

What's this E doing in my SWAPA? (Energy Conservation Opportunities)

Key NRCS Energy Practices: Farmstead Energy, Lighting, Building Envelope



20 March 2014 - first in a series

Webinar Agenda

- ❖ Series Overview
- ❖ Presenters
- ❖ Energy Conservation and Agriculture
- ❖ Building Envelope Energy Transfer Basics
- ❖ NRCS Approach to Energy Analysis & Upgrades ^
- ❖ Key Practices: Farmstead; Lighting; Building Envelope
- ❖ Final Q&A
- ❖ Post-webinar Test

^ - approx. Interim Q&A Break

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Questions via Notes
To
All Moderators
(slide # may help)

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Series Overview

2014	Energy Webinars
Mar 20	Key NRCS Practices: Farmstead Energy, Lighting, and Building Envelope
May 22	Lighting Systems: Analysis, Performance, and Energy Conservation Opportunities
Jul 24	Energy Analysis: Who, What, When, Where, Why, and How?
Sep 18	Energy Upgrades: Steps to Implement Energy Conservation Opportunities
Nov 20	Poultry Operations: Broiler and Layer Energy Conservation Opportunities

Materials, Methods, & Goals:

- Review key elements of energy conservation in agricultural operations.
- Better understand how NRCS will integrate energy into the realm of natural resource concerns - soil, water, air, plants, and animals - addressed by conservation planning.

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Stephen Henry, P.E.

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South Carolina ('92-today)

- *Asst. State Conservation Engineer*
- *Agricultural Engineer*
- *Environmental Engineer*

Clemson Biosystems Engineering

Professional Advisory Board (Chair)

University of Georgia ('90-'92)

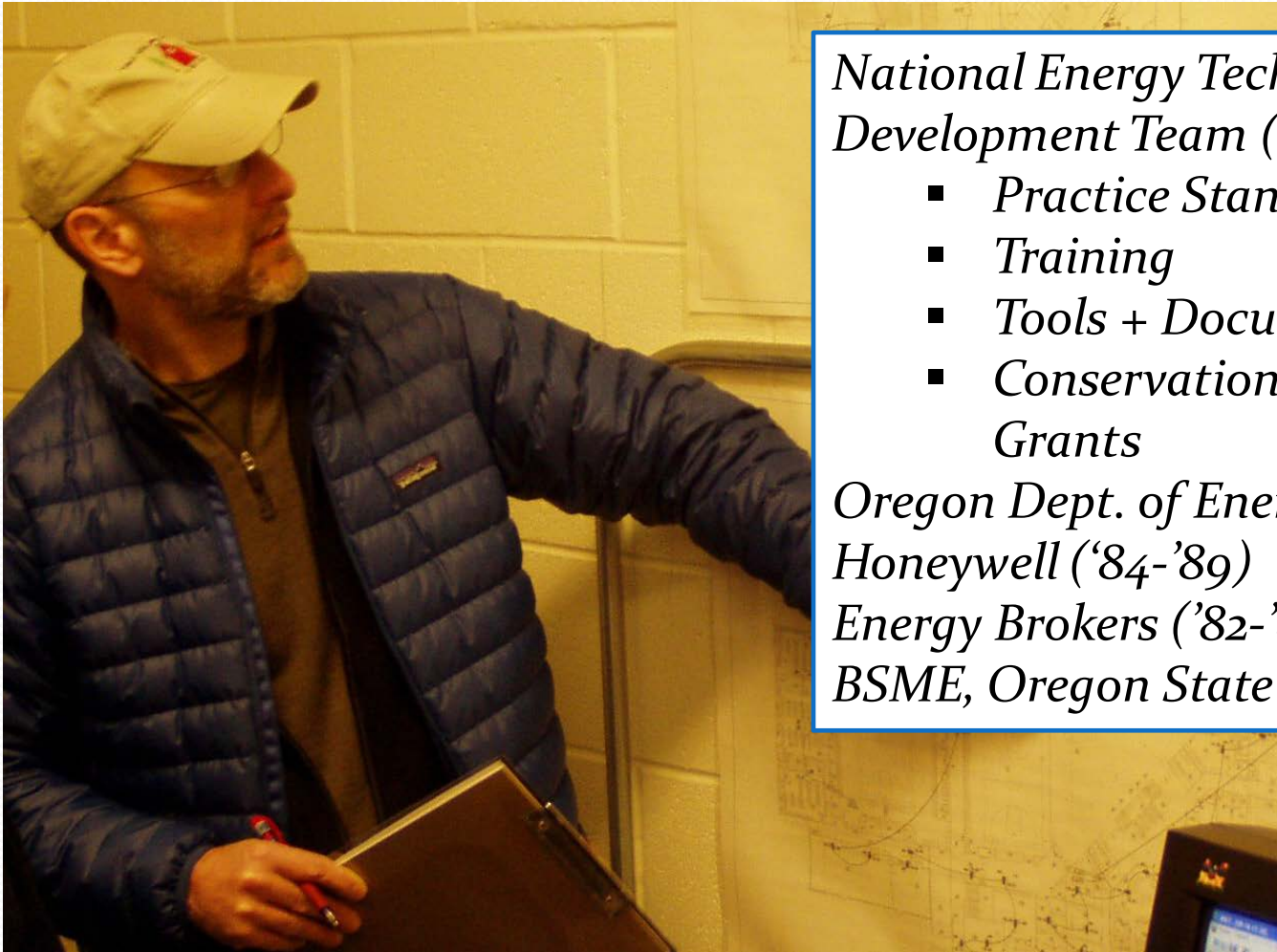
- *Research Engineer*

MSAE, Clemson (1990)

BSAE, University of Tennessee (1987)



Kip Pheil, C.E.M.



