Pacific Gas and Electric Company®

Photovoltaic (PV) Systems

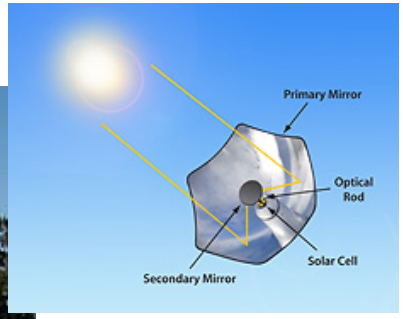
Courtesy of DOE/NREL

Other Solar Electric Generating Technologies

- Technology examples

Source: www.wapa.org

Dish Stirling

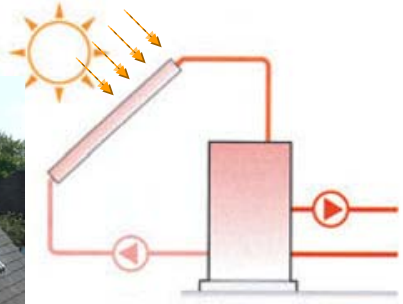


Source: www.solfocus.com

Concentrating PV

Source: www.geni.org

Solar Trough



Solar Thermal Heating/Cooling

PV Basics

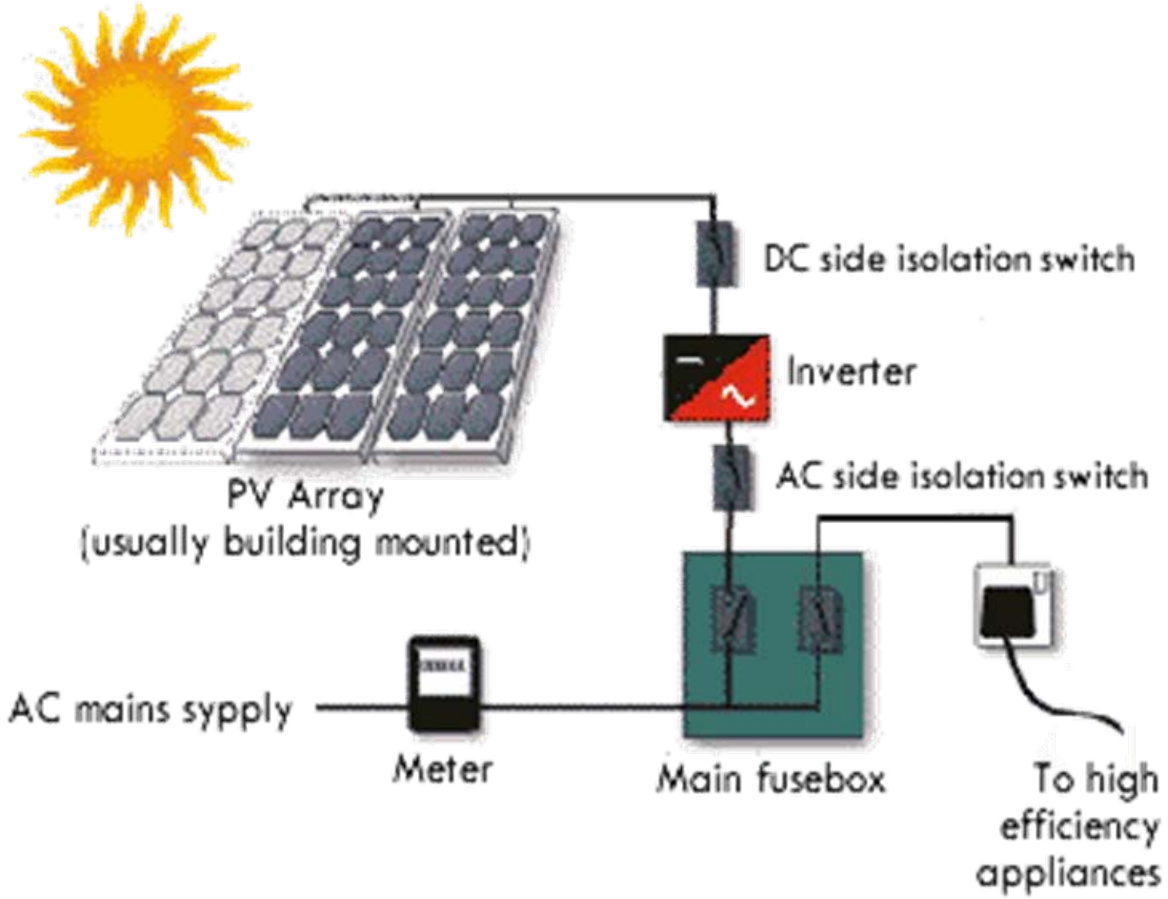
Solar Cells

- Thin wafers of silicon
- Cell converts sunlight energy into electric current – they do not store energy
- Sunlight is the “fuel”

