



Series of Energy-Climate Lectures: **Introduction**

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ACE

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Today's Sharing & Giving

- Survey results
- Series of Energy-Climate Lectures
- Why Energy and Climate Change?
- What is energy?
- Energy Resources & Distributions

Knowledge Survey at ACE

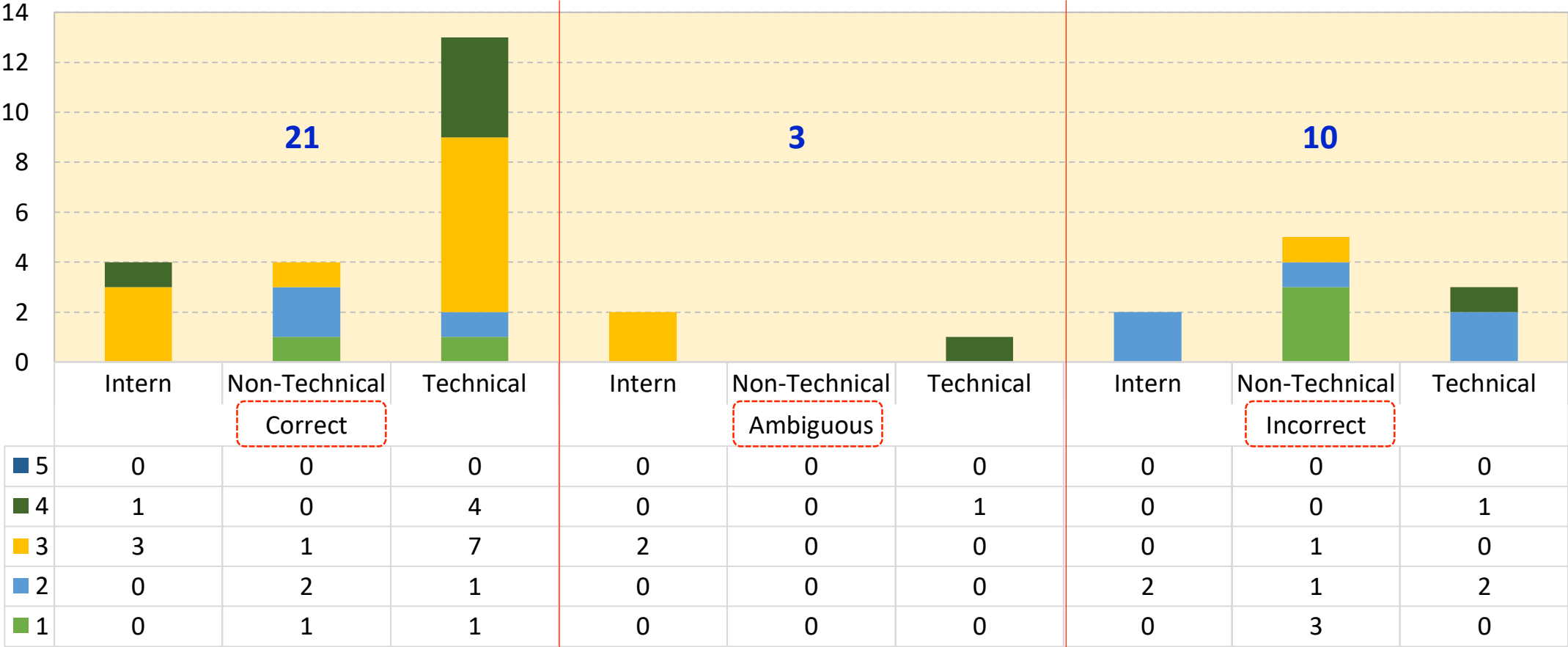
Respondents

- Total: 34 (comes & goes)
- Interns: 8
- Technical: 17
- Non-Technical (Finance, HR, ICT): 9

What is the difference between weather and climate?

