

# Beyond 2030

## *Factors and Consequences of Present Technology*

### Group Details

Your Name: Mr Crisp Class: \_\_\_\_\_

Group Member 1: Ms Ludlow Class: \_\_\_\_\_

Group Member 2: \_\_\_\_\_ Class: \_\_\_\_\_

Technology Area: Power Generation \_\_\_\_\_

### Factors

Working as a group list factors that have led to the development of the technology to its current state. Identify the most important three (3) by either **highlighting** them or by changing the font to **bold**.

- |               |                            |                              |
|---------------|----------------------------|------------------------------|
| • Steam       | • Ability to transport     | • <b>Alternating Current</b> |
| • Coal        | fuels                      | • OPEC                       |
| • <b>Oil</b>  | • Pollution                |                              |
| • Natural Gas | • <b>Greenhouse gasses</b> |                              |
| • Wind        |                            |                              |
| • Solar       |                            |                              |

Select one of the three most important factors identified above. Note that each team member must select a different factor.

Factor selected: Alternating Current \_\_\_\_\_

Explanation of how this factor has led to the development of the technology to its current state.

Alternating current power generation, as developed by Nicola Tesla, proved to be a superior technology to direct current power generation, as developed by Thomas Edison.

This is because alternating power:

- Can be easily transformed to higher and lower voltages with corresponding lower and higher currents. Transmission losses increase exponentially as the current increases, so the transmission of power at high voltages reduces losses. This allows the transmission of more power over longer distances.
- Alternating current generators can be built with multiple coils arranged at various angles around the axis of rotation. Power is generated simultaneously in each coil, but the voltage peaks occur at different times. In addition, the power, and therefore the current, is also reduced since the input power to the generator is distributed equally through the coils. This effect has led to power being generated with three “phases”. Although the transmission of each phase requires a separate conductor on power lines, the conductors are smaller due to the reduced current. This, and the resulting reduced size and strength of power poles, creates a cost saving.

## Consequences

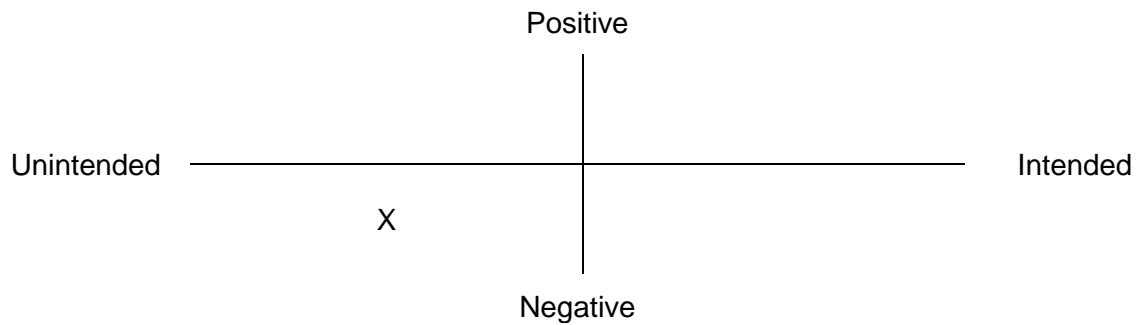
Working as a group list a range of consequences that have occurred as a result of the development of the technology. Identify the most important three (3) by either **highlighting** them or by changing the font to **bold**.

- High power machines / heavy industry
- Cities a long way away from power stations
- Fewer, but larger power stations
- Hazard of electrocution (high voltages)
- Power easily supplied to the masses
- Convenience of heating, cooking, appliances and entertainment in the home

Select one of the three most important consequences identified above. Note that each team member must select a different consequence.

Consequence selected:     Hazard of Electrocution (high voltages)

Categorise this consequence in terms of its intent and effect.



Explain the impact of this factor. Be sure to expand on the intent and effect of the consequence. You may also need to include some explanation of factors and previous consequences that have contributed to this one.

While you may feel a shock from low voltage electricity, it is seldom fatal. High voltage electric shocks, however, can kill. Because of the inability to transform or adjust the voltage of direct current power, it is typically generated at low voltages, and so it is not hazardous. Alternating current is typically generated and transmitted at voltages that could produce a fatal shock. Death as a consequence of electrocution is obviously both unintended and has a negative effect.

Except as proposed by Thomas Edison.

Edison realised the potential hazard of electrocution by high voltage alternating current power. Because of this, he believed that generation of direct current power was preferable. To prove his point, he invented the electric chair for the execution of criminals. This is a good illustration of an intended consequence that may be perceived as both negative and positive. It is obviously negative to the criminal being executed, but would presumably be perceived as positive by the criminal justice system that administered this sentence.