

## Second Workshop: Practices and Challenges in DSM

# Electricity Conservation in Saudi Arabia– Enhancing Consumer Awareness

By

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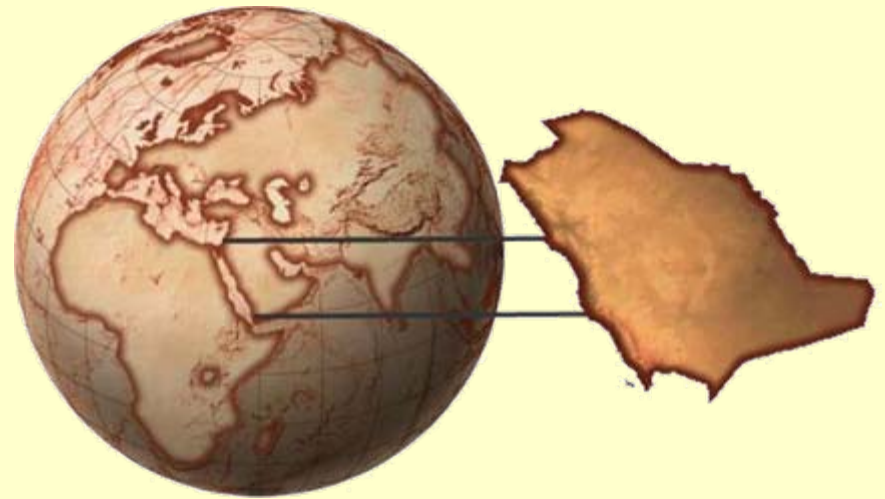
ECE Dept, KAU



# Preface

## Saudi Arabia is very unique!

- Geographical Location
- Size in sq. miles
- Climate
- Religious Seasons



\* Pictures source: images of yahoo.com and google.com

# Overview of Electricity Trends

- **In 1975**
  - No. of power utility customers was 351,000
  - Total Peak load was 300MW
- **In 2005**
  - No. of power utility customers was 4,728,918
  - Total peak load was 29,913MW
  - Customer 14 times higher, PL 100 times higher!
- **In 2009**
  - No. of power utility customers was 5,701,516 (21% more)
  - Total peak load was ##,### MW

\* Source: SEC Annual Reports

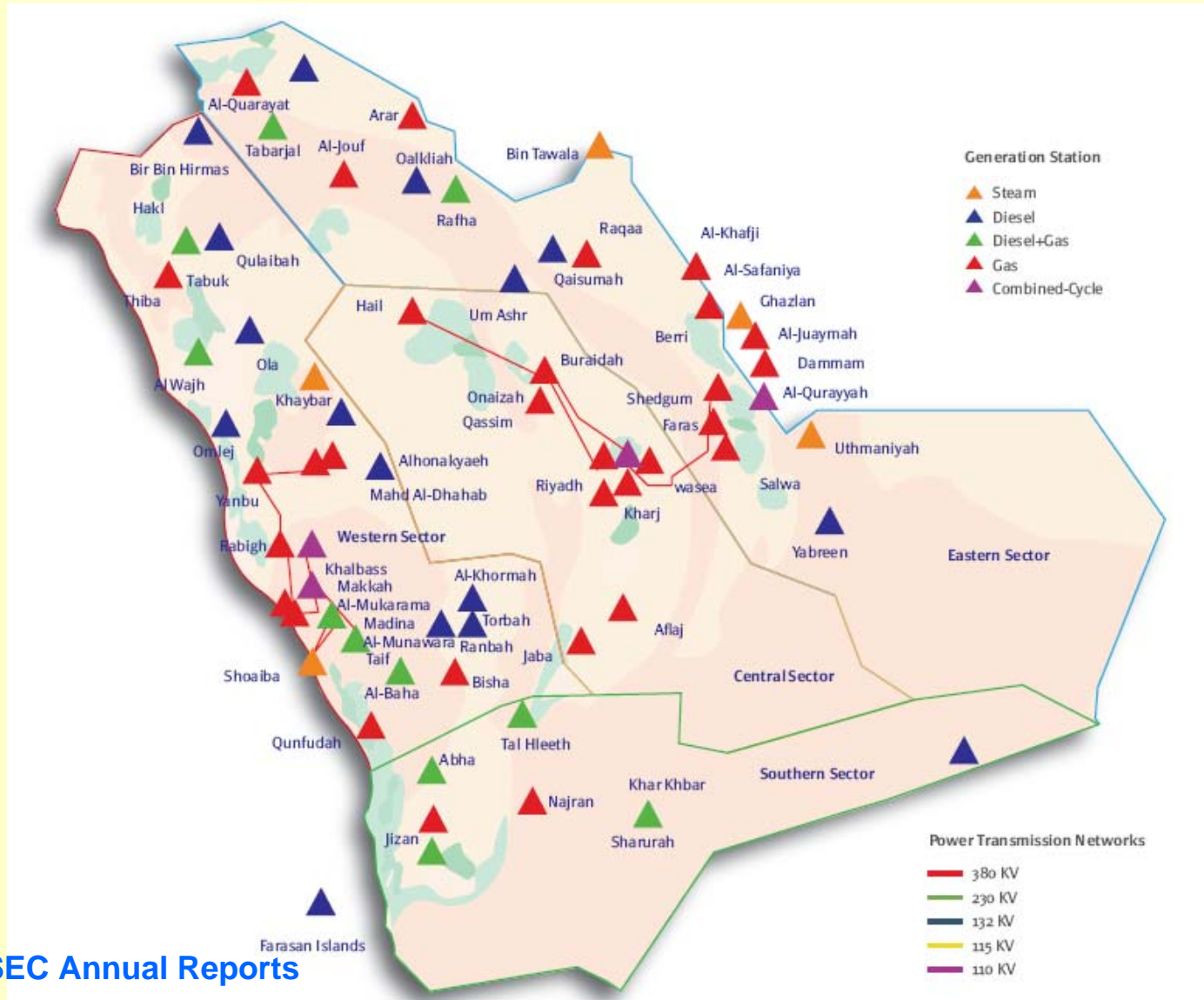
# Reasons for high Trend

- **Rapidly increasing population increases power demand**
- **Increase in number of customer connections**
- **Expansion in industrialization and development projects**
- **Extending electricity to remote villages**

# **Actions Taken**

- **Launching of Nationwide Power Projects**
  - Upgrading and expanding existing plants
  - Improving generating units' efficiency
  - Building new power generation facilities
- **National interconnection of power networks**
- **Interconnection of power networks with Gulf Nations**
- **Private Sector's contributing significantly**

