Powering Los Alamos With Solar and Wind Energy

New Mexico
Supercomputing Challenge
Final Report
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Our project:
Our project is about the replacement of solar and wind energy. Our environment is going to be affected if we keep up our environmentally unfriendly ways. The theory we studied is to replace the coal intake for Los Alamos (61%)with solar and wind energy. The simulation we are doing is on StarLogo TNG. We have 6 agents that run simultaneously. These agents are: two solar energies (one that represents on and one that represents off), two wind energies (one that represents on and one that represents off), and two variables (one that turns the wind and solar energies on and one that turns them off). “On” and “off” are relative terms, represented by colors. A “red” wind energy is “off”, as is a “black” solar energy. “On” wind energies are “turquoise” and “on” solar energies are “yellow”. Our program goes on until stopped, the numbers of on and off energies continuously changing.

Executive summary:
We first compared solar and wind energy in many different areas. Then we called the Los Alamos utilities department and they told us to use both solar and wind energy in comparison to energy from coal. With this understanding we researched the possibility of replacing the coal with solar and wind. This is a real situation in our community and the results we have discovered may become a practical way to provide energy for the city in the future.

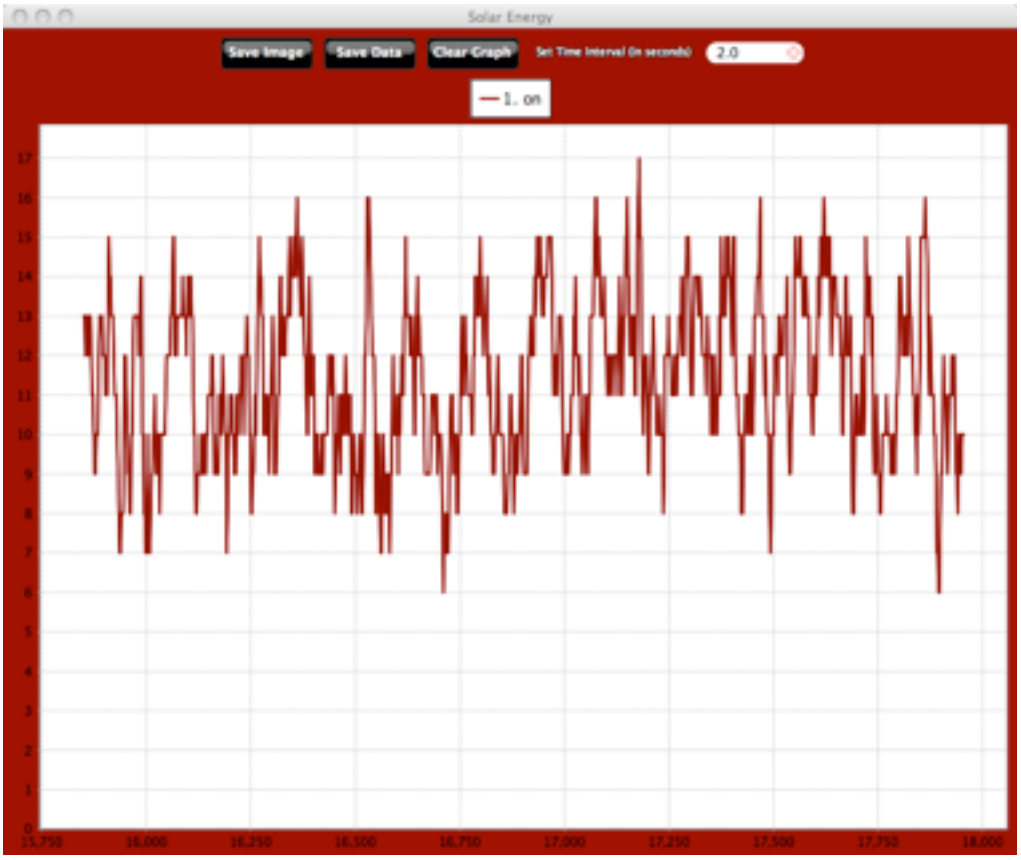
Results:

These graphs were created with:

10 wind and solar plants

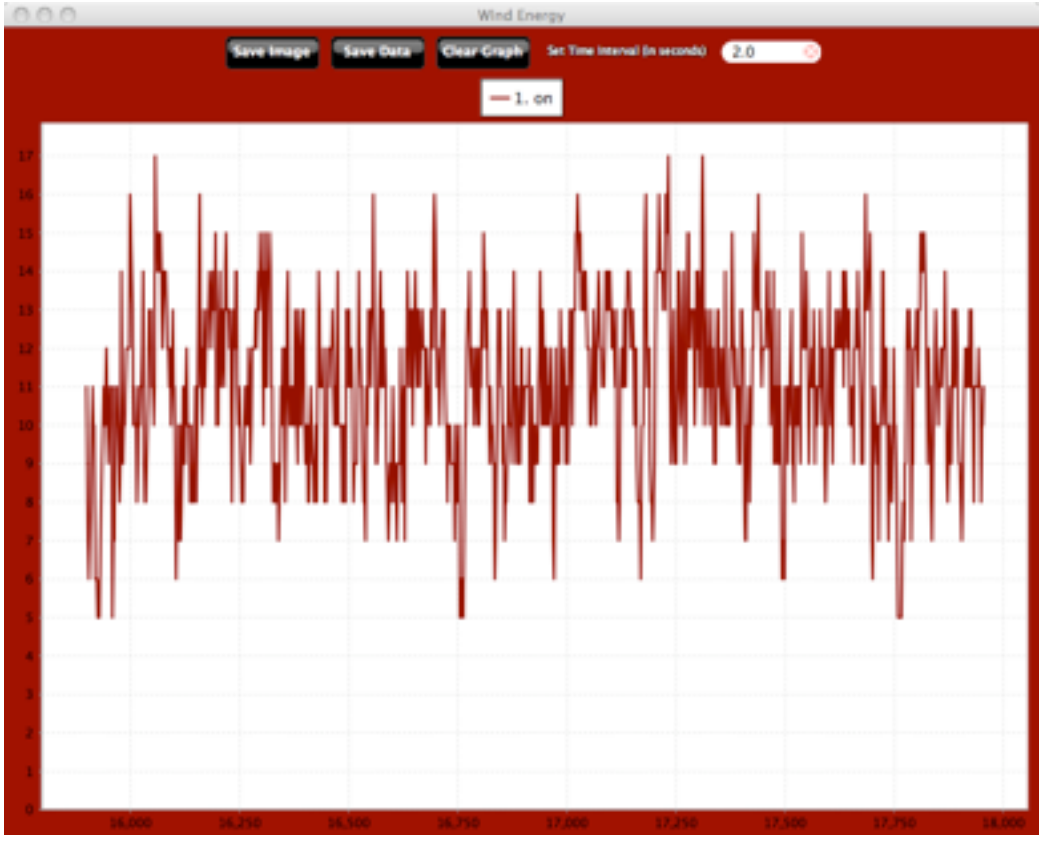
and 10 on variables

and 10 off variables



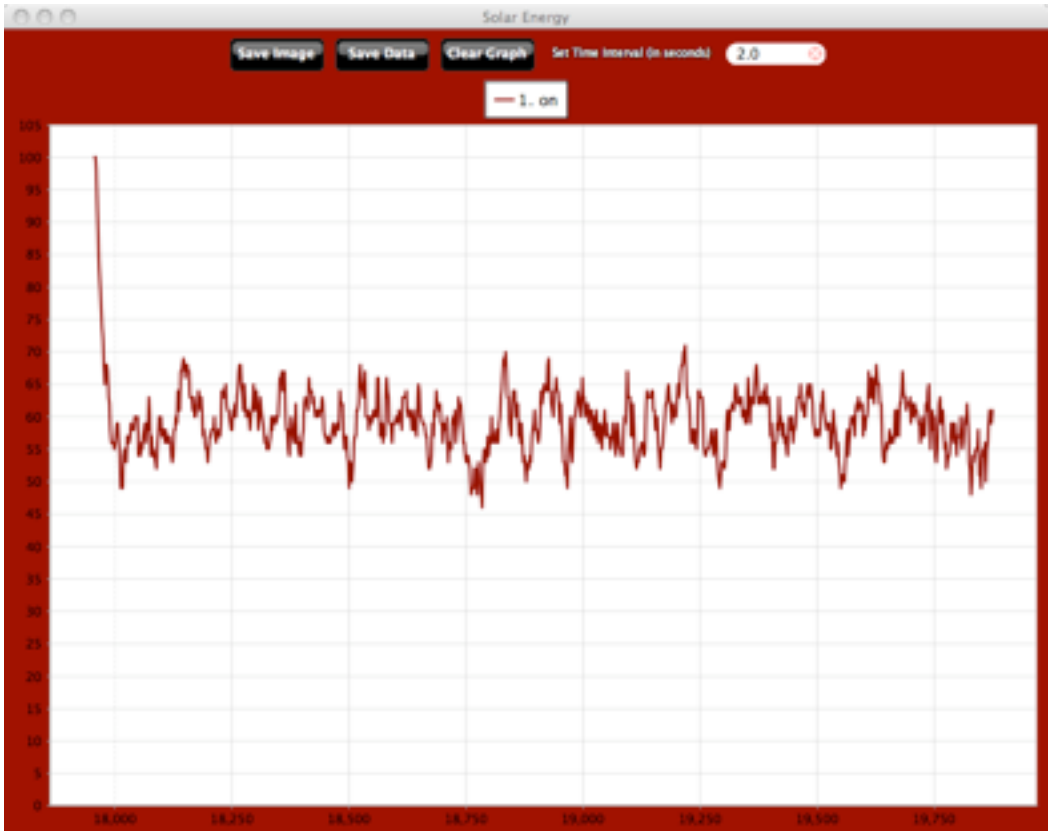
These graphs were created with:

20 wind and solar plants



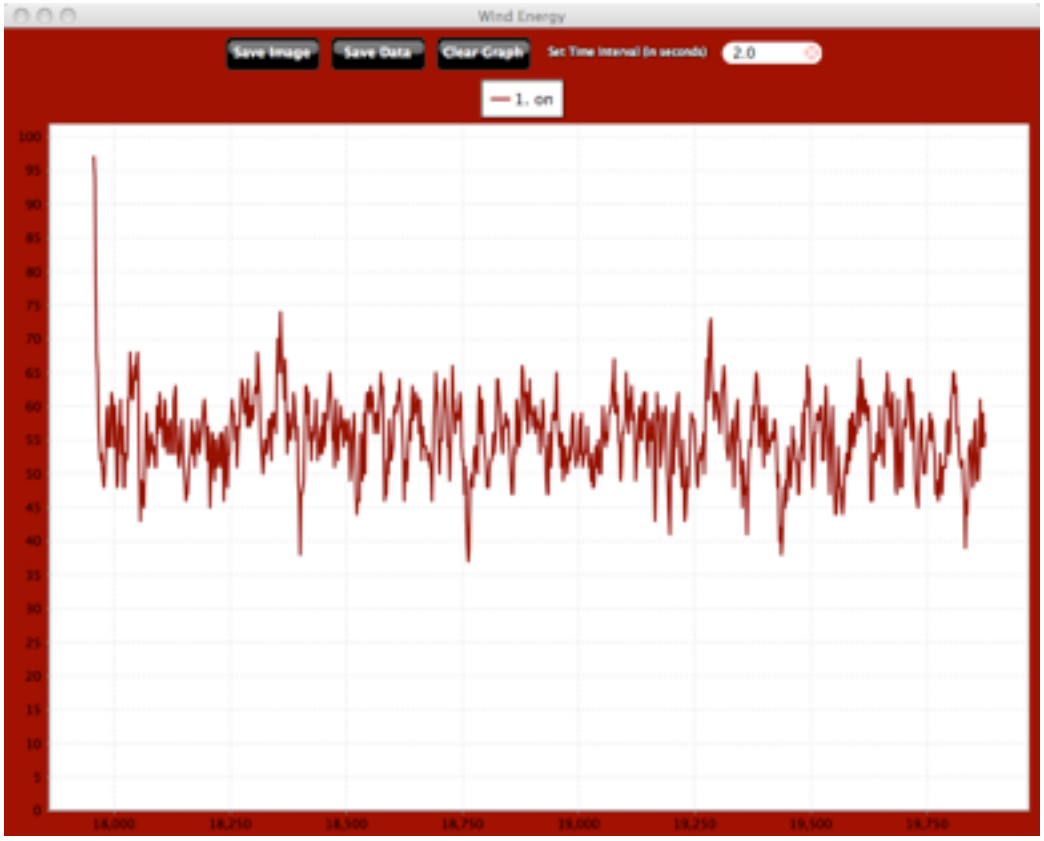
and 10 on variables

and 10 off variables



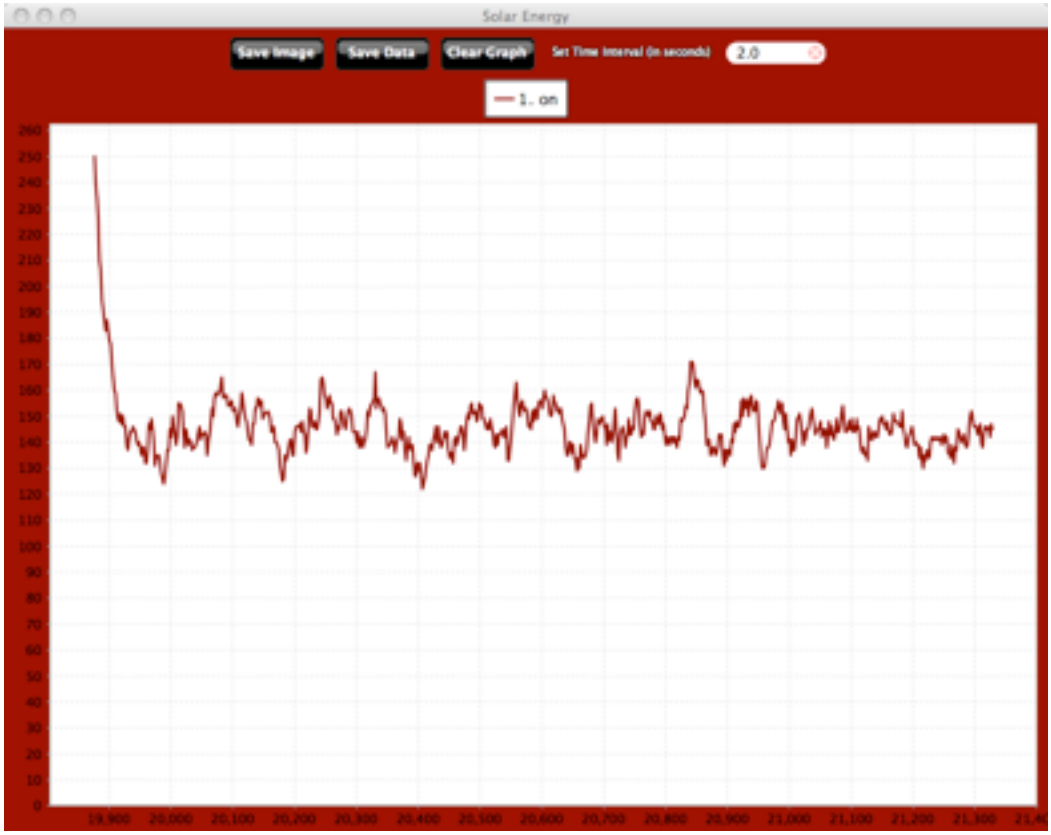
These graphs were created with:

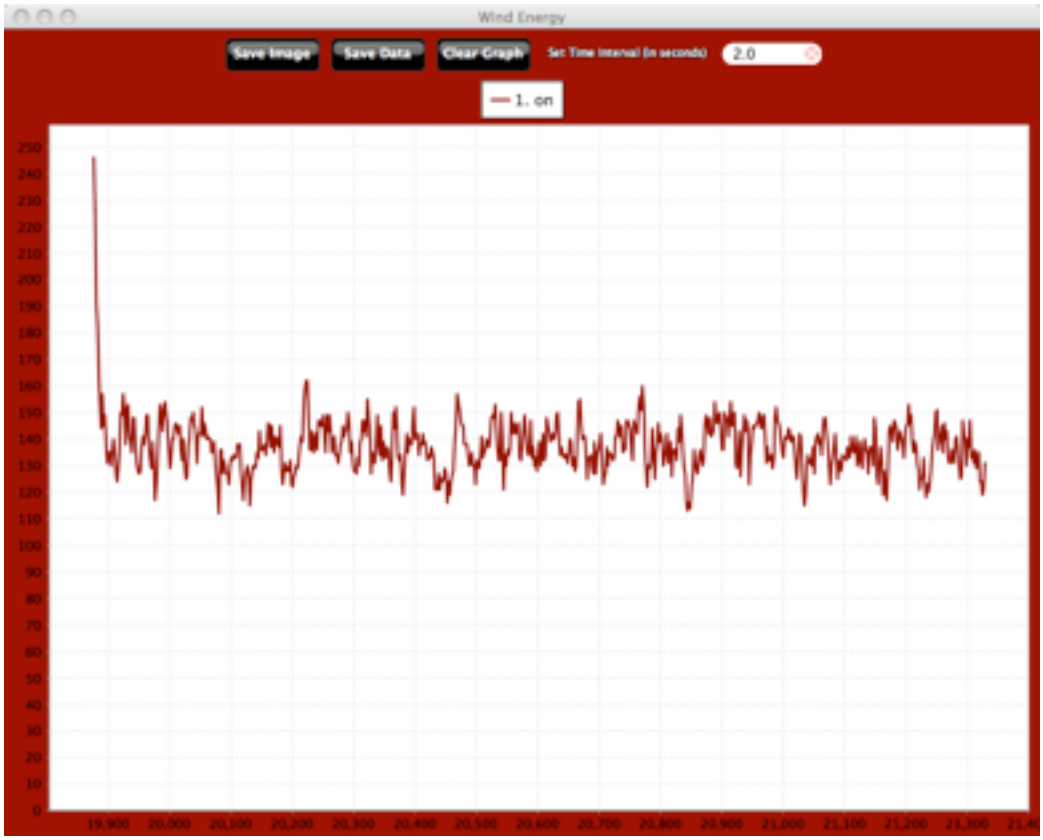
100 wind and solar plants



and 10 on variables

and 10 off variables



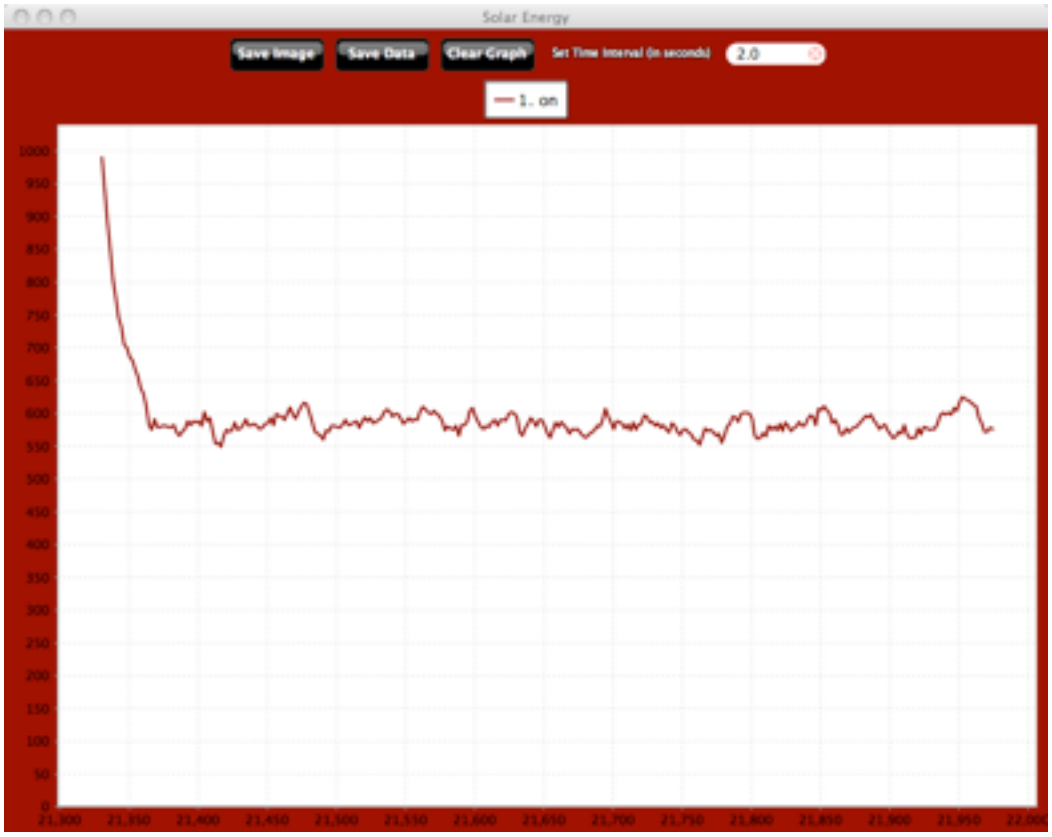


These graphs were created with

250 wind and solar plants

and 10 on variables

and 10 off variables

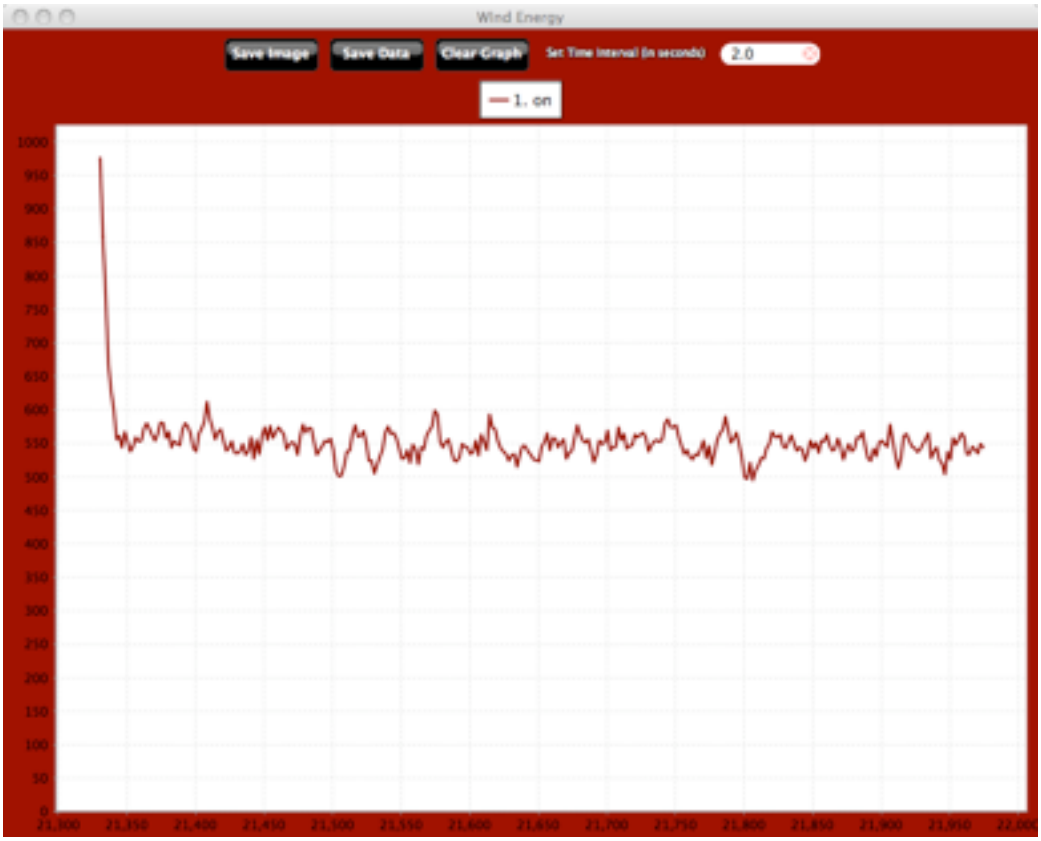


