Energy Storage as a Transmission Asset

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Defining Storage as Transmission

- Despite nearly two decades of policy guidance and regulatory precedent for the use of energy storage as a transmission asset, transmission plans still rarely consider storage alternatives
- Regulators have assigned the responsibility for proposing storage alternatives to non-utility participants in the transmission planning process
- The lack of storage alternatives in transmission plans suggests that those participants may lack clarity about when storage alternatives merit consideration
- Our forthcoming paper, “Energy Storage as a Transmission Asset: Definitions and Use Cases,” provides clarity on this topic by defining the ways that energy storage can interact with the transmission system and the specific use cases in which storage alternatives may be viable

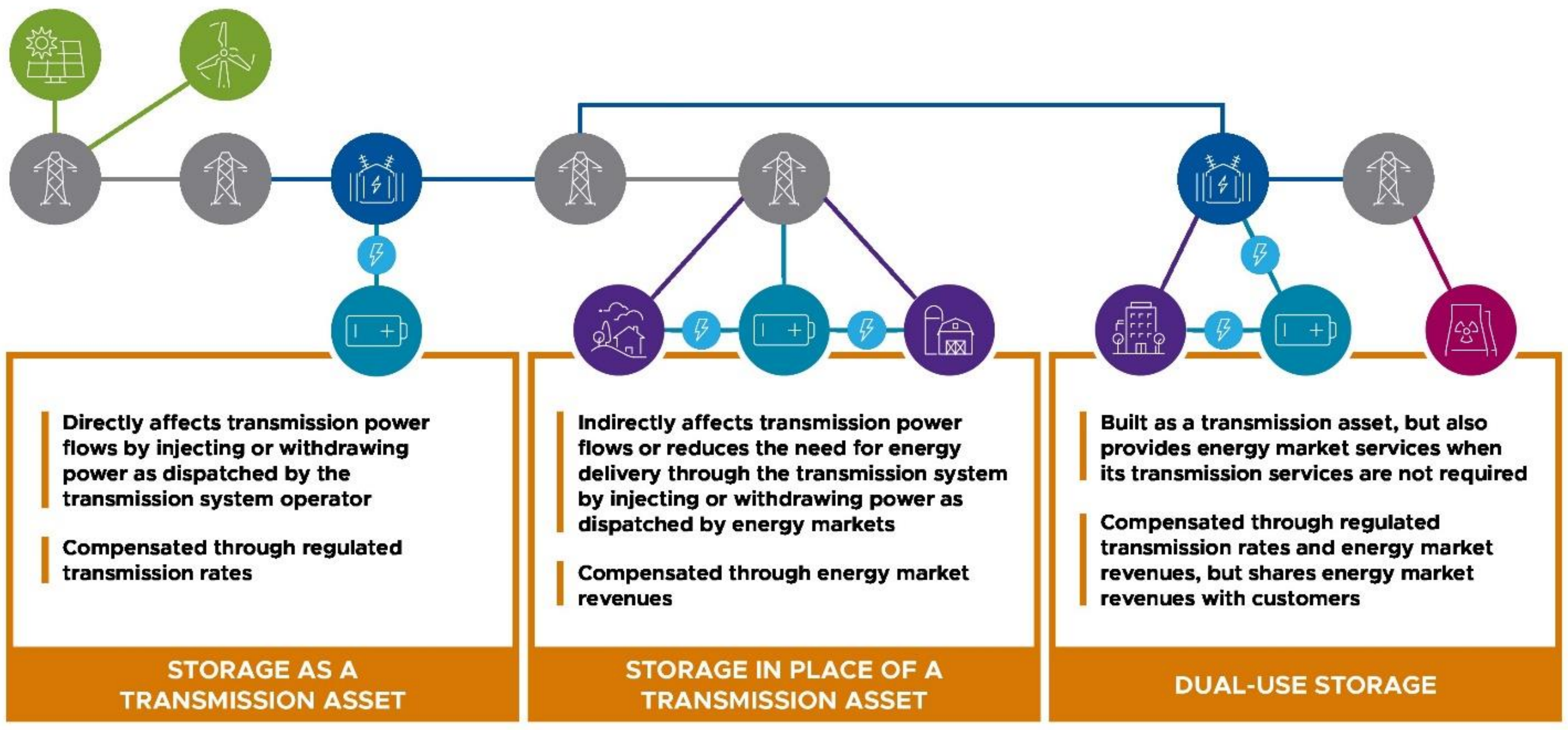


Figure 1: Defining the roles for energy storage on the transmission system

Use cases for energy storage as a transmission asset (SATA)

Thermal Overload

Energy storage can absorb excessive power flows that occur when a transmission line goes down, protecting other lines from receiving more power flow than they can handle. In instances that would require major upgrades to enable the remaining lines to carry those excess flows, storage can be a cost-effective alternative.

Voltage Support

Because electricity flows from higher voltages to lower voltages, the transmission system must maintain a high voltage to ensure that power flows to customers. When the loss of a generation unit or transmission line causes voltages to sag, energy storage can be strategically sited to inject voltage into the system and maintain power flows.

Reactive Power

Reactive power is the phenomenon that causes alternating current to constantly change direction and is necessary to ensure power flows. The loss of a generator or transmission line can result in insufficient reactive power. Because energy storage is connected to the grid through an inverter, it can inject reactive power when and where it is needed.

Outage Mitigation

The loss of a generator or transmission asset may result in the loss of service to customers; transmission planners may also intentionally cut service to customers in extreme circumstances to balance the grid. In these events, energy storage can be used to maintain service to customers that would otherwise be cut off.