# Overview of Electricity Services



\* Source: SEC Annual Reports

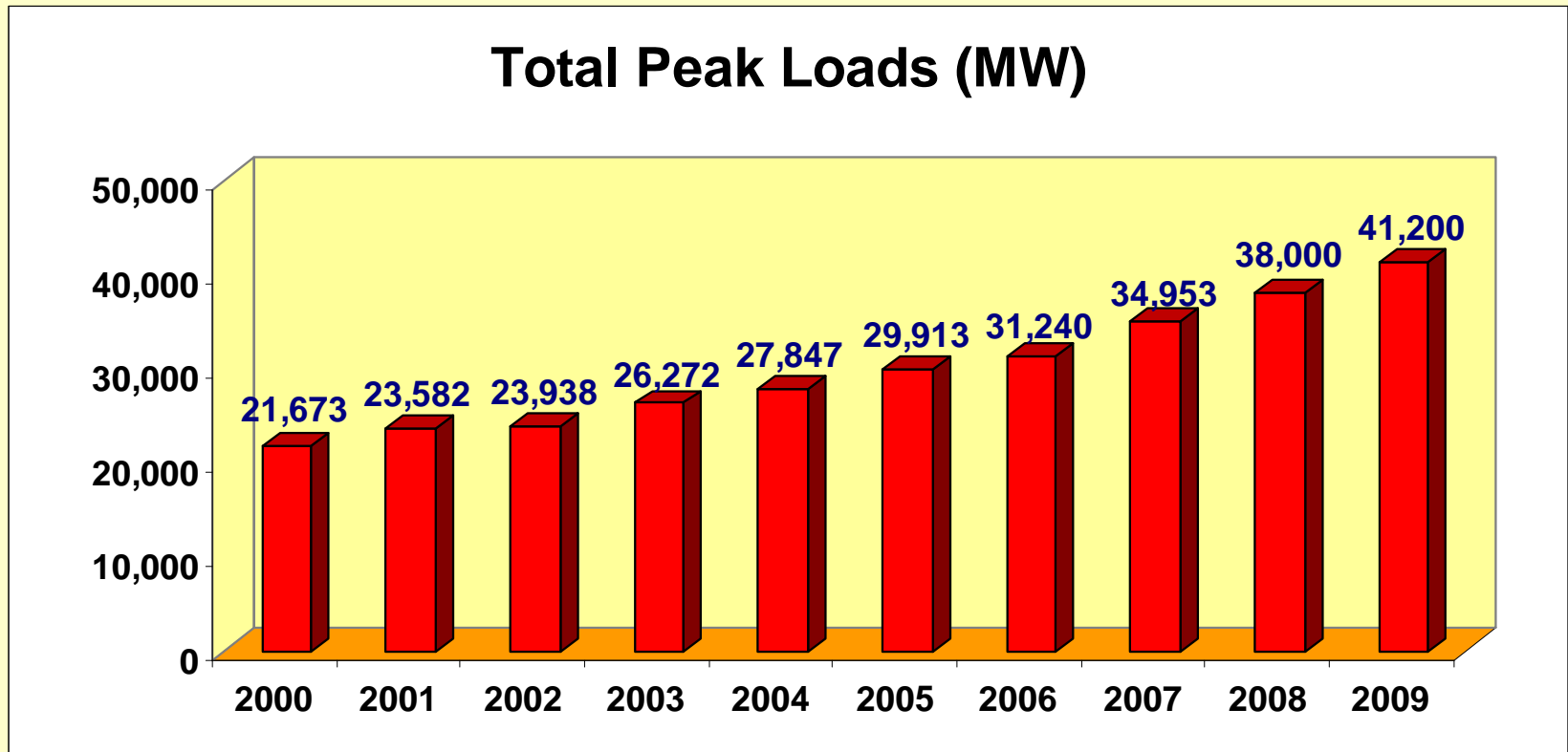
# Demand Forecast\*

	<b>Most Likely</b>	<b>High Growth</b>	<b>Low Growth</b>
<b>Year</b>	<b>Peak Load (MW)</b>	<b>Peak Load (MW)</b>	<b>Peak Load (MW)</b>
<b>2008</b>	<b>33,930</b>	<b>36,720</b>	<b>32,816</b>
<b>2013</b>	<b>41,940</b>	<b>48,253</b>	<b>39,468</b>
<b>2018</b>	<b>50,218</b>	<b>63,415</b>	<b>46,371</b>
<b>2023</b>	<b>57,808</b>	<b>83,779</b>	<b>52,588</b>

\* Independent study by KFUPM, Dhahran, 2005

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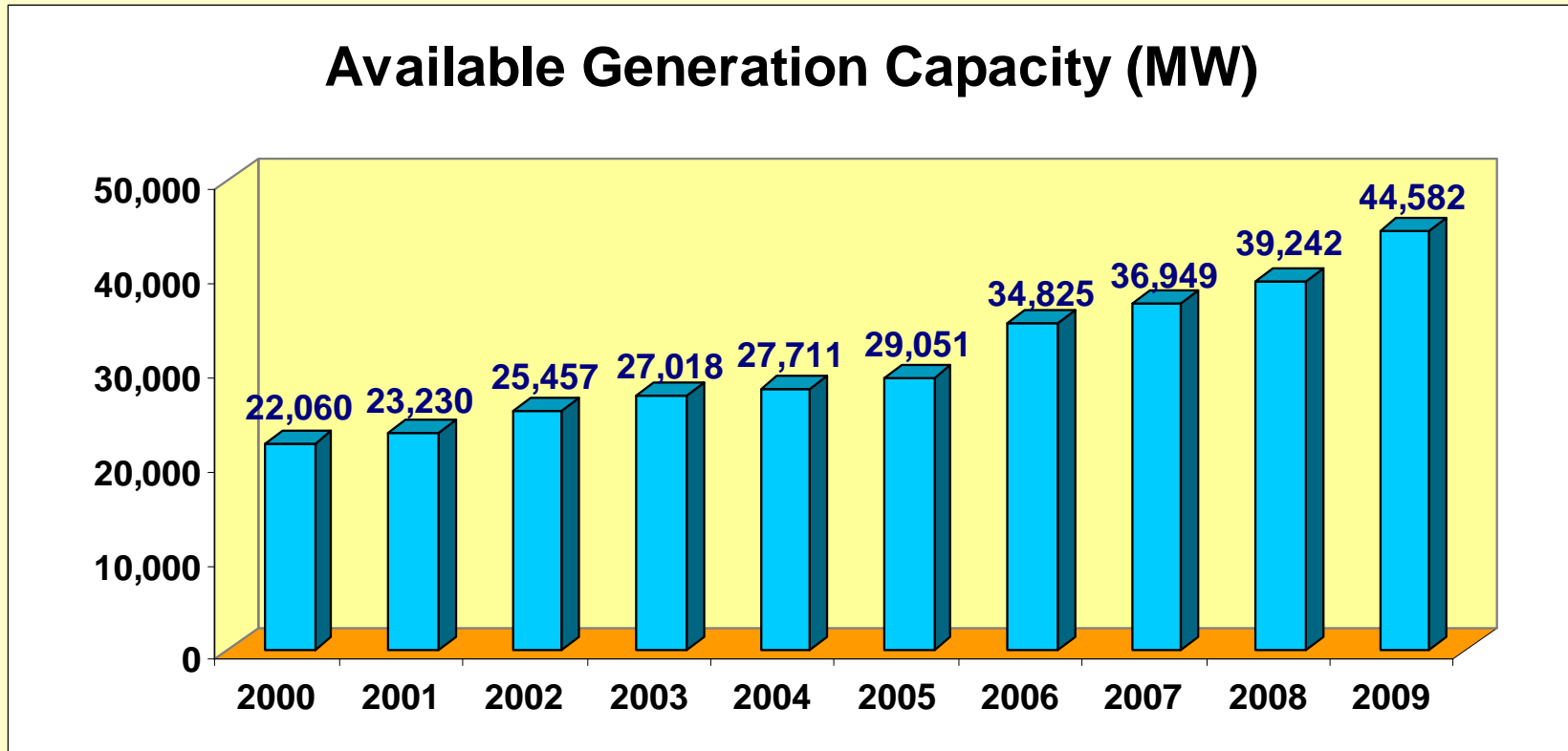
# Actual Electricity Demand



