

# New Energy For Goodtown

**Seventh Grade**  
**Activity: 1**  
**Time: 5 Class Periods**

## General Description

Students will be assigned to cooperative learning groups. These groups will take on the identity of a consulting firm or a group of stockholders of a new company. The stockholders' group will establish guidelines for choosing an energy source for its new power generation plant. The consultant groups will be given information on different energy sources for the production of electricity. They will use this information to produce a presentation to persuade the stockholders' group that their method of power production is best.

## Objectives

Students will analyze information to determine the strengths and weaknesses of various methods for producing electricity.

## Arizona State Standards

- SC07 S1C1 PO2 Select appropriate resources for background information related to a question for use in the design of a controlled investigation
- SC07 S1C2 PO1 Demonstrate safe behavior and appropriate procedures (e.g., use and care of technology, materials, organisms) in all science inquiry
- SC07 S1C3 PO1 Analyze data obtained in a scientific investigation to identify trends
- SC07 S1C4 PO5 Communicate the results of an investigation
- SC07 S2C2 PO1 Describe how science is an ongoing process that changes in response to new information and discoveries
- W08 S3C3 Write a variety of functional text (e.g., directions, recipes, procedures, rubrics, labels, poster, graphs/tables)
- R07 S3C1 PO5 Locate specific information by using organizational features in expository text

## Teacher Information

Electricity is generally produced by using a generator that changes mechanical energy from some source into electrical energy. This mechanical energy can be produced using various fuels. For example, coal can be burned to produce heat that is used to change water to steam. The mechanical energy in the steam is used to turn the generator to produce electricity. Energy production of this type can involve many transfers of energy from one form to another. This can decrease the efficiency of the process because some useful energy is lost at each transformation. This can also increase the cost of the electricity. Photovoltaic cells can convert solar energy directly into electricity, eliminating the many energy transformations that are usually required.

Another factor in the cost of electricity is the availability and expense of the fuel. The cost involved in building and operating the generating plant can be another consideration. Electric companies must also meet federal and state guidelines to protect the environment. These considerations, along with the demand for electricity and the availability of a work force to operate the plant, pose interesting situations that require careful decision making.

## Vocabulary

**Heliostat** - A bank of mirrors used to collect energy from the sun that moves during the day to follow the sun's rays.

**Kilowatt-hour (kWh)** - Unit of electrical energy. Energy consumed by a machine working at a steady rate of one kilowatt for one hour.

**Lead time** - Time needed to construct a power plant and begin operations.

**Photovoltaic cell** - A device that converts solar energy into direct electrical current (solar cell).

**Watt (W)** - A unit of power. 1 watt = 1 joule of work/second; 1 kilowatt (kW) = 1000 watts.

## Preparation

Divide students into the following cooperative learning groups:

- Stockholders in Citizens Heralding Electricity for All People (CHEAP)
- Consultants for SUN-Solar Unlimited Now (solar energy)
- Consultants for Windgen (wind generation)
- Consultants for Hot Air (geothermal energy generation)
- Consultants for COAL (coal generated energy)

## Materials (For each cooperative learning group)

Newspaper article "CHEAP Seeks Energy Source For New Plant", Activity Card 7-1a

Information packet -

Letter from CHEAP, Activity Card 7-1b

Solar Energy Fact Sheet, Activity Card 7-1c

Solar Environmental Statement, Activity Card 7-1d

Wind Letter from CHEAP, Activity Card 7-1e

Wind Energy Fact Sheet, Activity Card 7-1f

Wind Environmental Statement, Activity Card 7-1g

Average Recorded Wind Speeds, Activity Card 7-1h

Geothermal Letter from CHEAP, Activity Card 7-1i

Geothermal Energy Fact Sheet, Activity Card 7-1j

Geothermal Environmental Statement, Activity Card 7-1k

Coal Letter from CHEAP, Activity Card 7-1l

Coal Fact Sheet, Activity Card 7-1m

Data sheet, Activity Card 7-1n

General Guidelines, Activity Card 7-1o

Business Plan Worksheet, Activity Card 7-1p

Business Concept, Activity Card 7-1q

Criteria Sheet for Selection, Activity Card 7-1r

Parameters Information Sheet, Activity Card 7-1s

Pencils  
Paper  
Markers  
Large pieces of paper  
Overhead transparencies  
Video camera and tape  
Any other materials students might need for presentation

## **Procedures/Exploration**

### **Suggested Weekly Planner**

**First Session:** Teacher assigns cooperative learning groups. Students determine cooperative learning roles. Teacher gives materials to groups. Student groups begin reading through information packets and guides.

