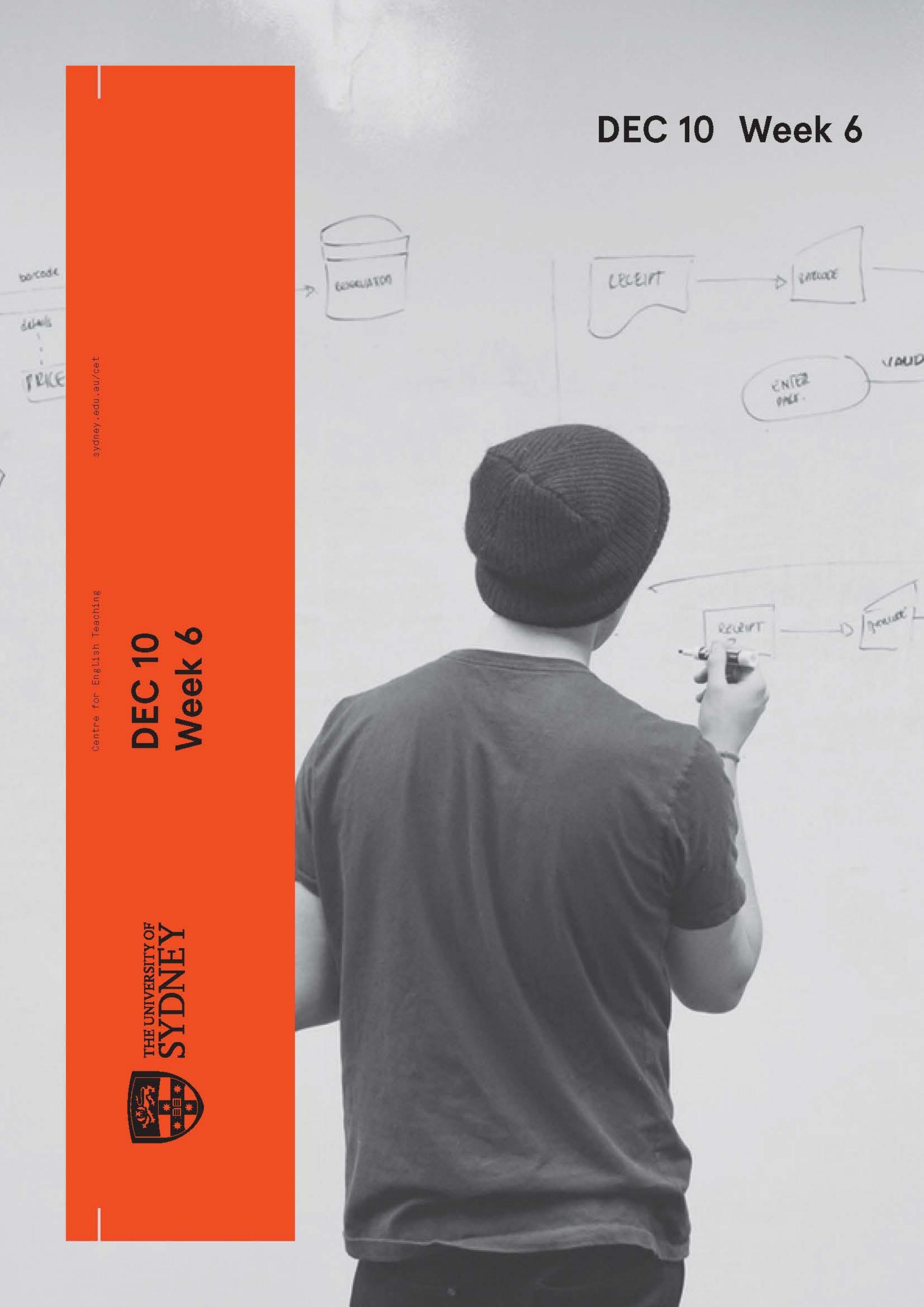
DEC 10 Week 6



DEC 10
Week 6

Centre for English Teaching

sydney.edu.au/cet

THE UNIVERSITY OF SYDNEY

DEC 10 Week 6

Contents

Reading

Wk 6 Reading 1: 20 000 megawatts under the sea

Lesson Objectives
• Practise skimming a text for main ideas • Identify features of journalistic writing • Practise a range of DEC 10 reading test question types

Instructions

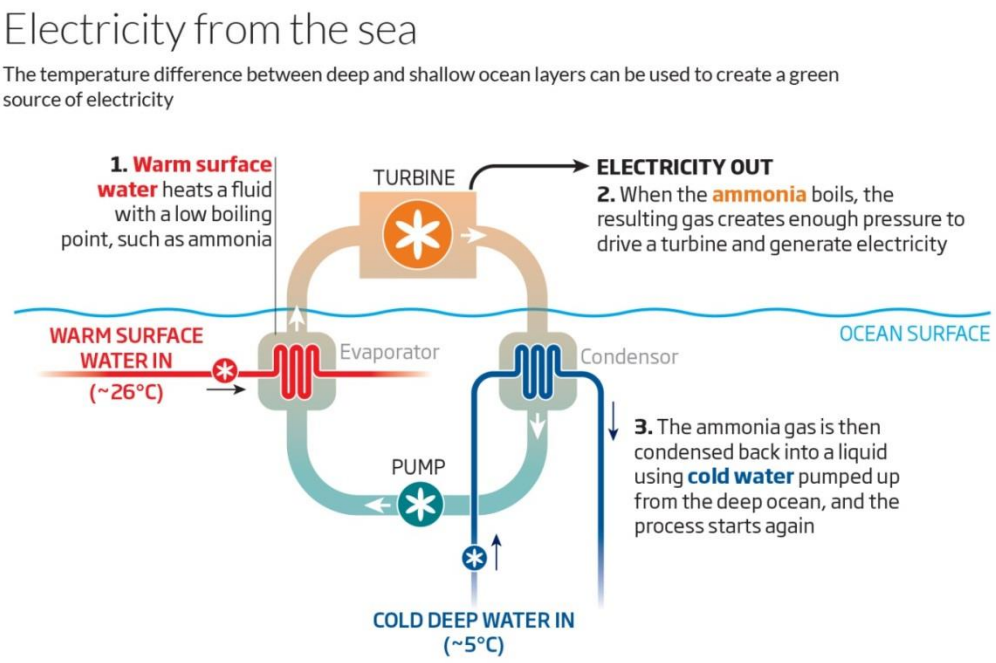
You will find the activities associated with this text on Canvas
Test preparation questions are included here in the book for you to practice. You will need to go to the lesson on Canvas to find the answers.

20,000 megawatts under the sea

Knight, H. (2014). 20,000 megawatts under the sea: oceanic steam engines (abridged and adapted). Retrieved February 27, 2014 from http://www.newscientist.com/article/mg22129580.900-20000-megawatts-under-the-sea-oceanic-steam-engines.html?full=true#.Uw6DA_lmiqc

1. In theory, ocean thermal energy conversion (OTEC) could provide 4000 times the world's energy needs in any given year, with neither pollution nor greenhouse gases to show for it. In the real world, it has long been written off as impractical. However, it is now being investigated by companies like aerospace giant Lockheed Martin.

2. The fundamental idea is brilliant. The ocean is a massive and constantly **replenished** storage medium for solar energy. Most of that heat is stored in the top 100 metres of the ocean, while the water 1000 metres below – fed by the polar regions – remains at a fairly constant 4 to 5 °C. To make energy from that heat difference, modern-day systems pump warm surface water past pipes containing a liquid with a low boiling point, such as ammonia. The ammonia boils and the steam is used to power a turbine, generating electricity. Cold deep-ocean water is then piped through the steam, causing the ammonia to condense back into a liquid, ready to begin the cycle again (see diagram).



3. Steam-powered turbines drive nearly every coal and nuclear power plant in the world, but their steam is produced by burning polluting coal or generating long-lived nuclear waste. OTEC, by contrast, provides steam in a clean and theoretically limitless way.

4. The process needs a temperature difference of at least 20 °C between the surface and deep water to work. Such conditions exist in a relatively narrow band around Earth's equator that includes the tropics and subtropics.

Electric Ocean

5. That's in an ideal world. **In reality, what the ocean's thermal gradient gives, the equipment takes away**. The main problem is accessing the cold deep water: pumping the vast amounts of water needed requires 1000-metre-long pipes that are wide enough and strong enough to handle several cubic metres of seawater per second for every megawatt of electricity produced. When all the inefficiencies are taken into account, the theoretical efficiency of an OTEC plant drops to a mere 4 to 6 per cent.

6. OTEC's efficiency may be low, but since it uses seawater, which is **abundant** and free, it still makes economic sense if done on a large-enough scale. Oil prices are unstable and climate change is becoming an increasingly urgent driver of alternative energy sources. The shortcomings of intermittent renewables, such as wind and solar energy, which only produce

electricity when the sun is shining or the wind is blowing, are still restricting their deployment. By contrast, OTEC plants can operate 24 hours a day. Round-the-clock power means an OTEC plant could simply be plugged directly into an electricity grid to replace fossil fuel power plants, without the adjustments and balances necessary to integrate unpredictable solar and wind power.

7. Advances have been made in lowering the costs of the equipment. Lockheed Martin borrowed techniques from bridge construction and wind turbine manufacturing – both of which use advanced fibreglass and resin composites to make their ultra-light, ultra-strong materials – to design a cheap pipe that is strong and flexible enough to withstand the stresses and strains of ocean currents. Even better, it can be assembled on the ocean-surface platform of the OTEC plant itself and gradually lowered in as it is made, eliminating the risk of transporting **the huge structure** into position – and dropping it.

8. There are also lessons from the offshore oil and gas industry, where it has become commonplace to operate in ocean depths greater than 1000 metres. These have made equipment available for commercial purchase that just 20 years ago would have needed to be designed from scratch.

9. Thanks to such developments, a 100-megawatt plant would cost about $790 million to build, says Luis Vega, an OTEC researcher at the Hawaii Natural Energy Institute. Taking the costs of building and running an OTEC plant into account, Vega estimates that it can produce electricity at around 18 US cents per kilowatt hour, not far from US Department of Energy estimates of 14 cents for coal with carbon capture and storage, and 14 to 26 cents for solar energy. **In this changed landscape**, OTEC projects have begun to pop up all over the world, in Okinawa, Japan, Hawaii and near Curaçao in the Caribbean Sea.

Environmental Concerns

10. In light of these rapid developments, OTEC has become promising enough that the prospect of its expansion has begun to ring alarm bells among environmentalists. Concerns have been raised by the US National Oceanic and Atmospheric Administration, among others, about the risk of algal blooms forming as nutrient-rich, bacteria-free water from the sunless depths is introduced to the hungry algae in warmer, sunlit waters. But computer modelling suggests that as long as the cold water is returned to the ocean at depths lower than 60 metres, the risk of algal blooms should be minimal, says Vega.

11. To eliminate even this modest risk, the British company, Energy Island, has patented a design for an OTEC plant in which the ammonia vapour is no longer condensed into liquid at the surface but at depth. This means nutrient-rich water would never need to be pumped up to the surface.

12. Another question being asked is whether OTEC has local and global effects on the environment, such as changing global temperatures. So far, research suggests we can increase OTEC production without affecting the ocean. Researchers at the University of Hawaii's Ocean and Resources Engineering department in Honolulu modelled the effect of widespread, commercial-scale OTEC production on the seas, including the global thermohaline circulation – the network

of slow currents that transport deep water throughout the oceans. They found that OTEC plants could safely extract the equivalent of 7 terawatts of electricity, or nearly 50 per cent of global energy consumption, before they would have any noticeable effect on ocean temperatures (*Journal of Energy Resources Technology*, vol 135, p 41202). However, the authors acknowledge the difficulties of drawing strong conclusions about the environmental effects of OTEC.

13. It is certainly a good time to add a new form of renewable-energy generation to the mix, since climate change may have unforeseen circumstances for some existing clean technologies. In July, the US Department of Energy released a report on the energy sector's vulnerability to climate change, which found that higher temperatures could reduce the amount of fresh water available for both hydropower generation and concentrated solar power plants, whose superheated equipment requires water cooling.

14. By comparison, the best OTEC spots don't appear to be vulnerable to climate change, says Robert Thresher, a research fellow at the National Renewable Energy Laboratory in Golden, Colorado. "Most of the OTEC resources are along the equator, and you wouldn't expect the sea surface temperature to dramatically change there," he says. It certainly appears as if the day of ocean thermal energy conversion has finally arrived.

(1128 words)

Questions 1-2 relate to paragraphs 1-4.

1. Which of the following statements are true? There is **more than one** correct response.
   a. Ocean thermal energy conversion could provide all the energy the world needs.
   b. The idea is good in theory but cannot be put into practice.
   c. The temperature at the bottom of the oceans is highly variable.
   d. Ammonia is used because it boils at relatively low temperatures.
   e. Every steam turbine involves some kind of pollution.
   f.The OTEC process is best suited to equatorial waters.

2. The word 'replenished' is closest in meaning to:
   a. Recycled
   b. Changed
   c. Evaporated
   d. Refilled

Questions 3-5 refer to paragraphs 5-6.