\* Source: SEC Annual Reports



# Actual Electricity Demand



\* Source: SEC Annual Reports

# **So what went wrong?**

**The study didn't take into account an important factor!**

**Consumer Behavior!**

# Consumer Behavior

## Mr. Rashed 1980:

2- fluorescent lamps  
20W each



3- Light bulbs  
60W each

Window unit  
12000btu

1-light bulb 60W



# Consumer Behavior

## Mr. Rashed 1980:

Low ceiling  
with 30  
fluorescent  
lamps  
20W each



# Consumer change of Behavior

## Mr. Ghanem: 2009

10-  
spotlights  
50W each



8-  
fluorescent  
lamps  
20W each



10- light  
bulbs  
60W each



2- Split  
Units  
24000btu  
each



# Consumer change of Behavior

**Mr. Ghanem: 2009**

High ceiling  
with 200+  
Incandescent  
lamps

200W each



# Consumer change of Behavior

Mr. Wiser: 1980

London Suburbs



1- Lightbulb  
60W

\* Picture source: images of yahoo.com

# Consumer change of Behavior

Mr. Gainer: 2009

London Suburbs



3- Lightbulbs  
60W each

\* Picture source: [images of google.com](https://www.google.com)



# Consumer change of Behavior

My office! At ECE Dept.

4 - fluorescent lamps, 20W each, one always out!



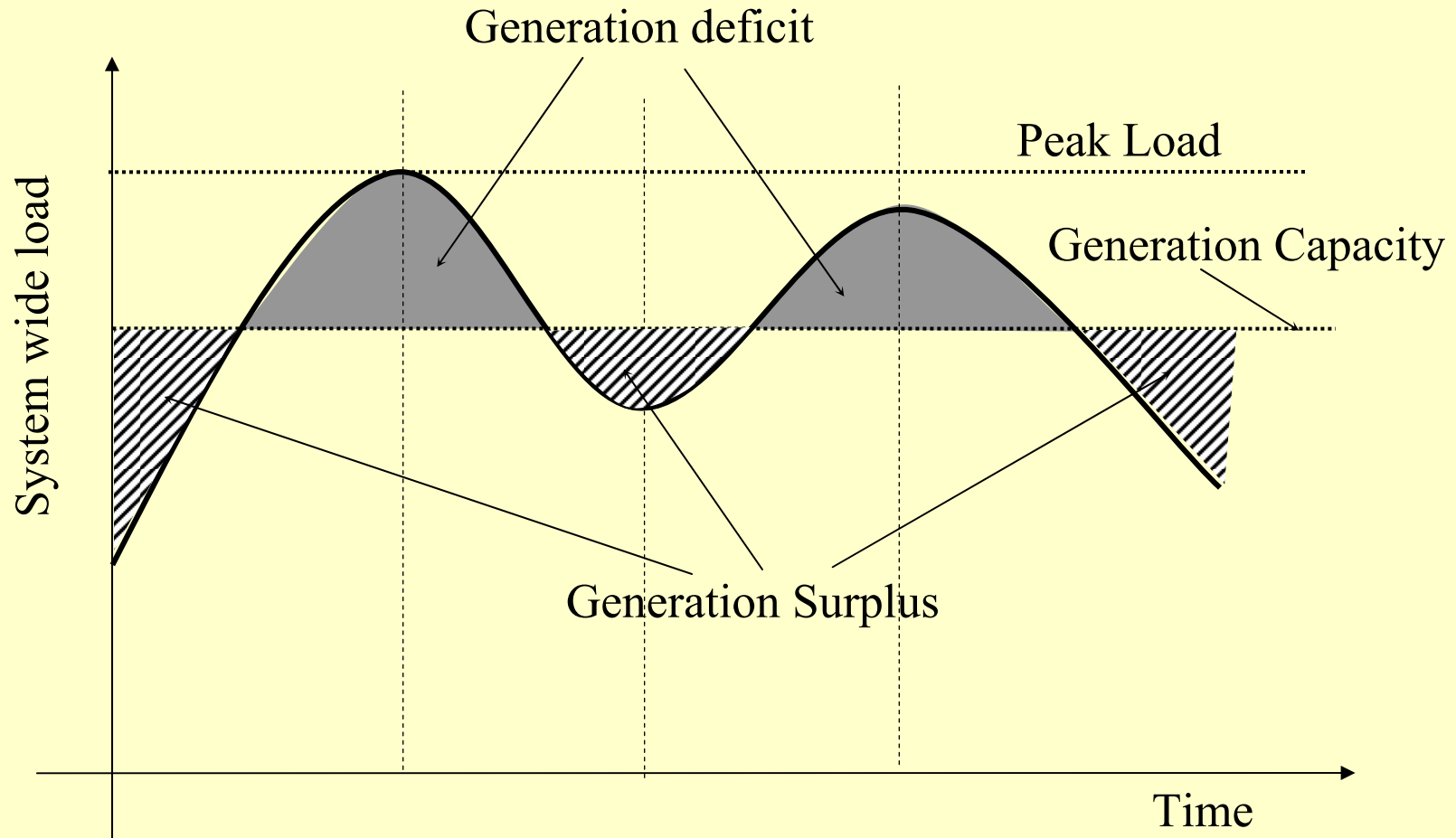
# Consumer change of Behavior

My office! At ECE Dept.