*National Energy Technology
Development Team ('10-today)*

- *Practice Standards*
- *Training*
- *Tools + Documents*
- *Conservation Innovation
Grants*

Oregon Dept. of Energy ('89-'10)

Honeywell ('84-'89)

Energy Brokers ('82-'84)

BSME, Oregon State Univ. ('78-'83)

Nat'l Tech Support Centers

Natural Resources Conservation Service

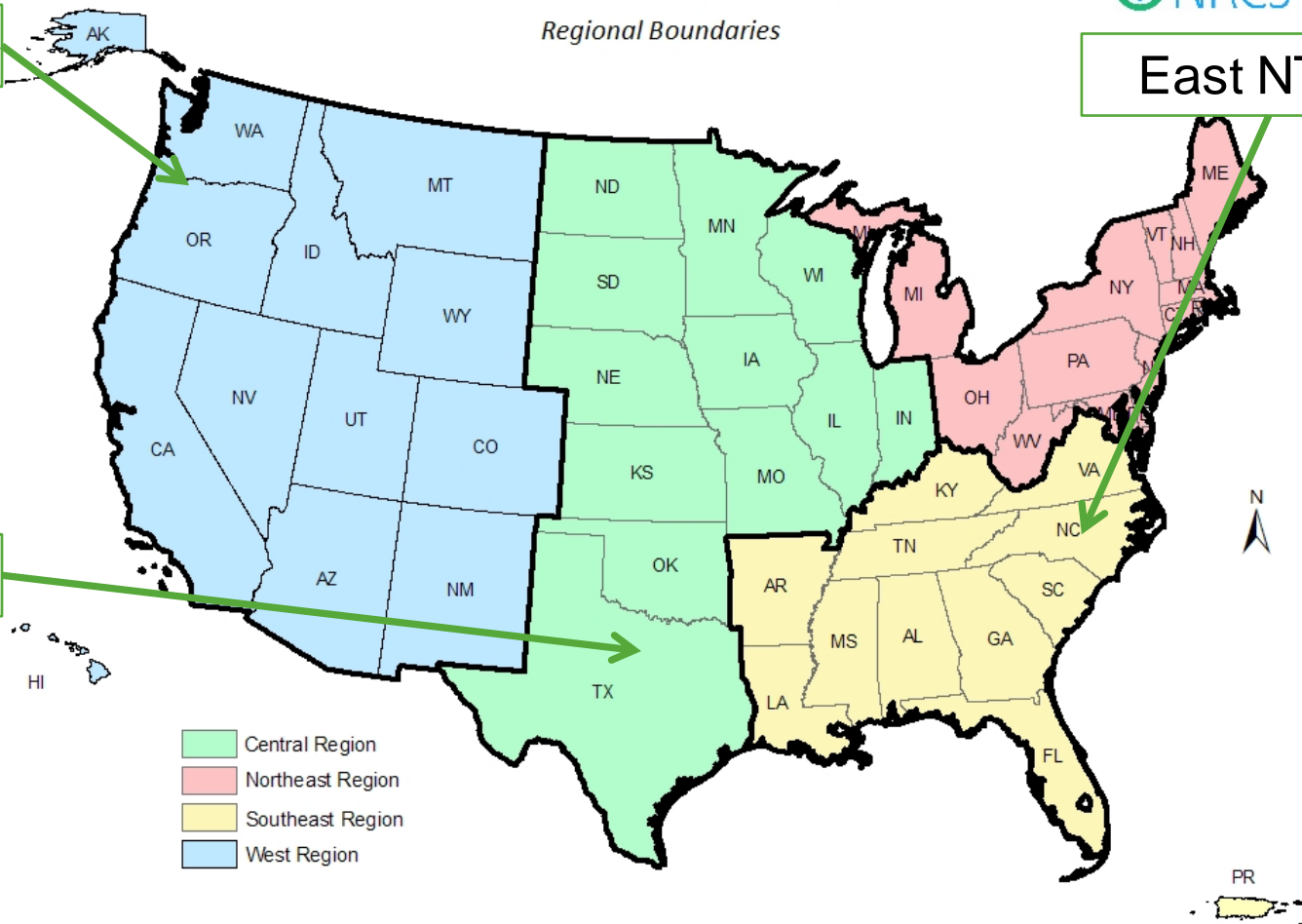


Regional Boundaries

West NTSC

East NTSC

Central NTSC