3. Which of the following sentences best expresses the essential information in the highlighted sentence in paragraph 5?
   a. The equipment carries cold water from the bottom to warm water on the surface.
   b. The equipment that is needed restricts the advantages of the process.
   c. The pipes must be wide, deep and strong to remove the water.
   d. The equipment solves the problem of carrying large amounts of water to the surface.

4. The word 'abundant' is closest in meaning to:
   a. Plentiful
   b. Clean
   c. Widespread
   d. Available

5. What is the chief advantage of OTEC over wind and solar?
   a. It can be done on a large scale.
   b. It is always available
   c. It can plug into electricity grids
   d. It makes more economic sense

Questions 6-8 refer to paragraphs 7 & 8.

OTEC technology has learned from three industries. These are:

6. _____
7. _____
8. _____

9. **'the huge structure'** in paragraph 7 refers to
   a. The ocean surface platform
   b. A cheap pipe
   c. The OTEC plant itself

Questions 10-11 refer to paragraph 9.

10. The main idea of paragraph 9 can be summarized as:
    a. OTEC projects are becoming very popular.
    b. Coal capture and storage is likely to be cheaper than OTEC or solar.
    c. OTEC is becoming competitive with other kinds of energy.
    d. The costs of building and running an OTEC plant are considerable.

11. 'In this changed landscape' refers to
    a. The costs of building an OTEC plant.
    b. Recent worldwide OTEC projects.
    c. The commercial viability of OTEC.
    d. US Department of Energy estimates.

Questions 12-13 refer to paragraphs 10 & 11.

Is this statement True, False or Not Given?

12. According to paragraph 10, some environmentalists are worried about OTEC.

13. We can learn from paragraphs 10 and 11 that
    a. Deep ocean water is rich in nutrients.
    b. Algal blooms form well below the ocean surface.
    c. Computer modelling is reliable.
    d. Ammonia vapour may cause algal blooms.

Questions 14 – 18. The following is a summary of paragraphs 12 to 14. Fill in the blanks with one of the words below. There are two extra words. Use each word **once only.**

Research suggests that large-scale OTEC production would not significantly affect ocean [14]_____ although it is difficult to claim this with [15] _____. Nevertheless, this is a good time to introduce this kind of energy especially since climate change may have unpredictable [16] _____for other renewable energies. Future [17]_____ of fresh water may have a negative impact on both hydro-electricity and solar energy plants. This is promising for OTEC, which may have less [18]_____ to climate variations because its resources are located around the equator where water surface temperatures are likely to vary less dramatically.

consequences	production	shortages	technologies	temperatures	certainty	vulnerability

Tracking text referents

Go back and consider the underlined phrases in the text again. What does each refer to?

Wk 6 Reading 2: Green power from hot rocks

Lesson Objectives
• Identify style and purpose of different texts • Practise skimming a text for main ideas • Practise a range of DEC 10 reading test question types • Synthesise and summarise information from different texts • Identify old-new information links between paragraphs

Part 1: Before you read

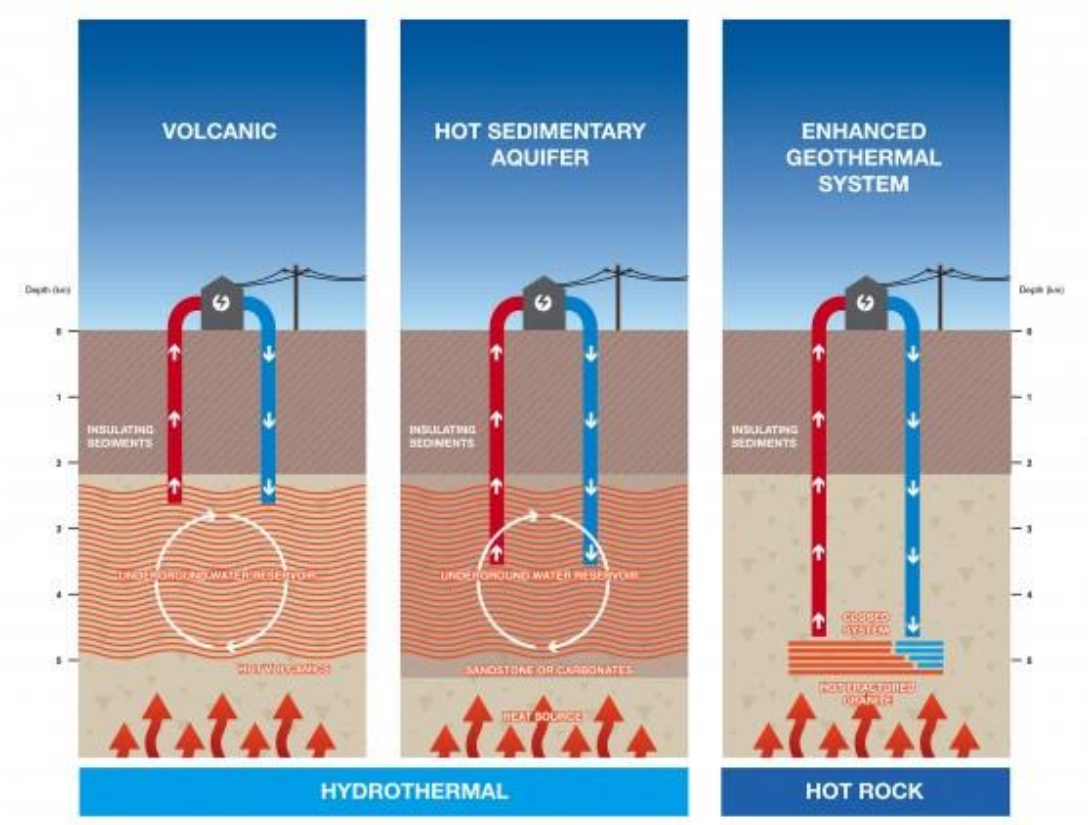


Figure 1 Source: www.greenearthenergy.com

Figure 2 Innamincka, South Australia

Figure 3 New Zealand

Part 2: Survey the text

Identifying Style/Genre

You are going to look at four texts from different sources.

Look at the bibliographic details for each source and predict what sort of style features each will have (e.g. technical/formal/informal vocabulary – including idioms; dense paragraphs versus one-sentence paragraphs; ways of referring to sources).

After discussion, skim through the articles and check whether your predictions were correct.

Text A: a general interest scientific journal

Nowak, R. (2008). Hot rocks tapped to produce green power. *New Scientist,* 199 (2665)

Text B: a clean energy web-site

Parkinson, G. (2013). Geodynamics writes off Innamincka geothermal assets Retrieved March 14, 2014 from http://reneweconomy.com.au/2013/geodynamics-writes-cooper-basin-geothermal-assets-40047

Text C: the Australian Broadcasting Commission (ABC) news website

Fedorowytsch, Y. (2016). Geothermal power project closes in SA as technology deemed not financially viable. Retrieved 6/11/2018 from https://www.abc.net.au/news/2016-08-30/geothermal-power-plant-closes-deemed-not-financially-viable/7798962

Text D: Abstract from the Proceedings of an international academic workshop discussing the success of this technology

PROCEEDINGS, 43rd Workshop on Geothermal Reservoir Engineering Stanford University, Stanford, California, February 12-14, 2018 Retrieved 6/11/2018 from https://pangea.stanford.edu/ERE/pdf/IGAstandard/SGW/2018/Trullenque.pdf

Identifying purpose and audience

1. What is the purpose of each text (e.g. to inform, entertain, argue, report, discuss)?
2. Who is the audience of each (e.g. general, general-educated, specialist, academic)?
3. Which would be suitable for background reading and which for evidence in an academic assignment?

Identifying the main focus of each text

Now skim through each text with a different aim: identify the main focus of each one. Note:

- dates i.e. when each was written
- main ideas of paragraphs (look at paragraph topic sentences, especially in Text A)
- any relevant supporting evidence from specialists and other sources
- tenses used – note especially the use of modals/hedging language versus past and present tense in different articles

After this, discuss what the four articles together are saying about the possibilities and success of EGS over time. Try to write a SHORT summary and share with others.

In your studies, skimming through articles like this for the main ideas before you start reading in depth will aid your general comprehension and your critical thinking ability.

Text A

Hot rocks tapped to produce green power

Nowak, R. (2008). **Hot rocks tapped to produce green power.** *New Scientist,* 199 (2665)

1. Conventional geothermal power taps hot water rising naturally to the surface from shallow beds of volcanic rock. By contrast, hot rock, or engineered geothermal systems (EGS), depend on heating water by circulating it through rock, deep underground, that has been shattered to make it porous. Neither type of geothermal power emits much in the way of greenhouse gases, but while volcanic rocks are rare, EGS can harvest heat from common types of hot subterranean rock, raising the possibility of a continuous, affordable, green power supply anywhere on Earth.

2. In hot rock systems, water is heated to high temperatures, typically around 200°C, and steam from this hot, pressurised water is used to generate electricity. The hot rocks tend to be granite, which is a good conductor of heat. To store heat they need to be buried beneath something like shale, an insulating sedimentary rock. An injection well and several production wells are drilled into the hot rocks. Water is then forced into the injecting well and great pressure is applied to it to naturally fracture the rock between the injection and production wells. This creates multiple fracture pathways that the water moves through, acquiring heat from the surrounding rock before it is extracted from the production wells at a lower pressure.

3. According to Ingvar Fridleifsson, director of the United Nations University Geothermal Training Programme in Reykjavik, Iceland, there is an enormous amount of energy in the Earth's upper crust. If EGS could be proved economical on a commercial scale, its development potential will be limitless. A recent study led by the Massachusetts Institute of Technology suggested that for a government investment of $1 billion dollars EGS could provide more than 100 gigawatts of affordable electricity in the US by 2050 - 6 per cent of its current needs.

4. After decades of development, heat mining is now at a pivotal point. The first 1.5-megawatt power station at Europe's experimental EGS plant in Soultz, France, will soon begin operating continuously, and a second 3-MW EGS power station in Landau, Germany, is already selling electricity, although heavily subsidised. Meanwhile, the US Department of Energy has announced plans to fund research geared towards commercialising EGS, raising hopes that the US will again become a major player in hot-rock technology.

5. However, while these plants have proved the technology works, they have yet to show that it is cost-effective, and this is where Innamincka in South Australia comes in. The town sits on a 1000-square-kilometre slab of granite that reaches a depth of 10 kilometres. This slab is heated by naturally occurring radioactive elements and covered by four kilometres of insulating sediment - the gas-rich Cooper Basin - on top of which sits the town. It is the biggest, shallowest, and at up to 290 °C, the hottest, non-volcanic rock formation in the world. This makes it an ideal place to try producing electricity from EGS, as the heat reserve in the granite is large enough to allow developers to rapidly build up to commercial-scale operation.

6. Also in the site's favour is Australia's pro-mining mindset. Government and private investors are ploughing money into EGS, comfortable with the high upfront costs for exploration and development, and the idea that wealth can be dug out of the ground. A total of 33 companies are exploring EGS in every state in Australia. One of these, Brisbane-based Geodynamics, has sole exploration rights to the granite beneath Innamincka. Doone Wyborn, Geodynamics's chief

scientist and executive director, says that his company estimates that the granite under Innamincka has a resource potential of 5 to 10 GW, 20 per cent of Australia's electricity requirements. The only drawback is that the slab is 500 kilometres from the national electricity grid. Building the power line to the grid will add to initial start-up costs, but Geodynamics is happy to provide Innamincka with free electricity to prove the technology works.

7. Since 2003 Geodynamics engineers have drilled two 4-kilometre-deep wells. They have also forced water at high pressure down the injection well and through the rock to expand natural fractures, converting it into a porous, underground heat-exchanger. Earlier this year, they ran tests which showed that water could be circulated down the injection well, through the rock and up the production well at speeds that would make it possible to extract enough heat at the surface to run a power station. This is crucial because if the flow is too slow it risks becoming uneconomic; too fast and it becomes unsustainable, with heat being extracted more rapidly than it can be replenished by conduction from adjacent rocks.

8. Geodynamics then plans to inject a dye into the system and monitor its concentration at the production well for two months. The dye will "smear out" as the water passes through the cracks, telling engineers the size of the underground network. This data will be used with temperature recordings to calculate how much heat can be mined from the two wells. If all goes to plan, Geodynamics will be able to "declare the reserve", meaning the company will release an audited statement of how much energy it can reasonably expect to extract from its wells. The company hopes to declare up to 10 MW, or enough electricity for a town of 10,000.

9. By January 2009, it plans to have a 1-MW demonstration plant in place to power Innamincka. Three years after that, Geodynamics hopes to go commercial, initially with nine wells and a 50-MW power plant at the site, expanding tenfold by 2016. Whatever the outcome, experts agree that it will take more than one successful demonstration of commercial-scale EGS for the technology to go mainstream. According to MIT's Jefferson Tester, three to five demonstrations, at different locations, running for at least five years are needed to persuade the banks to invest.

10. Other sites will inevitably be less favourable than the Cooper Basin area, requiring heat to be mined from rocks that are cooler, deeper and liable to fracture less favourably. But the developers are confident it can be done, with a little help from spiralling oil and gas costs. Besides making alternative energy sources like EGS appear cheaper in comparison, the increasingly desperate search for fossil fuels is spurring the development of faster, cheaper ways to drill very deep wells into very hot rocks, just the sort of technology that is needed to ensure that EGS becomes economically viable.

