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# New ITS Component C Following the OECD Plan to Climate Stabilization

BUILDING PARTNERSHIPS FOR ENERGY SECURITY

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# INOGATE New ITS Project

## Following the OECD Plan to Climate Stabilization

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*For ITS Banking Workshop*

*Vienna, Austria*

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# Overview

## Section I. Two Problems

1. Climate Change
2. Energy Security

## Section II. OECD Plan

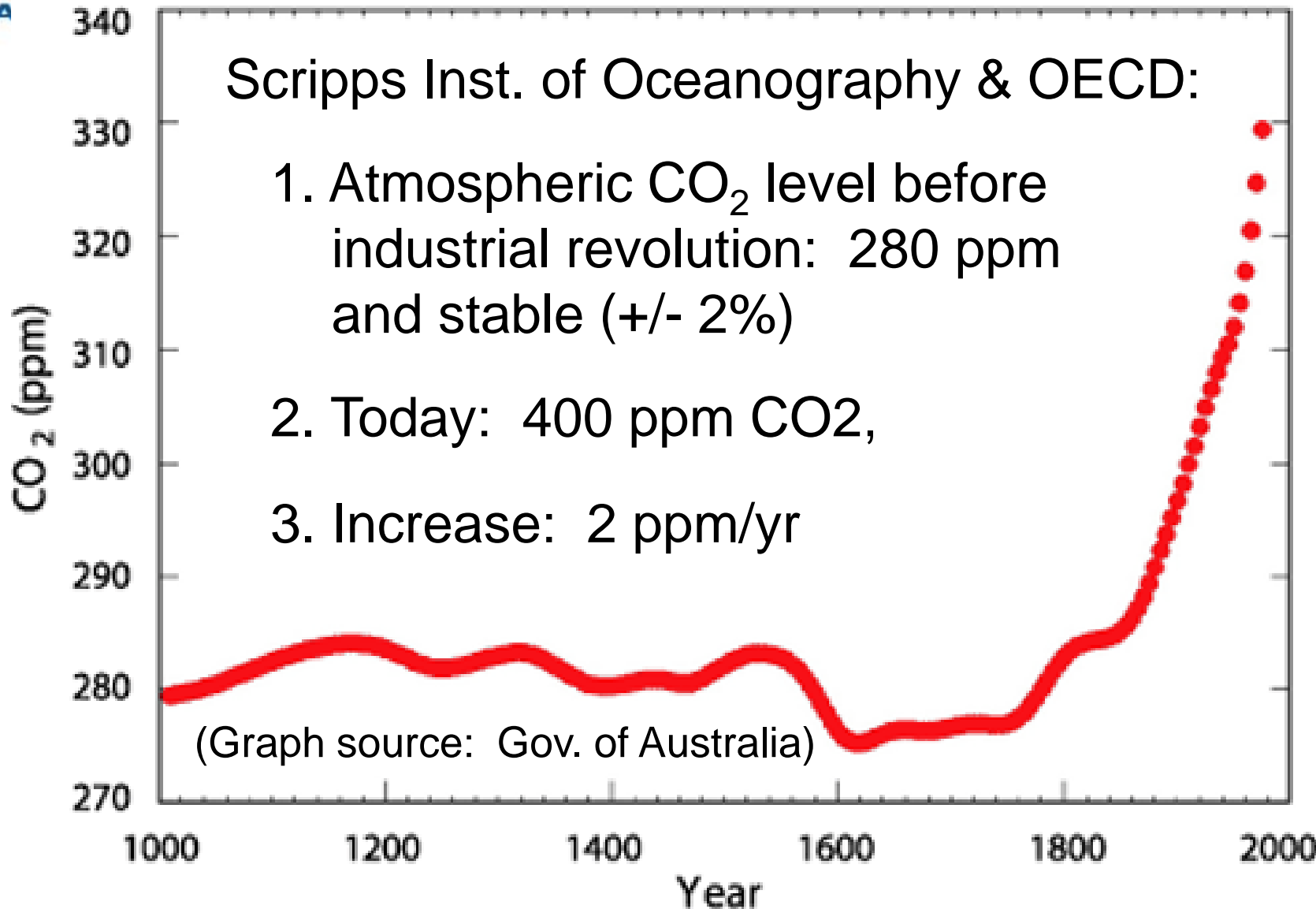
## Section III. Local Solutions



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# Problem #1: Climate Change