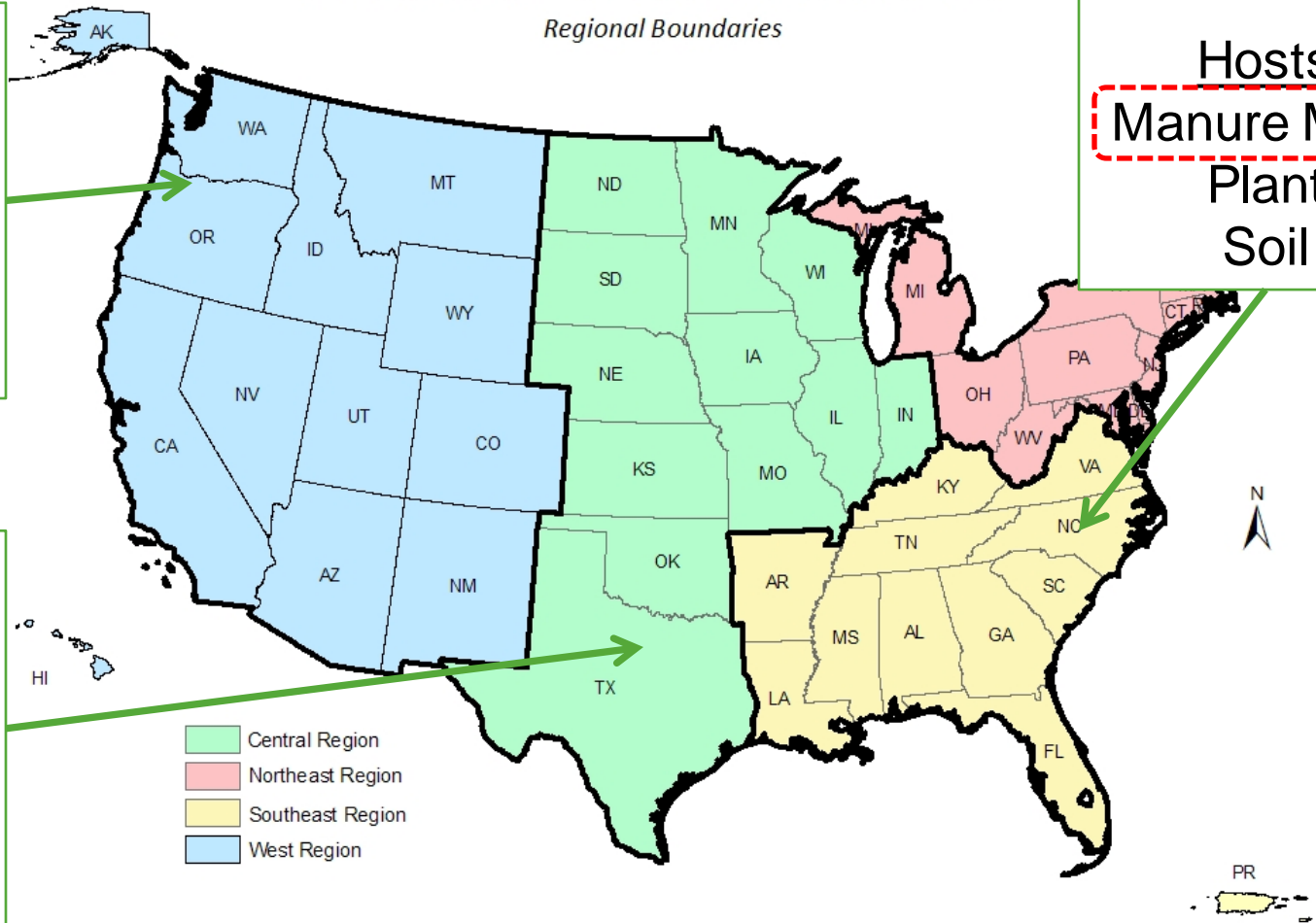


Map Date - June 2012
Map Source - Regional Conservationists Office

Nat'l Tech Support Centers

Natural Resources Conservation Service

Regional Boundaries



West NTSC

Hosts

Air
Energy
Water

East NTSC

Hosts

Manure Mngt
Plant
Soil

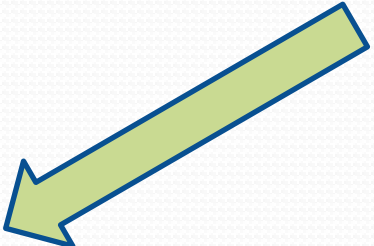
Central NTSC

Hosts

Grazing
Wetlands
Wildlife

Map Date - June 2012
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Ag Energy Flows