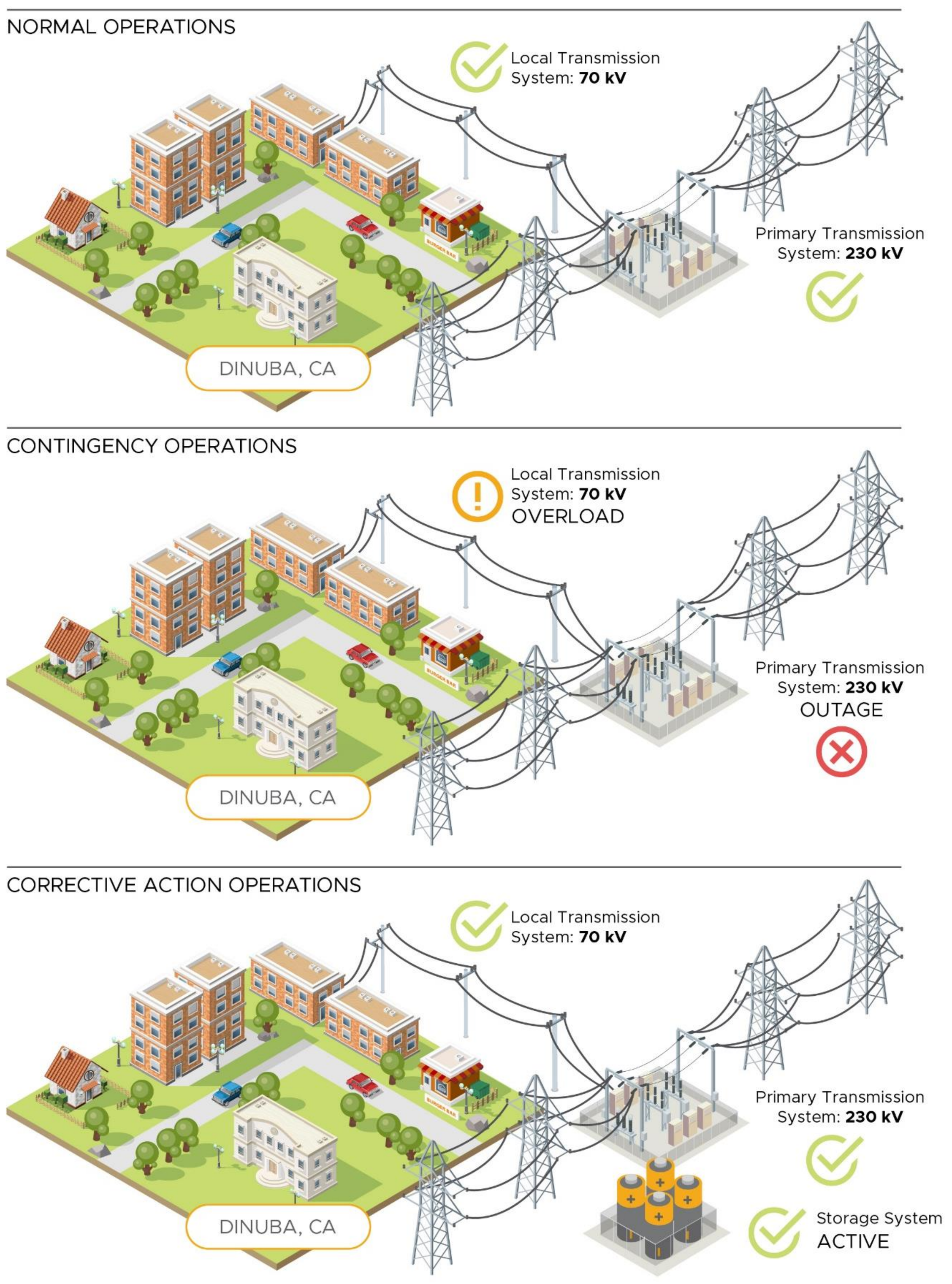
Use cases for energy storage in place of transmission asset (SIPTA)

Peak Management

When local demand exceeds the capacity of the transmission lines that serve it, energy storage can be deployed to meet that demand by charging during periods of low demand and discharging during periods of high demand. In this way, storage can defer or displace the need for additional transmission lines.

Congestion Management

Where inadequate connectivity exists between customers and low-cost energy resources, customers may be forced to rely on higher-cost resources. This can increase costs and reduce grid efficiency. Energy storage can allow for more of the low-cost energy to be harnessed during low-demand periods and used to meet demand during peak periods.



How storage can resolve transmission system contingencies

Storage as a Transmission Asset Potential Study

Project Approach:

- Review all publicly filed regional transmission plans in the U.S. from 2021-2023, supplemented by review of individual utility plans in regions that do not produce a detailed regional plan
- Identify all contingencies modeled, the system need, the options considered, and the cost of the selected option
- Structured like an energy efficiency potential study, in which we will assess the **technical potential** (total number of contingencies in which energy storage could have met the identified need) and then the **economic potential** (total number of contingencies in which energy storage may have been a cost-effective alternative to the option that was selected)

Expected Impacts:

- Technical potential study: indicate the number of scenarios in which storage could be a viable option to illustrate the range of services that storage can provide on the grid
- Economic potential study: provide an estimate of the potential market size for energy storage as a transmission asset to ascertain whether further policy guidance is warranted

Initial Findings

Region	SATA Policy in Place?	Number of Times Storage Considered in a Transmission Plan, 2021-2023
CAISO	No	2
MISO	Yes	0
ISO-NE	Yes	0
Northern Grid	No	0
NYISO	No	0
PJM	No	0
SERC	No	0
SPP	Yes	0
West Connect	No	0

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