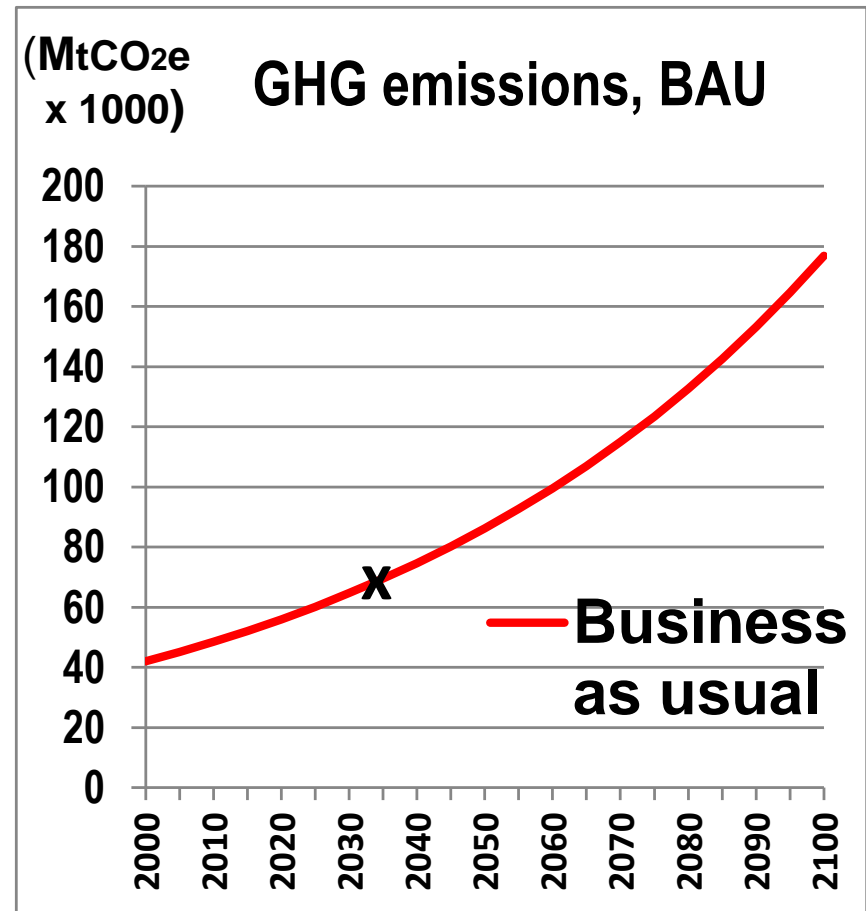


# Climate Change, 21<sup>ST</sup> century



From OECD:

- Beyond 450 ppm:  
Tipping points
- Without intervention, will cross 450 ppm by 2030 (OECD).



# Consequences

Beyond 450 ppm, > 50% probability:

- Average global atmospheric temperature will increase > 2°C (safe limit – Copenhagen Accord).
- Oceans begin releasing more CO<sub>2</sub> and absorbing less... beyond human ability to stop.
- Temperature will continue rising out of control.



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# The Cause

From IEA data

- Whole world burns 9,829 million tons - oil equivalent (Mtoe) of fossil fuel/yr.
- This produces about 48,500 Mtco<sub>2</sub>e/yr.
- Annual increase: 700 Mtco<sub>2</sub>e (1.45%).
- 3 biggest emitting sectors:
  - Electricity generation
  - Industry
  - Transport



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# Hungary

Fossil fuel burned (calculated from IEA data)

HU	19	Mtoe/yr
World	10,313	Mtoe/yr

GHGs emitted

HU	91	MtCO <sub>2</sub> e/yr
World	48,500	MtCO <sub>2</sub> e/yr





# Problem #2: Energy Security



- Most countries are energy-dependent.
- No country wants to be at the mercy of another for energy supply.
- Creates problems with national security, economy, sovereignty.