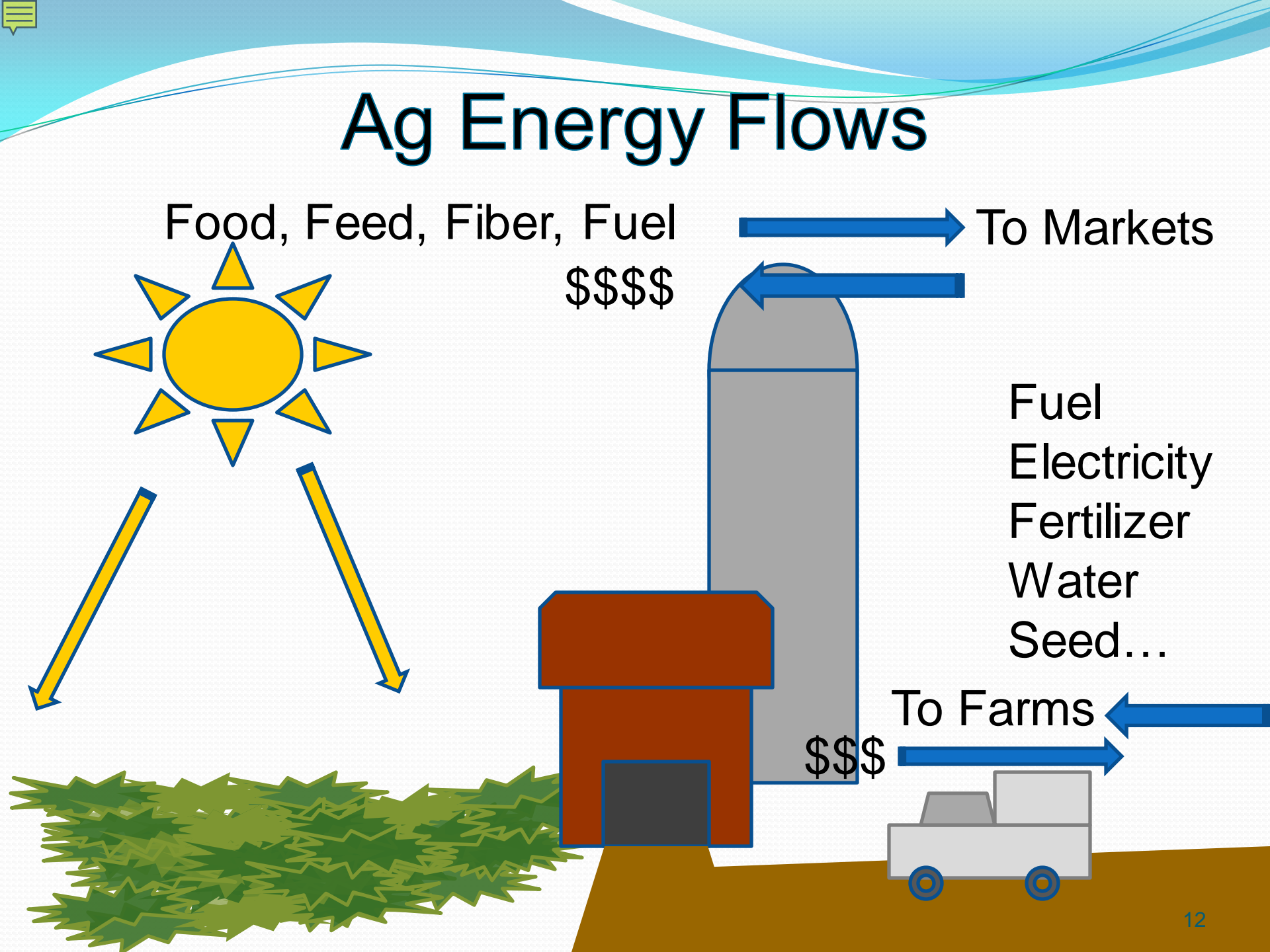
Food, Feed, Fiber, Fuel
\$\$\$\$

To Markets

Fuel
Electricity
Fertilizer
Water
Seed...

To Farms

\$\$\$



Ag Energy Flows

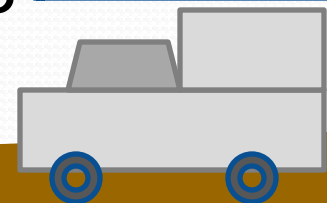
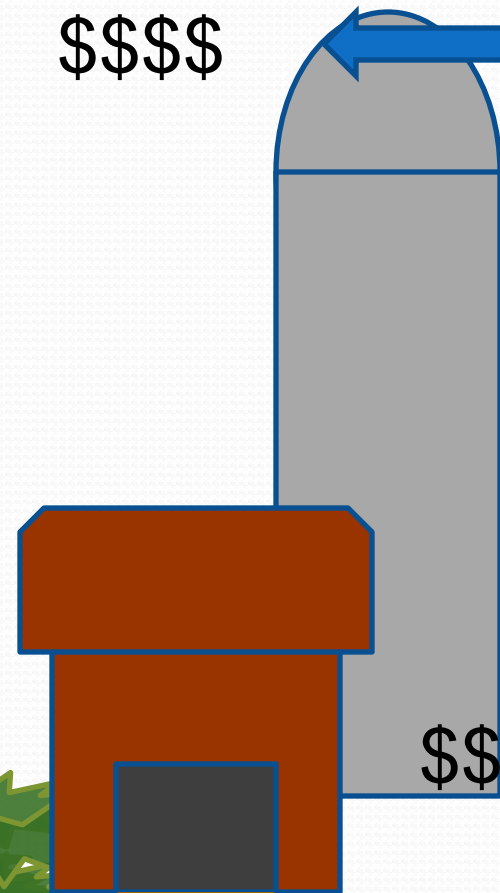
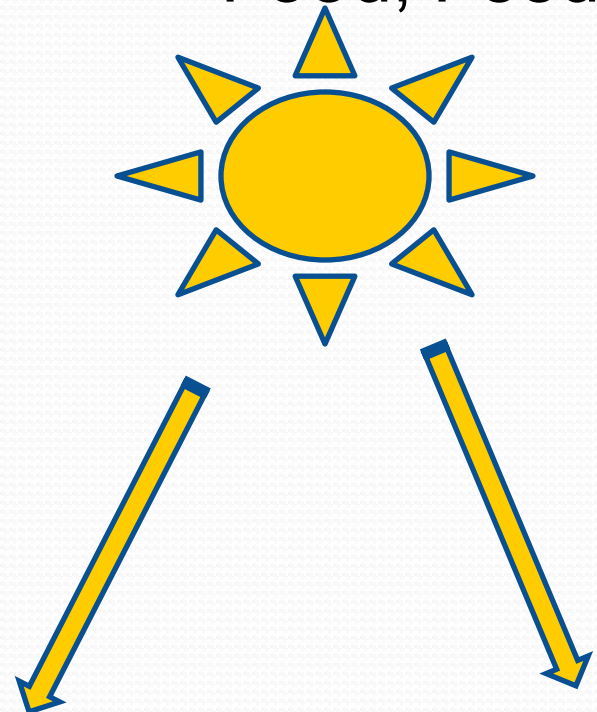
Food, Feed, Fiber, Fuel
\$\$\$\$

