



Virtual Town Hall Meeting on Smart Grid

To Honor the late Erich Gunther
Chairman, CTO & Co-Founder, EnerNex

Moderated by
Erfan Ibrahim, NREL

Agenda

- Eulogy for Erich Gunther (15 minutes)
 - Career highlights
 - Interactive dialogue with audience (memory sharing)
- Smart Grid overview with audience participation (60 minutes)
 - AMI/HAN
 - Demand Response
 - Distributed Energy Resources
 - Electric Vehicles
 - Distribution Grid Management
 - Wide Area Monitoring Protection & Control
 - Micro Grid
- Action items and final remarks (15 minutes)

Erich Gunther Eulogy

“If we live, we live for the Lord; and if we die, we die for the Lord. So, whether we live or die, we belong to the Lord.” (Holy Bible, Romans 14:8)



“He had a zest for all things in his professional and personal life, and enriched those who were fortunate enough to cross his path. Our industry has lost a bright light and we will miss him.”

Robert Zavadil, EnerNex Co-Founder and EVP

ERICH GUNTHER
1958 - 2016

Inna lillahi wa inna ilayhi raji'un

“We surely belong to Allah and to Him we shall return.” (Holy Quran Chapter 2 Verse 156)

Erich Gunther Career Highlights

- **Chairman, CTO and Co-Founder, EnerNex**
- **Year Joined Firm: 2003**
- **Power Industry Years: 30**
- **Education: B.S. Electrical Engineering from Gannon University; M.E. Electrical Engineering from Rensselaer Polytechnic Institute**
- **Expertise: Utility communications, power measurement, power system simulation, power quality, distributed resources, computing technology, systems engineering, smart grid development, advanced metering infrastructure, demand response**

Courtesy www.enernex.com

Erich Gunther Professional Affiliations

- **Fellow, Institute of Electrical and Electronics Engineers (IEEE)**
- **Member, IEEE Power and Energy Society (PES)**
- **Member, IEEE PES Intelligent Grid Coordinating Committee**
- **Chairman, IEEE interharmonics task force**
- **Chairman/Facilitator, UtilityAMI Working Group and OpenHAN Task Force**
- **Vice Chairman, IEEE PES Harmonics Working Group**
- **Member, IEEE Power Quality Subcommittee**

Courtesy www.enernex.com

Erich Gunther Electric Sector Roles

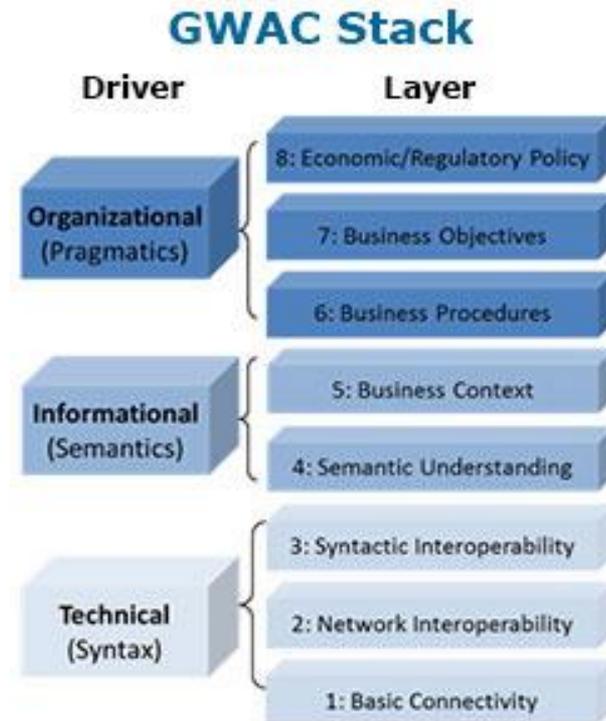
- **Chairman, UCA International Users Group**
- **Chairman Emeritus, DOE GridWise Architecture Council**
- **Governing Board Member, IEEE Power and Energy Society**
- **Member, UTC Smart Networks Council**
- **Member, SGIP Governing Board**
- **Member, Southern California Edison Technology Advisory Board**

Courtesy www.enernex.com

Erich Gunther Utility Experience (Sample)

AMI, Smart Grid and Technology Roadmap Development Projects

- SCE
- Consumers Energy
- Entergy
- First Energy
- Duke Energy
- Salt River Project
- Southern Company
- California ISO
- LIPA