These graphs were created with with

1000 wind and solar plants

and 10 on variables

and 10 off variables



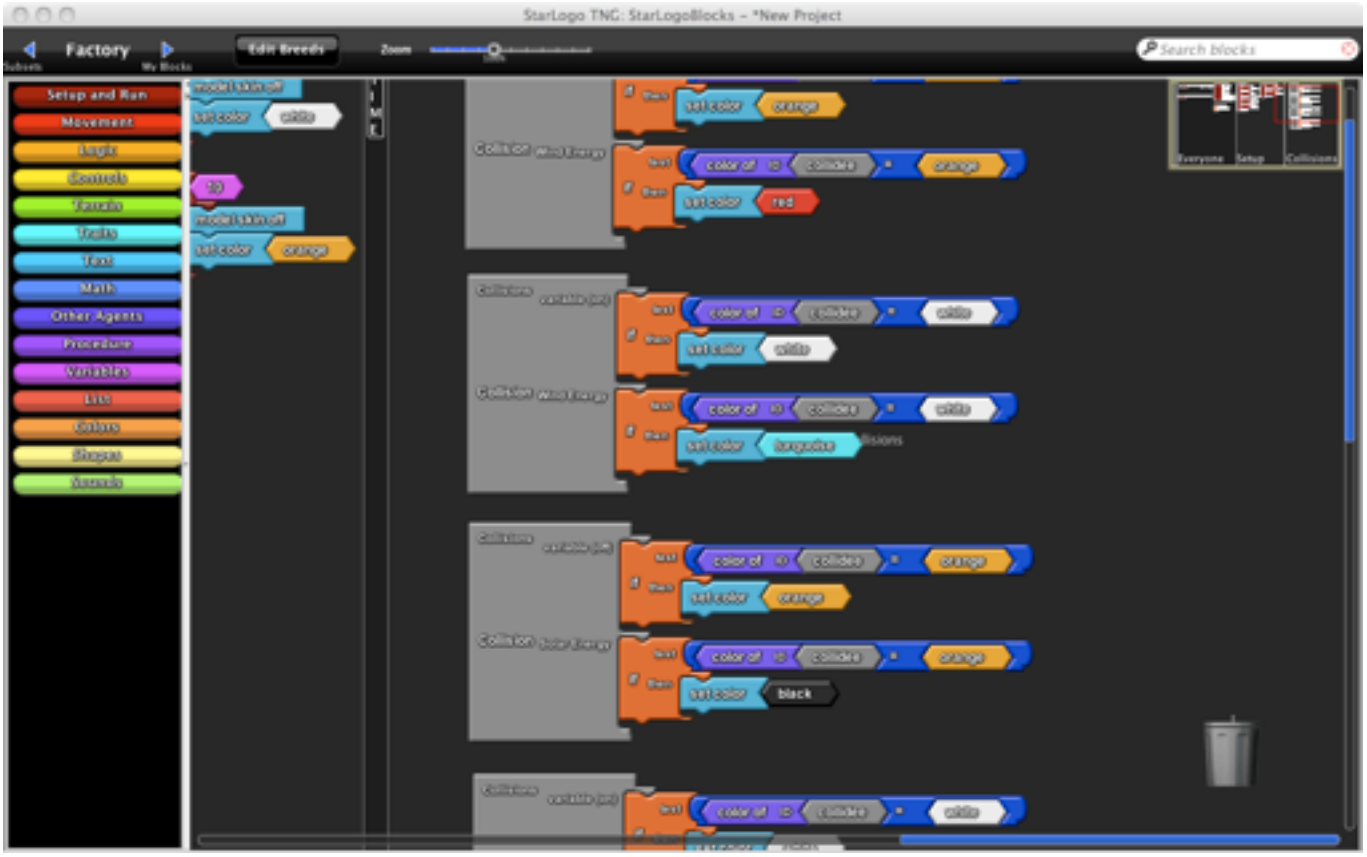
Conclusion from results:
By analyzing the graphs we concluded that to prevent a black out we must stay above a certain “black out number”, that is, the number of power plants that can be off without having a blackout. This number varies depending on how many power plants there are. When there are a higher number of plants, less energy is being wasted because the average is closer to the “black out number”. This is displayed in the graphs in the results section.