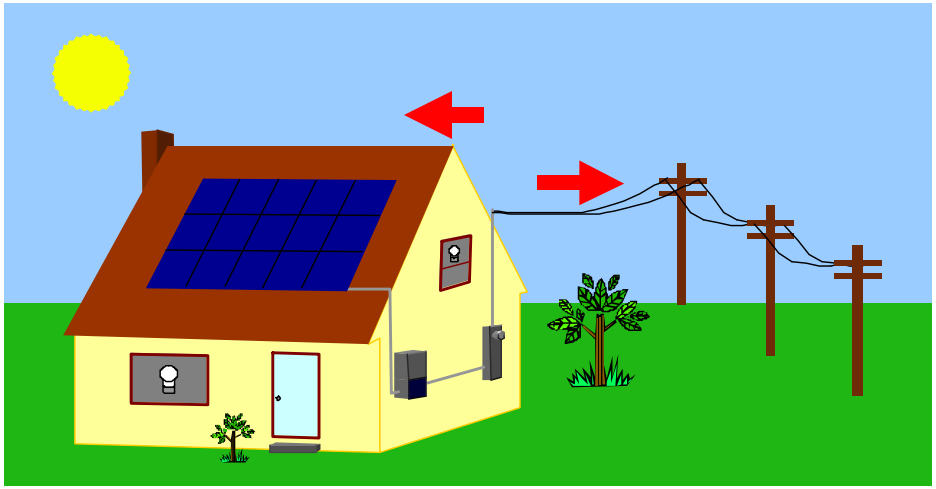
How Solar Cells Change Sunlight Into Electricity

- **Light knocks loose electrons from silicon atoms**
- **Freed electrons have extra energy, or “voltage”**
- **Internal electric field pushes electrons to top of the cell**
- **Electric current flows on to the load**
- **Cells never “run out” of electrons**

PV Block Diagram



Net Energy Metering (NEM)