**Second - Fourth Sessions:** Student consultant groups research energy source materials and prepare presentations. Members of the stockholders' group determine their criteria for choosing the best energy source.

**Fifth Session:** Consultant groups make their presentations. The stockholders' group makes its choice of energy source.

## **Session Outline**

### **Period One**

1. Tell students that they are residents of Goodtown, a community next to Alpine, Arizona. Ask them to locate Alpine on an Arizona map.
2. Assign students in the class to cooperative learning groups.
3. Tell student groups that they will be either playing the role of a stockholders' group that is seeking a new energy source for their electric generating plant or a consultant group that is trying to sell their energy source to the stockholders' group. Read the "CHEAP Seeks Energy Source for New Plant" newspaper article (Activity Card 7-1a).
4. Inform students about the group to which they have been assigned.
5. Tell students that members of the stockholders' group will be establishing the criteria they will use to choose the new energy source for their plant. The other groups will be responsible for generating a presentation that will convince CHEAP that their source of energy production is the best. The consultant groups will not know exactly what CHEAP's criteria for selection will be so they must prepare a presentation that emphasizes their assets and deals with their liabilities. Tell all groups that they may use the Data Sheet (Activity Card 7-1n) as a guide, but that they are not confined to just the attributes listed there.
6. Discuss the benefits of working in cooperative groups and cooperative learning roles with students. Ask students to make a brief outline of what they will need to accomplish and assign group members to the roles needed to complete their task. Tell students that when these role assignments have been made, they should report them to the teacher.
7. Give the information packets to each of the groups and ask them to examine the information.

### **Periods Two - Four**

1. Have students review the General Guidelines for CHEAP (Activity Card 7-1o), Data Sheet (Activity Card 7-1n), information packet and other materials, and instruct them to begin their group's work.
2. Give them assistance as needed.
3. Students will make decisions about the advantages and disadvantages of various energy sources.
4. The stockholders' group uses its information to establish the criteria they will use to choose the best energy source for their needs. They will record this criterion.
5. The consultant groups will create presentations designed to choose the stockholders that their energy sources is the best choice. They will need to include the advantages and disadvantages of their energy source.

### **Period Five**

1. The stockholders' group will share its criteria with the members of each group.
2. Each group will make its presentation to the stockholders' group.
3. After the presentations, the stockholders' group will take some time to discuss which energy source best fits its needs.
4. During this time, each group will evaluate their presentation based on the criteria from the stockholders' group.
5. The stockholders' group will formally award the contract to the group of its choice.
6. Students will discuss the evaluation of the stockholders' group and their own evaluations.
7. Students can also discuss what they did they thought was effective, and what they would change if they did the activity again.

Student's Name:

Date:

## CHEAP Seeks Energy Source for New Plant

by Tony Jones, Tribune writer

**“We hope to produce a clean, cost effective product.”**

**-Herbert Redwood**

CHEAP, Citizens Heralding Electricity for All People, announced today that it will build a new power generating plant in Goodtown. The stockholders of CHEAP are hoping to find an energy company to work closely with to produce inexpensive electricity for the townspeople.

Herbert Redwood, CHEAP's chairman of the board, stated that the newly formed company is looking for a source of energy that will provide the town with enough electricity and yet be environmentally friendly. Redwood said that the company was formed by a group of citizens who had concerns about past generating plants.

“Badzap, our former generating company, concentrated on their profit margin. They were not aware of the detrimental impact their plant had on the surrounding countryside.” Redwood said, “We hope to produce a clean, cost-efficient product.”

A former employee from Badzap, who did not wish to be identified, stated that Mr. Redwood and his committee did not have a clear understanding of the factors that must be considered when pricing electricity. “When you set a price for your product, you have to factor in the cost of construction as well as the cost of lead time, the length of time it takes to build the plant. I don't think they've considered that.”

June Maplethorp, president of the Friends of the Earth, stated that the newly formed company would need to comply with guidelines to protect the environment.

“There are costs involved in making sure the land, air and water in our area are not polluted,” she said. “We can't depend on companies whose only goal is to make a profit to protect our environment.”

Many people in Goodtown have expressed concern about potential jobs in the new generating plant. The closure of Badzap has left a large number of skilled workers without employment. It is hoped that CHEAP will choose a method of power generation that will provide for these people. The local employment bureau has offered to do some retraining of workers if necessary.

