Website of energy Information

Miss Pawittra Chotisukarn
Mr. Wittaya Yenraksa

A Special Project Submitted in Partial Fulfillment of the Requirements for
the Degree of Bachelor of Science
International Programs, Faculty of Science
King Mongkut's Institute of Technology Ladkrabang
2005

Special Project Title	:	Website of Energy Information
Student Names	:	Miss Pawittra Chotisukarn
		Mr. Wittaya Yenraksa
Faculty	:	Science
Program	:	Petrochemical Technology
		(International Program)
Academic Year	:	2005
Special Project Advisor	:	Asst. Prof. Dr. Phachernchai Chaiyasith

ABSTRACT

The aim of this research was to impart about the energy, presented by the Homepage that easier to search and use the data by the new technology. In this project, we collect the data about the source of energy that include originate, advantage, disadvantage, impact and principle of energy.

For about the website, we choose dream weaver to build it, and use some graphic design program to décor our website. So that make we have more knowledge about those program.

In the website, we collect and summarize the information about energy by separate in 2 types. That is renewable energy and non – renewable energy. And we also include the information about the environmental effect of different types of energy source, and the best way to use energy to be save.

ชื่อโครงงาน	:	เวบไซต์เรื่องข้อมูลพลังงาน
ชื่อผู้จัดทำ	:	นางสาว ปวิตรา โชติสุกานต์
		นาย วิทยา เย็นรักษา
คณะ	:	วิทยาศาสตร์
สาขา	:	ปิโตรเคมี เทคโนโลยี (หลักสูตร นานาชาติ)
ปีการศึกษา	:	2005
ชื่ออาจารย์ที่ปรึกษา	:	ผศ. ดร. เผชิญชัย ไชยสิทธิ์

บทคัดย่อ

จุดมุ่งหมายของโครงงานนี้เพื่อเป็นการเผยแพร่ความรู้เกี่ยวกับพลังงาน โดยจะนำเสนอในรูปแบบของเวบไซต์ เพื่อที่จะสามารถเป็นแหล่งค้นคว้าและ ใช้ข้อมูลเหล่านั้นที่ได้มาได้เกิดประโยชน์สูงสุด จากเทคโนโลยีที่มีในปัจจุบัน โครงงานนี้ได้รวบรวมข้อมูลเกี่ยวกับ แหล่งพลังงานต่างๆ รวมไปถึงแหล่งกำเนิด วิธีการใช้งาน ประโยชน์ ข้อดี ข้อเสีย ผลกระทบที่จะเกิดขึ้นกับสิ่งแวดล้อม อันเนื่องมาจาก การใช้พลังงาน

เกี่ยวกับทางด้านเวบไซต์ โครงงานนี้ได้เลือกโปรแกรม ดรีมวีเวอร์ เพื่อใช้ในการสร้างเวบไซต์ แล้วใช้ โปรแกรมทางด้าน การออกแบบเพื่อใช้ในการตกแต่งเวบไซต์ และเนื่องการใช้โปรแกรมเหล่านี้ ทำให้ผู้จัดทำ ได้รับวามรู้เพิ่มเติมทางด้านนี้อีกด้วย

ภายในเวบไซต์ ผู้จัดทำ ได้รวบรวม สรุป และเรียบเรียง ข้อมูลเกี่ยวกับพลังงาน โดยแบ่งเป็น 2 ประเภท ได้แก่พลังงานที่สามารถสร้างขึ้นมาใหม่ได้ และ พลังงานที่ไม่สามารถสร้างขึ้นใหม่ได้ และรวมถึงข้อมูลเกี่ยวกับผลกระทบต่อสิ่งแวดล้อมของพลังงานชนิดต่างๆแล้ววิธีการใช้พลังงานอย่างประหยัด

ACKNOWLEDGEMENT

This project was supported by King Mongkut's Institute of Technology Ladkrabang. The authors would like to thank Asst. Prof. Dr Phachernchai Chaiyasith for guiding us through this project work, positive encouragement and for useful discussion during the course of the project.

Finally, we would like to express our faithful thanks to our presents and friends for their kindness and encouragement through this project.

Miss Pawittra Chotisukarn

Mr. Wittaya Yenraksa

TABLE OF CONTENTS

TABLE OF CONTENTS (CONTINUE)

TABLE OF CONTENTS (CONTINUES)

TABLE OF CONTENTS (CONTINUES)

LIST OF TABLES

LIST OF FIGURES

LIST OF FIGURES (CONTINUES)

LIST OF FIGURES (CONTINUES)

LIST OF FIGURES (CONTINUES)

CHAPTER 1
INTRODUCTION

1.1 Motivation

Energy is one of the most fundamental parts of our universe. It is also an important part of our daily lives. We use energy to do work. Energy lights our cities. Energy powers our vehicles, trains, planes and rockets. Energy warms our homes, cooks our food, plays our music, gives us pictures on television. Energy powers machinery in factories and tractors on a farm.

According to some estimates, the global population may rise from its current 6.3 billion today to almost 9 billion by 2050. The oil consumption will be increased. Oil will become more expensive and less available. This will be painful in the industrialized countries which have become totally dependent upon oil, and in the less developed countries where oil use is extremely sensitive to price escalation.

If we reduce energy consumption, we can avoid construction of new power plants and other negative energy impacts. Energy-saving tools and tips to help you evaluate energy costs, potential savings and provide tips on ways you can save energy and money [1].

From the number of Thai internet user in 2004 is equal to 6,970,000 persons [2] and nowadays many people use internet to search data in place of search the information by books in the library. Thus we think to collect and summarize that data all about the energy to present to the public by website, it can be changed and updated the data anytime.

1.2 Objectives

1.2.1 Study and collect the energy information.

1.2.2 Study the program of web design and graphic design.

1.2.3 Create and design website of energy.

1.3 Scope of study

1.3.1 Collection of the energy information such as the information of renewable energy and non-renewable energy, new source of energy, and the best way of energy usage for the future. The sources of information come from libraries, internet, and from related government agencies and private organizations.

1.3.2 Preparation the data for website.

1.3.2.1 Summarize the information in suitable form for website.

1.3.3 Creation website by using graphic design and web programming softwares such as Adobe Photoshop CS, Adobe Illustrator CS, Adobe Image Ready CS, Micromedia Flash MX, and Micromedia Dream weaver MX.

1.4 Expected results

The website of energy information will be

1. The source of energy information.
2. The linkage of websites of energy.
3. The collection of energy research center.
4. The mediator between the scientist and curious person.

CHAPTER 2
RELATED LITERATURE

2.1 Basic knowledge of the internet

2.1.1 Internet

Internet is a worldwide network of computer networks. It is an interconnection of large and small networks around the globe. The Internet began in 1962 as a resilient computer network for the U.S. military. It has grown into a global communication tool of more than 12,000 computer networks that share a common addressing scheme.

The scope of the internet can be concluded as follow:

1. The internet is the largest networks across the world.
2. An interconnected system of networks is connected through the computers via the TCP/IP protocol (Transmission Control Protocol/Internet Protocol).
3. A computer network facilitates data transmission and exchange such as letter, picture and sound.
4. A worldwide network of computers allows the "sharing" or "networking" of academic institutions, research institutes, private companies, government agencies, and individuals.

2.1.2 History of the internet [3]

1962 RAND Paul Baran, of the RAND Corporation (a government agency), was commissioned by the U.S. Air Force to do a study on how could maintain its command and control over its missiles and bombers, after a nuclear attack. This was to be a military research network that could survive a nuclear strike, decentralized so that if any locations (cities) in the U.S. were attacked, the military could still have control of nuclear arms for a counter-attack. Baran's finished document described several ways to accomplish this. His final proposal was a packet switched network.

1969 The first node was connected to the internet's military ancestor, ARPANET with no HQ and the ability to bounce messages between surviving nodes until they reach their destination, ARPANET was intended to be America's bomb-proof communications network at the height of the Cold War.

1971 Michael Hart begins Project Gutenberg to make copyright free works electronically available. The first is the US declaration of independence.

1972 Bolt Beranek and Newman computer engineer Ray Tomlinson invents email by adapting an internal messaging program and extending it to use the ARPANET to send messages between sites. Within a year, three quarters of ARPANET traffic is email.

1973 University College of London is one of the first international connections to ARPANET.

1976 The Queen sends an email from the Royal Signals and Radar Establishment in Malvern.

1986 Internet newsgroups are born. Rick Adams at the Center for Seismic Studies releases software enabling news transmission, posting and reading using internet-standard TCP/IP connections. His software builds on work begun in 1979 at Duke University to exchange information between Unix machines.

1988 The first internet worm is unleashed by Robert Morris. It infects about 6000 computers. Although it causes no physical damage, it clogs up the internet and loses hundreds of thousands of dollars in computer time.

1989 Tim Berners-Lee and the team at CERN invent the World Wide Web to make information easier to publish and access on the internet.

1993 Marc Andreesen of the National Center for SuperComputer Applications in the US launches web-browser Mosaic. It introduces proprietary HTML tags and more sophisticated image capabilities. The browser is a massive success and businesses start to notice the web's potential. Andreesen goes on to develop the Netscape web browser.

1994 Jerry and David's Guide to the World Wide Web is renamed Yahoo! and receives 100,000 visitors. In 1995, it begins displaying adverts.

1995 Digital Equipment Corporation's Research lab launches search engine Alta Vista, which it claims can store and index the HTML from every internet page. It also introduces the first multilingual search.

Jeff Bezos launches Amazon.com, an online bookseller that pioneers ecommerce.

eBay is launched to enable internet users to trade with each other.

1996 The browser wars begin. Microsoft sees the internet as a threat and integrates Internet Explorer with Windows. Netscape and Microsoft go head-to-head, intensively developing and releasing upgrades to their browsers.

Macromedia Flash 1.0 launches to add interactive animation to webpages. Early adopters include Disney and MSN.

1998 Google arrives. It pioneers a ranking system that uses links to assess a website's popularity. Google's simple design is soothing while existing search engines cram their pages with animated adverts.

1999 Shawn Fanning launches Napster. The peer-to-peer software enables internet users to swap MP3 music files stored on their computers and to find each other through a central directory. Record labels are furious. By July 2001, they had effectively stopped Napster operating.

2000 The dotcom bust. After several years of venture capitalists throwing money at proposals with 'internet' on the cover, it all starts unravelling as many of these businesses fail to find a market and other realise they don't have a business plan.

2001 US regulators approve the merger of AOL and Time Warner. Shareholders of relative upstart AOL own 55% of the new company. AOL started in 1985 and grew its modest internet connection business into one of the world's biggest media companies.

2003 Nearly half of us are connected: UK telecoms regulator Oftel reports that 47% of UK homes have internet access and 58% have a PC. Of those online, 15% use broadband and 92% are satisfied with their service.

2004 As broadband becomes more popular, media companies start selling music and video online. Napster relaunches as a paid music download store. It's up against iTunes, Apple's download store for its trendy iPod portable music players.

2.1.3 The present Status

Now a day, the internet is a very important communication technology which has many function, high efficiency and low cost compared with the other communication technologies. The internet collect many information and expands very fast. Many person use the internet in their businesses, organisations, schools, and companies.

2.2 Definition

Website is a collection of Web pages on a particular subject (such as images, sound, and video files, etc.), including a beginning file called a home page. Other pages on the site can be reached, directly or indirectly, from the home page.

Web page is a document designed for viewing in a web browser. Typically written in HTML. A web site is made of one or more web pages.

WWW or **Web** is a distributed hypertext-based information system on the Internet, which provides users an easy way to access global information consisting of a mixture of text, graphics, sound files, and video clips.

Home Page (or Homepage) is originally, the web page that a browser is set to use when it starts up. The more common meaning refers to the top level document of a set of web pages.

Internet is the vast collection of inter-connected networks that are connected using the TCP/IP protocols and that evolved from the ARPANET of the late 60's and early 70's. The Internet connects tens of thousands of independent networks into a vast global internet and is probably the largest Wide Area Network in the world.

HTML (Hyper Text Markup Language) is the coding language used to create hypertext documents for the World Wide Web. In HTML, a block of text can be

surrounded with tags that indicate how it should appear (for example, in bold face or italics). Also, in HTML a word, a block of text, or an image can be linked to another file on the Web. HTML files are viewed with a World Wide Web browser.

URLs is the World Wide Web uses Uniform Resource Locators (URLs) to specify the location of files on other servers. A URL includes the type of resource being accessed (e.g., Web, gopher, FTP), the address of the server, and the location of the file. The syntax is:

scheme://host.domain [:port]/path/ filename

Browser is a World Wide Web program which retrieves Web pages for display on a computer screen. The two most popular browsers are Netscape and Microsoft Internet Explorer.

Cascading Style Sheet (CSS) provides the ability to separate the layout and styles of a web page from the data or information. Styles such as fonts, font sizes, margins, can be specified in one place, then the Web pages feed off this one master list, with the styles cascading throughout the page or an entire site.

Dream weaver is a powerful WYSIWYG authoring software from Macromedia enabling easy creation of sites containing graphics and multimedia elements. It is one of the best programs for creating JavaScript and DHTML animations.

2.3 HTML

2.3.1 HTML documents

HTML documents are plain-text (also known as ASCII) files that can be created using any text editor (e.g., Emacs or vi on UNIX machines; SimpleText on a Macintosh; Notepad on a Windows machine). You can also use word-processing software if you

remember to save your document as "text only with line breaks". But in this project we use program Macromedia Dream weaver MX to easier than other way.

2.3.2 Tags Explained

An element is a fundamental component of the structure of a text document. Some examples of elements are heads, tables, paragraphs, and lists. Think of it this way: you use HTML tags to mark the elements of a file for your browser. Elements can contain plain text, other elements, or both.

To denote the various elements in an HTML document, you use tags. HTML tags consist of a left angle bracket (<), a tag name, and a right angle bracket (>). Tags are usually paired (e.g., <H1> and </H1>) to start and end the tag instruction. The end tag looks just like the start tag except a slash (/) precedes the text within the brackets.

Some elements may include an attribute, which is additional information that is included inside the start tag. For example, you can specify the alignment of images (top, middle, or bottom) by including the appropriate attribute with the image source HTML code. Tags that have optional attributes are noted below.

NOTE: HTML is not case sensitive. <title> is equivalent to <TITLE> or <TiTIE>. There are a few exceptions noted in Escape Sequences below.

Not all tags are supported by all World Wide Web browsers. If a browser does not support a tag, it will simply ignore it. Any text placed between a pair of unknown tags will still be displayed, however.

2.3.3 The Minimal HTML Document

Every HTML document should contain certain standard HTML tags. Each document consists of head and body text. The head contains the title, and the body contains the actual text that is made up of paragraphs, lists, and other elements. Browsers expect specific information because they are programmed according to HTML and SGML specifications.

Required elements are shown in this sample bare-bones document:

```
<html>
<head>
<TITLE>A Simple HTML Example</TITLE>
</head>
<body>
<H1>HTML is Easy To Learn</H1>
<P>Welcome to the world of HTML.
This is the first paragraph. While short it is
still a paragraph!</P>
<P>And this is the second paragraph.</P>
</body>
</html>
```

Figure. 2.1 Sample bare-bones document.

The required elements are the <html>, <head>, <title>, and <body> tags (and their corresponding end tags). Because you should include these tags in each file, you might want to create a template file with them. (Some browsers will format your HTML file correctly even if these tags are not included. But some browsers won't! So make sure to include them.)

2.3.4 A teaching tool

To see a copy of the file that your browser reads to generate the information in your current window, select View Source (or the equivalent) from the browser menu. (Most browsers have a "View" menu under which this command is listed.) The file contents, with all the HTML tags, are displayed in a new window.

This is an excellent way to see how HTML is used and to learn tips and constructs. Of course, the HTML might not be technically correct. Once you become familiar with HTML and check the many online and hard-copy references on the subject, you will learn to distinguish between "good" and "bad" HTML.

Remember that you can save a source file with the HTML codes and use it as a template for one of your Web pages or modify the format to suit your purposes.

2.3.5 Markup Tags

2.3.5.1 HTML

This element tells your browser that the file contains HTML-coded information. The file extension .html also indicates this an HTML document and must be used. But you also use only .htm for your extension.

2.3.5.2 HEAD

The head element identifies the first part of your HTML-coded document that contains the title. The title is shown as part of your browser's window.

2.3.5.3 TITLE

The title element contains your document title and identifies its content in a global context. The title is typically displayed in the title bar at the top of the browser window, but not inside the window itself. The title is also what is displayed on someone's hot list or bookmark list, so choose something descriptive, unique, and relatively short. A title is also used to identify your page for search engines. Generally you should keep your titles to 64 characters or fewer.

2.3.5.4 BODY

The second and largest part of your HTML document is the body, which contains the content of your document (displayed within the text area of your browser window).

2.4 General Information of Energy

2.4.1 Introduction

Energy is the ability to do work. When we move something by pushing or pulling, we are doing work. Energy is necessary for anything to move or change. Energy can not be made or destroyed, but it can change from one form to another. Energy is either potential energy, (stored energy) or kinetic energy, (movement energy). Such as coal stored at a power station has potential energy. When the coal burns, it releases heat energy that drives the electric power generators. When petrol burns in a motor car engine, a rapid change in gas pressure drives the pistons to create mechanical power which turns the wheels. We can also describe energy as having different forms, for example atomic energy (nuclear energy), chemical energy, electrical energy, heat energy, light energy, mechanical energy, and radiation energy (including solar radiation).

Over many millions of years, chemical and physical processes can change substances from dead animals and plants to coal, oil and natural gas, or fossil fuels. These processes are still not fully understood but we know the energy stored in these fossil fuels came originally from the sun. When we burn these fuels, they form carbon dioxide gas and water, and release heat energy. We use the heat energy to drive machines that are essential for our modern way of life.

The increase in use of non-renewable fossil fuels may have increased the amount of carbon dioxide and other gases in the atmosphere to produce greenhouse effect. The temperature of the earth is believed to have increased and some scientists

think this may lead to climate changes and widespread flooding of low-lying areas as the increased temperature causes the sea to expand.

It makes sense then to be cautious and conserve non-renewable fuels for use by future generations and to control the global greenhouse effect. So, we should try to decrease energy use, and to change to renewable sources of energy.

2.4.2 History [4,5]

The development of energy can be concluded by its sources as follow ;

2.4.2.1 Wood (Biomass)

1860 Wood was the primary fuel for heating and cooking in homes and businesses, and was used for steam in industries, trains, and boats.

1890 Coal had displaced much of the wood used in steam generation.

1900 Ethanol was competing with gasoline to be the fuel for cars.

1910 Most rural homes were still heated with wood. In towns, coal was displacing wood in homes.

1930 Over half of all Americans lived in cities in buildings heated by coal. Rural Americans still heated and cooked with wood. Diesel and gasoline were firmly established as the fuel for trucks and automobiles. Street cars ran on electricity. Railroads and boats used coal and diesel fuel.

1950 Electricity and natural gas had displaced wood heat in most homes and commercial buildings.

1974 Some Americans used more wood for heating because of higher energy costs. Some industries switched from coal to waste wood. The paper and pulp industry also began to install wood and black liquor boilers for steam and power displacing fuel oil and coal.

1978 Public Utility Regulatory Policies Act (PURPA) passed, guaranteeing nonutility generators a market to sell power by mandating that utilities pay "avoided cost" rates for any power supplied by a qualifying facility.

1984 Burlington Electric (Vermont) built a 50 megawatts wood-fired plant with electricity production as the primary purpose. This plant was the first of several built since 1984.

1985 The biomass power industry in California began to grow, eventually adding 850 megawatts of power due to fuel cost escalation clauses in the Standard Offer #4 contracts (based on predicted oil costs of $100 a barrel, these 10 years contracts guaranteed power purchase rates).

1989 Pilot trials of direct wood-fired gas turbine plants were initiated conducted for the first time in Canada and in the United States.

1990 Electricity generating capacity from biomass (not including municipal solid waste) reached 6 Gigawatts. Of 190 biomass-fired electricity generating facilities, 184 were non-utility generators, mostly wood and paper.

1994 Successful operation of several biomass gasification tests identified hot gas cleanup as key to widespread adoption of the technology.

2.4.2.2 Electricity

1700's After eons of superstitious imaginations about electricity, Benjamin Franklin figured out that static electricity and lightning were the same. His correct understanding of the nature of electricity paved the way for the future.

1800 First electric battery.

1816 First energy utility in US founded.

1820 Relationship of electricity and magnetism confirmed.

1821 First electric motor (Faraday).

1826 Ohms Law (G.S. Ohm).

1830-1839 Michael Faraday built an induction dynamo based on principles of electromagnetism, induction, generation and transmission.

1860's Mathematical theory of electromagnetic fields was published. Maxwell created a new era of physics when he unified magnetism, electricity and light. One of the most significant events, possibly the very most significant event, of the 19th century

was Maxwell's discovery of the four laws of electrodynamics ("Maxwell's Equations"). This led to electric power, radios, and television.

1879 First commercial power station opens in San Francisco, uses Brush generator and arc lights.

1886 Stanley develops transformer and Alternating Current electric system.

1903 -First successful gas turbine (France).

-World's first all turbine station (Chicago).

-Shawinigan Water & Power installs world's largest generator (5,000 Watts) and world's largest and highest voltage line 136 km and 50 Kilovolts (to Montreal).

-Electric vacuum cleaner.

-Electric washing machine.

1909 First pumped storage plant (Switzerland).

1953 -First 345 Kilovolt transmission line.

-First nuclear power station ordered.

1954 -First high voltage direct current (HVDC) line (20 megawatts/1900 Kilovolts, 96 km).

-Atomic Energy Act of 1954 allows private ownership of nuclear reactors.

1981 PURPA ruled unconstitutional by Federal judge.

1997 ISO New England begins operation (first ISO). New England Electric sells power plants (first major plant divestiture).

1998 California opens market and ISO. Scottish Power (UK) to buy Pacificorp, first foreign takeover of -US utility. National (UK) Grid then announces purchase of New England Electric System.

1999 -Electricity marketed on Internet.

-FERC issues Order 2000, promoting regional transmission.

2.4.2.3 Coal

1763-1774 The first record of coal in the United States shown in a map prepared in by Louis Joliet. It shows charbon de terra along the Illinois River in northern Illinois.

1701 Coal was discovered near Richmond, Virginia USA.

1736 A map shows the location of several "cole mines" along the upper Potomac River, near what is now the border of Maryland and West Virginia.

1750s Coal was reported in Pennsylvania, Ohio, Kentucky, and West Virginia.

1762 Pennsylvania's anthracite deposits were found.

1748 The first commercial U.S. coal production began near Richmond, Virginia.

1800's Coal became the principal fuel used by locomotives. As the railroads branched into the coal fields, they became a vital link between mines and markets. Coal also found growing markets as fuel for households and steamboats. Another use of coal was to produce illuminating oil and gas.

1816 Baltimore, Maryland, became the first city to light streets with gas made from coal. With the beginning of the U.S. coke industry in the latter half of the 1800's, coke soon replaced charcoal as the chief fuel for iron blast furnaces.

1866 Strip mining began near Danville, Illinois, when horse-drawn plows and scrapers were used to remove overburden so the coal could be dug and hauled away in wheelbarrows and carts.

1870 Briquetting of coal was introduced in the United States.

1877 A steam-powered shovel excavated some 10 feet of overburden from a 3-foot- thick coal bed near Pittsburg, Kansas.

1880's Coal-cutting machines became available (prior to that, coal was mined underground by hand.)

1882 The first practical coal-fired electric generating station, developed by Thomas Edison, went into operation in New York City to supply electricity for household lights.

1885 A converted wooden dredge with a 50 feet boom was used to uncover a coal bed under 35 feet of overburden.

1910 Surface mining was underway with steam shovels specifically designed for coal mining.

1920's Mechanical coal-loading equipment replaced hand loading and increased productivity. Mules and, to a lesser degree, horses and oxen were used to haul coal and refuse in and around the early mines; a few dogs were used in small mines working thin coal beds. In time, the animals were replaced by electric locomotives, dubbed "electric mules" and other haulage equipment.

1982 Coal accounted for more than half of the supply of electricity but little was used in homes. In terms of national electricity generation, hydropower, natural gas, and nuclear energy contributed between 10 and 15 percent each.

2.4.2.4 Oil

3000 B.C Mesopotamians of that era used rock oil in architectural adhesives, ship caulks, medicines, and roads.

2000 B.C. The Chinese refined crude oil for use in lamps and in heating homes.

600-700 A.D. Arab and Persian chemists discovered that petroleum's lighter elements could be mixed with quicklime to make Greek fire, the napalm of its day.

1750 A French military officer noted that Indians living near Fort Duquesne (now the site of Pittsburgh) set fire to an oil-slicked creek as part of a religious ceremony. As settlement by Europeans proceeded, oil was discovered in many places in northwestern Pennsylvania and western New York to the frequent dismay of the well-owners, who were drilling for salt brine.

Mid-1800s Expanding uses for oil extracted from coal and shale began to hint at the value of rock oil and encouraged the search for readily accessible supplies.

1859 Oil was first discovered when a homemade rig drilled down 70 feet and came up coated with oil. This rig was near Titusville (in northwestern Pennsylvania) and was owned by "Colonel" Edwin L. Drake.

1890s Mass production of automobiles began,creating demand for gasoline. Prior to this, kerosene used for heating had been the main oil product.

1920 There were 9 million automobiles in the United States and gas stations were opening everywhere.

1950-present Oil became our most used energy source because of automobiles.

1960 The Organization of Petroleum Exporting Countries (OPEC) was formed by Iran, Iraq, Kuwait, Saudi Arabia, and Venezuela. The group has since grown to include 11 member countries.

1970 Production of petroleum (crude oil and natural gas gas plant liquids) in the U.S. lower 48 States reached its highest level at 9.4 million barrels per day. Production in the lower 48 States has been declining ever since.

1973 Price Controls, In reaction to the Arab Oil Embargo of 1973, Congress passed laws that tried to protect consumers from gasoline shortages and high prices. The price controls of the Emergency Petroleum Allocation Act were generally considered a failure, and they were later repealed.

1975 The Energy Policy and Conservation Act. Congress passed the Energy Policy and Conservation Act aimed at increasing oil production by giving price incentives. This act also created the Strategic Petroleum Reserve (SPR), and required an increase in the fuel efficiency (miles per gallon) of automobiles.

1978-1980 Oil Prices Doubled- The Iranian Revolution, which began in late 1978, resulted in a drop of 3.9 million barrels per day of crude oil production from Iran from 1978 to 1981. At first, other OPEC countries made up for the drop in Iranian production. In 1980, the Iran-Iraq War began, and many Persian Gulf countries reduced output as well. By 1981, OPEC production was about one-fourth lower than it had been in 1978, and prices had doubled.

