METERING AMERICA

BILLING/CIS AMERICA

THE metering and customer management MEGA-EVENT
for SMART electricity, water and gas utilities!

10th ANNIVERSARY 2000 - 2009
Produced by spintelligent

Steven W. Pullins, President,
Horizon Energy Group, and
DOE / NETL Modern Grid Strategy team**,**
Tennessee, USA

Horizon Energy Group

MODERN GRID STRATEGY

NETL

This material is based upon work supported by the Department of Energy under Award Number DE-AC26-04NT41817

This presentation was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

Leveraging the Data to Achieve Customer Satisfaction

Managing the Data Storm

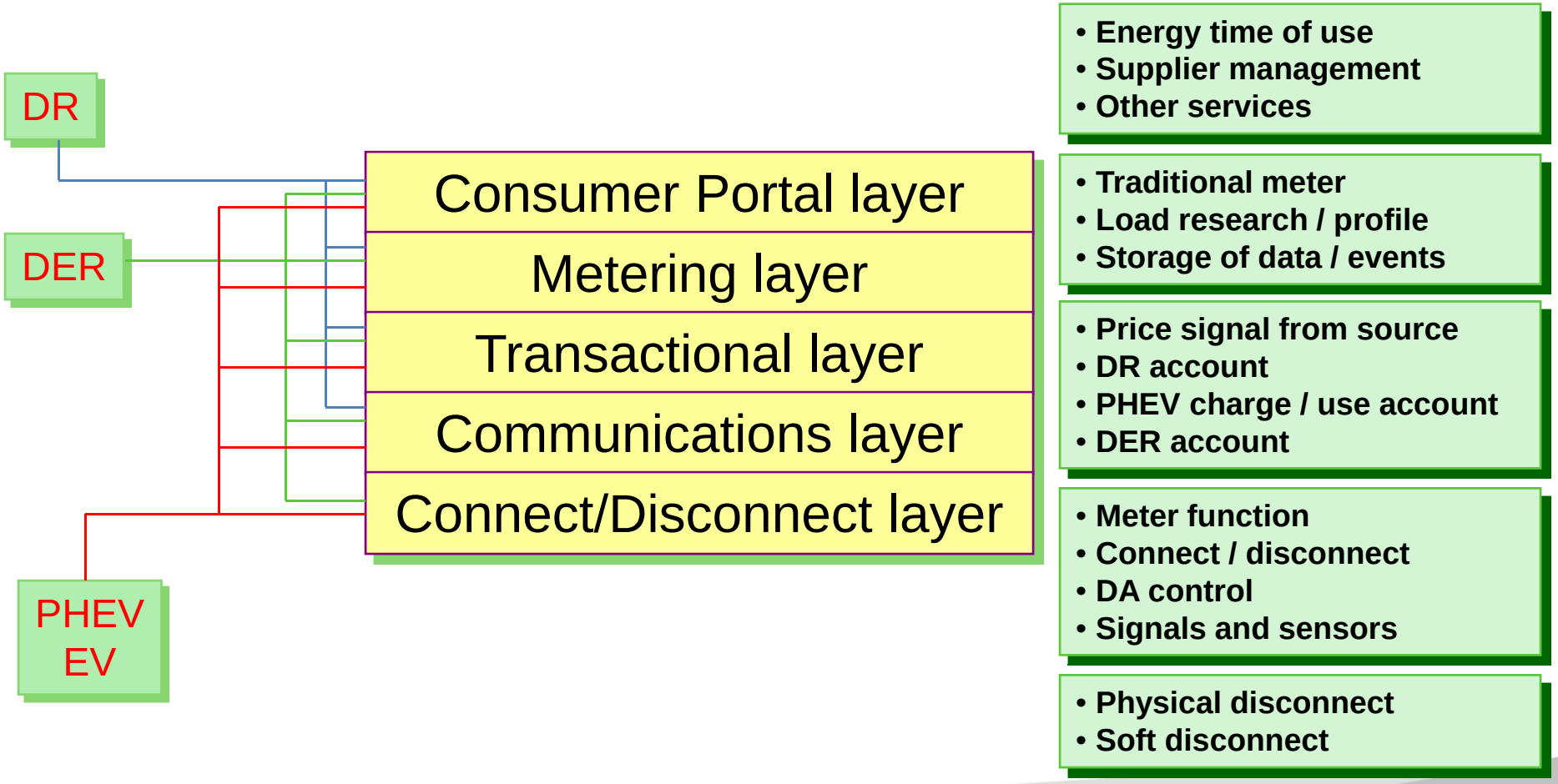
A Changing Consumer

- More green
- More technology savvy (nearly half of the average residential and commercial load is digital-based)
- More willing to seek their own solution to provide more control and independence
- Grid divorce is real: it has increased 33% per year for 10 years. Families and companies off-grid could reach 3 million by 2016, and 55 million by 2026.

What Do Customers Want?

Critical Success Factors	Today	Tomorrow
Reliability	Convenience and business continuity	Greater emphasis on business continuity
Security		Resilience
Safety	Do no harm	Do no harm
Efficiency	Low rates	Conservation & energy efficiency
Economics	Low rates	Access / take advantage of markets
Environmental Stewardship	Clean tech – not a challenge to rates	Accept higher rates for clean tech

Advanced Metering Infrastructure



Part of a larger Smart Grid strategy

Keeping the "End in Mind"

Smart Grid Characteristic	*AMI*	*ADO*	*ATO*	*AAM*
Enables Active Consumer Participation	✓	✓		
Accommodates All Generation & Storage Options	✓	✓	✓	
Enables New Products, Services and Markets	✓	✓	✓	
Provides PQ for Digital Economy	✓	✓	✓	✓
Optimizes Assets & Operates Efficiently	✓	✓	✓	✓
Anticipates and Responds to System Disturbances	✓	✓	✓	✓
Operates Resiliently Against Attack and Natural Disaster	✓	✓	✓	

AMI=advanced metering infrastructure; ADO=advanced distribution operations; ATO=advanced transmission operations; AAM=advanced asset management

Tomorrow's Consumer Options

Smart Grid Characteristic	*AMI*	*New Data Options*
