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Future Uses of Big Data in the Smart Grid

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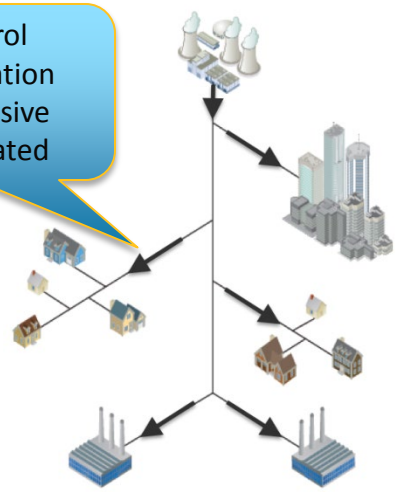
Evolution of the Grid

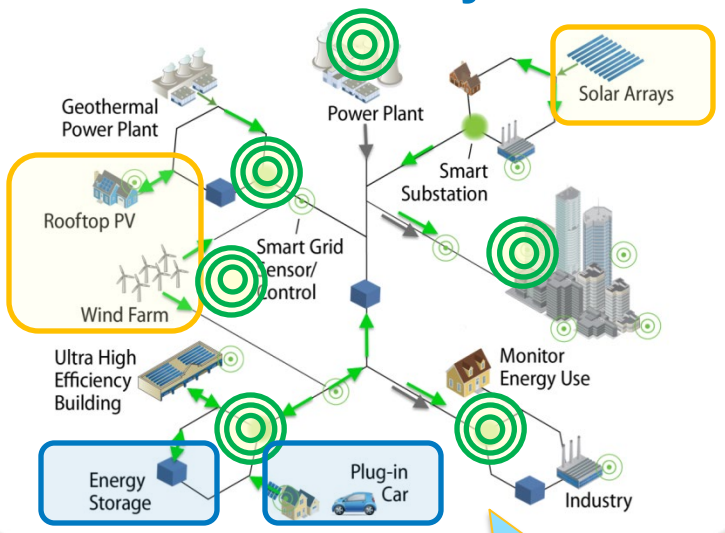
Energy Systems Integration

Current Power System

- Central Control
- Large Generation
- Carbon Intensive
- Highly Regulated



Future Power Systems



New Challenges in a Modern Grid

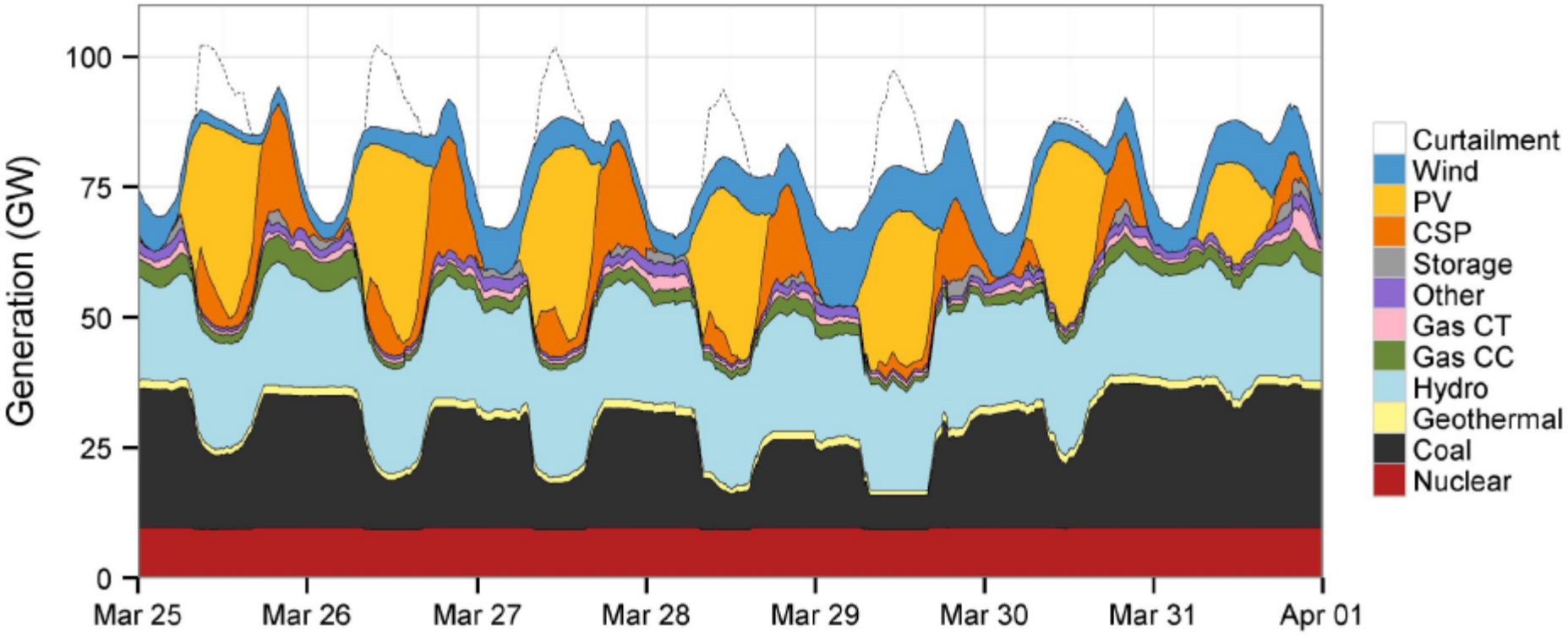
- New energy technologies and services
- Increasing penetration of variable renewables in grid
- New communications and controls (e.g. Smart Grids)
- Electrification of transportation
- Integrating distributed energy storage
- A modern grid needs increased system flexibility
- Capitalize on interactions between electricity/thermal/fuel systems

DRIVERS

- Increased variable gen
- More bi-directional flow at distribution level
- Increased number of smart/active devices
- Evolving institutional environment

High Penetration Dispatch Stack

Energy Systems Integration



- Annual Energy Average Penetration in the Western Interconnect: 25% solar, 8% wind
- Solar is 60% PV and 40% CSP with 6 hours storage

Source: Western Wind and Solar Integration Study Phase 2: http://www.nrel.gov/docs/fy12osti/56217.pdf