Goodtown's council hopes that a plant can be built soon that will provide new jobs, protect the environment, and use a fuel source that is close to the town. “Transporting large amounts of fuel can be costly and dangerous,” Mayor Smith said.

# Letter from CHEAP

**Seventh Grade**  
**Activity: 1**  
**Activity Card: 7-1b**

**Student's Name:**

**Date:**

Mr. George Raft, President  
SUN  
455 South Dark Drive  
Goodtown, AZ 34523

Dear Mr. Raft:

Our company is in the process of planning a new electric generating plant for Goodtown. We are interested in obtaining information about the energy source your company represents.

The members of our board of directors have come together because we have concerns for the future of Goodtown. We were not in favor of the business policies of Badzap, our former power plant. We wish to usher in a new era of energy production for our community.

It is our goal to build a plant that will be run in a cost-effective manner so that we can provide inexpensive electricity to the citizens of Goodtown. We realize that fuel costs, fuel availability, environmental protection devices and strategies, lead time and employment opportunities will all play a role in our decision. This is a complex issue.

We have planned a meeting to evaluate presentations from a variety of energy companies. We would like to invite your company to join the list of presenters.

We have set aside five to 10 minutes for each of the participating companies. We hope that you will be able to attend. Please call if you have further questions.

Sincerely,

Herbert Redwood  
Chairman of the Board  
CHEAP

**APS Power Posse™**

# Solar Energy Fact Sheet

Seventh Grade

Activity: 1

Activity Card: 7-1c

**Student's Name:**

**Date:**

Solar collectors can be classified as one of three basic types. Non-concentrating collectors are the most widely used types. They consist of a flat collecting surface that absorbs radiant energy from the sun. A fluid is heated as it passes over, under or through the collecting surface. This fluid transports the heat to the desired destination.

Concentrating collectors can achieve higher energy capture. Solar energy is collected by mirrors or other reflective surfaces and aimed or concentrated on a central point. Some of these reflective surfaces are capable of following the sun throughout the day, thus increasing the amount of direct solar energy that is collected. These tracking surfaces are called heliostats. Some heliostats have a curved surface that concentrates the sun's ray on a fluid filled tube. The fluid is heated and it delivers the heat to the desired destination. Another application of concentrating collectors is the power tower. The sun's rays are reflected off of a reflecting surface and sent to a receiver in the tower. The heat is sent to a boiler which creates steam to run a generator.

The third type of solar collector is a photovoltaic cell (solar cell). This is a specially built surface that changes radiant energy directly into electricity. Photovoltaic cells are very efficient. However, they are expensive to make and the manufacturing process has adverse effects on the environment. Photovoltaic cells are used to power satellites and are used in areas of the world that are far away from major population areas. One advantage to using photovoltaic is that the array can be added on to easily by just installing more cells.

All of these systems must have storage units to store energy for use on days when it is not sunny.

Solar installations require \_\_\_\_\_ years building time.

Electricity produced by using energy from the sun costs around \_\_\_\_\_ per kilowatt-hour.

# Solar Environmental Statement

Seventh Grade  
Activity: 1  
Activity Card: 7-1d

Student's Name:

Date:

Memo

From: Environmental Consultants, Inc.  
Re: Solar environmental impact

There is no evidence at this time that suggests that solar collectors pollute the air, soil or water. Even when they have been located near streams or ponds there has been no indication that they have caused the pollution of these areas. There is evidence, however, that the making of photovoltaic cells can pollute water and soil with the byproducts and wastes associated with their manufacture.

Solar arrays use large parcels of land. Use of land for these plants precludes its use for other things, such as housing.

The most significant problem with solar arrays is that they create a visual impact. In order to collect the greatest amount of sunlight large areas are covered with mirrors or other reflectors. This can create a visual distraction that many people find objectionable.

This brings up the question of the impact of these collectors on the wildlife of the area. Do these mirrors and buildings interfere with the habitats of local species of wildlife? Do they interfere with migration patterns of other wildlife species? Wildlife impact studies should be done and sites should be chosen on the basis of this information.



# Wind Letter from CHEAP

**Seventh Grade**  
**Activity: 1**  
**Activity Card: 7-1e**

**Student's Name:**

**Date:**

Ms. Stacey Frye, President  
Windgen  
1342 West Pleasant Lane  
Goodtown, AZ 34523

Dear Ms. Frye:

Our company is in the process of planning a new electric generating plant for Goodtown. We are interested in obtaining information about the energy source your company represents.