Text B

2013 Update

Parkinson, G. (2013). Geodynamics writes off Innamincka geothermal assets
Retrieved March 14, 2014 from http://reneweconomy.com.au/2013/geodynamics-writes-cooper-basin-geothermal-assets-40047

Australia's flagship geothermal developer, Geodynamics, has written down the value* of its Innamincka operations and plant assets, citing the subdued outlook for electricity demand in Australia.

The decision to write $88.8 million off its Cooper Basin assets comes as the company completes a trial of its 1MW Habanero pilot plant near Innamincka, which sourced energy from super-heated rocks 4.2kms below the surface – deeper than any other geothermal plant in the world.

However, despite the fact that the value of the operation has been written down, Geodynamics said it has not changed its view about the future of enhanced geothermal systems. Geodynamics said the results from the Habanero trial, including steam flows and reliability, supported its belief that EGS could play a material role in Australia's energy future because it could deliver large scale, continuous, predictable and controllable energy.

But it said that developing the Cooper Basin resource will require "significant capital investment" for further exploration, development and to extend transmission infrastructure.

"Under the current market conditions, this scale of expenditure is not economic and significant changes in the level of demand and improvement of wholesale power prices will be required to support such national scale infrastructure development," the company said.

The National Electricity Market is experiencing an unprecedented fall in demand, caused by the popularity of rooftop solar PV, the impact of energy efficiency measures, and declining manufacturing and industrial activity in some areas.

*Write down the value = to reduce the value of an asset after depreciation.

Text C

2016 Update

Fedorowytsch, Y. (2016). Geothermal power project closes in SA as technology deemed not financially viable. Retrieved 6/11/2018 from https://www.abc.net.au/news/2016-08-30/geothermal-power-plant-closes-deemed-not-financially-viable/7798962

A potential energy source in Australia is set to remain untapped, with a geothermal power project in the far north of South Australia now closed.

Energy company Geodynamics closed and remediated the sites of several test wells and generation plants in the Cooper Basin after deciding they were not financially viable.

Before the closure, the company had managed to extract super-heated water from five kilometres below the earth's surface and use it to generate small amounts of electricity.

"The technology worked but unfortunately the cost of implementing the technology and also the cost of delivering the electricity that was produced to a market was just greater than the revenue stream that we could create," Geodynamics chief executive Chris Murray said.

Professor Martin Hand ran the South Australian Centre for Geothermal Energy Research at the University of Adelaide.

"I think it was talked up too much — it's a very nice concept on the front page of a newspaper, looks very easy to do, and I think it was over-spruiked," he said.

Professor Hand said large areas of the Earth's crust across Australia were very hot and could be ideal for use as a non-conventional energy source.

"Rocks about five kilometres below the surface are at temperatures of around 240 to 250 degrees and, in principle, if water could be circulated through those rocks it could be returned to the surface to produce geothermal power in a power plant," he said.

He pointed out that Australian geothermal energy differed greatly from the energy created by abundant and accessible steam vents in countries such as New Zealand and Iceland.

"There are 46 countries around the world that generate significant geothermal energy, but all of those come from conventional systems — where you see the geysers and all the volcanic manifestation, where there is natural permeability in the ground," Professor Hand said.

Geodynamics now talks of a brighter future for bio-gas, the recycling of farm waste and methane for electricity production.

"Not only does it reduce the greenhouse gases of a facility, but it provides renewable energy," Mr Murray said.

South Australia's Conservation Council is keen to see more public investment in geothermal energy and other renewable energy sources.

"There's no doubt that a lot of these start-up, new sources of energy will require public funding to give them a start and, what we've found is, as soon as that happens the cost curve quickly reduces," chief executive Craig Wilkins said.

Professor Hand made a similar call. "If we could see [geothermal] as some kind of national resource, and therefore it's some kind of national research project, there is a vast amount of energy that could be potentially unlocked."

Text D

PROCEEDINGS, 43rd Workshop on Geothermal Reservoir Engineering Stanford University, Stanford, California, February 12-14, 2018 Retrieved 6/11/2018 from https://pangea.stanford.edu/ERE/pdf/IGAstandard/SGW/2018/Trullenque.pdf

Upscaling of EGS in Different Geological Conditions: a European Perspective

Ghislain Trullenque (1), Albert Genter(2), Bernd Leiss(3), (4), Bianca Wagner(4), Romain Bouchet(5), Eric Léoutre(6), Bruno Malnar(7), Kristian Bär(8) and Ivan Rajšl(

ABSTRACT

In Europe, only a few industrial geothermal plants based on the Enhanced Geothermal System (EGS) technology (Soultz-sous-Forêts and Rittershoffen in Alsace, France and Insheim in Germany) are operating. Most of them are located in the Upper Rhine Graben and are related to the exploitation of natural fluids trapped in deep fractured hard rocks made of clastic tertiary sediments and/or crystalline rocks.

The European commission decided to further explore and exploit its EGS potential by supporting the development of innovative techniques in different geological conditions. At European scale, these are deep sedimentary basins (e.g. the Southern Permian Basin area, the Pannonian Basin and the various foreland basins of the Alps and the Pyrenees) and the metamorphic and crystalline rocks of the Variscan orogen, which forms most of the bedrock of central and southern Europe.

More than 70% of the overall geothermal potential of Europe is located in low permeable bedrock only exploitable by EGS technology, which allows – theoretically – a permanent heat and electricity production at any place. However, for the implementation of enhanced geothermal energy systems into our future energy supply, distribution infrastructures dealing with EGS are crucial. Only EGS makes geothermal energy - heating or heat storage – exploitable at large scale and in view of a significant market penetration.

Until now, the main drawbacks of EGS are related to

1. high costs (drilling, CAPEX) and relative low experience due to only very few operating power or heat plants,
2. only very few exploitations due to the lack of available technical solutions of different reservoir types with unexceptional geothermal conditions,
3. highly aggressive fluids causing corrosion or scaling and thus damaging technical installations, and
4. the lack of a clear integration strategy in existing power or heat networks.

These gaps have to be filled by systematic studies associated with site demonstrations in different geological contexts in order to significantly extend the range of EGS in Europe.

The MEET project (Multidisciplinary and multi-context demonstration of EGS Exploration and Exploitation Techniques and potentials) aims to:

1. apply EGS techniques to a very common (in Europe) but until now nearly unexploited reservoir type, namely the different rock units of the Variscan orogenic belt. Several research and prospection wells have demonstrated the unexpected presence of hot fluids and sufficient rock permeabilities. We will explore sites, where we already have a strong heat demand for such reservoir types from existing district heating systems which have to be converted to sustainable energy systems.

2. increase the productivity of existing geothermal power plants (Soultz sous Forêts, France) using a fractured granitic basement as reservoir rock. The re-injection of geothermal fluids with a colder temperature in combination with the latest generation of small-scale ORC units will enhance the heat and electricity production. Solutions have to be developed to avoid the scaling problem, which increases by lowering the fluid temperature.
3. use the hot fluid of mature oil fields, where water is reinjected without using the calories. Such an enhancement through oil barrels and electricity KWh "co-production" of wells could be realized by new low temperature ORC systems, which we aim to test in French oil fields. Ultimately this could lead to a better definition of a value-creating method to assess the conversion of abandoned oil fields.

The proposed different studies clearly aim to enhance the geothermal reservoir types by new exploitation and energy production techniques with the consequence of geographically extending the geothermal heat and electricity production to be supplied to smart energy grids. The large amount of potential production sites together with the reconversion of existing wells will greatly contribute to lowering the costs of geothermal energy, making it economically competitive in comparison to conventional fossil and nuclear sources.

Part 3: Reading and understanding the text

Now answer the following questions.

Text A

Questions 1 – 4 Multiple Choice
Choose one answer.

1. Engineered geothermal systems are different from conventional geothermal power systems because these systems
    a. transmit fewer greenhouse gases.
    b. use rocks that are heated up using hot water.
    c. make use of less common rocks.
    d. utilize the heat from the rocks themselves.

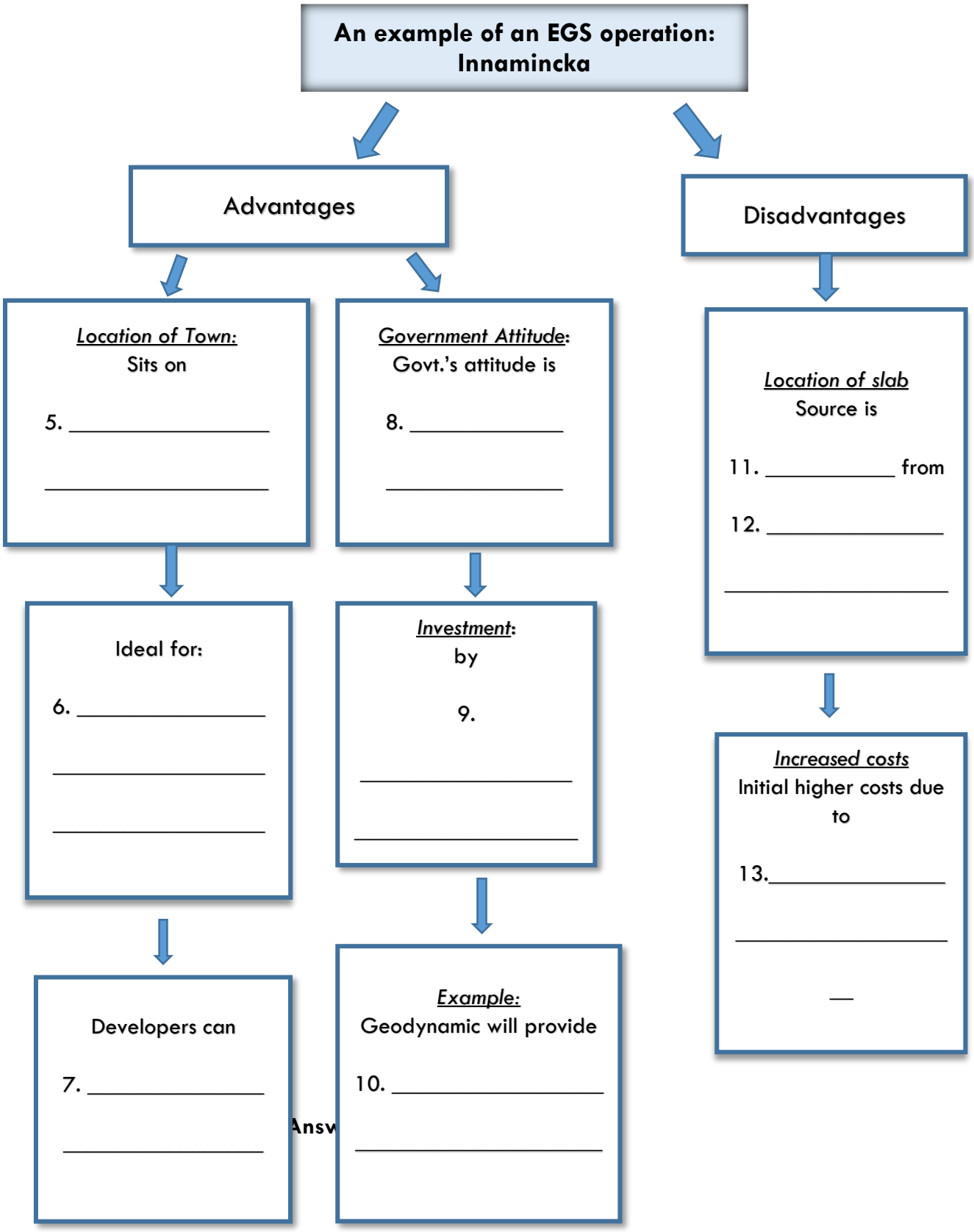
2. In order to allow the successful transmission of heat to the surface, what is needed?
    a. fractures in the rocks
    b. only one type of rock
    c. an underneath insulating rock
    d. a pool of water around the deep rock

3. The main obstacle to the commercial success of EGS would seem to be
    a. access to the energy of the earth's crust.
    b. concerns regarding its economic viability.
    c. the necessity for more research.
    d. the low demand for affordable electricity.

4. "Heat mining is at a pivotal point" means that
    a. the technology is already proving very successful.
    b. more and more European plants are operating.
    c. EGS is being researched by American companies.
    d. this process is in a position where it could finally become viable.

Questions 5 –13 Flow Chart

Complete the flow chart using your own words if necessary. Use no more than ***seven words for each gap.***



Answer the following questions using ***no more than seven words for each answer.***

Questions 14 & 15

Successful tests were run to show that flow speeds could be maintained in the extraction process. What would have been the consequences if these speeds were

14. insufficient? _____

15. excessive? _____

16. How will Geodynamics indicate its success in extracting sufficient energy from its wells?

_____

17. According to the company, how many demonstrations will be needed to encourage external investment?

_____

18. What factor has stimulated the development of new efficient drilling technologies designed to improve EGS's economic viability?

_____

Text B & C

Questions 19 – 25 Matching

Match the opinions expressed in the following statements with the options in the box. You may use each letter more than once.