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# Section II

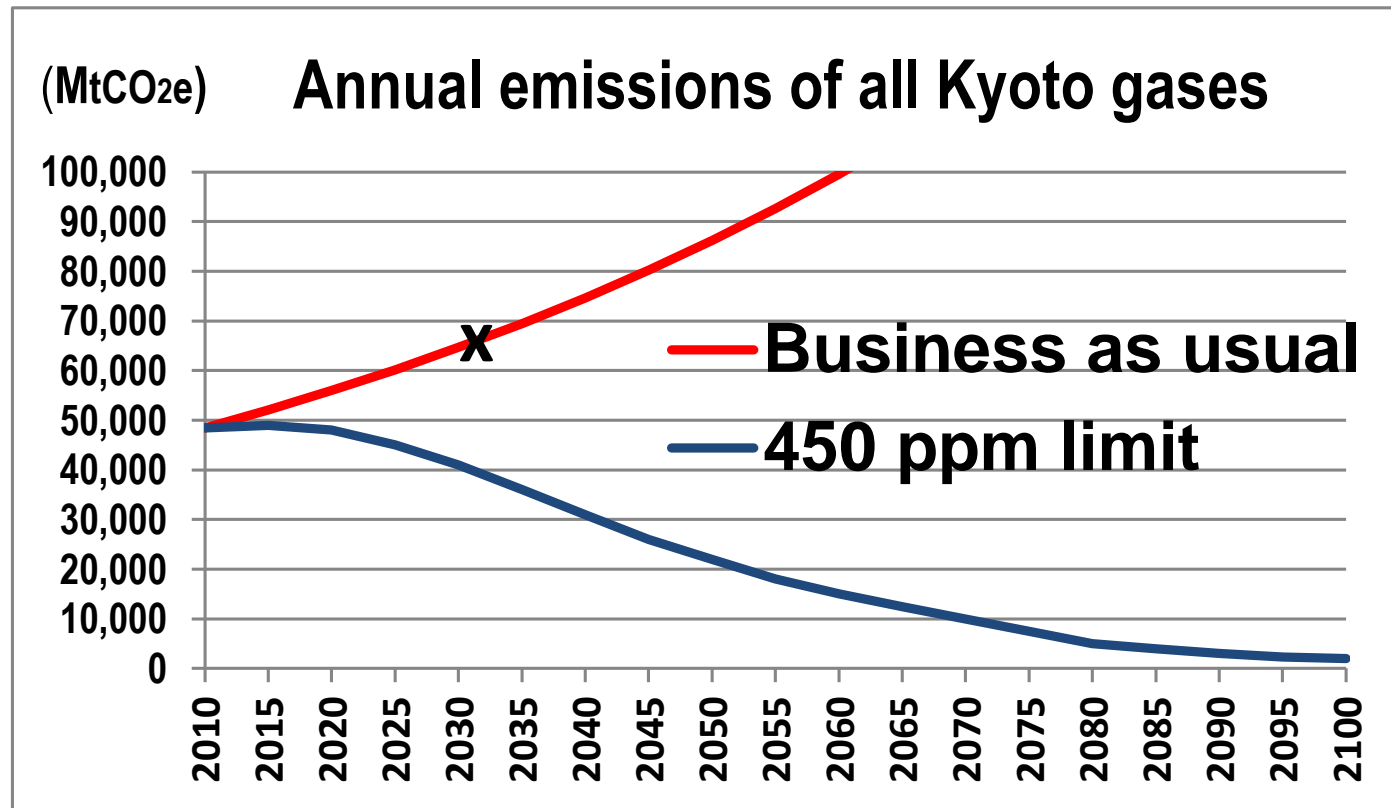
## OECD Plan



# OECD Plan, 2010-2100



Avoid tipping point (x) with 450 ppm limit.