Please rate your level of knowledge about climate change

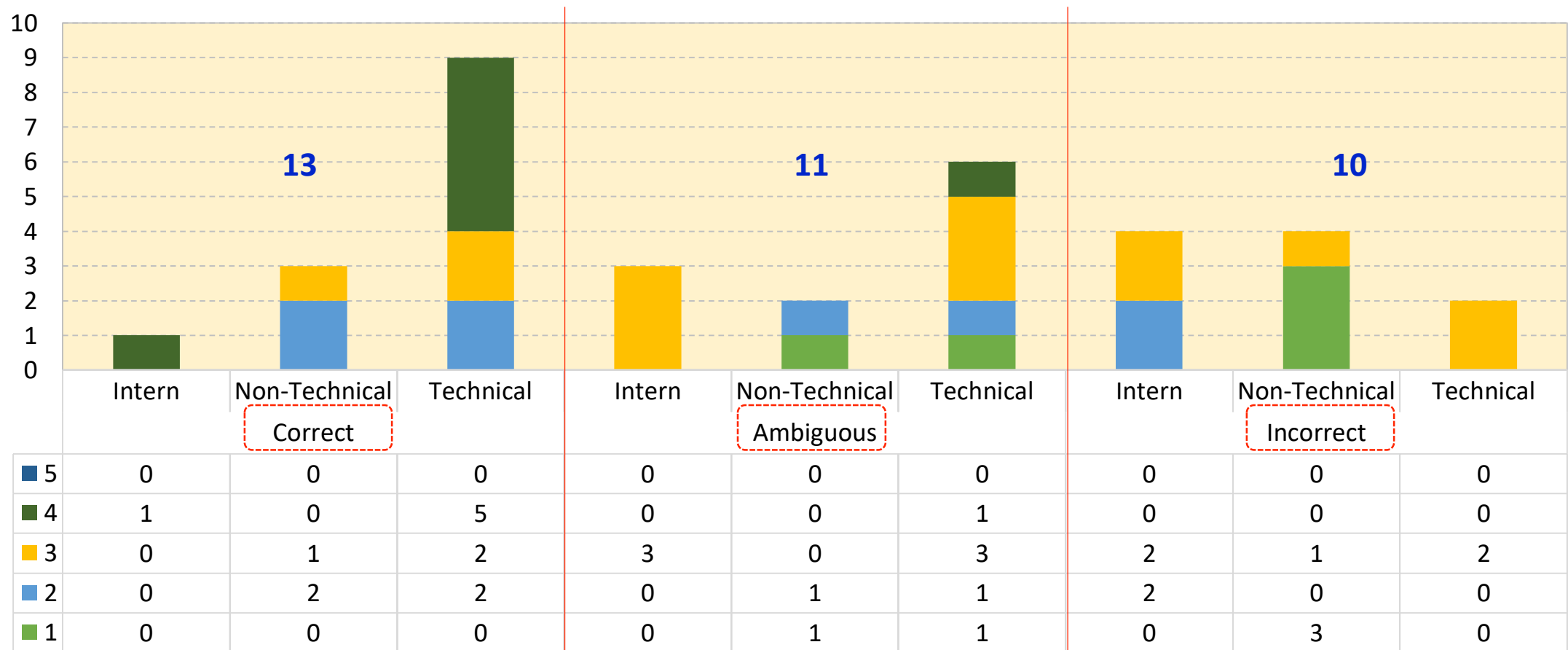
Level of knowledge (1-5): 1=know almost nothing about it; 5=know it well



What's the difference between climate change and global warming?