Enables Active Consumer Participation	✓	TOU, CPP; DR
Accommodates All Generation & Storage Options	✓	Consumer owned DER for consumption and sale
Enables New Products, Services and Markets	✓	Energy data services; use assets for grid services
Provides PQ for Digital Economy	✓	Monitor in real-time; anticipate problems
Optimizes Assets & Operates Efficiently	✓	More complete understanding of energy & capacity patterns
Anticipates and Responds to System Disturbances	✓	Monitor (knowledge) and isolate outages; reconfiguration
Operates Resiliently Against Attack and Natural Disaster	✓	Knowledge to rapidly respond and limit damage

How Smart Metering Helps

New Data Options	*New Functionality*
TOU, CPP; DR	Meter on 5 to 15 min intervals; receives real-time prices from utility/RTO; supplies data to DR controls
Consumer owned DER for consumption and sale	Real-time communications to link solar, generator, and storage units data and controls
Energy data services; use assets for grid services	Portal to analyze usage and options; consumer choice for in-premise use and out-premise use
Monitor in real-time; anticipate problems	Portal and tools to see developing problems and trend power quality
More complete understanding of energy & capacity patterns	Detailed load profiling and pattern-recognition; observe real capacity in near-real-time
Monitor (knowledge) and isolate outages; reconfiguration	Near-real-time metering info (volts, amps, etc) for isolation; load data for autonomous reconfiguration
Knowledge to rapidly respond and limit damage	Near-real-time metering info (volts, amps, etc) to repower unfaulted circuits; public and worker safety

Future Data Load

(1 million customers – one month)

New Data Options	*Per Customer*	*For Utility*
TOU, CPP; DR	9.4MB/mo	9,400 GB/mo
Consumer owned DER for consumption and sale	3.4MB/mo	1,020 GB/mo
Energy data services; use assets for grid services	Included above	Included above
Monitor in real-time; anticipate problems	Included above	Included above
More complete understanding of energy & capacity patterns	Included above	Included above
Monitor (knowledge) and isolate outages; reconfiguration	18KB	1.5GB/mo
Knowledge to rapidly respond and limit damage	6KB	0.5GB/mo