The members of our board of directors have come together because we have concerns for the future of Goodtown. We were not in favor of the business policies of Badzap, our former power plant. We wish to usher in a new era of energy production for our community.

It is our goal to build a plant that will be run in a cost-effective manner so that we can provide inexpensive electricity to the citizens of Goodtown. We realize that fuel costs, fuel availability, environmental protection devices and strategies, lead time and employment opportunities will all play a role in our decision. This is a complex issue.

We have planned a meeting to evaluate presentations from a variety of energy companies.

We would like to invite your company to join the list of presenters. We have set aside five to 10 minutes for each of the participating companies. We hope that you will be able to attend.

Please call if you have further questions.

Sincerely,

Herbert Redwood  
Chairman of the Board  
CHEAP

**APS Power Posse™**

# Wind Energy Fact Sheet

Seventh Grade  
Activity: 1  
Activity Card: 7-1f

**Student's Name:**

**Date:**

Windmills have been in use for thousands of years to grind grain and pump water. Since the nineteenth century, they have been used to generate electricity. Before electricity was brought to rural areas, the windmill was an important part of the farming operation. The wind turbines of today operate basically as the windmills of the past except that they produce electricity much more efficiently. Modern wind turbines have fewer, lighter blades that rotate faster. Some of the new turbines can generate three megawatts of power, enough to supply a small town.

Wind currents are caused by the uneven heating of the earth's surface by the sun. Air currents move from cold areas to warm areas. Wind turbines use this wind to turn blades connected to a drive shaft that turns an electric generator. The turning of the generator produces electric current.

Once a site has been obtained for a wind farm, installation can take place almost immediately. Construction of wind turbines takes very little time. The lead time for a wind farm could be one to four months. The cost of electricity generated by a wind turbine is around \_\_\_\_\_ per kilowatt-hour.

Most wind turbines have blades that rotate at right angles to the ground.

The Musgrove generator rotates parallel to the ground.

The Darrieus generator rotates parallel to the ground.

# Wind Environmental Statement

Seventh Grade  
Activity: 1  
Activity Card: 7-1g

Student's Name:

Date:

Memo

From: Environmental Consultants, Inc.  
Re: Wind turbine environmental impact

There is no evidence at this time that suggests that wind turbines pollute the air, soil or water. Even when turbines have been located near streams or ponds there has been no indication that they have caused pollution of these areas.

Large wind turbines have been thought to cause interference with television reception. One to five megawatt turbines are believed to cause this interference. Several smaller units could be used to produce the same amount of electricity as one large unit.

Wind farms use large parcels of land. About two acres of land are needed for a 100 kilowatt turbine. Use of land for wind farms precludes its use for other things, such as housing.

The most significant problem with wind turbines is that they create a visual impact. Many people object to the sight of miles and miles of wind turbines stretching across the landscape.

This brings up the question of the impact of these turbines on the wildlife of the area. Do these machines interfere with the habitats of local species of wildlife? Do they interfere with migration patterns of other wildlife species? Do they pose any hazards to birds flying in the area? Wildlife impact studies should be done and sites should be chosen on the basis of this information.

# Average Recorded Wind Speeds

Seventh Grade  
Activity: 1  
Activity Card: 7-1h

Student's Name:

Date:

<u>Location</u>	<u>Speed (mph)</u>
Prescott	9.3
Kingman	9.0
Winslow	8.9
Tucson	8.2
Payson	8.0
Chandler	6.8
Phoenix	6.3
Fort Huachuca	5.6
Douglas	2.6

Source: Arizona Solar Energy Commission

# Geothermal Letter from CHEAP

**Seventh Grade  
Activity: 1  
Activity Card: 7-1i**

**Student's Name:**

**Date:**

Mr. Henry Pointer  
President  
Hot Air  
3654 West Fifth Street  
Goodtown, AZ 34523

Dear Mr. Pointer:

Our company is in the process of planning a new electric generating plant for Goodtown. We are interested in obtaining information about the energy source your company represents.

The members of our board of directors have come together because we have concerns for the future of Goodtown. We were not in favor of the business policies of Badzap, our former power plant. We wish to usher in a new era of energy production for our community.

