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Smart Building, Concept, Opportunities and Challenges in Kazakhstan

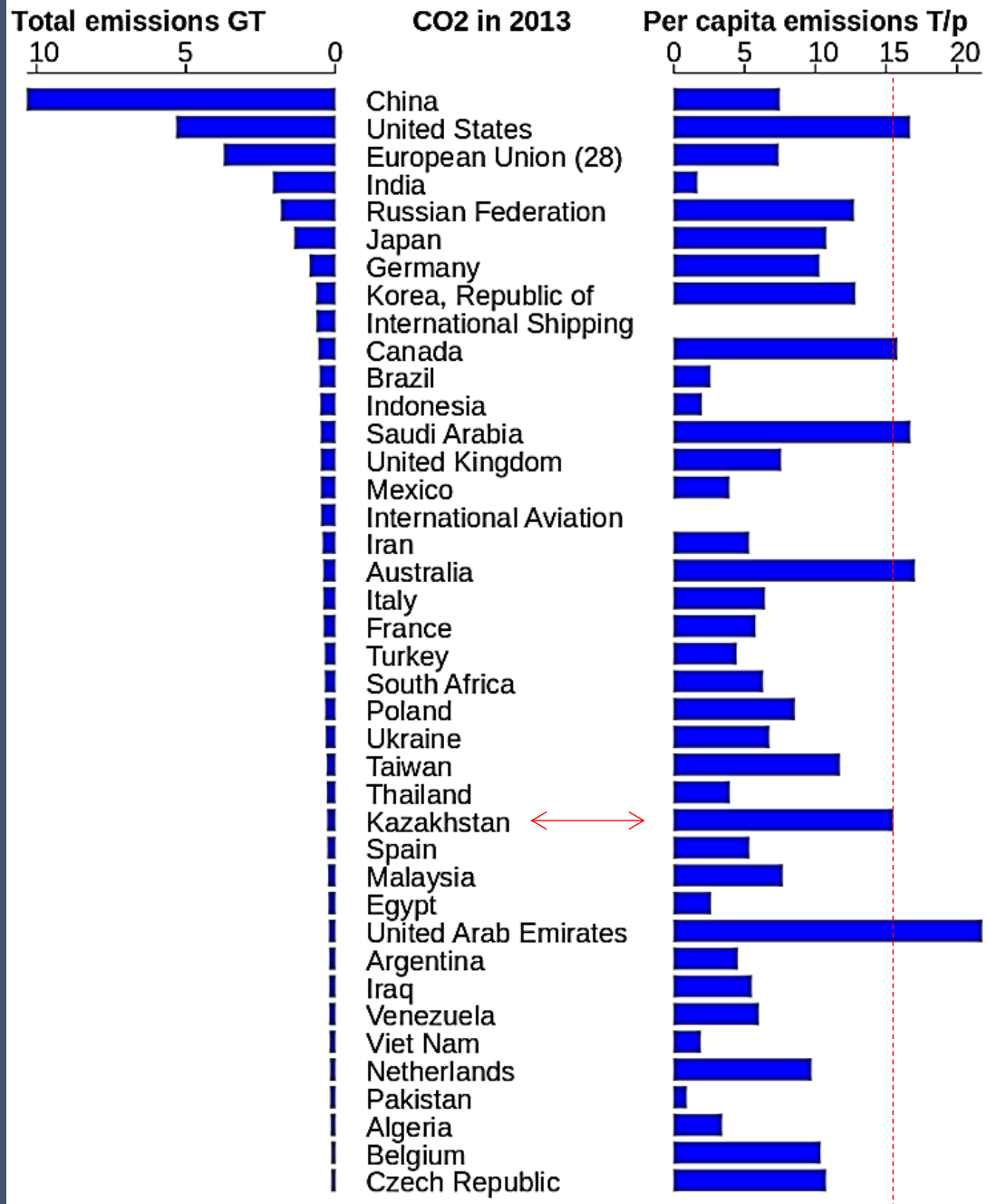


Topics

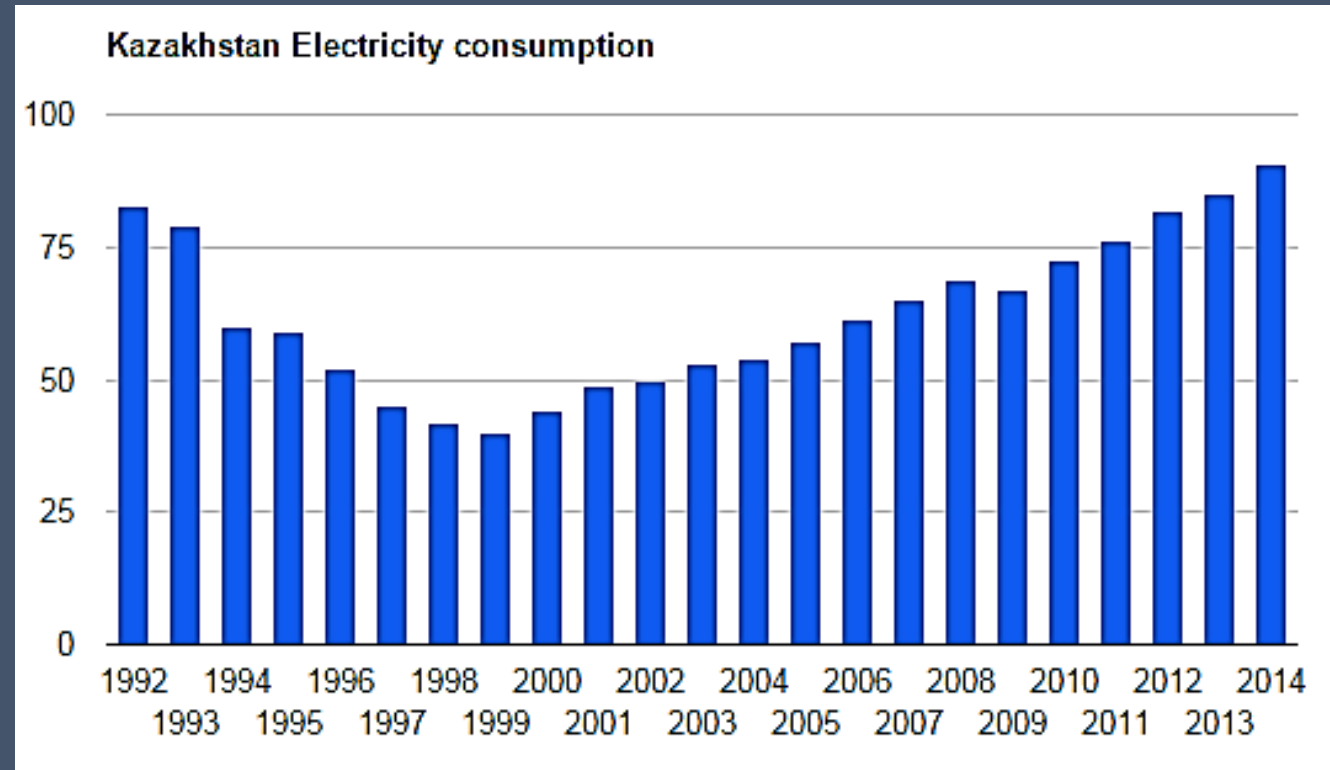
- Smart Buildings Concept
- Opportunities and Challenges for Smart Buildings
- Current Situation in Kazakhstan
- Smart Meter as a Solution for Smart Buildings
- Advantages and Disadvantages of Smart Meter
- Our Plan at NU, Features Offered

Why?

- Energy Consumption (we focus on electricity)
- Carbon Emission Reduction



Why?



http://www.theglobaleconomy.com/Kazakhstan/electricity_consumption/

Reference: http://edgar.jrc.ec.europa.eu/overview.php?v=CO2ts_pc1990-2013

What is Smart Building?

Understanding distinctive features of "intelligent" buildings is very important. "Smart" buildings differ from usual buildings, so designing process is different as well.



Smart Building?