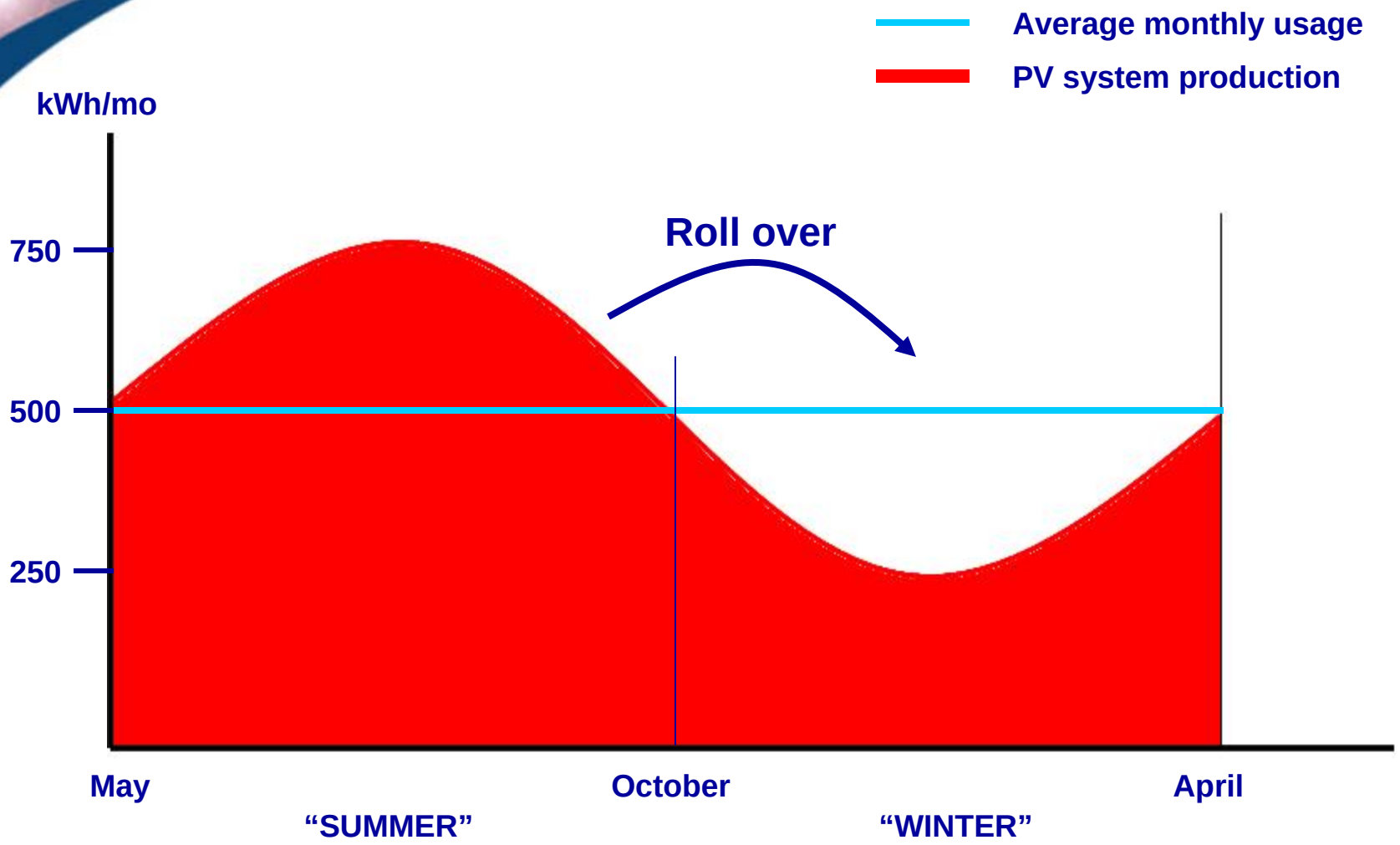
The utility grid is a two-way street