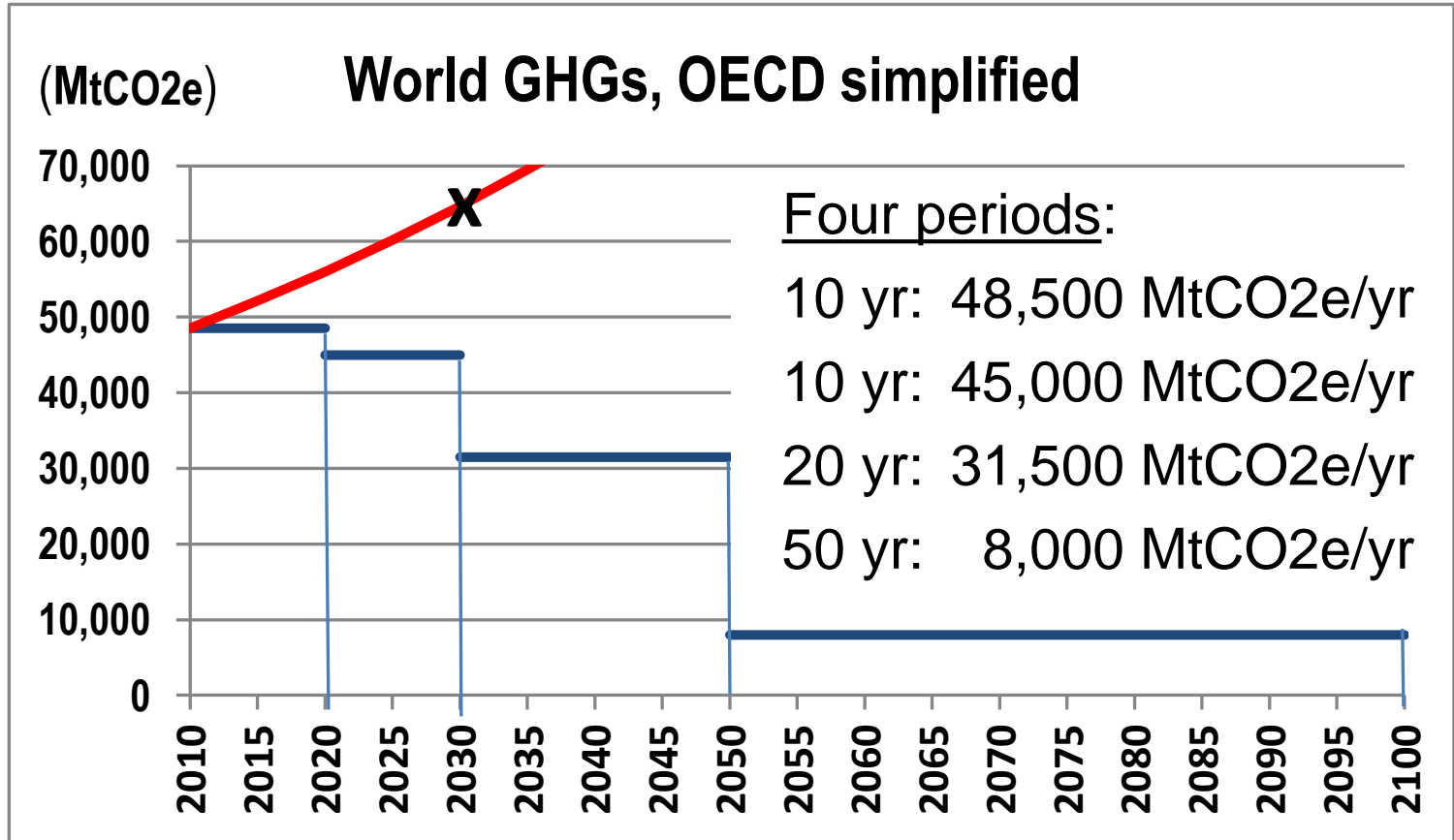
Gradual reduction almost to carbon neutrality



# OECD Plan, Step by Step



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Simplified, shown by average in period

# Solution: Sustainable Development

To stop global warming:

*Replace increases in fossil fuel with sustainable energy (SE).*

- Energy efficiency stops unnecessary fossil fuel consumption.
- Renewable energy sources replace fossil fuel with carbon-neutral energy sources.



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# Following OECD

To accomplish OECD plan,

1. Change ***behavior***.
2. Invest in ***technology***.

Next slides present

- a) methodology to determine right level of investment in sustainable energy technology.
- b) thoughts about behavior



# What does technology cost?



- Prices vary widely.
- To demonstrate methodology, use median prices.
- To calculate for own country, use local prices.

