



Building a Better House

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Background

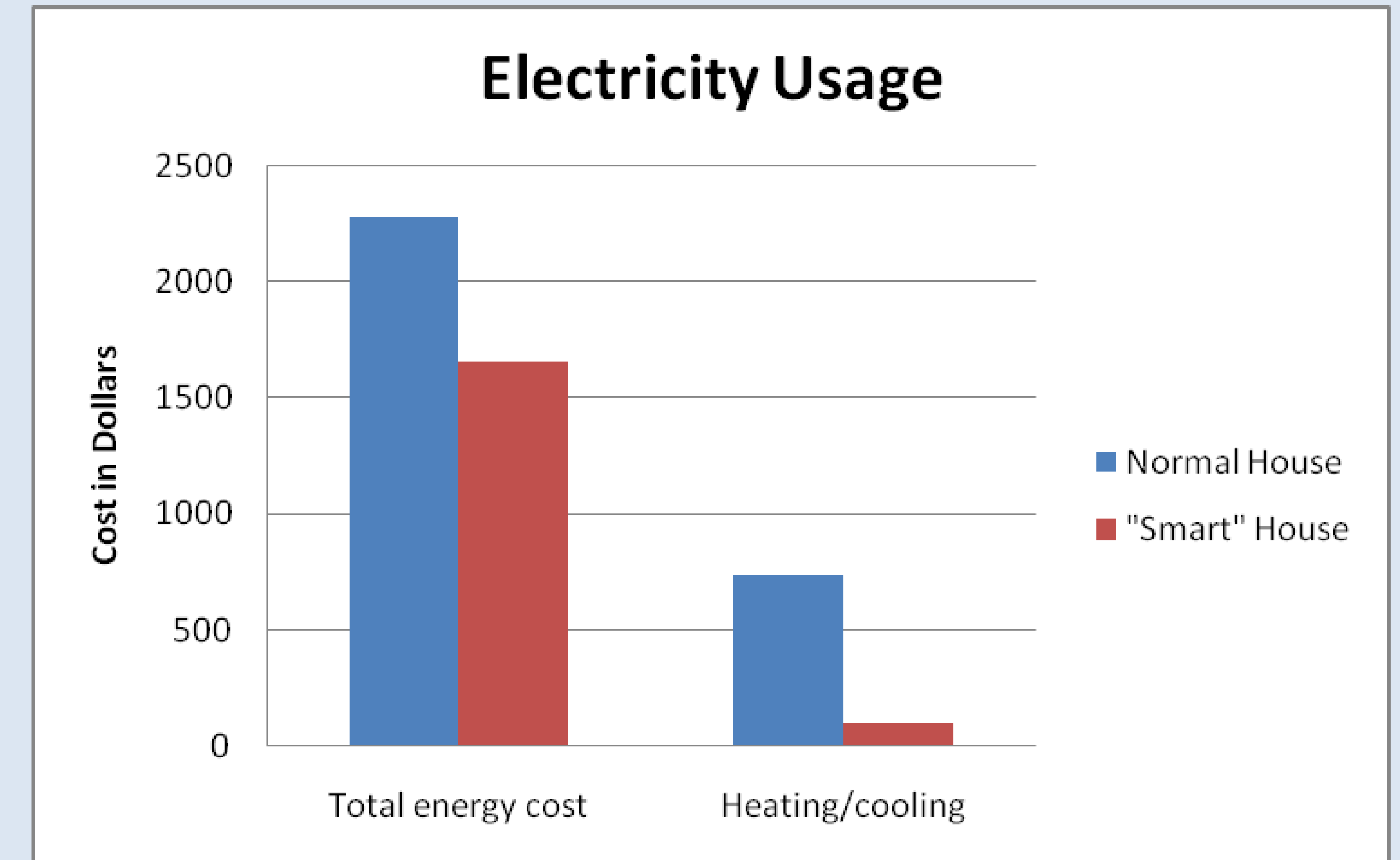
From laptops that are less than an inch thick to robots assisting in surgeries, the advancement in technical knowledge in recent years has become more of a constant presence in our lives. This technology may also be incorporated into the design of our homes in order to automate their basic functions and decrease the dependence on the energy grid. The technologies will come together and work in unison to create a "smart" home. This smart home could produce, manage, and use energy with extreme efficiency – not only for the advantage of the environment, but also for the homeowner's budget.



Abstract

The goal of this project is to construct a house that is sustainable, self-sufficient, and low-maintenance through the use of three strategies that would ensure its higher efficiency. The concept of this "smart" home is based on energy efficiency, natural integration and the use of control mechanisms. Energy efficiency will be achieved by utilizing renewable energy sources such as solar, wind, and geothermal power and by the smart management of its energy input and output to reduce the overall usage and cost of energy. The home will also use natural integration: and take advantage of pre-existing biological systems and other non-mechanical methods to reduce the amount of energy required to power and maintain it. These functions will all be administered through a centralized control mechanism much like a computer. The overall goal of the "smart" home will be not only to reduce the cost of living for its owner but to decrease its impact on the environment and help improve the conditions for those in and around it. By intelligently designing a home from the beginning and through use of sustainable methods, we can improve its internal living conditions and cut down on the cost of running it while at the same time minimizing its harmful impact it has on the environment.

Results cont.



Category	Normal House	"Smart" House	
Total energy cost	2277	1657	Dollars
Heating/cooling	740	100	Dollars

Methodology

Home Automation

Our smart house is equipped with a system that will automatically regulate the inside of the house. This system is also fully integrated with the solar and geothermal systems allowing the homeowner to monitor energy usage and output. The automation system also manages light, adjusting shades to take advantage of natural lighting.

