

V(A). Planned Program (Summary)

Program # 2

1. Name of the Planned Program

Sustainable Energy

Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
511	New and Improved Non-Food Products and Processes	30%		90%	
608	Community Resource Planning and Development	70%		10%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2014	Extension		Research	
	1862	1890	1862	1890
Plan	4.0	0.0	2.7	0.0
Actual Paid	4.0	0.0	1.9	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
224909	0	210297	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
224909	0	610450	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Throughout the planning period, research and Extension activities will inform sustainable energy and advanced materials programs, through both basic and applied research, and with the full range of Extension activities. The research takes place in all academic departments/schools within the College of Food, Agricultural, and Environmental Sciences. Laboratories for experiments, pilot plants, a feedstock processing plant, greenhouses, and research plots and stations throughout the state support this program. All functional laboratories and sites are improved over time as program need warrants.

OSU Extension provides parallel educational programs in this Planned Program to advance knowledge, promote adoption and change, develop human capital, and support economic development activities. 'Energize Ohio', an Ohio State University Extension signature program, provides non-biased, research-based information to address critical energy issues impacting Ohioans. The programming is designed to enhance community leaders' and local residents' knowledge of energy drivers and development in order to promote best practices and informed decision-making on the implementation of sustainable energy strategies in Ohio's communities, businesses, and farms.

OARDC and OSU Extension faculty and staff engage in appropriate levels of outreach, engagement, and consultation, with both internal and external stakeholders, to ensure the research has the greatest chance of effecting change within society.

2. Brief description of the target audience

Targeted audiences include, but are not limited to:

- Businesses, industries, and residents that have expressed a need for sustainable energy and advanced materials information that is derived through new research, extracted from on-going research, or is derived from scientific literature;
- Other stakeholders, with particular focus on consumers;
- Academic units that partner with program scientists to create systems and processes needed to support not only the research, but also the adoption of the research findings by industrial partners;
- Fellow agencies or support organizations who will not only use the information but will also be brokers of that information, including embedding it into groups to encourage change;
- Populations who have not requested the information but will likely benefit from that information, e.g. community leaders, general public;
- Other scientists and scientific groups;
- Political entities;
- Other education, outreach, and Extension personnel;
- Students from elementary school to post doctorate studies;
- News organizations.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2014	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	1903	19813	0	0

2. Number of Patent Applications Submitted (Standard Research Output)

Patent Applications Submitted

Year: 2014
 Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2014	Extension	Research	Total
Actual	7	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- number of educational workshops and seminars

Year	Actual
2014	62

Output #2

Output Measure

- number of research-based assessments of energy project sites
 Not reporting on this Output for this Annual Report

Output #3

Output Measure

- number of counseling sessions / meetings concerning community energy project assistance & planning
 Not reporting on this Output for this Annual Report

Output #4

Output Measure

- number of attendees at on-farm photovoltaic solar energy development workshops

Year	Actual
2014	289

Output #5

Output Measure

- number of visitor sessions to the "Energize Ohio" website

Year	Actual
2014	16464

V(G). State Defined Outcomes**V. State Defined Outcomes Table of Content**

O. No.	OUTCOME NAME
1	Programs in this area will develop strategies to engage producers, industrial partners, and consumers groups over a 5-year period resulting in effective leadership-oriented partnerships.
2	The program will build scientist/stakeholder cores to guide/provide biological, chemical, physical, engineering, and social research necessary to create new and improved processes and products commensurate with demand.
3	Annually the program will report, in conjunction with industrial partners, non-proprietary research gains made to the consuming public to garner interest in adoption of new products and processes when released.
4	Maintain an ongoing needs assessment program to identify yet to be determined needs of society for bio-based products as crude oil and natural gas supplies decline, as well as assessing impacts from other external factors.
5	By 2018, the program will contribute at least two alternatives to a petroleum-based product or process that meets client needs with an acceptable point of purchase price.
6	Support, through research, the building of biobased development that annually, beginning in 2013, utilizes Ohio and the region's plentiful supply of biomass, including waste steam materials in such manner as to improve the economy.
7	Support the building of biobased development that, beginning in 2013, effectively utilizes agriculture's production capacity to produce plants that have the desired attributes for manufacturing.
8	Increased understanding of energy alternatives, resources and project support (OSUE)
9	Implement change in energy usage by workshop participants (OSUE)
10	Complete installation of alternative energy activity (OSUE)
11	Complete plan for community or business energy activity (OSUE)
12	number of on-farm alternative energy projects completed (OSUE)
13	proportion of participants who indicated they know more about energy as a result of the 'Energize Ohio' program (OSUE)
14	proportion of participants who indicated that they plan to use the materials and / or information from the 'Energize Ohio' program in making decisions related to energy at their home, farm, or business (OSUE)
15	proportion of 'Energize Ohio' participants who indicated that the program provided valuable information that they would recommend to others (OSUE)

Outcome #1

1. Outcome Measures

Programs in this area will develop strategies to engage producers, industrial partners, and consumers groups over a 5-year period resulting in effective leadership-oriented partnerships.

