

# Foundations of Circuit Analysis: Passive Sign Convention

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# Learning Objectives

- Apply the *passive sign convention* and compute power dissipated by circuit elements.

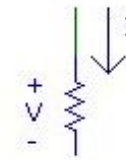
# Passive Sign Convention Ensures Conservation of Energy

- Energy is Conserved When:
  - Total energy generated in a circuit equals the total energy dissipated.
  - *Inductors and capacitors store energy and are considered passive.*
- Sign convention also helpful when assigning voltage polarities in analysis problems.

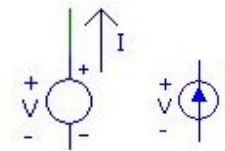
# V polarity & I Direction

## Determine Power Absorption/Delivery

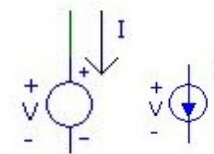
- *In these cases,  $V > 0$  and  $I > 0$ .*
- Passive devices (resistors) can only absorb power. *I enters (+)*
- Active sources typically deliver power. *I leaves (+)*
- Active sources can also absorb power. *I enters (+)*



Power  
**Absorbed**



Power  
**Delivered**



Power  
**Absorbed**

# Using Passive Sign Convention

- *Works for an arbitrary direction for  $I$  flow*
- Label passive elements (resistors).
  - Power always absorbed.  $I$  flows in (+) terminal.
- As needed, compute power absorbed.
  - If positive  $I$  flows into (+) terminal  $\rightarrow$  Power absorbed.
- Occasionally you may need to define a current for a voltage source, or a voltage for a current source.
  - Suggestion: Assume power is delivered.
  - If power is actually absorbed, then a  $V$  or  $I$  quantity will evaluate to a negative value.

*$V > 0$  and  $I > 0$  in the above definitions!*