Renovated:  
Low artificial  
ceiling  
with 36  
fluorescent  
lamps  
20W each

# Electricity Company Concern



# The More Crucial Concern

## Electricity Demand itself!!

- Unnecessarily and unrealistically high
- Inflated and not reasonable!
- Not really needed!
- Doesn't really have to be met!
  - More customers like Mr. Ghanem
  - Less customers like Mr. Rashed

# Where is the Electricity being used?

- Wasted in homes and offices
- Wasted on excessive unnecessary use
- Lighting like daylight!
- Wasted on streets



# Where is the Electricity being used?

- Air-conditioning of large spaces and Huge glass buildings



# Is applying DSM sufficient?

**Water spills and leaks and drip irrigation!**



\* Pictures source: images of yahoo.com and google.com

# Facts!

- **Excess in availability teaches wastefulness!**
- **Most consumers are spoiled and wasteful!**
- **Not every Demand should be met!**
- **Electricity company must not strive to meet the demand as if it was sacred!**



# So what do we do?



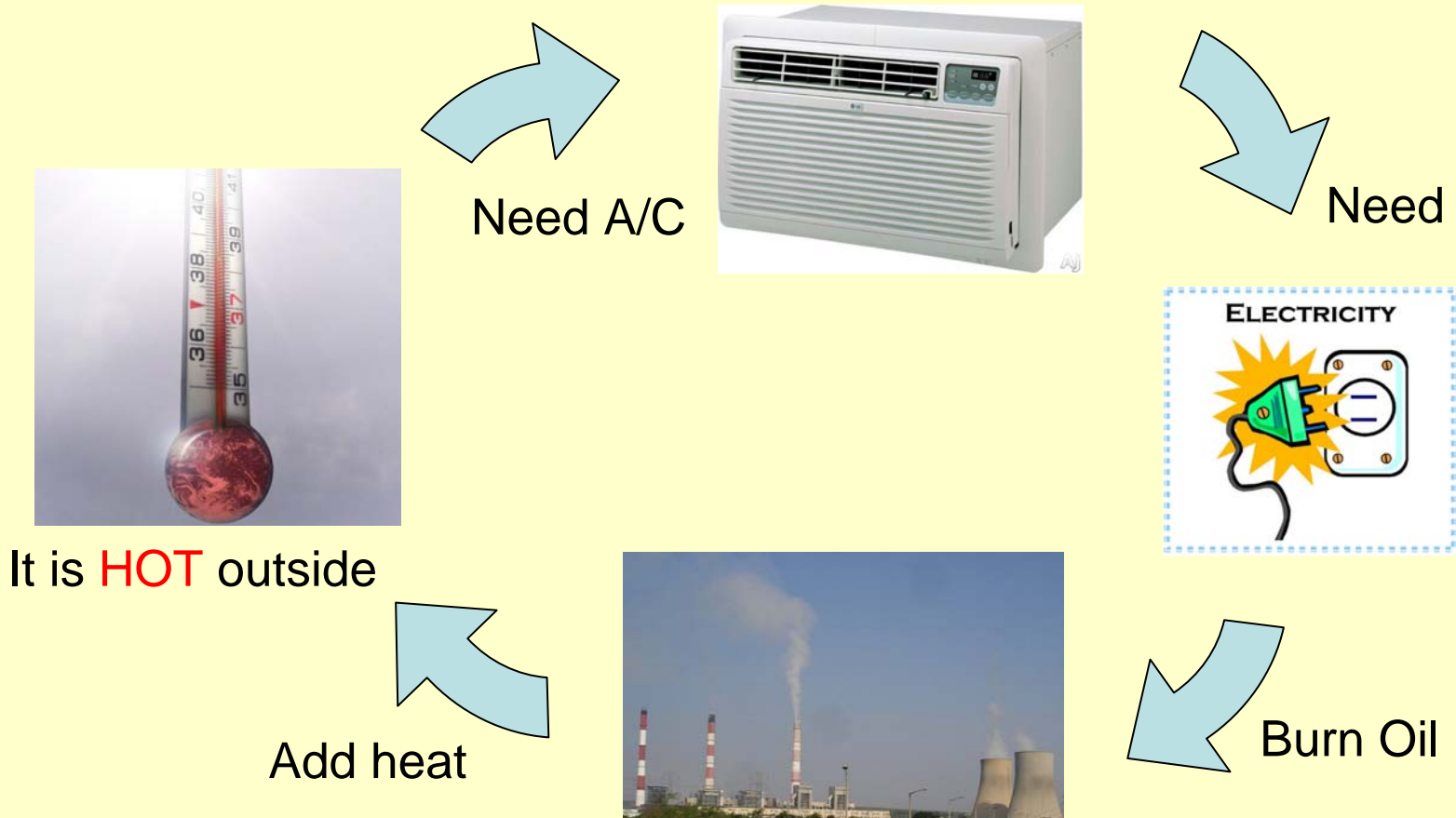
- **Teach people how to conserve!**
- **Don't spend SR10B to build a 2GW plant!**
- **Spend a few SRM and teach consumers that they don't need these extra 2GW**

# **Start Promoting Electricity Conservation in Homes**

- **People usually care for their homes more than their work or business**
- **Teach everyone around you to conserve**
- **Children need to be raised on the value of conservation**
- **Every penny counts, don't underestimate little savings**

