



*"I saw her grow day by day and understanding the different types of energy."*

## KETTERING UNIVERSITY

# DTE Renewable Energy and Sustainable Cities Summer Camp

SUMMARY 2023

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The existence of all forms of life on our planet depends upon the consumption of energy in one form or another. All life, ranging from human beings to plants and animals, even very tiny sea creatures extract energy from our surroundings and convert it to usable forms. The food we consume, the solar rays that shine on us and the fires we get by burning are all different forms of energy. Summer camp students learn how human activities impact climate change that have impacted the raging California and Alaska *mega* forest fires, to the African droughts, to the devastating United States NE and Texas winter storms, and to the ever-expanding intensity of the United States Gulf and Coastal Hurricanes.



The 2023 summer camp was exceptionally timely considering that the 2023 summer months exhibited the hottest months in the last 100,000 years of human history, globally.



The primary DTE summer camp objectives were:

- Help GENERATION ALPHA future engineers and scientists understand their social responsibility to the survival and environmental security of future generations.
- Educate students to a conversational level in several renewable energy areas and technology including solar, wind, geothermal, biofuels and bio-power, fuel cells, hydrogen, hybrid transport,

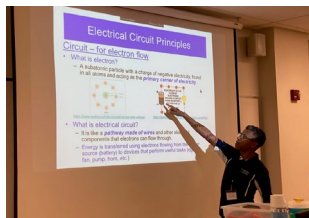
heat pumps, hydroelectricity, engineering ethics, water security, and Agriculture and Aquaponics.

- Educate students to help understand the use of instrumentation for energy measurements and for the calculation of power and resistance.
- Provide an opportunity for students to use basic hand tools for the assembly, operation, and data collection of a renewable energy power generation device.
- Help students to understand the importance of data collection, data formatting, and technical presentations for engineers and scientists.
- Help students understand the vital necessity of engineering and society ethics as a guiding mindset for future engineers and scientists as decision makers focused on securing our future for future generations.

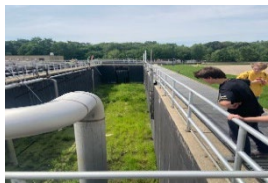
Our 2023 energy campers had remarkable experiences as they toured the DTE Lapeer Solar facility and the Bad Axe wind power generation facility. They were introduced to the DTE Michigan solar and wind capacity, power generation strategy and technology, and learned more regarding the collection of solar energy, the transmission of the energy, and the importance of solar and wind power as a hedge against global warming and climate change.



Their experiences were unique and included hands on broad exercises from how fuel cells work to generate clean electrical power with no emissions; to lectures and instructions relative to energy measurements as preparation for their individual group energy projects.



The trip to the Linden Wastewater Treatment plant was perhaps the most eye and “nose” opening experience as students were exposed to the realities of sewage treatment and water recovery. The trip was very informational as this was related to the class lectures regarding the additional 3 billion people projected to inhabit our planet in the next 30 years and the ever-increasing issue of waste generation, landfills, and the need for sustainable cities that must conserve resources.



**H**ydrogen is a clean alternative to methane, also known as natural gas. It's the most abundant chemical element, estimated to contribute 75% of the mass of the universe. Here on earth, vast numbers of hydrogen atoms are contained in water, plants, animals and, of course, humans. But while it's present in nearly all molecules in living things, it's very scarce as a gas – less than one part per million by volume.

Hydrogen can be produced from a variety of resources, such as natural gas, nuclear power, biogas and **renewable power** like solar and wind. The challenge is harnessing hydrogen as a gas on a large scale to fuel our homes and businesses.



**Green hydrogen** is produced by using electricity to power an electrolyser that splits the hydrogen from water molecules. This process produces pure hydrogen, with no harmful by-products. An added benefit is that, because this method uses electricity, it also offers the potential to divert any excess electricity – which is hard to store (like surplus wind power) – to electrolysis, using it to create hydrogen gas that can be stored for future energy needs<sup>1</sup>.

Our energy campers had the opportunity to tour the Flint MTA Hydrogen Fuel Cell Bus and Alternative (Propane/CNG) Fueling facility. They reviewed the process of making green hydrogen through the use of grid power and the electrolysis process and also were exposed to the hydrogen storage and bus refueling process.





While on-campus our future engineers received additional very specialized lectures in diverse topics such as the Flint Water Crisis, Hybrid Mobility, Engineering and Societal Ethics, and industrial lectures from DTE and Consumers Energy discussing Michigan’s strategic plan for securing our energy future.