A Geodynamics
B Chris Murray
C Professor Martin Hand
D Craig Wilkins

19. The excessive promotion of the technology was not justified. _____

20. Government funding will quickly contribute to cost reduction. _____

21. The most successful geothermal energy has come from conventional sources. _____

22. Based on trials, it is still possible that the Cooper Basin will be successful. _____

23. A possible new source of energy creation would have two benefits. _____

24. The project did not generate sufficient income to cover costs. _____

25. More investment is needed to fulfil potential. _____

Text D

Questions 26 – 29 True, False or Not Given

Decide if the following statements are True (T), False (F) or Not Given (NG) according to the information in the text.

26. EGS plants are operating widely in Europe. _____

27. There has been official encouragement to develop EGS even more widely. _____

28. In order for EGS systems to be exploitable, it is essential that they be connected to distribution networks. _____

29. The high costs and lack of a clear integration strategy are considered to be far greater drawbacks than technical issues and factors. _____

Questions 30 – 34 Summary

Complete the summary with one word from the text.

The MEET project has been created with several aims. The first aim relates to applying EGS **30.** _____ to different types of rock in which hot fluids have been identified. This will involve the exploration of **31.** _____ where the existing heating systems need to be converted to energy systems which are **32.** _____. The second aim is to increase productivity of current power plants using a system of fracturing and **33.** _____of geothermal fluids at colder temperatures. The third makes use of a combination of hot fluids from older oil fields and the reinjection of **34.** _____ in order to enhance new systems which will be trialled in French oil fields.

Follow on

1. Check your answers.
2. Look back at the questions in the pre-reading. Also look at your summary. What would you add to your discussion after having read these texts in detail?

Part 4: Information flow

Information in English is organised in a pattern of old-new connections. This means that each sentence begins with information that the reader already knows - it already been given in the text. New information that develops the text comes **after** the main verb.

A. Information flow between sentences

Task 1

Consider this paragraph from text A:

1. Identify the main verb in each sentence
2. Look at the information before the main verb – what is it referring to? The first example is done for you.

Since 2003 Geodynamics engineers have drilled two 4-kilometre-deep wells. They have also forced water at high pressure down the injection well and through the rock to expand natural fractures, converting it into a porous, underground heat-exchanger. Earlier this year, they ran tests which showed that water could be circulated down the injection well, through the rock and up the production well at speeds that would make it possible to extract enough heat at the surface to run a power station. This is crucial because if the flow is too slow it risks becoming uneconomic; too fast and it becomes unsustainable, with heat being extracted more rapidly than it can be replenished by conduction from adjacent rocks.

Task 2

Consider another paragraph from text A:

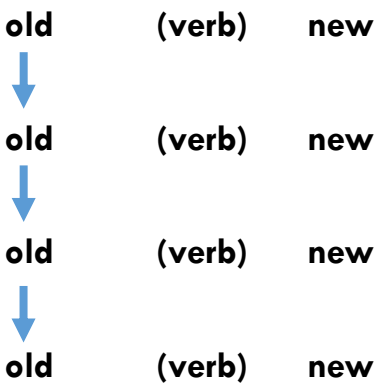
1. Identify the main verb in each sentence
2. Look at the information before the main verb – what is it referring to?

However, while these plants have proved the technology works, they have yet to show that it is cost effective, and this is where Innamincka in South Australia comes in. The town sits on a 1000-square-kilometre slab of granite that reaches a depth of 10 kilometres. This slab is heated by naturally occurring radioactive elements and covered by four kilometres of insulating sediment - the gas-rich Cooper Basin - on top of which sits the town. It is the biggest, shallowest, and at up to 290 °C, the hottest, non-volcanic rock formation in the world. This makes it an ideal place to try producing electricity from EGS, as the heat reserve in the granite is large enough to allow developers to rapidly build up to commercial-scale operation.

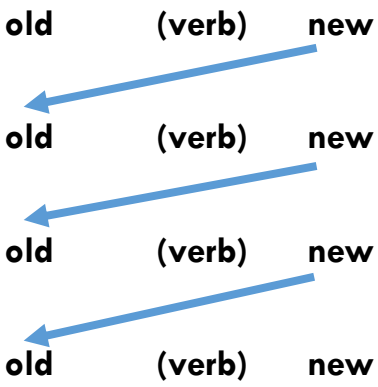
Task 3

There are two main patterns for linking sentences with old-new information connections.

A.



B.



1. Which pattern does each of the paragraphs we considered in tasks 1 and 2 most closely match?

2. What do you think is the difference between the two patterns in terms of how the information in the text is being developed?

B. Information flow between paragraphs

We find the same patterns of old-new links between the paragraphs of a text. The first sentence of the paragraph acts as the 'old' information and the body of the paragraph is the 'new'.

Work through the phrases in bold in the first sentence of each paragraph of Text A. What does each refer back to?

What does this tell you about the organisation of the text?

Listening

Wk 6 Listening & Note-taking

Lesson Objectives
• Identify signals of text organisation • Understand the use of key word repetition to signal text structure • Practise using abbreviations

Part 1: Identify text structure

Read the transcript of the short talk 'Hydropower'. You should already have listened to this talk before you did lesson **Wk 6 Reading 1 *"20 000 megawatts under the sea"*.**

1. Underline any language that the speaker uses to signal the organisation of her talk

2. What is the key topic word(s) in this talk?

3. Go through the transcript and highlight all instances of the key word(s)

4. What does this tell you about another important signal of text organisation?

Hydropower

https://www.youtube.com/watch?v=q8HmRLCgDAI

Hydropower or hydroelectricity refers to the conversion of energy from flowing water into electricity it is considered a renewable energy source because the water cycle is constantly renewed by the sun
00:15
One of the first uses of hydro energy was for mechanical milling such as grinding grains but today modern hydro plants produce electricity using turbines and generators. The mechanical energy created by moving water spins rotors on a turbine. This turbine is connected to an electromagnetic generator which produces electricity when the turbine spins.
00:36
There are two main types of hydroelectricity production - dams and run of river. Hydro dams utilize the potential energy from dammed water to produce electricity. A dam is a large barrier constructed to raise the level of water and control its flow. The elevation created by the dam creates gravitational force for turning the turbine when water is released. Some dams also contain an additional reservoir at their base where water is stored to be pumped to the higher reservoir for release when electricity is in demand. This is referred to as pumped-storage hydro
01:12
The second form of hydroelectricity production is run of river hydro. Run of river still uses turbines and generators but relies on natural water flow rates of rivers, diverting just a portion of the water through turbines. Because run of river hydro is subject to natural water variability it is more intermittent than dammed hydro.
01:32
There are various sizes of hydro plants that produce electricity - large hydro greater than 30 megawatts, small hydro 100 kilowatts to 30 megawatts and micro hydro less than 100 kilowatts. The Hoover Dam in the United States is a whopping 2074 megawatts which is enough to serve 1.3 million people. Of all renewable energy sources hydropower holds the largest share of worldwide electricity production.
02:00
Hydropower has several benefits - it is a cost competitive form of electricity even though the initial building cost can be high. It is quite reliable compared to other renewable options and pairs well with other sources as it can be used as base load power. In some cases, dammed reservoirs can also help with flood control and be a reliable water supply for communities
02:23
There are also some concerns with hydropower especially when it comes to large dams. Damming a river has a major impact on the local environment - changing wildlife habitats, blocking fish passage and often forcing people in riverside communities to move out of their homes. In addition, dam failures can be catastrophic claiming the lives of those living downstream. Hydro plants are also not completely free of greenhouse gas emissions. As with most forms of energy carbon dioxide emissions happen during construction particularly due to the large quantities of cement used and plant matter in the flooded areas makes methane, another greenhouse gas, as it decays underwater.
03:01
That's hydropower.

Part 2: Abbreviations

1. Use the space in your book to take notes from the transcript. As you do think carefully about:

    a. How you will organise your notes

    b. Abbreviations that you can use to help you write more quickly

2. Compare your notes to the sample notes.

    a. What abbreviations are used in the sample notes?

    b. Did you use any different abbreviations? Will you remember what your abbreviations mean later?

Part 3: Listening & note-taking

Now listen to the talk and take notes as you listen. Pay attention to the repetition of key topic words as signals of new points in the text.

Use this page for note-taking

Part 4: Reflection

1. How much of your original notes from the transcript were you able to write down when listening?
2. How well could you hear the organisation of the talk as you listened? What signals of organisation help you the most?
3. How well can you concentrate on listening to what the speaker is saying while you are writing something else at the same time?

Wk 6 Transactional Listening 1: Job Interview

Part 1: Pre-Listening Discussion

1. Have you ever attended a job interview?
2. What questions do you expect will be asked at a job interview?
3. What is a resume? When do you send it?

Part 2: Listening

Task One

Look at the following resume.

1) Take a minute to predict what kind of information is missing
   e.g. It's a number. OR It's the name of a company etc
2) Now listen and complete the resume.

Resume

Name Joe Fontaine

Address 2/56 Station St, Petersham

Mobile Phone (1) _____

Email jfont@hotmail.com

Nationality (2) _____

Languages English, (3)_____, Spanish

Education: Bachelor of Accounting, The University of Sydney (4)_____

Employment History

2004 - now (5)_____ Industries
Accountant

(6)_____ - 2004 Chubb Security Services
Accountant

Computer Skills

(7) _____ competent with spreadsheets, (8) _____, word processing.

Hobbies and Interests

(9) _____ music, rock climbing, (10) _____.

Task Two

Now listen to the rest of the job interview and circle the correct answer.

1. How many current responsibilities does Joe Fontaine mention?
   A three
   B two
   C five
   D four

2. How many people work in the Accountancy Division of Joe's current job?
   A four
   B six
   C three
   D seven

3. What is the main reason for Joe wanting to change jobs?
   A He wants to work closer to home.
   B He is restless in his current job.
   C He is looking for an interesting challenge.
   D He wants to be rewarded for working hard.

4. What salary is he looking for?
   A $60,000
   B at least $60,000
   C $55,000
   D $55,000 - $60,000

5. According to the manager, why is the job available?
   A The company is restructuring
   B Head office has ordered it
   C The company is growing
   D Someone is moving to head office

Now, discuss with a partner any problems you had with trick questions. What strategies can you use to overcome these problems?

Wk 6 Listening 1: Water is Priceless

Lesson Objectives
• Review listening strategies • Predict text structure and organisation • Practise using abbreviations

Adapted from: Water is priceless. (2003, July 17). *The Economist*.

Part 1: Listening strategies

In the first part of your DEC 10 course, you learned about strategies for managing your listening.

1. Which strategies did you find most useful? Why?
2. Which strategies can help you with note-taking?

Predict text organisation

You are going to listen to a talk called "Water is Priceless". Listen to the talk being introduced.

1. What problem is identified?
2. Why do you think this is likely to be a challenge?
3. How is the talk likely to be organised?
4. Using your prediction of the text organisation, plan how you could organise your notes.
5. Then look at the headings given for note-taking in the next section. Do they reflect your prediction about text organisation?

Part 2: Before you listen 

Complete the pre-listening activities on Canvas.

Key vocabulary

The lecturer gives the following reasons for water shortages. Discuss what you understand by these factors and explain some examples of each that you are aware of:

- Location issues
- Seasonal water supply
- Wastage
- Mismanagement of resources
- Pricing issues
- Infrastructure problems
- Cost imbalances
- Other possible factors

Preparation for Note-taking

Now look below at the headings showing how the lecture is organised. Predict what you think will be in each part. Notice how much space you have for each part.

Try to organise your notes so that you can distinguish between main ideas, evidence, examples and data. What are some techniques that you could use to do this?

Part 3: Listening and note-taking

1. First listen to the first speaker in her introduction to the lecture without taking notes. After listening, discuss what you understood. What are her main points?

2. Listen again to her introduction for confirmation, then start taking notes to John Peet's talk.

Headings for note-taking

Lecturer's introduction

Why water is important

The natural water cycle

Two reasons for shortage

The first

The second

One solution

Recent events including a problem

Repetition of lecturer's position

Environmentalists' arguments - claims

Lecturer's position (arguments against the environmentalists' claims – with examples)

Different ways water is wasted– with statistics

Prediction – future - wars

Potential solutions - private sector involvement + dams

Why clean water and basic sanitation are essential

Meeting the goals

Part 4: Using your notes

Work with your partner.

1. Take turns to explain the main ideas of each section using your notes.

   Do you agree? What did you miss?

   How easy was it to hear and write down information?

2. Use your notes to answer the following questions.

Questions 1 & 2 Multiple Choice

Choose one answer

1. Both the introducer and the lecturer agree that

   a. providing clean and safe water for drinking can be economically challenging
   b. too much water is locked up in glaciers.
   c. most of the world's water is salt water.
   d. the water issue is one that cannot be solved.

2. Which of the following does John Peet claim?

Water

   a. is a natural product similar to coal.
   b. evaporates from rivers into the ocean.
   c. has a natural recycling process unlike oil.
   d. is locked up naturally, just like oil and coal.

