

# How do I deal with Stray Voltage?



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What kind of **Stray Voltage** are you talking about?

- > “Classical” 60 Hertz?
- > Other Electrical Phenomena?
  - > Earth Currents?

# Classical Stray Voltage-Limits

- 60 Hertz voltages measured at cow contact points
- 2-4 volts steady state RMS can affect production
- Action taken at 0.5 volt level

# Classical Stray Voltage-Sources

- Cooperative PNEV that makes it to cow contact points
- Member SNEV available at cow contact points

# Classical Stray Voltage-Solutions

- Good primary neutral wiring
- Good secondary wiring
- Solid-state isolators plus EQ Plane

# Other Electrical Phenomena-**Limits**

- No known min/max levels
- No scientific basis for levels of concern

# Other Electrical Phenomena-**Sources**

- Radio frequency transmitters
- High frequency from house wiring
- Magnetic fields
- Poor electrical power quality
- Harmonic voltages and currents

# Other Electrical Phenomena-Solutions

- First we must determine if we have a problem.....
- For animals use “Classical” solutions
- For humans use... ????



# Earth Currents-**Limits**

- No known min/max levels
- No scientific basis for levels of concern

# Earth Currents -Sources

- Cooperative PNEV grounding points
- Member SNEV grounding points
- Other power supplier's grounding
- Gas line protection system
- Solar storms
- Induced current from magnetic fields

# Earth Currents -Solutions

- First we must determine if we have a problem.....
- For animals use “Classical” solutions
- For humans use... ????

# What should the Cooperative Do?

- Recognize that classical stray voltage can and will occur.
- Help farmers test for stray voltage.
- Keep your distribution system **neutral** in good repair.
- Offer isolation if state/local codes permit.

# What are your responsibilities?

In my opinion:

Provide a level of isolation between the farm electrical system and your primary neutral system such that the farm owner is able to construct a reasonable electrical environment for the animals.

# What is reasonable isolation?

In my opinion:

Levels of PNEV visible at any cow contact point of less than 0.5 volts when averaged over a 10 second period.

# How do you achieve this isolation?

Normally a well maintained distribution system and a farm wired to National Electrical Code standards will be adequate.

If that does not work.....

# Consider electrical isolation

Assuming the farm electrical system has been examined by a registered electrician and determined to be in compliance with the National Electrical Code, especially with respect to grounding.....

**You could install a solid-state isolator.**



# Will the isolator eliminate all concerns?

Properly installed, I would expect an isolated farm to have cow contact voltage levels that are 5 to 10 times less than when the farm is not isolated.

At this point I would expect that any electrical event on the primary system will not affect “cow contact” electrical conditions.

# What else can be done to improve “on-farm” conditions?

- 4 or 5 wire electrical systems.
- EQ plane in livestock areas.
- Monitor SV on a regular basis

These are all preventive measures that are the responsibility of the farmer

Who is responsible for providing  
the proper electrical environment  
for livestock?

In my opinion:

The owner of the livestock.

# What is the responsibility of the Cooperative and other service providers?

In my opinion:

To provide services in such a manner that the services provided do not prevent the livestock owner from constructing a proper electrical environment.

What if the livestock owner is not satisfied with the type of services provided by the Cooperative?

In my opinion:

The only possible choice is for the livestock owner to get off the grid and produce his/her own electricity or operate the facilities without the use of electricity.

# Is getting off the grid a practical solution?

No, but sometimes you will run into Members that cannot be satisfied with the method of power delivery you must follow.

It is impossible to deliver electrical power in a manner that will overcome the deficiencies in the farm electrical environment.

# What haven't we talked about?

Let's start the list:

- Isolation transformers.
- Circle of Life or Concentrator Rings.
- Moving your transformers...and meter.
- Who pays for what?
- What livestock is affected?
- Are fluorescent lights bad?

# What else.....?

- What about impulses?
- How about levels as low as 10 millivolts?
- Average-RMS-Averaged RMS-Peak....
- and Peak-to-Peak voltage values?
- Is it current or voltage that is the problem?
- How many capacitors do you plug in?



# What else.....?

- Member wants 480 volt 1 phase.
- Member wants you to remove grounds.
- Member removes your grounds.
- How much current in a ground rod?
- Do you isolate the telephone, water....?
- What is “objectional ground current”?

# What else.....?

- Should you convert to an ungrounded system?
- How about a 5 wire primary system?
- What is the best system for a farm?
- What is the best primary system?
- How much should you do?
- Plus all of your questions.

# Check my webpage

Email me some questions

I'll put the answers in "Cow Contact"  
(if I have a good answer)

**Thanks!**

If you have any questions  
contact me:

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