solar pump for irrigation

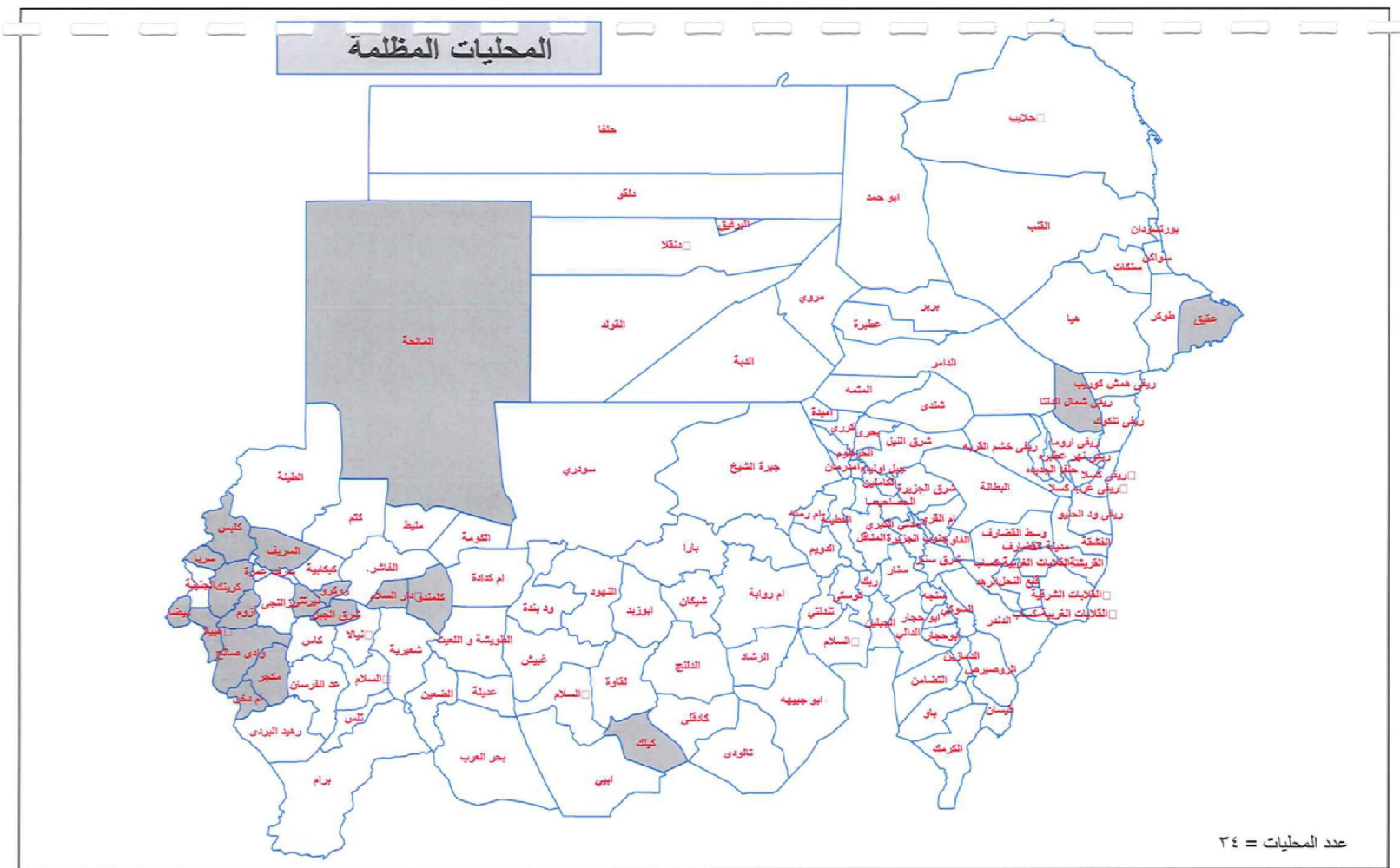
**BARRIER REMOVAL TO SECURE MARKET PENETRATION TO USE PV (2001 - 2007)** grant of an environmental program (GEF) ,250 \$, to raise awareness among citizens and policy makers of the importance of the use of renewable energies and the involvement of banks in financing



