

NETL's Grid Modernization Characteristics

Characteristic	20 th Century Grid	21 st Century Grid	Emerging Technologies
1. Self Healing	<ul style="list-style-type: none"> • Responds to prevent Damage • Protect assets 	<ul style="list-style-type: none"> • Automatically detects, responds and restores • Prevention and minimization 	<ul style="list-style-type: none"> • High speed SPS • Real-time contingency analysis • AMI/outage management systems
2. Incorporates and Motivates the Consumer	<ul style="list-style-type: none"> • Consumers are uninformed and non-participative 	<ul style="list-style-type: none"> • Informed, involved and active consumers. • Broad penetration of Demand Response. 	<ul style="list-style-type: none"> • Internet enabled thermostats (Comverge) • TOU rates • Real-time pricing • Zigbee devices
3. Resists Attack	<ul style="list-style-type: none"> • Vulnerable to attacks and natural disasters 	<ul style="list-style-type: none"> • Resilient to attacks and disasters • Rapid restoration capabilities 	<ul style="list-style-type: none"> • Redundancy built-in • High speed communication and detection systems • Micro-Grids • Distributed generation
4. Power Quality Supply	<ul style="list-style-type: none"> • Focus on outages and reliability 	<ul style="list-style-type: none"> • PQ focus in design and monitoring • Various levels of PQ rates 	<ul style="list-style-type: none"> • Fly-wheel systems • Large UPS systems • Micro-Grids
5. Wide Variety of Generation	<ul style="list-style-type: none"> • Small number of large plants • Difficult and expensive interconnection 	<ul style="list-style-type: none"> • Large number of diverse DG • Plug-and-play convenience • Expedited interconnection 	<ul style="list-style-type: none"> • Small wind and solar applications • Expedited small DG process • Net metered installations • Combined inverter/protection packages – pre-approved std's • Demand Response Negawatts • Energy storage options (Ice Energy)
6. Enables Markets	<ul style="list-style-type: none"> • Limited wholesale markets • No national design • Transmission congestion separates buyers/sellers 	<ul style="list-style-type: none"> • National wholesale market available to all participants • Minimal transmission congestion • Clean energy purchase options 	<ul style="list-style-type: none"> • Maturing wholesale markets • Aggregation of smaller customers • Internet buying • Renewable energy credits available to all sizes
7. Optimizes assets and Operates Efficiently	<ul style="list-style-type: none"> • Poor load factors 	<ul style="list-style-type: none"> • Low loss systems • High load factors • Advanced information for improved planning 	<ul style="list-style-type: none"> • AMI systems measure distributed load • Distributed energy resources lower losses • Demand response and load shifting improve load factor • System modeling down to customer