Courtesy www.enernex.com

Erich Gunther Electric Sector Experience

- **EPRI Intelligrid Architecture**
- **NIST Interoperability Roadmap Project (2009 – 2013)**
- **SGIP (2013 – Present)**
- **GridWise Architecture Council (GWAC) (Emeritus Chair)**
- **California Energy Commission (2003 – 2010)**
 - AMI
 - Demand response
 - Distribution automation
 - Intelligent consumer devices
- **Illinois Commerce Commission (2008 – 2010)**
 - Deployment of Smart Grid Technologies

Courtesy www.enernex.com

Erich Gunther (Other Accomplishments)

Certifications:

- Private pilot, single engine land – instrument rated, rotorcraft – helicopter
- Commercial radiotelephone license with ship radar endorsement
- Amateur radio operator – WG3Q

Patents

- US Patent #5,408,523 – “Electronic remote data recorder with facsimile output for utility AC power systems“

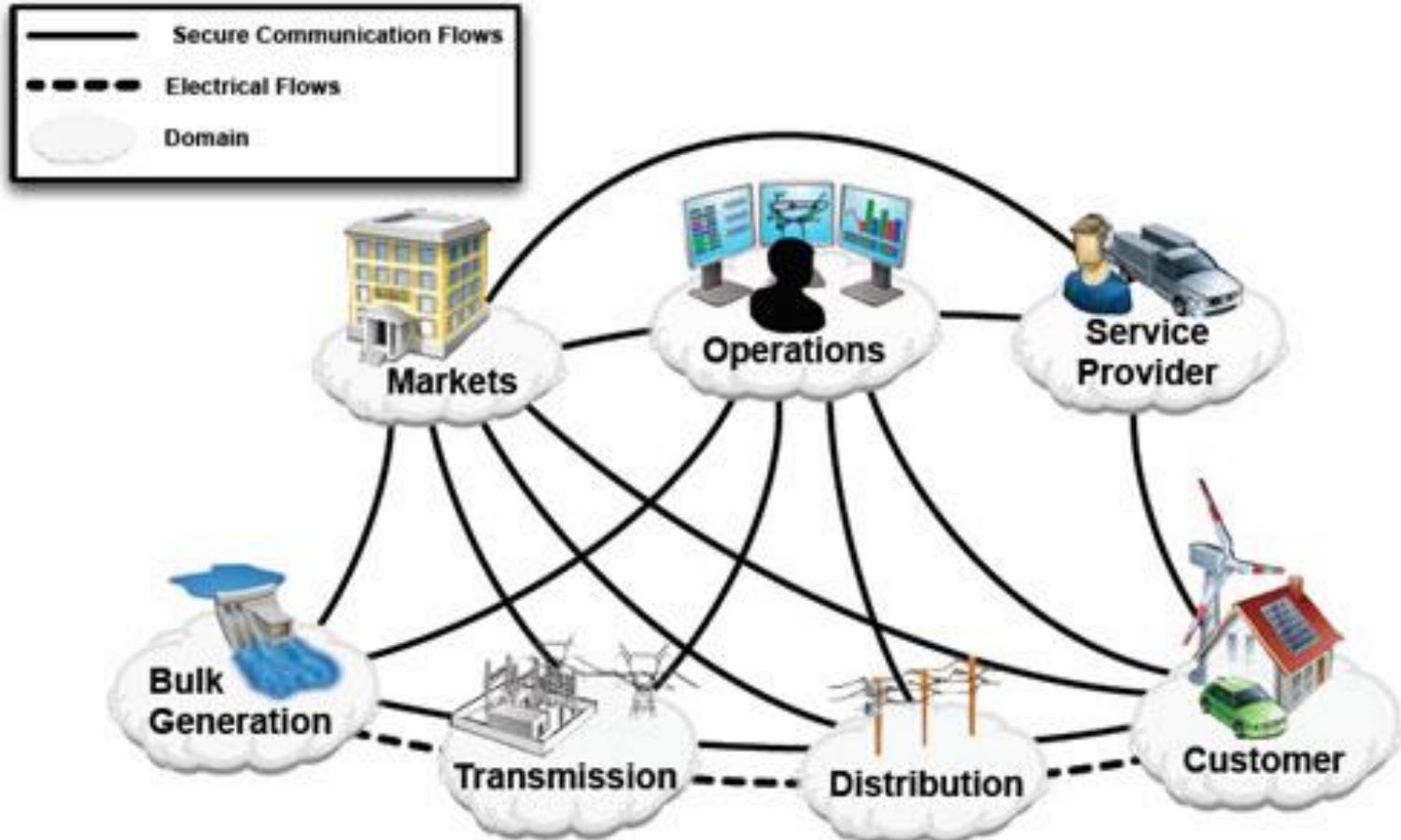
Courtesy www.enernex.com

Smart Grid Overview

Technology, Business Process & Policy Aspects of:

- **Advanced Metering Infrastructure / Home Area Networks**
- **Demand Response**
- **Distributed Energy Resources**
- **Electric Vehicles**
- **Distribution Grid Management**
- **Wide Area Monitoring Protection & Control**
- **Micro Grid**

Smart Grid Domains



NIST Smart Grid Framework 1.0 January 2010

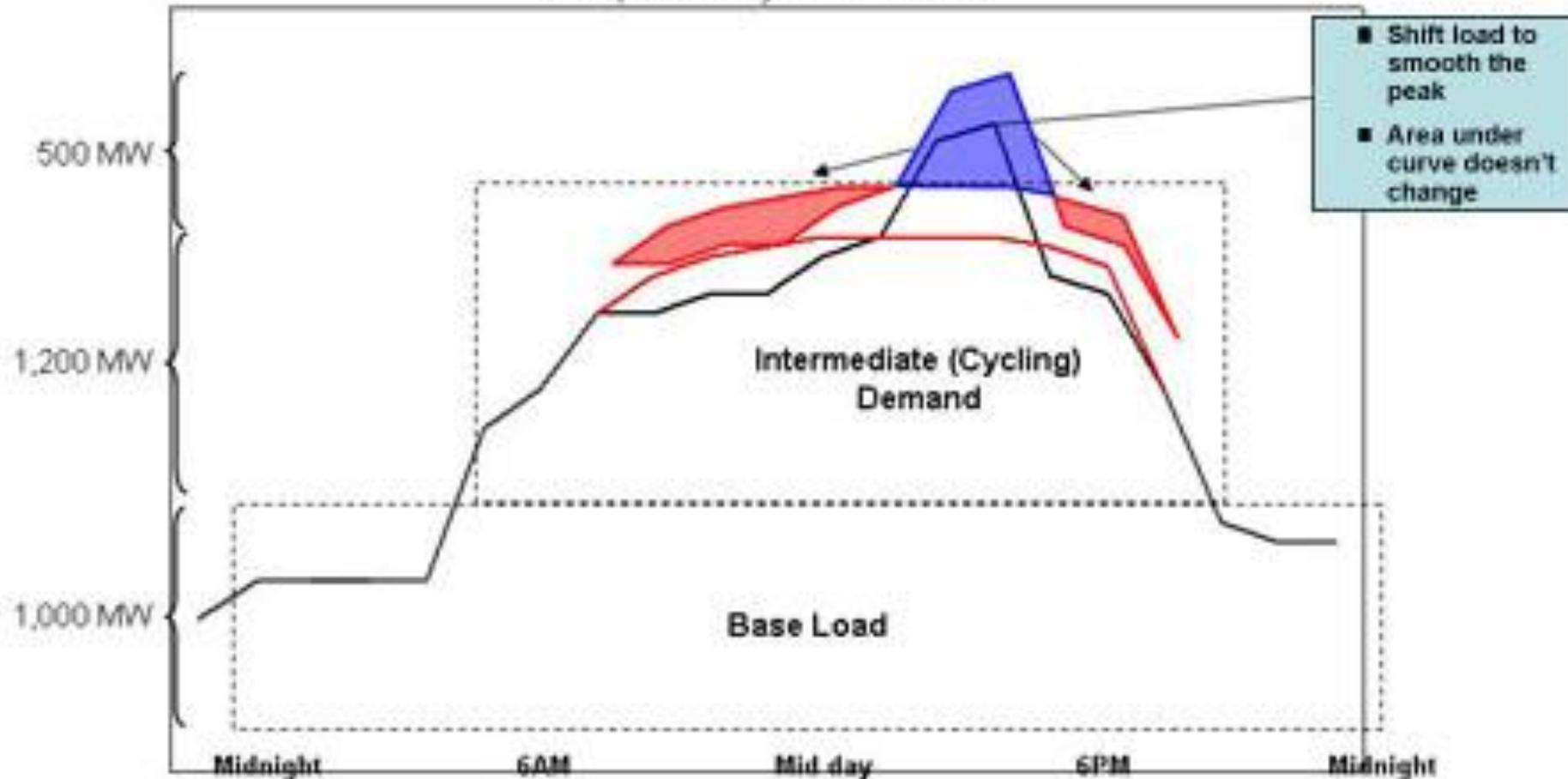
AMI/HAN



- Standards
- Data Privacy & Cybersecurity
- Technologies (Communications, Energy Applications)