Figure 1. Smart Building Concept

- **Current Definition:** Any structure which utilize automated processes to automatically, locally or remotely control the building's operations including heating, ventilation, air conditioning, lighting, security and other systems.
- Implementation of sensors, actuators and microchips, in order to collect data and manage it according to a business functions and services.

What is Smart Building?

Definition by: Online oxford dictionary definition

“A home equipped with **lighting, heating, and electronic devices** that can be controlled remotely by smartphone or computer: **you can contact your smart home on the Internet** to make sure the dinner is cooked, the central heating is on, the curtains are drawn, and a gas fire is roaring in the grill when you get home”.



What is Smart Building?

What is really inaccurate in this definition?

- All decisions are initiated not by a "smart" home, but by smart inhabitants.
- This definition reflects the current state of the market. This is now available.
- Very often "smart" buildings are confused with just automated buildings.
- Most commercial products can provide only the ability to use a remote control and predefine behavior of different engineering systems.

What is Smart Building?

More recently CIB Working Group W98

- An intelligent building is a dynamic and responsive architecture that provides every occupant with productive, cost effective, and environmentally approved condition, through a continuous interaction among elements:
 - Places (fabric structure, facilities)
 - Processes (automation, control systems)
 - People (Services and users)
 - Management (Maintenance, performance) and the interaction between them

Background for Kazakhstan



Figure 2. Highvill apartments in Astana.
Highvill apartments – example of smart buildings implementation in Kazakhstan?

Current situation of most of the buildings:

- **Not networked, independent**
- Have no active monitoring system
- **Have no centralized control system**
- Building automation or management systems are not integrated

Companies implementing building automation based on foreign technologies:

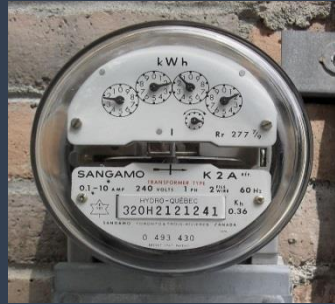
- “Homecontrol” (<http://homecontrol.kz>)
- “Smarta” (<http://smarta.kz>)
- “SmartHouse” (<http://smart.kci.kz/>)

One of the solution to make building smart is **Smart Meter** implementation.

Meter History

1. Analog meter

Year 1891



2. Automatic Meter Reading (AMR)

mid-'80s, and more prominently in the early 1990s



3. Advanced Metering Infrastructure (AMI)

around 2005



4. Smart Meter

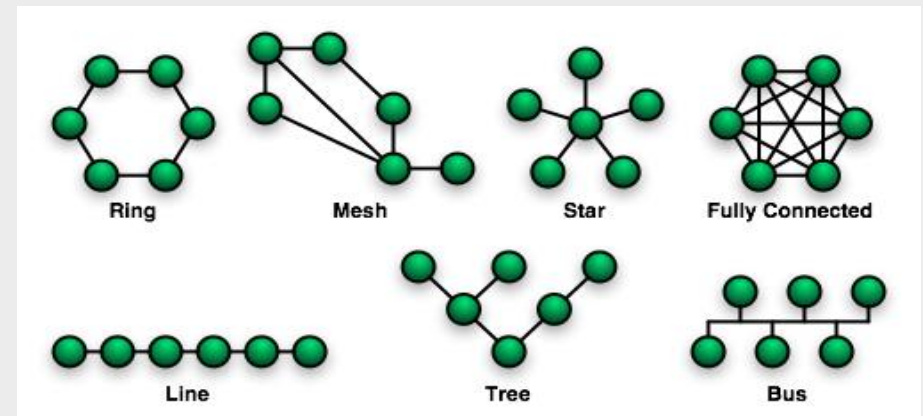


Smart meter solution for smart buildings

The present system of energy metering as well as billing in Kazakhstan uses **electromechanical and somewhere digital energy** meter (~5M electricity meters installed). Recently in Almaty AMIs are installed.

Understanding distinctive features of "intelligent" buildings is very important. **"Smart" buildings differ from usual buildings**, so designing process is different as well. **Smart meter is not just an automated meter.**

A "smart" meter is an electric meter acts as a gateway for **two-way communications** or information exchange between the consumer and the utility.