## Solar Home system (SHS) Project program (Launched and implemented)

- ▶ the first initiative driven by the ministry of water resources and electricity to use off-grid solar energy applications to provide electricity in remote rural areas.
- ▶ The plan was released in 2013 and it relied on solar applications to provide electricity to 9 million people located in countryside.
- ▶ The target was to provide, eventually, 100 or 200 watts of capacity per household as well as social services. The program finally started in 2014

# THE DRIVERS TO THE PROJECT





## Objectives of the SHS Program

- The SHS Program aims to raise levels of socioeconomic development and improve rural households' livelihoods
- promotes to use renewable energy and supports initiatives in rural areas for productive use of electricity to increase household income



## Implementation plan

- First stage (2013 –2014) a pilot to supply and install solar home system (SHS) to electrification 100 household located in four different states of the Sudan
- Second stage (2015 – 2031);The long term plan to supply and install about **1,100,000** rural homes with SHSs all over Sudan by 2031 (**6million inhabitants, 26% of rural population**).





## 1. Pilot project

pilot project consist of **100** solar Home Systems (SHS) in **4** states in Sudan. Each system is **100W** (AC) with the timers which was sued to control the monthly payments of the installments.



## Cont , Pilot project

A pilot project has been implemented to:

- ▶ Identify the optimum **capacities** and size for the system according to the needs.
- ▶ **Get acquainted** with the various types of systems and manufacturers of the systems
- ▶ Identify the **response** of the citizens to the project and the **problems facing the project** and ways to address them in the future
- ▶ Test the **functionality** of the system of collection of the monthly installments through the Timer

## Prepaid meter (control timer)

The timer



User interface





## pilot project stages

- Promoting and awareness of solar energy benefit
- Supply and installation (SHS).
- follow up all (SHS) for evolution (technical, prepaid meter and Measure customer)

# THE PILOT PROJECT



## Awareness Campaigns



"Sustainable Energy Access for the Rural Areas" within the Framework of the 7<sup>th</sup> International Beirut Energy Forum

# THE PILOT PROJECT



Sustainable Energy Access for the Rural Areas” within the Framework of the 7<sup>th</sup> International Beirut Energy Forum