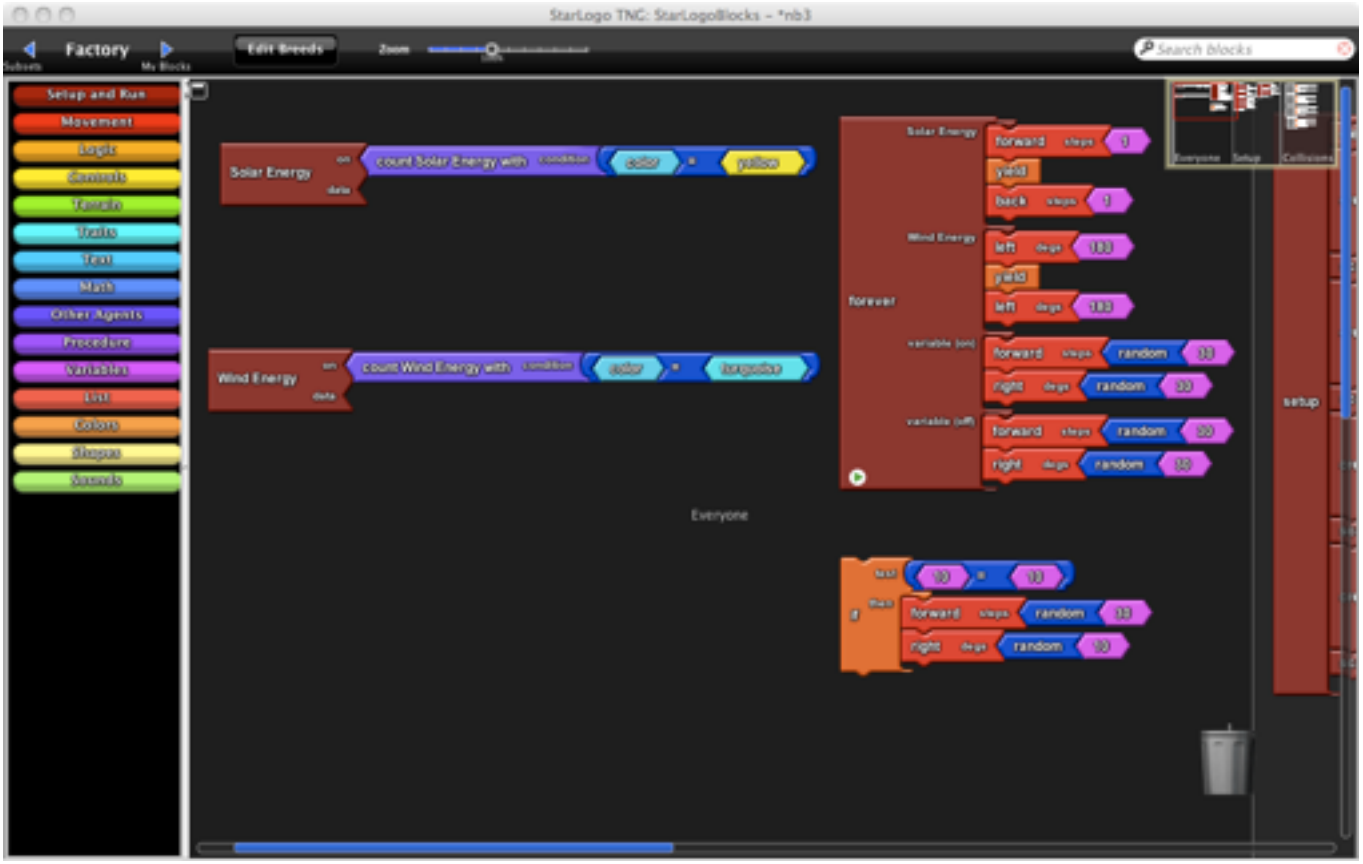
Software and references:
We’ve been working off of the newer type of StarLogo TNG. This is the version 2.0. The program has been working well for us. We know this isn’t a very complex system, but if we were to continue this project next year we would probably use a more complex system such as NetLogo TNG or R. We’ve also had a ton of references. All have been extremely helpful to our progress. Books about the energies we are using have been the most helpful. We used two books form the school Library. One told us about solar energy. That book was ‘Putting the Sun to Work’. The other book was ‘Wind Mills’. The last reference we had was Matt from the Utilities Department. He told us all about our predicament for energy usage in Los Alamos. This info is what has brought us to this standing point.