Questions 3 - 10 Table

*Complete the table using **no more than four words** for each answer.*

Reasons for the Water Shortage		
Reason	**Problem**	**Example**
The First Reason		
➢ **3.** Wrong _____	**A. 4.** _____	Canada, Austria, Ireland
	B. too little water	**5.** _____ (one example)
➢ Water is heavy	**6.** _____	
➢ Supply is seasonal	Arrives in short period	**7.** _____
The Second Reason		
Too much is **8.** _____	• mismanaged • **9.** _____ • cost of production ignored • overused	**10.** _____ _____ (one example of one of these)

Questions 11 & 12 Short Answer

*Complete the following questions using **no more than six words** for each answer.*

11. What solution does John Peet give to solve the water problem?

_____

12. Water has become a focus of International Politics. Give one example of an event illustrating this.

_____

Questions 13 – 18 Matching

*Match the following statements with the options in the box. Which statements reflect the opinions of the Lecturer, Environmentalists or Both? Choose **A**, **B** or **C**. You may use each letter more than once.*

A. the Lecturer
B. Environmentalists
C. Both the Lecturer and Environmentalists

13. It is sensible to charge a reasonable price for water. _____

14. Water should be free to all. _____

15. The private sector should be involved with water. _____

16. Water is essential. _____

17. There is no longer a correlation between water consumption, income and population growth. _____

18. The world is running out of water. _____

Questions 19 – 23 Summary Completion

Complete the following summary using one suitable word in each space.

USES OF WATER

The amount of water used by different types of consumers varies. For example, in developing countries, the main use water in agriculture is for **19.** _____, which accounts for 75-90%. In developed countries, water use by **20.** _____ and energy supply accounts for large amounts of water use. Surprisingly, **21.** _____ users are not to blame as they use quite a small amount, even taking into account swimming pools and wastage.

The issue of water sharing between countries also needs consideration because of the possibility of conflict as occurred between Israel and Arab countries. However, despite this, countries have co-operated, for example, **22.** _____ and Pakistan. Another example is in South-East Asia, where several countries share the water of the **23.** _____ River and in Africa with the sharing of the Nile.

Question 24 Multiple Choice

Choose one answer.

24. The speaker encourages the involvement of private companies in water delivery because
a. governments have competing interests and insufficient funds.
b. consumers expect excellent services.
c. private companies have not done enough so far.
d. a large amount of capital is needed to achieve goals.

Questions 25 – 27 Multiple Choice

Which three of the following reasons does John Peet give for why clean water should be provided to all?

a. It is essential to all activities.
b. It helps prevent illness caused by poor sanitation.
c. It contributes to higher quality children's education.
d. It helps the government with its long-term goals.
e. It saves time for women in their daily lives.

Question 28 Multiple Choice

Choose one answer.

28. Overall, the speaker believes that

a. it will be easy to achieve the goal of greater access to fresh water.
b. sufficient money is all that is needed to achieve goals.
c. the water access problem can be solved although it will be expensive.
d. it is necessary to have expensive sewage systems and piped water to every house.

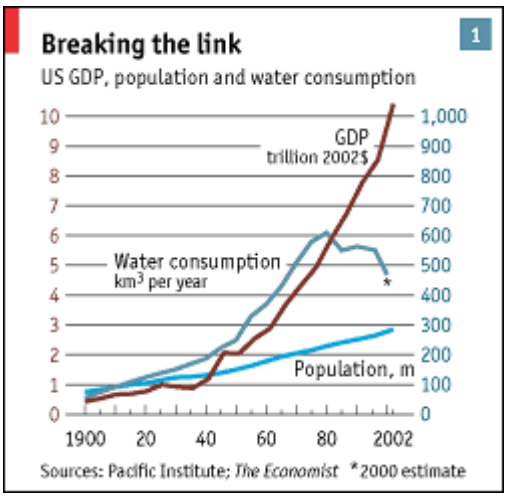
Follow on

1. Use the transcript to check your answers to the questions.
2. Listen again if necessary.

Part 5: Restructuring

Describing graphs

1. The first graph below shows the link between water consumption, income and population from 1900 to 2002. How could the speaker use this graph to support his argument?



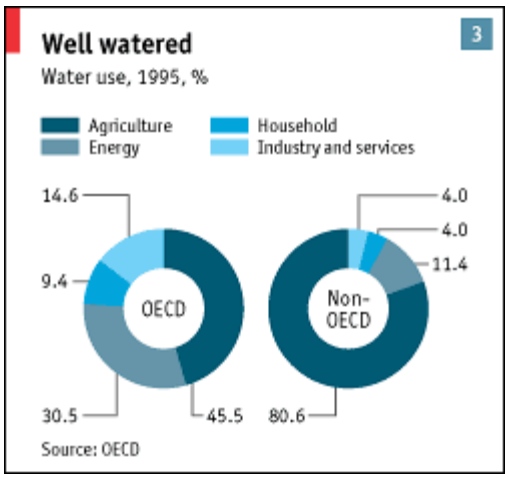
2. Read this extract from the transcript where John Peel talks about the quantities of water used for different purposes. Can you predict what phrases he uses in the gaps?

Domestic consumers are hardly ever to blame for water shortages. _____ *of the water in piped systems is lost through leakage. More important, wherever in the world water is scarcest, which is mostly in developing countries, irrigation for agriculture uses up* _____ *and sometimes* _____ *of the available water. In richer countries, industry and energy use* _____. *Domestic users everywhere account for* _____ .

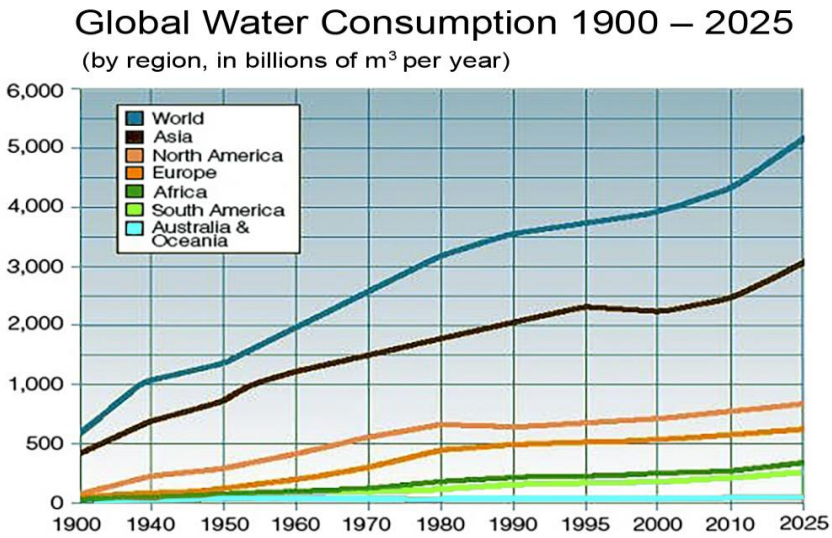
3. Listen to check

Analysing graphs

1. This graph contrasts water use in OECD and non-OECD countries in 1995. Discuss the most significant features of the graph with your partner. Try to incorporate some of the language you heard in the previous activity



2. The next graph shows global water consumption from 1900 to that predicted in 2025. Discuss the most significant features of the graph with your partner



https://en.wikipedia.org/wiki/Water_scarcity

Extension

If you are interested in more data about water, you can find a lot here:

https://ourworldindata.org/water-use-sanitation

Transcript

Adapted from: **Water is priceless**. (2003, July 17). *The Economist*.

Introduction:
Water is by far the most common substance on earth, but 97% of the total is seawater, unfit for human use. Of the 3% that is fresh, two-thirds is locked up in glaciers or ice and snow around the poles. Therefore, only 1% of all the world's water is available for human consumption. One of the world's greatest economic challenges is the provision of clean, safe drinking water to the world's population. John Peet is here to tell us more about this precious resource. Welcome John.

John Peet:
Thank you for giving me the opportunity of talking about this very important subject. It's important because water is literally vital: without it, life could not exist. But even the 1% of the earth's available water you mentioned in your introduction should be enough for all. In a natural water cycle, rainwater falls from the clouds on to the land, nourishes life, returns through rivers to the salty sea and evaporates as fresh water back into the clouds. It's a natural resource not at all like oil or coal because, unlike them, water is infinitely renewable.
So if water is plentiful, why are there water shortages in so many places? Let's have a look at the two main problems that are preventing the delivery of water to people.
The first is that it is often in the wrong location. Some places, such as Canada, Austria and Ireland, have more water than they can possibly use; others, such as Australia, northern China and the Middle East, have too little. In many parts of the world, such as India and Bangladesh, rainfall is highly seasonal: almost all the year's supply may arrive within a few months. There are variations even at local levels. For example, in Tanzania, there are two villages just thirty kilometres apart. One has more than enough water and the other not enough. Water is also heavy, which makes it very expensive to transport over long distances.
OK, let's have a look at the second difficulty with water which is a much bigger problem than the first. This problem is neither physical nor geographical. It's the incredible amount of water that is wasted. Why does this happen? Well, for a start, water is not treated like other economic goods, subject to the laws of supply and demand. Water ought to be the most precious of all resources. Yet throughout history, and especially over the past century, it has been mismanaged and, most importantly, greatly underpriced. Indeed it's often given away completely free. Not only does this ignore the huge costs of collecting, cleaning, storing and distributing it, to say nothing of treating waste-water and sewage. It also leads to overuse of water for the wrong things, especially for highly water-intensive crops. I believe that the best way to deal with water is to price it more sensibly—to reflect, so far as possible, the costs of providing it (including environmental costs).
In the past few years, water has become a focus of international politics. In March 2002 a water forum was held in Kyoto, Japan. The United Nations declared 2003 to be the international year of fresh water. The Johannesburg Earth Summit in August 2002 agreed to reduce the number of people without safe access to clean water and basic sanitation by half by 2015. But the task is enormous because today, over a billion people in developing countries have inadequate access to water, and 2.4 billion lack basic sanitation

I believe pricing water more realistically is necessary but many environmentalists disagree. They believe that it is immoral to charge for water because it is essential and God-given; that private-sector involvement in water is disgraceful, and that interference with the flow of rivers, such as dam-building, is environmentally disastrous. They claim that water consumption grows with income and population, and that this will lead to increasing shortages and even to wars. The environmentalists say the world is fast running out of water and wasteful domestic consumption is to blame.

OK, let's take this last claim first. The world is not running out of water, partly because the natural cycle continually renews it but also because the growth in water consumption no longer seems to be connected with growth in GDP and population. Here are a few examples. In the 1930s, it took 200 tonnes of water to make a tonne of steel in America; now it takes only 20 tonnes of water, and the best Korean methods use only 3-4 tonnes. Toilets, which account for the biggest domestic use of water, show a similar gain: from six gallons of water per flush in 1980 to only 1.6 gallons in the latest models.

Domestic consumers are hardly ever to blame for water shortages. As much as 50% of the water in piped systems is lost through leakage. More important, wherever in the world water is scarcest, which is mostly in developing countries, irrigation for agriculture uses up at least 75% and sometimes as much as 90% of the available water. In richer countries, industry and energy use a surprisingly large amount. Domestic users everywhere account for a relatively small share. Any shortages should thus be blamed on farmers and manufacturers, not on swimming-pool owners.

Now let's think about the prediction that future wars will be about water not oil. It is true that water has played a critical role in the Arab-Israeli conflict, and it has sometimes been a cause of fighting elsewhere. But the management of water, especially of rivers, needs co-operation, and it has more often been linked to peace than to war. For example, despite conflict, India and Pakistan have co-operated with each other over the Indus River. Also, the Mekong River in SE Asia, has been a co-operative venture even though the region through which it flows has been affected by war. And ten countries which impact on the Nile River have signed up to an agreement.

Now it is important that the private sector be involved in water supply because water delivery and treatment need large investment of capital. After all, "God provided the water, but not the pipes." Someone needs to pay for this capital - users or taxpayers or aid donors. For the people who now have no access to clean water, what matters is whether water comes out of the tap, not who delivers it.

Dams, too, are the subject of a debate. Certainly, many have been built with little regard for cost or for the environment. But dams have been an essential part of civilisation ever since it began to develop. After all, the Romans built aqueducts everywhere.

Providing clean water and basic sanitation is essential because no other development goals can be met without them. At present, millions of poor people (usually women) must walk for several hours a day to get water; or they are forced to buy it at very high prices from private water sellers. Either way, the water's quality is often poor. Inadequate sanitation makes matters worse. As much as 60% of the world's illness is water-related. In fact, it's really surprising that more has not been done to improve water access and sanitation before now.

Meeting the goals will certainly take a huge investment. Yet there is room for argument about how much is needed. In 2000, $75-80 billion a year was spent on this, but it is suggested that this would need to be raised to around $180 billion.

How much development is needed? Standpipes in villages may be sufficient, not piped water to every home; and when resources are scarce, there isn't much point in treating all water to drinking quality, since much of it is used for cleaning or washing. And instead of expensive sewage systems, ventilated improved latrines could be used. I should point out that simply washing hands with soap is the best single sanitation measure.
Action is needed as well as money. To meet the goal on sanitation, for instance, will mean bringing clean, safe water to 400,000 new people every day.
Achieving goals by 2025 is achievable. But to achieve them would mean providing water to 400,000 people per day. Delivering clean water and removing waste-water is expensive. But it is one of the few environmental problems that can be solved. And the best way of solving it is to treat water pretty much as a business like any other.
Thank you for listening.

