“Renewable Energy Solutions ... Batteries Included”

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San Diego Gas & Electric Co.
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- **1.4 million** electric meters (~900k gas meters) serve over **3 million** people.
- **~100,000** distributed solar systems installed by customers
- **4,300** employees support a territory covering **4,100** square miles in two counties and **25** cities.

- **Transmission (69-500kV)**
  - ~**1,800** mi overhead, ~**105** mi underground
  - Over **14,000** structures
  - **22** substations
  - **201** tie lines

- **Distribution (12kV & 4kV)**
  - ~**10,100** mi underground (60%)
  - ~**6,700** mi overhead (40%)
  - ~**280** substations
  - ~**1,000** circuits
  - ~**220k** wood poles
The California ISO (CAISO)

• Manages the flow of electricity for about 80 percent of California

• Encompasses all of the investor-owned utility territories and some municipal utility service areas.

• Is the largest of the balancing authorities in the Western Interconnection, handling an estimated 35 percent of the electric load in the west
New Resources Need to Have Operating Characteristics to Integrate Renewables
Solar Doesn’t Address Residential Distribution Peaks
"Energy Storage" takes a lot of different forms:

- Lithium Ion batteries (Nickel Cobalt Aluminum, NMX, Iron Phosphate, Titanate)
- Flow batteries (Zinc-Bromine, Vanadium Redox, Nickel-Chromium)
- Molten salt (Sodium Nickel Chloride)
- Sodium Sulfur (NaS)
- Hybrid systems – thermal storage coupled with lithium-ion
- Pumped hydroelectric storage (Traditional & variable speed)
- Compressed Air
- Flywheels
- Hydrogen
Potential Use Cases for Energy Storage

- Bulk Energy Services
  - Electric Energy Time-Shift (Arbitrage)
  - Electric Supply Capacity

- Ancillary Services
  - Regulation
  - Spinning, Non-Spinning and Supplemental Reserves
  - Voltage Support
  - Black Start
  - Other Related Uses

- Transmission Infrastructure Services
  - Transmission Upgrade Deferral
  - Transmission Congestion Relief

- Distribution Infrastructure Services
  - Distribution Upgrade Deferral
  - Voltage Support

- Customer Energy Management Services
  - Power Quality
  - Power Reliability
  - Retail Electric Energy Time-Shift
  - Demand Charge Management

Source: DOE/EPRI Electricity Storage Handbook
The “Expedited Storage Project”: El Cajon – 7.5 MW / 30 MWh Array
The “Expedited Storage Project”: Escondido – 30 MW / 120 MWh Array
Thank You!