# Lesson #1: The Vicious cycle of A/C

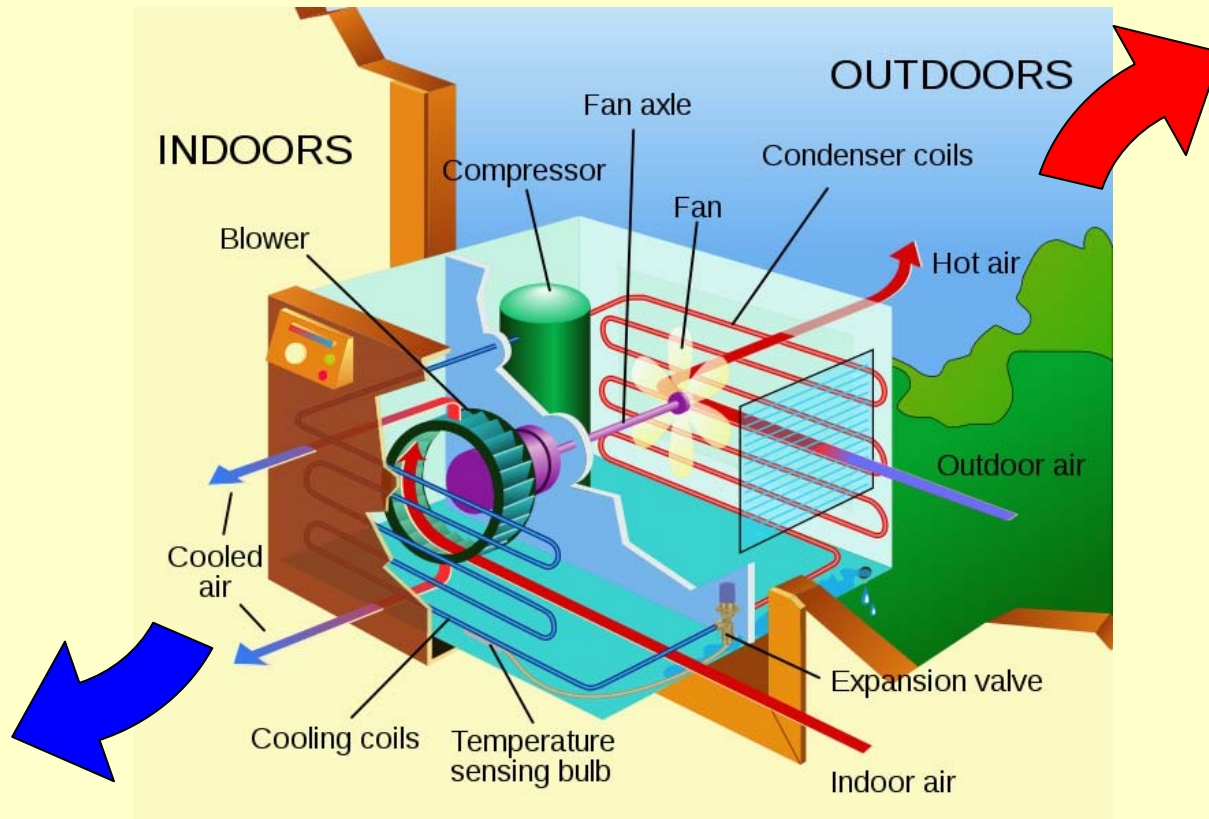
- Air-conditioning is a misleading term!
- It is actually Heat Cycling



\* Pictures source: images of yahoo.com and google.com

# Lesson #1: The Vicious cycle of A/C

- Wait!!! There is more to that!
- An A/C dumps the heat outside to make the room colder!



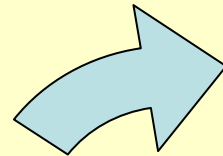
\* Picture source: images of yahoo.com

# Lesson #1: The Vicious cycle of A/C

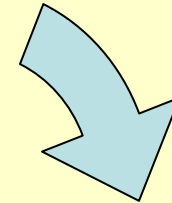
## The full picture!



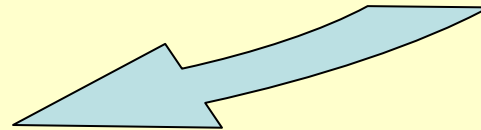
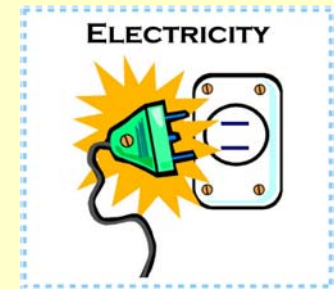
It is **HOTTER** outside