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

The program will build scientist/stakeholder cores to guide/provide biological, chemical, physical, engineering, and social research necessary to create new and improved processes and products commensurate with demand.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Millions of Americans, including 8-17 percent of healthcare workers, are allergic to latex. Medical professionals prefer latex gloves because they perform better and offer more protection, but the risk of allergies has made synthetic gloves increasingly common.

What has been done

To address this problem, OARDC researchers have developed new, patent-pending materials that are safe for both Type I and Type IV latex allergy sufferers. Some of these materials are made from guayule, a U.S. desert shrub that produces high-quality latex that is naturally Type I-hypoallergenic. The scientists also created a new process that gets rid of the residues on latex products that cause Type IV allergy.

Results

This new, bio-based latex can also be used in other conventional-latex healthcare products including catheters, dental dams, and orthodontic rubber bands. A startup company, EnergyEne

Inc., headquartered in Wooster, OH, has been established to lead the development and commercialization of products made from these new materials.

Guayule is one of many new bioenergy and bioproduct crops that OARDC is evaluating. The Ohio State University is conducting guayule trials in southern Ohio with the aim of developing new agricultural industries and economic opportunities in the region. In addition to rubber and latex, guayule produces a diesel-like fuel that can be extracted easily and cheaply.

4. Associated Knowledge Areas

KA Code	Knowledge Area
511	New and Improved Non-Food Products and Processes

Outcome #3

1. Outcome Measures

Annually the program will report, in conjunction with industrial partners, non-proprietary research gains made to the consuming public to garner interest in adoption of new products and processes when released.

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

Maintain an ongoing needs assessment program to identify yet to be determined needs of society for bio-based products as crude oil and natural gas supplies decline, as well as assessing impacts from other external factors.

Not Reporting on this Outcome Measure

Outcome #5

1. Outcome Measures

By 2018, the program will contribute at least two alternatives to a petroleum-based product or process that meets client needs with an acceptable point of purchase price.

Not Reporting on this Outcome Measure

Outcome #6

1. Outcome Measures

Support, through research, the building of biobased development that annually, beginning in 2013, utilizes Ohio and the region's plentiful supply of biomass, including waste steam materials in such manner as to improve the economy.

Not Reporting on this Outcome Measure

Outcome #7

1. Outcome Measures

Support the building of biobased development that, beginning in 2013, effectively utilizes agriculture's production capacity to produce plants that have the desired attributes for manufacturing.

Not Reporting on this Outcome Measure

Outcome #8

1. Outcome Measures

Increased understanding of energy alternatives, resources and project support (OSUE)

Not Reporting on this Outcome Measure

Outcome #9

1. Outcome Measures

Implement change in energy usage by workshop participants (OSUE)

Not Reporting on this Outcome Measure

Outcome #10

1. Outcome Measures

Complete installation of alternative energy activity (OSUE)

Not Reporting on this Outcome Measure

Outcome #11

1. Outcome Measures

Complete plan for community or business energy activity (OSUE)

Not Reporting on this Outcome Measure

Outcome #12

1. Outcome Measures

number of on-farm alternative energy projects completed (OSUE)

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	4

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

It may be possible for ag producers to lower energy costs using new alternative energy-generating technologies. Lowering energy costs via alternative energy-generation sources has environmental and economic benefits.

What has been done

Fifteen on-farm alternative energy-generation programs and demonstration days have been conducted involving 600 participants. In addition, to support landowner and community education on renewable energy, the 'Energize Ohio' team has developed a number of new tools in 2014, including 4 new fact sheets, 3 short videos, a technical report, and a journal article.

Results

Four farmers have installed solar systems on their farms, generating roughly 118,000 kWh of electricity and offsetting nearly 180,600 pounds of greenhouse gas emissions annually.

4. Associated Knowledge Areas

KA Code **Knowledge Area**
511 New and Improved Non-Food Products and Processes

Outcome #13

1. Outcome Measures

proportion of participants who indicated they know more about energy as a result of the 'Energize Ohio' program (OSUE)

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	84

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Energy development in Ohio is important for the future vitality of the state as it influences both economic growth and the general quality of life of Ohioans. In 2012, the average per capita energy expenditures in Ohio was \$4,265, representing roughly 12 percent of Ohioans per capita income. As a result, access to affordable energy directly influences our quality of life.