Please rate your level of knowledge about climate change

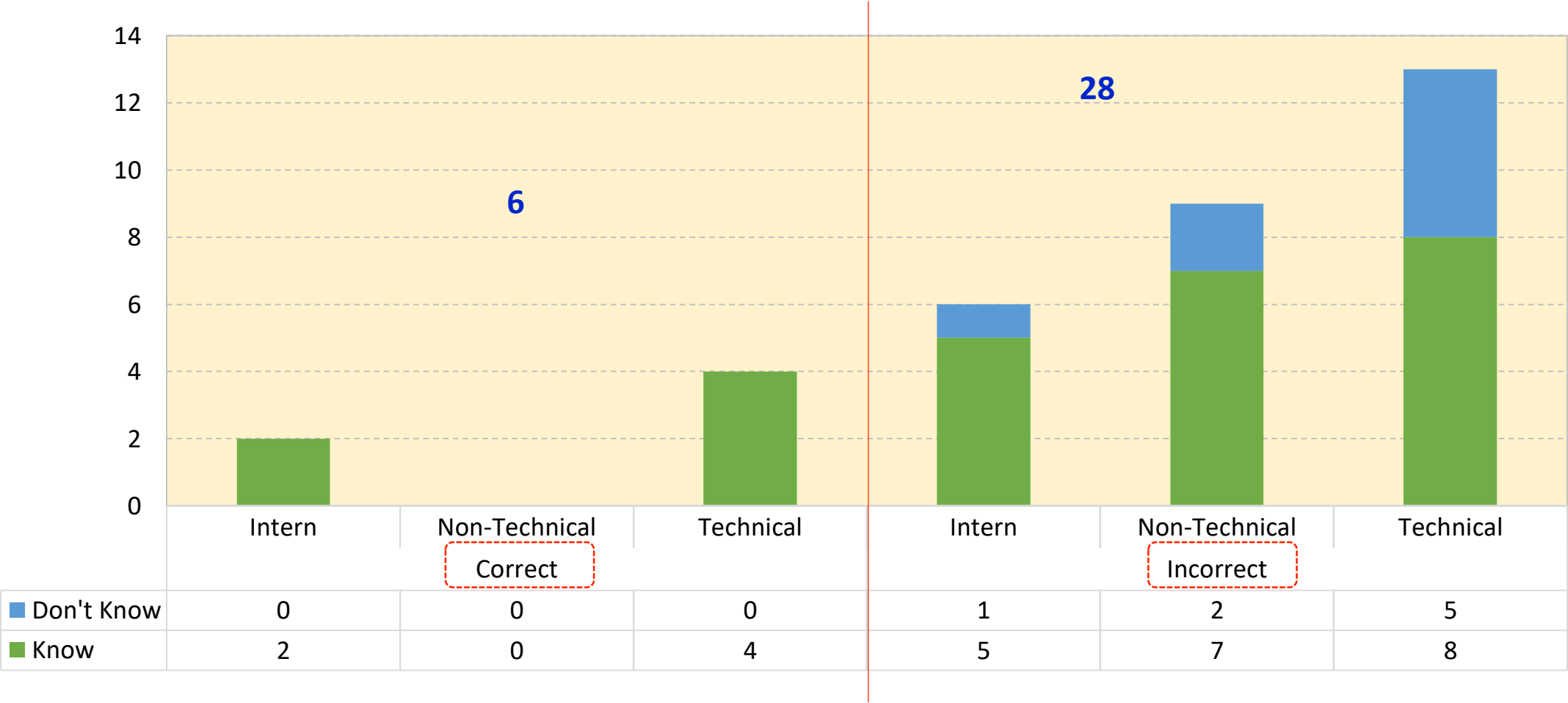
Level of knowledge (1-5): 1=know almost nothing about it; 5=know it well



Which sector is the largest emitter of global energy-related CO₂ emissions for the past 5 years?

Do you know energy sector is the largest contributor to global greenhouse gas emissions?

Yes, I know ; No, I don't



Series of Energy-Climate Lectures

Core Topics: All levels

1. Energy & Sustainability
2. Basic Climate Change
3. Paris Agreement
4. Renewable Energy
5. Energy Efficiency & Conservation

Different Levels (On Demand)

1. Types Renewable Energy Technologies
2. Energy Efficiency Measures & Technologies
3. Climate Change Adaptation

Interactive Activity (Optional)

- Debate

Knowledge sharing has **no limitations**
Feel free to let us know what are you **curious** to know
Welcome **to inspire** or to **be inspired**
Smart people always **ask**
No such thing as “stupid questions”
Respect but not to be afraid

What is Energy

- Ability to do work
- Energy **cannot be destroyed** but can be transformed/ converted
- Energy in the forms of:
 - Kinetic
 - Potential
 - Chemical
 - Light
 - Thermal
 - Electricity
 - Etc.

