Air Pollution

New Mexico Adventures in SuperComputing Challenge

Final Report

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Team 079

Shiprock High School

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Executive Summary

Our goal in doing this project is to discover what air pollution is and some major causes. We decided to study APS (Arizona Public Service) Power Plants and see what they are doing to reduce air pollution coming from the smoke stacks. We did extensive research on APS and ways to reduce air pollution. If we find a better way of reducing pollution we will suggest it to APS. In setting out to accomplish this project, we were hoping to raise awareness of the dangers of air pollution. One of the reasons that we feel so dedicated is, many of us have a loved one who works at APS (Arizona Public Service). We know the dangers that they face on a daily basis and would like to learn about different ways to protect them. The result of this was that we found out many things that are caused and causes of air pollution. People are the number one supplier of pollution. Many of the things that contribute to it are man-made and used without a second thought, such as your car. If we educate people of the dangers, they will learn to take care of this earth. We alone cannot tackle the problem by ourselves; everyone needs to remember that we all share this earth and need to take care of it for future generations.

Introduction

Hypothesis:

If APS plants are causing major pollution, then we will try to find a way to reduce the pollution.

Model:

Our model's purpose is to show how pollution spreads by the wind.

We began our project by learning about air pollution and major contributions. Most of the pollutants that are contributed are man-made. There are some natural sources, but not enough to cause any real change. The pollutants return to earth in the form of acid rain and snow, damaging the ecosystem.

Fossil fuels are produced by automobiles, factories, or power plants. When fossil fuels are burned, they put carbon dioxide, carbon monoxide, nitrogen oxides, and sulfur dioxide into the air. APS smoke stacks produce many of these chemicals. They operate eight power stations with a total of thirty-nine generating units in New Mexico and Arizona; there are one to eight units per site.

Since more than 575 employees work at the Four Corners Power Plant, we were curious about what effects pollution could have on humans. We found it can cause breathing problems and cancer if you are exposed to great amounts for a long period of time.

The most current Toxic Release Inventory report we could find was for 1998. It shows 1,050,000 lbs of Hydrofluoric Acid and 1,700,000 lbs of Hydrochloric Acid were produced that year. Both are on the top five most potent chemicals produced by APS.

Both exceeded the limit that the Environmental Protection Agency has where it states that chemicals can't be used in an excess of 10,000 pounds a year.

Most of the chemicals are metal compounds locked in the ash. Out of the thirty-five chemicals that the Environmental Protection Agency requires industries to report, APS reported a release of thirteen from its power plants. The chemicals come from burning fossil fuels, such as coal. Coal is 55% of their energy; they burn on average fifteen million tons of coal each year while natural gas, oil, and water only account for about 10%.

Our research is ongoing to find other, environmentally safe ways, of producing energy.

Project Description

To begin with, we broke down our project into parts and each team member researched a different topic. We had to do research on APS (Arizona Public Service), find out causes of air pollution, what effects it could have, and different ways of reducing it. Then we put it all together to see what we all had discovered.

Next we decided on a math model to help us to find out how far pollutants can travel from the plant.

$$\text{Distance} = \text{Time} * \text{Rate}$$

We figured this could help us to see how pollutants build up. In doing this we saw that on a very windy day, the pollutants can travel farther but it is thinned out. If you were to calculate it on a not-so-windy day, the pollutants wouldn't travel as far, but it would be more concentrated.

Results

Our research showed that the biggest problem is the smoke. So what to do? By using a sort of filter, the plant can reduce the amount of smoke. Therefore, less smoke, the less pollutants getting blown by the wind or collecting nearby. The problem is that these filters cost quite a lot.

Our solution was to fund raise. There are many environmental protection agencies that would be more than happy to invest time and money to help. We believe that the Environmental Protection agencies are there to assist in cleaning our earth. They should have more resources and knowledge of the problem and able to help.

Conclusion

We have concluded that if we raise awareness about the dangers of air pollution, there is a good chance that people will pay attention. There is a protest against the Four Corners Power Plant to close it. That is one of the reasons that we wanted to learn all we could about what was happening. After doing all the research, which was a lot of work, we feel that others need to know.

Shiprock Chapter house is planning to build another power plant. As we have read in the newspapers, both Arizona Public Services and San Juan Generating Station are giving out more Mercury than all the power plants in the Northwest of the country, even more than all the California power plants put together. In just three months, they have released 1,350 pounds of mercury.

The Daily Times is now informing people about APS's future plans, such as building another plant around San Juan County. We think that two power plants are enough to supply power to local communities.

Recommendations

We would like to show some of the things that we would like to see put into action.

1) Run the power plants less
2) Reduce smoke from the smokestacks by using filters
3) Raise money for organizations that work to clean up the earth
4) Educate people on using less electricity

We would like to discover what environmental organizations are out there and what they do to help. If we could get more involved, we could really make a difference.

