E-LEARNING ON DISTRIBUTED GENERATION

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"I hereby declared that this report is a result of my own work except for the Excepts that have been cited clearly in the references".

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Tarikh : 23rd April 2008

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ABSTRACT

A distributed generation(DG) can be defined as an electric energy source which connected to the distribution network or load centre directly. It have been located closer to the customer‟s premises, in other word decentralized and environmental sense. Currently, industrial countries generate more than 99% of their electricity in large power plant which used coal as a fuel. But, as a renewable source, distributed energy will survived and subsidized. An E-learning of DG project will help student to understand the benefit from the success of it, plus, this is also the sub chapter from power generation subject for those who studied electric power course. Flash software which will create an attractive and interesting graphic slide, surely will „create‟ the interest in student‟s mind to lay their eyes on it. The E-learning also much easier method in teaching and learning process because they do not need to copy down each notes, words-by-words, but just download it from the internet.

ABSTRAK

Penjanaan penghantaran bermaksud sumber tenaga elektrik yang berangkaian dengan talian penghantaran atau beban secara langsung. Ia telah ditempatkn berhampiran dengan premis pelanggan, untuk tujuan pemindahan kuasa pusat dan lebih mesra alam. Dewasa ini,negara-negara industri menjana lebih daripada 99% tenaga elektrik mereka daripada stesen janakuasa yang besar yang menggunakan arang batu sebagai bahan api.Tetapi sebagai sumber yg boleh diperbaharui,penjanaan penghantaran akan mampu bertahan dan mendapat bantuan dari segi kewangan. Proses E-Pembelajaran tentang penjanaan penghantaran ini akan membantu pelajar untuk memahami faedah daripada kejayaan pelaksanaan proses penjanaan penghantaran.Tambahan lagi,proses ini juga merupakan salah satu bab di dalam subjek Kuasa Penjanaan didalam bidang kuasa elektrik.Perisian „Flash" akan membantu mencipta paparan grafik yang menarik dan interaktif,yang mana akan menambah minat pelajar untuk memerhatikannya.Konsep pembelajaran ini juga lebih mudah kerana pelajar tidak perlu menyalin nota perkataan demi perkataan,hanya muat turun dari internet sahaja.

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CHAPTER 1

INTRODUCTION

1.1 Overview

The teaching and learning process nowadays have been using computer.It have been proved effective because students have understand easily by using an animation and simple text. It also help certain students which have no heart to go to the library,which they can find the very same information from the computer. An application of internet have been widely used in education process internet which offer unlimited access to over all place in the world as long as the connection through it exist.The students may download several notes and tutorial without hesitated.

During this project,the knowledge about distributed generation (DG) has been applied. This project is to introduced a renewable energy source that may be some of it are not well-known.It is also an interactive learning which contain information and tutorial. The student will get all the benefit from this project. Some researches about DG have been done to ensure the information about renewable sources are not misleading. To develop this project, software Macromedia Flash 8.0 will help to create an animation and any other things to make the project more attractive.

The former way of teaching which used power point slide presentation for example, sometimes is not present clearly by lecturer because its are so simple and not creatively designed.It will drop a student‟s interest and the process of teaching and learning will not reach it goal.So,by using this fully attracted and creatively designed brand new method of teaching,an e-learning will be the most best way to catch student attention.Besides,the e-learning will easily download from the internet in case they have to take an emergency leave,and accidentally will missed some lectures and classes.

1.2 Objectives

One of the main objectives from this project is to develop an interactive learning in distributed generation. This new method of teaching will attract student to learn more about distributed generation which have been teach in power generation subject.(BEKP 3453) at UTeM.They will find the usefulness of it in theory and practical way because it contain not only the notes,but also have a tutorial which will help them to understand more about distributed generation.

Furthermore,this project will help student to measure the market potential of distributed generation.Nowadays,in the current environment of increasing deregulation, the expansion potential of distributed generation systems is quite substantial. However, the spread of DG will vary substantially by region and technology. Those markets set to experience strong electricity demand will be more prone to an increasing penetration, as will markets which experience extreme price volatility.