<u>Typical unit costs</u>	<u>€/kWh</u>	<u>€/toe</u>	<u>€/tCO<sub>2</sub>e</u>
Energy efficiency	0.025	300	60
Renewable energy	0.085	1000	200

- Technologies cover all sectors
  - Energy
  - Industry
  - Buildings
  - Transportation

# Calculate avoided emissions

Illustrative example:

- World needs to avoid increase of **700 MtCO<sub>2</sub>e/yr.**
- Try method with 1/3 EE, 2/3 RES.

MtCO<sub>2</sub>e/yr

233 Energy efficiency

467 RES technologies

700 Total





# Calculate world cost



Avoided emissions (MtCO <sub>2</sub> e/yr)		Unit cost (€/tCO <sub>2</sub> e)		Annual investment (billion €/yr)	
233	x	60	=	14	EE
<u>467</u>	x	200	=	<u>93</u>	RES
700				<b>107</b>	<b>World Cost</b>

(Repeat every year as economy grows.)

# Cost of World Business as Usual?



- Usual annual world energy infrastructure investment: **13 400 billion €/yr**  
(unofficial ITS estimate)
- Cost of annual SE upgrades: **107 billion €/yr**
- Most of SE upgrades will repay their investments with profit.

# Section III

## Local solution



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# About GHG Growth Rates



- OECD model: 1.45%/yr GHG growth rate.
- Each country is different.
- Assume local GHG growth = GDP growth.
- Use World Bank post-crisis GDP data for each country.

# EU investment example

- Baseline emissions: 6,133 MtCO<sub>2</sub>e/yr
- GDP increase: 1.86%
- 1.86% GHG increase = 114 MtCO<sub>2</sub>e/yr
- Illustrative investment mix to avoid increase:

<u>MtCO<sub>2</sub>e/yr</u>			<u>€/tCO<sub>2</sub>e</u>		<u>billion €/yr</u>
38	EE	x	60	=	2.3
<u>76</u>	RES	x	200	=	<u>15.2</u>
114	Total				<b>17.5</b>



# Hungary Investment Example



- Baseline emissions: 91 MtCO<sub>2</sub>e/yr
- GDP increase: 1.5%
- 1.5% GHG increase = 1.36 MtCO<sub>2</sub>e/yr
- Illustrative investment mix to avoid increase:

<u>MtCO<sub>2</sub>e/yr</u>			<u>€/tCO<sub>2</sub>e</u>		<u>million €/yr</u>
0.45	EE	x	60	=	27
<u>0.91</u>	RES	x	200	=	<u>182</u>
1.36	Total				<b>209</b>

# Cost of Business as Usual?



- Annual energy infrastructure investments typically cost 10 or 15 times more than annual upgrades needed for OECD plan.
- Most of SE upgrades will repay their investments with profit.
- Good for private sector investment.

# Return on Investment

## Example:

- Georgian policy: Maximize use of all available hydropower resources.
- Approximate ROI: 13%
- Approximate IRR: 10%
- These numbers are acceptable in GE.
- Therefore, higher are more acceptable.