To Markets

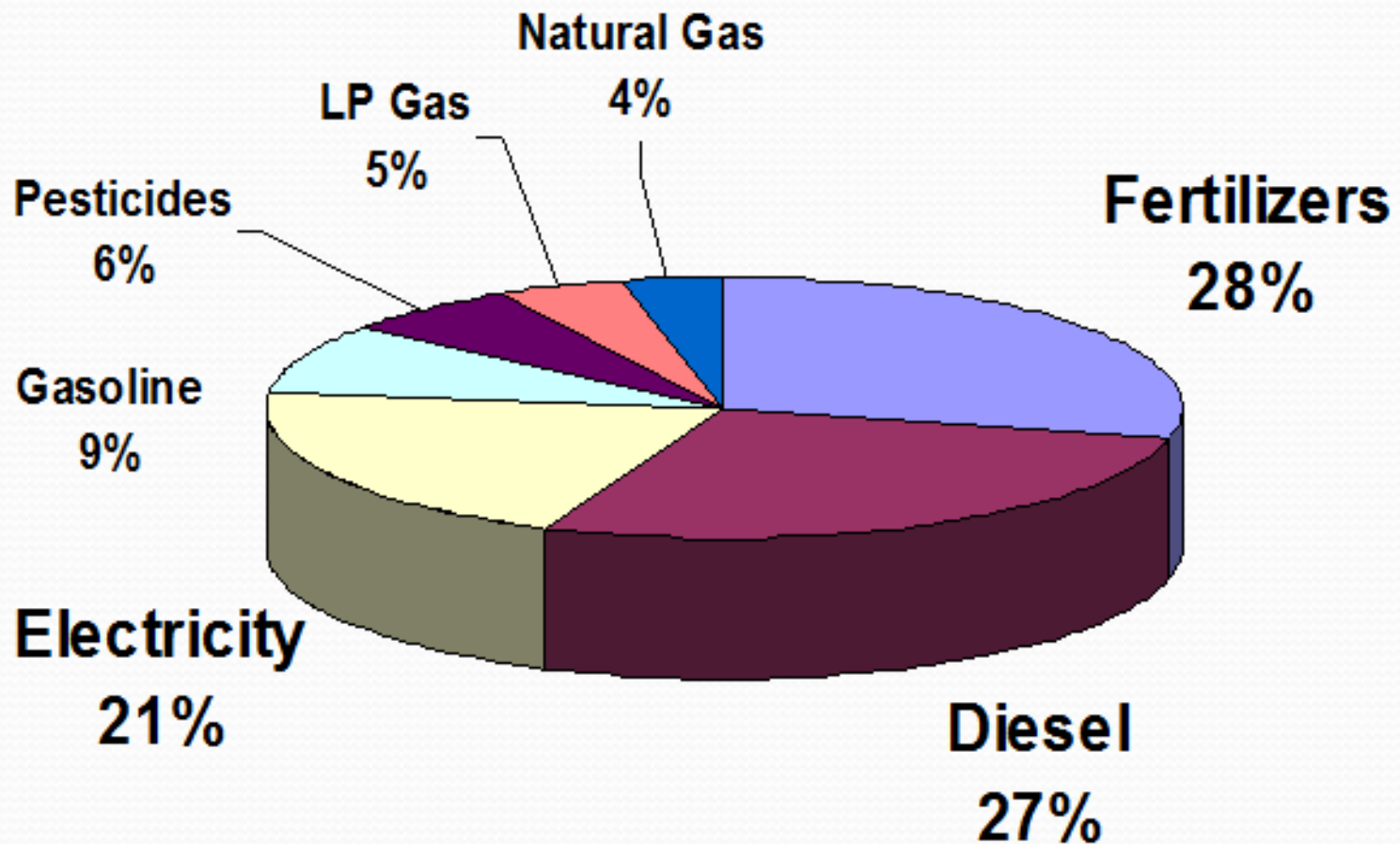
Fuel
Electricity
Fertilizer
Water
Seed...