Is Energy Important?

Traditional



Biomass
(wood)

Modern



Gas



Electric

Is Energy Important?

Traditional



Modern



Petrol/ Diesel/ Gas

Is Energy Important?

Traditional



Candle



Kerosene
lamp

Modern



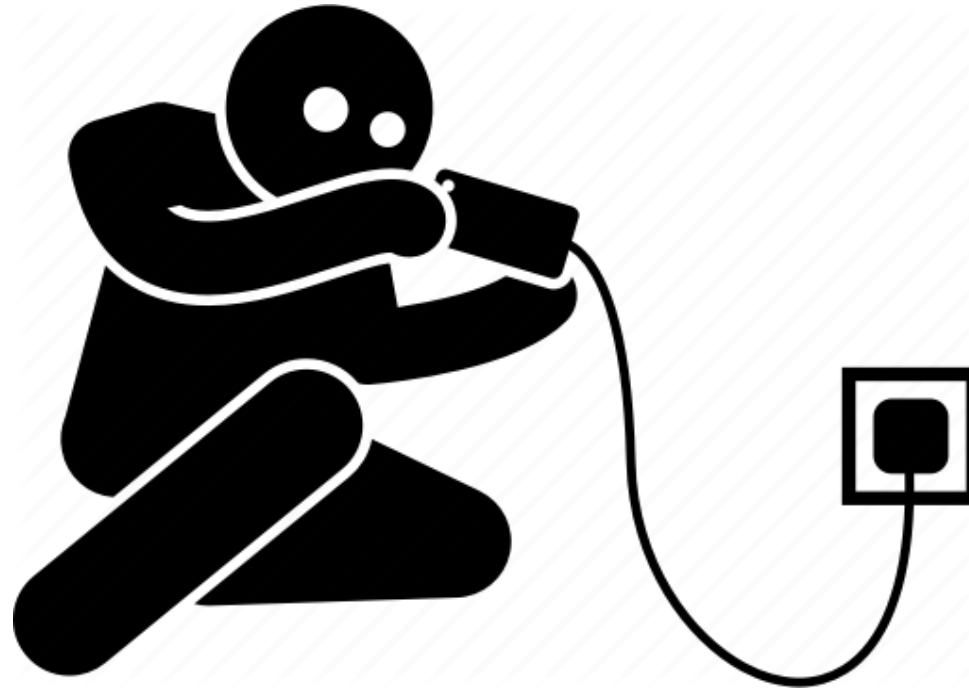
Electric



Is Energy Important?



Is Energy Important?



Energy and Socio-Economic Development

- Need energy for
 - Daily life activities
 - Industries & manufacturing: factories
 - Services: offices, commercial buildings
 - Transportation
- To generate income hence have better lifestyle, higher standard
 - Increase the affordability hence consume more energy
- All these => more power generation

Impacts of modern electrification

Power plant:

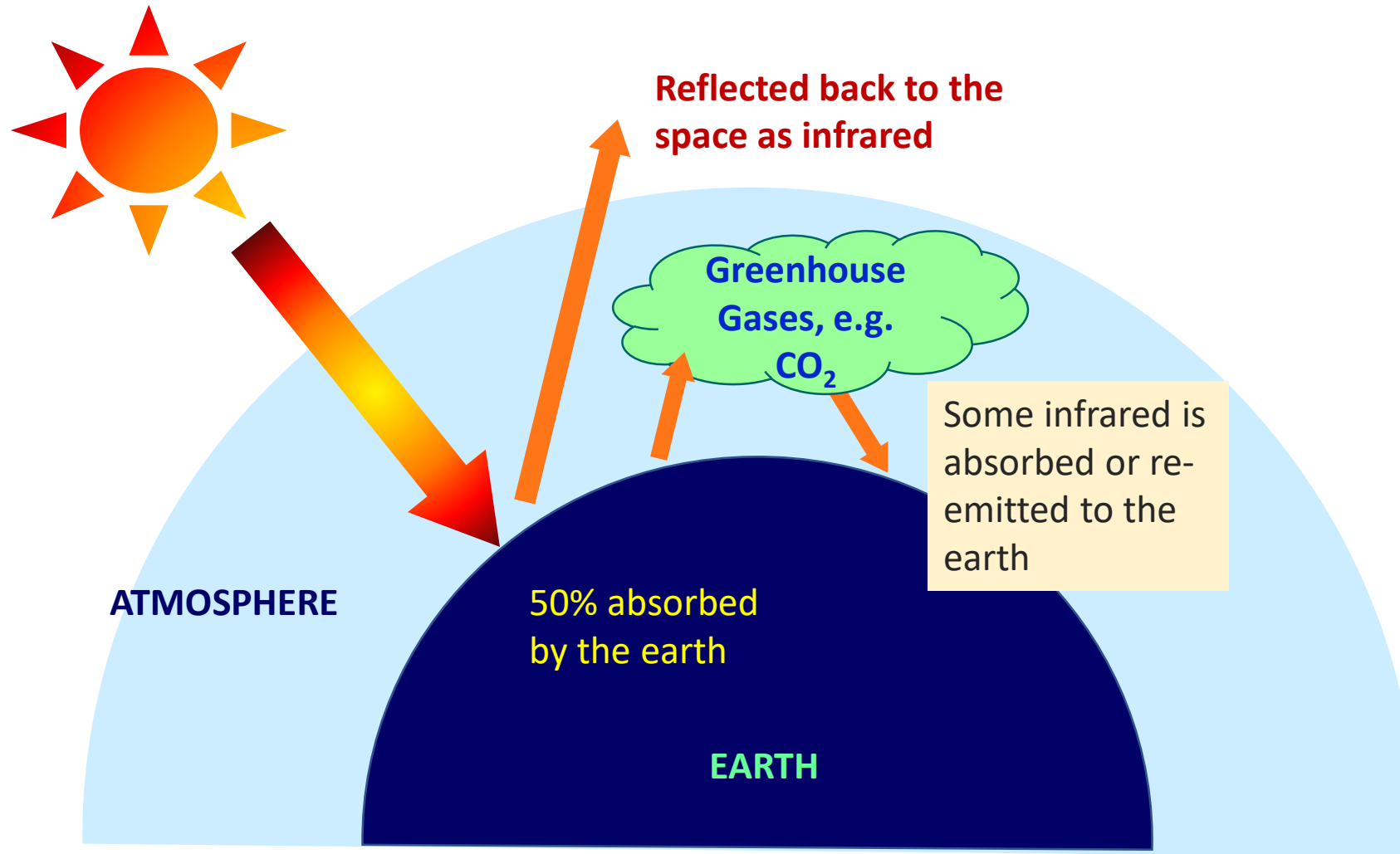
- Fossil fuels combustion => heat energy

=> mechanical energy through rotating machinery, e.g. steam/ gas turbines

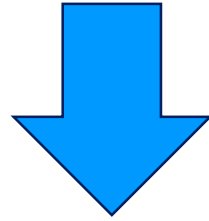
=>drive the electrical generators => electricity

Fossil Fuels combustion emit **carbon dioxide (CO₂)** and other harmful/
toxic products

Greenhouse Effect



Fossil Fuels



**Renewable Energy &
Green Technologies**

Energy Resources

1. Non-renewable

- i. Petroleum
- ii. Natural gas
- iii. Coal
- iv. Uranium

2. Renewable

- i. Solar
- ii. Wind
- iii. Waves/ Current
- iv. Biomass
- v. Ocean Thermal Energy Conversion (OTEC)
- vi. Tidal
- vii. Geothermal

Fossil Fuels

- Formed millions of years
- before the first dinosaurs
- Non-renewable: consumption faster than formation
 1. Petroleum (liquid)
 2. Natural gas (gas)
 3. Coal (solid)

Petroleum & crude oil: Are they the same?

- Crude oil: Unrefined petroleum
- Petroleum: crude oil & petroleum products
- Petroleum products: refined petroleum;
- Refinery process ➤ Gasoline, kerosene, and diesel oil, etc.

