



# “ Sewage To Energy - An affordable and efficient Option for Modern Chinese Cities”

“从污水到能源——  
一个对现代中国城市可负担且  
有效的选择”

Sino German Energy Partnership

中德能源伙伴

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# Content 内容

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## 1. Current Situation and Clean Energy Transition Problems

当前形势和清洁能源转型遇到的问题

## 2. Technology Introduction

技术介绍

## 3. Barriers, Planning and Regulatory Framework

障碍、计划和监管框架

# China Large Scale Clean Energy Transition

## 中国大规模能源转型



- Certainly China has embarked on largest clean energy transition in history of mankind

中国无疑已经开始了人类历史上最大规模的清洁能源转型。

- Industry, Cities and Villages 工业，城市和村庄
- Major Objective: Reduce local pollution through replacement of dirty coal by clean energies (gas, electricity, waste heat)

主要目标：以清洁能源（天然气，电力和废热）来替代煤炭从而减少当地污染

- Results are obvious: almost all cities see improvement of air quality  
(Greenpeace Report China Air Quality)

结果显而易见：几乎所有城市的空气质量都有所改善

（来自绿色和平关于中国空气质量的报告）

... but we also noticed some opportunities for further improvement

.....但我们也注意到有一些机会可以做进一步的提升

# City Challenge: Heating/Cooling Supply

## 城市所面临的挑战：供热/制冷



- Relatively high investment costs of new energy heating systems (Heat Pumps,..) and limitations to their use  
新能源供热系统（热泵等）的投资成本较高并且应用的局限性较大
- Unsustainably high operating costs (coal → gas and electricity)  
在从煤转向天然气和电力之后，不可持续的高运营成本
- Higher comfort requirements and higher summer temperatures (“heat island effect”) 更高的舒适要求和更高的夏季温度（“热岛效应”）
- Gas has also a CO<sub>2</sub> footprint and large scale use contributes to local pollution 天然气也会产生二氧化碳的排放，大规模使用会造成当地污染
- No comprehensive approach to solve heating, cooling and hot water together 没有一并解决供热、制冷和提供热水的综合方案

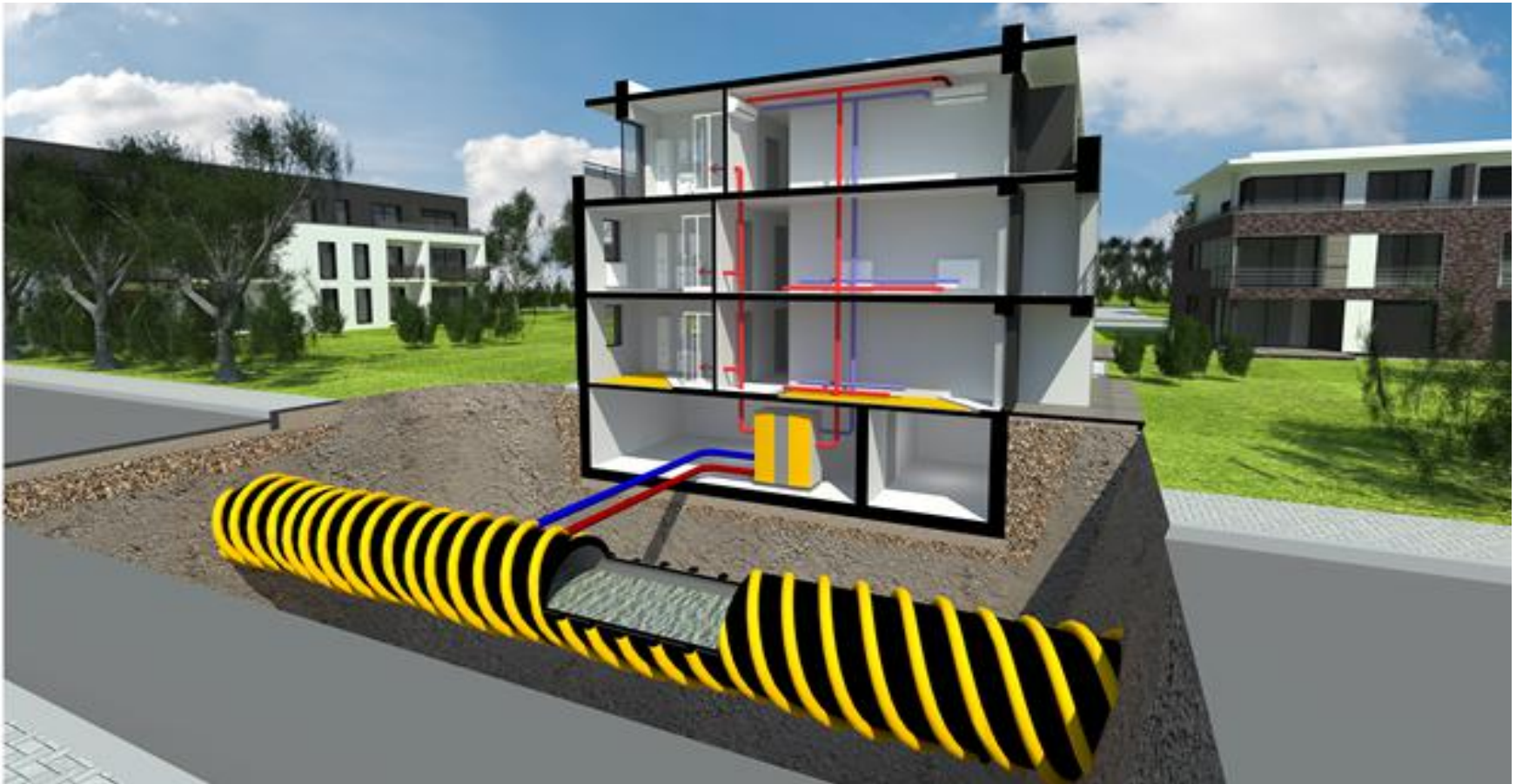
The application of one technology is helpful here. 一种技术的应用会有所帮助。