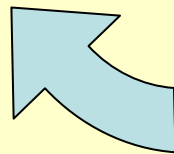
Need A/C



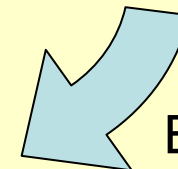
Need



Add **more heat**

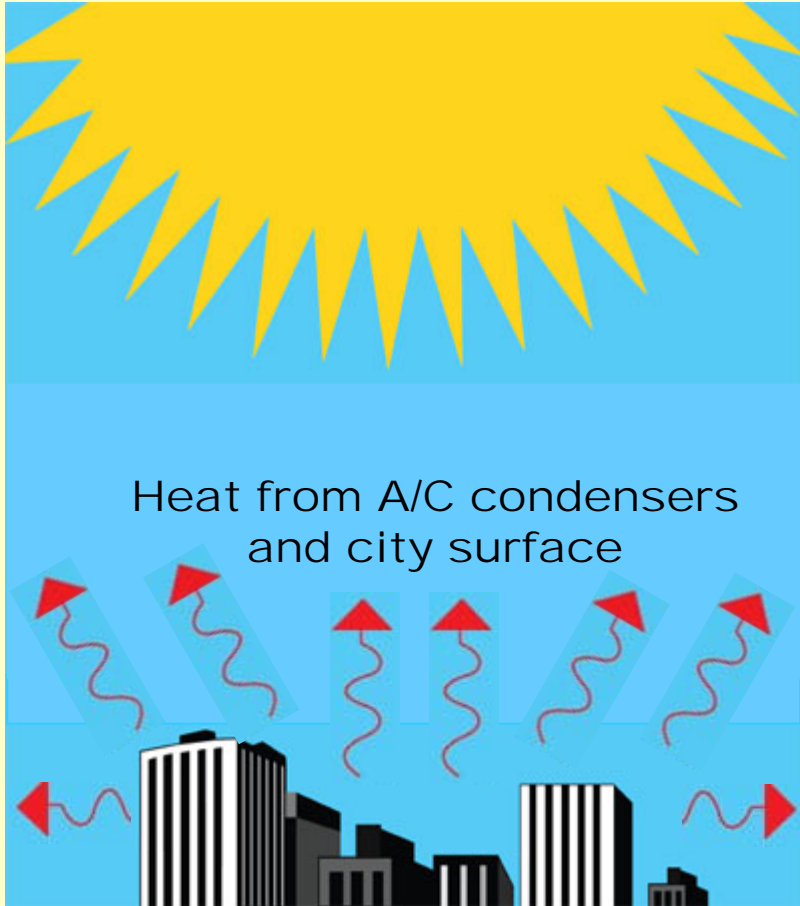


Add **heat**



Burn Oil

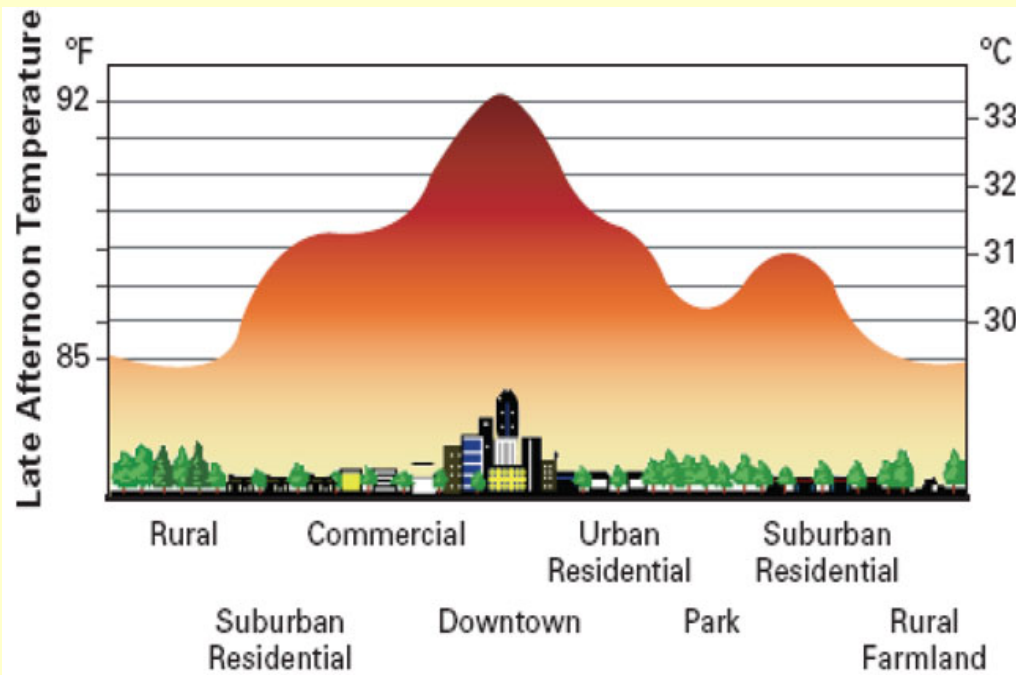
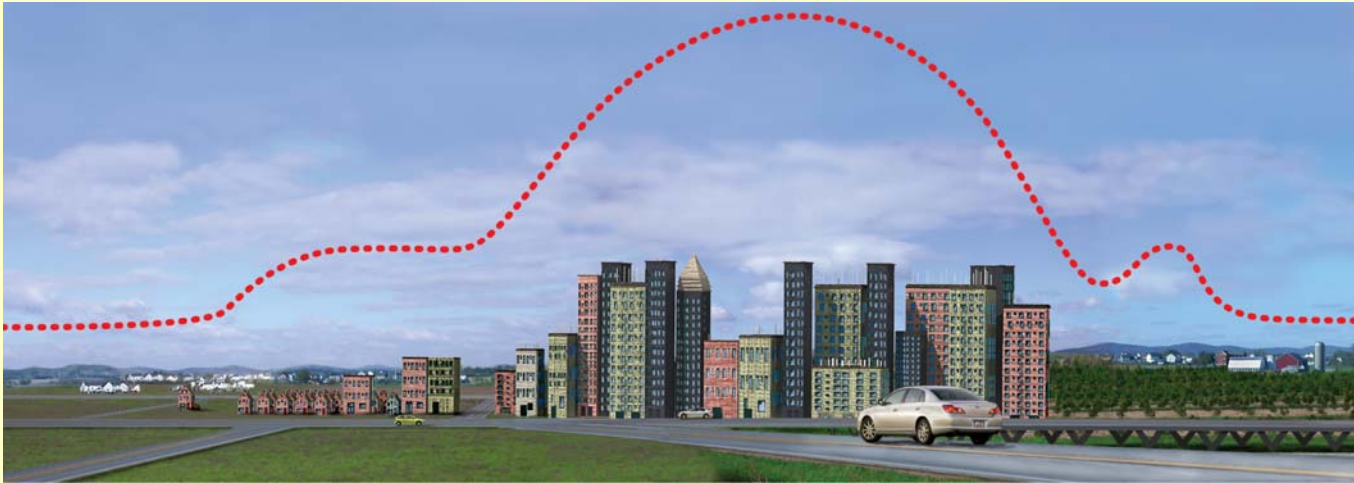
# Lesson #1: Urban Heat Island