1980-1985 OPEC kept prices high by producing less oil. Saudi Arabia acted as a "swing producer", cutting more production than any other OPEC country. But high prices caused less oil to be used. For example, cars became smaller using less gasoline. The drop in oil consumption meant that less oil needed to be produced. Oil production from Saudi Arabia fell from 9.9 million barrels per day in 1980 to 3.4 million barrels per day in 1985.

1981 Removal of Price Controls, The U.S. Government responded to the oil crisis of 1978-1980 by removing price and allocation controls on the oil industry. For the

first time since the early 1970s, market forces (supply and demand) set domestic crude oil prices.

1986 Crude Oil Price Collapse, in 1986, Saudi Arabia stopped holding back production, and other OPEC increased production. This caused an oil glut and prices were almost cut in half. Oil consumption grew quickly in the late 1980's because prices remained low.

1988 Alaska's production at Prudhoe Bay peaked at 2.0 million barrels per day and fell to 1.0 million barrels per day in 1999. By then U.S. total output had dropped to 7.8 million barrels per day, 31 percent below its peak.

1990-1991 Persian Gulf Crisis, Iraq invaded Kuwait on August 2, 1990, causing crude oil and product prices to rise suddenly and sharply. Prices rose even higher when the United Nations (UN) limited the oil that could be purchased from these countries. Between the end of July and August 24, 1990, the world price of crude oil climbed from about $16 per barrel to more than $28 per barrel. The price rose even higher in September, reaching about $36 per barrel. As UN troops began seeing military successes in Iraq, concerns about long-term supply problems were eased and oil prices dropped again.

1990 The Clean Air Act Amendments required many changes to gasoline and diesel fuels to make them pollute less. The use of these cleaner fuels was phased-in during the 1990s. Since 1995 "reformulated" gasoline has been used in places with the worst pollution problems.

1993 forward For the first time the U.S. imported more oil and refined products from other countries than it produced. More and more imports have been needed because of growing petroleum demand and declining U.S. production.

1997-1998 The Asian financial crisis that occurred in 1997 had worldwide economic effects. As the Asian economies shrank, their demand for petroleum products declined. The slow demand for petroleum, along with the reluctance of OPEC to cut its production quotas, led to the plummet of oil prices in 1998.

2001 -The Nation's petroleum production measured an average of 11.0 barrels of oil per day per well, 41 percent below the 1972 peak.

-U.S. petroleum consumption reached 19.7 million barrels per day, an all-time high.

-Of every 10 barrels of petroleum consumed in the United States, more than 4 barrels were consumed in the form of motor gasoline. The transportation sector alone accounted for two-thirds of all petroleum used in the United States.

-To meet demand, crude oil and petroleum products were imported at the rate of 11.9 million barrels per day, while exports measured 1.0 million barrels per day.

-Net imports (imports minus exports) of crude oil and petroleum products more than doubled from the 4.3 million barrels per day in 1985 to 10.9 million barrels per day. The five leading suppliers of petroleum to the United States that year were Canada, Saudi Arabia, Venezuela, Mexico, and Nigeria.

2.4.2.5 Nuclear

1895 Wilhelm Roentgen, a German physicist, discovered x-rays.

1898 Marie Curie discovered the radioactive elements radium and polonium.

1905 Special theory of relativity written. Albert Einstein created a new era of physics when he unified mass, energy, magnetism, electricity, and light. One of the most significant events of the 20th century was Einstein's writing the formula of $E=mc^2$: energy = mass times the square of the speed of light. This led to nuclear medicine and a much longer life span, astrophysics, and commercial nuclear electric power.

1927 Herman Blumgart, a Boston physician, used radioactive tracers to diagnose heart disease.

1938 The process of splitting uranium atoms, called nuclear fission, was demonstrated by German scientists Otto Hahn and Fritz Strassman.

1942 -The Manhattan Project was formed in the U.S. to secretly build the atomic bomb for use in World War II.

-First controlled nuclear chain reaction led by Enrico Fermi and other scientists at the University of Chicago. The experiment lasted 28 minutes.

1945 -First test of a nuclear weapon, called the "Trinity" test, in Alamogordo, New Mexico.

-U.S. dropped an atomic bomb on Hiroshima, Japan, and three days later dropped another one on Nagasaki, Japan. Japan surrendered less than two weeks later, ending World War II.

1946 -Atomic Energy Act (AEA) of 1946 was passed, establishing the Atomic Energy Commission (AEC) to control nuclear energy development and explore peaceful uses of nuclear energy.

-Joint Congressional Committee on Atomic Energy established.

1949 The Soviet Union detonated its first atomic device.

1951 In December 1951, an experimental breeder reactor (EBR Reactor in Idaho) produced the first usable electric power from the atom, lighting four light bulbs. Scientists had already known that nuclear power could produce electricity. The purpose of the experimental EBR was to prove that a breeder reactor could produce more fuel than it used.

1953 -The first nuclear powered submarine, U.S.S. Nautilus, was launched.

-Eisenhower's "Atoms-for-Peace" Program proposed an international agency to develop peaceful nuclear technologies.

1954 Atomic Energy Act of 1954, the first major amendment of the original Energy Act, gave the civilian nuclear energy program further access to nuclear technology.

1955 -The Atomic Energy Commission announced the beginning of a cooperative program between government and industry to develop nuclear power plants.

-First U.S. town was powered by nuclear energy (Arco, Idaho, population 1,000) by the experimental boiling water reactor BORAX III at the Idaho National Energy Laboratory.

-First international conference on the peaceful uses of nuclear energy is held in Geneva, Switzerland, sponsored by the United Nations.

1957 -First power generated from a civilian nuclear plant at Santa Susana, California.

-Price-Anderson Act enacted. This legislation was designed limit the financial risk of nuclear plant owners in the event of an accident.

-First full-scale nuclear power plant (Shippingport, Pennsylvania) began service.

-The International Atomic Energy Agency (IAEA) was formed with 18 member countries to promote peaceful uses of nuclear energy and to prevent the spread of nuclear weapons.

-The Soviet Union launched the first nuclear powered surface ship, the Lenin.

1959 First U.S. plant (Dresden-1 Nuclear Power Station in Illinois) built entirely without government funding, achieved a self-sustaining nuclear reaction.

1960 -The Atomic Energy Commission published its 10 years plan for nuclear energy.

-Small nuclear-power generators were first used in remote areas to power weather stations and to light buoys for sea navigation.

1962 First nuclear-powered merchant ship, N.S. Savannah, was put to sea. The Savannah was christened by Mrs. Dwight D. Eisenhower in 1959, and was shown as an example of the peaceful use for nuclear power. The use of the Savannah as a cargo ship was delayed until 1964 due to publice hearings, safety testing and labor disputes.

1963 First nuclear plant (Jersey Central Power and Light Company, Oyster Creek Plant) was ordered as an economical alternative to a fossil fuel plant.

1964 -Private Ownership of Special Nuclear Materials Act was signed, allowing the nuclear energy industry to own the fuel for its units. After June 30, 1973, private ownership of the uranium fuel became mandatory.

-The U.S. Navy sent three nuclear powered surface ships (Enterprise, Long Beach and Bainbridge) on an around the world cruise to show the ability of nuclear powered ships to operate away from shore bases.

-The Atomic Energy Commission issued a construction permit for Oyster Creek nuclear power plant.

1965 -First nuclear reactor, a 500 Watts system, operated in space. (It operated for 43 days and remains in orbit.)

-The Atomic Energy Commission gave the Liquid Metal Fast Breeder reactor highest priority and decided to build the Fast Flux Test Facility.

-First major electrical blackout occured in the Northeast United States.

1968 Nuclear Nonproliferation Treaty (NPT) called for halting the spread of nuclear weapons capabilities.

1970 -First Earth Day celebrated.

-Electricity "brownouts" hit the Northeast during a heat wave.

1971 President Nixon announced a national goal of completing the Liquid Metal Fast Breeder unit by 1980.

1973 -President Nixon proposed replacing the Atomic Energy Commission with the Energy Research and Development Administration and the Nuclear Regulatory Commission.

-The Organization of Petroleum Exporting Countries (OPEC) agreed to use oil as a foreign policy weapon, cutting exports 5 percent until Israel withdrew from Arab territory occupied during the Yom Kippur War. Days later, Saudi Arabia cut oil production by 25 percent and joined many other oil-producing nations in embargoing oil shipments to the United States.

-U.S. utilities ordered 41 nuclear power plants, a one year record.

1974 -The first 1,000-Megawatt nuclear plant went into service (Commonwealth Edison's Zion 1 plant).

-Atomic Energy Commission was abolished and the Nuclear Regulatory Commission(NRC) was created to regulate the nuclear industry. The Joint Congressional Committee on Atomic Energy was also abolished.

1975 Energy Research and Development Administration began operating.

1977 -President Carter combined the Energy Research and Development Administration with the Federal Energy Administration, creating the Department of Energy.

-The Voyager 2 spacecraft was launched into space. The spacecraft's electricity was generated by the decay of plutonium pellets.

1979 -A major accident occured at Unit 2 of the Three Mile Island nuclear plant near Harrisburg, Pennsylvania. No one was directly injured in the accident but thousands of people evacuated the area and it caused a public scare. Concerns from the accident led to many safety improvements for nuclear power industry in the United States.

-U.S. nuclear energy industry created the Institute of Nuclear Power Operations to address issues of safety and performance.

-President Carter, completing a process begun by President Ford, banned nuclear fuel used at power plants from being reprocessed. The purpose of the ban was to prevent the used fuels from falling into the wrong hands and being used for nuclear weapons.

1980 Nuclear energy generated more electricity than oil in the United States.

1981 President Reagan lifted the ban on reprocessing used nuclear fuel.

1984 Nuclear replaced hydropower as the second largest source of electricity in the United States, after coal.

1986 -The Perry power plant in Ohio became the 100th U.S. nuclear power plant in operation.

-The world's worst nuclear power accident happened at the Chernobyl plant in the former USSR (now Ukraine).

1987 Congress selected Yucca Mountain in Nevada for study as the first high level nuclear waste repository site.

1989 Nuclear power plants provided 19 percent of the electricity used in the United States; 46 units entered service during the decade.

1993 Two decades after the first oil embargo, the 109 nuclear power plants operating in the United States provided about one-fifth of the nation's electricity.

1994 The Nuclear Regulatory Commission (NRC) issued final design approval for the first two of four advanced nuclear power plant designs. General Electric's Advanced Boiling Water Reactor (ABWR) and ABB Combustion Engineering's System 80+.

1996 -The NRC granted the Tennessee Valley Authority (TVA) a full-power license for its Watts Bar 1 nuclear power plant, bringing the number of operating nuclear units in the United States to 110.

-Kashiwazaki-Kariwa 6, the world's first Advanced Boiling Water Reactor, began commercial service.

1997 The NRC issued design certification for the General Electric Advanced Boiling Water Reactor.

1998 Baltimore Gas and Electric Co. submitted an application to renew the license of its two-unit Calvert Cliffs nuclear power plant, the first U.S. company to apply for a 20-year extension of its 40-year license.

2000 -The NRC issued the first-ever license renewal to Constellation Energy's Calvert Cliffs Nuclear Power Plant, allowing an additional 20 years of operation.

-The NRC approved a 20-year extension to the operating license of Duke Energy's three unit Oconee Nuclear Station.

2001 The National Energy Plan was published in May 2001. The Plan included a significant role for nuclear power in meeting energy demand and reducing air pollution levels.

2002 -April 30, the oldest nuclear power plant in the world, Obninsk (located in Russia), closed down its sole reactor.

-Nuclear power provided about 16% of the world's electricity.

2003 On August 14th, the Nation's largest ever power outage left much of the Northeast and parts of Canada without electricity for several days. A transmission line in Ohio, strained the electrical system so much that plants all over the grid, including nine U.S. and eight Canadian commercial nuclear reactors, were shut down.

2004 The British Nuclear Group announced the closing of the Chapelcross nuclear power plant, one of the world's oldest plants.

2005 -January 3rd, Lithuania, the world's most nuclear dependent nation, began the complete and final shutdown of one-half of its nuclear capacity. Lithuania's nuclear reactors are being shutdown due to safety

concerns. The have the same design as the reactors at Chernobyl, the site of the world's worst nuclear accident.

-Polish Government decided to build nation's first nuclear power plant.

-August 8th, President Bush signed the Energy Policy Act of 2005, which included measures to encourage the nuclear industry to build new nuclear power plants. (No construction of a nuclear plant has begun since 1971.)

2.4.3 Sources of Energy

Energy resources can be described as renewable and non-renewable. Renewable energy sources are those which are continually being replaced such as energy from the sun and wind etc. Non-renewable energy source are the energy resource is being used faster than it can be replaced (for example, coal takes millions of years to form) then it will eventually run out.

2.5 Renewable energy

2.5.1 Introduction

Renewable energy resources may be used directly, or used to create other more convenient forms of energy. Examples of direct use are solar ovens, water and windmills, and geothermal heating. Examples of indirect use which require energy harvesting are electricity generation through wind turbines or photovoltaic cells, or production of fuels such as ethanol from biomass.

Renewable energy's impact on the world's energy picture is significant. Many important event have occurred during the history of using renewable sources to generate electricity. 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.

2.5.2 Type of renewable energy

In this project, it shows 9 types of renewable energy, that is;

Wind

Solar

Hydrogen Fuel Cell

Hydropower

Tidal

Wave

Geothermal

Biomass

Pumped Storage

2.5.3 Wind

Introduction

Wind power is energy from the air, we have used the wind as an energy source for a long time. Wind can be used to do work. The kinetic energy of the wind can be changed into other forms of energy, either mechanical energy or electrical energy.

Source

There are many good sites for wind plants in the United States including California, Alaska, Hawaii, the Great Plains, and mountainous regions. Scientists say there is enough wind in 37 states to produce electricity. An average wind speed of 14 mph is needed to convert wind energy into electricity economically. Scientists use an instrument called an anemometer to measure how fast the wind is blowing. An anemometer looks like a modern-style weather vane. It has three spokes with cups that spin on a revolving wheel when the wind blows. It is hooked up to a meter that tells the wind speed. A weather vane shows the direction of the wind, not the speed [6].

As a rule, wind speed increases with altitude and over open areas with no windbreaks. Good sites for wind plants are the tops of smooth, rounded hills, open plains or shorelines, and mountain gaps that produce wind funneling.

Wind speed varies throughout the country. It also varies from season to season. In Tehachapi, California, the wind blows more from April through October than it does in the winter. This is because of the extreme heating of the Mojave Desert during the summer months. The hot air over the desert rises, and the cooler, denser air above the Pacific Ocean rushes through the Tehachapi mountain pass to take its place. In a state like Montana, on the other hand, the wind blows more during the winter.

These seasonal variations are a good match for the electricity demands of the regions. In California, people use more electricity during the summer when air conditioners are used for cooling. Conversely, more people use electricity in Montana during winter heating months.

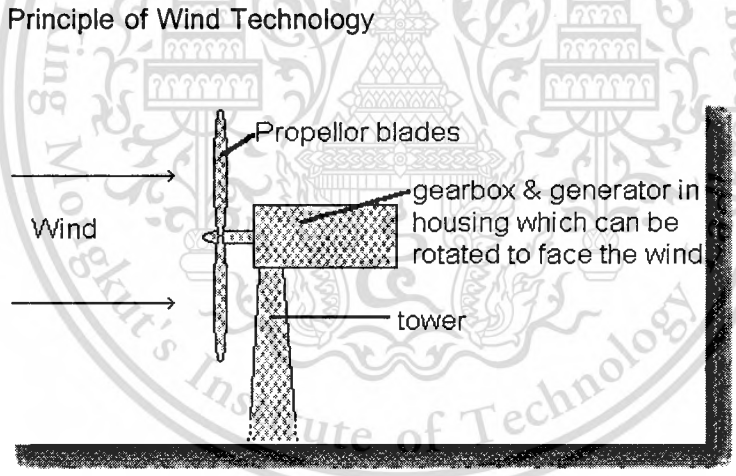


Figure. 2.2 Windmill's technology [6].

The Sun heats our atmosphere unevenly, so some patches become warmer than others. These warm patches of air rise, other air blows in to replace them and we feel a wind blowing. We can use the energy in the wind by building a tall tower, with a large propellor on the top.

Figure. 2.3 Windmills farms [7].

The wind blows the propellor round, which turns a generator to produce electricity. We tend to build many of these towers together, to make a "wind farm" and produce more electricity. The more towers, the more wind, and the larger the propellors, the more electricity we can make.

It's only worth building wind farms in places that have strong, steady winds, although boats and caravans increasingly have small wind generators to help keep their batteries charged.

Advantages

- Wind is free, wind farms need no fuel.
- Produces no waste or greenhouse gases.
- The land beneath can usually still be used for farming.
- Wind farms can be tourist attractions.
- A good method of supplying energy to remote areas.

Disadvantages

- The wind is not always predictable, some days have no wind.
- Suitable areas for wind farms are often near the coast, where land is expensive.
- Some people feel that covering the landscape with these towers is unsightly.
- Can kill birds, migrating flocks tend to like strong winds.
- Can affect television reception if you live nearby.

- Noisy, A wind generator makes a constant, low, "swooshing" noise day and night, which can drive you nuts.

2.5.4 Solar

Introduction

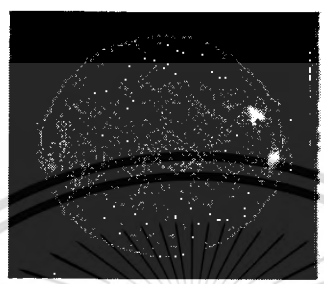


Figure. 2.4 Sun [8].

Solar power is energy from the Sun that we've used the Sun for drying clothes and food for thousands of years, but only recently have we been able to use it for generating power.

Principle of Solar Technology

There are three main ways that we use the Sun's energy;

1. Solar Cells (really called "photovoltaic" or "photoelectric" cells) that convert light directly into electricity. In a sunny climate, you can get enough power to run a 100 Watts light bulb from just one square metre of solar panel [6].

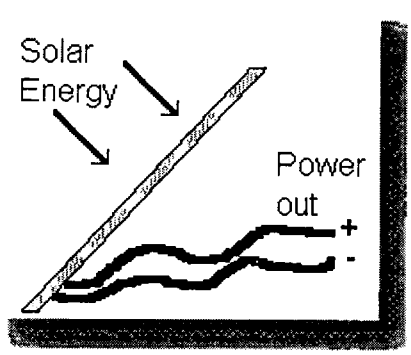


Figure. 2.5 Work of solar cells [6].

This was originally developed in order to provide electricity for satellites, but these days many of us own calculators powered by solar cells.

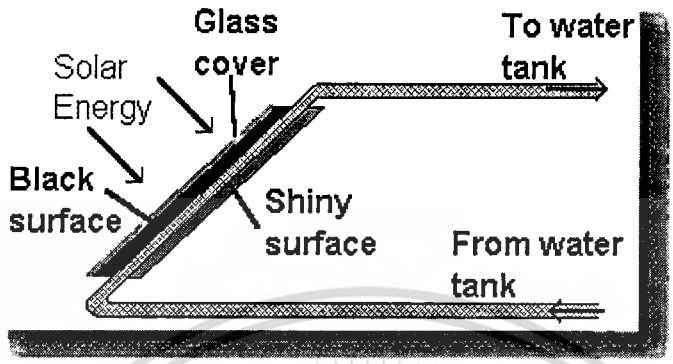


Figure. 2.6 Work of solar water heating [6].

2.Solar water heating, where heat from the Sun is used to heat water in glass panels on your roof. Water is pumped through pipes in the panel. The pipes are painted black, so they get hot when the Sun shines on them.

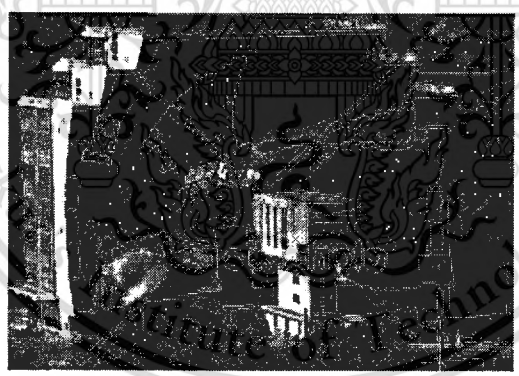


Figure. 2.7 Sample of solar furnaces [9].

3.Solar Furnaces use a huge array of mirrors to concentrate the Sun's energy into a small space and produce very high temperatures.

Advantages

- Solar energy is free, it needs no fuel and produces no waste or pollution.

- In sunny countries, solar power can be used where there is no easy way to get electricity to a remote place.

- Handy for low-power uses such as solar powered garden lights and battery chargers.

Disadvantages

- Doesn't work at night.

- Very expensive to build solar power stations. Solar cells cost a great deal compared to the amount of electricity they'll produce in their lifetime.

- Can be unreliable unless you're in a very sunny climate.

2.5.5 Hydrogen Fuel Cell

Introduction

Fuel cells are electro-chemical devices that operate at a high level of efficiency with little noise or air pollution. There are many potential applications for fuel cells, including electricity generation in stationary applications and provision of motor force for a new generation of transportation vehicles.

Principle of hydrogen fuel cell technology

All fuel cells operate on the same principle, they convert chemical energy directly into electricity and heat. In most, but not all fuel cells, the source of the fuel's chemical energy is hydrogen. In some cases, the fuel may need to be processed, or "reformed," before it can be used in the fuel cell.

An input fuel is catalytically reacted (electrons removed from the fuel elements) in the fuel cell to create an electric current. Fuel cells consist of an electrolyte material

that is sandwiched in between two thin electrodes (porous anode and cathode). The input fuel passes over the anode and oxygen passes over the cathode where it catalytically splits into ions and electrons. The electrons go through an external circuit to serve an electric load while the ions move through the electrolyte toward the oppositely charged electrode. At the electrode, ions combine to create by-products, primarily water and CO_2. Depending on the input fuel and electrolyte, different chemical reactions will occur.

Conceptual diagram of a fuel cell. Hydrogen and oxygen are combined electrochemically to produce energy, with water and useful heat as the only byproducts.

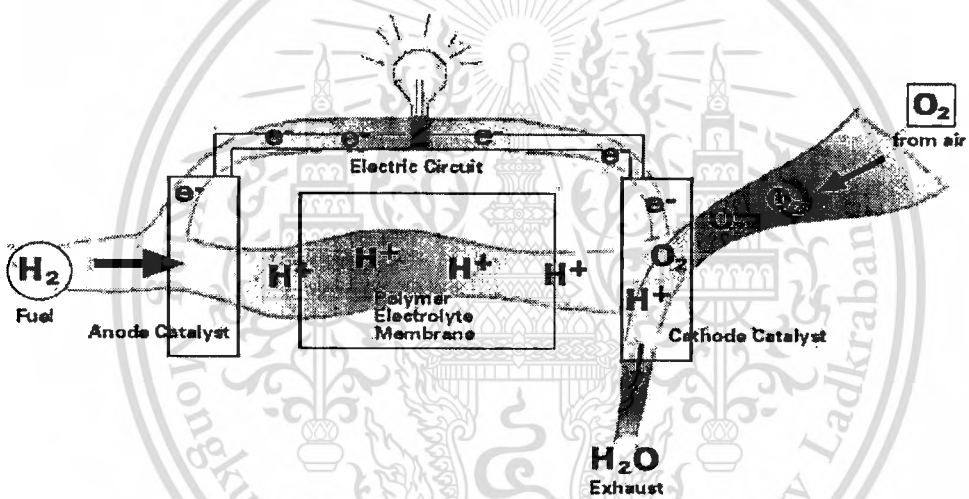


Figure. 2.8 Work of hydrogen fuel cell [10].

2.5.6 Hydropower

Introduction

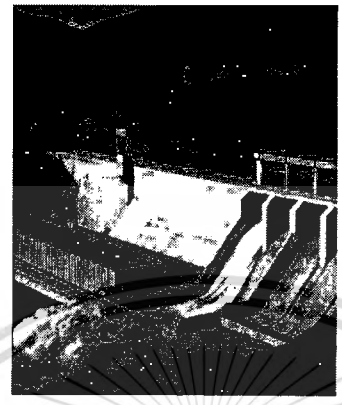


Figure. 2.9 Sample of hydropower [11].

Hydro-electric power is generated from falling water, we have used running water as an energy source, mainly to grind corn. The first use of water to generate electricity was in 1882 on the Fox river, in the USA, which produced enough power to light two paper mills and a house [6].

Principle of Hydro Technology

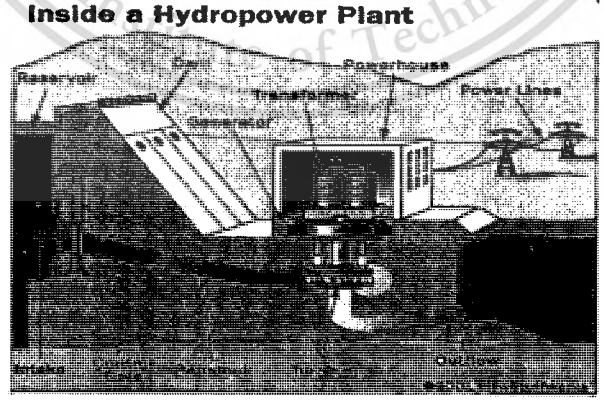


Figure. 2.10 Work of hydropower [12].

A dam is built to trap water, usually in a valley where there is an existing lake. Water is allowed to flow through tunnels in the dam, to turbine and thus drive generators. The dam is much thicker at the bottom than at the top, because the pressure of the water increases with depth.

Hydro-electric power stations can produce a great deal of power very cheaply. Although there are many suitable sites around the world, hydro-electric dams are very expensive to build. However, once the station is built, the water comes free of charge, and there is no waste or pollution.

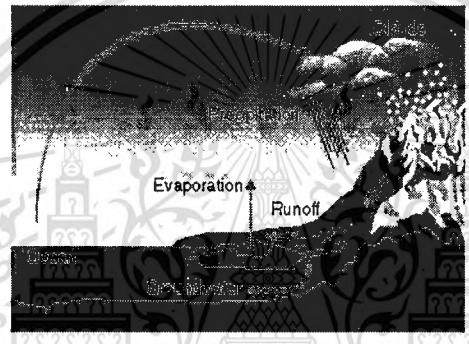


Figure. 2.11 Water's cycle [13].

The Sun evaporates water from the sea and lakes, which forms clouds and falls as rain in the mountains, keeping the dam supplied with water.