Oil History: OPEC

- The Organization of the Petroleum Exporting Countries (OPEC)
- permanent, intergovernmental Organization,
- created at the Baghdad Conference on September 10–14, 1960, by:

Founder

- 1) Islamic Republic of Iran,
- 2) Iraq,
- 3) Kuwait,
- 4) Saudi Arabia and
- 5) Venezuela

Later joined:

- 6) Qatar (1961),
- 7) Indonesia (1962-2009, 2016),
- 8) Libya (1962),
- 9) the United Arab Emirates (1967),
- 10) Algeria (1969),
- 11) Nigeria (1971),
- 12) Ecuador (1973),
- 13) Angola (2007)
Gabon (1975-1995)

OPEC's Formation

- 60s: The international oil market was dominated by the “Seven Sisters” multinational companies
- OPEC was organized to resist pressure by the "Seven Sisters" to reduce oil prices
- OPEC operated as an informal bargaining unit for resource-rich third-world countries
- to co-ordinate and unify petroleum policies among Member Countries,
- in order to secure fair and stable prices for petroleum producers;
- an efficient, economic and regular supply of petroleum to consuming nations; and
- a fair return on capital to those investing in the industry.

The 7 Sisters

1. Anglo-Iranian (started as Anglo-Persian) Oil Company (now BP)
2. Gulf Oil (later part of Chevron)
3. Royal Dutch Shell
4. Standard Oil Company of California (SoCal, now Chevron)
5. Standard Oil Company of New Jersey (Esso, later Exxon, now part of ExxonMobil)
6. Standard Oil Company of New York (Socony, later Mobil, also now part of ExxonMobil)
7. Texaco (later merged into Chevron)

OPEC in the 1970s

- OPEC rose to international prominence
- OPEC confined its activities to gaining a larger share of the profits generated by oil companies and greater control over member production levels.
- In the early 1970s it began to exert economic and political strength
- Member Countries took control of their domestic petroleum industries and acquired a major say in the pricing of crude oil on world markets.
- OPEC Embargo 1973 (Oil Crisis)
<https://www.youtube.com/watch?v=VCLRIVxOH-Q>
- Second Oil Crisis 1979
Decreased in oil output due to Iranian Revolution

Crude oil: Reserves, Production, Import & Export

	Proven Reserves (2017) ¹ , Billion Barrels	Production (2017) ² , Mtoe	Net Importer (2017) ²	Net Exporter (2017) ²
1	Venezuela (301)	United States	China	Saudi Arabia
2	Saudi Arabia	Saudi Arabia	United States	Russia
3	Canada	Russia	India	Iraq
4	Iran	Canada	Japan	Iran
5	Iraq	Iran	South Korea	United Arab Emirates
6	Kuwait	Iraq	Germany	Canada
7	United Arab Emirates	China	Singapore	Kuwait
8	Russia	United Arab Emirates	France	Venezuela
9	Libya	Kuwait	Spain	Bolivarian
10	Nigeria	Brazil	Italy	Norway
	Malaysia (27)	Norway (15)	Thailand (13)	Brunei (26)
	Indonesia (27)	Malaysia (27)	Indonesia (15)	Malaysia (30)
	Vietnam (25)	Thailand (31)	Philippines (23)	
	Norway (21)	Indonesia (25)	Vietnam (38)	
	Brunei (39)	Vietnam (33)	Myanmar (43)	
	Thailand (49)	Brunei (41)		
	Philippines (65) (0.1)	Philippines (75)		
		Myanmar (76)		

1 https://www.eia.gov/beta/international/rankings/#/?pid=57&aid=6&tl_type=a&tl_id=6-A&cy=2017

2 <http://energyatlas.iea.org/#!/tellmap/-1920537974>

Crude oil: Res

	Proven Reserves (2017) ¹ , Billion Barrels
1	Venezuela (301)
2	Saudi Arabia
3	Canada
4	Iran
5	Iraq
6	Kuwait
7	United Arab Emirates
8	Russia
9	Libya
10	Nigeria
	Malaysia (27)
	Indonesia (27)
	Vietnam (25)
	Norway (21)
	Brunei (39)
	Thailand (49)
	Philippines (65) (0.1)

