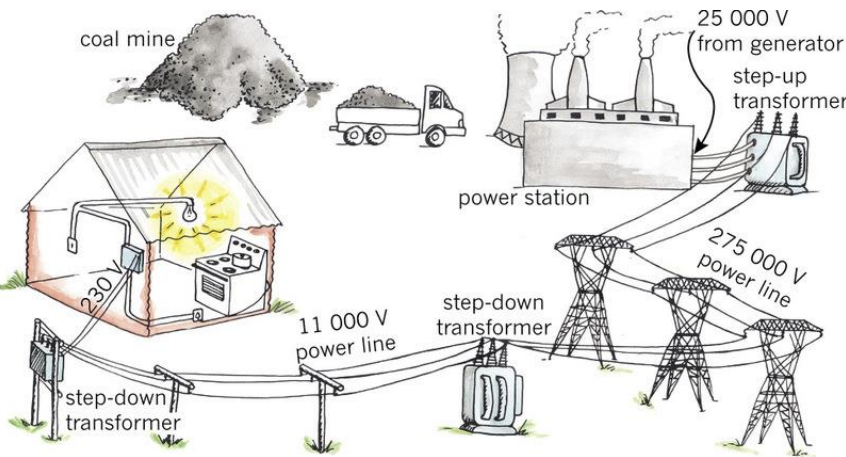
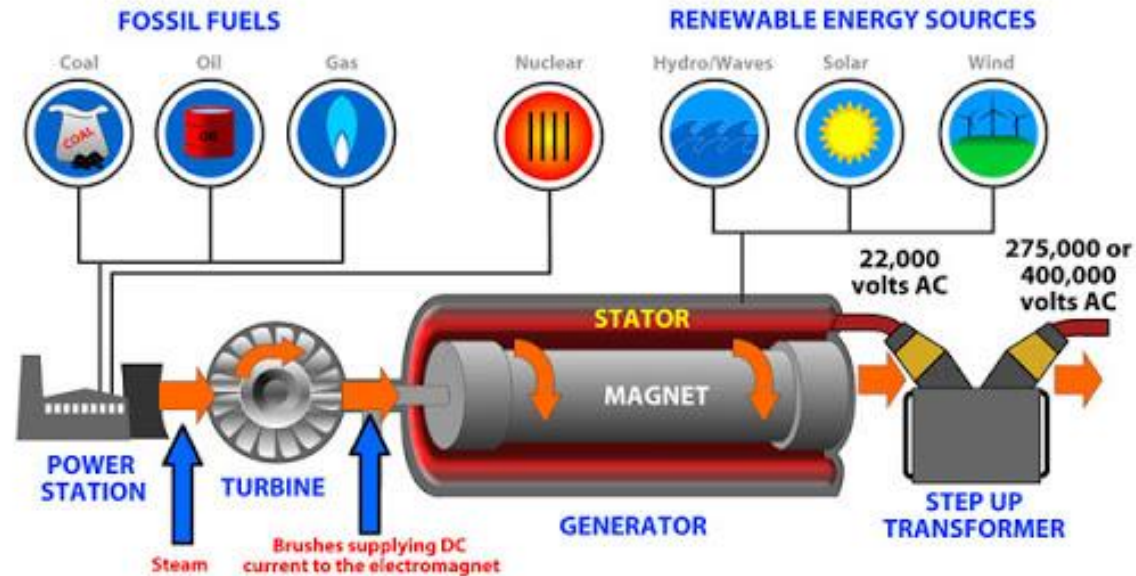




SUBJECT and GRADE	Electrical Technology Grade 12	
TERM 1	Week 5	
TOPIC	Three Phase Generation lesson 1	
AIMS OF LESSON	This lesson is about the understanding of 3 phase generation with reference to basic terminology and their meaning in 3 phase systems.	
RESOURCES	Paper resources	Digital resources
	Electrical Technology Textbook Grade 12 (pg. 90-92)	YouTube links and web pages for this lesson See end of lesson for links
INTRODUCTION	<ul style="list-style-type: none"> • This lesson is about the understanding of 3 phase systems with reference to: distribution networks, generation, transmission, the national grid, distribution, control centres as well as advantages and disadvantages of 1 phase systems over 3 phase systems. • This lesson must be done in conjunction with your textbook. • It is important that you consolidate these terminologies by reading through it with understanding and writing them down. 	
CONCEPTS AND SKILLS	<p>Distribution networks</p> <p>Distribution networks is an electrical network starting from the power station where generation is started and end of at the consumers as the final user of the electricity. Below is a picture of a typical distribution network in SA.</p>  <div style="border: 1px solid black; padding: 10px; margin-top: 20px;"> <p>Do you know?</p> <ul style="list-style-type: none"> • What is 3ph generation? • What is the national grid? • What is 3ph distribution? • What is a control centre? • The advantages and disadvantages of 1phase and 3 phase systems </div>	

Electricity generation

- Electricity is generated in a power station
- In the power station the energy produced by (fossil fuel, oil, natural gas, coal, nuclear fuel and water) is converted into electrical energy.
- The power stations generate electricity at 22000v or 22kV



Transmission

- The generated electricity is transported along high voltage power lines to areas where it is needed.
- Transformer at power stations step the generated voltages up to 220kV, 275kV, 400kV or 765kV
- Electricity is fed to the national grid of Eskom
- The overhead conductors used are made of aluminium and steel.
- Electricity is transmitted over long distances to different distribution stations



The National Grid:

- The network of over 40000km high voltage power lines to various bulk suppliers is called the National Grid.
- Eskom do not supply electricity directly to all consumers, it goes via municipalities which buys electricity from Eskom and resell then to the consumers.