Advantages

- Once the dam is built, the energy is virtually free.
- No waste or pollution produced.
- Much more reliable than wind, solar or wave power.
- Water can be stored above the dam ready to cope with peaks in demand.
- Hydro-electric power stations can increase to full power very quickly, unlike other power stations.
- Electricity can be generated constantly.

Disadvantages

- The dams are very expensive to build, however, many dams are also used for flood control or irrigation, so building costs can be shared.

- Building a large dam will flood a very large area upstream, causing problems for animals that used to live there.

- Finding a suitable site can be difficult.

- The impact on residents and the environment may be unacceptable.

- Water quality and quantity downstream can be affected, which can have an impact on plant life.

2.5.7 Tidal

Introduction

Figure. 2.12 Sample of tidal [14].

Tidal power is energy from the sea, the tide moves a huge amount of water twice each day, and harnessing it could provide a great deal of energy. Although the energy supply is reliable and plentiful, converting it into useful electrical power is not easy.

Principle of Tidal Technology

These work rather like a hydro-electric scheme, except that the dam is much bigger. A huge dam (called a "barrage") is built across a river estuary. When the tide goes in and out, the water flows through tunnels in the dam.

The ebb and flow of the tides can be used to turn a turbine, or it can be used to push air through a pipe, which then turns a turbine. Large lock gates, like the ones used on canals, allow ships to pass.

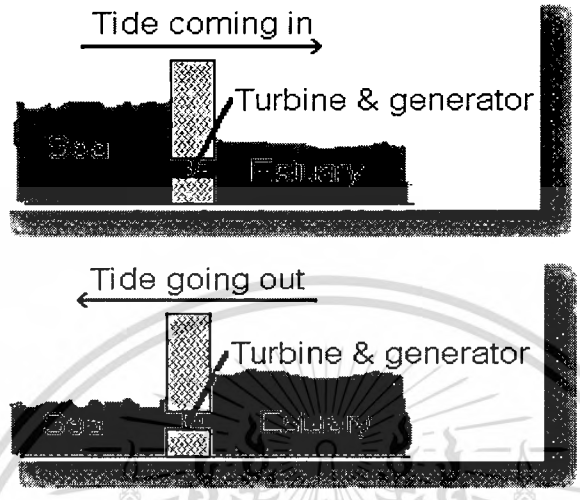


Figure. 2.13 Work of tidal power [15].

Advantages

- Huge amounts of energy are produced.
- It produces no greenhouse gases or other waste.
- It needs no fuel.
- It produces electricity reliably.
- Not expensive to maintain.
- Predictable energy production.
- Low running costs.

Disadvantages

- Very few suitable sites.
- Hazard to shipping.
-A barrage across an estuary is very expensive to build, and affects a very wide area.

- The environment is changed for many miles upstream and downstream. Many birds rely on the tide uncovering the mud flats so that they can feed. There are few suitable sites for tidal barrages.

-Only provides power for around 10 hours each day, when the tide is actually moving in or out.

2.5.8 Wave

Introduction

Figure. 2.14 Sample of wave [16].

Wave power is energy from the wind on the sea. Ocean waves are caused by the wind as it blows across the sea. Waves are a powerful source of energy. The problem is that it's not easy to harness this energy and convert it into electricity in large amounts. Thus, wave power stations are rare.

Principle of Wave Technology

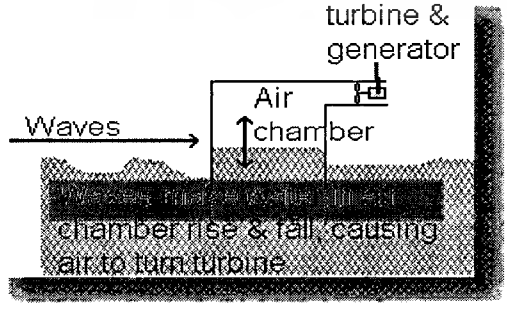


Figure. 2.15 Work of wave technology [6].

There are several methods of getting energy from waves, but one of the most effective works like a swimming pool wave machine in reverse. At a swimming pool, air is blown in and out of a chamber beside the pool, which makes the water outside bob up and down, causing waves.

At a wave power station, the waves arriving cause the water in the chamber to rise and fall, which means that air is forced in and out of the hole in the top of the chamber. We place a turbine in this hole, which is turned by the air rushing in and out. The turbine turns a generator.

A problem with this design is that the rushing air can be very noisy, unless a silencer is fitted to the turbine. The noise is not a huge problem anyway, as the waves make quite a bit of noise themselves.

Advantages

- The energy is free, no fuel needed, no waste produced.
- Not expensive to operate and maintain.
- Can produce a great deal of energy.

Disadvantages

- Depends on the waves, sometimes you'll get loads of energy, sometimes nothing.
- Needs a suitable site, where waves are consistently strong.
- Some designs are noisy.
- Must be able to withstand very rough weather.

2.5.9 Geothermal

Introduction

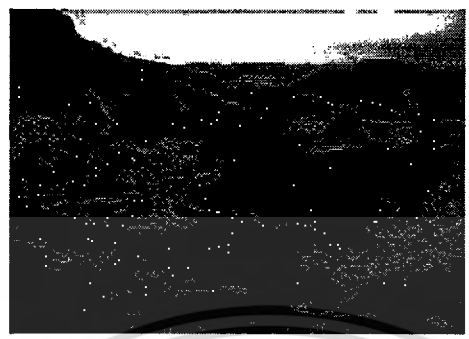


Figure. 2.16 Sample of geothermal source [17].

Geothermal energy is energy from heat inside the Earth. The centre of the Earth is around 6000 degress Celsius, hot enough to melt rock. Even a few kilometres down, the temperature can be over 250 degrees Celsius [6].

Source

The geologic processes known as *plate tectonics*, the Earth's crust has been broken into 12 huge plates that move apart or push together at a rate of millimeters per year. Where two plates collide, one plate can thrust below the other, producing extraordinary phenomena such as ocean trenches or strong earthquakes. At great depth, just above the down going plate, temperatures become high enough to melt rock, forming magma. Because magma is less dense than surrounding rocks, it moves up toward the earth's crust and carries heat from below. Sometimes magma rises to the surface through thin or fractured crust as lava.

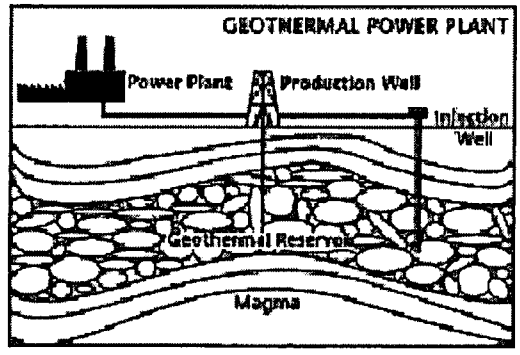


Figure. 2.17 Schematic of geothermal power plant production and injection wells[18] .

Principle of Geothermal Technology

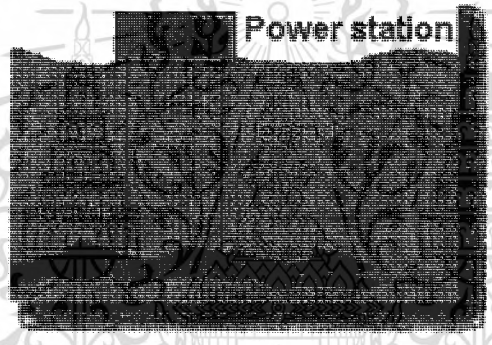


Figure. 2.18 Work of geothermal technology [6].

Hot rocks underground heat water to produce steam. We drill holes down to the hot region, steam comes up, is purified and used to drive turbines, which drive electric generators. There may be natural "groundwater" in the hot rocks anyway, or we may need to drill more holes and pump water down to them.

The first geothermal power station was built at Landrello, in Italy, and the second was at Wairekei in New Zealand. Others are in Iceland, Japan, the Philippines and the United States [6].

Advantages

- Geothermal energy does not produce any pollution, and does not contribute to the greenhouse effect.

- The power stations do not take up much room, so there is not much impact on the environment.

- No fuel is needed.

- The energy is almost free. It may need a little energy to run a pump, but this can be taken from the energy being generated.

Disadvantages

- Need hot rocks of a suitable type, at a depth where we can drill down to them.

-The type of rock above, it must be of a type that we can easily drill through.

- Sometimes a geothermal site may "run out of steam", perhaps for decades.

- Hazardous gases and minerals may come up from underground, and can be difficult to safely dispose of.

2.5.10 Biomass

Introduction

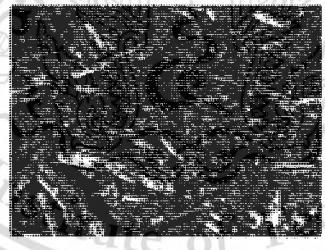


Figure. 2.19 Sample of biomass [19].

Biomass is energy from organic materials, wood was once our main fuel. We burned it to heat our homes and cook our food. Wood still provides a small percentage of the energy we use, but its importance as an energy source is dwindling.

Sugar cane is grown in some areas, and can be fermented to make alcohol, which can be burned to generate power in the same way as coal. Alternatively, the cane can be crushed and the pulp (called "bagasse") can be burned, to make steam to drive turbines.

Other solid wastes, can be burned to provide heat, or used to make steam for a power station. "Bioconversion" uses plant and animal wastes to produce fuels such as methanol, natural gas, and oil. We can use rubbish, animal manure, woodchips, seaweed, corn stalks and other wastes.

Source

Biomass energy is derived from three distinct energy sources: wood, waste, and alcohol fuels. Wood energy is derived both from direct use of harvested wood as a fuel and from wood waste streams. The largest source of energy from wood is pulping liquor or "black liquor," a waste product from processes of the pulp, paper and paperboard industry. Waste energy is the second-largest source of biomass energy.

The main contributors of waste energy are municipal solid waste (MSW), manufacturing waste, and landfill gas. Biomass alcohol fuel, or ethanol, is derived almost exclusively from corn. Its principal use is as an oxygenate in gasoline.

Principle of Biomass Technology

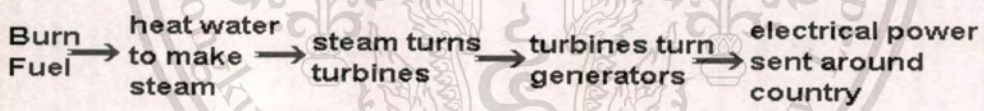


Figure. 2.20 Work of biomass technology [6].

The fuel is burned, which heats water into steam, which turns turbines, which in turn drive generators, just like in a fossil-fuel power station.

Advantages

- It makes sense to use waste materials where we can.
- The fuel tends to be cheap.
- Less demand on the Earth's resources.

Disadvantages

- Collecting the waste in sufficient quantities can be difficult.
- We burn the fuel, so it makes greenhouse gases.
- Some waste materials are not available all year round.

2.5.11 Pumped Storage

Introduction

Figure. 2.21 Sample of place that can use pumped storage technology [20].

Reservoirs aren't really a means of generating electrical power. They're a way of storing energy so that we can release it quickly when we need it. Demand for electrical power changes throughout the day. For example, when a popular TV programme finishes, a huge number of people go out to the kitchen to put the kettle on, causing a sudden peak in demand. If power stations don't generate more power immediately, there'll be power cuts around the country, traffic lights will go out, causing accidents, and all sorts of other trouble will occur.

The problem is that most of our power is generated by fossil fuel power stations, which take half an hour or so to crank themselves up to full power. Nuclear power stations take much longer.

We need something that can go from nothing to full power immediately, and keep us supplied for around half an hour until the other power stations catch up. Pumped storage reservoirs are the answer we've chosen.

Source

Pumped Storage is means of storing energy from other power stations so that source are sitted very where.

Principle of Pumped Storage Technology

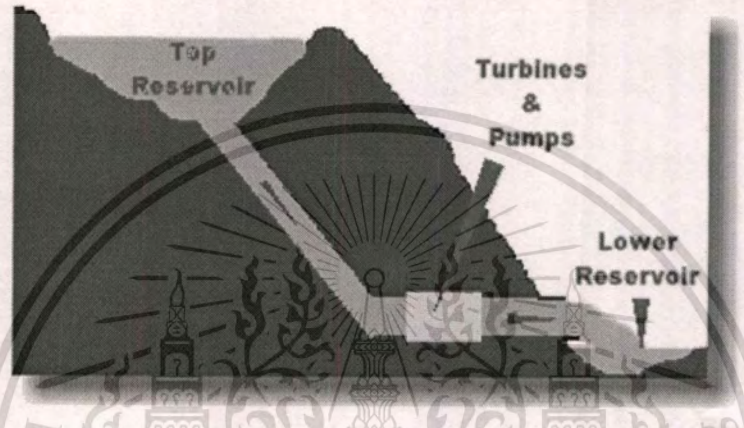


Figure. 2.22 Work of pumped storage technology [15].

Water is pumped up to the top reservoir, when there's a sudden demand for power, the "headgates" (huge taps) are opened, and water rushes down the tunnels to drive the turbines, which drive the powerful generators. The water then collects in the bottom reservoir, ready to be pumped back up later.

Advantages

- Provides a constant and reliable source of power.
- Can provide extra energy when it is needed most.
- Once installed, running costs are low.
- There is no atmospheric pollution and very little water pollution.
- Dams can also be used for flood control, water supply, irrigation or recreation.
- Pumped storage schemes have little visual impact.

Disadvantages

- Very expensive to construct.
- Alters the hydrological system, affects animals and plants in and around the water.
- Floods a large area:
- Loss of farmland and thus livelihood/food.
- Displacement of large numbers of people.
- Loss of natural habitat.
- Can alter drainage patterns over a huge area causing draught.
- Can cause micro-seismisity and affect the Earths orbit.

2.6 Non-renewable energy

2.6.1 Introduction

Non-renewable energy is sources will eventually run out. Nonrenewable energy sources come out of the ground as liquids, gases and solids. Nowaday, crude oil is the only naturally liquid commercial fossil fuel. Natural gas are normally gases, and coal is a solid. Coal, petroleum, natural gas are all considered fossil fuels because they formed from the buried remains of plants and animals that lived millions of years ago. Uranium ore, a solid, is mined and converted to a fuel. Uranium is not a fossil fuel. These energy sources are considered non renewable because they can not be replenished (made again) in a short period of time.

2.6.2 Type of non-renewable energy

Non-renewable energy was separated into 2 types, that is;

Fossil Fuel

Coal

Crude oil

Natural gas

Nuclear

2.6.3 Fossil Fuel

Introduction

Fossil Fuel or petroleum mean rock oil and is derived from the Greek petra-rock and the latin oleum-oil. Fossil fuels supply extensively of the world's energy needs .All fossil fuels, whether solid, liquid, or gas, are the result of organic material being covered by successive layers of sediment over the course of millions of years. Oil and natural gas were formed from the slow decomposition and burying of planktonic marine plants and animals that sank to the muds of the sea floor.

Basic components of petroleum

Most contituents are hydrocarbons, but there are significant amounts of compounds containing nitrogen (0 to 0.5%), sulfur (0 to 6%), and oxigen (0 to 3.5%) [21].

Aliphatics, Or Open Chain Hydrocarbons

1. n-Paraffin Series or Alkane, C_nH_{2n+2}

This series comprise a larger fraction of most crudes than any other. Most stright-run gasolines are predominantly n-paraffins. These material have poor antiknock properties.

2. Iso-paraffin Series or Iso-alkanes, C_nH_{2n+2}

These brain chain materials perform better in internal-combustion engines than n-paraffins and hence are considered more desirable. They may be formed ba catalytic reforming, alkylation, polymerization, or isomerization.

3. Olefin, or Alkaneseries, C_nH_{2n+2}

This series is generally absent in crudes, but refining processes such as cracking produce them. These relatively unstable molecules improve the antiknock quality of gasoline. Althrough not as effectively as iso-paraffins.

Ring Compounds

4. Naphthene Series or Cycloalkanes, C_nH_{2n}

This series, has the same chemical formula as the olefins, but lacks their instability and reactivity bacause the molecular configuration permits them to be saturated and unreactive like the alkanes. These compounds are the second most abundant series of compounds in most crudes.

5. Aromatic, or Benzenoid Series, C_nH_{2n-6}

Only small amounts of this series occur in most common crudes, but they are very desirable in gasoline since they have high antiknock value, good storage stability, and many uses beside fuels.

Lesser Components

Sulfur has always been an undesirable constituent of petroleum and other such as nitrogen, oxigen etc.

2.6.3.1 Coal

Introduction

Coal mainly consists of carbon atoms that come from plant material from ancient swamp forests. It is a black solid that is reasonably soft. You can scratch it with a fingernail. It is not as soft as charcoal, however, and is quite strong. It can be carved into shapes. There are different types of coal. Some contain impurities such as sulphur that pollute the atmosphere further when they burn, contributing to acid rain.

Principle of coal technology

Coal is a nonrenewable energy source, it takes millions of years to create. The energy in coal comes from the energy stored by plants that lived hundreds of millions of years ago, when the earth was partly covered with swampy forests.

For millions of years, a layer of dead plants at the bottom of the swamps was covered by layers of water and dirt, trapping the energy of the dead plants. The heat and pressure from the top layers helped the plant remains turn into coal.

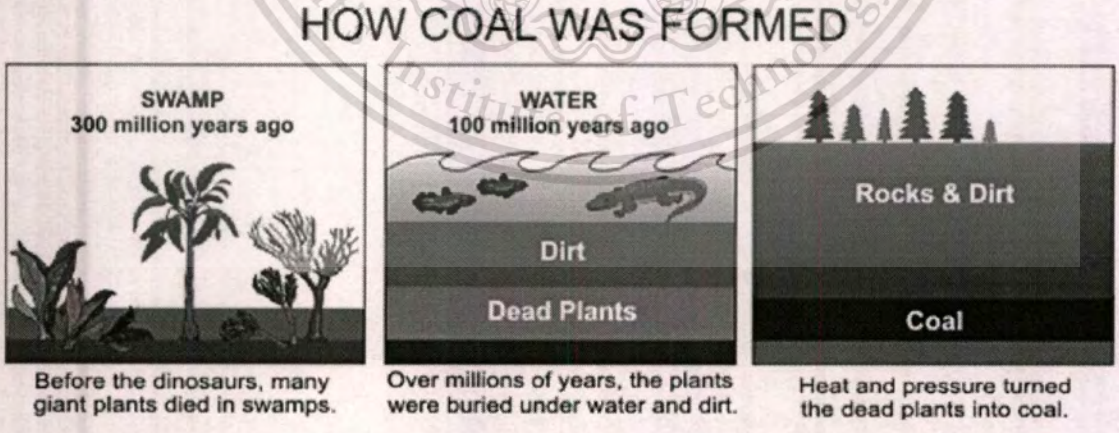


Figure. 2.23 Coal formation [5].

Mining the Coal

Coal miners use giant machines to remove coal from the ground. They use two methods: surface mining and underground mining. Many U.S. coal beds are very near the ground's surface, and about two-thirds of coal production comes from surface mines. Modern mining methods allow us to easily reach most of our coal reserves. Due to growth in surface mining and improved mining technology, the amount of coal produced by one miner in one hour has more than tripled since 1978 [5].

Figure. 2.24 Surface mining [22].

Surface mining is used to produce most of the coal because it is less expensive than underground mining. Surface mining can be used when the coal is buried less than 200 feet underground. In surface mining, giant machines remove the top-soil and layers of rock to expose large beds of coal. Once the mining is finished, the dirt and rock are returned to the pit, the topsoil is replaced, and the area is replanted. The land can then be used for croplands, wildlife habitats, recreation, or offices or stores.

Figure. 2.25 Underground mining or deep mining plant [5].

Sometimes called, is used when the coal is buried several hundred feet below the surface. Some underground mines are 1,000 feet deep. To remove coal in these underground mines, miners ride elevators down deep mine shafts where they run machines that dig out the coal.

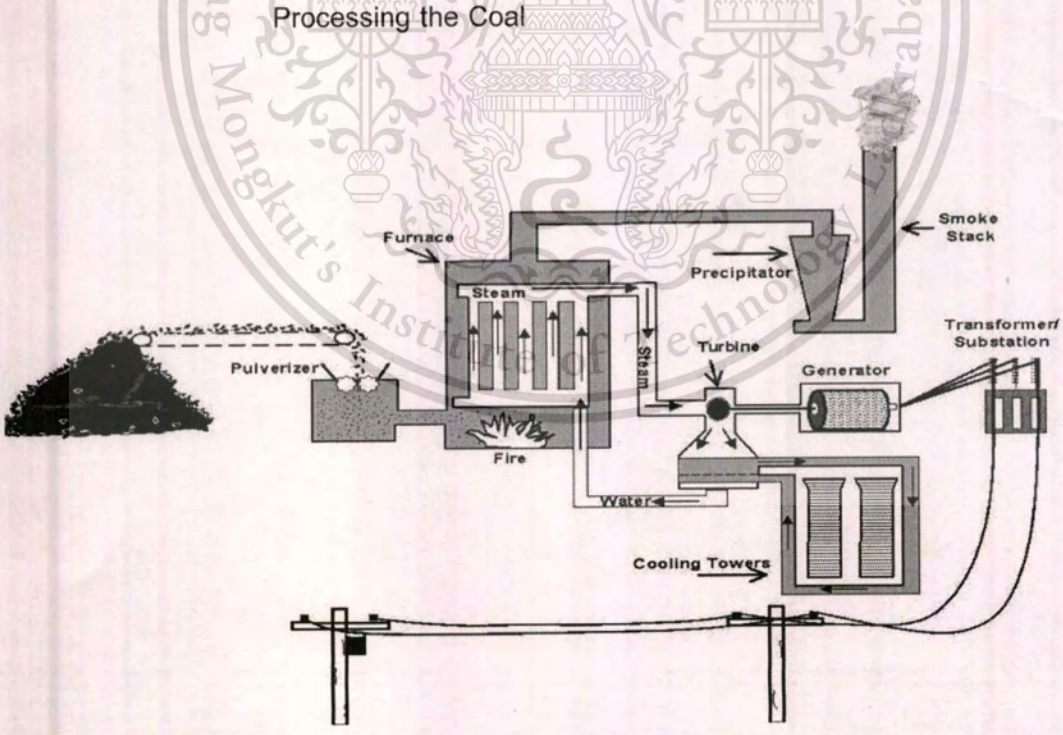


Figure. 2.26 Electricity generation by conventional coal combustion [23].

After coal is mined, it is transported to power plants by trains, barges, and trucks. A conveyor belt carries the coal to a pulverizer, where it is ground to the fineness of talcum powder. The powdered coal is then blown into a combustion chamber of a boiler, where it is burned at around 1,400°C. Surrounding the walls of the boiler room are pipes filled with water. Because of the intense heat, the water vaporizes into superheated high-pressure steam. The steam passes through a turbine (which is similar to a large propeller) connected to a generator. The incoming steam causes the turbine to rotate at high speeds, creating a magnetic field inside wound wire coils in the generator. This pushes an electric current through the wire coils out of the power plant through transmission lines. After the steam passes through the turbine chamber, it is cooled down in cooling towers and it again becomes part of the water/steam cycle.

Several by-products, including solids and gases, are created in the electricity generation process. A substance called "clinker" or bottom ash (glassy particles of melted coal ash) settles at the base of the furnace. This material is periodically removed and disposed of. Fly ash, the noncombustible minerals found in coal (including ash, dust, soot, and cinders) travels upward with gaseous by-products. Fly ash can be captured in an electrostatic precipitator and then transported by pipes to a holding pond, where it settles. Over 98 percent of all solids are captured in the plant. Gaseous by-products include carbon dioxide (CO_2), sulfur oxides (SO_x), and nitrogen oxides (NO_x). Sulfur oxides can be controlled by the installation of scrubbers at coal-fired power plants. Scrubbers allow high-sulfur coals to be used because they remove sulfur dioxides out of the gas stream in the stacks (a process called desulfurization). Scrubbers work by spraying limestone slurry directly in the path of the materials leaving the boiler chamber. The limestone reacts with the sulfur in the gases within the stacks. The combination of carbonate (limestone) and sulfur forms the mineral gypsum. Gypsum is a solid, which falls out of the gas to the bottom of the stacks, where it can be collected. The by-product gypsum created in this process can be used to make drywall and bowling balls. Nitrogen oxides are managed by careful control of the furnace temperature. There is current technology to control carbon dioxide; however, using high-efficiency coals helps reduce the output of CO_2 [23].

Transportation of Coal

Figure. 2.27 One of the way to transport coal [24].

After coal is mined and processed, it is ready to be shipped to market. The cost of shipping coal can cost more than the cost of mining it.

Most coal is transported by train, but coal can also be transported by barge, ship, truck, and even pipeline. It is cheaper to transport coal on river barges, but barges cannot take coal everywhere that it needs to go. If the coal will be used near the coal mine, it can be moved by trucks and conveyors. Coal can also be crushed, mixed with water, and sent through a "slurry" pipeline. Sometimes, coal-fired electric power plants are built near coal mines to lower transportation costs.

Type of Coal

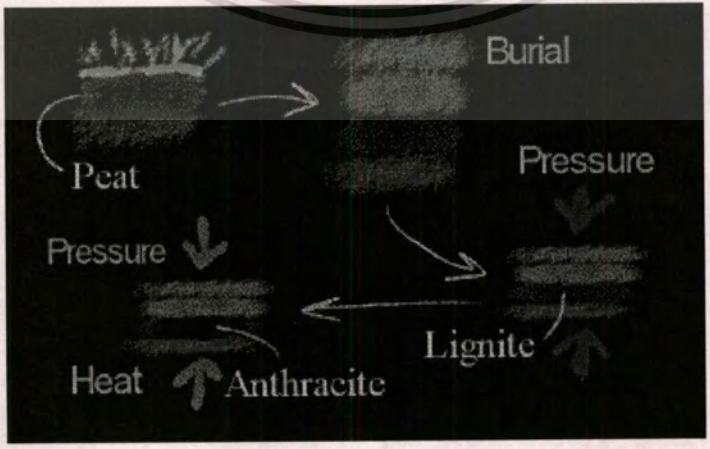


Figure. 2.28 Coal formation [25].

Coal is classified into four main types, depending on the amounts and types of carbon it contains and on the amount of heat energy it can produce. The rank of a deposit of coal depends on the pressure and heat acting on the plant debris as it sank deeper and deeper over millions of years. For the most part, the higher ranks of coal contain more heat-producing energy.