\*Adapted from images of yahoo.com



# Lesson #1: Urban Heat Island



**The  
Atmosphere  
is not a  
Heat sink!**

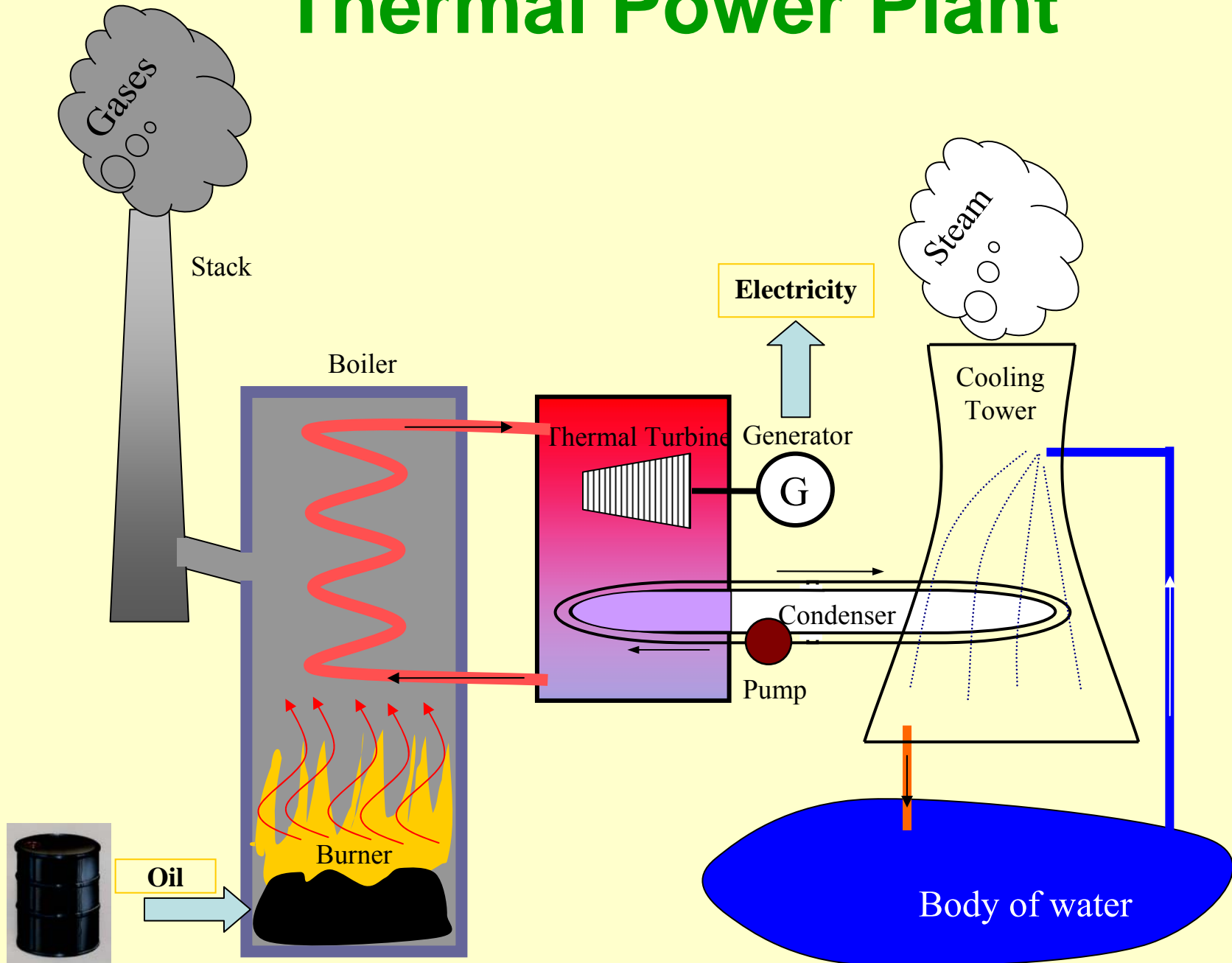
\* Pictures source: images of yahoo.com and google.com

# **Lesson #2: Electricity Costs way more than what we pay!**

- **Oil is a precious and very important resource**
- **To get Electricity, we burn Oil**
- **Burning Oil harms the environment**
- **Burning Oil wastes our resources**
- **We can't afford wasting electricity!**



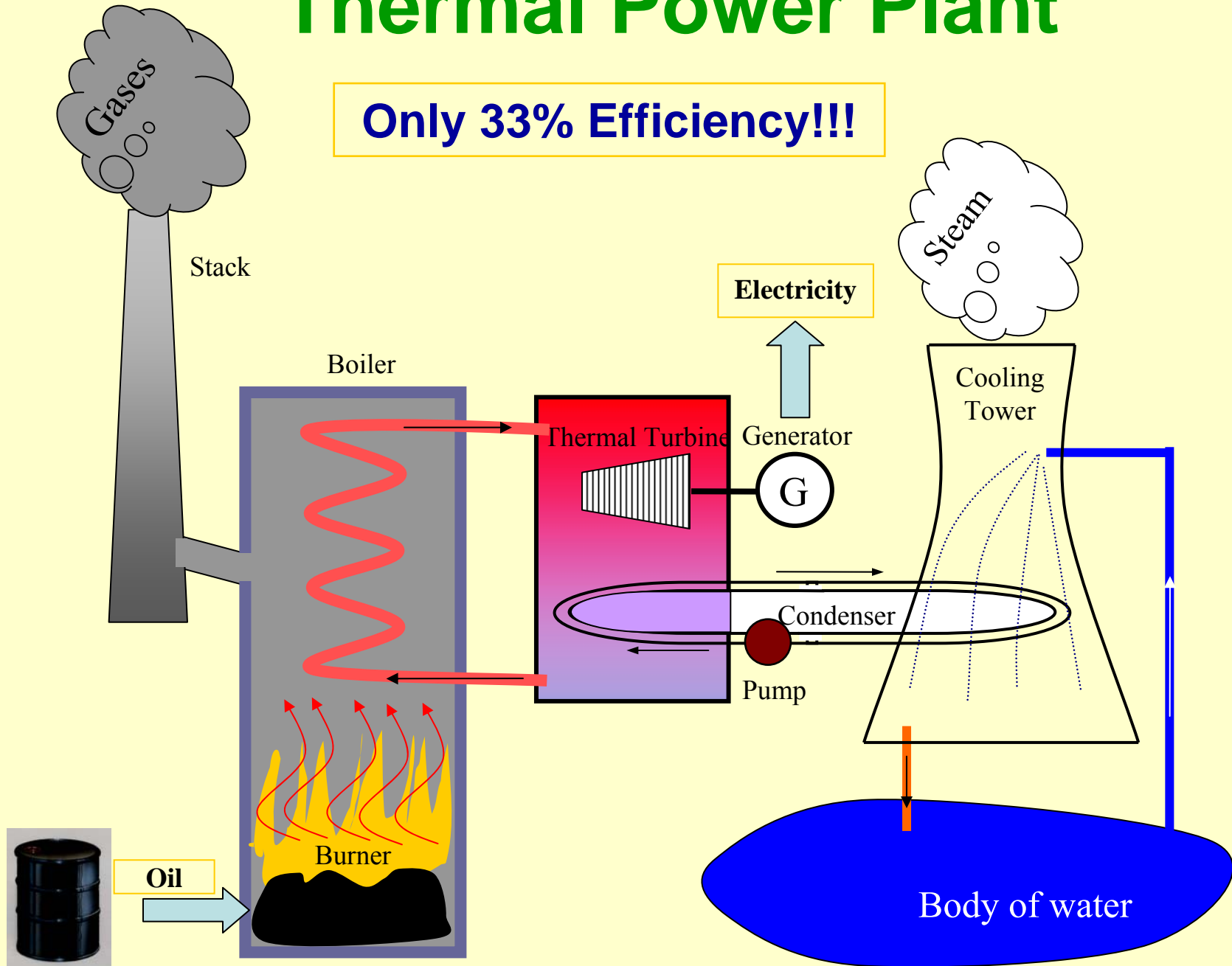
# Thermal Power Plant



\* Source: Adapted from "Electric Energy : An Introduction" book by M. El-Sharkawi, CRC, 2008