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**Waste Water to Energy**  
**Clean, Efficient & Commercially Viable !**  
**废水到能源**  
**清洁，高效&商业可行**

# The Technology 技术

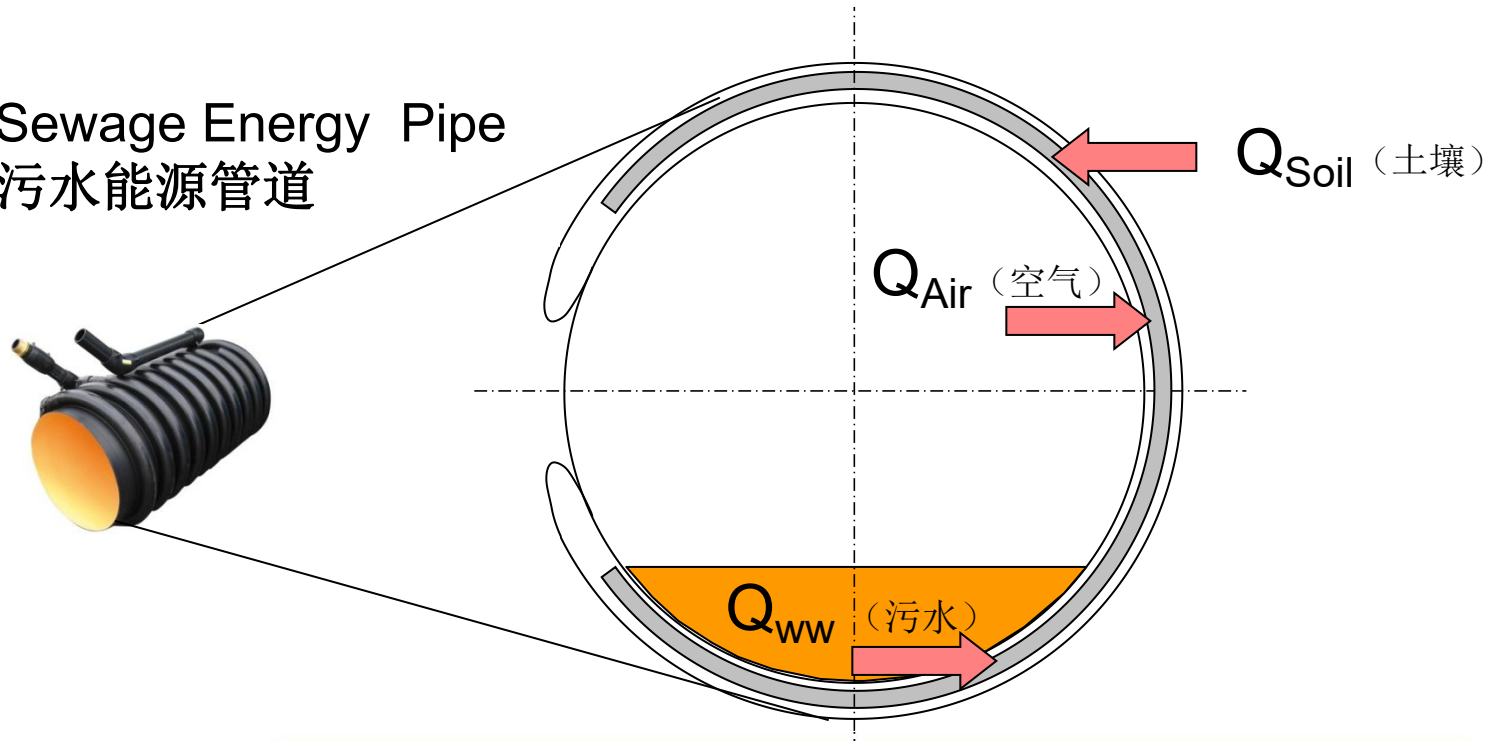


**Sewage Energy Pipe:** Providing heating, hotwater and cooling by using the thermal energy of the waste water. Combined with a heat pump, the HVAC can meet the demands of a house.