1. **Lignite** is the lowest rank of coal with the lowest energy content. Lignites tend to be relatively young coal deposits that were not subjected to extreme heat or pressure. Lignite is crumbly and has high moisture content.

2. **Subbituminous** coal has a higher heating value than lignite. Subbituminous coal typically contains 35-45 percent carbon, compared to 25-35 percent for lignite.

3. **Bituminous** coal contains 45-86 percent carbon, and has two to three times the heating value of lignite. Bituminous coal was formed under high heat and pressure. Bituminous coal is used to generate electricity and is an important fuel and raw material for the steel and iron industries.

4. **Anthracite** contains 86-97 percent carbon and its heating value is slightly lower than bituminous coal.

2.6.3.2 Crude oil

Introduction

Crude oil is a complex mixture of hydrocarbons with minor proportions of other chemical such as compound of sulphur, nitrogen and oxygen.

Crude oil is a naturally, occurring substance found trapped in certain rocks below the earth's crust. It is a dark, sticky liquid which, scientifically speaking, is classed as a hydrocarbon. This means, it is a compound containing only hydrogen and carbon. Crude oil is highly flammable and can be burned to create energy. Crude oil is measured in barrels [18].

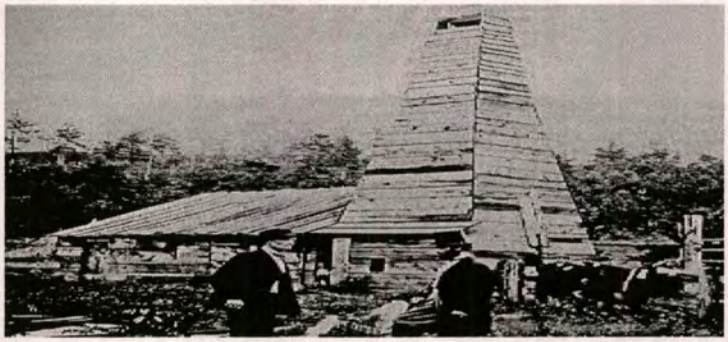


Figure. 2.29 The U.S.'s first commercial oil well was drilled in 1859 near Titusville, Pennsylvania, by Edwin Drake, in top hat [18].

Today's oil industry began almost 150 years ago, in 1859. In those days, an oily fuel for lamps and lubricants was made by melting the fact of whales. But whale oil had become expensive. A company called the Pennsylvania Rock Oil Company became interested in digging for natural oil. Oily rocks had been encountered in Pennsylvania by people drilling for salt. At first, this "rock oil" had been used as a medicine, but if enough of it could be found, perhaps it might be a cheaper substitute for whale oil. The Pennsylvania Rock Oil Company came up with the idea of drilling for oil. Not everyone was convinced, however. One banker who was asked to lend some of the money for the venture remarked, "Oil coming out of the ground, pumping oil out of the earth as you pump water? Nonsense!" But the Pennsylvania Rock Oil Company was convinced that drilling for oil rather than digging for it was the way to go. They hired a part-time railroad conductor named Edwin L. Drake to go to Titusville, Pennsylvania and see if he couldn't drill for oil. After a year of planning and drilling Drake struck oil. A new industry was born [18].

World crude oil reserves are estimated at more than one trillion barrels, of which the 11 OPEC Member Countries hold more than 75 percent [17]. According to the reference case of OPEC's World Energy Model (OWEM), total world oil demand in 2000 is put at 76 million barrels per day, As world economic growth continues, crude oil demand will also rise to 90.6m b/d in 2010 and 103.2m b/d by 2020 [18].

Table 2.1 Countries with largest crude oil reserves [18]

Country	Crude oil reserves *(million barrels)*
Saudi Arabia	262,784
Iraq	112,500
United Arab Emirates	97,800
Kuwait	96,500
Iran	93,100

Source

Crude oil is a smelly, yellow-to-black liquid and is usually found in underground areas called reservoirs. Scientists and engineers explore a chosen area by studying rock samples from the earth. Measurements are taken, and, if the site seems promising, drilling begins. Above the hole, a structure called a "derrick" is built to house the tools and pipes going into the well. When finished, the drilled well will bring a steady flow of oil to the surface.

Principle of oil technology

Oil was formed from the remains of animals and plants that lived millions of years ago in a marine (water) environment before the dinosaurs. Over the years, the remains were covered by layers of mud. Heat and pressure from these layers helped the remains turn into crude oil.

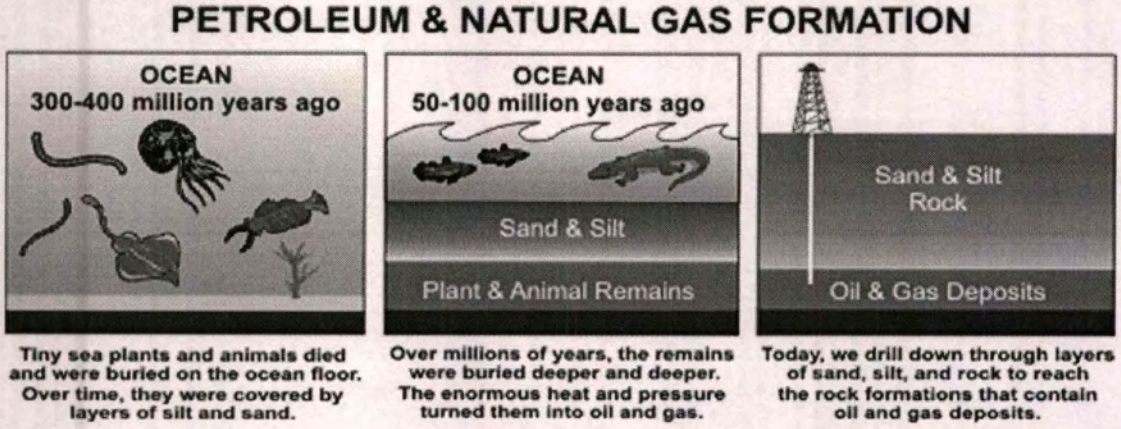


Figure. 2.30 Petroleum and natural gas Formation [5].

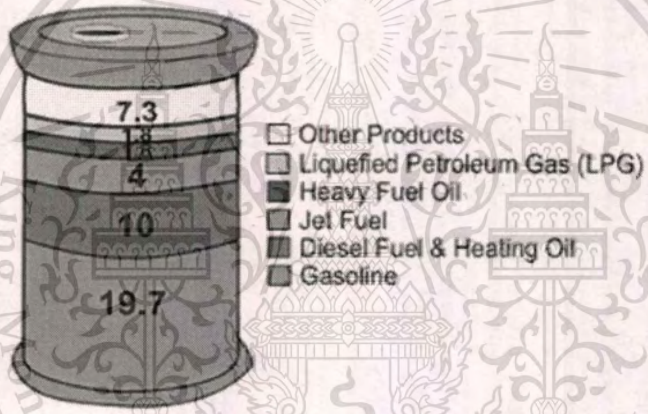


Figure. 2.31 Crude Oil made into Different Fuels [5].

After crude oil is removed from the ground, it is sent to a refinery by pipeline, ship or barge. At a refinery, different parts of the crude oil are separated into useable petroleum products. Crude oil is measured in barrels (abbreviated "bbls").

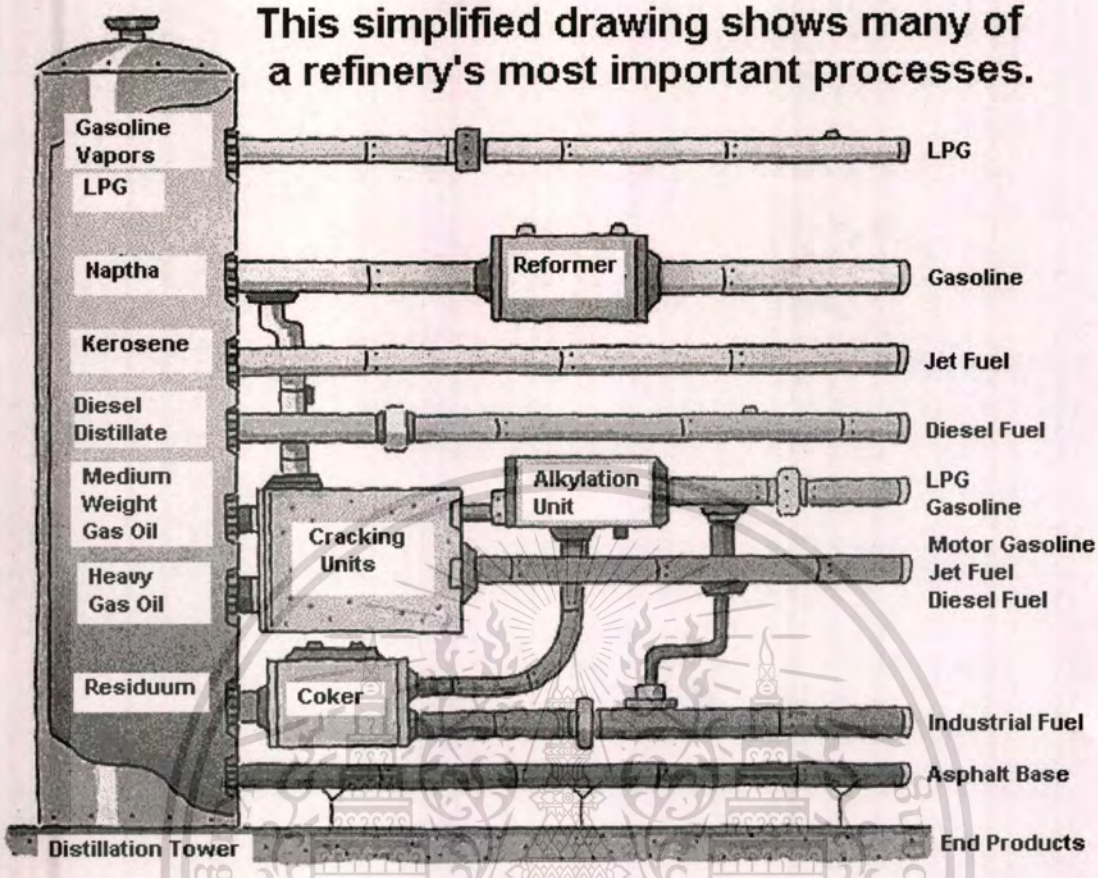


Figure. 2.32 Refinery product of crude oil [5].

2.6.3.3 Natural gas

Introduction

Natural gas is a mixture of hydrocarbons with small molecules. There molecules are made of atoms of carbon and hydrogen. Natural gas was formed millions of years ago when most of the earth was covered by water. Plant and tiny animal remains were mixed and layered with sand and mud. When the Earth underwent natural but drastic changes to form today's landscape, the intense heat and pressure transformed these fossils into hydrocarbons. Natural gas is made up mainly of a chemical called methane, a simple, compound that has a carbon atom surrounded by four hydrogen atoms. Methane is highly flammable and burns almost completely. There is no ash and very little air pollution. Depending on the arrangement of the atoms, what were once sea

plants and animals are now natural gas or crude oil deposits contained in the earth's crust. Natural gas (a combustible, gaseous mixture of simple hydrocarbons) is a very light portion of petroleum, which includes both natural gas and crude oil. Natural gas may rise to the surface through natural openings in the earth's crust or can be brought to the surface through man-made wells. Humans discovered thousands of years ago that this naturally occurring resource could be burned and used for heat and light.

In its natural state you can't see or smell natural gas. It is colorless, odorless and lighter than air. Mercaptan, a chemical odorant, is added to natural gas so it can be smelled if it leaks. Natural gas is made up mostly of methane, which has a simple hydrocarbon structure of one carbon atom and four hydrogen atoms (CH_4). This means it burns easily and emits less pollution. When natural gas is burned, it produces mostly carbon dioxide and water vapor. Natural gas can be found in a variety of different underground formations, including: shale formations, sandstone beds, coal seams, and deep, salt water aquifers (underground ponds of water).

TYPICAL NATURAL GAS COMPONENTS

COMPONENTS	PERCENT BY VOLUME
Methane	89.5 - 92.5
Ethane	5.1 - 2.0
Propane	2.1 - 0.7
Butanes	1.6 - 0.5
Nitrogen	0.6 - 1.9
Carbon Dioxide	1.1 - 2.4
Total	**100.0 - 100.0**

Figure. 2.33 Natural gas composition [26].

Formation of Natural Gas

Millions of years ago, the remains of plants and animals decayed and built up in thick layers. This decayed matter from plants and animals is called organic material , it was once alive. Over time, the mud and soil changed to rock, covered the organic material and trapped it beneath the rock. Pressure and heat changed some of this

organic material into coal, some into oil (petroleum), and some into natural gas, tiny bubbles of odorless gas. The main ingredient in natural gas is methane, a gas (or compound) composed of one carbon atom and four hydrogen atoms.

In some places, gas escapes from small gaps in the rocks into the air; then, if there is enough activation energy from lightning or a fire, it burns. When people first saw the flames, they experimented with them and learned they could use them for heat and light.

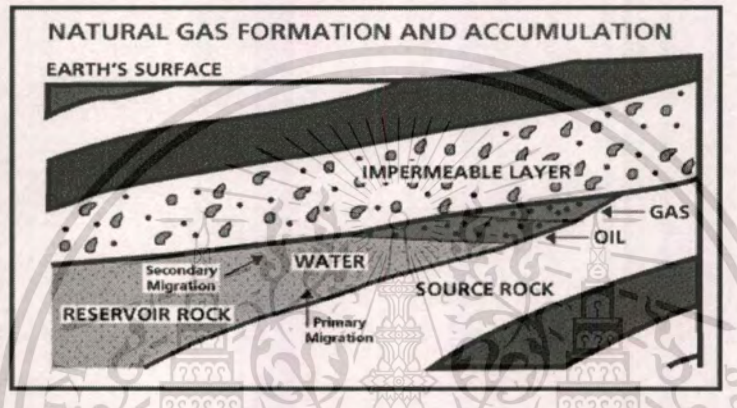


Figure. 2.34 Natural gas Formation [26].

Principle of natural gas technology

The search for natural gas begins with geologists locating the types of rock that are usually found near gas and oil deposits.

Today their tools include seismic surveys that are used to find the right places to drill wells. Seismic surveys use echoes from a vibration source at the earth's surface (usually a vibrating pad under a truck built for this purpose) to collect information about the rocks beneath. Sometimes it is necessary to use small amounts of dynamite to provide the vibration that is needed.

Scientists and engineers explore a chosen area by studying rock samples from the earth and taking measurements. If the site seems promising, drilling begins. Some of these areas are on land but many are offshore, deep in the ocean. Once the gas is found, it flows up through the well to the surface of the ground and into large pipelines. Some of the gases that are produced along with methane, such as butane

and propane (also known as "by-products"), are separated and cleaned at a gas processing plant. The by-products, once removed, are used in a number of ways. For example, propane can be used for cooking on gas grills.

Because natural gas is colorless, odorless and tasteless, mercaptan (a chemical that has a sulfur like odor) is added before distribution, to give it a distinct unpleasant odor (smells like rotten eggs). This serves as a safety device by allowing it to be detected in the atmosphere, in cases where leaks occur.

We can also use machines called "digesters" that turn today's organic material (plants, animal wastes, etc.) into natural gas. This replaces waiting for thousands of years for the gas to form naturally.

Storage and Deriverance of Natural Gas

The gas companies collect it in huge storage tanks, or underground, in old gas wells. The gas remains there until it is added back into the pipeline when people begin to use more gas, such as in the winter to heat homes.

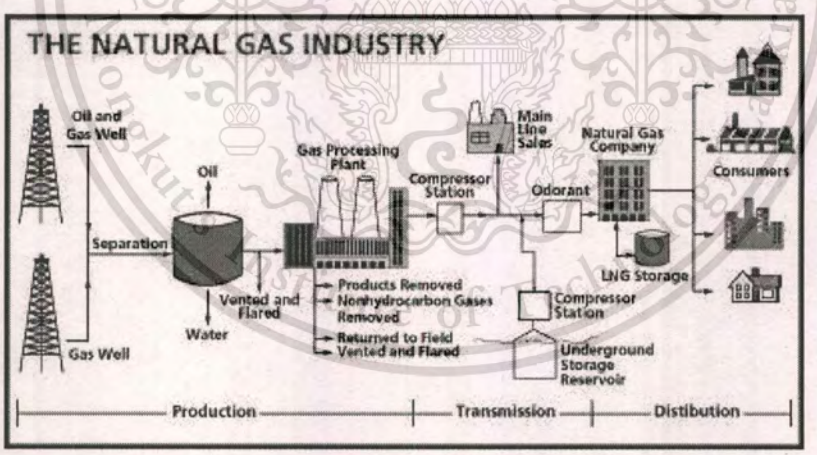


Figure. 2.35 Steps of natural gas translation [26].

Natural gas is moved by pipelines from the producing fields to consumers. Since natural gas demand is greater in the winter, gas is stored along the way in large underground storage systems, such as old oil and gas wells or caverns formed in old

salt beds. The gas remains there until it is added back into the pipeline when people begin to use more gas, such as in the winter to heat homes.

When chilled to very cold temperatures, approximately -260 degrees Fahrenheit, natural gas changes into a liquid and can be stored in this form. Liquefied natural gas (LNG) can be loaded onto tankers (large ships with several domed tanks) and moved across the ocean to deliver gas to other countries. Once in this form, it takes up only 1/600th of the space that it would in its gaseous state. When this LNG is received in the United States, it can be shipped by truck to be held in large chilled tanks close to users or turned back into gas to add to pipelines.

When the gas gets to the communities where it will be used(usually through large pipelines), the gas is measured as it flows into smaller pipelines called "MAINS". Very small lines, called "SERVICES", connect to the mains and go directly to homes or buildings where it will be used.

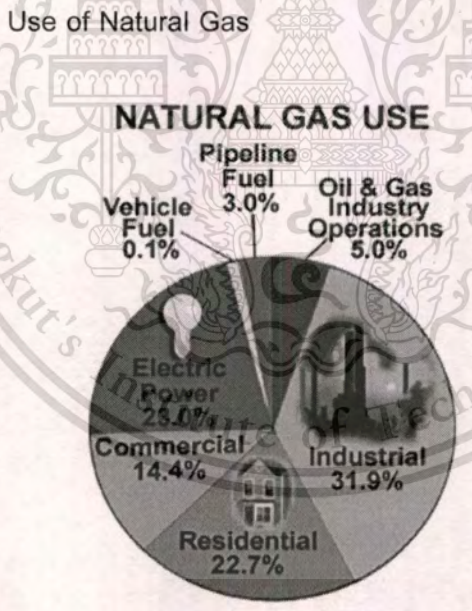


Figure. 2.36 Percent of use of natural gas [5].

Natural gas is also an essential raw material for many common products, such as: paints, fertilizer, plastics, antifreeze, dyes, photographic film, medicines, and explosives. We also get propane, a fuel we use in many of our backyard barbecue grills, when we process natural gas.

Industry depends on it. Natural gas has thousands of uses. It's used to produce steel, glass, paper, clothing, brick, electricity and much more. Homes use it too. Homes use natural gas to fuel stoves, furnaces, water heaters, clothes dryers and other household appliances. It is also used to roast coffee, smoke meats, bake bread and much more.

2.6.4 Nuclear

Introduction

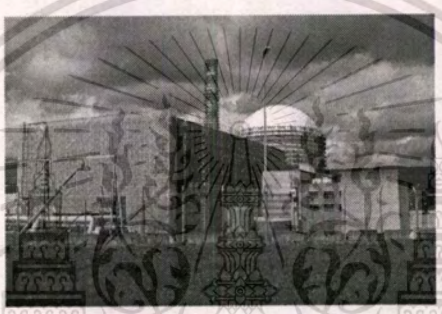


Figure. 2.37 Nuclear power [27].

Nuclear energy is energy in the nucleus (core) of an atom. Atoms are tiny particles that make up every object in the universe. There is enormous energy in the bonds that hold atoms together. Nuclear energy can be used to make electricity. But first the energy must be released. It can be released from atoms in two ways: nuclear fusion and nuclear fission.

In nuclear fusion, energy is released when atoms are combined or fused together to form a larger atom. This is how the sun produces energy.

In nuclear fission, atoms are split apart to form smaller atoms, releasing energy. Nuclear power plants use nuclear fission to produce electricity.

Source

Figure. 2.38 Uranium ore [28].

Nuclear power is generated using Uranium, which is a metal mined in various parts of the world. The first large-scale nuclear power station opened at Calder Hall in Cumbria, England, in 1956 [6].

Principle of Nuclear Technology

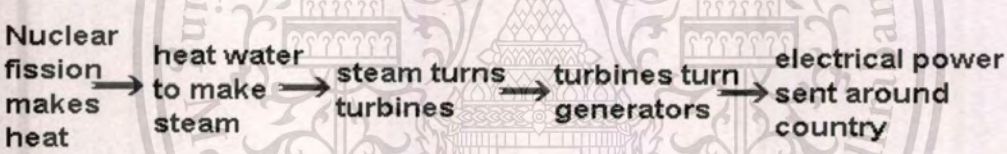


Figure. 2.39 Step of Nuclear Technology [6].

Nuclear power stations work in pretty much the same way as fossil fuel-burning stations, except that a "chain reaction" inside a nuclear reactor makes the heat instead. The reactor uses Uranium rods as fuel, and the heat is generated by nuclear fission. Neutrons smash into the nucleus of the uranium atoms, which split roughly in half and release energy in the form of heat. Carbon dioxide gas is pumped through the reactor to take the heat away, and the hot gas then heats water to make steam. The steam drives turbines which drive generators. Modern nuclear power stations use the same type of turbines and generators as conventional power stations.

In Britain, nuclear power stations are built on the coast, and use sea water for cooling the steam ready to be pumped round again. This means that they don't have the huge "cooling towers" seen at other power stations.

The reactor is controlled with "control rods", made of boron, which absorb neutrons. When the rods are lowered into the reactor, they absorb more neutrons and the fission process slows down. To generate more power, the rods are raised and more neutrons can crash into uranium atoms.

Advantages

- Nuclear power costs about the same as coal, so it's not expensive to make.
- Does not produce smoke or carbon dioxide, so it does not contribute to the greenhouse effect.
- Produces huge amounts of energy from small amounts of fuel.
- Produces small amounts of waste.
- Nuclear power is reliable.

Disadvantages

- Althoughnot much waste is produced, it is very dangerous. It must be sealed up and buried for many years to allow the radioactivity to die away.
- Nuclear power is reliable, but a lot of money has to be spent on safety, if it does go wrong, a nuclear accident can be a major disaster.

2.7 Environmental effect

2.7.1 Wind and the Environmental

Wind energy offers a viable, economical alternative to conventional power plants in many areas of the country. Wind is a clean fuel; wind farms produce no air or water pollution because no fuel is burned.

The most serious environmental drawbacks to wind machines may be their negative effect on wild bird populations and the visual impact on the landscape. To some, the glistening blades of windmills on the horizon are an eyesore; to others, they're a beautiful alternative to conventional power plants.

2.7.2 Geothermal and the Environmental

Geothermal power plants do have some environmental impacts. The primary impacts of geothermal plant construction and energy production are gaseous emissions, land use, noise, and potential ground subsidence.

Gaseous Emissions

Geothermal fluids contain dissolved gases, mainly carbon dioxide (CO_2) and hydrogen sulfide (H_2S), small amounts of ammonia, hydrogen, nitrogen, methane and radon, and minor quantities of volatile species of boron, arsenic, and mercury.

Geothermal power provides significant environmental advantage over fossil fuel power sources in terms of air emissions because geothermal energy production releases no nitrogen oxides (NO_x), no sulfur dioxide (SO_2), and much less carbon CO_2 than fossil-fueled power. The reduction in nitrogen and sulfur emissions reduces local and regional impacts of acid rain, and reduction in carbon-dioxide emissions reduce contributions to potential global climate change. Geothermal power plant CO_2 emissions can vary from plant to plant depending on both the characteristics of the reservoir fluid and the type of power generation plant. Binary plants have no CO_2 emissions, while dry steam and flash steam plants have CO_2 emissions on the order of 0.2 lb/kWh, less than one tenth of the CO_2 emissions of coal-fired generation [29].

Table 2.2 Comparison of CO_2 Emissions by Power Source [29]

Power Source	CO_2 Emissions (lb/kWh)
Geothermal	0.20
Natural gas	1.321
Oil	1.969
Coal	2.095

Hydrogen sulfide emissions do not contribute to acid rain or global climate change but does create a sulfur smell that some people find objectionable. The range of H_2S emissions from geothermal plants is 0.03-6.4 g/kWh. Hydrogen sulfide emissions can vary significantly from field to field, depending on the amount of hydrogen sulfide contained in the geothermal fluid and the type of plant used to exploit the reservoir. The most common process is the Stretford process, which produces pure sulfur and is capable of reducing H_2S emissions. More recently developed techniques include burning the hydrogen sulfide to produce sulfur dioxide, which can be dissolved, converted to sulfuric acid and sold to provide income [29].

Landscape Impacts and Land Use

Geothermal power plants require relatively little land. Geothermal installations don't require damming of rivers or harvesting of forests, and there are no mineshafts, tunnels, open pits, waste heaps or oil spills. An entire geothermal field uses only 1-8 acres per MW versus 5-10 acres per MW for nuclear plants and 19 acres per MW for coal plants [29].

Table below compares acreage requirements by technology. Geothermal power plants are clean because they neither burn fossil fuels nor produce nuclear waste. Geothermal plants can be sited in farmland and forests and can share land with cattle and local wildlife.

Table 2.3 Comparison of Land Requirement for BaseloadPower Genreation [29]

Power Source	Land Requirement (Acre/MW)
Geothermal	1-8
Nuclear	5-10
Coal	19

Geothermal plants are also benign with respect to water pollution. Production and injection wells are lined with steel casing and cement to isolate fluids from the environment. Spent thermal waters are injected back into the reservoirs from which the fluids were derived. This practice neatly solves the water-disposal problem while helping to bolster reservoir pressure and prolong the resource's productive existence.

Noise

Noise occurs during exploration drilling and construction phases. Table below shows noise levels from these operations can range from 45 to 120 decibels (dBa). For comparison, noise levels in quiet suburban residences are on the order of 50 dBa, noise levels in noisy urban environments are typically 80–90 dBa, and the threshold of pain is 120 dBa at 2,000-4,000 Hz. Site workers can be protected by wearing ear mufflers. With best practices, noise levels can be kept to belower, and construction noise should be practically indistinguishable from other background noises at distances of one kilometer [29].