The student also will understand the used of renewable sources.Historically, low fossil fuel prices, especially for natural gas, have made growth difficult for renewable fuels. The deregulation and restructuring of the electric power industry could have a major impact on renewable energy consumption. Demands for cheaper power in the short term would likely decrease demand for renewable energy, while preferences for renewables included in some versions of proposed electricity restructuring legislation would breathe new life into this industry.

1.3 Scope

The study of this project will involves the potential and benefit of the distributed generation. It will guide a student to learn about the usefulness of renewable source because it do no hurm to the environment,and it can replace the uses of coal in the future because the coal trade is faster than coal production.It cannot be happen while we meet the growing demand of electricity.So,by understand the purpose of distributed

generation ,the student will be able to help in the invention of the renewable generation technologies.

Renewable energy technologies, such as hydro (large and mini), solar, geothermal, wind and tidal can deliver power with virtually zero emissions. Distributed generation (including landfill waste methane-based generation) also has the potential to significantly reduce emissions and promote greater cost and network efficiencies. The wide scale deployment of renewable energy and distributed generation technologies increases the diversity of energy supply, and can contribute to improving energy security and reducing fuel risks, particularly in remote and fringe-of-grid areas. These energy sources and distributed generation technologies, which are ideally suited to mid-sized and smaller scale applications can also assist in alleviating poverty by improving access to energy services, as well as increasing job opportunities and improving air quality and public health.

Micro-hydro electric is a term used for hydroelectric power installations that typically produce up to 100 kW of power. They are often used in water rich areas as a Remote Area Power Supply (RAPS). There are many of these installations around the world, including several delivering around 50 kW in the Solomon Islands, supplying energy for small communities. Micro hydro is frequently accomplished with a pelton wheel for high head, low flow water supply. The installation is often just a small dammed pool, at the top of a waterfall, with several hundred feet of pipe leading to a small generator housing.

Solar energy is an energy which directly extract from the Sun.This energy drives the climate and weather and supports virtually all life on Earth. Heat and light from the sun, along with solar-based resources such as wind and wave power, hydroelectricity and biomass, account for most of the available flow of renewable energy.

Wave power refers to the energy of ocean surface waves and the capture of that energy to do useful work - including electricity generation, desalination, and the

pumping of water (into reservoirs). Wave power is a form of renewable energy. Though often co-mingled, wave power is distinct from the diurnal flux of tidal power and the steady gyre of ocean currents. Wave power generation is not a widely employed technology, and no commercial wave farm has yet been established.

Meanwhile,biomass refers to living and recently dead biological material that can be used as fuel or for industrial production. Most commonly, biomass refers to plant matter grown for use as biofuel, but it also includes plant or animal matter used for production of fibres, chemicals or heat. Biomass may also include biodegradable wastes that can be burnt as fuel. It excludes organic material which has been transformed by geological processes into substances such as coal or petroleum.

Although not yet widely used,tidal power which sometimes called tidal energy, is a form of hydropower that exploits the movement of water caused by tidal currents or the rise and fall in sea levels due to the tides. Tidal power has potential for future electricity generation and is more predictable than wind energy and solar power. In Europe, tide mills have been used for over a thousand years,(since prehistoric ages) mainly for grinding grains.

1.4 Report Structure

Report structure will summarize the whole content of this report. For chapter 1, it is explain about an overview that give a main idea about this project. Objective section will elaborately detailed about project objective that need to be achieve. Project scope which in scope part have focus on each type of distributed generations.

Chapter 2 on the other hand refer on the research for project which include books, paper works, journal, internet source and other information that related with the
topic. The literature review that have been done come with the summary and analysis which can help in develop this project.

Theoritical background is on chapter 3.It will discover about the current problem which have encounter. It will explain about the former way of generations and the project focus. This project have focus on micro-hydro, solar, biomass, wave and tidal energy. Some figure have been added to make it understandable.

