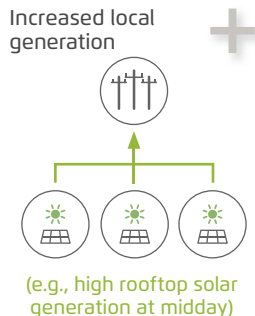


## Traditional operations (passive, one-way system)

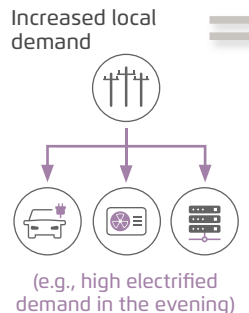


- Power flows in one direction: from substation to the consumers
- Demand is relatively predictable
- Distribution grids are designed to accommodate these flows without interventions from the operator

## Future operations (two-way system)

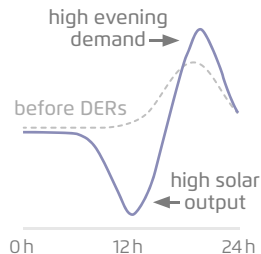


- Rooftop solar PV installations inject surplus power back into the grid
- When PV output is high, power can start to flow from consumers to the local substation
- In parts of the grid where demand is low and PV output is high, overvoltage issues can occur



- New, high power appliances – like batteries, EVs and heat pumps – can increase local peak demand
- If many devices operate together, the local substation and grid lines can get overloaded
- In parts of the grid where demand is high and PV output is low, undervoltage issues can occur

## Greater variability



- Changes in power flows become faster and larger as unmanaged DER deployment grows
- This creates new challenges for keeping voltage and equipment loading within limits
- Operators need to manage their grids more actively, requiring greater visibility and control