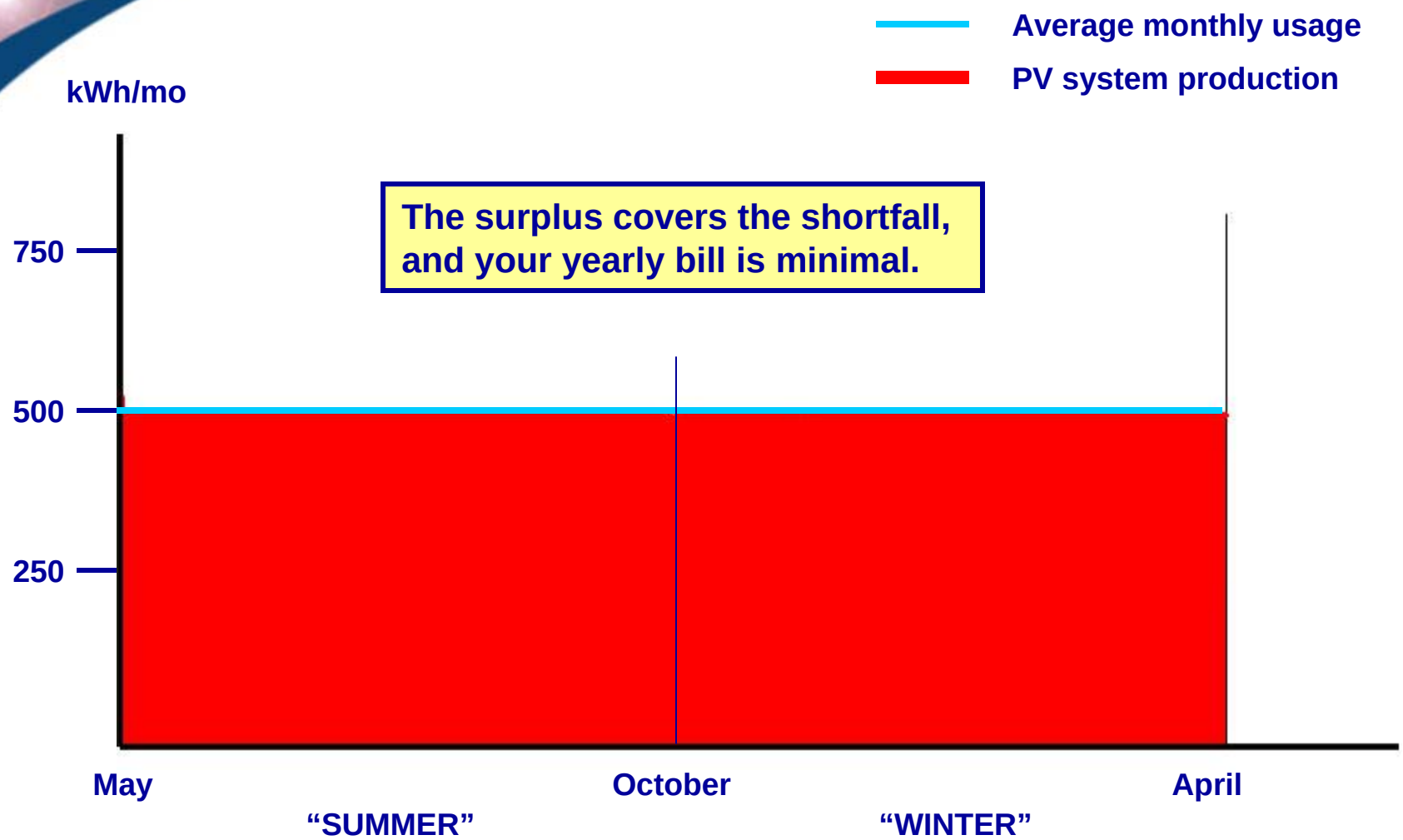
Electricity can be “sent back” to the grid by the customer