Each project have its own methodology. For this project, it is in chapter 4.It shown how the project software has been develop from the collecting information until the report process. In chapter 5, results, discussion and analysis have been provided. Result consist of well developed project explaination. Discussion part will discuss about the distributed generation and explain the achievement. Furthermore, analysis section will analyze which system is the best.

At the end of this report, the conclusion and recommendation part are in chapter 6. This last chapter will conclude about the project and evaluation of the whole project, whether the objective have been obtained or not. A recommendation also been added for the project improvement in the future.

CHAPTER 2

LITERATURE REVIEW

Literature review is a some kind of research,done by a new inventor to research about the current project,and how to improvise it.The weakness from the former subject will be solve and some of the new information will add up to make a better performance.It can give the overview of the project that has been suggested from the project that already been done by someone else. This project based on e-learning,so the computer have been used during the teaching and learning process. Paper work and journal which is related with the distributed energy have been took,in case if any problem may occur in the future,it can be used as a reference.

For this project,a books have been used as a prior sources.A chapter 1 from Power System Restruction and Deregulation will explain a lot about renewable generation technologies and the competitive market for generation.It also explain why many electricity markets around the world are currently in transition towards more deregulated and competitive markets.Sustainable Energy Systems Engineering by P.Gevorkian will explain competition in supply and maintaining distribution planning in chapter 4 on Distributed in a Deregulated Market.It also elaborately explain the

development of competition have start from the awareness of responsibilities towards retail and distribution.

A sources from internet also have been used to support any information from books.Net Generation by Energy Source website contain a lot of information about micro hydro system, Pearl Street Station: The Dawn of Commercial Electric Power website have give some new idea about distributed generation.Former project about e-Learning also can be take as a references.Here,the Computer Aided Education on Special Transformer project give a guidance to assemble the basic of Macromedia Flash.

2.1 Distributed Generations

Distributed generation figured as an another approach. It reduces the amount of energy lost in transmitting electricity because the electricity is generated very near where it is used, perhaps even in the same building. This also reduces the size and number of power lines that must be constructed.

Typical distributed power sources have low maintenance, low pollution and high efficiencies. In the past, these traits required dedicated operating engineers, and large, complex plants to pay their salaries and reduce pollution. However, modern embedded systems can provide these traits with automated operation and clean fuels, such as sunlight, wind and natural gas. This reduces the size of power plant that can show a profit.The usual problem with distributed generators are their high costs.The one exception is probably microhydropower. A well-designed plant has nearly zero maintenance costs, and generates useful power indefinitely.

2.1.1 Renewable electricity power systems (REPS)

Renewable electricity power systems (REPS) use renewable energy sources such as the sun, wind and water are continuously replenished from natural sources which use to produce electricity with very low greenhouse gas emissions.

REPS usually operate at low cost but can be expensive to install. The cost per kWh for the system life includes the installation and maintenance costs and remains unaffected by future energy price rises.

The design and installation of a REPS is a complex task requiring specialist knowledge. The Sustainable Energy Industry Association (SEIA) has a register of

accredited designers and installers who can ensure systems comply with the appropriate Australian Standards.Rebates may be available to offset the initial cost of installing REPS. Distributed generation generates electricity from many small energy sources. It has also been called also called on-site generation, dispersed generation, embedded generation, decentralized generation, decentralized energy or distributed energy.

2.2 E-Learning and it History

Moodle is designed to help educators create online courses with opportunities for rich interaction. Its open source license and modular design means that people can develop additional functionality. An example of this moodle is discussion board threading, wiki and real time textual chat. However, moodle is referred to a CMS, this is because course material if often video, mp3, text documents, scanned images or links to other web sites.

Along with the terms learning technology and Educational Technology, the term is generally used to refer to the use of technology in learning in a much broader sense than the computer-based training or Computer Aided Instruction of the 1980s. It is also broader than the terms On-line Learning or Online Education which generally refer to purely web-based learning. In cases where mobile technologies are used, the term M-learning has become more common.