Minimum Advantages of AMIs

Customer side

- **Consumption Management**
- **Usage Pattern**
- **Billing Accuracy**

Service Provider side

- **Load Profile Analysis**
- **Billing Accuracy**
- **Reliability**

Disadvantages of Smart Meter

- **Security**
- **Privacy**

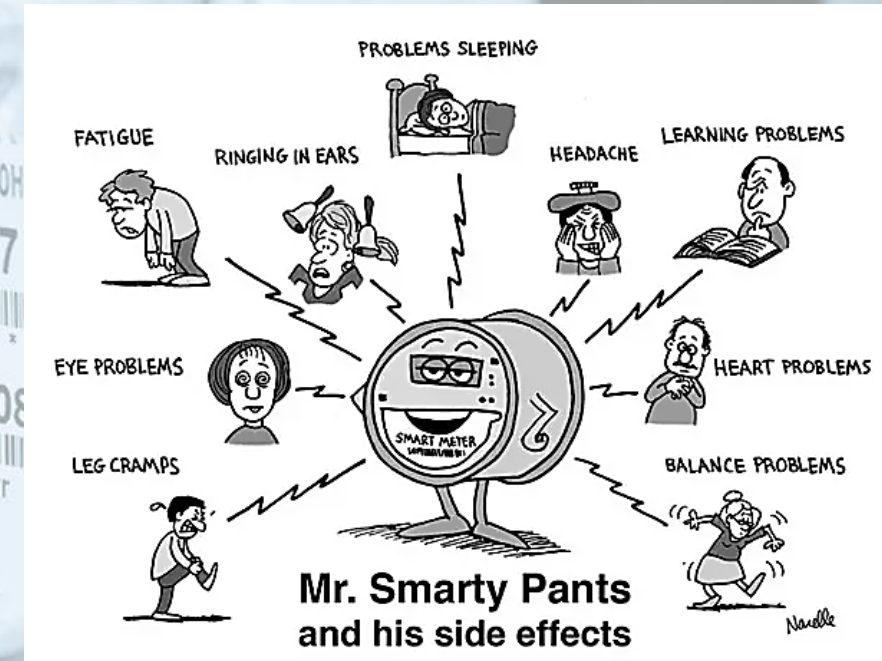


Figure 3. Side effects of smart meter.

How to
eliminate
disadvantage

The features in smart meter should be able to make both **consumer** and **electricity provider** happy.



How we make consumer happy? **Is that just giving automatic bill?**



How the people usually becoming happy?

1. Earning money
2. Saving money
3. Interrupting corruption
4. Tell a good joke
5. Bringing a cup of tea or coffee
6. Helping each other
7. Good food
8. More comfort
9. Security
10. Honesty
11. Having large kitchen
12. Good parking space
13. More Discount
14. Controlling everything with smart phone
15. Having success
16.



Available AMI System in Kazakhstan

Advanced Metering Infrastructure (AMI)

- *LCD display over the meter, reactive power / pulses of full power*
- *LCD status indicator of the modem (green color: when installing the modem)*
- *In-home displays (IHDs)*
- *RS-485 communication port (IN / OUT)*
- *Battery*
- *PLC communication port*
- *LCD indicator of active power pulse*
- *Port for the control relay (LATCH RELAY)*
- *Calculating electricity bill*
- *Sending/receiving information to data center*
- *Connecting to RF, GSM, and Wifi*



But this is still far away to what we are planning to perform

Challenges ahead

1. More privatization is required
2. Governmental plan is required
3. There should be deadline for implementation
4. Governmental encouraging system is required
5. Network traffic management

Advantages of Proposed Smart Meter

Customer side

- Usage Pattern
- Billing Accuracy
- Consumption Management
- Performance and Fault Detection
- Energy Saving
- Easy Payment
- Safety
- ...

Service Provider side

- Load Profile Analysis
- Billing Accuracy
- Reliability
- Security
- Dynamic Tariff
- Demand-Response
- DG Integration Management
- Adoption with Smart Grid Protocols
- ...



Shell Yurt

NURIS

On campus facilities for testing and implementation



Figure 4. Shell Yurt

Thanks for your attention!

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Figure References

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