To Farms

\$\$\$

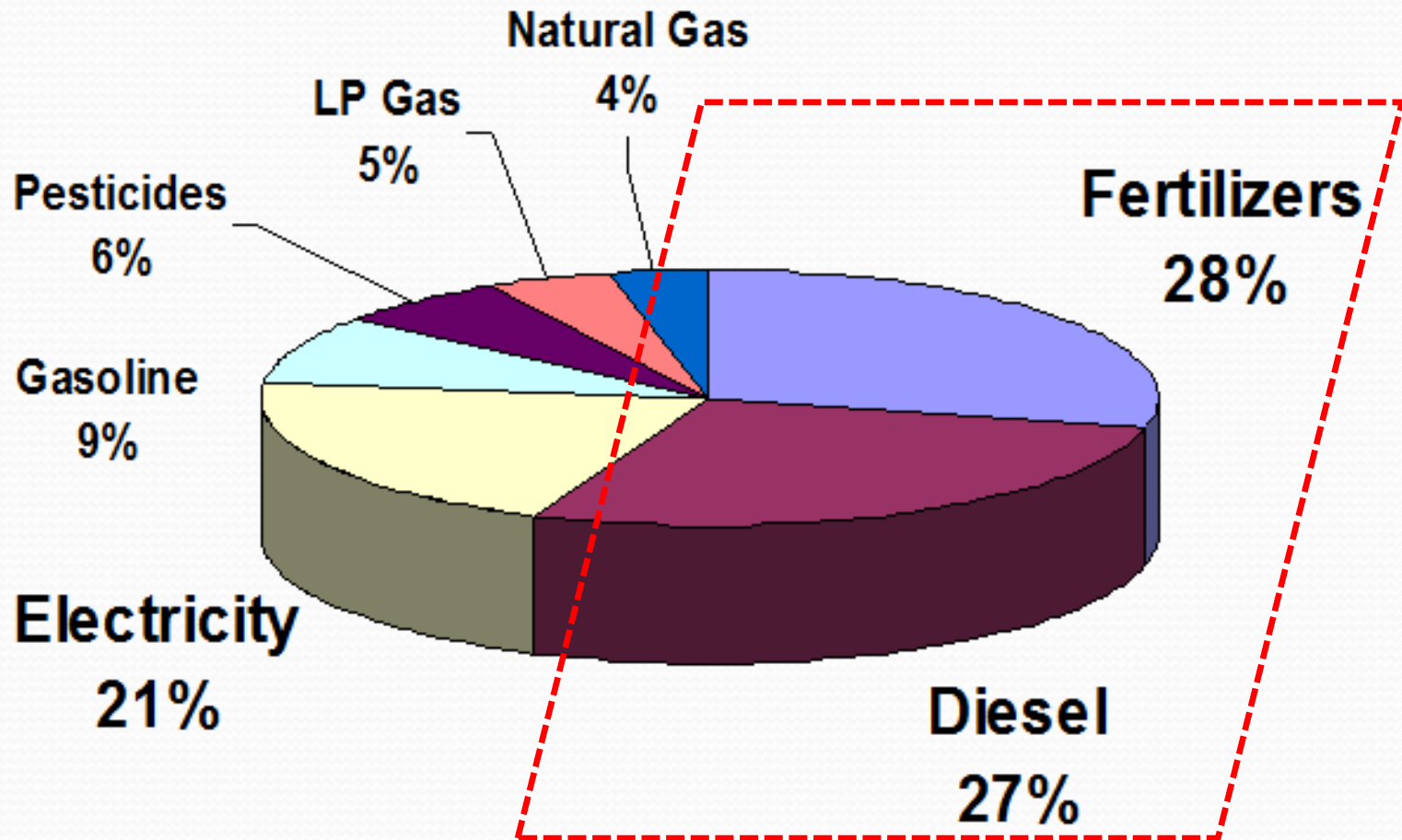


US Farm Energy Input (2002)



Miranowski (2004)

US Farm Energy Input (2002)



Miranowski (2004)

(one) View of Ag Energy Issues

- ❖ Sustainable agricultural requires sustainable energy practices.
- ❖ Energy costs can reduce producer stability.
- ❖ NRCS can integrate energy along with conservation of other natural resources; aka SWAPA+(H)E. [^]
- ❖ Producers can deliver varied energy resources to meet U.S. and global demands.

[^] Soil, Water, Air, Plants, Animals, Humans, Energy

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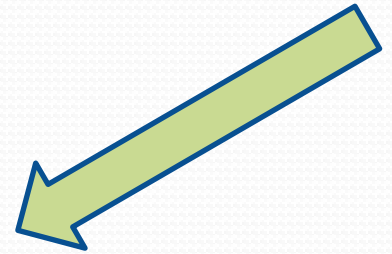
+ E

SWAPA

[^] Soil, Water, Air, Plants, Animals, Humans, Energy

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Three Modes of Heat Transfer

- ❖ Conduction
- ❖ Convection
- ❖ Radiation

Dominant mode depends on site / event conditions.

Assess them all.

Heat migrates from a hotter place to colder place (eventually).

Three Modes of Heat Transfer

❖ Conduction



Solid Materials
& Contact
Required.

[americaslibrary.org]

Three Modes of Heat Transfer

❖ Convection

Fluids ^
& Contact
Required.



[wildfire-economics.org]

^ Fluids = liquids & gases (just no solids)

Three Modes of Heat Transfer

❖ Radiation



No Materials,
No Contact
Required.