It is our goal to build a plant that will be run in a cost-effective manner so that we can provide inexpensive electricity to the citizens of Goodtown. We realize that fuel costs, fuel availability, environmental protection devices and strategies, lead time and employment opportunities will all play a role in our decision. This is a complex issue.

We have planned a meeting to evaluate presentations from a variety of energy companies. We would like to invite your company to join the list of presenters. We have set aside five to 10 minutes for each of the participating companies. We hope that you will be able to attend.

Please call if you have further questions.

Sincerely,

Herbert Redwood  
Chairman of the Board  
CHEAP

**APS Power Posse™**

# Geothermal Energy

## Fact Sheet

Seventh Grade  
Activity: 1  
Activity Card: 7-1j

Student's Name:

Date:

Geothermal energy comes from local concentrations of heating in the earth's crust or the upper part of the mantle (the layer of molten rock just below the crust). The heating can come from the decay of radioactive elements in the crust, a deformation of mantle and crystal rocks or convection currents in the mantle.

There are three ways to classify geothermal areas.

One method is to classify based on temperature. Low temperature areas have a temperature less than 90°C, moderate temperature areas have a temperature between 90°C and 150°C, and high temperature areas have a temperature greater than 150°C.

The second way to classify geothermal sites is by the phase of the fluid involved. There are four basic fluid phases of geothermal energy:

- 1) dry steam
- 2) hot water
- 3) pressurized steam
- 4) hot, dry rock.

The third way to classify sites is by heat source. The heat source could be from a bubbling up of magma from the mantle, high heat flow or the presence of radioactive elements.

Some of the geothermal sites in Arizona are hot springs. The average temperatures of these areas are between 30°C and 90°C at the surface. All of the known prime hot springs sites are found between Safford, Clifton and Peridot. Through exploration, other sites may be found. The southern portion of the state seems to be the best source of geothermal sites.

Often, geothermal energy is referred to as renewable energy source. This is not the case. Geothermal reservoirs have definite volumes and definite lifetimes.

Geothermal plants require \_\_\_\_\_ years to build.

Geothermal power can be generated for \_\_\_\_\_ per kilowatt-hour.

# Geothermal Environment Statement

Seventh Grade  
Activity: 1  
Activity Card: 7-1k

Student's Name:

Date:

Memo

From: Environmental Consultants, Inc.

Re: Geothermal energy production environmental impact

Where steam is released into the atmosphere at wet-steam and dry-steam geothermal sites, the air can become polluted from toxic elements in the gas emitted. Known sites in Arizona are not wet-steam or dry-steam.

There may be pollution of the soil and water from the release of geothermal fluids. These fluids may contain high amounts of salts or other chemicals that may be toxic to plants and animals. There are two methods of dealing with this problem that are legally acceptable in Arizona. One is injecting the fluids back into the ground. The other method is to use evaporating ponds. These ponds are lined with a substance that keeps the polluted fluids from seeping into the groundwater while the fluid evaporates. The toxic substances are left behind. These substances can either be properly disposed of or recycled.

Another environmental problem that occurs at geothermal sites is subsidence (settling of the earth). When fluids are drawn from underground reservoirs, the surrounding ground can collapse (settle) causing great holes to occur on the surface of the ground. These holes are called subsidence. Reinjection of fluids can help to prevent this from happening.

Often, there is a great deal of noise associated with a geothermal plant, especially at a wet steam site.

# Coal Letter from CHEAP

Seventh Grade

Activity: 1

Activity Card: 7-11

**Student's Name:**

**Date:**

Miss Jenny Penny  
President  
COAL  
8095 South George Street  
Goodtown, AZ 34523

Dear Miss Penny:

Our company is in the process of planning a new electric generating plant for Goodtown. We are interested in obtaining information about the energy source your company represents.

The members of our board of directors have come together because we have concern for the future of Goodtown. We were not in favor of the business policies of Badzap, our former power plant. We wish to usher in a new era of energy production for our community.

It is our goal to build a plant that will be run in a cost-effective manner so that we can provide inexpensive electricity to the citizens of Goodtown. We realize that fuel costs, fuel availability, environmental protection devices and strategies, lead time, and employment opportunities will all play a role in our decision. This is a complex issue.

We have planned a meeting to evaluate presentations from a variety of energy companies. We would like to invite your company to join the list of presenters.

We have set aside five to 10 minutes for each of the participating companies. We hope that you will be able to attend.

Please call if you have further questions.