污水能源管道: 利用废水的热能来供暖、制冷和提供生活热水。再与热泵相结合, 暖通空调系统便可以满足房屋的需求。

# Waste Water Pipe Heat Exchanger 污水管道换热器

Sewage Energy Pipe  
污水能源管道



$$Q_{tot} = Q_{soil} + Q_{air} + Q_{ww}$$

$$Q_{\text{共计}} = Q_{\text{土壤}} + Q_{\text{空气}} + Q_{\text{污水}}$$

Heating Mode: up to 60° C Heating/Hot Water

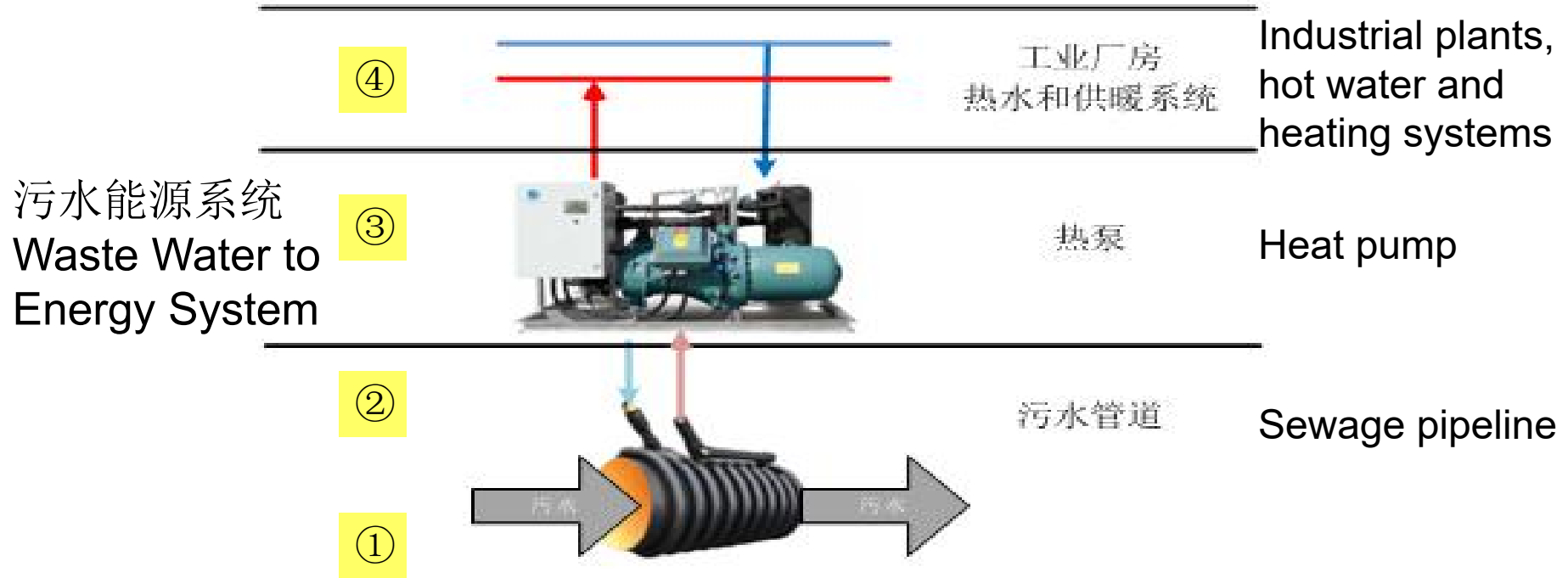
供热模式: 高达60° C 热水

Cooling Mode: 7° C Chilled water

制冷模式: 7° C 冷冻水

# System Principle

# 系统原理



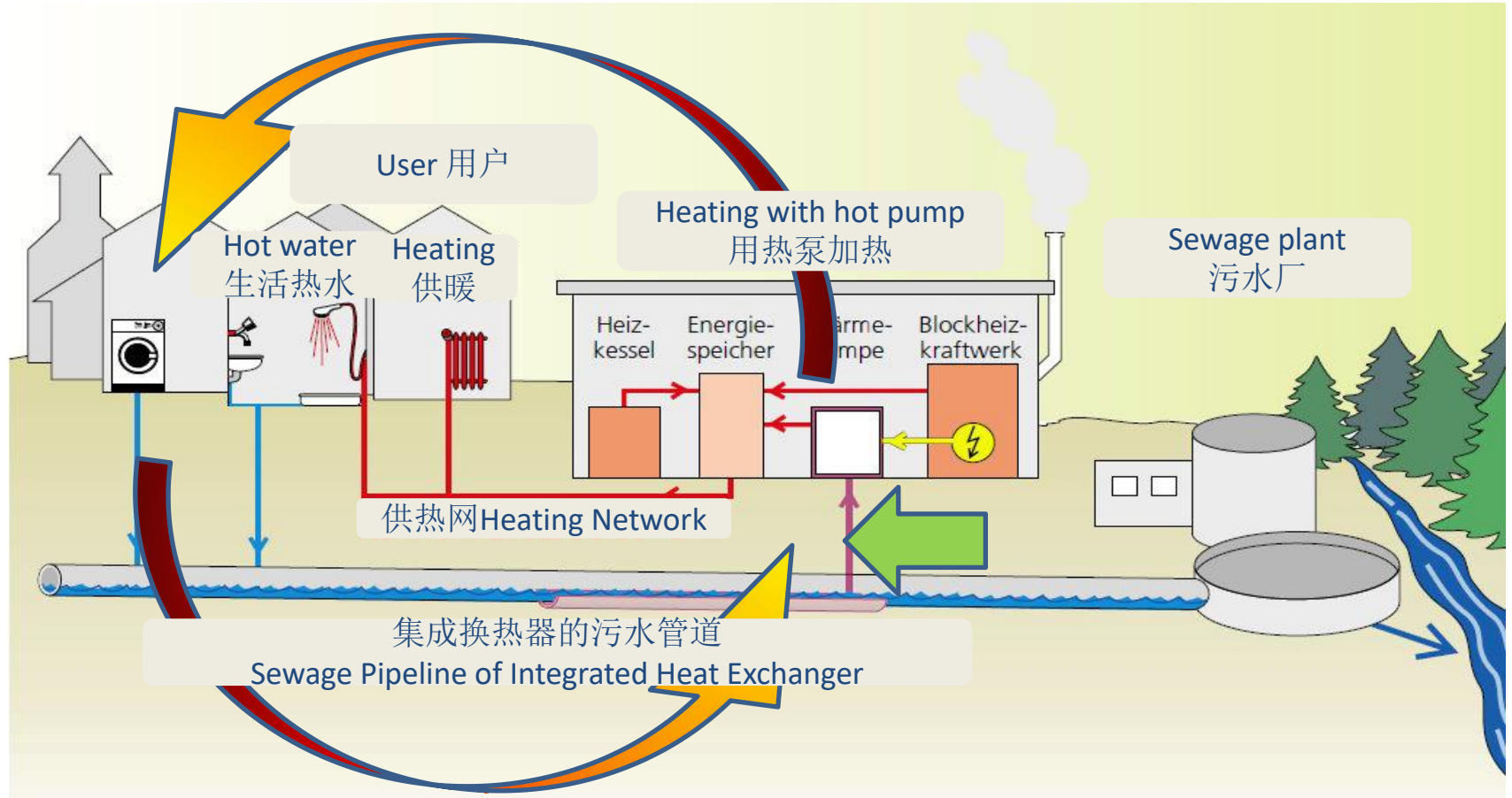
- ① The heat from the waste water is transferred to the clean water in the pipeline by a sewage pipe heat exchanger  
通过污水管道换热器把废水中的热量转换到管路中的清洁水中
- ② Heat is transferred to the heat pump through the "lower" heat pump loop  
热量通过“下面”的热泵回路输送到热泵
- ③ Heat pump will temperature increase to the desired level (40-80 ° C)  
热泵将温度提升到所需的水平 (40-80° C)
- ④ Heat is transferred to the user through the "upper" heat pump loop  
热量通过“上面”的热泵回路传递给用户