Solar Power

The smart house also has a solar array that generates electricity to reduce energy costs. Our array uses "solar shingles", solar panels that look like ordinary roofing tiles but have power outputs that rival conventional panels. We looked at a 2.8 kW solar system, which would provide most of the power a house would need. We calculated the payoff time for the photovoltaic array by determining the savings of the approximate output of the array over a year then dividing the total cost to find the number of years in which the array would pay for itself.

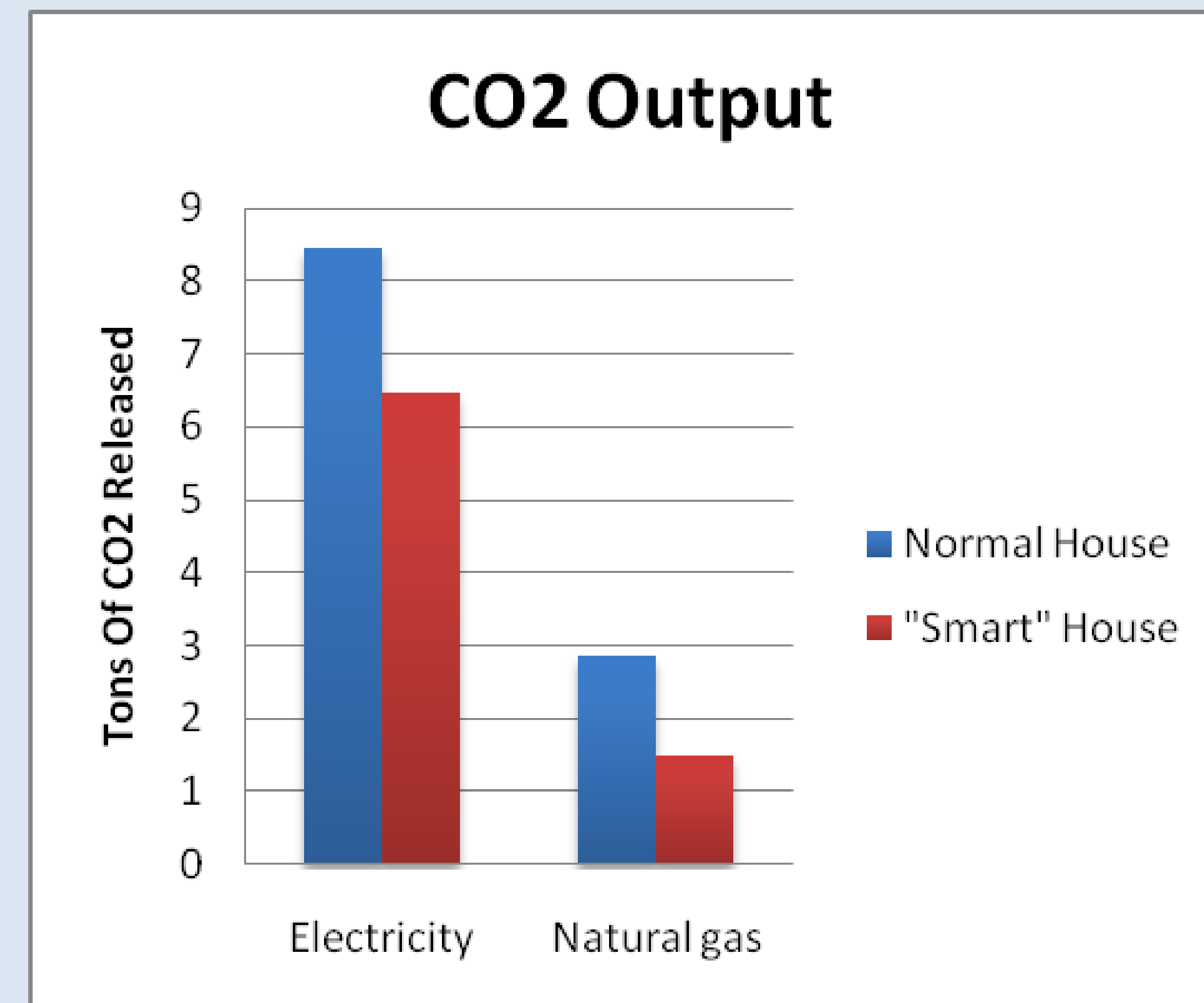
Geothermal Energy

To reduce green house gas emissions, we opted to install a geothermal heating and cooling system. We looked at several different designs before finally selecting one that would be the most efficient for our location. In addition to calculating savings over a conventional oil or gas fired heater coupled with an AC, we estimated the reduction in CO2 output.

Natural Integration

To complete the smart house, our research also looked into changes in conventional housing design that could result in a more efficient home and less wasted energy. We considered the possibility of a green roof as well as changes in the way a house is built and alternative building materials.

Results



CO ² released	Normal House	"Smart" House	
Electricity	8.46	6.46	tons
Natural gas	2.85	1.50	tons

Conclusion

Our smart home is an investment in a better way of life. The design of the home and the utilization of smart, clean technologies can create a better environment not only for the residents of the home, but eventually for all the people and other life forms of the world. With solar panels alone, if five more homes were to adopt them, in a single year ten tons of carbon emissions would be reduced. It may not be much for the current outpouring of emissions throughout the world, but it is a big step in the right direction. The cost savings would be a huge selling factor for all homeowners looking to change the way their home operates and affects the environment. This home and its control system can make for a safer, cleaner home with less waste and a higher standard of living. It's about time we do something to help the environment and ultimately our future.

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