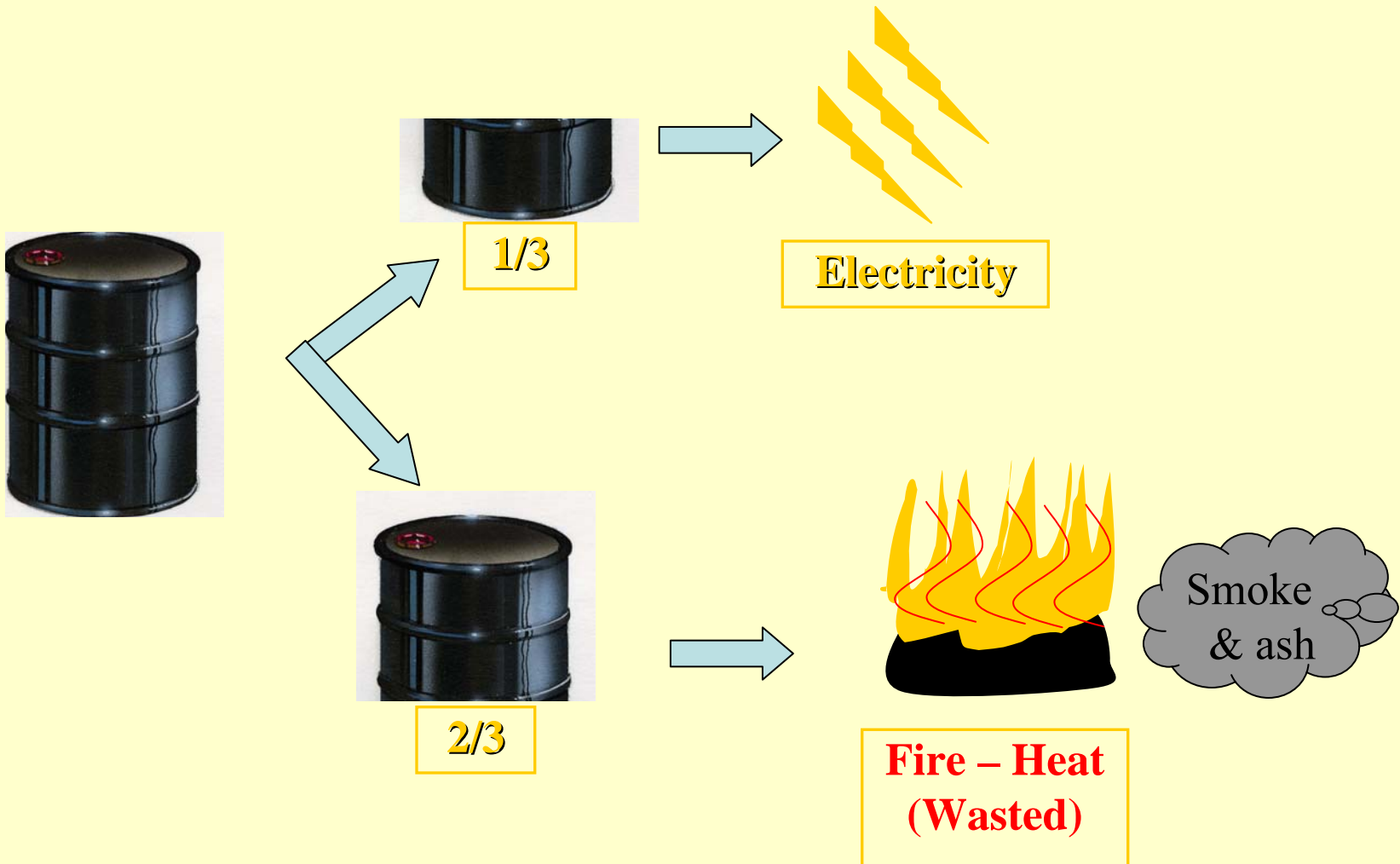
# Thermal Power Plant

Only 33% Efficiency!!!



\* Source: Adapted from "Electric Energy : An Introduction" book by M. El-Sharkawi, CRC, 2008

# Wasting Oil and Harming the Environment

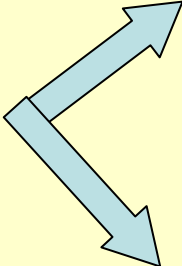


# Wasting Oil and Electricity

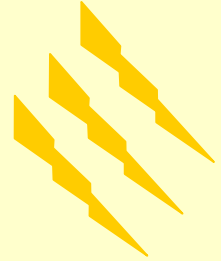
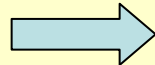
\* Picture source: images of yahoo.com



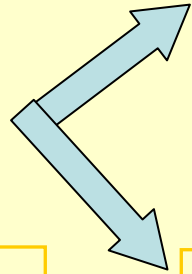
**83.33%  
Wasted  
Plus ->**



**1/3**



**Electricity**



**1/2 Used**

**1/2 Wasted**



**2/3**



**Fire – Heat  
(Wasted)**

- SO<sub>2</sub> and SO<sub>3</sub>**
- Acid Rain**
- CO<sub>2</sub>**
- NO<sub>x</sub>**
- Ashes**
- Troposphere**
- Ozone (O<sub>3</sub>)**
- Global warming**

# Lesson #3: We do not own Earth

- We are only entrusted with it for our lifespan, and we are held responsible
- We share Earth with other inhabitants and with our descendants too
- Consuming our resources at current rates will leave nothing for our grandchildren
- We will pay badly for harming our Earth



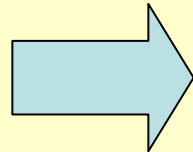
# Lesson #3: We do not own Earth

- It is there... doesn't mean it is solely yours  
... It doesn't mean you can use it all!



# Lesson #3: Stop wasting Earth's Resources

- Even if you pay for it all, you can't have it all!!
- The rest will be wasted!!
- If you take more than your need, you will be taking someone else's need.



\* Pictures source: images of yahoo.com and google.com

# Lesson #3: Stop wasting Earth's Resources

Same with Electricity!!



Power  
Outage!



# Conclusions

- **In addition to DSM, the unnecessarily rapidly increasing electricity demand should be stopped**
- **Electricity conservation should be seriously pursued or even enforced.**
- **We should educate consumers with three important lessons:**
  - 1. Air-conditioning heats up Earth and harms it, thus should be used moderately and only when really needed!**
  - 2. Electricity comes at a very high cost, thus we can't afford wasting it! – We lose twice!**
  - 3. We should use from Earth's resources only as much as really needed. – Leave the rest to those in need!**

# Could we really conserve Electricity?

**Available Generation Capacity (MW)**