# Providing a unique solution for the city – waste heat from sewage



## 为城市提供独特的解决方案---来自污水的废热



从门前流过的分散式环境友好型热量 decentral energy



# Applications 在城市的应用和重要性

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- **New waste water systems in the new urban area**— a system that provides clean and low cost thermal energy for heating, hot water and cooling
- 新的城区采用新的废水处理系统——一个为供暖、热水和制冷提供清洁和低成本热能的污水系统
- **Urban sewage pipeline reconstruction**
- 城市污水管道改造
- **Suitable applications: Industrial Plants, waste water plants and coal mines**
- 工业厂房、废水处理厂和煤矿将是合适的应用



## Advantages 优势

- In a new city planning: low investment costs
- 应用在新的城市规划中：低投资成本
- 4 problems could be solved:
- 解决4项问题
  - ✓ Sewage transportation 污水运输
  - ✓ Heating 供暖
  - ✓ Cooling 制冷
  - ✓ Hot water 热水
- Low Operating costs (25% of electrical or gas boilers)
- 低运营成本（25%的电力或燃气锅炉）
- No Pollution (no flue gas, no noise)
- 无污染（无烟道气，无噪音）
- Reduce Heat Island Effect in summer
- 夏季减少热岛效应
- Little space requirements
- 很少的空间需求
- Be easily combined with other technologies if necessary
- 若需要，可以很容易与其他技术结合使用



# Importance for Chinese Society 对中国社会的重要性

- Reduce the dependence on fossil fuel to meet the obligations of Paris Climate Agreement COP24
- 减少对化石燃料的依赖，以履行巴黎气候协定的义务
- Reduce the financial burden for the cities and their citizens by reducing investment and operating costs
- 通过降低运行成本，减轻城市及其公民的经济负担
- Improve attractiveness of the cities and quality of life by reducing local pollution and the heat island effects in summer (hot and humid)
- 通过减少本地污染和夏季热岛效应（炎热和潮湿），提高城市的吸引力和生活质量。
- Beautify the city by removing outdoor units of traditional conditioning systems
- 通过移除传统空调系统的室外机来美化城市。

# Barriers to implement large scale projects in cities

## 在城市实施大型项目的障碍



1. Waste water system and thermal energy planning not integrated  
废水系统与热能规划无法整合
2. Time lag between waste water system and building construction  
废水系统与建筑施工间存在时间延迟
3. Higher initial investment costs for sewage system by sewage system operator vs. lower investment costs of integrated heating/cooling/hot water systems  
对污水系统运营商而言污水系统的较高初始投资成本 vs. 供热/制冷/生活热水系统整合的较低投资成本
4. Heating/Cooling demand for later construction projects not known when sewage pipe system is constructed  
后期建设项目对供热/制冷的需求在污水管系统的建设时期尚不明确
5. Heating and Cooling demand higher than SE capacity  
供热和制冷需求高于污水发电能力

# Measures to overcome the barriers

## 克服障碍的措施



- 1. Integrated City Planning – considering use of sewage energy for Heating/Cooling and Hot Water**  
整合城市规划——考虑利用污水能源来供热/制冷以及提供生活热水
- 2. Establish a city energy supply company (“Energy Operator”) to invest and operate this system**  
设立城市能源供应企业（“能源运营商”）来投资和运营该系统
- 3. Change policy to require users in the area to buy heating and cooling energy from the Energy Operator**  
更改政策来要求该地区的用户从能源运营商购买供热和制冷能源
- 4. Set up pricing system to give users confidence**  
建立价格体系以给予用户信心



**Thank you for your attention.**  
**感谢您的关注**

**Energy & Cost Efficiency  
for your City !**

**为您的城市提供清洁能源和成本效率！**

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