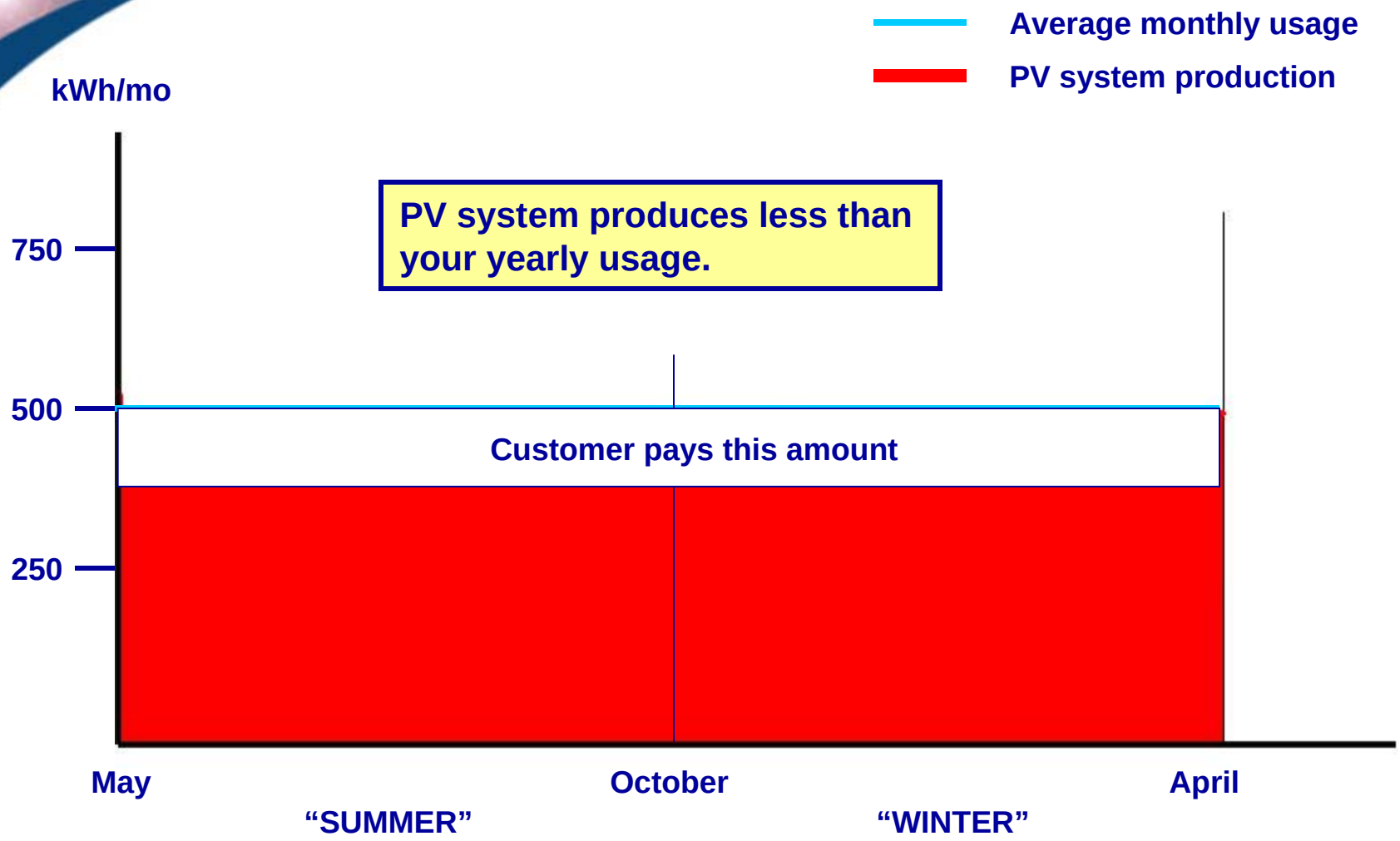
- **Eliminates the need for batteries**
- **Reduces cost and maintenance.**
- **Ensures a constant supply of electricity.**