E-learning is naturally suited to distance learning and flexible learning, but can also be used in conjunction with face-to-face teaching, in which case the term Blended

learning is commonly used.In higher education especially, the increasing tendency is to create a Virtual Learning Environment (VLE) (which is sometimes combined with a Management Information System (MIS) to create a Managed Learning Environment) in which all aspects of a course are handled through a consistent user interface standard throughout the institution.

A growing number of physical universities, as well as newer online-only colleges, have begun to offer a select set of academic degree and certificate programs via the Internet at a wide range of levels and in a wide range of disciplines. While some programs require students to attend some campus classes or orientations, many are delivered completely online. In addition, several universities offer online student support services, such as online advising and registration, e-counselling, online textbook purchase, student governments and student newspapers.

E-Learning can also refer to educational web sites such as those offering learning scenarios, worksheets and interactive exercises for children. The term is also used extensively in the business sector where it generally refers to cost-effective online training.By E-learning,students are be able to communicate with fellow classmates independent of spatial distance, a greater adaptability to learner's needs, more variety in learning experience with the use of multimedia and the non-verbal presentation of teaching material. Streamed video recorded lectures and MP3 files provides visual and audio learning that can be reviewed as often as needed. For organizations with distributed and constantly changing learners (e.g. restaurant staff), E-learning has considerable benefits when compared with organizing classroom training.

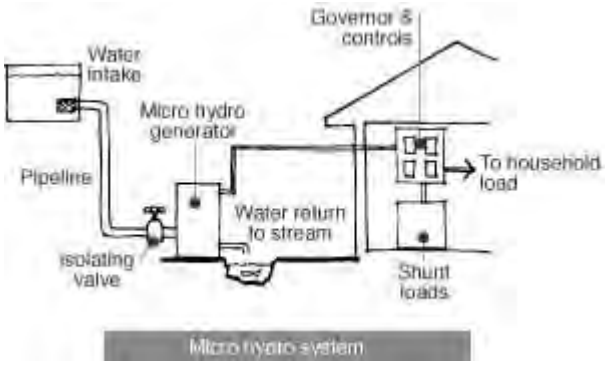
CHAPTER 3

THEORETICAL BACKGROUND

In the past,power system was developed to transmit large amount of power at the high voltage from the generate station to the consumer.It required a centralized control,but currently the renewable energy source such as hydro,tidal,wave ,biomass,solar have been used as a source of the electricity and the new invention have been discovered when a micro hydro power plant,solar photovoltaic generators on roofs can be used near the consumer sanctuary.It will save the transmission of power due to long distance,which always have losses during it and besides it will be less centralized and more dispersed.This e-learning will guide student to understand about distributed energy,and a Macromedia Flash 8.0 is essentially need to learn because it used to esemble this project.

3.1 Micro hydro systems

Micro hydro units convert the energy of flowing water into electrical energy. The energy produced by them is renewable and the process does not emit polluting gases.Domestic micro hydro generators used in stand alone power systems can be DC units, designed to charge a battery bank, or AC units designed to supply the household loads directly.In micro hydro systems water turns a wheel or a runner (like a propeller) to rotate a turbine and produce electricity. The wheels come in different shapes and sizes depending on the site and the type of turbine.There are two types of micro-hydro turbines: impulse and reaction.



Micro hydro system

Figure 3.1 Micro hydro system Figure 3.2 The flow of micro hydro system

Impulse turbine wheels run freely in air. Water is directed onto the runner by jets and then drops away, its energy depleted. Impulse turbines are usually installed on sites with heads greater than ten metres and are the most common type of turbine installed in a domestic system.Reaction turbine runners rotate fully immersed in water in a sealed case. After passing the turbine the water continues to the waterway via a pipe.These are usually installed in low water head applications.