Leverage

- Customer Loyalty – be the best partner on the customer-side of the meter
  - Currently others are doing this better than utilities
  - Reliability and PQ decisions; education
  - Going Green; installing renewables
  - Economics, options, and markets
- Fully understand load profile – customer, community, region – to advise customer
- Improve system operations from the customer perspective – consumer and societal benefits

Future Customer Satisfaction

- Basis is already changing for residential and commercial (74% of load)
  - Rates to electric bills (California experience)
  - “Lights on” philosophy to suite of offerings
  - Silent service to sustainability partner
  - Customer–generation: from discouraging to encouraging
- Creativity based on understanding the commercial (34% of load) customer’s business model
- Hear less “me” and more “thee”

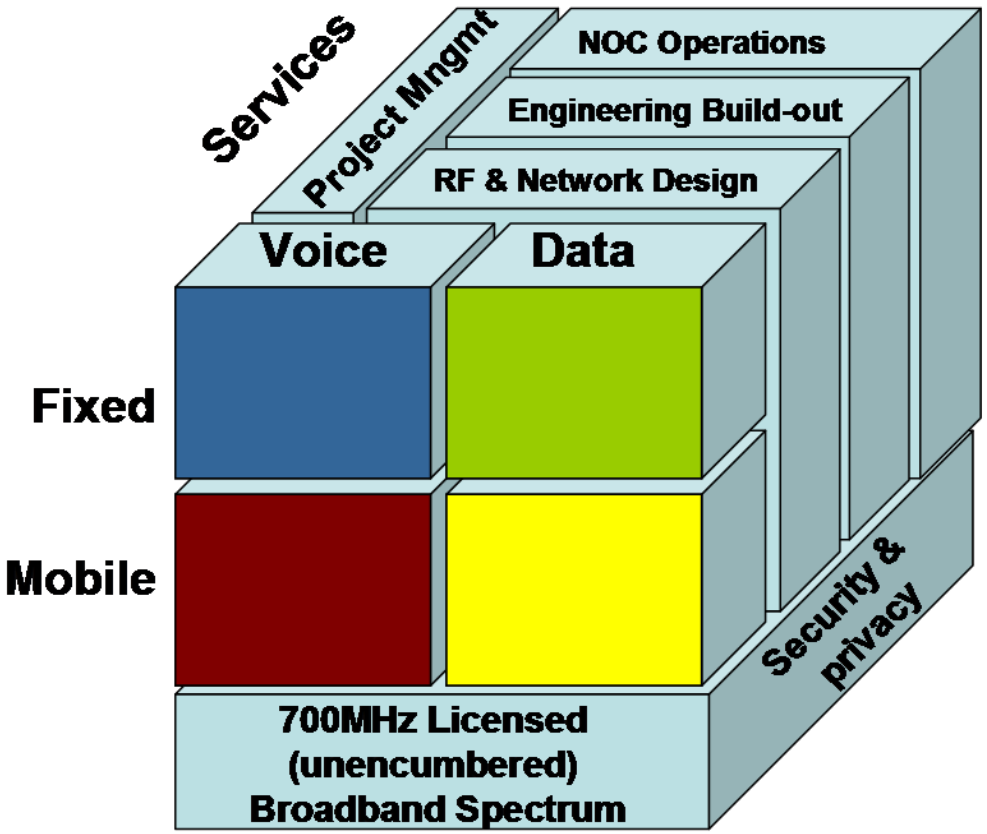
Extra Credit

EMBRACING THE CHALLENGE

Communication Challenge

- Can do it wrong in AMI design and spoil the Smart Grid implementation
  - If a utility selects a wireless mesh communication network (unlicensed 900MHz) for AMI, the comm layer may not be capable of dispatching DR, DER, and PHEV on top of reading meters
- Many, independent legacy utility communications systems generate inertia against converging of the communications necessary to support the Smart Grid