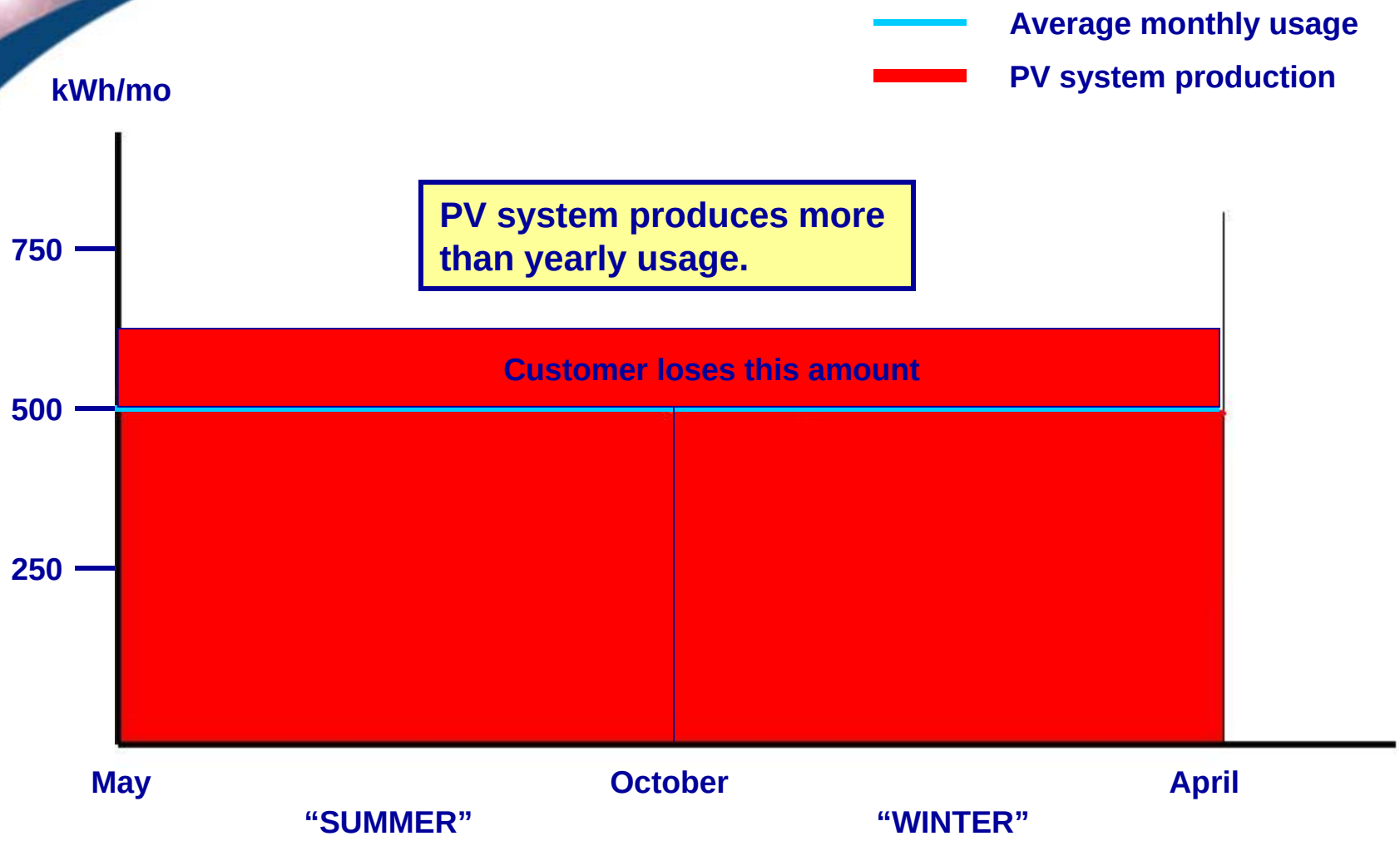
How NEM Billing Works

- Meter runs forwards/backwards and only records “net energy”
- PG&E will not pay cash or issue a check for exporting to the grid
- Credits carry over each month for 12 months, referred to as “True-Up Period”


Average monthly usage
PV system production
kWh/mo
750
500
250
Roll over
May
October
April
"SUMMER"
"WINTER"


Average monthly usage
PV system production
kWh/mo
750
500
250
The surplus covers the shortfall, and your yearly bill is minimal.
May
October
April
“SUMMER”
“WINTER”


Average monthly usage
PV system production
kWh/mo
PV system produces less than your yearly usage.
750
500
250
Customer pays this amount
May
October
April
“SUMMER”
“WINTER”


Average monthly usage
PV system production
kWh/mo
PV system produces more than yearly usage.
750
500
250
Customer loses this amount
May
October
April
“SUMMER”
“WINTER”

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PG&E PV Issues

AC Disconnects

- What are PGE's requirements?
  - Accessible, Visible, Lockable
  - Residential Customers
  - Commercial Customers