Table 2.4 Geothermal Exploration and construction Noise Levels by Operation [29]

Operation	Noise Level (dBa)
Air drilling	85-120
Mud drilling	80
Discharging wells after drilling (to remove drilling debris)	Up to 120
Well testing	70-110
Diesel engines (to operate compressors and provide electricity)	45-55
Heavy machinery (e.g., for earth moving during construction)	Up to 90

Ground Subsidence

In the early stages of a geothermal development, geothermal fluids are withdrawn from a reservoir at a rate greater than the natural inflow into the reservoir. This net outflow causes rock formations at the site to compact, particularly in the case of clays and sediments, leading to ground subsidence at the surface. Key factors causing subsidence include:

- A pressure drop in the reservoir as a result of fluid withdrawal
- The presence of a highly compressible geological rock formation above or in the upper part of a shallow reservoir
- The presence of high-permeability paths between the reservoir and the formation, and between the reservoir and the ground surface

If all of these conditions are present, ground subsidence is likely to occur. In general, subsidence is greater in liquid-dominated fields because of the geological characteristics typically associated with each type of field. Ground subsidence can affect the stability of pipelines, drains, and well casings. It can also cause the formation of ponds and cracks in the ground and, if the site is close to a populated area, it can lead to instability of buildings.

2.7.3 Hydrogen fuel cell and the Environmental

Hydrogen is the simplest and most abundant element in the universe. Hydrogen can be produced from a wide variety of domestic resources using a number of different technologies. Fuel cells harness the chemical energy of hydrogen to generate electricity without combustion or pollution. NREL is working to develop and demonstrate advanced hydrogen and fuel cell technologies to reduce our nation's dependence on foreign oil, improve our air quality, and maintain our economic.

2.7.4 Oil and the Environmental

Products from oil do many things. We use them to fuel our airplanes, cars, and trucks, to heat our homes, and to make products like medicines and plastics. Even

though petroleum products make life easier, finding, producing, moving, and using them can cause problems for our environment like air and water pollution. Over the years, new technologies and laws have helped to reduce problems related to petroleum products. As with any industry, the government monitors how oil is produced, refined, stored, and sent to market to reduce the impact on the environment. Since 1990, fuels like gasoline and diesel fuel have also been improved so that they produce less pollution when we use them.

Exploring and drilling for oil may disturb land and ocean habitats. New technologies have greatly reduced the number and size of areas disturbed by drilling, sometimes called "footprints." Satellites, global positioning systems, remote sensing devices, and 3-D and 4-D seismic technologies, make it possible to discover oil reserves while drilling fewer wells. Plus, the use of horizontal and directional drilling make it possible for a single well to produce oil from much bigger areas. When the oil in a well is gone, the well must be plugged below ground, making it hard to tell that it was ever there. As part of the "rig-to-reefs" program, some old offshore rigs are toppled and left on the sea floor to become artificial reefs that attract fish and other marine life. Within six months to a year after a rig is toppled, it becomes covered with barnacles, coral, sponges, clams, and other sea creatures [29].

If oil is spilled into rivers or oceans it can harm wildlife. Although this type of spill can cause the biggest shock to wildlife because so much oil is released at one time, only 2 percent of all oil in the sea comes from ship or barge spills. While oil spills from ships are the most well-known problem with oil, more oil actually gets into water from natural oil seeps coming from the ocean floor. Or, from leaks that happen when we use petroleum products on land. For example, gasoline that sometimes drips onto the ground when people are filling their gas tanks, motor oil that gets thrown away after an oil change, or fuel that escapes from a leaky storage tank. When it rains, the spilled products get washed into the gutter and eventually go to rivers and the ocean. Another way that oil sometimes gets into water is when fuel is leaked from motorboats and jet skis [29].

A refinery is a factory where crude oil is processed into petroleum products. Because many different pollutants can escape from refineries into the air, the

government monitors refineries and other factories to make sure that they meet environmental standards.

When a leak in a storage tank or pipeline occurs, petroleum products can also get into the ground, and the ground must be cleaned up. To prevent leaks from underground storage tanks, all buried tanks are supposed to be replaced by tanks with a double-lining. This hasn't happened everywhere yet. In some places where gasoline has leaked from storage tanks, one of the gasoline ingredients called methyl tertiary butyl ether (MTBE) has made its way into local water supplies. Since MTBE makes water taste bad and many people are worried about drinking it, a number of states have started to ban the use of MTBE in gasoline [29].

Gasoline is used in cars, diesel fuel is used in trucks, and heating oil is used to heat our homes. When petroleum products are burned as fuel, they give off carbon dioxide, a greenhouse gas that is linked with global warming. The use of petroleum products also gives off pollutants such as carbon monoxide, nitrogen oxides, particulate matter, and unburned hydrocarbons that help form air pollution. Since a lot of air pollution comes from cars and trucks, many environmental laws have been aimed at changing the make-up of gasoline and diesel fuel so that they produce fewer emissions. These "reformulated fuels" are much cleaner-burning than gasoline and diesel fuel were in 1990. In the next few years, the amount of sulfur contained in gasoline and diesel fuel will be reduced dramatically so that they can be used with new, less-polluting engine technology.

2.7.5 Natural Gas and the Environmental

Natural gas burns more cleanly than other fossil fuels. It has fewer emissions of sulfur, carbon, and nitrogen than coal or oil, and it has almost no ash particles left after burning. Being a clean fuel is one reason that the use of natural gas, especially for electricity generation, has grown so much and is expected to grow even more in the future.

Of course, there are environmental concerns with the use of any fuel. As with other fossil fuels, burning natural gas produces carbon dioxide, which is the most

important greenhouse gas. Many scientists believe that increasing levels of carbon dioxide and other greenhouse gases in the earth's atmosphere are changeing the global climate.

As with other fuels, natural gas also affects the environment when it is produced, stored and transported. Because natural gas is made up mostly of methane (another greenhouse gas), small amounts of methane can sometimes leak into the atmosphere from wells, storage tanks and pipelines. The natural gas industry is working to prevent any methane from escaping. Exploring and drilling for natural gas will always have some impact on land and marine habitats. But new technologies have greatly reduced the number and size of areas disturbed by drilling, sometimes called "footprints." Satellites, global positioning systems, remote sensing devices, and 3-D and 4-D seismic technologies, make it possible to discover natural gas reserves while drilling fewer wells. Plus, the use of horizontal and directional drilling make it possible for a single well to produce gas from much bigger areas [29].

Natural gas pipelines and storage facilities have a very good safety record. This is very important because when natural gas leaks it can cause explosions. Since raw natural gas has no odor, natural gas companies add a smelly substance to it so that people will know if there is a leak. If you have a natural gas stove, you may have smelled this "rotten egg" smell of natural gas when the pilot light has gone out [29].

2.7.6 Coal and the Environmental

Environmental laws and modern technologies have greatly reduced coal's impact on the environment. Without proper care, mining can destroy land and pollute water. Today, restoring the land damaged by surface mining is an important part of the mining process. Because mining activities often come into contact with water resources, coal producers must also go to great efforts to prevent damage to ground and surface waters.

When coal is burned as fuel, it gives off carbon dioxide, the main greenhouse gas that is linked with global warming. Burning coal also produces emissions, such as sulfur, nitrogen oxide (NO_x), and mercury, that can pollute the air and water. Sulfur mixes

with oxygen to form sulfur dioxide (SO_2), a chemical that can affect trees and water when it combines with moisture to produce acid rain. Emissions of nitrogen oxide help create smog, and also contribute to acid rain. Mercury that is released into the air eventually settles in water. The mercury in the water can build up in fish and shellfish, and can be harmful to animals and people who eat them. The Clean Air Act and the Clean Water Act require industries to reduce pollutants released into the air and the water.

The coal industry has found several ways to reduce sulfur, nitrogen oxides, and other impurities from coal. They have found more effective ways of cleaning coal before it leaves the mine, and coal companies look for low-sulfur coal to mine. Power plants use "scrubbers" to clean sulfur from the smoke before it leaves their smokestacks. In addition, industry and government have cooperated to develop "clean coal technologies" that either remove sulfur and nitrogen oxides from coal, or convert coal to a gas or liquid fuel. The scrubbers and NO_x removal equipment are also able to reduce mercury emissions from some types of coal. Scientists are working on new ways to reduce mercury emissions from coal-burning power plants, since the Environmental Protection Agency (EPA) has set tighter mercury limits for the future.

2.7.7 Nuclear and the Environmental

Like all industrial processes, nuclear power generation has by-product wastes: radioactive waste and heat. Because nuclear generated electricity does not emit carbon dioxide into the atmosphere, nuclear power plants in the U.S. prevent emissions of about 697 million metric tons of carbon dioxide [29].

Radioactive wastes are the principal environmental concern for nuclear power. Most nuclear waste is low-level nuclear waste. It is ordinary trash, tools, protective clothing, wiping cloths and disposable items that have been contaminated with small amounts of radioactive dust or particles. These materials are subject to special regulation that govern their storage so they will not come in contact with the outside environment.

On the other hand the irradiated fuel assemblies are highly radioactive and must be stored in specially designed pools resembling large swimming pools (water cools the fuel and acts as a radiation shield) or in specially designed dry storage containers. Most nuclear fuel is stored under water. A few reactors store their older and less radioactive fuel in dry storage facilities outside using special concrete or steel containers with air cooling.

2.8 Saving energy

2.8.1 Introduction

If we reduce energy consumption, we can avoid construction of new power plants and other negative energy impacts. The savings below are expressed primarily as reduced Carbon dioxide emissions, but many other environmental damages will also be equally reduced.

2.8.2 Efficient Transportation

Transportation is a leading energy consumer. Try to live near your work or school, and use public transportation, carpool, walk, or bike when you can. Replace your SUV with one of the new hybrid gas and electric cars. The new efficient hybrids are reliable and drive (and refuel) just like a standard car, with no need to recharge batteries.

2.8.3 Better Appliances

Purchase energy efficient household appliances. This can make an enormous difference.

2.8.4 Cold Water Wash and Line Dry

Washing clothes in cold water reduces your washer's energy use by 75% and saves almost 500 lbs. of CO_2 per year [30]. Drying clothes outside in the fresh air and sunlight not only lengthens the life of your clothes but also saves energy. When you need to use the clothes dryer, run full loads and use the moisture-sensing setting. Clean the lint trap after each use and clear the outdoor dryer vent frequently to eliminate blockage and reduce resistance.

2.8.5 Refrigeration Tips

Maintain your refrigerator and freezer at the right temperature. The refrigerator should be between 38 and 42 degrees F and the freezer between 0 and 5 degrees F .Make sure the door is sealed tightly. Check the gasket (rubber seal) for cracks and dried on food. Choose a refrigerator with a freezer on top rather than a side-by-side unit [30].

2.8.6 Air Conditioning

In our part of the country, air conditioning is seldom necessary in a well-insulated home. If you increase your air conditioning thermostat by only 3°F you can save an average of 470 lbs. of carbon dioxide per year [30]. Ceiling or room fans can also be used to cool rooms significantly while using less energy than air conditioning. An attic "whole house" fan is an effective way of cooling your home without using the air conditioner. It forces hot air out of your home and draws cooler air in through attic vents.

2.8.7 Unplug Unnecessary Appliances

Unplug the extra refrigerator in your basement or garage. Unplug appliances like microwaves, stereos, VCRs and printers that do not have to be on all the time, but use energy when plugged in. Simply unplugging these appliances can save a lot of

energy. If possible, unplug electronic devices and chargers that have a block-shaped transformer on the plug when they are not in use.

2.8.8 Lighting

For every 75 watts incandescent light bulb which you replace with a 20 watts compact fluorescent, you'll get the same amount of light but save 1,300 lbs. of CO_2. (Compact fluorescents screw into regular sockets.) Fluorescents save 75% of the energy, yet they last much longer. Turn off unneeded lights. Also, keep bulbs dust-free. When building a new home, include natural lighting features (skylights, suntubes, larger south-facing windows, etc.) to reduce the need for artificial lights. Adjust your schedule when possible to be active in daylight and sleep during the dark [30].

2.8.9 Home Heating

Change furnace filters often because dirty filters restrict airflow and waste energy. Keep your furnace clean and properly adjusted. Switch from an oil or electric heating system to natural gas, which is more efficient. Replace simple dial-type thermostats with smart programmable thermostats. These units allow you to set the heating and cooling system to take a break while you're asleep or out, then come on at preset times to keep you comfortable when you wake up or come home. Dress warmly to stay comfortable without turning up the heat

2.8.10 Oven Smarts

Minimize the number of times you open an oven door during cooking. Each time, you lose 25 to 50 degrees or more. Do not preheat longer than necessary. Ten minutes should be sufficient. Preheating is not necessary when broiling [30].

2.8.11 Reduce Your Home Size

If you're about to build or buy a new home, aim for something smaller. Many new homes are much larger per person than in the past, which increases home energy consumption dramatically for construction, heating, dehumidifying and cooling.

2.8.12 Seal Air Leaks

One of the least expensive and most effective ways to reduce energy consumption in the home is to seal air leaks. A simple effort to weatherize your home, especially to seal any large air gaps in the attic and basement. Keep your fireplace damper closed unless a fire is burning to prevent heated air from escaping through the chimney. Avoid using kitchen, bathroom and other ventilating fans in excess, as these can eject a significant amount of heated or cooled air in a very short period of time.

2.8.13 Add Insulation

Adding attic insulation is also highly effective. Adding wall, attic, and basement insulation costs more per unit of energy saved. Pool blankets, insulating sheets that float on the surface, cut the energy consumption of pool heaters.

2.8.14 Window Efficiency

Adding air-gap window films or low-e films to existing windows, while not always cost-effective. When possible, replace old windows with new high performance, energy efficient (double-paned) windows or install storm windows. Curtains and shades can also help prevent hot or cold air from escaping.

2.8.15 Smart Landscaping

Shading your east and west windows with overhangs or trellises or by planting shade trees are also effective ways to reduce unwanted heat gain on hot, sunny days. They also act as windbreaks in winter. Also, Plant trees or shrubs to shade air-conditioning units (but not to block the airflow.)

2.8.16 Duct Work

Sealing and insulating heating and cooling ducts is a more expensive job, but saves more energy and therefore can reduce your emissions. Upgrading your heating or cooling equipment with new technology and making sure these units are regularly tuned (typically every year) will also reduce.

2.8.17 Hot Water Efficiency

Turn down your water heater to 120°F (from the usual 145°F). Reduce hot water consumption by installing efficient showerheads, faucets and other fixtures. You can insulate the water heater with an insulating blanket. This is especially valuable for older water heaters with little internal insulation. When buying a new water heater, look for the most efficient and properly sized type with the lowest life-cycle cost. Better yet, install a solar hot water heater [30].

2.8.18 Save Energy at Work

Turn off office equipment when not in use. Reduce energy consumption and equipment wear by setting computers, monitors, and copiers to sleep-mode. Better yet, turn them all the way off if you are not going to use them for an extended period of time, particularly when you go home at the end of the workday. To keep it simple, just plug your computer, scanner and printer into one power strip that can be switched off after shutting down your computer. Do the same with the microwave in the office lunchroom,

and other office appliances which are always on otherwise. Over your lunch break, turn off your computer monitor. This will save energy without losing your work or having to reboot. Encourage your co-workers to do the same.

2.8.19 Limit Your "Stuff" Consumption

Virtually every physical object you buy in a store requires energy for its production and/or operation. This includes clothing, accessories, household furnishings, office supplies, appliances, sporting goods, decorative objects, and toys which all consume energy. We could easily have happy, fulfilled lives while reducing this consumption, and save tremendous energy (and money) in the process. Unclutter your life and live more simply. When you do buy, try to purchase locally made goods and avoid energy costs due to long-distance transportation.

2.8.20 Eat a Vegetarian Diet

The production of meat, dairy, and eggs is energy intensive. We can all reduce our food energy consumption by eating plant proteins directly, converting at least some of our daily meals to vegetarian dishes. This will also be healthier for you and your family, save money, reduce water consumption, reduce water pollution, reduce landuse impacts of livestock production, and reduce the potential for animal cruelty.

2.8.21 Limit Your Family Size

Each person requires energy to live. Our human population is rapidly rising to levels which make it difficult to provide adequate energy while sustaining a healthy environment. If each couple limited themselves to no more than 2 children, our world's population could stabilize and support everyone without conflict or suffering.

2.8.22 Get Involved and Talk to Your Legislators

Many of our current governmental regulations are not helpful for conserving energy, and some policies actually reward large energy users with lower bulk rates. Citizens need to contact their legislators and ask for better policies.

CHAPTER 3
RESEARCH DETAILS

Research Details were separated into 2 parts i.e. Collection of the energy information and website building.

3.1 Collection of energy information

In this special project the energy information was collected from internet by;

1. Using search engines such as;

- www.google.com
- search.yahoo.com
- www.altavista.com
- www.hotbot.com
- www.excite.com

2. Using many key words and phrases such as

By key words

- Energy
- Energy Fuel
- Alternative Energy
- Renewable Energy
- Non-renewable Energy
- Wind
- Wind Energy
- Solar
- Energy saving

- Fuel Saving
- Etc.

By phrases

- New Ways of Energy
- Source of Energy
- Renewable Source of Energy
- Non-renewable Source of Energy
- Research of Energy
- Energy Research
- Etc.

3.2 Manipulation of energy information

The collected energy information was categorized as following;

General energy information

Introduction

Renewable energy

Introduction

Type of renewable energy

Wind

Introduction

Source

Principle of wind technology

Advantage

Disadvantage

Experimental and research

. Solar

Introduction

Source

Principle of solar technology

Advantage

Disadvantage

Experimental and research

Hydrogen fuel cell

Introduction

Source

Principle of hydrogen fuel cell technology

Advantage

Disadvantage

Experimental and research

Hydropower

Introduction

Source

Principle of hydropower technology

Advantage

Disadvantage

Experimental and research

Tidal

Introduction

Source

Principle of tidal technology

Advantage

Disadvantage

Experimental and research

Non-renewable energy

Introduction

Type of non-renewable energy

Fossil Fuel

- Introduction
- Coal
  - Introduction
  - Source
  - Principle of coal technology
  - Advantage
  - Disadvantage
  - Experimental and research
- Oil
  - Introduction
  - Source
  - Principle of oil technology
  - Advantage
  - Disadvantage
  - Experimental and research
- Natural gas
  - Introduction
  - Source
  - Principle of natural gas technology
  - Advantage
  - Disadvantage
  - Experimental and research

Nuclear fuel

- Introduction
- Source
- Principle of nuclear fuel technology
- Advantage
- Disadvantage
- Experimental and research

Environmental effect of different types of energy

Introduction

Effect of energy separate by type of energy

Saving energy

3.3 Website building

Step 1 Write down the design of web site.

The web site was designed in which it can be contained title, logo, menu, data and site map. The design of front and color of the web site were also considered.

Step 2 Write the site map.

There are 3 types of site map;

1. Sequence method organizes information into a linear path. This can be chronological, general to specific, or alphabetical. This method works well for training sites and with sequential information that only makes sense in a linear presentation.

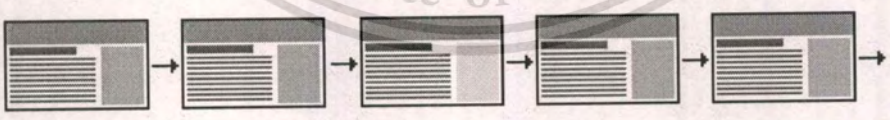


Figure. 3.1 Sequence method organizes information.

2. Hierarchy of information is organized by level of importance. This method works best for complex units of well-organized information.

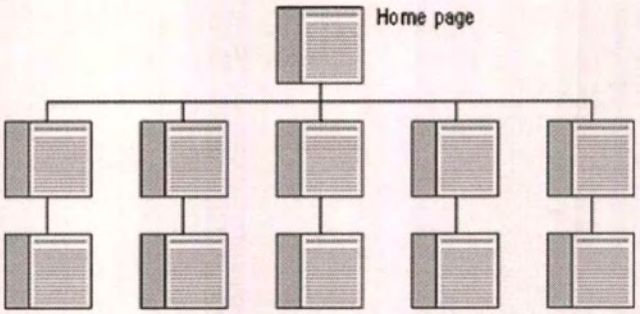


Figure. 3.2 Hierarchy of information.

3. Web organization links all information to all other information. This allows people to choose which topics to explore, but can be confusing since there is no specific order to be followed.

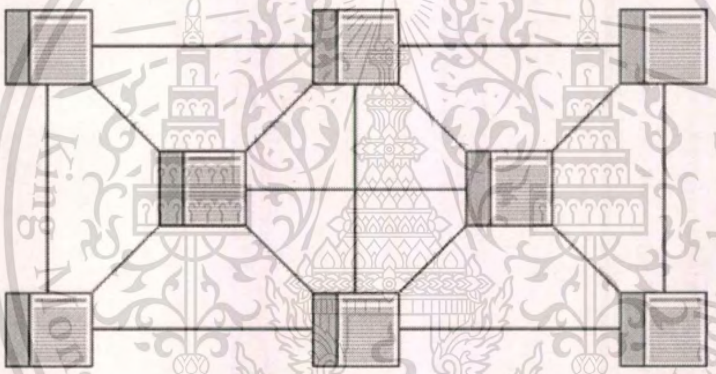


Figure. 3.3 Web organization.

Step 3 Set up the color, style of page background, font.

This step, just choose the color, style of page background, font that we prefer.

Step 4 Get started with macromedia dream weaver mx

1. Open Dreamweaver MX.

Most people will be able to open Dreamweaver by selecting Start > Programs > Macromedia > Dreamweaver.

2. Creating a New Web Page.

Dream weaver automatically opens a blank Web document for you to begin typing or pasting text to create your Web document. To start another blank document at any time, choose File > New > Basic page > Html > Create.

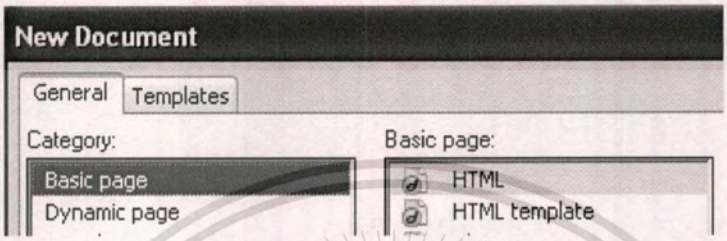


Figure. 3.4 Creating new web page.

Give the Web page a meaningful title. In the *Title* box type in the name of your Web page. That is "Energy Information".

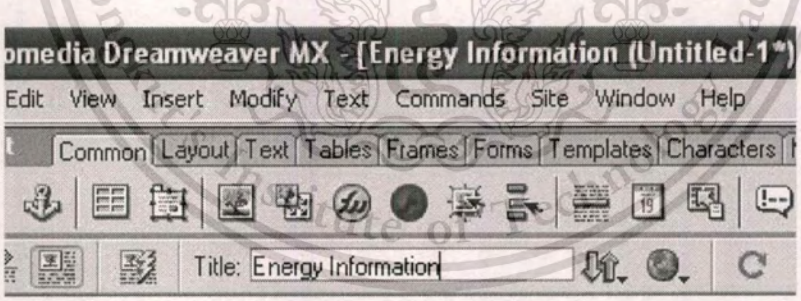


Figure. 3.5 Title fill form by dream weaver program.

Or, you can see in HTML code is

```
1 <!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.01
2 <html>
3 <head>
4 <title>Energy Information</title>
5 <meta http-equiv="Content-Type" content="tex
6 </head>
7
8 <body>
```

Figure. 3.6 Title fill form by HTML code.

Step 5 Creating a simple layout using tables

1. Position the cursor where you want the table to appear and click once.
2. From the menu bar, choose **Insert > Table.**

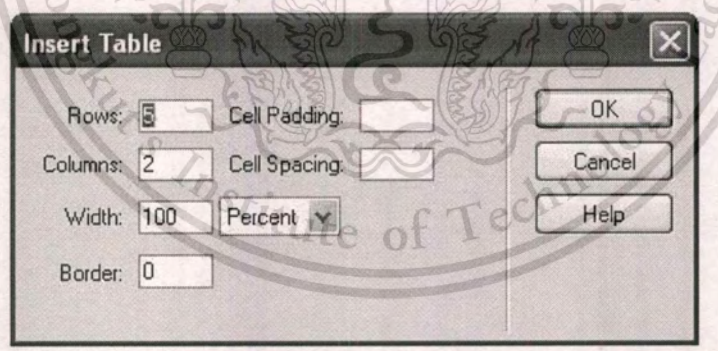


Figure. 3.7 Table insertion.

Will get like this;

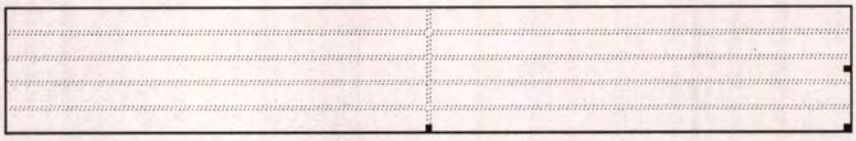


Figure. 3.8 Table from.

3. Set a background color for each cell. Click into a cell to select it, select the down arrow next to the small *Bg* box of the *Properties* window. A palette of color choices will appear. A common scheme is to use one color for both cells in the top row, a complementary color for the links column, and a third color for both cells in the bottom row.

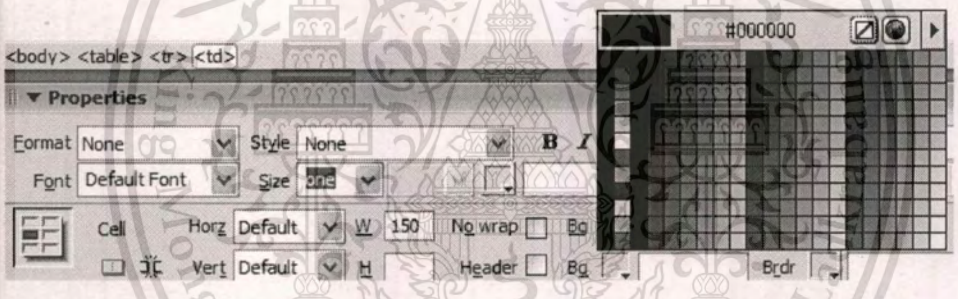


Figure. 3.9 Properties set; color addition.