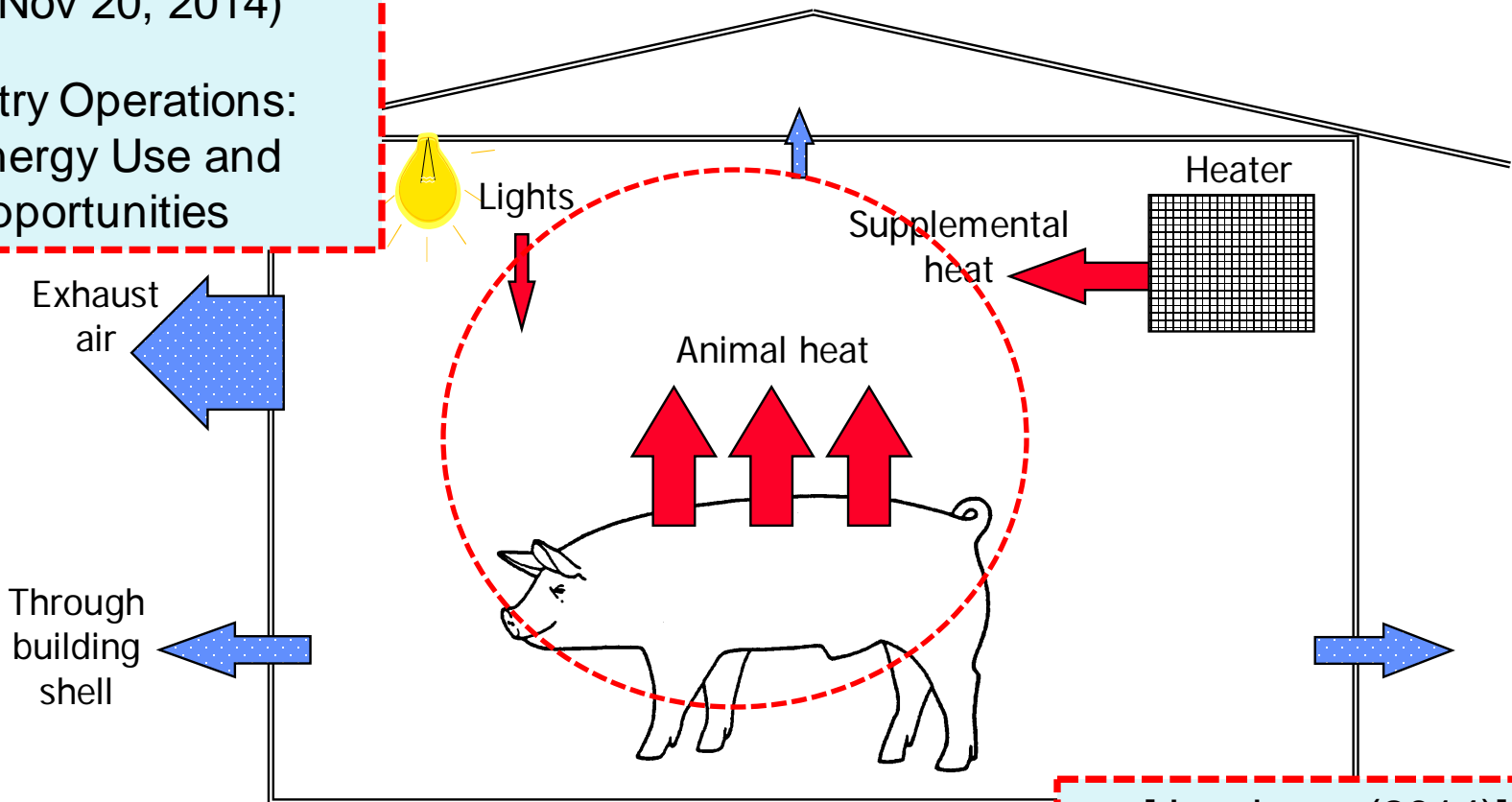


[NAC]

hiding from radiation – hot enough for branding?

Energy Transfer & Buildings

E in SWAPA?
(Nov 20, 2014)
Poultry Operations:
Energy Use and
Opportunities

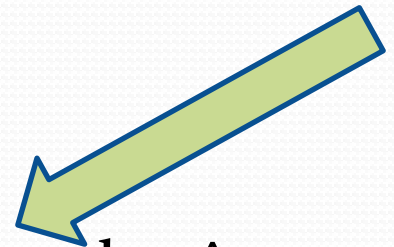


[Jacobson (2014)]

(true, this animal does not fall within a 'poultry' enterprise)

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Energy Systems, NRCS Skills

Function or System Group ('Major Activity')
Lighting
Ventilation
Refrigeration
Milk harvesting
Controllers
Other motors/ pumps
Water heating
Air Heating / Bldg environment
Drying
Waste handling
Air Cooling
Cultural Practices
Crop/feed Storage
Water management
Material handling
Irrigation

Derived from ASABE S612 (more later)

Historic areas of NRCS efforts to promote 'energy conservation.'

Reached in pursuit of other benefits, principally improved:

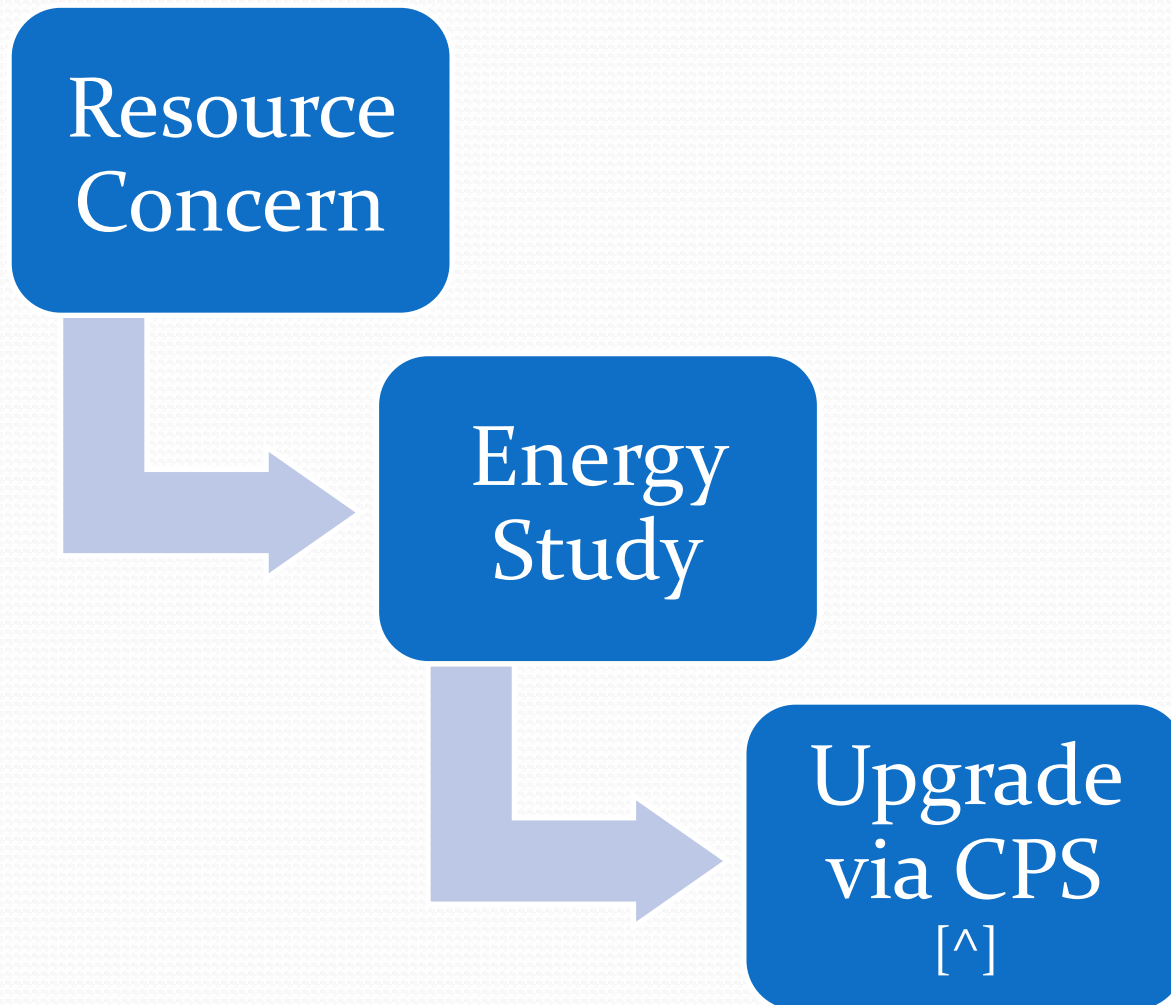
- Water quality or quantity.
- Soil health (& more of it).
- Local air quality.
- Control of GHG emissions.