Converged Communications

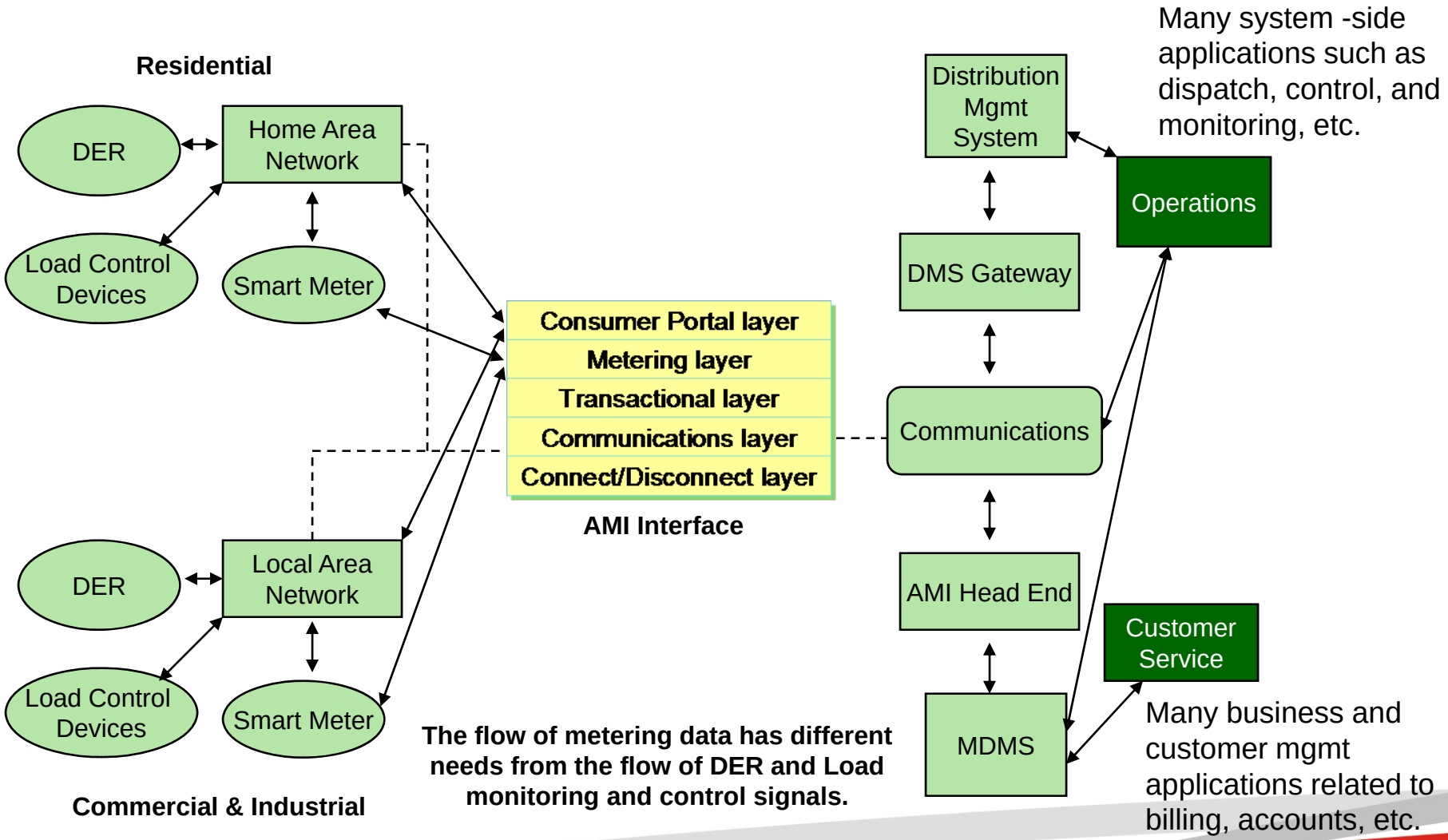


- Data from meter
- Data and updates to meter
- Data from in-home display
- Data to in-home display
- Sense DR
- Control DR

- Sense breakers, switches, capacitors, LTC
- Control distribution devices
- Monitor substations
- Control substations
- Sense distributed generators
- Control distributed generators
- Monitor storage devices
- Control storage devices
- Collect event data
- Collect asset management data

* from Arcadian Networks

AMI Technologies – How They Fit



Contact Information

For additional Information, contact

Modern Grid Strategy Team

http://www.netl.doe.gov/moderngrid/

304-599-4273 x101