

# Characterization of Electrochemical Devices

## Learning objectives:

- 1) To become familiar with the various parameters used to compare electrochemical devices
- 2) To use constant set point operation to diagnose electrochemical devices
- 3) To use polarization curves to diagnose electrochemical devices

## **Energy Storage Device:**

Fuel and oxidant are stored within the device.

## **Energy Conversion Device:**

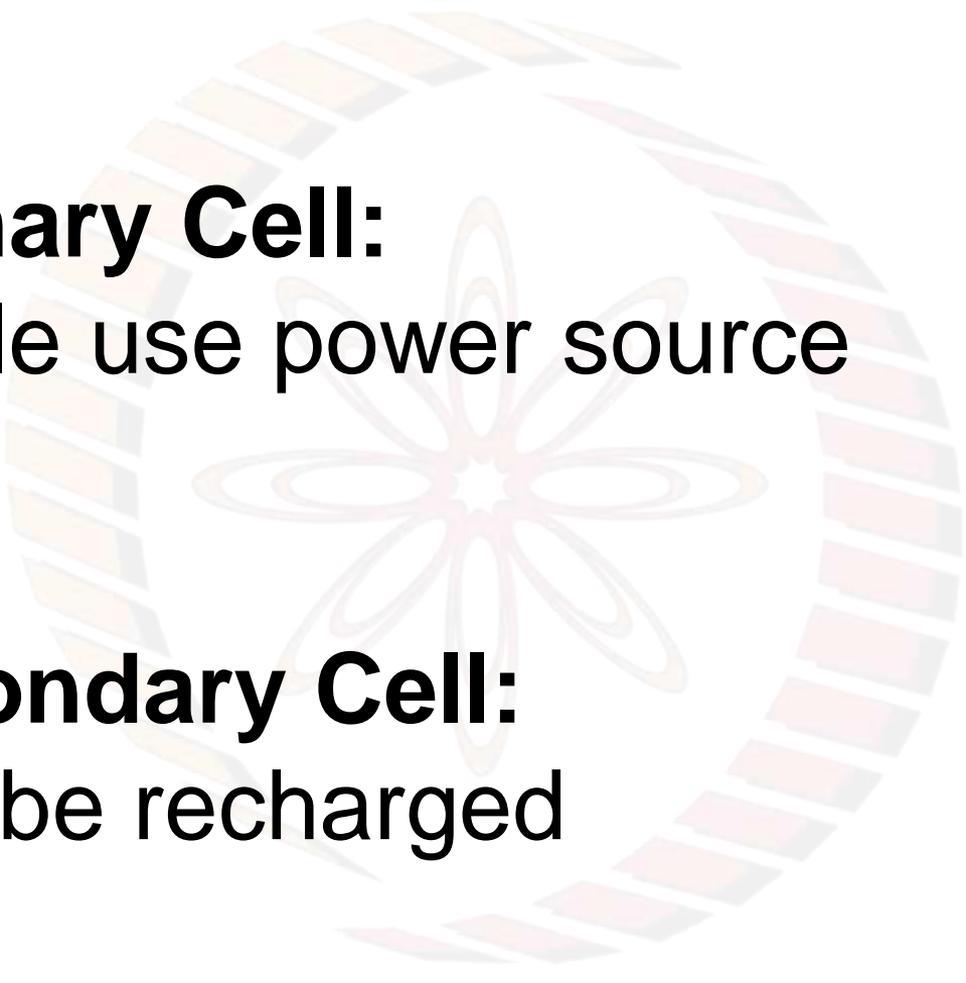
Fuel and oxidant are stored external to the device