Cultural Practices

- Plant
- Till
- Harvest
- Engine-driven eqpt

NRCS Energy Upgrade Path



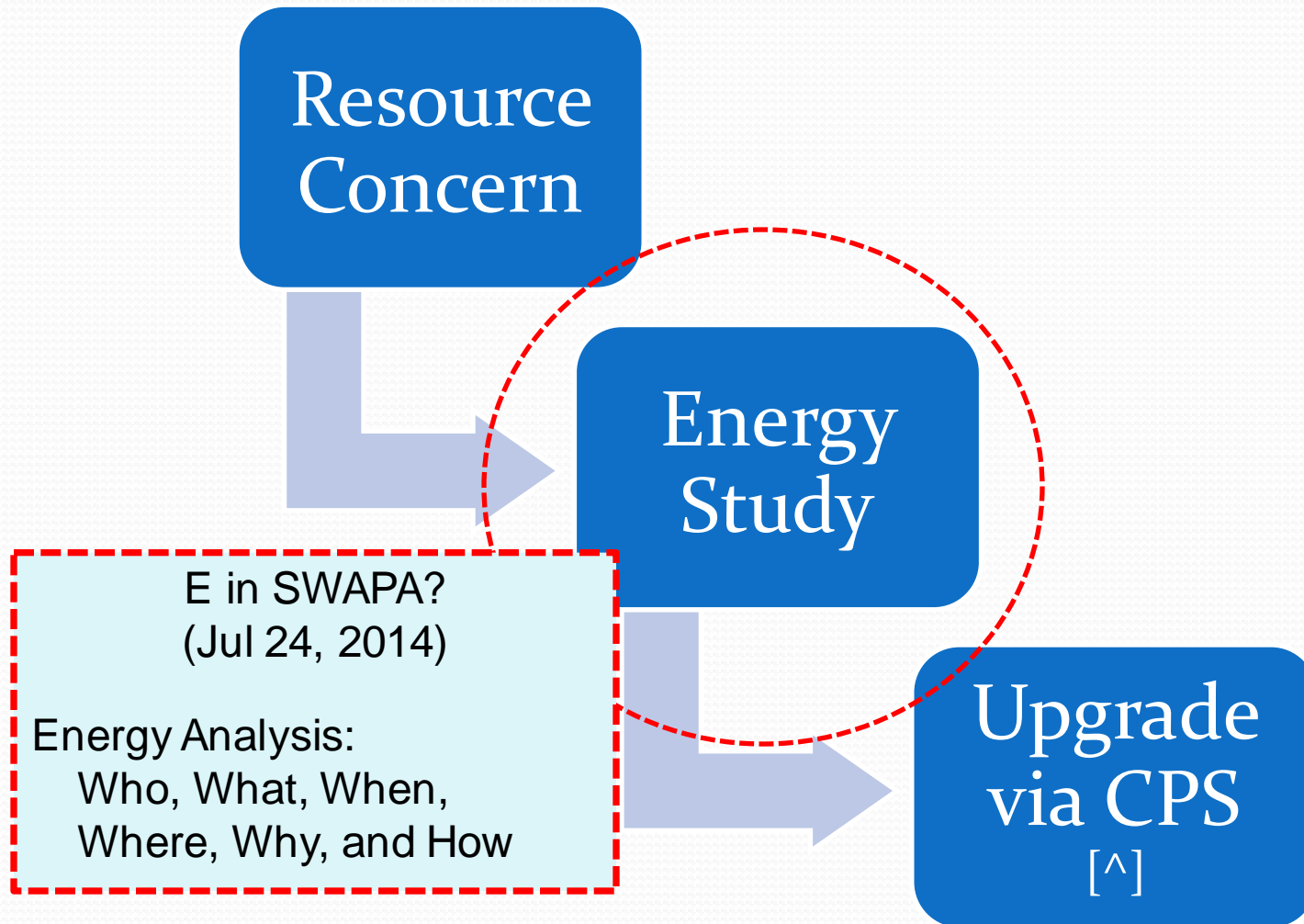
[^] Conservation Practice Standard



Quality / Planning Criteria

- ❖ Q.C.: Landowner Expresses A Concern
 - ❖ (note that, typically, an unconcerned operator is more likely to have energy “problems”)
- ❖ Planning Criteria, preliminary direction:
 - ❖ Energy Use Intensity / Index (EUI)
 - ❖ EUI ~ G.P.A.

NRCS Required Energy Study



[^] Conservation Practice Standard

Energy Study and “9 Steps”

1. Identify Problems
2. Determine Objectives
3. Inventory Resources
4. Analyze Resource Data
5. Formulate Alternatives
6. Evaluate Alternatives
7. Make Decision
8. Implement Plan
9. Evaluate Plan

ASABE
S612



Webinar Agenda

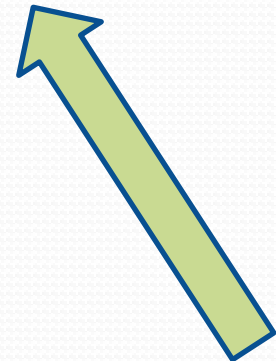
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Energy – NRCS Standards Development

...a work in progress!

Stephen T. Henry, P.E.

Assistant State Conservation Engineer

Columbia, SC