1410 words

Speaking

Wk 6 Referring to texts in a discussion

Lesson Objectives
• Compare notes and ideas regarding the key concept question • Learn how to verbally summarise texts • Learn how to verbally compare and contrast texts to support opinions

Part 1: Tutorial Discussion Task

In Week 10 you will be assessed on your performance in a Tutorial Discussion.

The tutorial discussion assessment requires you to participate in a 20-minute discussion in which you should provide an evaluative response to a given question.

Step 1:
You will be given three texts (up to 3000 words in total) related to the same topic at least one day prior to the tutorial discussion.

Step 2:
Read the texts and identify common themes in relation to the question, including where the authors support or contradict each other. **It will help you if you make notes of these.**

Step 3:
You will receive a question related to the topic 30 minutes before the discussion. This will give you time to review your notes, decide on your response and identify relevant supporting evidence in the reading texts.

Step 4:
Participate in the discussion.

Tutorial Discussion time: Approximately 20 minutes

Tutorial Discussion group size: 6-7 students

A successful participant in the discussion will:

- draw on information from the reading texts
- refer to and respond to the contributions of other participants
- contribute to moving the discussion forward
- present fully developed ideas
- demonstrate critical understanding of the texts and topic

Your performance will be marked on the following key criteria:

- Content/Relevance
- Fluency & Coherence
- Pronunciation
- Communication Skills
- Grammar & Vocabulary

You will have opportunities to practice your tutorial skills in Weeks 6, 7, 8 & 9

Part 2: Tutorial Discussion Marking Criteria

Take a look at the marking criteria on Canvas. Discuss any points you don't understand.

Part 3: Summarising a text

Before this lesson, you should have closely read and taken notes on **one** of the Wk 6 Key Concept texts.

You should have taken notes on the information that is relevant to answering this question.

What are the most significant barriers to the widespread adoption of renewable energy sources?

Task 1

Work with a partner that closely read the same text as you.

1. Compare the notes that you took. Did you think the same information was relevant?

   Make any changes to your notes if you wish.
2. What do you think the author would say in response to the key concept question? Discuss.
3. Use your notes and prepare a short summary of the text including the information that is relevant to the question and what you think the author's answer to the key concept question would be.

Task 2

1. Work with a student who has taken notes on a different text to you.
2. Share with each other your summaries of the texts you have read. Record yourself as you speak.

   Your summary should include the information that is relevant to answering the Key Concept question, including what you think the author's answer would be.
3. Make notes in your note-taking grid of information from the text your partner is summarising.

Sample summaries

Watch the two sample videos of individuals summarising Text 1 in relation to this question:

'Which stakeholder is most responsible for the slow growth in the renewable energy sector? Governments, energy investors or consumers?'

1. Listen for the answers to these questions and discuss what you heard before you listen again and complete the table

   - What does each speaker say is the main argument / point made in the article?
   - What different aspects of this argument does the article address?
   - What does each speaker say would be the author's answer to the question?

2. Listen again and complete the table (leave the box blank if the speaker doesn't cover the aspect).
3. Listen a third time and try to identify the language the speakers use to introduce the information
4. After you have listened to the summaries three times, check the transcript.
5. How is a verbal summary different from a written summary?

	Language used to introduce each aspect	
Aspect of the Text	**Sample 1**	**Sample 2**
Title		
Author		
Year of publication		
Main argument / point in the text in relation to the question		
Key points made in the text (in relation to the question)		
Author's likely position in response to the question		

Your summary

Complete these tables as you listen to each of your group members summarise the text they have read.

	Language used to introduce each aspect	
Aspect of the Text	**Sample 1**	**Sample 2**
Title		
Author		
Year of publication		
Main argument / point in the text in relation to the question		
Key points made in the text (in relation to the question)		
Author's likely position in response to the question		

	Language used to introduce each aspect	
Aspect of the Text	**Sample 1**	**Sample 2**
Title		
Author		
Year of publication		
Main argument / point in the text in relation to the question		
Key points made in the text (in relation to the question)		
Author's likely position in response to the question		

PEER REVIEW FORM 1		
	objective achieved? ☺ 😐 ☹	**Notes/ Comments**
Structure of the verbal summary. Were all aspects covered?		
Use of appropriate **language** to provide the verbal summary		
General Comments on any other aspect of the performance, e.g. pronunciation, fluency & coherence or/and grammar & vocabulary:		
One Suggestion for improvement:		

PEER REVIEW FORM 2		
	objective achieved? ☺ 😐 ☹	**Notes/ Comments**
Structure of the verbal summary. Were all aspects covered?		
Use of appropriate **language** to provide the verbal summary		
General Comments on any other aspect of the performance, e.g. pronunciation, fluency & coherence or/and grammar & vocabulary:		
One Suggestion for improvement:		

SELF EVALUATION FORM		
	objective achieved? ☺ 😐 ☹	**Notes/ Comments**
Structure of the verbal summary. Were all aspects covered?		
Use of appropriate **language** to provide the verbal summary		
General Comments on any other aspect of the performance, e.g. pronunciation, fluency & coherence or/and grammar & vocabulary:		
One area I need to work on to improve:		

Wk 6 Tutorial Discussion

Lesson Objectives
• Utilize pronunciation features to enhance communication • Practice participating in a tutorial discussion • Evaluate your own performance in a tutorial discussion

Part 1: Synthesising texts

In order to answer an academic writing task, you need to synthesise the information from the sources that you have. This means identifying:

- where the sources are saying the same / similar things
- where the sources might contradict each other

When we are talking in tutorial or seminar discussions, we need to synthesise the information that we have about the topic in a similar way

Task 1

Prepare to answer this discussion question with specific reference to the Wk 6 Key Concept texts.

You should try to refer to all of the texts if appropriate.

'Which stakeholder is most responsible for the slow growth in the renewable energy sector? Governments, energy investors or consumers?'

Work in the same group of 3 and give each other your responses.

Record yourselves doing this.

Sample synthesis

Watch Maria responding to the question with reference to the texts and complete the activities on Canvas.

Part 2: Pronunciation

Follow the tasks on Canvas to develop and practise your pronunciation skills.

Mark the extract below for:

- chunking
- stress
- intonation

You will need to listen three times to do this.

So the reason has to be that the government has just not got behind in a strong and consistent way as an advocate for these new energies and this is mentioned in each of these either directly or indirectly in the three texts that we're reading.

Part 3: Tutorial discussion

Task 1

Student A: Participate in a 10-minute discussion in a group of 3 answering the question:

'Which stakeholder is most responsible for the slow growth in the renewable energy sector? Governments, energy investors or consumers?'

You should refer to the reading material in the discussion where appropriate.

Student B: Sit behind your partner, listen carefully and evaluate their performance.

Complete the *Peer Feedback sheet* for your partner **in your partner's book**. Your teacher may ask you to focus on just one or two criteria.

Task 2

Student B: Participate in a 10-minute discussion in a group of 3 answering the question below.

What are the social barriers to the growth of the renewable energy sector and what do you think can be done to overcome these?

Student A: Sit behind your partner, listen carefully and evaluate their performance.

Complete the *Peer Feedback sheet* for your partner **in your partner's book**. Your teacher may ask you to focus on just one or two criteria.

You should refer to the reading material in the discussion where appropriate.

Remember that a successful participant in the discussion will:

- compare the given reading texts
- refer to and respond to the contributions of other participants
- contribute to moving the discussion forward
- present fully developed ideas
- demonstrate critical understanding of the texts and topic

Part 4: Homework

Follow the instructions on Canvas to record a short tutorial discussion in groups and upload it to Canvas. 

DEC10 Tutorial Discussion Peer feedback form					
		Less than 60	**60-64**	**65-69**	**70 and over**
Content/ Relevance	You will be assessed on these aspects of Content/Relevance: • Relevance of ideas • Strength of ideas • Development of ideas • Critical understanding of the topic • Use of evidence from the sources	Ideas are **sometimes relevant,** and content **lacks any critical understanding** of the topic	Ideas are **mostly relevant,** but content demonstrates only **occasional critical understanding** of the topic	Ideas are **relevant and** content demonstrates **some critical understanding** of the topic	Ideas are **highly relevant** and demonstrate **full critical understanding** of the topic
Fluency & Coherence	You will be assessed on these aspects of Fluency & Coherence: • Organisation of ideas • Use of synonyms, paraphrases, referencing, repetition of key topic words and linkers to make ideas flow • Frequency of hesitations to think of vocabulary	Ideas often **lack clarity,** are **difficult to follow,** with **poor organisation** Speech often **lacks fluency**	Ideas are **generally clear** and **can be followed,** but could be **more logically organised** Speech is **sometimes fluent**	Ideas are **mostly clear, logically organised** and **easy to follow.** Speech is **mostly fluent**	Ideas are **clear, logically organised** and can be **easily followed** with rare exceptions **Speaks fluently** almost consistently
Pronunciation	You will be assessed on these aspects of pronunciation: • fluency • Chunking & pausing • Stress • Intonation • Sounds	Speech often causes **strain for the listener** and the **message is difficult to understand**	Speech may cause **some strain for the listener** and the **message is occasionally difficult to understand**	Speech is **mostly clear,** but **may cause occasional strain** for the listener and the message is **mostly easy to understand**	Speech is **clear,** with very **occasional lapses** that do not interfere with the communication of the message

	Score	Less than 60	60-64	65-69	70 and over
Communication skills	You will be assessed on these aspects of communication skills: • Body language, including posture, gestures, facial expressions and eye contact • The extent to which contributions move the discussion forward • Active listening skills • Responses to others • Active participation without dominating	The speaker s**ometimes participates appropriately** in the discussion, but contributions of **others** are **rarely considered**	The speaker **usually participates appropriately** in the discussion and **sometimes considers** the contributions of **others**	The speaker **almost always participates appropriately** in the discussion and **often considers** the contributions of **others**	The speaker **actively participates** in the discussion and **carefully considers** the contributions of **others**
Grammar & vocabulary	You will be assessed on these aspects of grammar and vocabulary: • Range of grammatical structures & vocabulary • Accuracy of grammar in both simple and complex structures • Vocabulary choice and precision • Academic style • Ability to convey message through grammar and vocabulary choices	Vocabulary & grammar are **sometimes academic, limited in range** and **are generally only correct in simple sentences**	Vocabulary & grammar are **mostly academic,** with a **range of structures used. Whilst simple structures are often correct, complex ones often contain errors**	Vocabulary & grammar are **academic,** with a **range of simple and complex structures,** and are **correct in the majority of sentences**	Vocabulary & grammar are **academic, wide-ranging** and show **only occasional error**

Two aspects of my performance I need to work on to improve:

1.

2.

Key concepts

Wk 6 Renewable energy key concepts

Lesson Objectives
• Identify the key components of the writing question • Understand the task given in the writing question • Plan note-taking organisation and strategies

Part 1: Analyse the question

This week's practice writing task will require you to answer the following question:

What are the most significant barriers to the widespread adoption of renewable energy sources?

1. What are the key topic words in this question?

2. What is the question asking you to do?

3. What are the possibilities for answering this question?

4. What are the key functions that you will need to include in your answer?

5. As you work through this week's reading and listening material, make notes of any information you find that is relevant to answering this question.

   Use the note-taking grid on the following pages OR download the template from the Wk 6 Key Concepts module on Canvas.

Barrier to renewable energy	Notes / details	Source (include page numbers)
Example: cost	Geothermal power project in South Australia shut down cos cost of implm'n & delivery of electricity too ↑	Fedorowytsch (2016)

Barrier to renewable energy	Notes / details	Source (include page numbers)

Barrier to renewable energy	Notes / details	Source (include page numbers)

Part 2: Key concept texts

Text 1

Edited extract from:

Union of Concerned Scientists (2017). Barriers to renewable energy technologies. Retrieved from the Union of Concerned Scientists website: https://www.ucsusa.org/clean-energy/renewable-energy/barriers-to-renewable-energy#.W_oN1ZMzaqA

Barriers to renewable energy technologies

The most obvious and widely publicized barrier to renewable energy is cost—specifically, capital costs or the upfront expense of building and installing solar and wind farms. Like most renewables, solar and wind are exceedingly cheap to operate—their "fuel" is free, and maintenance is minimal—so the bulk of the expense comes from building the technology.

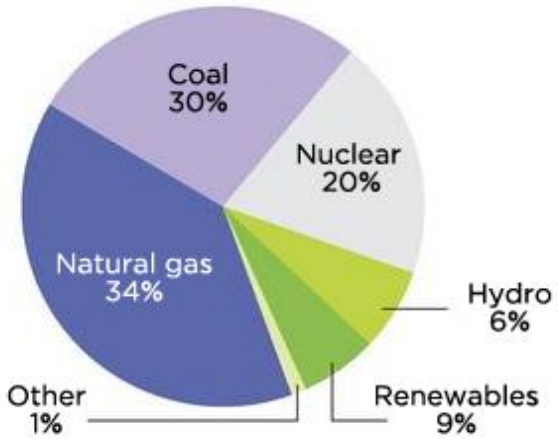
The average cost in 2017 to install solar systems ranged from a little over $2,000 per kilowatt (kilowatts are a measure of power capacity) for large-scale systems to almost $3,700 for residential systems. A new natural gas plant might have costs around $1,000/kW. Wind comes in around $1,200 to $1,700/kw.