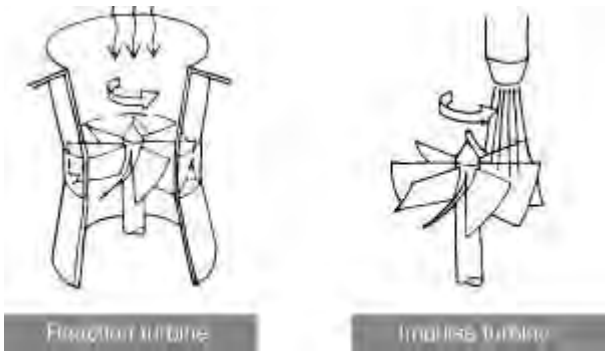


Figure 3.3 Reaction and Impulse turbine

With a suitable water source micro hydro may be the most cost effective form of renewable electricity. For an AC unit, the cost of electricity produced over the lifetime of the unit should be cheaper than extending the mains power grid or installing other stand alone systems. Unfortunately, as Australia has only a small number of areas where micro hydro is suitable, it is estimated that micro hydro is installed in only about two percent of stand alone power systems.

It may be illegal to interfere with a watercourse without prior approval.Micro hydro power is best where water supply is continuously available. Where supply is seasonal it may still be cost effective to install micro hydro as a stand-alone system. This will depend on whether the cost of installing the system is offset by the savings made

during the period when the creek is flowing. Another renewable system, or a generator, will be required when water is not available.

3.1.1 Design and siting of micro hydro system

The amount of energy in water is dependent on the available head and the flow.The static head (or gross head) is calculated from the vertical distance in metres between the water intake of the system and the point where the water enters the generator. For reaction turbines the static head includes the vertical distance from the turbine to the bottom of the draft pipe where the water is released back into the creek.The static head can be determined by using good topographical maps but it is best to seek the advice of a micro hydro expert.

The dynamic head is used to determine the amount of water power available. This allows for friction losses that occur in pipework (penstock) between the water intake point and the micro hydro generator.The smaller the diameter of the penstock, the higher the friction between the water and the walls, and the greater the energy loss. The physical length of the penstock contributes to the frictional loss. To calculate the dynamic head, the total frictional loss in the penstock is converted to a head loss in metres, and subtracted from the static head.To minimise head losses the penstock diameter should be as large as possible. The cost of larger pipes must then be included in the final benefit analysis.

Flow is the rate at which water is moving through the pipe and is measured in litres per second (L/s). It is more difficult to measure than the head. A trained micro

hydro designer can use a number of techniques to determine the actual flow. This will generally take some time and could involve building a small temporary weir on the creek.

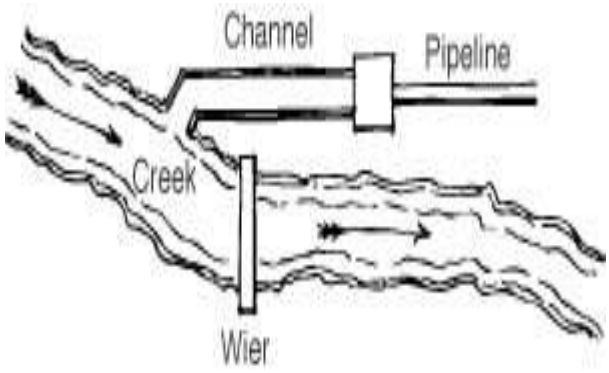


Figure 3.4 The flow of water

The amount of water power available is determined by the following formula:

Water Power = Head x Flow x Gravity
Gravity is the acceleration due to gravity and is approximately 10 m/s^2. So a system with a dynamic head of 10 metres and a flow rate of 5 litres per second could provide 10 x 5 x 10 = 500 Watts of water power.

The power formula demonstrates that a site with high head might only need a small flow while a site with a high flow might only need a small head. While a micro hydro unit can operate with as little as two metres of head, most units used in domestic situations will require at least ten metres head. Designing and installing the pipe work