## **Cell:**

A single electrochemical unit; i.e. one anode, one cathode, and the electrolyte

## **Battery:**

A collection of cells in series or parallel



## **Primary Cell:**

Single use power source

## **Secondary Cell:**

Can be recharged

# Cell characteristics:

**Capacity: Total charge in cell**

**Coulombs or Ah**

**Voltage**



**Power = V \* I**

**Current**

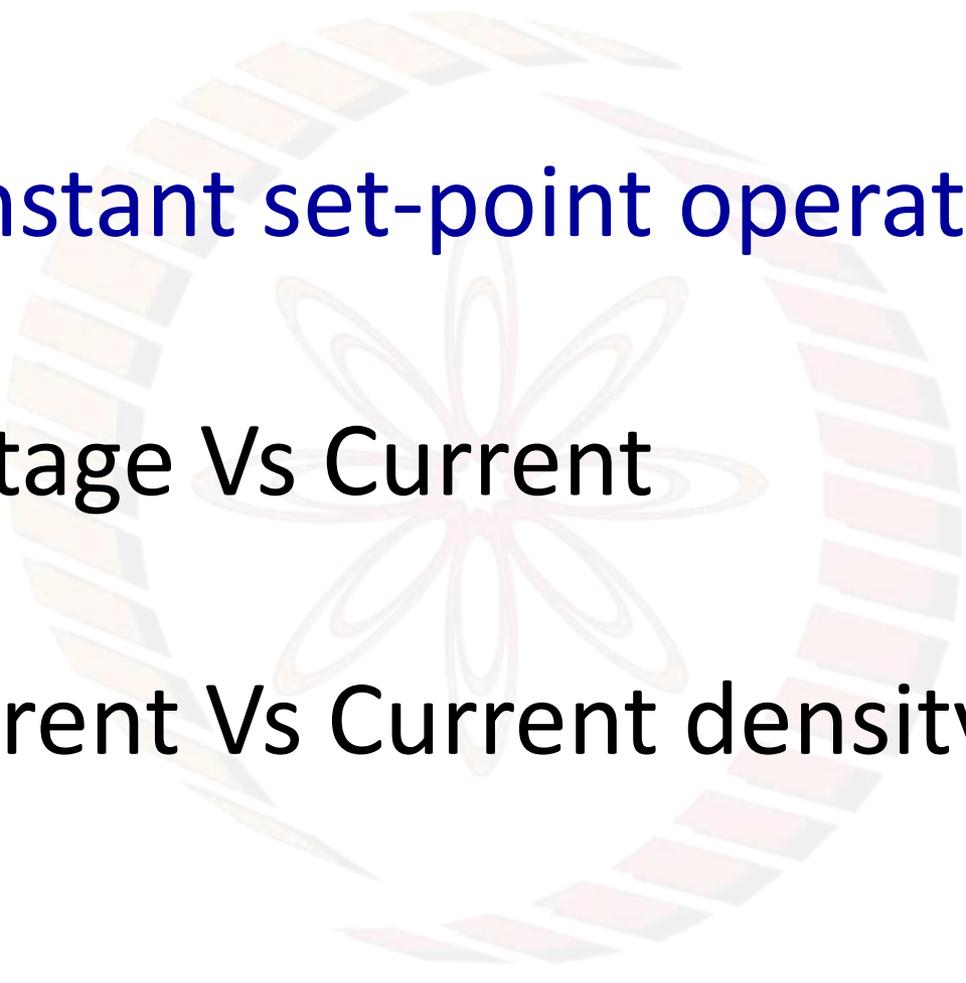
**Watts**

**Time**

**Power \* Time**

**Energy:**

**Joules or Wh**