At this point, your page should look something like this

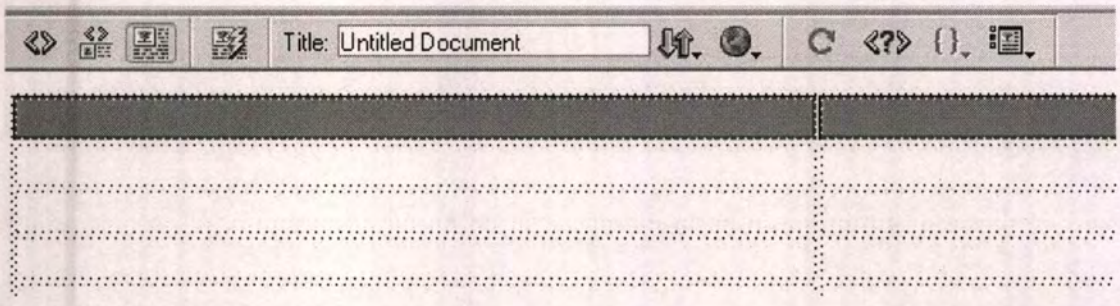


Figure. 3.10 Table after fill background color.

Step 6 Working with Text

Add text to your Web site. Click in the top right cell and type in the text for the title of your page. If you want to change the format, highlight the text, and then change the desired property.

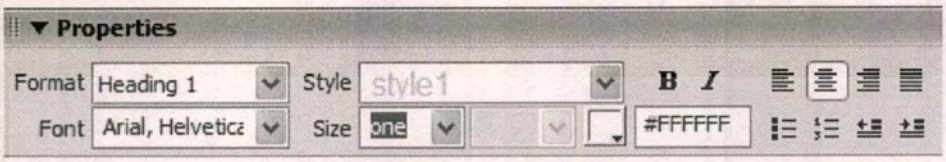


Figure. 3.11 Properties set; Font style.

Click in the left middle cell and type in the text for the links that will allow visitors to navigate your site. Since you haven't created other pages yet, use place holders for now and change them later within Dreamweaver. Place the cursor in the center row of the left links column, click on the *Left Align* icon and then the Text *Indent* icon to move the text from the left edge. Set the *Vert* (vertical alignment) to *Top*.

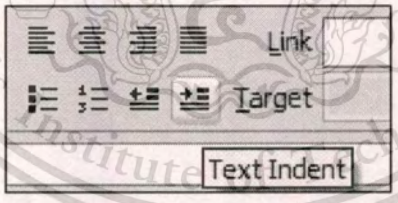


Figure. 3.12 Text Indent.

Step 7 Inserting Images, ALT Text

Go to the Insert menu and select Image. In the Select Image Source dialog box, locate the desired image. Click on the Down Arrow to the right of the Look In box, choose the correct drive, go to the desired folder, and select the image.

If this image is outside of your Web site, Dreamweaver will ask if you want to save a copy of the image inside of your Web. Click *Yes*.

Dreamweaver will then give you the option of renaming your image or changing the folder where it will be saved. Make any necessary changes and then click *OK*.

With the image selected, go to the *Properties* window and type in a short description of the image in the *Alt* field. This text will appear if the image does not display, and when the image is moused over in a Web browser. Each image on your Web site should have an *Alt* tag.

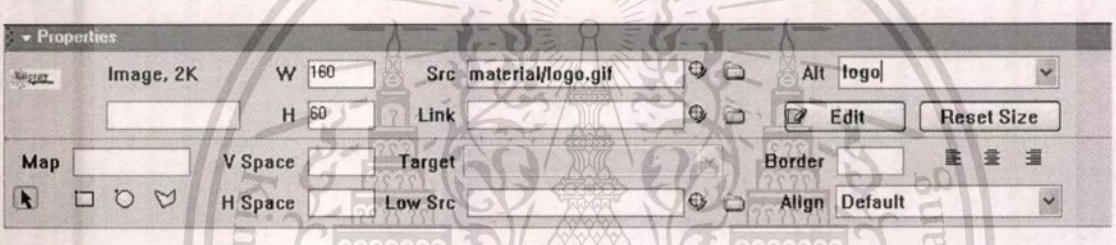


figure. 3.13 Properties set; ALT set.

Step 8 Creating Links

1. Type in text, such as "Energy"
2. Highlight the text.
3. Go to the *Link* field of the *Properties* box. For external links to other Web sites, type in the full Web address in the *Link* field. For internal links to pages on your Web site, use the *Folder* icon to the right of the *Link* field to browse to and select the file. Dreamweaver will then set the link properties for you.

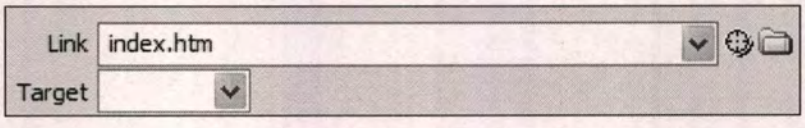


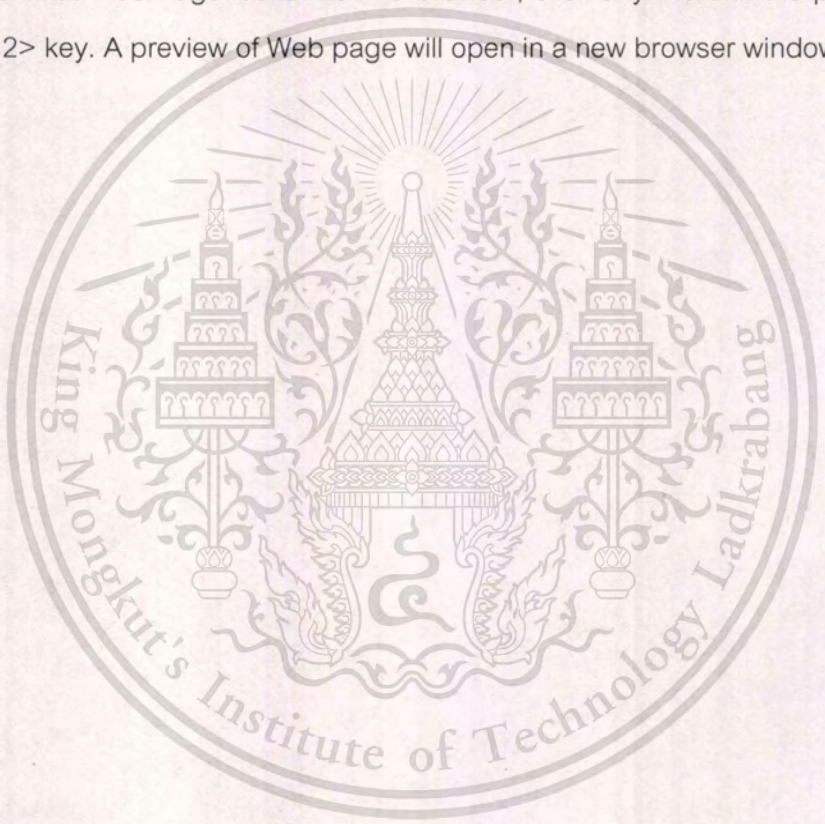
Figure. 3.14 Properties set; link set.

Step 9 Saving your Web Page

1. Go to *File* > *Save*. Browse to your Web folder,
2. Choose a short name (8 characters or less, all lower case, no symbols or spaces for maximum compatibility) for your Web page and click *Save*.

Step 10 Previewing your Web Page

To see what Web Page looks like in a browser, click anywhere in the page and press the <F12> key. A preview of Web page will open in a new browser window.



CHAPTER 4

RESULT AND DISCUSSION

4.1 Collection of energy information

Some search engines and some key words used for collection of energy information were shown in figure 4.1-4.5.

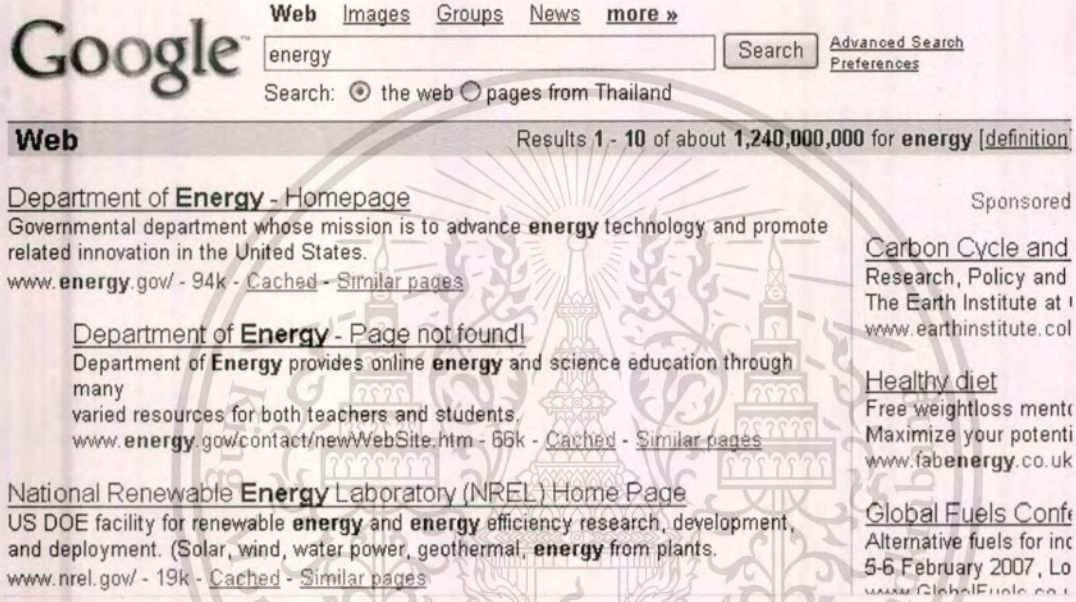


Figure. 4.1 Searched by www.google.com with key word "energy".

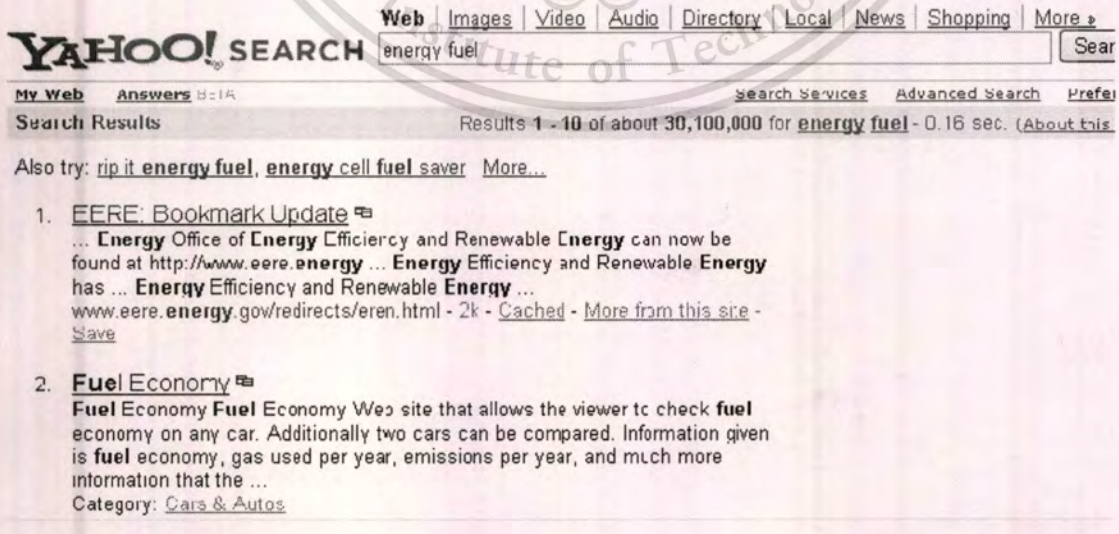


Figure. 4.2 Searched by search.yahoo.com with key word "energy fuel".

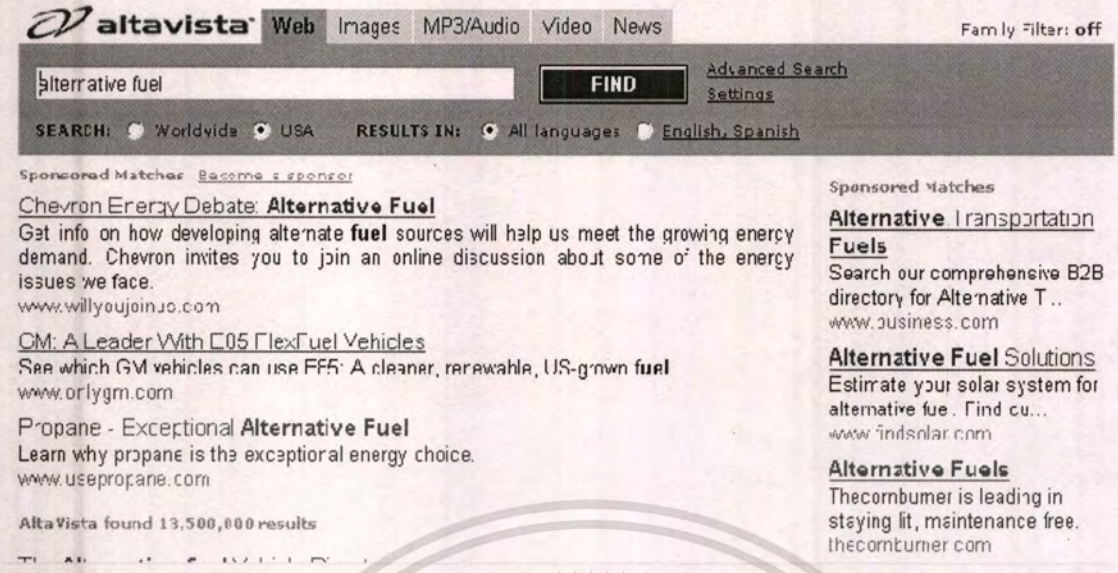


Figure. 4.3 Searched by www.altavista.com with key word “alternative fuel”.

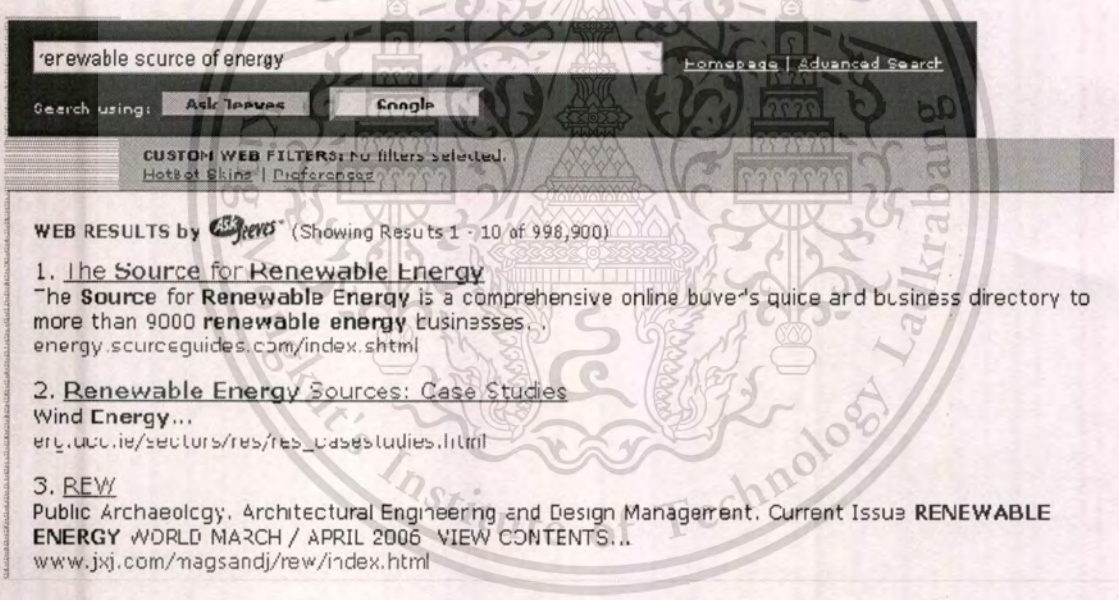


Figure. 4.4 Searched by www.hotbot.com with phase “renewable source of energy”.

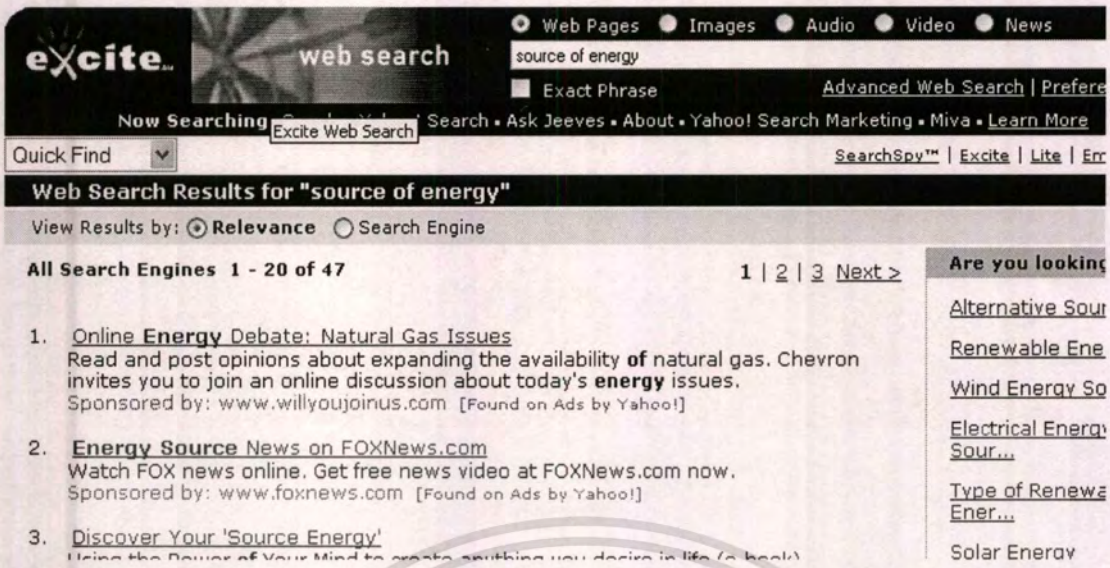


Figure. 4.5 Searched by www.excite.com with phase "source of energy".

After collected information, It was summarizes into the form like 3.2 in chapter 3. And will get the information that shown in chapter 2.

4.2 Website building

The designed website of energy information was shown in figure 4.6. It has URL http://energy-page.e-thai.net. The hosting of this website is kid-d network or http://my.kid-d.com/club/index.php and transfer the URL in short form by web page Thai or http://freeurl.webpagethai.com.

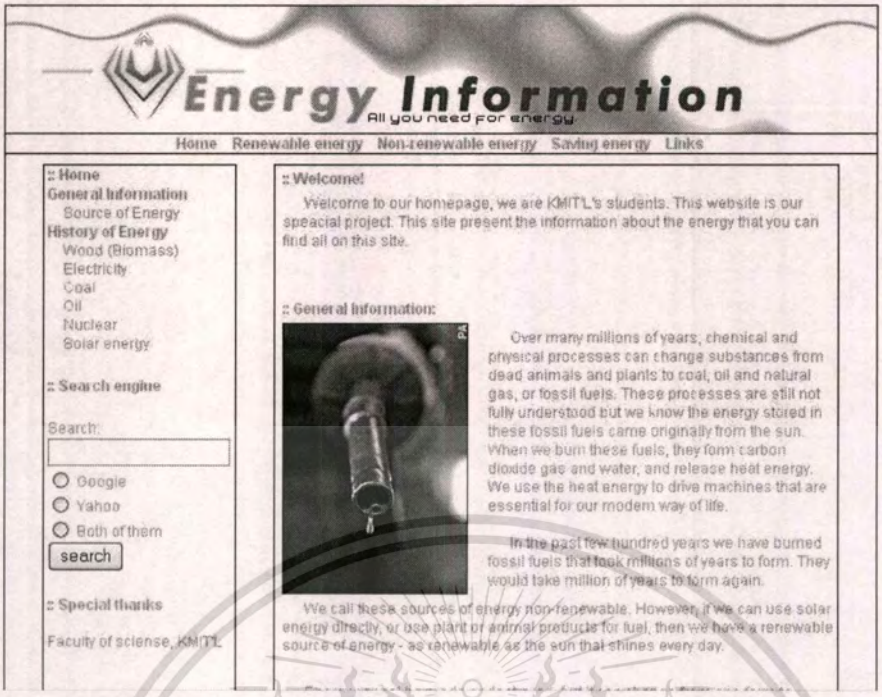


Figure. 4.6 Index page of energy information website.

The first page or index of energy-page was shown in figure 4.6. The web pages of each energy were shown in the figure 4.7-4.20.

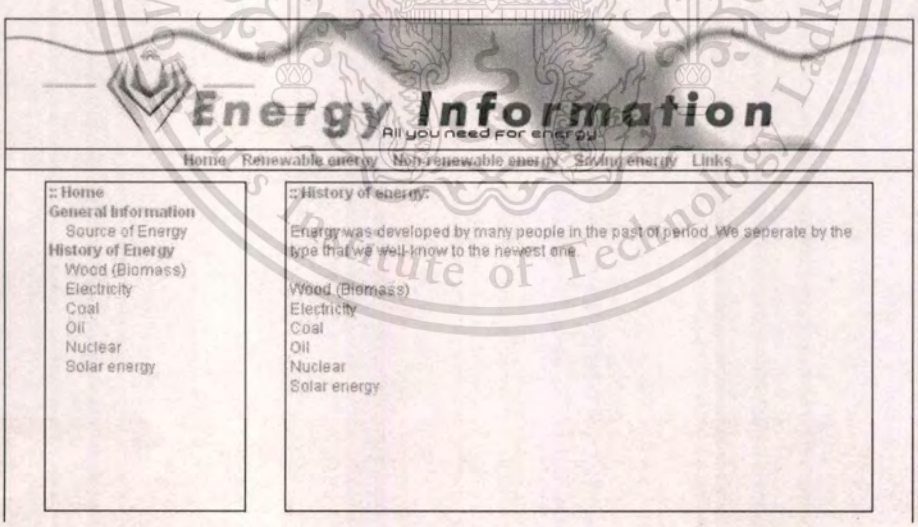


Figure. 4.7 History of energy page.

Figure 4.7 - 4.9 show the web pages of the history of energy.

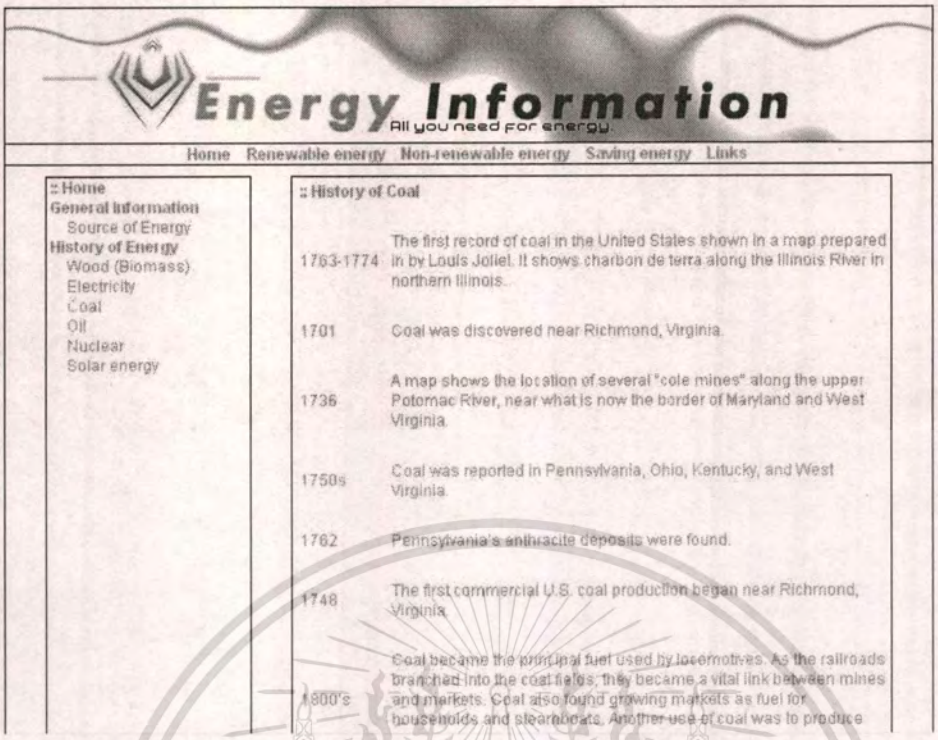


Figure. 4.8 History of coal energy page.

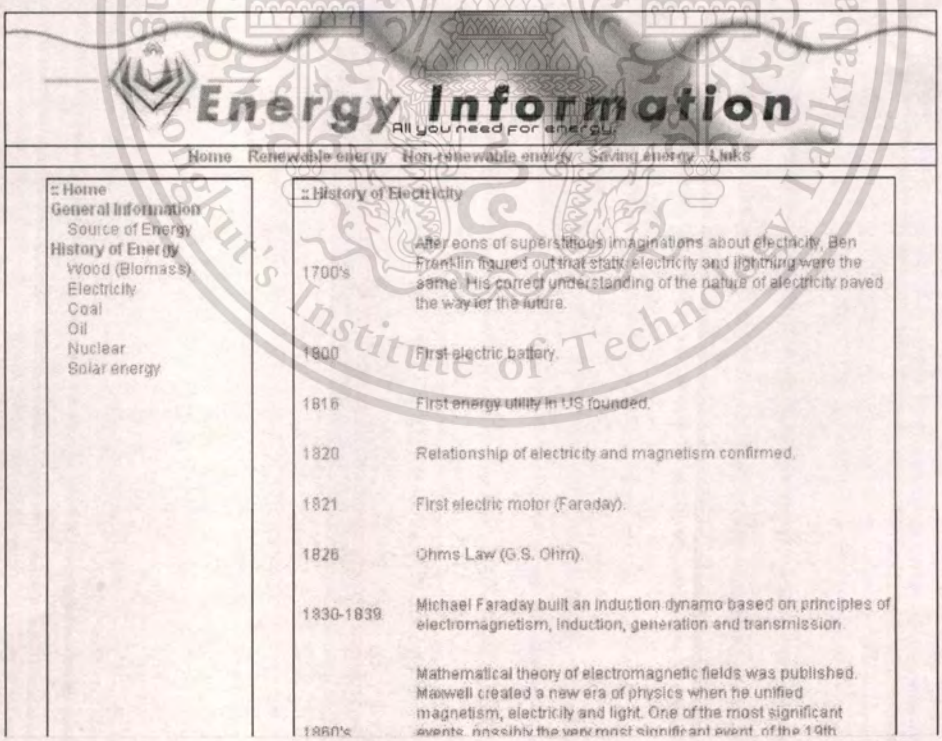


Figure. 4.9 History of electricity energy page.