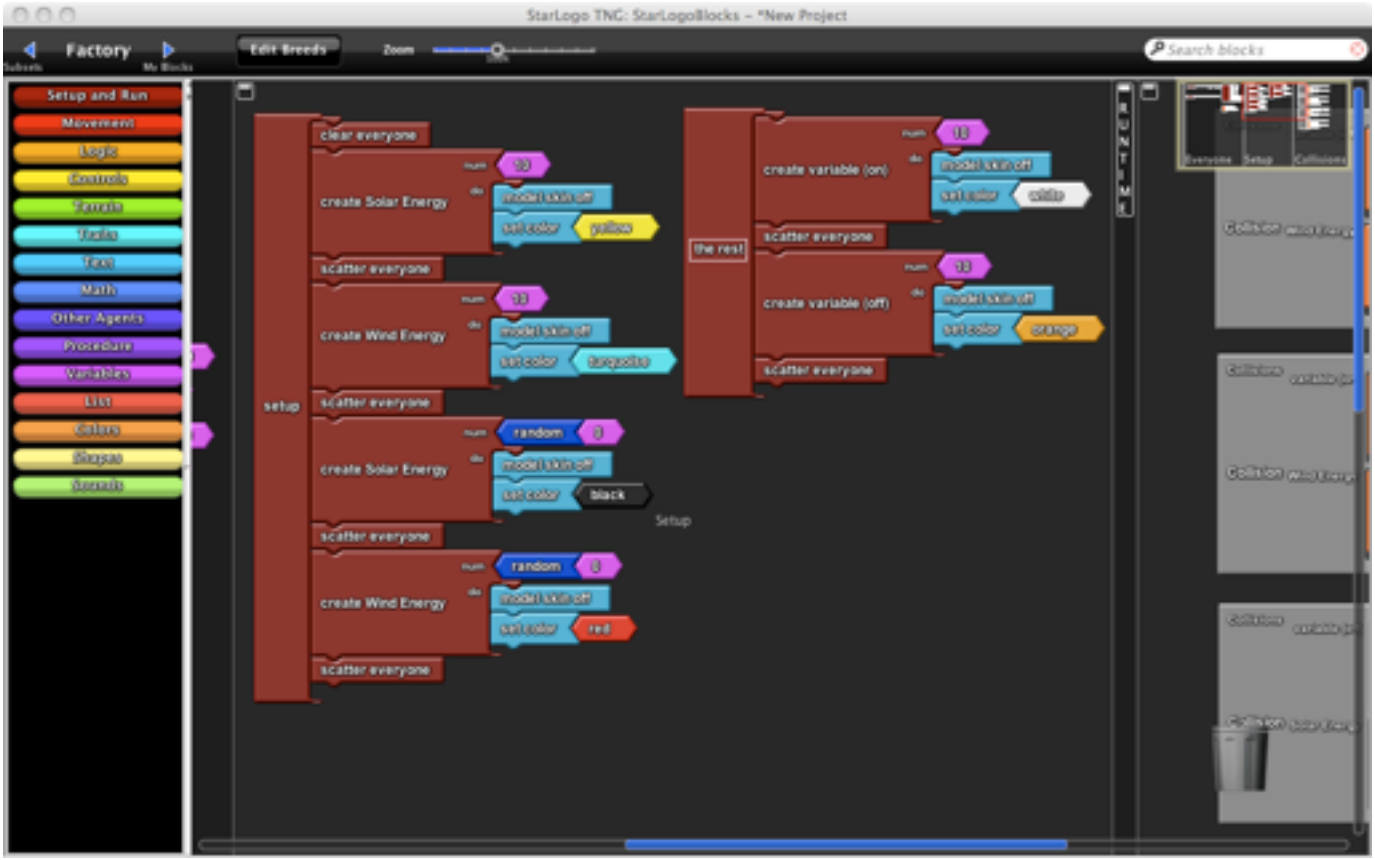
Most significant achievement:
We’ve come very far practically by ourselves. This has been a great learning time for us. We believe that all of these things the challenge has given us has taught us more. All of our work has been great and we think that this has been the one biggest achievement this year.

Acknowledgments:
We’d like to thank:
Zeynep Unal for letting us work in her room,
Mr. Wallstrom for helping restore our project multiple times,
Mrs. Cooper for coming and helping us with the graphs,

And the computing people for giving us a an exiting challenge.






StarLogo TNG: StarLogoBlocks – *New Project
Factory
Edit Breeds
Zoom
Search blocks
Setup and Run
Movement
Logic
Controls
Turtle
Turtle
Text
Math
Other Agents
Procedure
Variables
List
Colors
Shapes
Sounds
setup
clear everyone
create Solar Energy
num 10
do model skin off
set color yellow
scatter everyone
create Wind Energy
num 10
do model skin off
set color turquoise
scatter everyone
create Solar Energy
num random 0
do model skin off
set color black
scatter everyone
create Wind Energy
num random 0
do model skin off
set color red
scatter everyone
Setup
the rest
create variable (on)
num 10
do model skin off
set color white
scatter everyone
create variable (off)
num 10
do model skin off
set color orange
scatter everyone
Everyone
Setup
Collisions
Collision Wind Energy
Collision Solar Energy