Distribution

- At the distribution stations, bulk supplies at 22kV are distributed to intermediate substations in towns, industrial areas, farms and other big consumers.
- At the intermediate substations, the voltage is stepped down to 11kV
- Secondary distribution lines carry the electricity to the main consumers and terminate in distribution substations.
- At the distribution substations the voltage is further reduced to 400/230v to be used by shops, offices, schools, homes and light industries.

Control centres

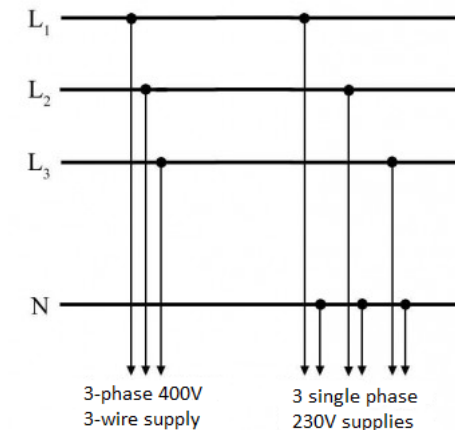
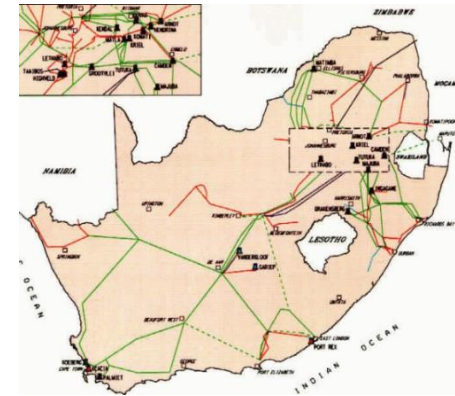
- Control centres monitors the electricity that is needed in SA.
- It establishes how much electricity must be generated.
- Power stations adjust generation capacity according to the instructions from the control centres.
- Eskom's National Control Centre is situated at Simmerpan in Germiston
- There are a further six regional control centres in different parts of SA.


Advantages of 3 phase systems

- Three phase system is worldwide adopted
- Power supply is constant
- Uses less copper/aluminium in the conductors
- 3 phase systems are more economical
- Can be connected in star and or delta
- Can supply both 1ph(230V) and 3ph (400V) voltages
- Balancing of 3ph loads can be done
- A neutral point is available for 4-wire star connections.

Disadvantages of 3 phase systems

- Installation cost are very high
- Not available everywhere
- Not suitable for most residential applications
- Appliances are expensive



	<p>Advantages of 1phase systems</p> <ul style="list-style-type: none"> • 1 Phase can be obtained from 3 phase systems • Are mostly used in residential such as houses, schools, offices and light industries • Small electrical appliances used around the house are using 1 phase electricity • Single phase appliances are cheaper. <p>Disadvantages of 1phase systems</p> <ul style="list-style-type: none"> • Cannot be distributed economically over long distances • Not suitable for heavy duty applications requiring large amounts of power. • Uses larger currents and hence thicker cables • For equivalent applications it is not economical as 3 phase systems.
ACTIVITIES/ ASSESSMENT	<p>NB: It is important that you do all the questions on your own first, before you consult any resources. Refer to end of chapter activity and do all the questions related to this section of the work. (pages 108-109)</p> <p>Time per question (1 mark = 1 minute)</p>
CONSOLIDATION	<ul style="list-style-type: none"> • The work done in the lesson was about the introduction of 3 phase terminology such as: distribution networks, generation, transmission, the national grid, distribution, control centres as well as advantages and disadvantages of 1 phase systems over 3 phase systems. • It is important that you work through these concepts a few times to try and understand them fully. • It is always a good thing to write down and summarise these concepts to remember them. • Congratulations on completing this lesson. 
VALUES	<p>The understanding of how electricity is generated, transmitted and distributed will help us understand the basics of electricity better as well as appreciating it more as an energy source.</p>
YouTube links and web pages for this lesson	<p>https://intl.siyavula.com/read/science/grade-9/energy-and-the-national-electricity-grid/20-energy-and-the-national-electricity-grid (Generating electricity)</p> <p>https://www.youtube.com/watch?v=Pg4wCztypHs (National Grid)</p> <p>https://www.eskom.co.za/Pages/VideoClips1.aspx (Power stations)</p>