Recall.. OPEC

Founder

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- 10) Algeria (1969),
- 11) Nigeria (1971),
- 12) Ecuador (1973),
- 13) Angola (2007)
- Gabon (1975-1995)

& Export

	Net Exporter (2017) ²
	Saudi Arabia
	Russia
	Iraq
	Iran
	United Arab Emirates
	Canada
	Kuwait
	Venezuela
	Bolivarian
	Norway
	Brunei (26)
	Malaysia (30)

1 <https://www.eia.gov/beta/international/rankings/#/?pic>

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Crude oil: Reserves, Production, Import & Export

	Proven Reserves (2017) ¹ , Billion Barrels	Production (2017) ² , Mtoe	Net Importer (2017) ²	Net Exporter (2017) ²
1	Venezuela (301 Bil bbl)	United States	China	Saudi Arabia
2	Saudi Arabia	Saudi Arabia	United States	Russia
3	Canada	Russia	India	Iraq
4	Iran	Canada	Japan	Iran
5	Iraq	Iran	South Korea	United Arab Emirates
6	Kuwait	Iraq	Germany	Canada
7	United Arab Emirates	China	Singapore	Kuwait
8	Russia	United Arab Emirates	France	Venezuela
9	Libya	Kuwait	Spain	Bolivarian
10	Nigeria	Brazil	Italy	Norway
	Norway (21)	Norway (15)	Thailand (13)	Brunei (26)
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	Brunei (39)	Vietnam (33)	Myanmar (43)	
	Thailand (49)	Brunei (41)		
	Philippines (65) (0.1 Bil bbl)	Philippines (75)		
		Myanmar (76)		

1 https://www.eia.gov/beta/international/rankings/#/?pid=57&aid=6&tl_type=a&tl_id=6-A&cy=2017

2 <http://energyatlas.iea.org/#!/tellmap/-1920537974>

Natural Gas: Reserves, Production, Import & Export

	Proven Reserves (2018) ¹ , Trillion cubic feet	Production (2017) ² , Mtoe	Net Importer (2017) ²	Net Exporter (2017) ²
1	Russia	United States	Japan	Russia
2	Iran	Russia	China	Qatar
3	Qatar	Iran	Germany	Norway
4	United States	Canada	Italy	Australia
5	Saudi Arabia	Qatar	Turkey	Canada
6	Turkmenistan	China	Korea	Algeria
7	United Arab Emirates	Norway	France	Turkmenistan
8	China	Algeria	Mexico	Malaysia
9	Venezuela	Saudi Arabia	United Kingdom	Indonesia
10	Nigeria	Turkmenistan	Spain	Nigeria
	Indonesia (14)	Indonesia (11)	Thailand (15)	Myanmar (15)
	Norway (21)	Malaysia (12)	Singapore (21)	Brunei (19)
	Malaysia (24)	Thailand (25)		United States (22)
	Brunei (39)	Myanmar (33)		Vietnam (29)
	Thailand (43)	Brunei (39)		
	Philippines (51)	Vietnam (43)		
		Philippines (53)		

¹ <https://www.eia.gov/cfapps/ipdbproject/IEDIndex3.cfm?tid=3&pid=3&aid=6>

² <http://energyatlas.iea.org/#!/tellmap/-1165808390>

Coal: Reserves, Production, Import & Export

	Reserves (2017) ¹ , Million Tons	Total Production (2017) ²	Net Importer (2017) ²	Net Exporter (2017) ²
1	United States (253455 Mtons)	China	China	Australia
2	Russia	United States	India	Indonesia
3	Australia	Australia	Japan	Russia
4	China	India	Korea, South	Colombia
5	India	Indonesia	Taiwan	United States
6	Ukraine	Russia	Germany	South Africa
7	Germany	South Africa	Turkey	Mongolia
8	South Africa	Colombia	Malaysia	Canada
9	Poland	Poland	Brazil	Kazakhstan
10	Kazakhstan	Kazakhstan	Thailand	Mozambique
	Indonesia (11)	Vietnam (14)	Philippines (14)	
	Vietnam (19)	Philippines (22)	Vietnam (19)	
	Thailand (33)	Thailand (27)	Singapore (40)	
	Philippines (47)	Malaysia (29)	Norway (42)	
	Malaysia (54) (198 Mtons)	Myanmar (56)	Myanmar (52)	
	Norway (77)	Norway (62)		
		Cambodia (69)		

