Cows & Electricity
Basic Principle –

Electrical current returns to the transformer through all available paths.
Stray Voltage –

. . . . A voltage between two surfaces that animals can touch

“cow contact voltage”
Cow Contact Points
Stray Voltage –

- Less than 10 volts
- Measured between 2 contact points
- Cow contacts both points at same time
- Current flows when animal is in contact
Stray Voltage –

Animals respond to

*current flow* – not to voltage

“Stray current” might be a better name
Cow Response –

- The most sensitive cows (< 3%) can detect about 1 volt or 1 milliamp

- Avoidance behavior observed at 3 to 6 milliamps
Stray Voltage – Causes

- Electrical currents in the “grounded – neutral network”
- Earth to neutral voltages
On – Farm Sources

- Undersized secondary neutral
- Bad neutral connections
- Ground – faults
- Equipment ground used as neutral
- Electric fence short circuits to equipment
- Fence charger using building ground
Most Common Source

- Ground fault conditions –
  Allow current to flow through the earth

- Ungrounded equipment
- Loose / corroded connections or wires
- Damaged insulation
- Dirt / moisture in boxes & fixtures
- Using ground as a neutral
Return Current Flow
Leakage to Equipment
Ground Fault – Buried Cable

Current Flow
10 mA

Cow
500 ohms

Ground Fault

5 V
10 V
120 V
Off – Farm Sources

- Voltage on primary neutral
- Ground fault at neighbor’s farm
- Distribution system problems
Off – Farm Source

- Fault in water pump
- Fault current
- Neighbor’s side
- Your side
- Fault in water pump
Solutions

- Good connections – all conductors
- Proper size neutral & grounds
- Correct equipment grounding
- Balanced 120 V loads
  - 240 V motors where possible
Solutions

- Separate neutral & grounding conductors in branch circuits
- 4-wire service to buildings
- Equipotential planes
Recommendation

*Cow contact voltage below 2 to 4 volts*
Goal – Happy Cows !!
Questions