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Mr. Calvin Charlie.....Mentor (Info.)

Ms. Alayna Largo.....Mentor (Code)

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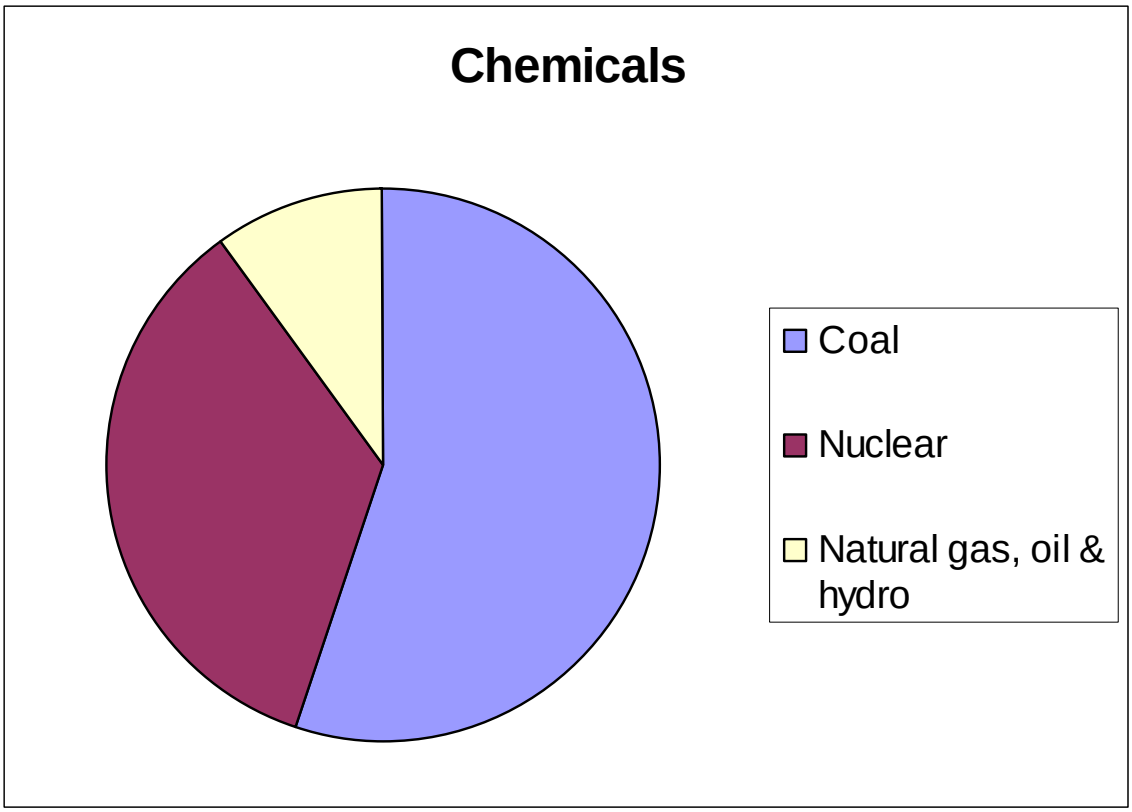
- **Farmington Daily Times (newspaper)**

- **Appendix A:**



APS uses 55% coal, 35% nuclear, and 10% natural gas, oil & hydro to produce energy for their power plant.

Appendix B:

Children Being Exposed Within 30 Miles to Lung Cancer

Plants	County	Exposed Population	Children under 18	Children in Poverty	Pediatric Asthma
Escalante	McKinley	60,868	20,274	10,298	1,150
Four Corners	San Juan	103,854	33,340	12,173	1,989
San Juan	San Juan	103,854	33,340	12,173	1,989

Appendix C:

```
// This program computes the distance, time, and rate
// of air pollution from APS (Arizona Public Service) power plant.

# include <iostream>  //For std::cin, std::cout, and std::endl
using namespace std;  //Allow use of cout, cin, endl, and string
int main ()
{
    // A. Intialize objects
        double t = 0.0;          // t = TIME
        double r = 0.0;          // r = RATE
        double d = 0.0;          // d = DISTANCE

    //B. Input
        cout << "Enter a number for time : "  << endl;
        cin  >> t;

        cout << "Enter a number for rate : "  << endl;
        cin >> r;

    //C. Process
        d = (t * r ) * 0.01        // distance = time * rate  * 0.01 (for decimal reason)

    //D. Output
        cout << "The distance pollution traveled in " << t << "minutes at
                a rate of " << r << "MPH is " << d << "miles.";
```

return 0;

}

COMPUTER SCREEN

For example: t = 60 ; r = 45

```
Enter a number for time: 60
Enter a number for rate: 45
The distance pollution traveled in 60 minutes at a
rate of 45 MPH is 32 miles.
```