Sincerely,

Herbert Redwood  
Chairman of the Board  
CHEAP



# Coal Fact Sheet

Seventh Grade

Activity: 1

Activity Card: 7-1m

Student's Name:

Date:

Most of Arizona's coal is located in the northeast corner of the state. The coal is removed from the ground by strip mining.

There are four types of coal:

1. Anthracite
2. Bituminous
3. Sub bituminous
4. Lignite

Anthracite coal has a carbon content of between 86% and 98% and can produce 15,000 BTUs-per-pound of heat energy. Bituminous coal has carbon content between 45% and 86% and can produce 10,500 to 15,000 BTUs-per-pound of heat energy. Sub bituminous coal has carbon content between 35% and 45% and can produce 8,300 to 13,000 BTUs-per-pound of heat energy. Lignite coal has a carbon content of between 25% and 35% and can produce .00 BTUs-per-pound of heat energy.

Most of the coal reserves in Arizona are lignite coal. It produces less BTUs-per-pound than other types of coal, but has a lower sulfur content and, therefore, produces less air pollution from sulfur dioxides.

Building a coal fired electric generating plant takes \_\_\_\_\_years.

The cost of producing electricity from coal is\_\_\_\_\_ per kilowatt-hour.

# Data Sheet

Seventh Grade

Activity: 1

Activity Card: 7-1n

**Student's Name:**

**Date:**

Notes on the technology of your energy source. (How does it work?)

Is your fuel readily available? Where does it come from? Where is the best place to get it?

What is the cost of your fuel per kilowatt-hour?

What is the lead time for construction?

How will your fuel effect the environment? What can be done to lessen its impact?

# General Guidelines for CHEAP

Seventh Grade  
Activity: 1  
Activity Card: 7-1o

Student's Name:

Date:

## General Guidelines for New Electric Company Stockholders (CHEAP)

### 1. Develop a business plan

Use the Business Plan Worksheet (Activity Card 7-1p) to help you develop a plan for your energy company. Your business plan is very important to your success in choosing the type of energy source you desire for your electric company. Answer as many questions as possible. The more accurately you can answer the questions, the greater the planning and chance for success as an energy company.

### 2. Create a business concept

Use the Business Concept Worksheet (Activity Card 7-1q) to help create a summary of what your business is and its competitive advantage over other energy companies. Put your business concept on the Criteria Sheet (Activity Card 7-1r) that you will give to the consultants the day of the presentations.

### 3. Determine criteria for acceptance

You will determine the criteria for choosing the energy source for your electric company and put this information on the criteria sheet.

Use the Parameters Information Sheet (Activity Card 7-1s) for range amounts for fuel availability, cost, lead time, and environmental impact to help choose criteria.

Use the information generated from your Business Plan and Concept to help decide which criteria factors are most important to your company; rate the importance 1 = most important and 4 = least important.

# Business Plan Worksheet

Seventh Grade

Activity: 1

Activity Card: 7-1p

Student's Name:

Date:

(Adapted from Rio Salado Small Business Development Center –  
BUSINESS PLAN WORKSHEETS Developed by Rod Christian)

## Customer Base

Describe your potential customers in Goodtown. Develop a clear mental picture of your ideal customers so you can think from their frame of reference. Use the following factors:

- age and sex
- income level
- education level
- geographic location
- occupational area
- leisure interests
- buying habits

## Competition

Describe your competition (other energy companies) by answering these questions:

- Who are your major competitors?
- Why are they successful?
- What substitutes are there for your product?
- What distinctive difference separates you from your competitors?
- Why will customers leave your competitors to choose your product?
- What percent of the population of Goodtown do you expect to get?

## Location Analysis

Describe your business location and how it will enhance the sale of your product. Your description should answer these questions:

- What advantages do you have at this location?
- Is there opportunity for expansion?
- What are the neighboring businesses?
- Do they compliment or detract from yours?
- How is the neighborhood changing?

## **Price Determination**

A description of the price structure for your product will answer the following questions:

- What price will you set for your product?
- How does the price compare with competition?
- Why will the customers pay your price?
- What image will be projected by this price?

## **Marketing**

A description of your marketing effort should answer these questions:

- What benefits are sought by your customers?
- How will your product satisfy customer needs?
- How will your image be consistently conveyed to the public?
- Which media are most suitable for advertising?