Figure 4.10 - 4.14 show the renewable energy that separate links from the source of energy such as;

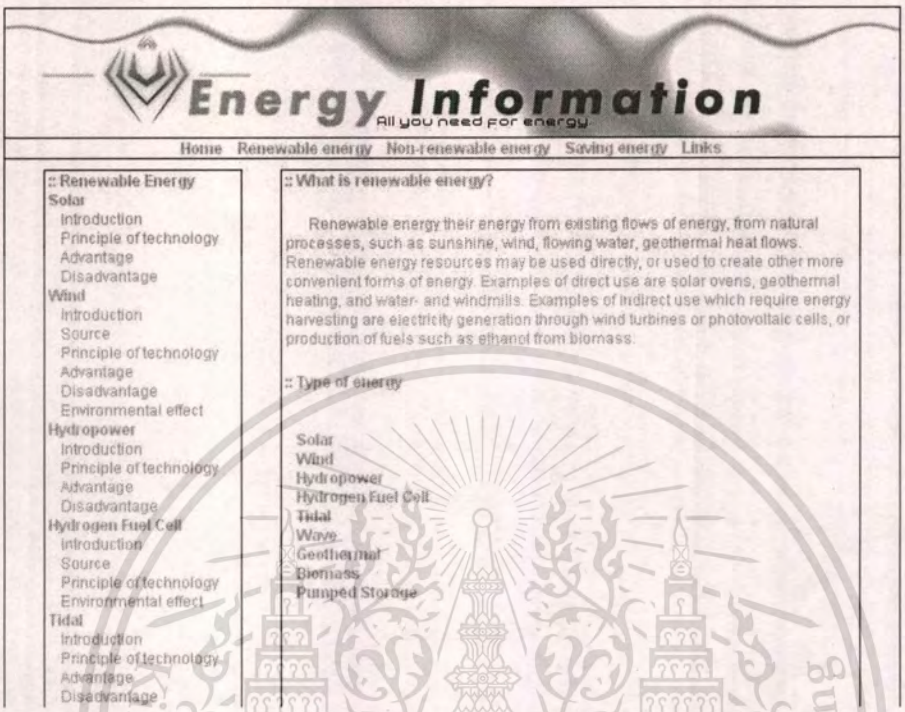


Figure. 4.10 Renewable energy page.

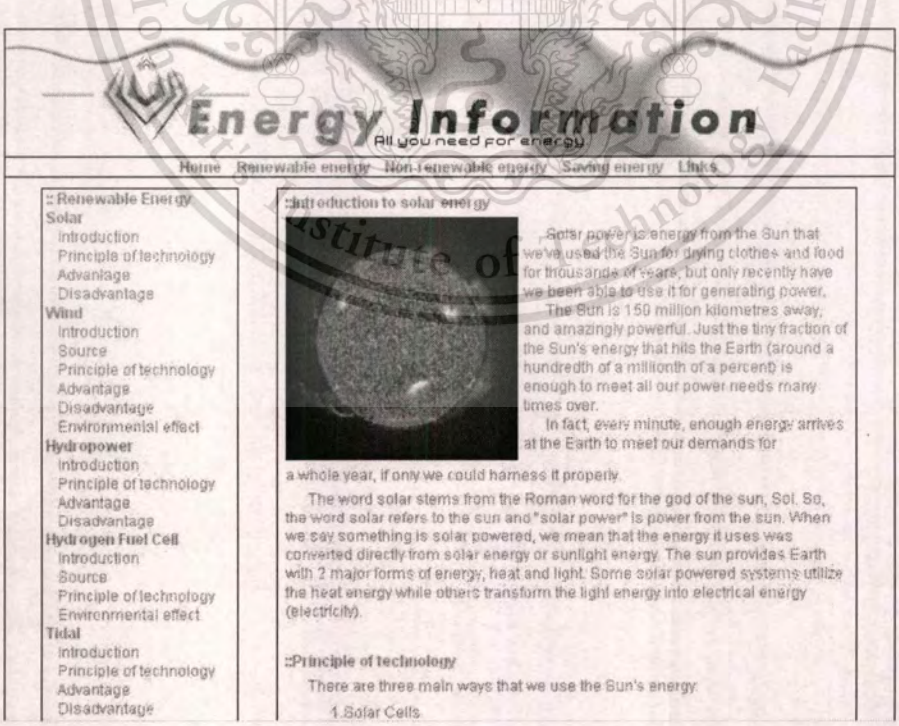


Figure. 4.11 Solar energy page.

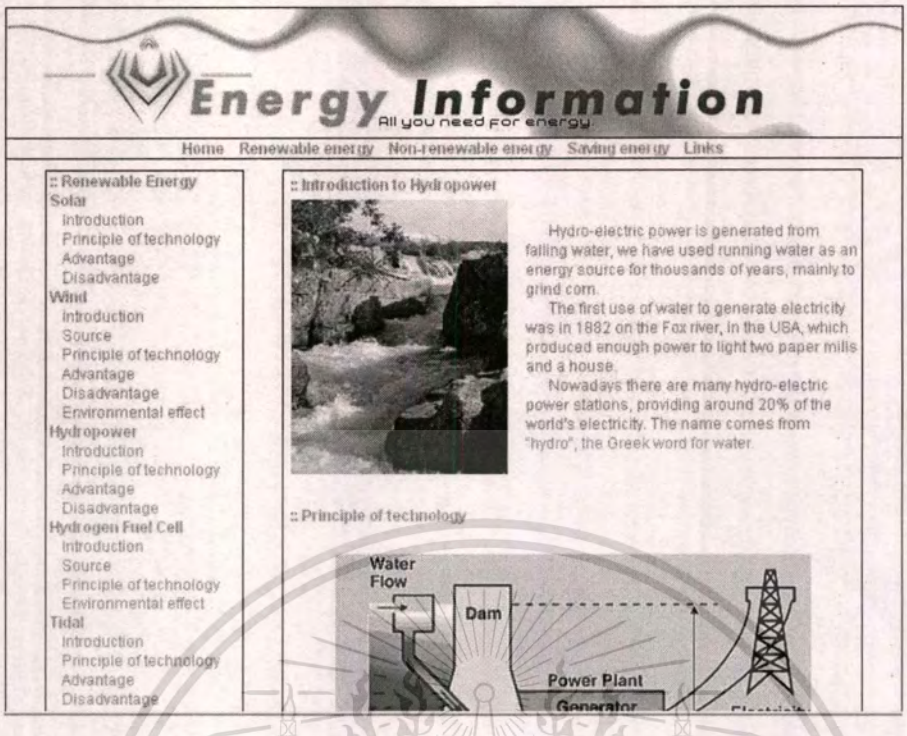


Figure. 4.12 Hydropower energy page.

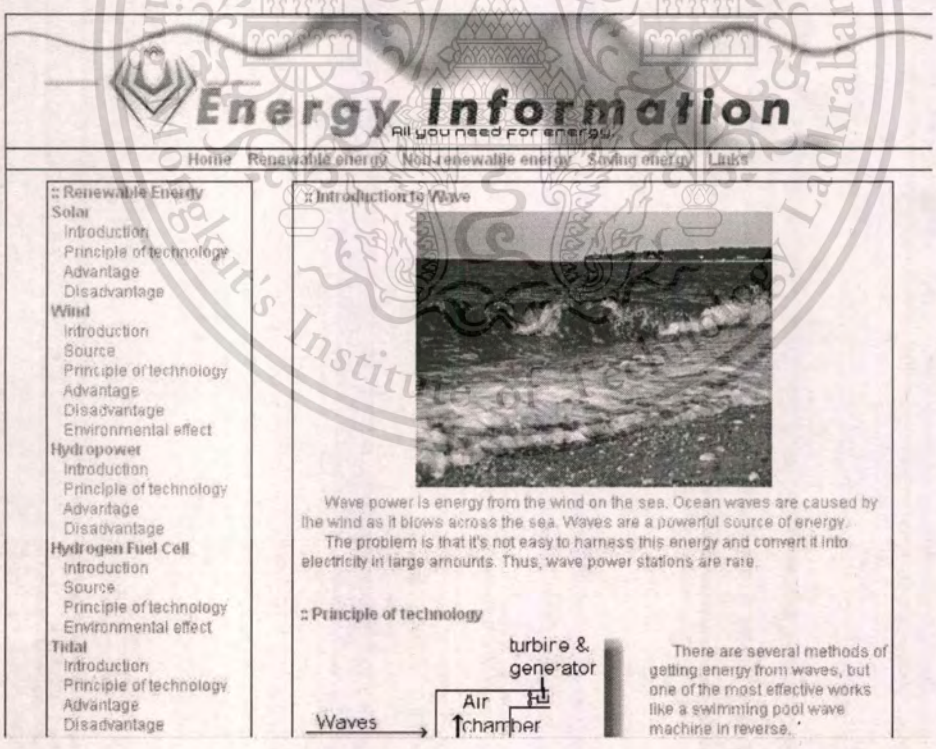


Figure. 4.13 Wave page.

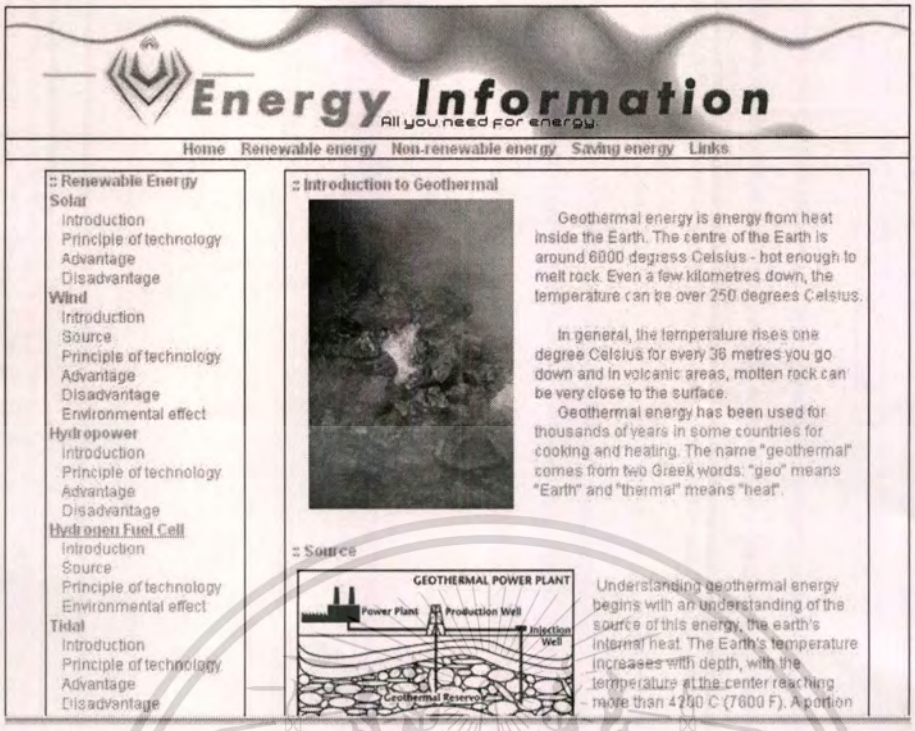


Figure. 4.14 Geothermal energy page.

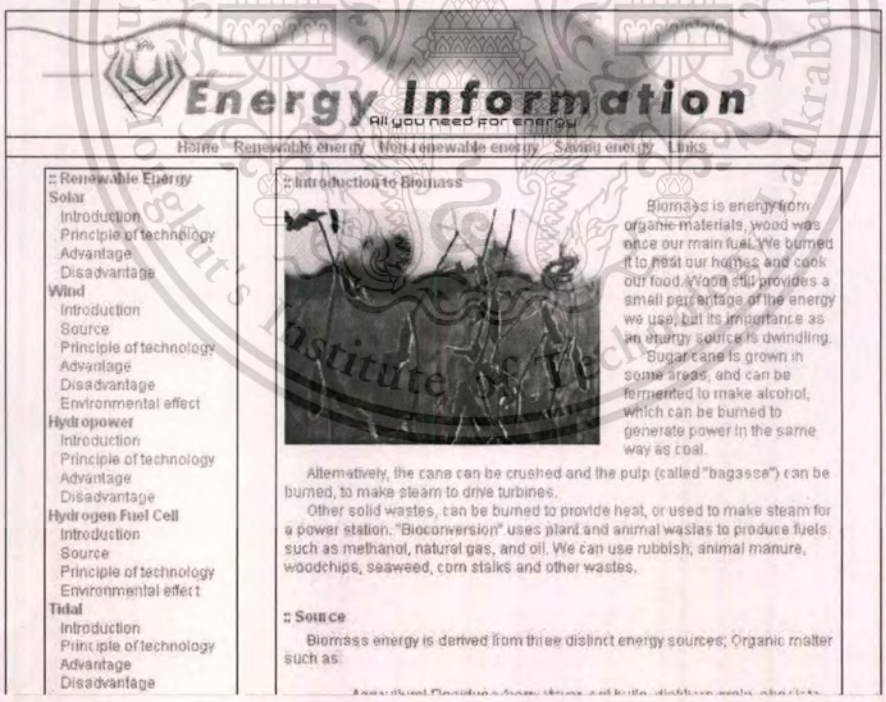


Figure. 4.15 Biomass page.

Figure 4.16 - 4.20 show the non-renewable energy page that separate links from the source of energy such as;

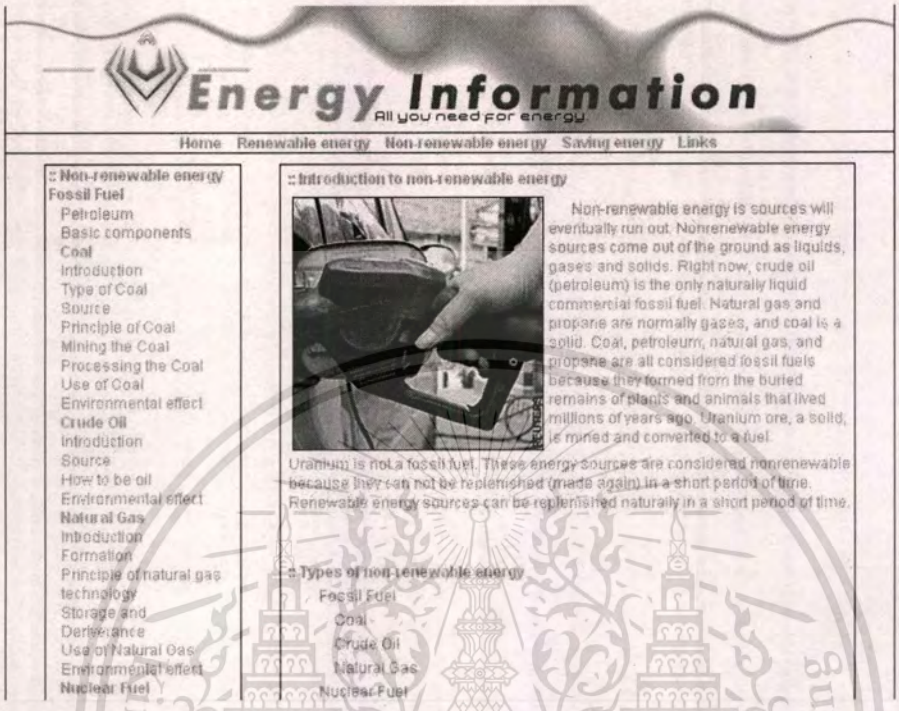


Figure. 4.16 Non-renewable energy page.

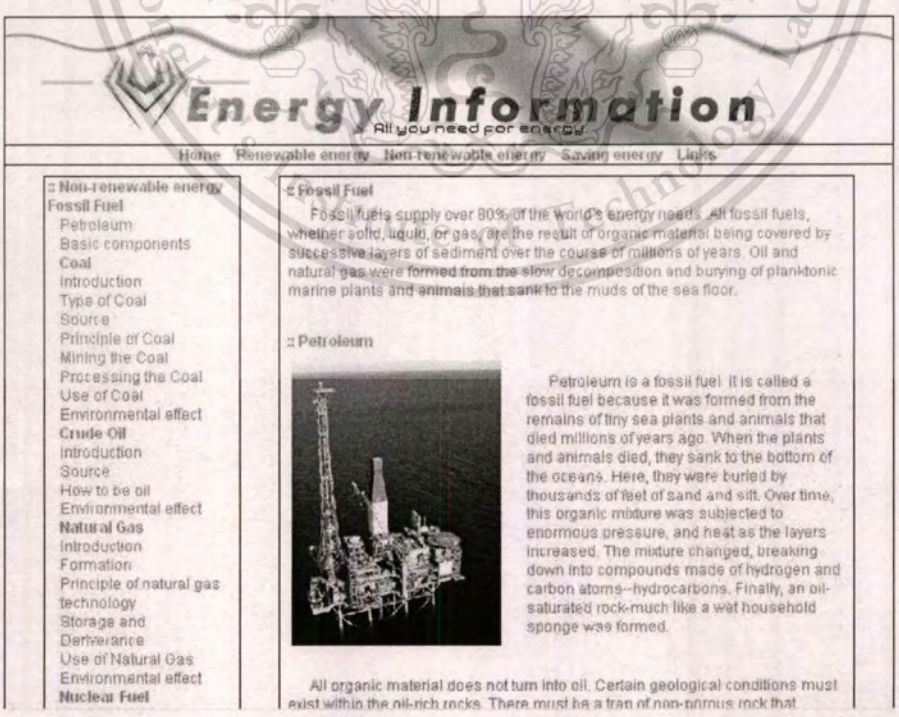


Figure. 4.17 Fossil fuel page.

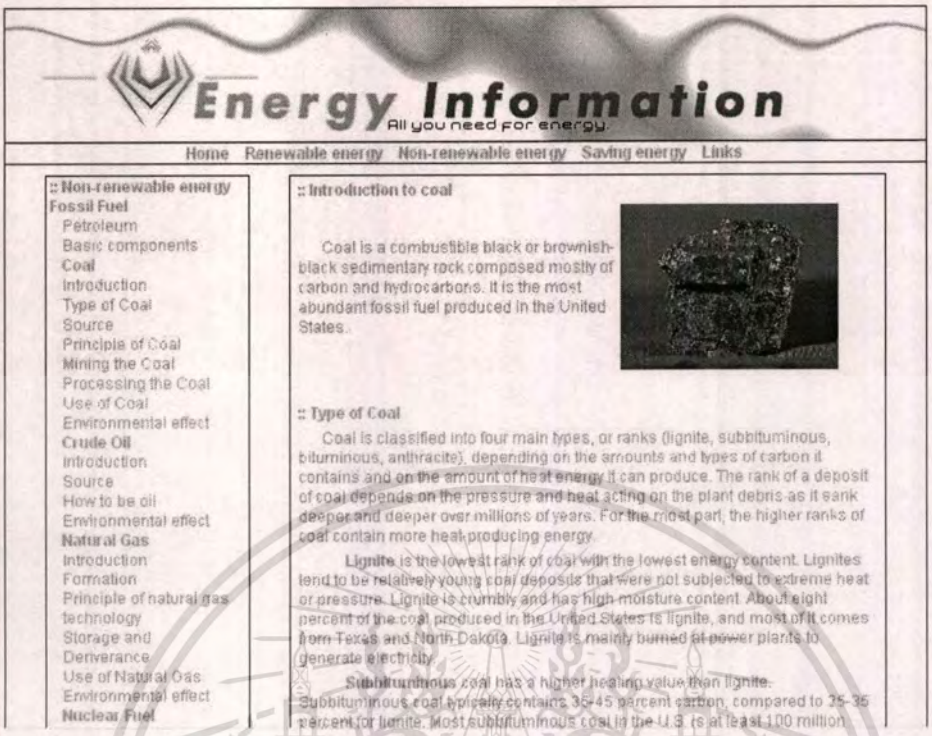


Figure. 4.18 Coal page.

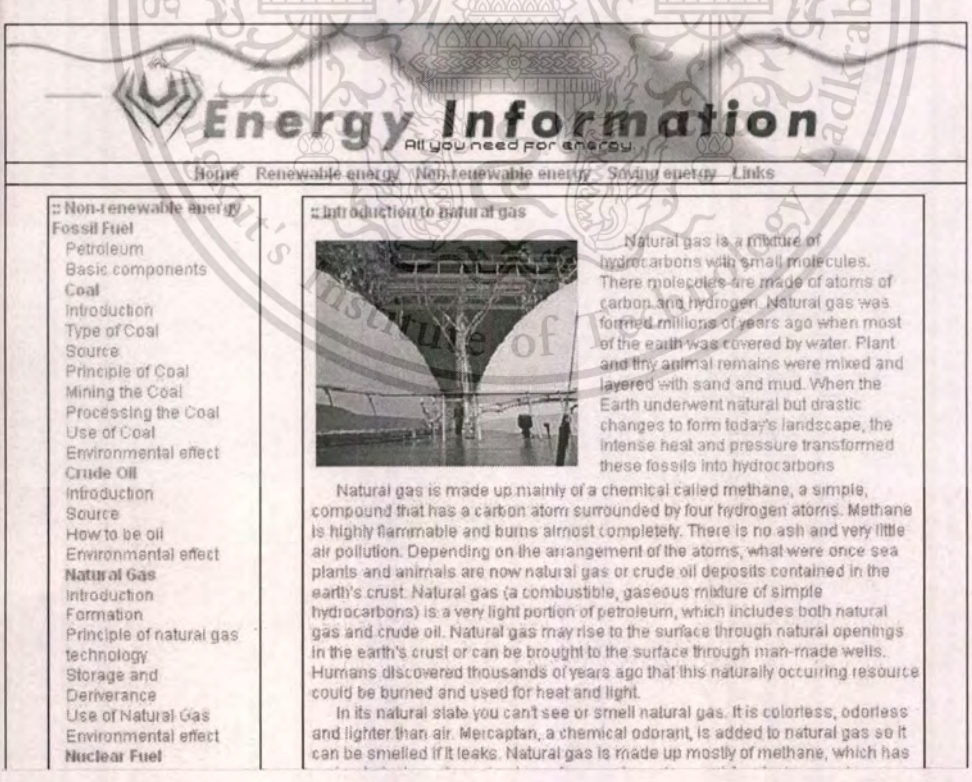


Figure. 4.19 Natural gas page.

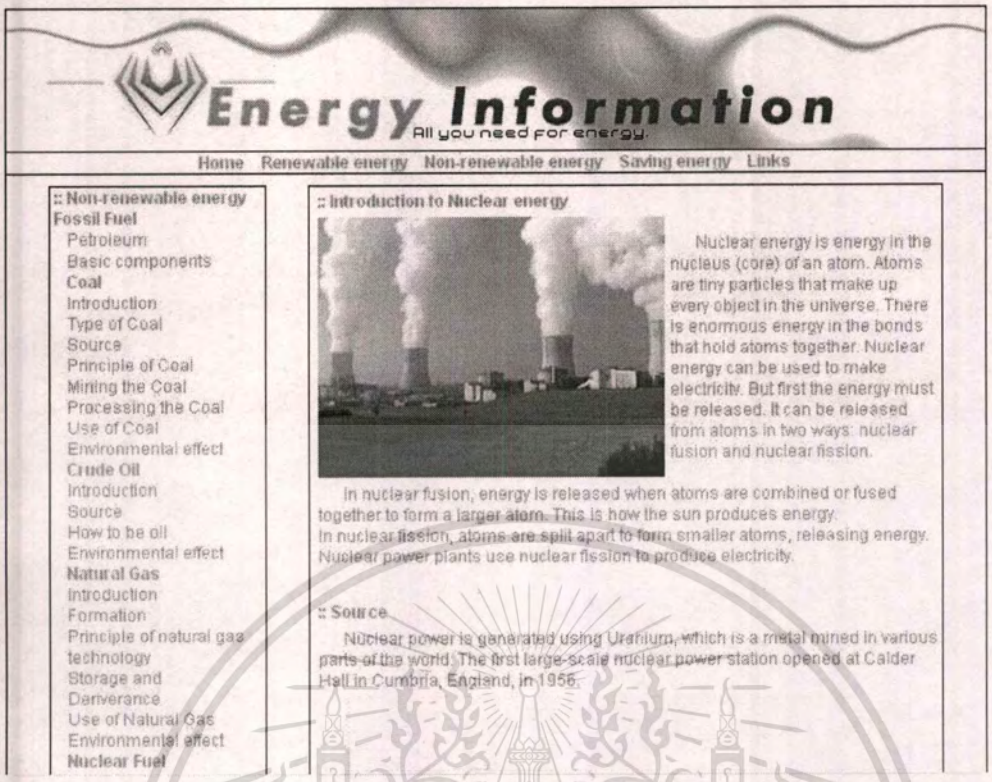


Figure. 4.20 Nuclear energy page.

Figure 4.21 - 4.24 show the energy saving web pages.

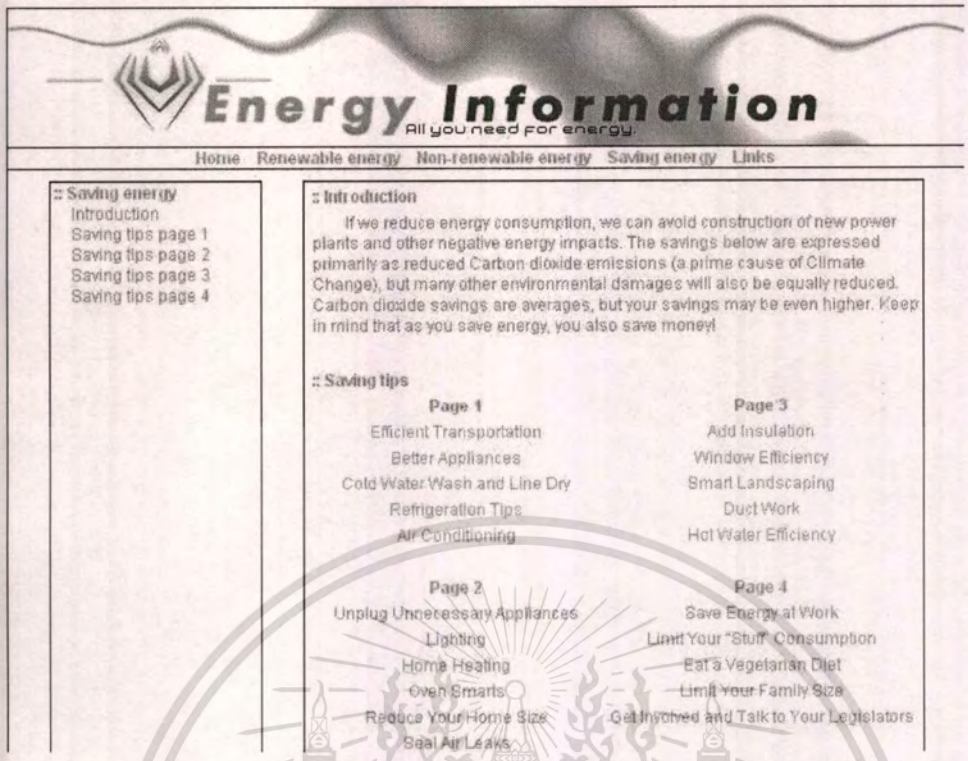


Figure. 4.21 Saving energy pages.

