PORTSFUTURE
IMAGINING THE OPPORTUNITIES, GATHERING YOUR IDEAS
THE FACILITY AT PIKETON, OHIO

OHIO
UNIVERSITY
Voinovich School of
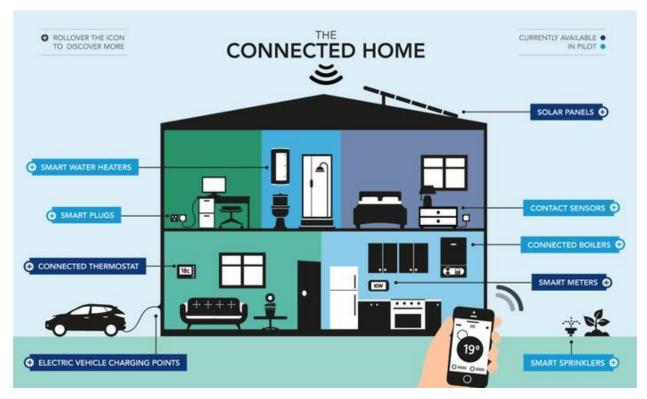Leadership and Public Affairs

**AMERICAN
ELECTRIC
POWER
FOUNDATION**

Ohio University Voinovich School of Leadership and Public Affairs
American Electric Power (AEP) Foundation and
U.S. Department of Energy Office of Environmental Management (DOE EM)
Portsmouth/Paducah Project Office-PORTSfuture Program

STEM Initiative-Meeting Renewable Energy Challenges with the Internet of Things

The Voinovich School is utilizing funding from the AEP Foundation and from the US DOE PORTSfuture grant to launch an Internet of Things (IoT) STEM education pilot project in southern Ohio. This project will better prepare high school students and educators for this emerging field, will leverage the unique opportunities available in Appalachian counties, and ignite a new generation of social innovators.

This rapid integration of the physical and digital world is fundamentally changing our lives and businesses, from people to devices, to data and processes and will create new opportunities for entrepreneurs and job seekers. The THINGS around us (e.g., renewable energy sources, home appliances, industrial equipment, smart energy monitoring devices, medical devices, and entertainment devices) are becoming interconnected, enabling them to exchange information and allowing us to monitor and control them remotely. The major objectives for the IoT are the creation of "smart" environments/spaces and self-aware things for climate, food, energy, house, mobility, digital society and health applications. In fact, this year alone there will be nearly 5 billion connected things, according to Gartner, with the number expected to increase to 25 billion things by the end of this decade.[i]

THE
CONNECTED HOME

ROLLOVER THE ICON
TO DISCOVER MORE

CURRENTLY AVAILABLE ●
IN PILOT ●

SOLAR PANELS
SMART WATER HEATERS
SMART PLUGS
CONNECTED THERMOSTAT
ELECTRIC VEHICLE CHARGING POINTS
CONTACT SENSORS
CONNECTED BOILERS
SMART METERS
SMART SPRINKLERS

Graphic source: energydigital.com

i.Internet of Things Primer for 2016. Gartner, Inc.

(more information below)

We see signs of it in a wide range of industries that may come to life in the future:

➢ A world where power optimization monitoring can help energy-intensive appliances to operate more efficiently and smooth out spike in power needs.

➢ A world of smart connected things, for example a smart mailbox that tells you when the mail is delivered.

➢ A world where security and emergency monitoring will help detect and prevent a burglary before it can occur through smart security monitoring systems where a door remembers to lock even if you forget to do so.

➢ A world where indoor air quality monitoring will help detect and prevent disasters before they can occur through smart monitoring systems. For example, a smart window that can save a life by opening automatically when a smart carbon monoxide sensor detects CO, an odorless, colorless gas that can kill you.

The Metropolitan Policy Program at the Brookings Institute's recent report on "Digitalization and the American Workforce" presents data that "digital technology is disrupting the American workforce, but in vastly uneven ways…Digitalization is associated with increased pay and job resiliency in the face of automation but also vastly uneven trends for job growth and wages. Sharp gender- and race-based challenges also exist."

To address this new reality, Brookings recommends "First, firms, industry associations, educational institutions, and governments must work urgently with workers and students to expand the high-skill IT talent pipeline. And second, governments, businesses, and others need to greatly expand basic digital literacy, especially among underrepresented groups. Finally, on both fronts, an effort must be made to cultivate durable human qualities, not just rote skills better done by machines."
Source: https://www.brookings.edu/research/digitalization-and-the-american-workforce/

➢ A world where environmental monitoring will help prevent environmental events before they can occur through various monitoring systems. Examples include smart air pollution sensors that can control CO_2 emissions of factories, pollution emitted by cars and toxic gases generated in farms.

➢ A world where smart farming will be commonplace, where the farming experience meets modern digital technology to deliver the food the world needs to feed a burgeoning population.

Technology is increasingly becoming a core driver of how our society functions, redefining the landscape in which we live and work. The World Economic Forum has labelled this as the Fourth Industrial Revolution. The Internet of Things will provide benefits and transform the way we interact with our world. Embracing industrial revolutions

How can educators integrate new skills into the classroom?

By developing IoT courses supplemented by in-class interaction to introduce the Internet of Things (IoT) to students in resource-challenged communities in Appalachian Ohio, we can help students become better prepared to enter the workforce of the future. The program, in later stages, also hopes to offer a competition to recognize exemplary student ideas and efforts, and provide support to encourage superior student-generated ideas to pursue marketable small business status.

propels economies forward, creating new opportunities to improve society and grow innovation.

For more information, contact Stephanie Howe: howe@ohio.edu

The program will:

➢ Create opportunities for collaboration between high schools and colleges to introduce students to IoT concepts and encourage college aspirations for students.

➢ Encourage student innovation by providing structure and support for superior student-generated ideas on how to become marketable small business ventures through a session with Techgrowth Ohio, a program sponsored by Ohio University and the Ohio Third Frontier program.

➢ Learn science by monitoring or solving their community problem such as water/air pollution, renewable energy challenges, forest and land environments, traffic monitoring, or energy usage at school or home.

➢ Using this partnership, local educators will be given access to the relevant tools they need to integrate software and curriculum used in the industry into current product design, sensory networking, data analytics, or other innovative courses to provide their students with a leg up in the competitive job market.

The program offers an interdisciplinary approach to critical thinking, creative problem solving, programming and data science around the subject of IoT. Students will:

➢ Build hardware and software to collect, exchange, analyze and compare real-world sensor data through the Internet.

➢ Learn about hardware and software through mentoring, workshops and boot camps, thus taking advantage of the surging maker-movement.

➢ Analyze collected data and compare between school teams, taking into account differences in location, time zones, climates, etc…

➢ Choose appropriate sensors and collect data.

➢ Use microcontrollers to transfer data from sensors to the Internet.

➢ Apply web tools to remotely analyze the data.

➢ Send processed information back to a device.

➢ Control electronic systems over the Internet.

➢ Apply the information to solve problems.

➢ Predict key trends in emerging IoT industries.