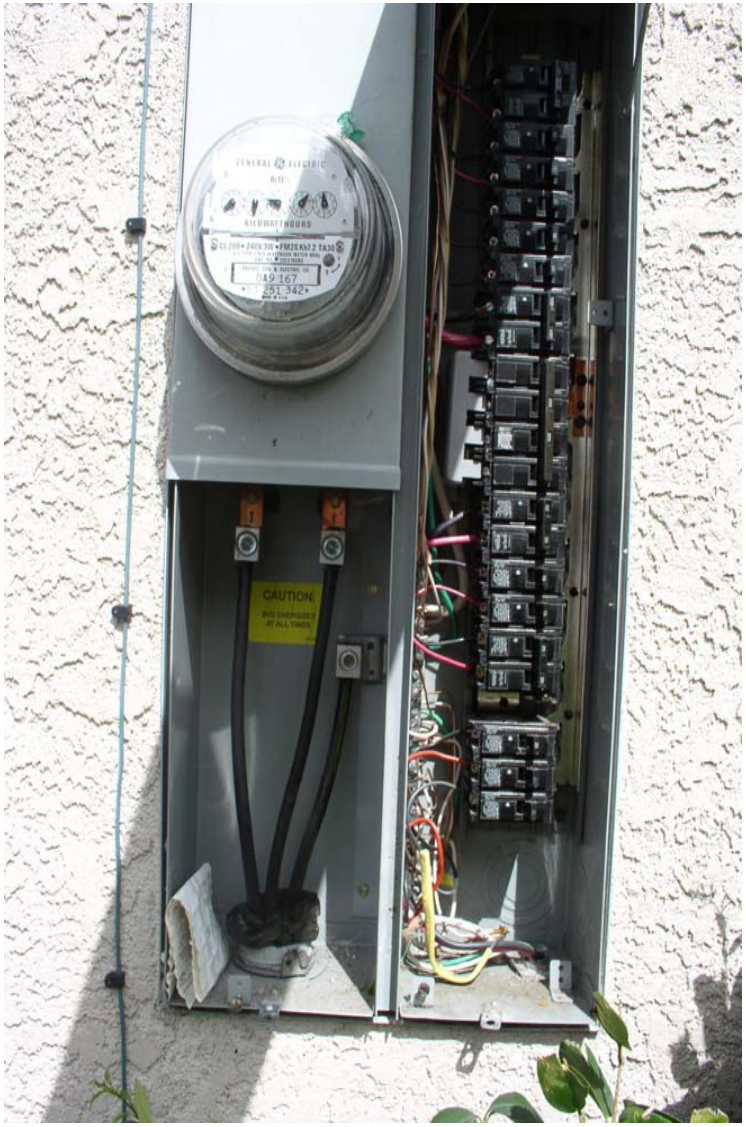
- 2005 NEC
  - Article 690.17

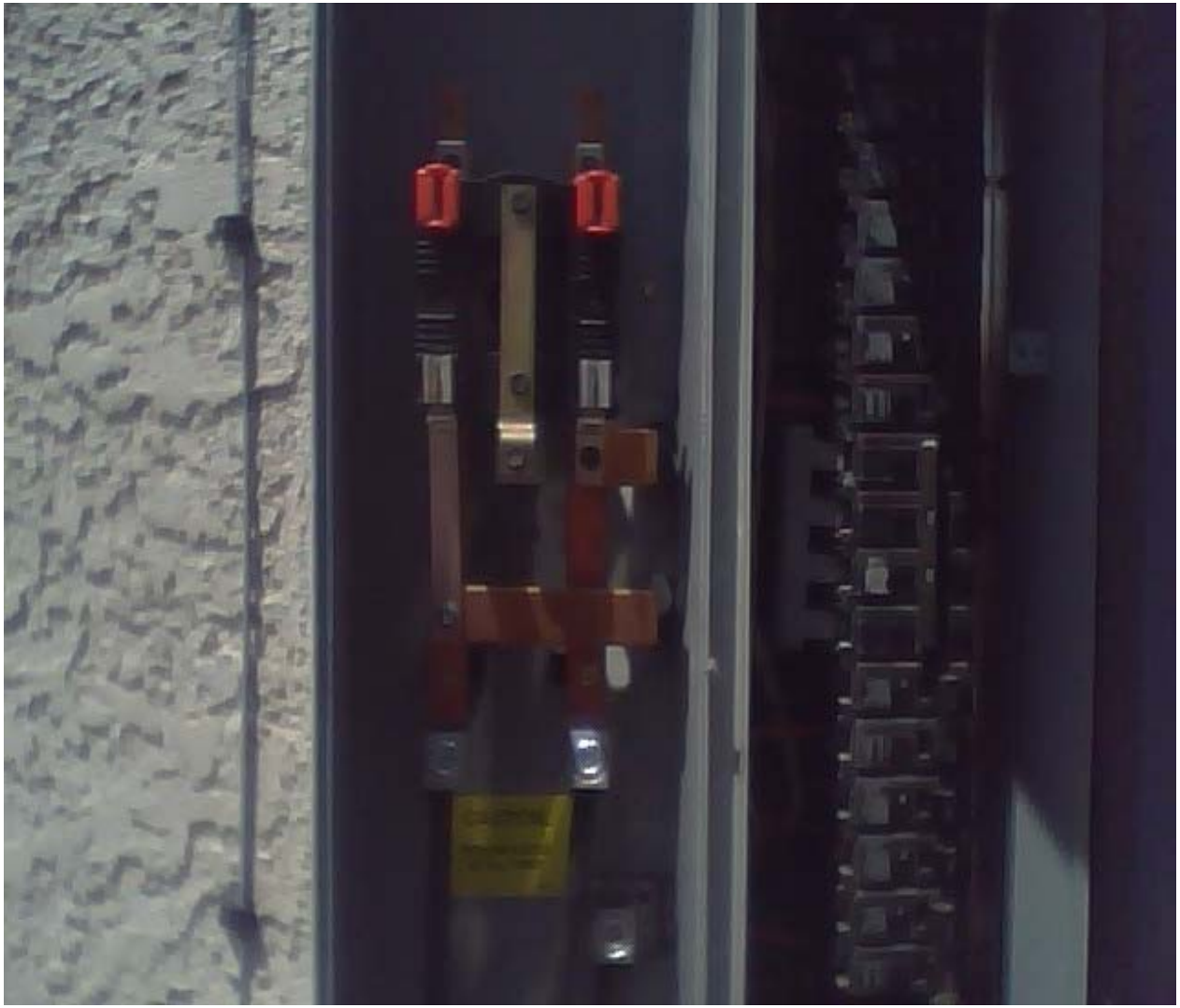
DANGER/PELIGRO
Tri-onic
TRS90R
90A
600V AC
600V DC
Tri-onic
TRS90R
90A
600V AC
600V DC
Tri-onic
TRS90R
90A
600V AC
600V DC