What has been done

Sixty-two 'Energize Ohio' programs were conducted involving 1,903 participants from throughout Ohio in 2014. Participants were educated about renewable energy and shale energy issues, including: energy policy, farm energy education, homeowner energy education, and sustainable community planning.

Results

In a post-program assessment, 84% of 'Energize Ohio' participants indicated that they had learned more about energy as a result of participating in the 'Energize Ohio' workshops. One past participant commented, "OSU Extension is not only giving us guidance, but they've been in touch with other states that have already been through shale development, and they're providing us with that experience and expertise. It's been invaluable."

4. Associated Knowledge Areas

KA Code **Knowledge Area**

511	New and Improved Non-Food Products and Processes
608	Community Resource Planning and Development

Outcome #14

1. Outcome Measures

proportion of participants who indicated that they plan to use the materials and / or information from the 'Energize Ohio' program in making decisions related to energy at their home, farm, or business (OSUE)

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	68

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Energy development in Ohio is important for the future vitality of the state as it influences both economic growth and the general quality of life of Ohioans. In 2012 the average per capita energy expenditures in Ohio was \$4,265, representing roughly 12 percent of Ohioans per capita income. As a result, access to affordable energy directly influences our quality of life.

What has been done

Sixty-two 'Energize Ohio' programs were conducted in 2014, involving 1,903 participants from throughout Ohio covering topics such as shale energy leasing, pipeline easements, on-farm renewable energy, and community-scale renewable energy development.

Results

68% of participants in 2014 'Energize Ohio' programming indicated on post-program assessments that they planned to use materials and / or information learned in making decisions related to energy at their home, farm or business. Following the program being offered in their county, an OSU Extension educator commented, "Since the program was conducted in September 2014, two of our county's greenhouse growers, who were in attendance, have investigated solar energy development for their own operations, and one of which has already begun installing solar panels just 4 months later."

4. Associated Knowledge Areas

KA Code	Knowledge Area
511	New and Improved Non-Food Products and Processes
608	Community Resource Planning and Development

Outcome #15

1. Outcome Measures

proportion of 'Energize Ohio' participants who indicated that the program provided valuable information that they would recommend to others (OSUE)

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	82

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Energy development in Ohio is important for the future vitality of the state as it influences both economic growth and the general quality of life of Ohioans. In 2012 the average per capita energy expenditures in Ohio was \$4,265, representing roughly 12 percent of Ohioans per capita income. As a result, access to affordable energy directly influences our quality of life.

What has been done

To support landowner education on shale and renewable energy, tools to support educational efforts, such as shale energy fact sheets and 7 Extension workshops, were captured electronically and converted into multimedia programs.

Results

82% of 2014 'Energize Ohio' program participants indicated via post-program assessments that they found the information received through educational events to be valuable, and would share that information with others. An OSU Extension educator made the following comment after inviting the 'Energize Ohio' team to come speak in her county: "In September, the team was invited to Medina County, Ohio to provide a public on-farm solar program. The team was great to work with and was flexible about having the program in a barn. They brought out the solar display which I feel was a bonus for attendees who may be experiencing solar technology for the first time. I feel the results of this program were significant."

4. Associated Knowledge Areas

KA Code	Knowledge Area
511	New and Improved Non-Food Products and Processes
608	Community Resource Planning and Development

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Public Policy changes

Brief Explanation

On-farm alternative energy installation is economically feasible under current Ohio policy. Should that policy change, the feasibility may be in question and as such, programming could be affected.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Post-program evaluations have been used to gauge change in participant knowledge and plans for using new knowledge. Evaluation data suggest participants intend to act on their new knowledge; for example, one-third of participants indicated they would use it directly when speaking with others about their business operations, and 42 percent indicated the information would be useful to them in their occupations in general. Every one of the participants at each of the 'Small Farm College' / 'On-Farm Solar Energy Workshop' programs indicated in post-program evaluations that they gained new knowledge, they would recommend the information learned to others, and would use their new knowledge when making decisions related to renewable energy at their home, farm, or business. Finally, approximately 118,000kWh of electricity has been generated via the installation of four on-farm solar systems in 2014. These systems have offset nearly 180,600 pounds of greenhouse gas emissions last year.

Key Items of Evaluation

OARDC's new hypoallergenic latex made from guayule creates a new bioenergy and bio-product business opportunity. The following feedback is from a raw material supplier:

"Having a steady supply of domestically produced natural latex would open the door for major dipped-goods manufacturers and medical glove producers to re-establish facilities in the U.S. As a raw material supplier, we applaud the work championed by Dr. Cornish and supported by OARDC."

-- Tom Marsh, president, Centrotech Minerals and Metals, Chesapeake, Virginia.