Along the way they even had a chance for a little fun and games in the Kettering Recreation Center:



At the end of the program four student teams of 2-4 were formed. They had 3-days, with help of mentors, to assemble, test, and collect data for their pre-assigned energy conversion projects; and prepare technical presentation. This is an especially unique program aspect that allows students to see some of technical learning implemented within hands-on and age-appropriate conversion projects. Projects were very diverse and ranged from Hydroelectric Power and Battery Charging to Wind and Solar Battery Charging, Solar Water Purification, and hydrogen electrification & mobility.



## **PARENT COMMENTS and ASSESMENT**

### **WAS THE ENERGY CAMP AND EXPERIENCES VALUABLE TO YOU AND/OR YOUR STUDENT AND WHY?**

*"Yes. Every day I heard my students share new information on what they had learned. He was really excited about the hydrogen fuel cells, the field trip to the bus depot, the speakers from Consumers & DTE, and the time he worked on his project."*

*"Yes. As an introduction to alternative energy this camp provided ample opportunity for the students to learn many different aspects of AE, including ethics."*

*"Yes. Future technology exposure high schools don't provide renewable energy experience."*

*"My Daughter learned valuable information on conservation and re-cycling to understand what is required for a sustainable environment for people need to ensure resources are always available."*

*"It was a very valuable experience. My son saw this camp & asked to be enrolled. I'm so glad that he did because he loved this experience."*

*"Yes. Very valuable. Student learned variety of renewable energy sources to make the world more sustainable."*

*"Yes, it was valuable because it taught my kid some important concepts. For instance, my daughter told me that from 3-7pm don't turn on the AC unit or dryer or washing machine. And with reason she explained it. It was good to hear that she learned it at the camp."*

*"Yes, the energy camp was extremely valuable to my child. I noticed how he was eager to learn even though he's never attended a camp like this before."*

*"The hands-on experience, field trips, and access to knowledgeable staff to ask questions and to dive deeper."*

*"The camp allowed my child to begin to organize his thoughts about energy in a hands-on manner. He was able to bring his thoughts into classroom."*

## **PARENT COMMENTS and ASSESMENT**

### **PLEASE TELL US "IF" AND "HOW" YOUR STUDENT ENHANCED THEIR LEARNING AND UNDERSTANDING ABOUT ENVIRONMENT ISSUES?**

*"My student was able to talk about, share and discuss how the new information has had impact on current day living."*

*"Reese has shown interest in alternative energy but had been focused on nuclear energy. This has expanded his views of possible options. He has expanded his views of possible options. He has been motivated to research methods further and has a greater appreciation for the urgency of the use of alternative forms of energy."*

*"Yes, I feel my child has enhanced his learning and understanding about environmental issues by talking about Hydrogen Fuel cells & The Flint Water Crisis."*

*"Now she reads the news about environmental issues and talks about the politics."*

*"Yes. Camp enhanced the overall learning and understanding in the field. Very well-organized camp. All the best to the team."*

*"I think that this camp offers a view into an area of engineering that had not been considered before".*

*"Yes, she understands the importance of water and energy conservations."*

*"They learned a lot about the Flint Water Crisis & maybe the MOTT family. They will be ahead of their peers having attended this camp. The field trip was wonderful! Excellent staff."*

*"Seems to now have a well-rounded education on AE (Alternative Energy)."*

*"He definitely did learn more about the environmental issues presented. He saw possibilities and challenges. He has interest in reading and possibly experimenting with some of the technology studied this week."*

## **PARENT COMMENTS and ASSESMENT**

### **WAS THE ENERGY CAMP MORE OR LESS THAN EXPECTED AND WHY?**

*"More-He learned a lot about alternative energy sources. He enjoyed being able to ask questions of experts all week and to learn more about how these technologies are being used. The student projects were a bonus we didn't expect."*

*"More-They were able to see, experience so much more than I thought they would in this 9-fay time period."*

*"More-Offered by Kettering. Field Trips. Its awesome how the amp counselors could repair the bus. Way to go! Loved the presentations!"*

*"It was as expected, but additional field trips would be good for the students."*

*"We were very impressed with the number of field trips and the speakers that the campers were exposed to. Tie that in with hands-on experience and you have an amazing camp."*

*"More than expected! Energy tours. Learn by doing. Small group sizes. Friendly environment by the organizers to teach in a fun way."*

*"It was more than expected. I saw her grow day by day and understanding the different types of energy."*

*"The energy cap was more than I expected due to the educational field trips my child attended & the informative presentation on the last day".*

*"More! We are very excited to pursue more camps through Kettering. We have had many engaging conversations as a family based on his experiences at camp."*

*"It was hands on, a lot of information. I do think information should have been shared a little more w/parent. Camp did exceed expectations."*