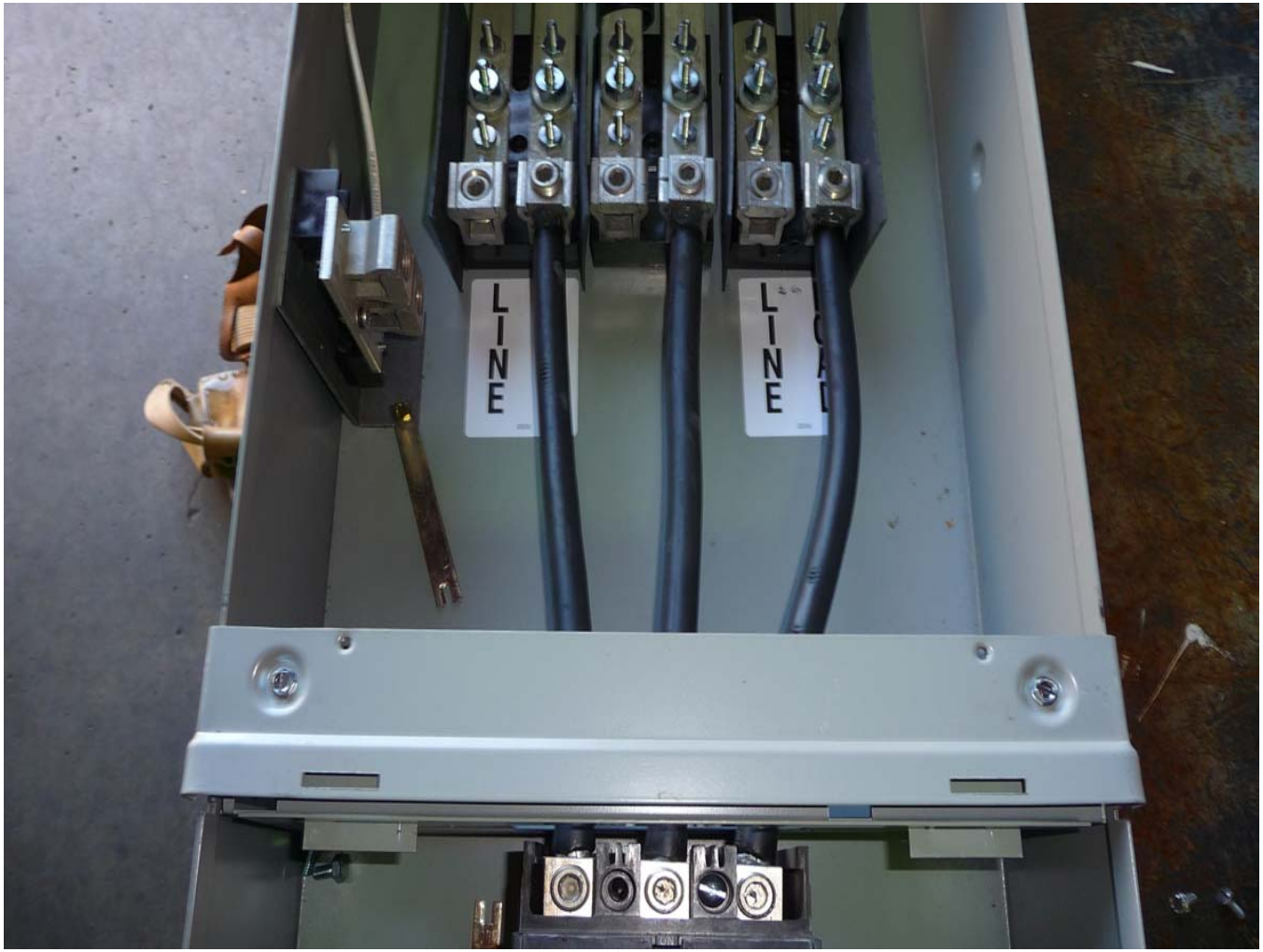
Line-Side Taps

- PGE Electric & Gas Service Requirements
  Section 5.5.2.

- 2005 NEC Requirements
  Article 690.64 Point of Connection


GENERAL ELECTRIC
KILOWATTHOURS
049167
251342
CAUTION




LINE
LINE

TEAM
SAFETY
ON

ON
MAIN
OFF

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Thank you!!