

Smart Grid



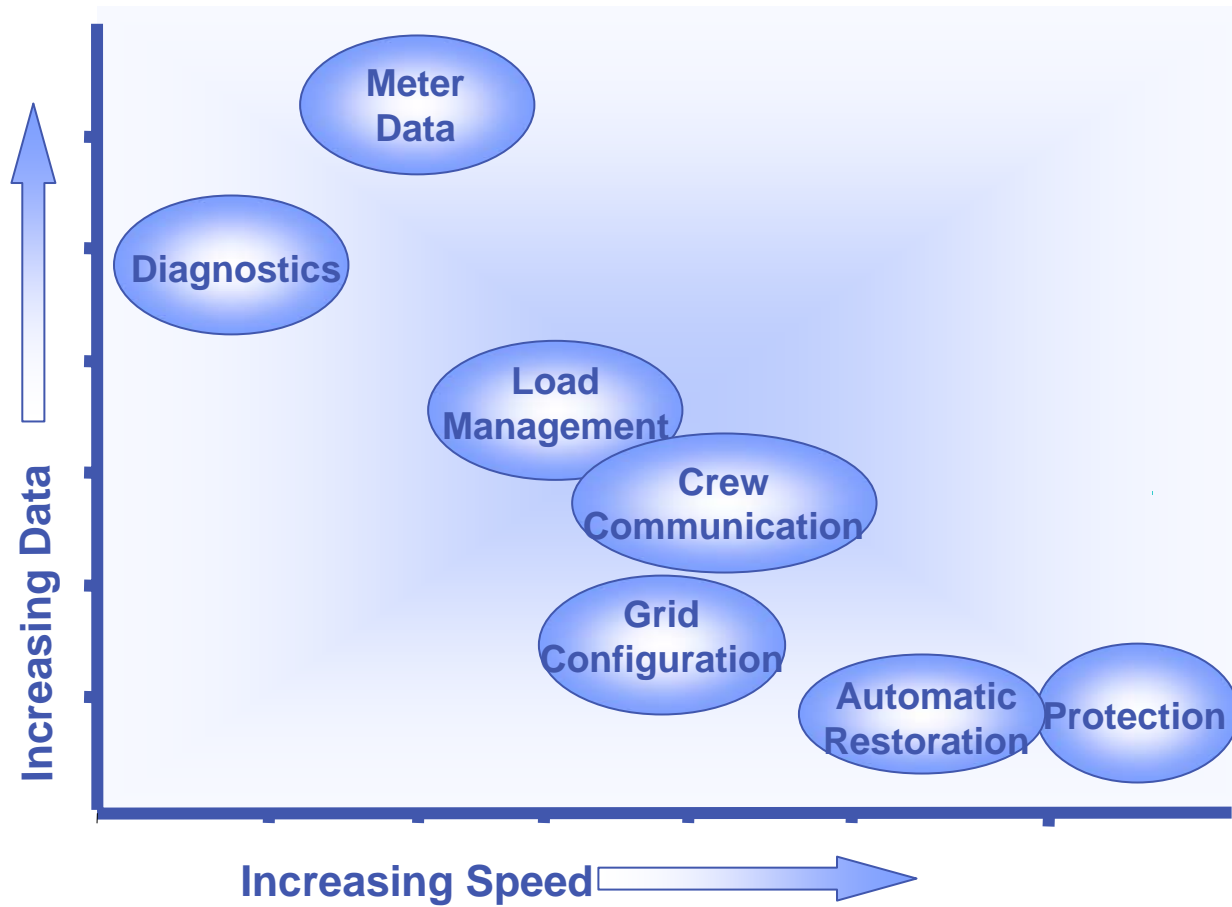
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Smart Grid Benefits

	What it is	Why	Utility Value Example*
Demand optimization	Manage peak via control of power consumption	Empower the consumer; best CAPEX use	\$15MM/yr** 58K tons of CO2 reduction Res consumer savings up to 10%
Delivery optimization	Reduce delivery losses ~10% of Power Generated	Less energy waste and higher profit margins	\$27MM/yr*** 29K tons of CO2 reduction
Asset optimization	Prognostics for proactive equipment maintenance	Reduced outages and forced maintenance	\$12MM/yr ~3.5 yr ROI
Reliability optimization	Improved Grid Control	Increased network performance & reliability	\$21MM/yr Based on a 4hr blackout per year of a transmission utility
Grid Mgt. optimization	Compensation for generation variability	Enable higher Renewable Penetration	Key to meeting RPS targets
PHEV'S	Converting from oil to electric transportation	Reduced emissions and reduced oil imports	More KWH Sales

*Utility savings are approximate annual savings per MM customers
 **1.6% peak load reduction
 ***IVVC with 1-2% CVR peak load reduction

Function vs. Communication Needs





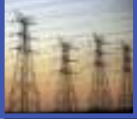





Smart Grid and Dedicated Spectrum

- Improved Security ?
- Mandated Use ?
- New Business Models ?
- Faster Smart Grid Deployment ?
- Bandwidth Impact ...



Backup

Elements of Today's Smart Grid

	Offerings	Customer Benefits	Future Enablers
	Grid-Friendly Renewables	<ul style="list-style-type: none"> • Controllability: Ramp, curtail... • Reduced uncertainty: for operating efficiency 	<ul style="list-style-type: none"> • Stronger tie with utility EMS • Coordination with DER & loads
	Grid Control Systems	<ul style="list-style-type: none"> • System reliability 	<ul style="list-style-type: none"> • 'Ever Green' Service • Modular applications
	Substation Digitization	<ul style="list-style-type: none"> • Modular/standard • Less cost, time, risk 	<ul style="list-style-type: none"> • IEC 61850 Compliant • Open architecture
	Intelligent Electronics	<ul style="list-style-type: none"> • Performance monitoring • Control devices 	<ul style="list-style-type: none"> • Standards based • IEC 61850 compliant
	Monitoring & Diagnostics	<ul style="list-style-type: none"> • Asset protection • Life extension 	<ul style="list-style-type: none"> • Progressive offering • Long term services
	Communications Infrastructure	<ul style="list-style-type: none"> • Performance visibility • Remote control 	<ul style="list-style-type: none"> • Seamless NMS, Security • Multi-applications
	Smart Metering	<ul style="list-style-type: none"> • Customer billing • Demand management 	<ul style="list-style-type: none"> • Software upgradeable
	Smart Appliances & Home Controls	<ul style="list-style-type: none"> • Participation in DR programs • Utility bill savings 	<ul style="list-style-type: none"> • Standards based • Software upgradeable

Wimax Secure Standards at Every Level

SmartMeter Identity

- Crypto EEPROM “credential and key store” on meter
- Dynamic “digital signature” across meter (AES-CMAC)
- Secure login required to obtain Smart Grid Identity

Secure Digital Keys / Certificates

- Certificate Authority w/Public Key Infrastructure (PKI)
- OCSP Server for x.509 Digital Certificate validation

Secure Authentication

- EAP/TLS over RADIUS: Authentication, Authorization and Accounting seamlessly integrated into PolicyNet

Secure Communication

- DHE-HSS Diffie-Hellman Key Exchange (ephemeral MSK)
- Message integrity, encryption, replay protection

Secure Data Transmission

- WiMAX PKMv2
- TLS (Transport Layer Security)
- IPSec (Internet Protocol Security / Internet Key Exchange)