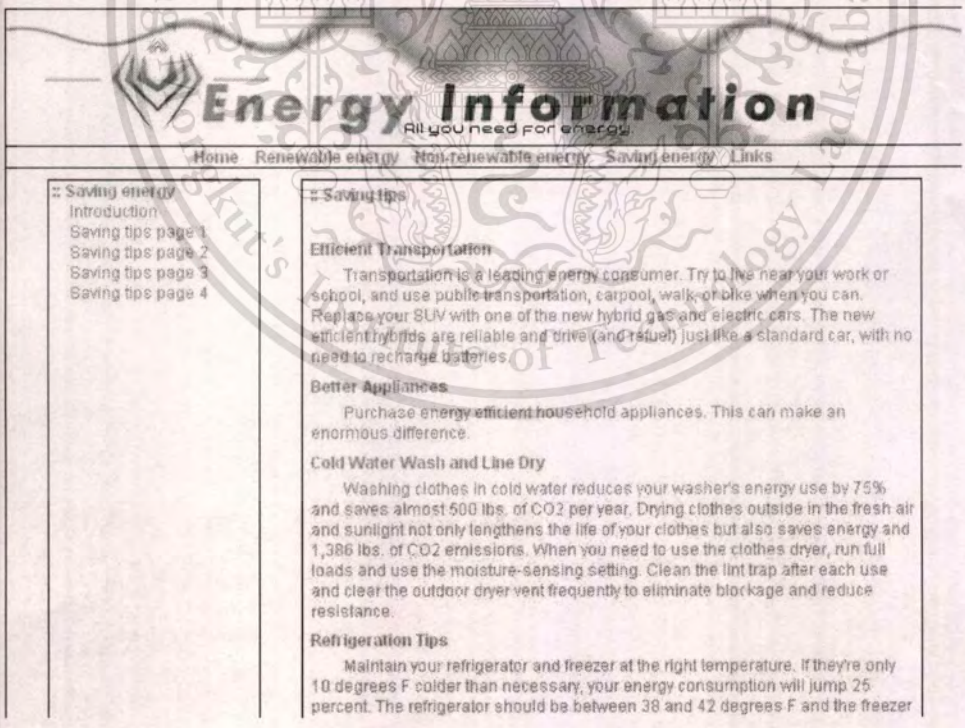


Figure. 4.22 Saving tips page 1.

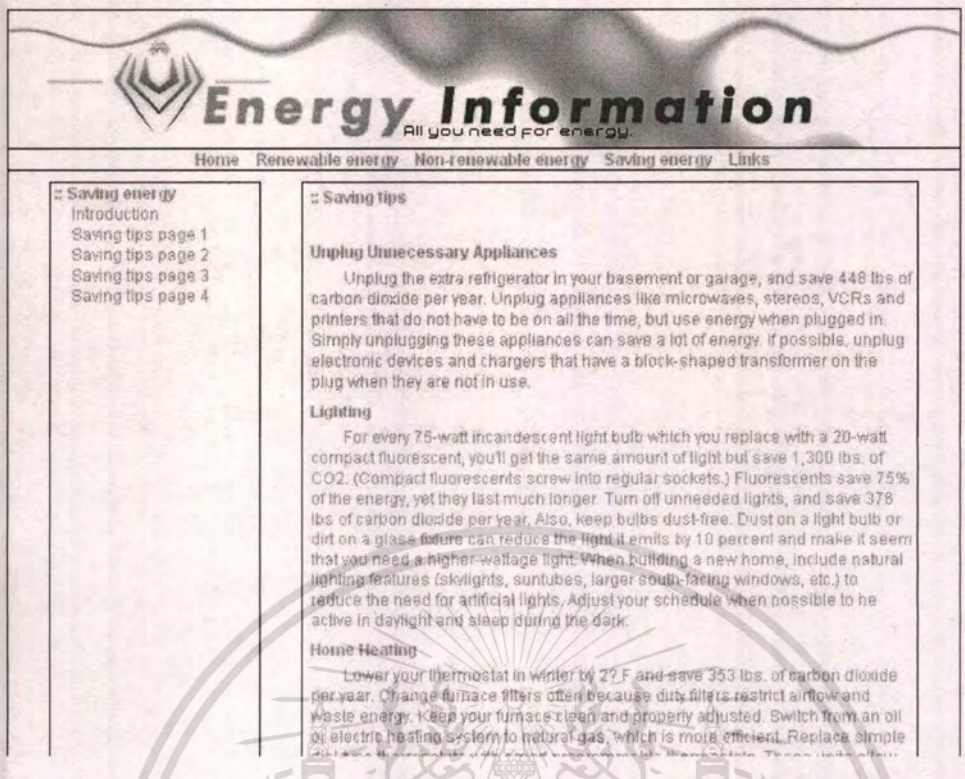


Figure. 4.23 Saving tips page 2.

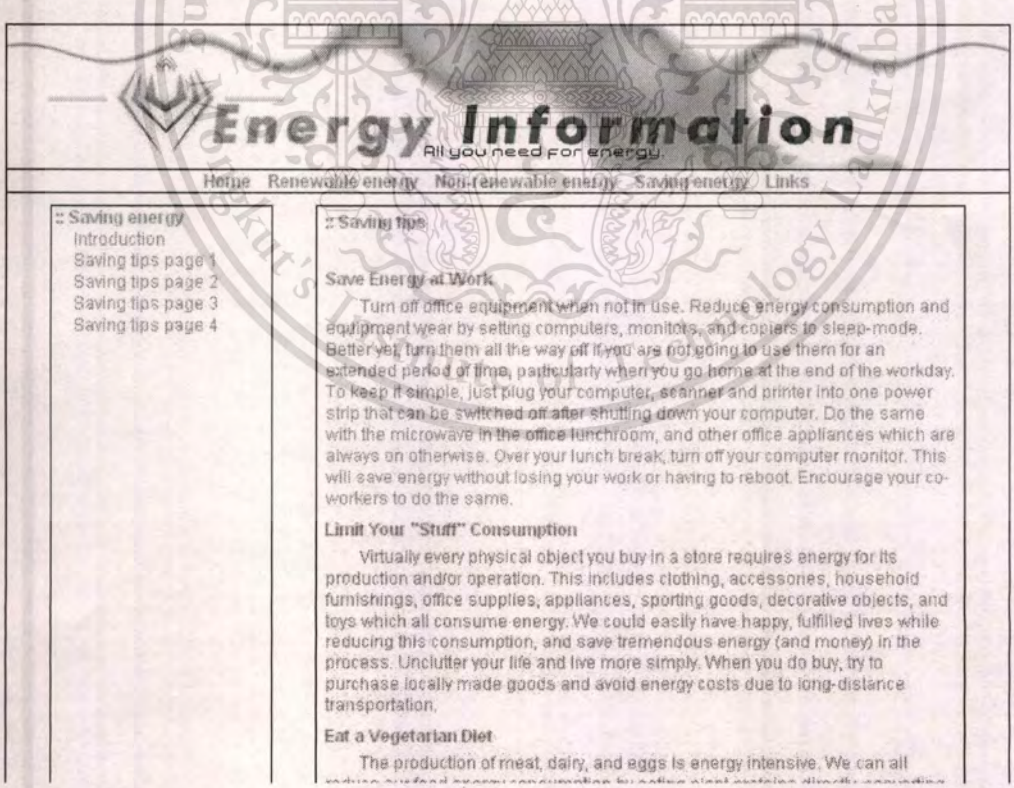


Figure. 4.24 Saving tips page 4.

Figure 4.25 show the linkage between the energy website.

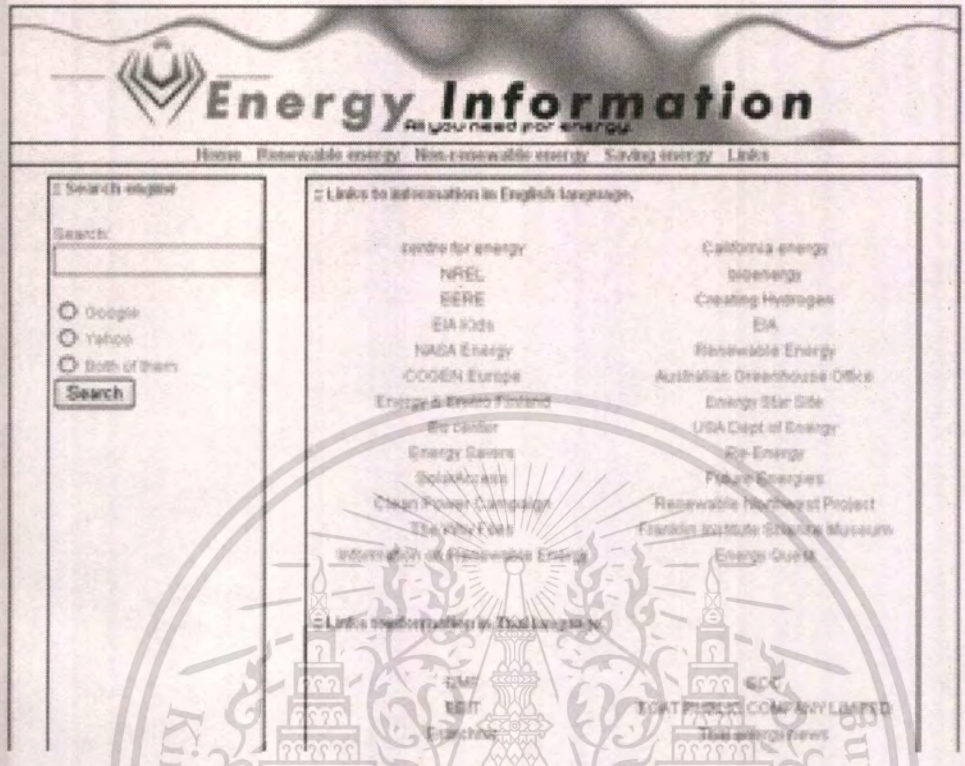


Figure. 4.25 Links page.

4.3 Data allocation

In the energy information website was separated into 3 parts; (1) main menu, (2) sub menu, and (3) web contents which were shown in the figure 4.26, 4.27 and 4.28 respectively.

1 Main Menu

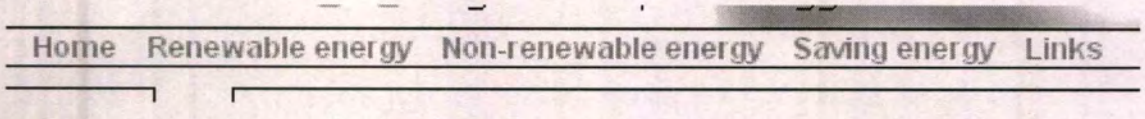


Figure. 4.26 Main menu of energy information website.

From figure 4.26 it can be seen that all web pages have the same form of main menu. There are five sub menus in the main menu. These five sub menu are, home renewable energy, non-renewable energy, saving energy and links.

2 Sub Menu

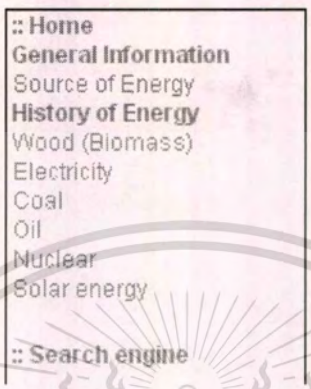


Figure. 4.27 Sub-menu of energy information website.

Each sub menu contains, the head links of energy information. It provides a link to the content of each head line by click on such head line.

3 Web Content

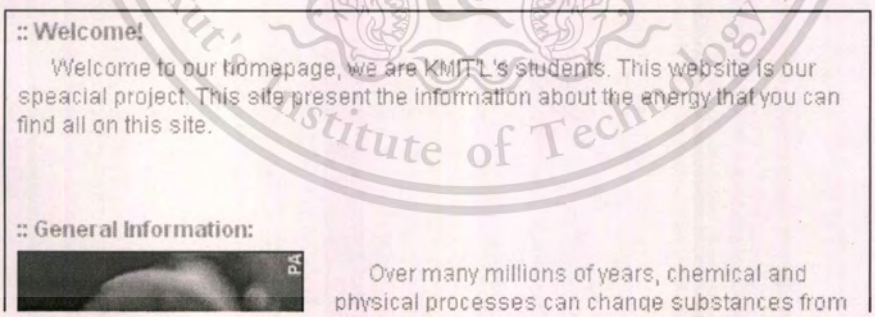


Figure. 4.28 Detail frame of energy information website.

The content of each web page was shown in this part.

4.4 Links page

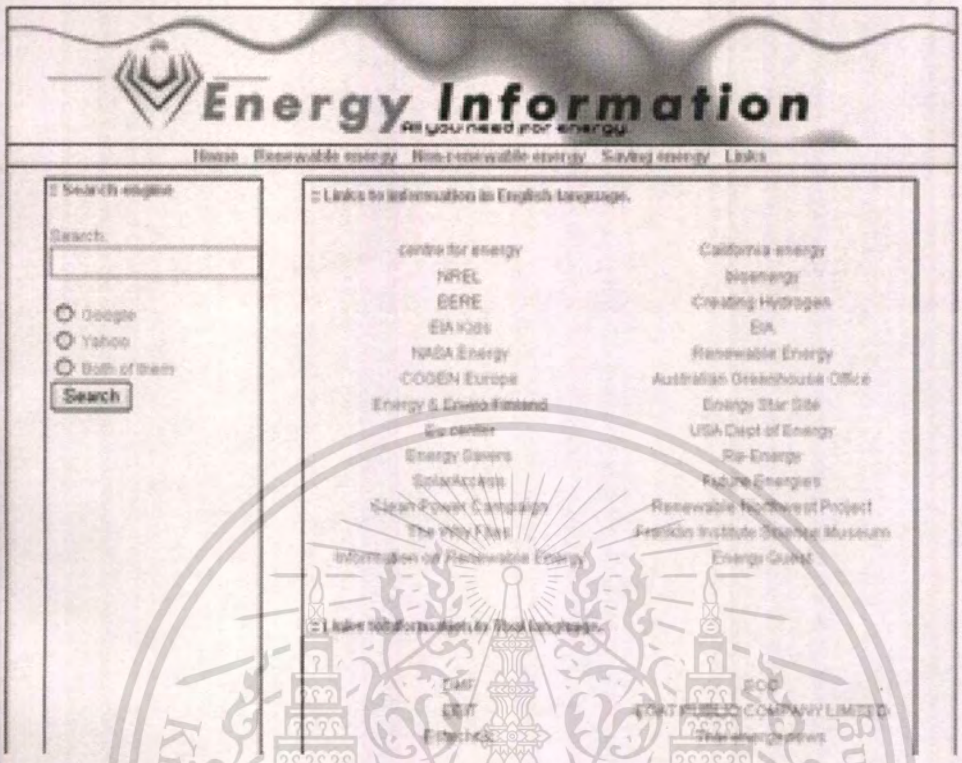


Figure. 4.29 Links page.

In this page you can find 2 parts of links which separated by language; Thai language and English language.

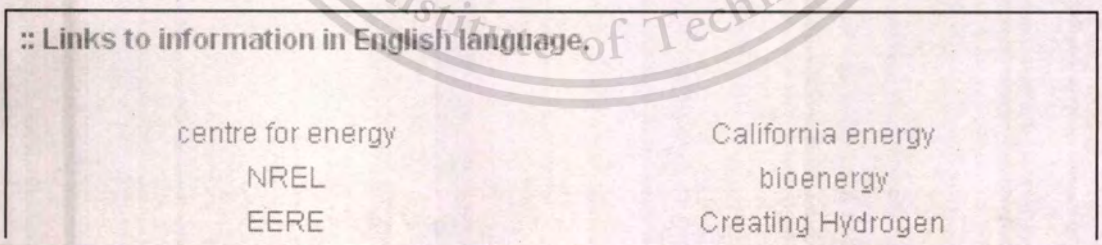


Figure. 4.30 Link in English language homepage in link page.

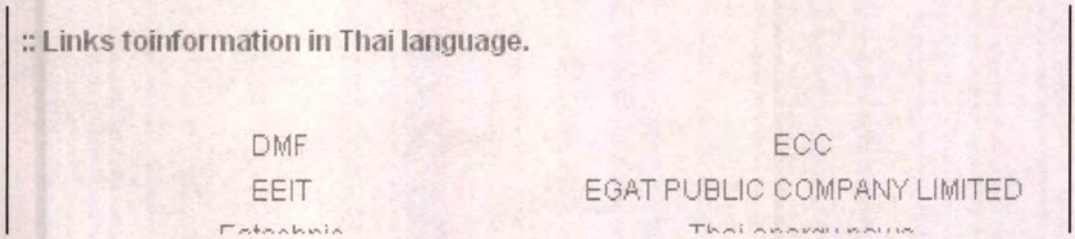


Figure. 4.31 Link in Thai language homepage in link page.

4.5 Search engines

The way that can find more information is search in search engines. In our site, There are 2 search engines that can be used to find out in one time. They are Google and Yahoo.

Figure. 4.32 search engines in link page.

Fill up the blank with the word or phrase that we would to search.

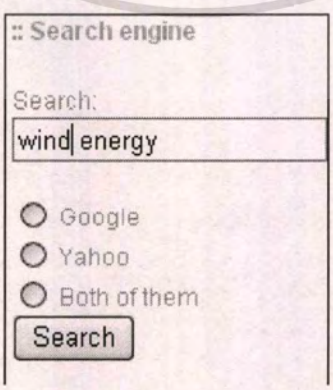


Figure. 4.33 Type the word into search engines.

Choose one of the search engines. Or choose Both of them (in case that the two search engines are used in the same time.) and then click search.

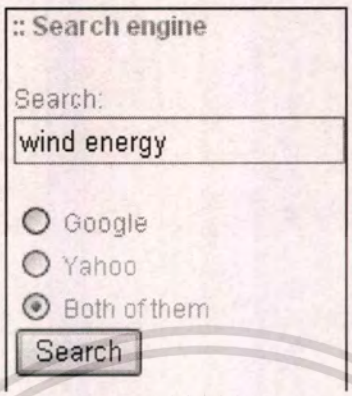


Figure. 4.34 Choose search engines.

And the results are seem like have 2 of them in the same page.

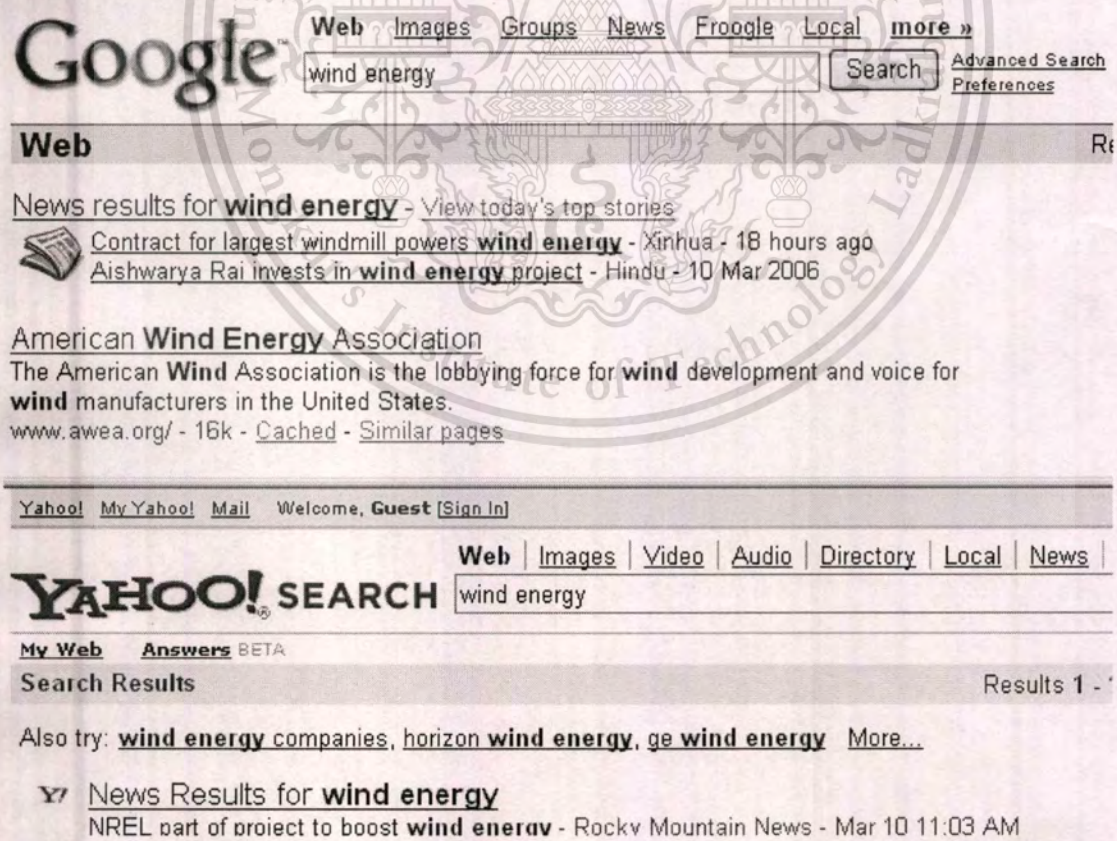


Figure. 4.35 Result of search by 2 of search engines in once time.

CHAPTER 5
CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

This website contains many of informations of renewable energy, non-renewable energy and alternative energy etc. At the same time it provides the interactive discussion and suggestion between webmaster and visitors.

The website of energy information was created and written by using graphic design and web programming softwares such as Adobe Photoshop CS, Adobe Illustrator CS, Adobe Image Ready CS, Micromedia Flash MX, and Micromedia Dream weaver MX. This website is shown on "http://energy-page.e-thai.net". The capacities, limitations, and developments of this website will be given as follow.

5.1.1 capacity of this project

- The website will be a source of energy information.
- Visitors can take the information from this website and can find further related information from those linkages in the web.
- This website can provide the interactive discussion and suggestion between web providers and visitors.
- The web site provides visitors two search engines in the same time.

5.1.2 Limitation of this project

- Because of used free web hosting, a very few space, only 25 MB is available for this website.
- A few types of files can be used to build website, under the hosting conditions such as .asp, .cgi, .pl, .php, .php3. .zip, .rar, .tar, .gz, .mp3 and .exe files those files can not upload in this hosting.

- Limited visitors can be supported, it has to share the loading with other website under the same hosting. So if it has a lot of visitors in the same time, website can be error.

- Honor, credit and quality of web hosting is very important, Non standard hosting will make trouble to website.
- Because of time limitation, Development of website can be not better than expected. The information may not complete or have something lost, but the development will complete that.

5.1.3 Development of this project

From the limitations of this project, some of that limited cannot do anything such as about time limited, but the merit for the project is it is a website, so it can develop, up date as far as possible.

5.2 Recommendations

- Web provider should have skill and clean in website development software.
- When there are new information or data, web provider should update database of website.
- Web provider should use service of trusty and reliable host for sufficient space and convenient to upload data.
- Web provider should concern and attend to opinion of website's user that can use for correct problem and improve website.

REFERENCES

[1] Pacific Gas and Electric Company Website (http://www.pge.com/res/rebates/energy_tools_resources/)

[2] Starrsites Website (http://www.starrsites.com/glossary.htm)

[3] Sean McManus Website (http://www.sean.co.uk/a/science/history_of_the_internet.shtm)

[4] National Geoscience Database of Iran Website (http://ngdir.ir/SiteLinks/Kids/html/energy_%20mafahem_%20Time%20Lines.html.htm)

[5] Energy Information Administration Website (http://www.eia.doe.gov/kids/

[6] Energy resources Website (http://www.darvill.clara.net/altenerg/index.htm)

[7] Radford University Website (http://www.radford.edu/~wkovarik/envhist/RenHist/)

[8] National Oceanic and Atmospheric Administration Website (http://www.noaanews.noaa.gov/ stories2005/images/)

[9] Istockphoto Website (http://www.istockphoto.com/file_closeup/business/)

[10] The Online Fuel Cell Information Resource Website (http://www.fuelcells.org/)

[11] Clean Air Primer Website (http://www.sparetheair.org/teachers/bigpicture/IIIb4_08e.html)

[12] Penn State Personal Website (http://www.personal.psu.edu/users/d/z/dzy105/hydropower.htm)

[13] Idao National Laboratory Website (http://hydropower.inel.gov/hydrofacts/)

[14] Energy and Environmental in India Website (http://www.renewingindia.org/tid.html)

[15] University of Wales, Aberystwyth Website (http://users.aber.ac.uk/jlb3/)

[16] Ventura Country Relocation Website (http://www.ventura-county-relocation.com/photo_gallery/gallery_main.htm)

[17] Danny Yee's Homepage (http://danny.oz.au/travel/iceland/reykjanes.html)

[18] Center for Renewable Energy and Sustainable Technology Website (http://www.crest.org/)

[19] Education Highway Oberosterreich Website (http://gw.eduhi.at/thema/energie/biomass/biomass.htm)

[20] International Association of Hydraulic Engineering and Research Website (http://www.2001iahr.iwhr.com/iahr/SpeIntro.htm)

[21] George T. Austin. Shreve's Chemical Process Industries, Fifth Edition, 1984

[22] Coal Surface Mining Information Page (http://66.113.204.26/mining/coal/)

[23] University of Kentucky Website (http://www.uky.edu/KGS/coal/uses_of_coal.htm)

[24] University of Wisconsin-Milwaukee Website (http://www.uwm.edu/Course/416-350/chapter14/lecture33.html)

[25] Athro Website (http://www.athro.com/geo/trp/gub/coal.html)

[26] MyDTE Energy Website (http://my.dteenergy.com/products/naturalGas/sources.do)

[27] Picture Newsletter Website (http://www.picture-newsletter.com/nuclear/)

[28] The Silver Bear Café Website (http://www.silverbearcafe.com/private/uranium2.html)

[29] Clean Water Action Council Website (http://www.cwac.net/)

[30] Consumer Energy Center Website (http://www.consumerenergycenter.org/tips/)