## THE PILOT PROJECT - RESULTS

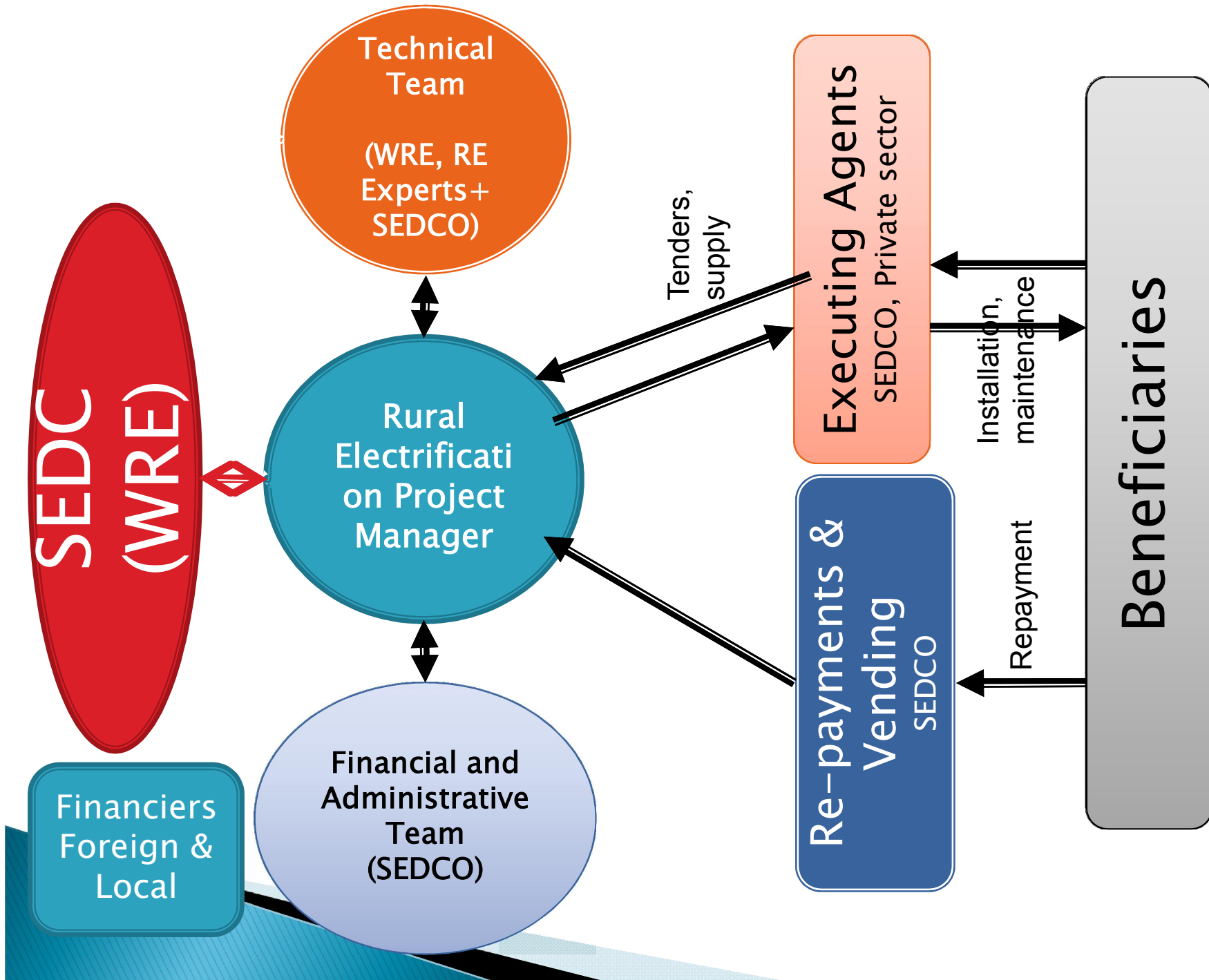
- The pilot project was evaluated and showed that:
- The **satisfaction** of the beneficiaries was found to be **>90%** in the villages of the pilot project
- **Repayment** of the monthly installment was more than **95%**, system **affordable** with the monthly installment regime
- More than **85%** of the people can afford and willing and afford to install SHS in the main project target areas
- The system worked **well** except for some **invertors**

## 2. Long term plan plan



Year	Target	Budget \$	Remark
1 <sup>st</sup> Year (2014)	100	60,000	Already completed (pilot), financed by WRE
2 <sup>nd</sup> Year	5000	3,000,000	Tender was completed, now in contracting phase
3 <sup>rd</sup> Year	15,000	9,000,000	
4 <sup>th</sup> Year	60,000	36,000,000	
5 <sup>th</sup> Year	70,000	42,000,000	
<b>1<sup>st</sup> 5-Years (2014-2017)</b>	<b>150,000</b>	<b>90,000,000</b>	
<b>(2018-2022)</b>	<b>250,000</b>		
<b>(2023-2027)</b>	<b>300,000</b>		
<b>(2028-2031)</b>	<b>400,000</b>		
<b>Total</b>	<b>1,100,000</b>		