# Constant set-point operation

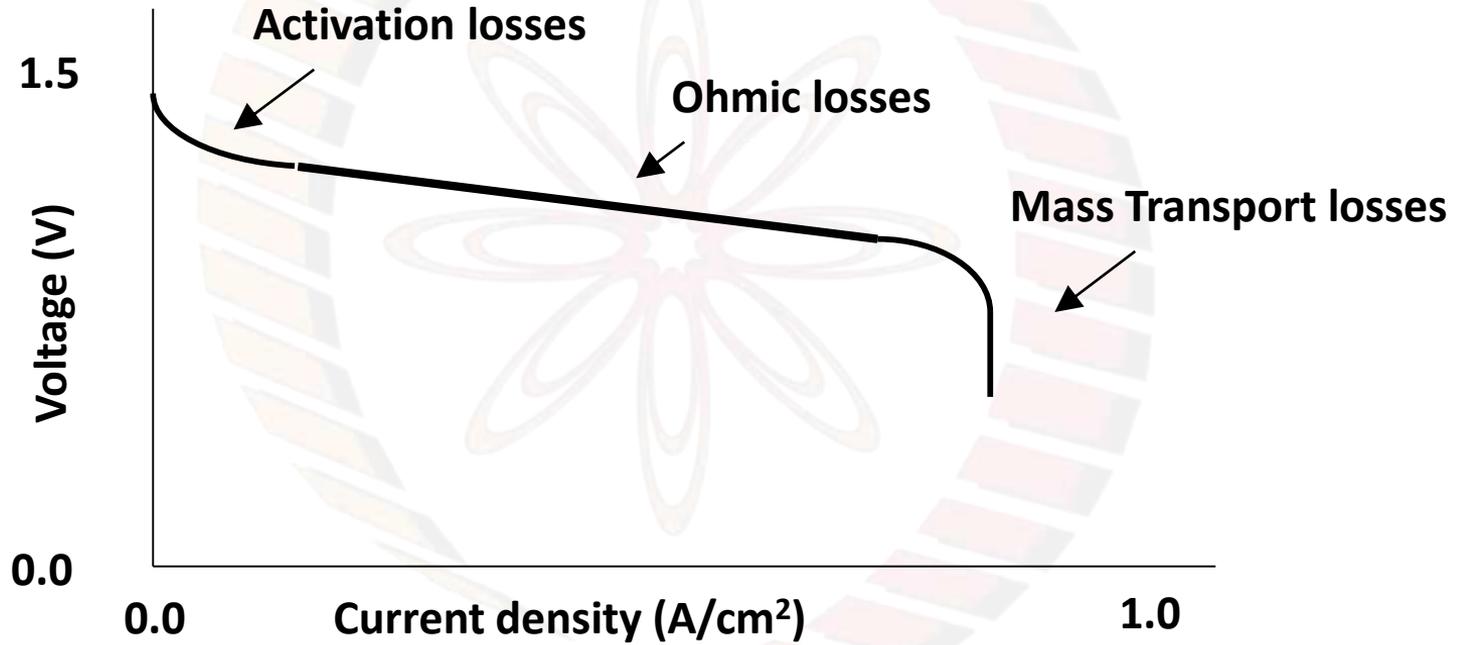
Voltage Vs Current

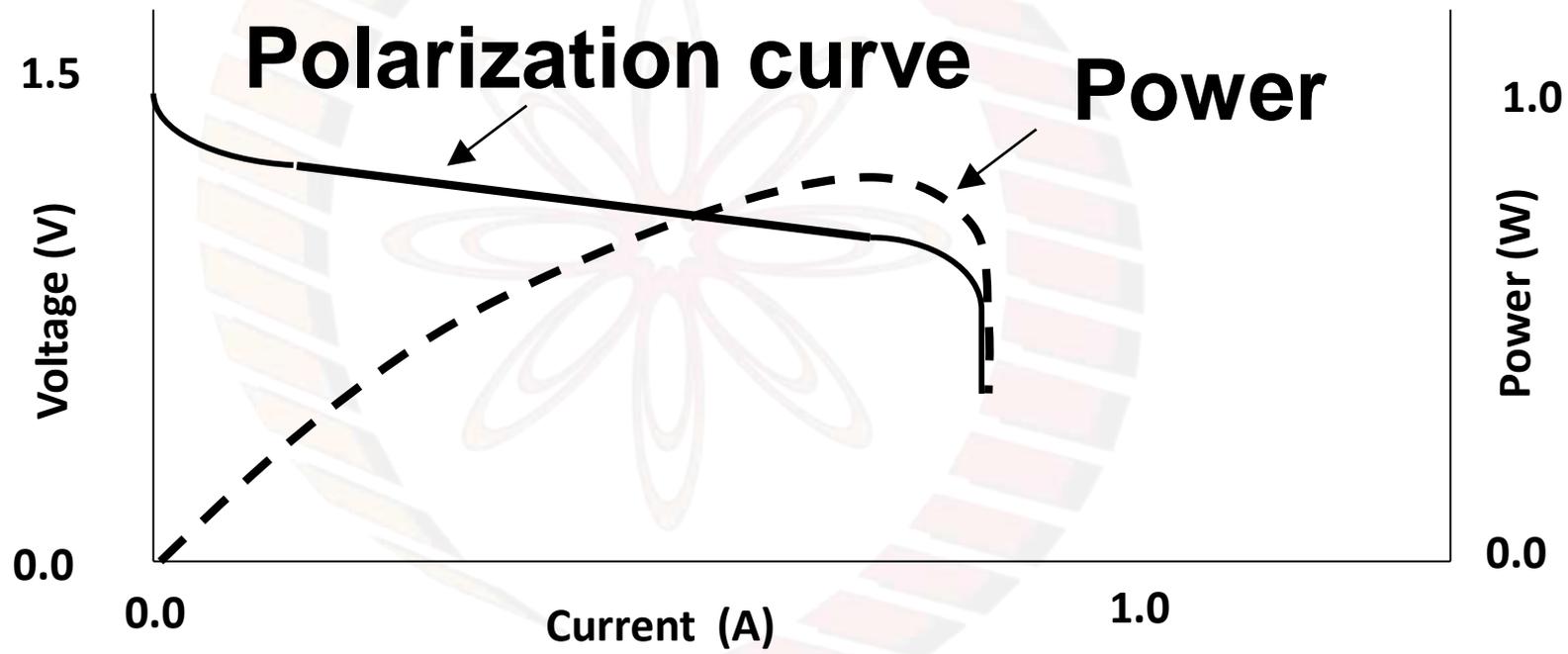
Current Vs Current density



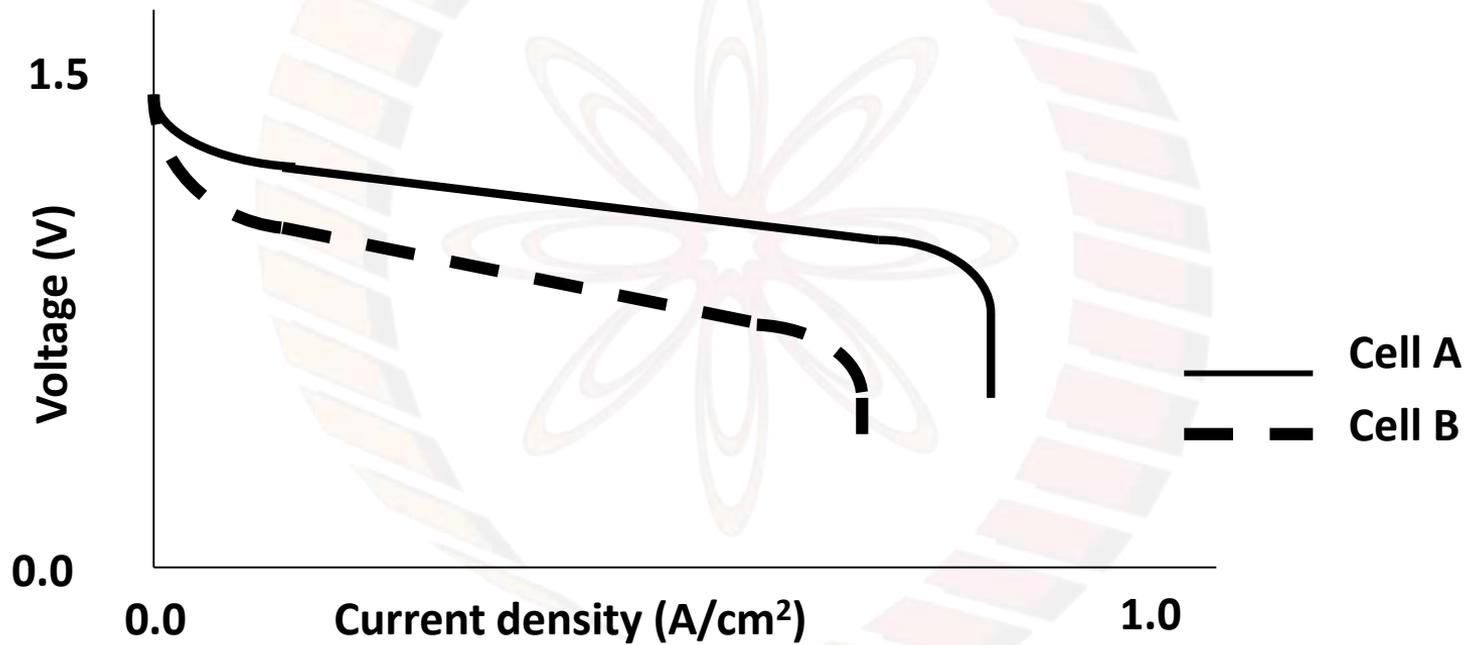


# Polarization curve

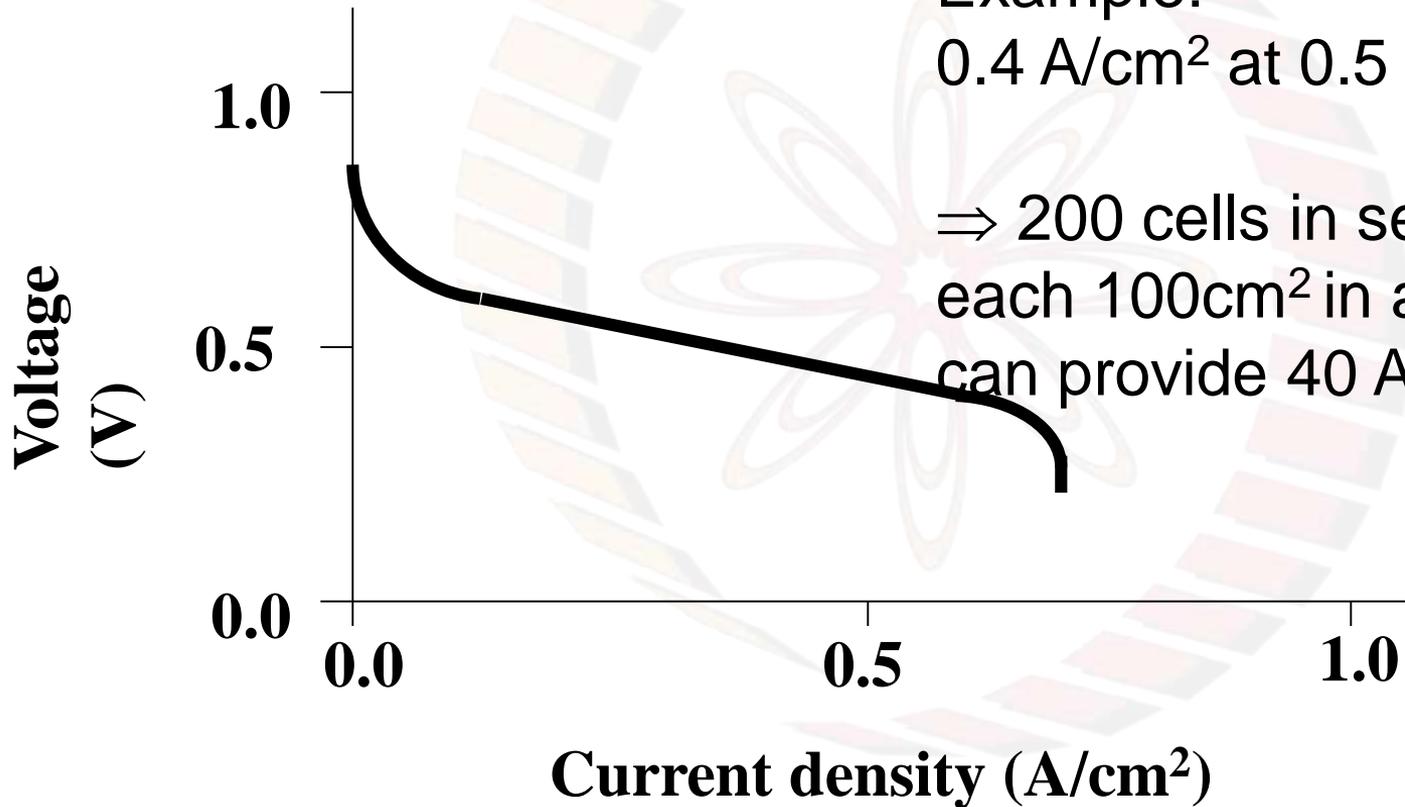




# A comparison between two cells



# Schematic of polarization curve from a fuel cell



Example:

0.4 A/cm<sup>2</sup> at 0.5 V

⇒ 200 cells in series,  
each 100cm<sup>2</sup> in area  
can provide 40 A at 100 V (DC)