1 <https://www.eia.gov/beta/international/>

2 <http://energyatlas.iea.org/#!/tellmap/2020991907>

Coal: Reserves, Production, Import & Export

	Reserves (2017) ¹ , Million Tons	Total Production (2017) ²	Net Importer (2017) ²	Net Exporter (2017) ²
1	United States (253455 Mtons)	China	China	Australia
2	Russia	United States	India	Indonesia
3	Australia	Australia	Japan	Russia
4	China	June 2019: Norway to divest €5 billion from coal giants Norway's Government Pension Fund Global (GPF) - embracing renewable energy and winding down fossil-fuel investments.		
5	India			
6	Ukraine			
7	Germany			
8	South Africa			
9	Poland			
10	Kazakhstan			
	Indonesia (11)			
	Vietnam (19)	Philippines (22)	Vietnam (19)	
	Thailand (33)	Thailand (27)	Singapore (40)	
	Philippines (47)	Malaysia (29)	Norway (42)	
	Malaysia (54) (198 Mtons)	Myanmar (56)	Myanmar (52)	
	Norway (77)	Norway (62)		
		Cambodia (69)		

¹ <https://www.eia.gov/beta/international/>

² <http://energyatlas.iea.org/#!/tellmap/2020991907>

Recall

Net Importer (2017) ²	Net Importer (2017) ²	Net Importer (2017) ²
China	Japan	China
United States	China	India
India	Germany	Japan
Japan	Italy	South Korea
South Korea	Turkey	Taiwan
Germany	South Korea	Germany
Singapore	France	Turkey
France	Mexico	Malaysia
Spain	United Kingdom	Brazil
Italy	Spain	Thailand

Which countries are net importers for the all three types of fossil fuels? (top 10)

Japan, South Korea, Germany, China

Recall

Net Exporter (2017) ²	Net Exporter (2017) ²	Net Exporter (2017) ²
Saudi Arabia	Russia	Australia
Russia	Qatar	Indonesia
Iraq	Norway	Russia
Iran	Australia	Colombia
United Arab Emirates	Canada	United States
Canada	Algeria	South Africa
Kuwait	Turkmenistan	Mongolia
Venezuela	Malaysia	Canada
Bolivarian	Indonesia	Kazakhstan
Norway	Nigeria	Mozambique

Which countries are net exporters for the all three types of fossil fuels? (top 10)

Russia, Canada

CLEAN ENERGY
(NON-RENEWABLE):

NUCLEAR

Uranium

	tonnes U	percentage of world
Australia	1,818,300	30%
Kazakhstan	842,200	14%
Canada	514,400	8%
Russia	485,600	8%
Namibia	442,100*	7%
South Africa	322,400	5%
China	290,400	5%
Niger	280,000*	5%
Brazil	276,800	5%
Uzbekistan	139,200*	2%
Ukraine	114,100	2%
Mongolia	113,500	2%
Botswana	73,500*	1%
Tanzania	58,200*	1%
USA	47,200	1%
Jordan	43,500	1%
Other	280,600	4%
World total	6,142,600	

Uranium resources by country in 2017 - World Nuclear association

Top 3 countries who are net exporters of
oil, natural gas & coal?

Canada & Russia

End of Lecture 1...

Next Lecture:

Upon majority request

Basic of Climate Change

THANK YOU!



ASEAN Climate Change and Energy Project

 <http://accept.aseanenergy.org/>



Norwegian Ministry
of Foreign Affairs

Implemented by:



Norwegian Institute
of International
Affairs