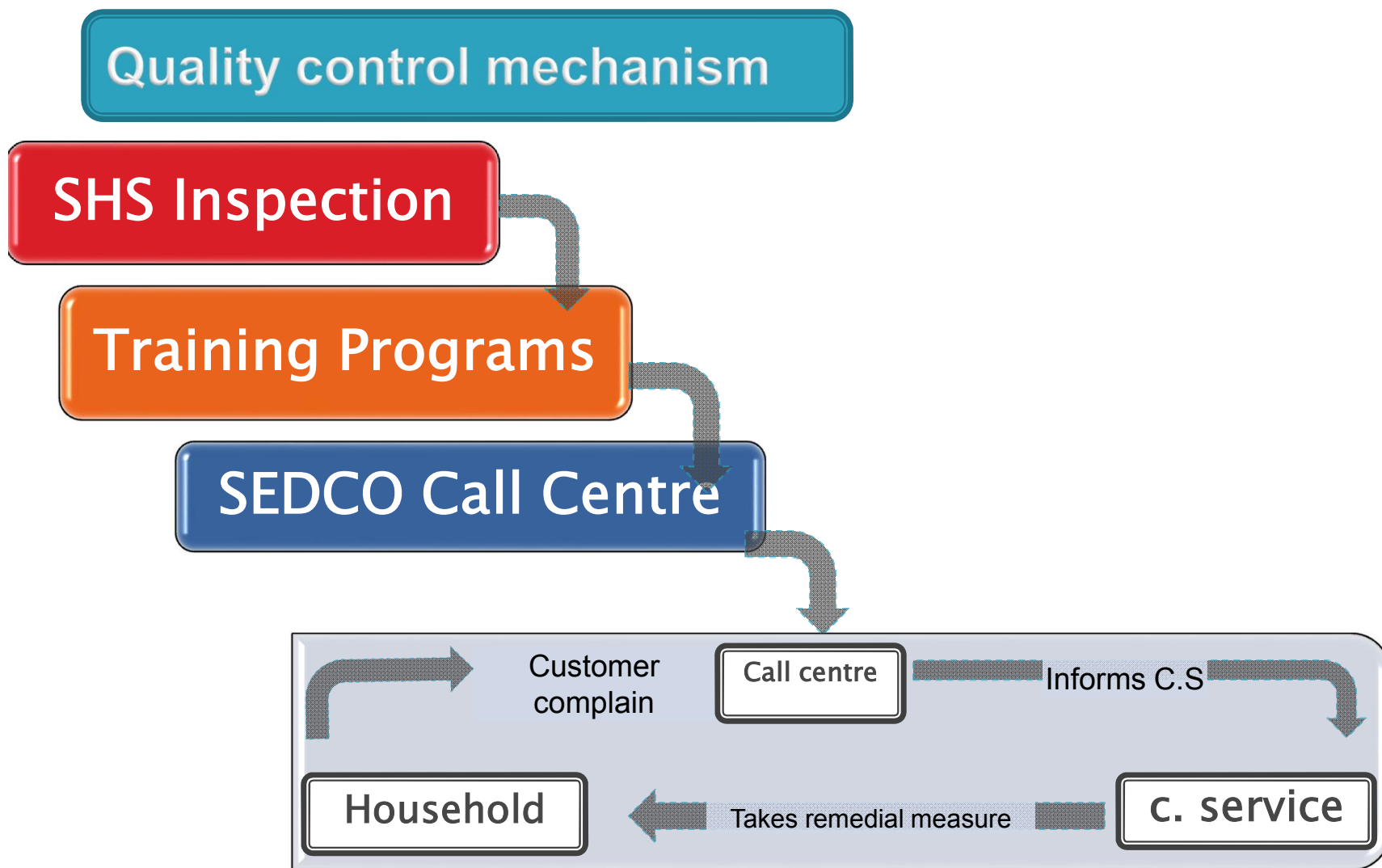




# Financing and quality control mechanism

## Financing structure

(a) Market Price of 100Wp SHS (including 33% Tax & VAT)	\$600
(b) Tax and VAT exempted (33%) (government)	\$150
(c) equipment price [(a)-(b)]	\$450
(d) Installation and service cost	\$70
(e) System Price for Household [(c)+(d)]	\$520
(f) Down Payment from Household to SEDCO [10% of (e)]	\$52
(g) Loan Payable from Household to SEDCO [(e)-(f)]	\$468
Repayment period	5 Years
Cost of loan	7%
Monthly Installment Amount	\$10.5





## benefit and impacts expected

- Improved **lifestyle**, living conditions of households have generally improved.
- Better **education** (more study hours)
- Reduces the need for candles and kerosene lamps and improves indoor air quality.
- Improve service in **community places** like that mosques, Clinics, schools, government offices, and other public facilities
- **Jobs creation** and more **income generation**, **more working hours**

A nighttime photograph of a cityscape reflected in water. A suspension bridge is visible in the middle ground, and a prominent, illuminated, conical tower stands on the right. The scene is bathed in a warm, golden light.

*Thank you for your attention*

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