Higher construction costs might make financial institutions more likely to perceive renewables as risky, lending money at higher rates and making it harder for utilities or developers to justify the investment. For natural gas and other fossil fuel power plants, the cost of fuel may be passed onto the consumer, lowering the risk associated with the initial investment (though increasing the risk of erratic electricity bills).

However, if costs over the lifespan of energy projects are taken into account, wind and utility-scale solar can be the least expensive energy generating sources, according to asset management company Lazard. As of 2017, the cost (before tax credits that would further drop the costs) of wind power was $30-60 per megawatt-hour (a measure of energy), and large-scale solar cost $43-53/MWh. For comparison: energy from the most efficient type of natural gas plants cost $42-78/MWh; coal power cost at least $60/MWh.

Even more encouragingly, renewable energy capital costs have fallen dramatically since the early 2000s, and will likely continue to do so. For example: between 2006 and 2016, the average value of photovoltaic modules themselves plummeted from $3.50/watt $0.72/watt—an 80 percent decrease in only 10 years.

Market entry



US electricity sources, 2016. Renewables face stiff competition from more established, higher-carbon sectors.

For most of the last century US electricity was dominated by certain major players, including coal, nuclear, and, most recently, natural gas. Utilities across the country have invested heavily in these technologies, which are very mature and well understood, and which hold enormous market power.

This situation—the well-established nature of existing technologies—presents a formidable barrier for renewable energy. Solar, wind, and other renewable resources need to compete with wealthier industries that benefit from existing infrastructure, expertise, and policy. It's a difficult market to enter.

New energy technologies—startups—face even larger barriers. They compete with major market players like coal and gas, *and* with proven, low-cost solar and wind technologies. To prove their worth, they must demonstrate scale: most investors want large quantities of energy, ideally at times when wind and solar aren't available. That's difficult to accomplish, and a major reason why new technologies suffer high rates of failure.

Increased government investment in clean energy—in the form of subsidies, loan assistance, and research and development—would help.

Reliability misconceptions

When done correctly, reliability isn't a concern with wind and solar—it's actually a strength.

Renewable energy opponents love to highlight the variability of the sun and wind as a way of bolstering support for coal, gas, and nuclear plants, which can more easily operate on-demand or provide "baseload" (continuous) power. The argument is used to undermine large investments in renewable energy, presenting a rhetorical barrier to higher rates of wind and solar adoption.

But reality is much more favorable for clean energy. Solar and wind are highly predictable, and when spread across a large enough geographic area—and paired with complementary generation sources—become highly reliable. Modern grid technologies like advanced batteries, real-time pricing and smart technologies can also help solar and wind be essential elements of a well-performing grid.

Tests performed in California, which has some of the highest rates of renewable electricity use in the world, provide real-world validation for the idea that solar and wind can actually *enhance* grid reliability. A 2017 Department of Energy report confirmed this, citing real-world experience and multiple scientific studies to confirm that the United States can safely and reliably operate the electric grid with high levels of renewables.

Many utilities, though, still don't consider the full value of wind, solar, and other renewable sources. Energy planners often consider narrow cost parameters, and miss the big-picture, long-term opportunities that renewables offer. Increased awareness—and a willingness to move beyond the reliability myth—is sorely needed.

730 words

Text 2

Edited extract from:

Kariuki, D. (2018). Barriers to Renewable Energy Technologies Development. Retrieved from the American Energy Society website: https://www.energytoday.net/economics-policy/barriers-renewable-energy-technologies-development/

Dorcas Kariuki is a Postgraduate Student of the Department of Geography, Geology and the Environment at Keele University in the UK.

Other Barriers to Renewable Energy Development

Political and regulatory barriers

Lack of policies and regulations favouring the development of renewable energy technologies can hinder adoption of these technologies. Due to the nature of renewable energy structures, the renewable energy market needs clear policies and legislation to increase the interest of investors (15). This is because "enabling policies create stable and predictable investment environments, help overcome barriers and ensure predictable project revenue streams" (16). Additionally, regulatory measures such as standards and codes enhance the adoption of renewable energy technologies by minimising the technological and regulatory risk that comes along with investments in these projects (17).

However, in some countries like India, there are no complete renewable energy policy declarations simply because most renewable energy technologies in the country remain in the advancement stage (8). Similarly, Mohammed et al., (2013, p.461) in their study on renewable energy adoption in Sub-Saharan Africa noted that many countries in the region have distinctive national renewable energy policies whereas regional policies are not fully formed because of unsuitable implementation approaches.. This means that, despite the many renewable energy policies developed in most of these countries, it has been difficult to implement them mainly because they are immature.

Additionally, private sector participation in renewable energy projects in some countries is hindered by the lack of well-defined policies on private investment and delays in the authorisation of private sector projects (8). Therefore, because large-scale renewable energy projects require large amounts of capital to run (17), many countries' progress toward renewable energy is held back by policymakers' failure to implement measures to attract private investors.

Social-cultural barriers

Socio-cultural barriers, for example, households' unwillingness to adopt renewable energy for fear of unreliability (19), form one of the bases for failure to adopt renewable energy technologies in some countries. For example, general public disinterest and disengagement in wind energy development were identified as the main social issues hindering renewable energy development in Saskatchewan, Canada (18).

Further, lack of knowledge and awareness of renewable energy technologies and systems amongst rural communities in developing countries is another challenge encountered in renewable energy

development (20). For example, a majority of people in Sub-Saharan Africa are uneducated and may not be familiar with the concept of renewable energy (7). These uneducated people in the region are also unlikely to be oriented to technical and environmental impacts associated with over-use of combustible renewables such as the wood they use for fuel (3). These factors coupled together have slowed down the rate of development, circulation and usage of renewable infrastructure and technological knowledge. Therefore, the creation of awareness of renewable energy among communities and a critical focus on their socio-cultural practices is required (21).

Market-related barriers

Initial investment costs for renewable energy systems are usually high. Consequently, market prices for these systems remain high and unaffordable to many potential customers, especially in the developing countries (21). This is because the total production cost of renewable energy also become relatively high compared to fossil fuels, and therefore, market prices for renewable energy remain relatively high. Consequently, because in most cases many people prefer to go for cheaper options, renewable energy technologies, therefore, suffer unfair market competition from fossil fuel technologies whose establishment and operational costs are usually subsidised.

In connection with this, other factors that make renewable energy technologies less competitive or unavailable in the markets include: lack of successful and replicable renewable energy business models to help turn small-scale projects into commercial businesses (30) ; inconsistent biomass supply in some areas like Europe (31); lack of market for renewable energy; and the high and fluctuating prices of renewable energy in some countries like China (28). Therefore, most people cannot afford renewable energy technologies because their initial installation costs and operation costs are usually high which raises their market prices, ultimately limiting their marketability. Since the market for renewable energy sources is limited, its development is also limited. This is because, when something is not marketable people do not invest so much in its development. In this case of renewable energy technologies, it is clear that most people are not motivated to acquire or develop them.

665 words

Text 3

Edited extract from:

Pasqualetti, M. (2011). Social barriers to renewable energy landscapes. *Geographical review*, 101 (2), 201 – 223.

https://www-jstor org.ezproxy1.library.usyd.edu.au/stable/41303623?seq=1#metadata_info_tab_contents

Social barriers to renewable energy landscapes

We are knocking on the door of a renewable energy future, and we are making some progress. If we can consolidate our gains, we may be able to pass through the portal with some real chance of developing a genuine measure of sustainability. Some barriers, however, still block our way. Some of the remaining barriers are technical, but most of them are social, and they are accumulating. This is not surprising because each new step forward prompts more people to begin considering what a renewable energy future will mean to their lives. Their most common reaction is to try to slow things down until their questions and reservations are addressed.

The social barriers to renewable energy have been underappreciated and under- examined. There are many examples of renewable projects from around the world that illustrate how, if not addressed, these social barriers can inhibit, redirect, discourage, or even halt projects. We need to rebalance the attention we pay to these challenges. Such rebalancing will require acknowledging that social issues can be as important as- and in many cases more important than- technical issues. We must realize that conditions for development differ from group to group, time to time, and especially landscape to landscape. This means that neither acceptance of nor opposition to a technology in one location will necessarily transfer to another location. Likewise, support or opposition to renewables will depend less on the type of resource than on how one location differs from another in terms of physical environment, cultural underpinnings, and social structures.

The problem that champions of renewable energy development face is that they have often assumed- and have expected to receive unquestioning public support for their projects. What they have not anticipated is that love of existing landscapes can rout any benefits that renewable energy development may promise. We are finding that commercial development of renewable energy resources, now upon us, is repeatedly bumping up against this hard reality. Renewable energy projects will require the construction of infrastructure which may radically alter the landscape, for example geothermal plants or wind turbines, and there is often fierce local public resistance when the renewable infrastructure project means the landscape will potentially look very different or be subject to different uses. The attachment that the public has to their landscapes is very often underestimated by renewable energy developers.

The mistake commonly made in the name of a renewable energy future is to consider the technical and economic challenges of commercialization as the only obstacles that must be overcome in order to

make the leap from dream to reality. Government programs and industry give little attention to identifying and addressing social barriers. Consequently, attention tends to bounce around, alighting on one topic after another that happens to appeal to the media, or some interest group, or an individual set of researchers. With wind power, for example, attention has been directed to such topics as ice toss, fires, fluid leaks, turbine collapse, generator efficiency, blade design, interference with radar, aircraft navigation, and the potential of wind turbines to maim or kill wildlife. Although these are legitimate concerns, equal attention should be directed toward public attitudes, perceptions of risk, interference with established lifestyles, altered landscapes, and even the infringement of new projects on the local sense of propriety and justice, all topics that contribute much more directly to public attitudes.

560 words

1940 words total

Writing

Wk 6 Key concept note-taking

Lesson Objectives
• Understand the critical response task • Identify writer's position • Practice taking and organising notes relevant to a given question

Part 1: Critical response task

In this final part of your DEC 10 course, your writing assessment is a **critical response**. The critical response is a short essay of between 500 – 700 words.

In class, you will examine and practice 3 possible patterns of organisation that you could use to write an answer to the question. In the assessment task, you will need to decide what you think is the most appropriate way to organise your answer.

To complete this task you will:

- be given a question to which you will need to write an answer of 500 – 700 words
- listen to a short talk of up to 7 minutes length and take notes relevant to the question
- read 3 texts of up to 2000 words combined length and take notes relevant to the question
- take a position in answer to the question based on your understanding of the input material
- plan a response to the question using a suitable organisational structure
- write your answer

Total time allowed is 2 hours and 15 minutes

The task requires you to:

- Identify information in the input texts that is relevant to the question
- Synthesise the information from the texts that is relevant to the question, showing similarities and differences between the information in the texts where appropriate
- Indicate to the reader how the information you have included from the sources is relevant to the position you have taken

Part 2: Review the question

Our question for this task is the following:

What are the most significant barriers to the widespread adoption of renewable energy sources?

Refer to your notes and think about the discussions you have had with your class. Which option from would you choose for answering the question and why?

You should refer to the sources in explaining the rationale for your answer.

Part 3: Making notes

Listen to a short talk about obstacles to the adoption of renewable energy technologies.

The talk was originally part of a panel discussion with Richard Smith from the National Grid UK and David MacKay from the Department of Energy & Climate Change UK.

Make notes as you listen.

Before you listen, focus your attention and plan.

- What are you listening for specifically?
- How are you going to organise your notes?

Use this space for taking notes:

Space for note-taking

Transcript

Edited extract from:
https://www.youtube.com/watch?v=9JWtmgScPTs

Richard Smith National Grid UK & David MacKay Dept of Energy & Climate Change

So I'd like to say just a little bit about what the major obstacles are to most societies going one hundred percent clean energy. By 100% clean energy I mean 100% renewable. So I'll start by saying that social acceptability is probably the hardest obstacle to overcome because whatever we do, it means a lot of change it means changes in the sources of our power supply which means we might have to accept some different infrastructure around our countryside but it also means behavioural change in ourselves and how we use energy on a day-to-day basis as well so change for all of us sustaining that over a long period of time as being the number one thing I think that will make a big difference

Now we don't think about our energy use today, we don't think about it very much. We turn on our light switch and we expect the energy to be there and I think fundamentally if we're going to get to zero carbon as a way of living we would have to just radically rethink that and engage with energy in a completely different way understand what we're using why we're using it when we're using it. it's it's a tricky issue this because at the moment the thinking seems to be if people can't see it it doesn't matter you know they can't see most of the carbon emissions it doesn't really matter .

01:39

And it's the same with the renewable technologies. Most people are supportive of renewables and they don't for example mind a wind farm provided it's not near them or anywhere they'd like to go on holiday. You see this incredible resistance, there's many examples of this, when people, when local communities object to renewable energy infrastructure, when it's built near them, where they can see it. For us to get to zero carbon will mean a radical change in our energy infrastructure and people are supportive of that for the most part, there's an awareness that things need to change, until that infrastructure is in their backyard so to speak, in their local community and then they object, they want the wind farm, but they don't want the wind farm near their house. So there's this disconnect between the awareness that we need to move towards renewable energy technologies and the acceptability of those technologies in our communities.