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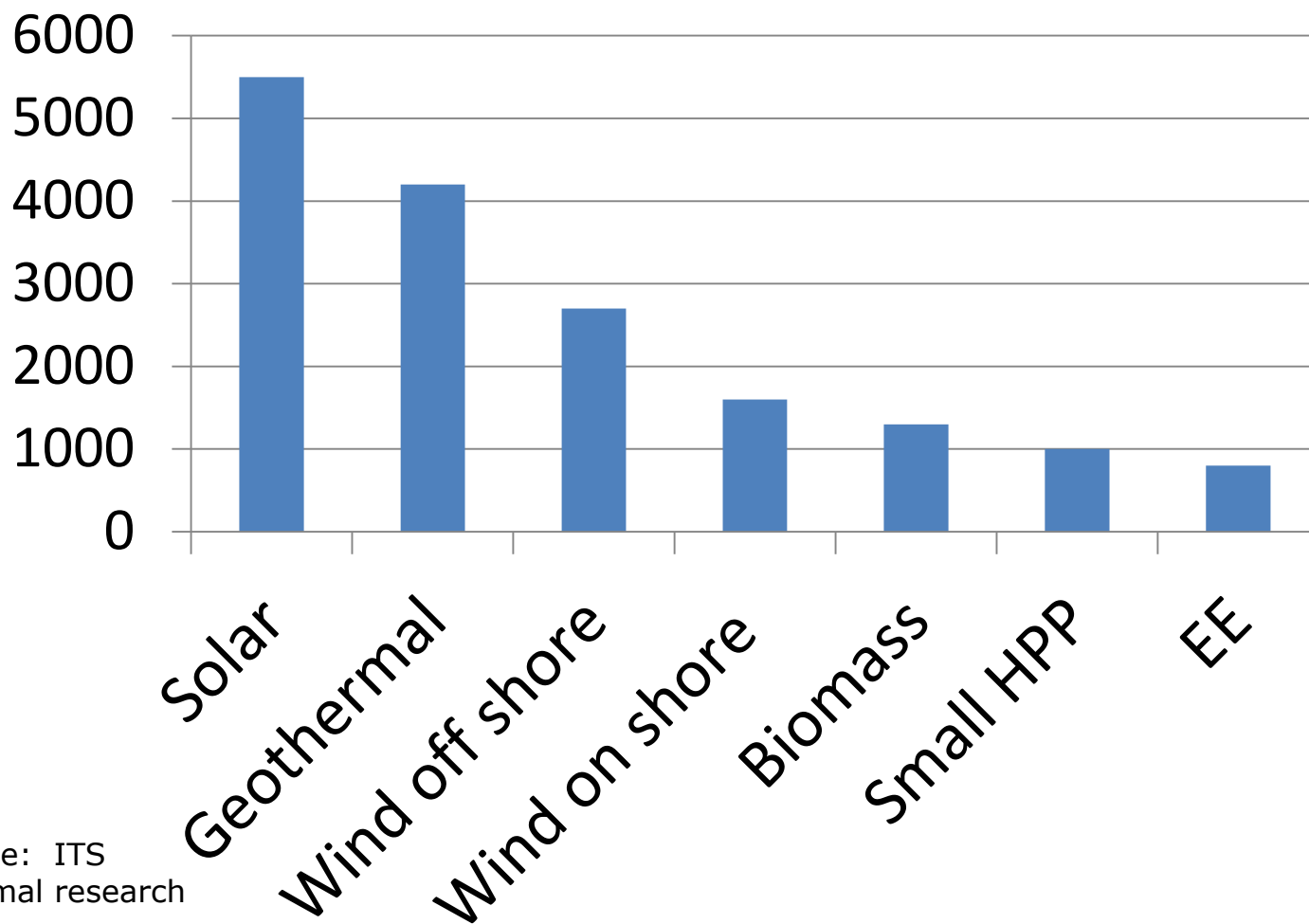




# Installed Costs of SE Electricity Capacity



(€/kW)



source: ITS  
informal research

# Considerations

- Repeat investment ***every year*** to offset growth.
- Investments may come from
  - Domestic private industry
  - International private investors
  - International finance institutions
  - Municipal/regional budget
  - National budget
- Determine
  - investment potential by technology
  - unit cost by technology
  - energy consumption growth rate



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# Profit

- Every country's goal:

*Maximize national income!*

- Every kWh not wasted at home is a kWh that can be sold abroad.



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# Investment Summary

- Investments
  - Reduce GDP energy intensity
  - Increase productivity
  - Improve energy security
  - Reduce global warming
  - Create jobs
- Choose greatest ROIs first!



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# Changing behavior



- With motivation, people will
  - Close doors in winter.
  - Turn off lights by day.
  - Drive further on less petrol.
- *Changing behavior costs LESS MONEY than the cheapest EE technology!*

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# How to change behavior?

- Building codes, vehicle codes (policy)
- Energy audit requirements (policy)
- Public awareness campaigns
- Driver training to save fuel (and lives)
- Efficient appliance demonstration centers
- Public school curricula (children influence parents)



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# However...

- Behavioral benefits need strong leadership.
- If leaders fall asleep, benefits stop.
- Policies need constant enforcement.
- Awareness raising must be continuous.



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# Thank you for your attention!



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