# The Business Concept

Seventh Grade

Activity: 1

Activity Card: 7-1q

Student's Name:

Date:

(Adapted from Rio Salado Small Business Development Center –  
BUSINESS PLAN WORKSHEETS Developed by Rod Christian)

The business concept is a summary paragraph that explains what your business is, its competitive advantage over other (energy) companies, and its general philosophy. Provide a clear description of your energy company's unique qualities that set you apart from other energy companies who are competing for the same customers. A business concept should answer the following questions:

- What does the business do?
- In what general market does it compete?
- What trends are evident in that market?
- What quality image does it have?
- What customer needs are met?
- Is there evidence this demand is increasing?
- What makes it unique from the competition?
- What volume of sales is expected?

# Criteria Sheet for Selection

**Seventh Grade**  
**Activity: 1**  
**Activity Card: 7-1r**

**Student's Name:**

**Date:**

## **Criteria Sheet for Energy Selection**

Developed by CHEAP (Give to Consultant groups the day of presentations)

### **Business Concept**

### **Criteria Factors**

(descriptions of what the company desires and rated according to importance of factors in accordance with our business concept: 1 = most important and 4 = least important)

**Desired Fuel Availability**

**Desired Fuel Cost per Kilowatt-hour**

**Desired Lead Time for Construction**

**Desired Environmental Impact**

# Parameters Information Sheet

Seventh Grade  
Activity: 1  
Activity Card: 7-1s

Student's Name:

Date:

## Parameters Information Sheet

The stockholders will determine the criteria for choosing the energy source for their electric company. The four criteria factors and associated ranges are described below.

### Fuel Availability

Your company's budget requires that the fuel availability be within the state of Arizona. Other considerations include the cost of transportation (the farther away the energy source is from the electric company, the higher the cost per kilowatt. This cost will be added to the initial cost.)

### Fuel Cost

Your company can choose what it wants to spend per kilowatt from \$500/KW to \$5000/KW.

The cost to the company will have an effect on the cost to the customers and the amount of profit to the company.

Considerations include the business concept of your company (to provide the cheapest, most environmentally friendly electricity and the amount of profit your company desires, etc.). In general, the higher the cost, the higher the cost to the customer unless your company wants a low profit.

Lower profits may mean less money to spend on research to improve your company for the future.

### Lead Time

Your company can choose between one and 20 years for the beginning of when you want to start selling your electricity.

Decide if you (the stockholders) need to start your business now because you need the money or if you can wait because you are presently wealthy.

Decide if there is a demand for the electricity now.

Decide if there is an available work force.



## **Environmental Impact**

Your company can choose if you want the least harm possible to the environment or if you want to consider the legal guidelines as your limit.

Consider future environmental impact.

Decide which type of pollution your company wants to avoid most.

## **Criteria Factors**

Your company should discuss each of these factors and formulate sentences that describe the qualities you desire for your energy source. Put this information on the criteria sheet that you will give to the consultants on the day of presentations.

You should decide the importance of the four factors and rate them such that 1 = most important and 4 = least important based on your business concept and plan.

# Parameters Information Sheet

**Seventh Grade  
Activity: 1  
Activity Card: 7-1s**

**Student's Name:**

**Date:**

## **Parameters Information Sheet**

The stockholders will determine the criteria for choosing the energy source for their electric company. The four criteria factors and associated ranges are described below.

### **Fuel Availability**

Your company's budget requires that the fuel availability be within the state of Arizona. Other considerations include the cost of transportation (the farther away the energy source is from the electric company, the higher the cost per kilowatt. This cost will be added to the initial cost.)

### **Fuel Cost**

Your company can choose what it wants to spend per kilowatt from \$500/KW to \$5000/KW.

The cost to the company will have an effect on the cost to the customers and the amount of profit to the company.

Considerations include the business concept of your company (to provide the cheapest, most environmentally friendly electricity and the amount of profit your company desires, etc.). In general, the higher the cost, the higher the cost to the customer unless your company wants a low profit.

Lower profits may mean less money to spend on research to improve your company for the future.

### **Lead Time**

Your company can choose between one and 20 years for the beginning of when you want to start selling your electricity.

Decide if you (the stockholders) need to start your business now because you need the money or if you can wait because you are presently wealthy.

Decide if there is a demand for the electricity now.

Decide if there is an available work force.

## **Environmental Impact**

Your company can choose if you want the least harm possible to the environment or if you want to consider the legal guidelines as your limit.

Consider future environmental impact.

Decide which type of pollution your company wants to avoid most.

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