As I said, we need to engage with energy in a different way. Right now, we're living like kings and we're unaware of the amount of energy that's being produced and and turned into useful forms on our behalf but if you had to collect it at the shopping with your shopping at the supermarket every day yeah it would be about 30 kilograms of stuff you'd be having to cart home. That weight translates into that's the weight of the fossil fuels and the co2 per person every day. It's a lot of milk right?.

So that's one major obstacle to going completely renewable – let's call it the social acceptability. Renewable energy is great, but not where I can see it – I don't want to see the wind farm or the solar farm or the geothermal plant. People don't want the landscapes around their homes to change.

So what are the other obstacles in the way of going one hundred percent clean energy? Well, first let's think about what the renewable options are. There's onshore wind, offshore wind, wave and tidal power, heat pumps and electric vehicles, building insulation a lot of things which at today's prices are quite expensive and so a barrier to getting there, a barrier is it's actually a bit too expensive right now. Not everyone can afford these sort of things.

So what do we need? We need innovation support to drive the inventions and the breakthroughs that will drive down the cost of these technologies. I think a very short term one is probably financing and funding of these things and you know there's a lot of debate continually in the media around the cost of energy and the future is very uncertain depending on you know are fossil fuel prices going to go up? Or you know are nuclear power plants and solar panels too expensive? We see this a lot in the media and I think the initial inertia in financial markets getting over that, finding the money to come into renewables and follow with the innovation follow with the acceptability, that's what you need to really get this thing started and once you've got that money coming, that investment coming and getting it started, then it stands a chance of keeping going.

I'm confident that with continued innovation support for engineers, for universities, there's lots of smart inventors out there, I'm confident that with continued innovation support we'll be able to get some breakthroughs and drive down the costs of the low-carbon equipment.

So there we go, we need breakthroughs, innovation breakthroughs and financial support for innovation research to drive down the cost of renewable technologies, and we need investment in renewable infrastructure but perhaps the trickiest part is that we need to get people to embrace the infrastructure. We need to work with communities, find ways of embedding the technologies in those communities in a way that's acceptable to them. Because ultimately it's the public acceptance of these things that's going to make or break it.

Part 4: Review your notes

Wk 6 Critical response sample 1

Lesson Objectives
• Identify writer's position • Identify text organisation • Review old-new information links between sentences • Understand language and organisation of causality

Part 1: Deconstruction

1. Read the sample response to the question:

What are the most significant barriers to the widespread adoption of renewable energy sources?

2. Answer the questions:

   a. What is the writer's position (review our possible options for answering the question if necessary)

   b. How is the answer organised? (review our possible options for answering the question if necessary) Which option did our writer use?

Map the text

1. Complete the text map showing the organisation of ideas.

2. Go through the answer and identify the language used to achieve the functions shown in bold in each step of the text map.

Sample answer

It is now widely accepted by the scientific community that society needs to transition away from dependence on fossil fuels. Our dependence on fossil fuel-based energy sources is contributing not only to global warming and climate change, but also contributes to significant public health costs as a result of the pollution generated. While there is much public support for a transition to renewable energy sources, significant barriers still remain. These include high set up costs and barriers to market entry. However, perhaps the most significant barrier to the transition to renewable energy is social acceptance of renewable infrastructure projects.

The most obvious barrier to the adoption of renewable energy technologies on a large scale is the high initial investment of capital. This high initial cost compared to capital costs for more established sources of energy mean that market prices of renewables for consumers remain high, even unaffordable (Kariuki, 2018; Smith & MacKay, 2014). High retail prices are a significant obstacle to greater uptake of renewable energy as price sensitive consumers are likely to simply choose the cheaper fossil fuel-based option. Fossil fuel energy technologies are more price competitive not only because they are heavily subsidised (Kariuki, 2018), but these markets also benefit from existing infrastructure and policy settings (Union of Concerned Scientists, 2017).

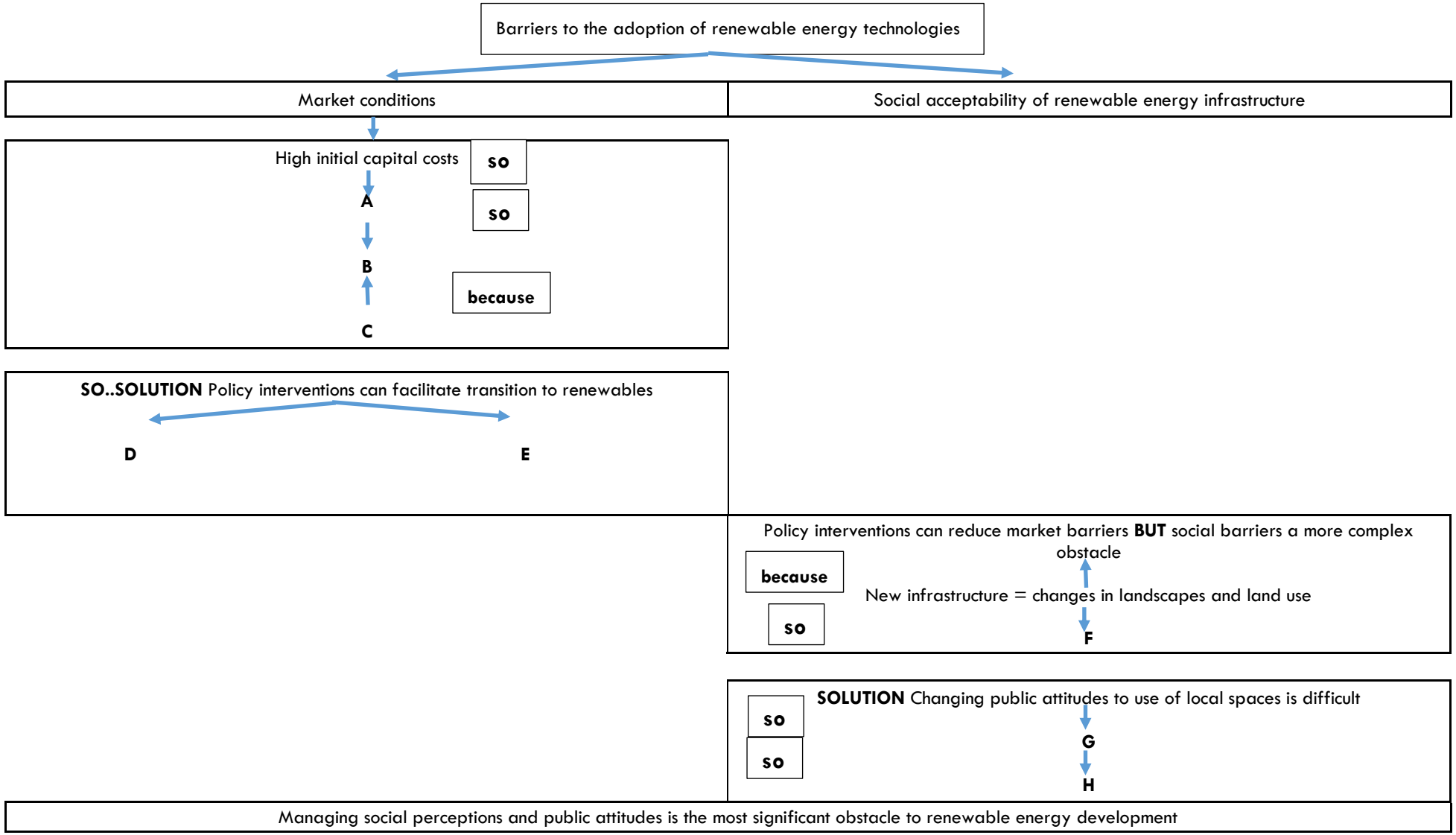
Policy interventions in energy markets can potentially facilitate the transition to renewables. While the set-up costs for renewable infrastructure may currently be high, costs over the lifespan of the project are potentially much lower as the fuel for solar and wind is free (Union of Concerned Scientists, 2017), unlike coal and oil which must be extracted from the ground. In order to overcome the barrier of high initial capital costs to set up the infrastructure required, targeted policy and legislation can create a stable and predictable market environment and foundation for investment (Kariuki, 2018). In addition, financial support for research and development can drive the innovation that may bring down the cost of renewable technologies (Smith and MacKay, 2014) to make these more accessible to a wider market.

While policy interventions such as these can certainly reduce market barriers, a more complex obstacle to the establishment of the renewable energy industry is the social barriers to renewable energy. The establishment of clean energy projects on a large scale will mean a significant change in energy infrastructure and this will mean landscapes will change and land use will change, for example with the construction of wind or solar farms. There are many examples of intense resistance from local communities when a proposed renewable project has meant that the local land will look different or be used for different purposes to those that the community is accustomed to (Pasqualetti, 2011). Indeed, there seems to be a disconnect between the desire of communities to move towards a sustainable energy future and the reality of what that future means physically and aesthetically in those communities (Smith & MacKay, 2014).

Changing public attitudes to the use of local spaces is a complex and difficult barrier to overcome. Managing this shift will require engaging with local communities in order to address perceptions of risk, as well as objections to changes in lifestyle and landscapes and these objections will differ from one community to another (Pasqualetti, 2011). These local differences mean that one single approach will be insufficient and developers and policy makers will need to engage with and address the concerns of individual communities. This makes social barriers a far more complex obstacle to address than addressing market barriers by, for example, the implementation of broad market policies to encourage investment.

The move to a sustainable energy future is a challenge that can be managed through policy interventions to encourage capital investment and innovation to drive down cost. However, managing social perceptions and public attitudes is a more complex obstacle that will likely require not only time, but ongoing and flexible engagement by developers and policymakers with individual local communities.

657 words

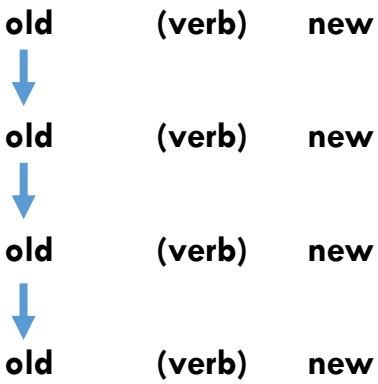

Barriers to the adoption of renewable energy technologies
Market conditions
Social acceptability of renewable energy infrastructure
High initial capital costs
so
A
so
B
because
C
SO..SOLUTION Policy interventions can facilitate transition to renewables
D
E
Policy interventions can reduce market barriers BUT social barriers a more complex obstacle
because
New infrastructure = changes in landscapes and land use
so
F
SOLUTION Changing public attitudes to use of local spaces is difficult
so
so
G
H
Managing social perceptions and public attitudes is the most significant obstacle to renewable energy development

Part 2: Review old-new information flow

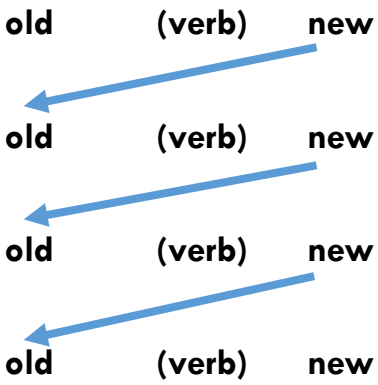
In the reading lesson ***Wk 6 Reading 2: Green power from hot rocks***, you examined old-new information connections between sentences and between paragraphs.

We saw that there are two main patterns for linking information in this way:

A.



B.



1. Information flow between sentences

Consider this paragraph from the sample essay. Which pattern does it follow?

The most obvious barrier to the adoption of renewable energy technologies on a large scale is the high initial investment of capital. This high initial cost compared to capital costs for more established sources of energy mean that market prices of renewables for consumers remain high, even unaffordable (Kariuki, 2018; Smith & MacKay, 2014). High retail prices are a significant obstacle to greater uptake of renewable energy as price sensitive consumers are likely to simply choose the cheaper fossil fuel-based option. Fossil fuel energy technologies are more price competitive not only because they are heavily subsidised (Kariuki, 2018), but these markets also benefit from existing infrastructure and policy settings (Union of Concerned Scientists, 2017).

2. Information flow between paragraphs

Now consider just the first sentence of each paragraph.
What patterns of information flow can you see from one first sentence to the next?
Use the highlighted key words in the introduction to help you. Your teacher will guiide you.

Part 3: Reconstruction

Work together to reconstruct the sample essay.

1. Use the text map with the key language you have identified to guide you
2. Sources are given in the text map – check the source to find the original information and think carefully about how you will paraphrase it to include it in your text
3. Make sure you use old-new information connections to help you establish chains of cause and effect relationships where appropriate

Set up a google doc for this task and give your teacher access.

You may need to finish your reconstruction for homework. If so, you can continue to work together on your google doc.

Wk 6 Reconstruction: Evaluate your response

On Canvas, you will find the rubric that is used to assess your writing for this task.

Choose ONE bullet point from each category on the rubric.

Evaluate your group's writing (or the writing of another group) on each of these points.

Follow your teacher's instructions.

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