Demand Response

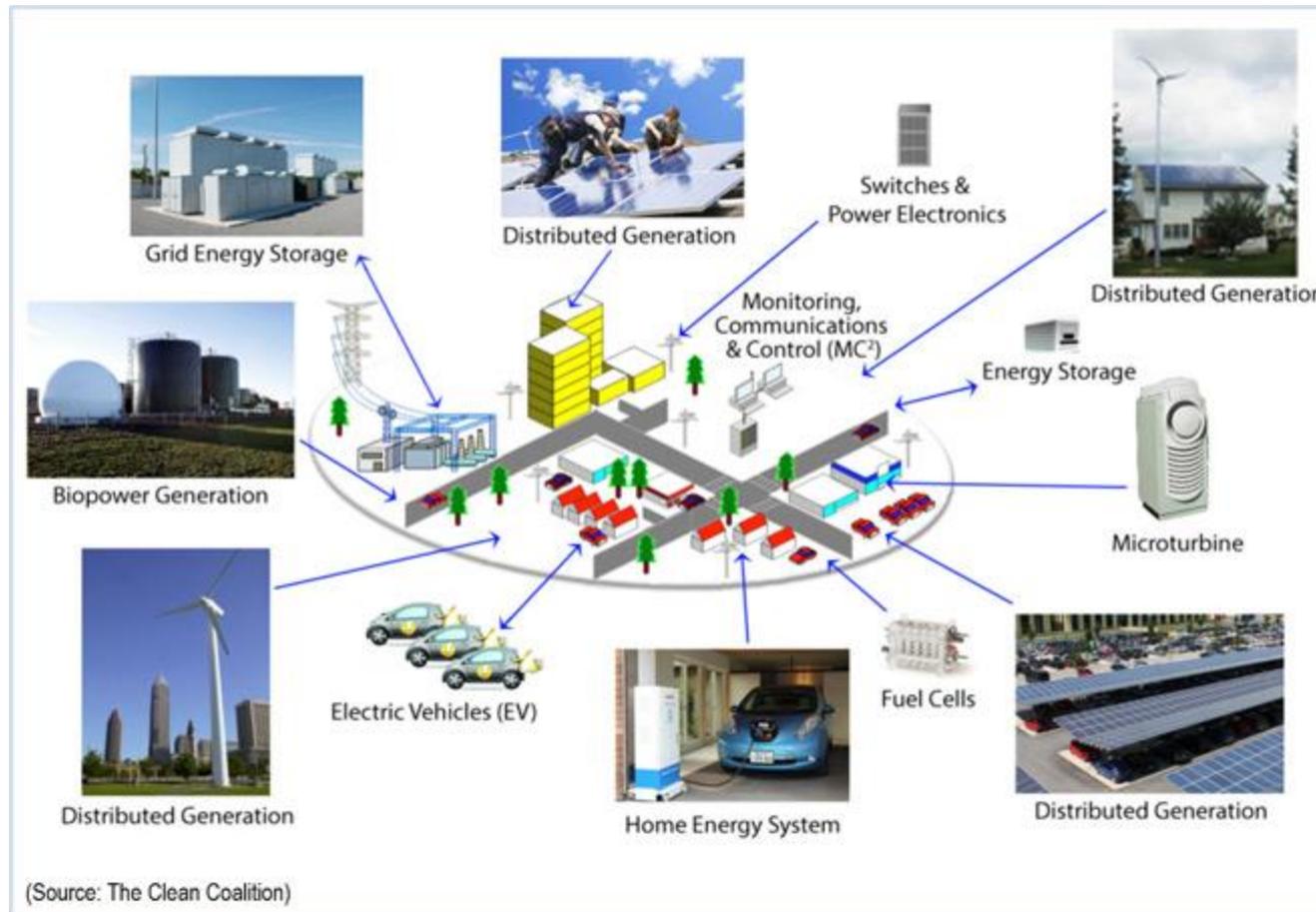
Simplified Daily Demand Curve



- Tiered Rates
- Time of Use Rates

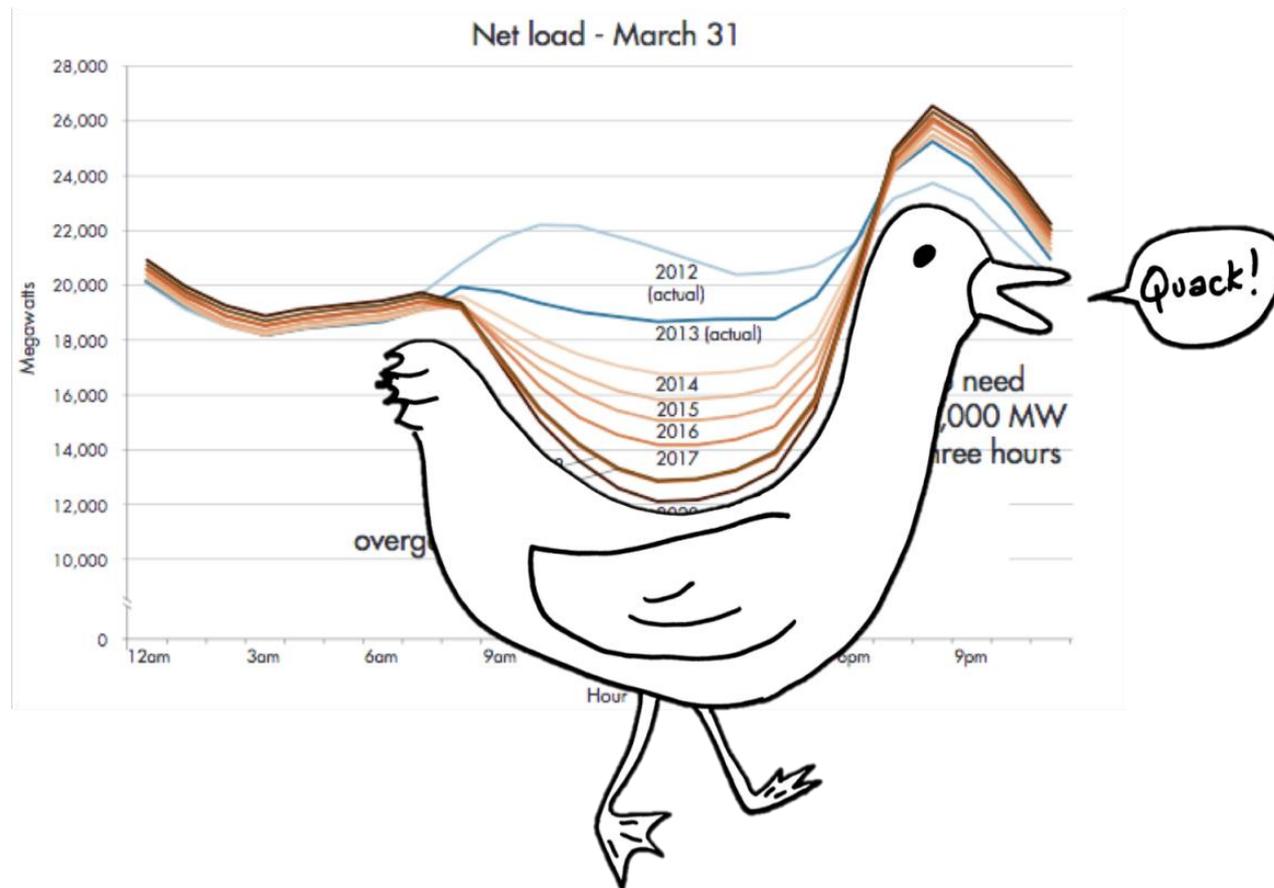
- Dynamic Pricing
- Transactive Energy

Distributed Energy Resources



- Resiliency versus reliability
- Lower carbon versus variable cost (natural gas price volatility)

Renewable Energy & Duck Curve



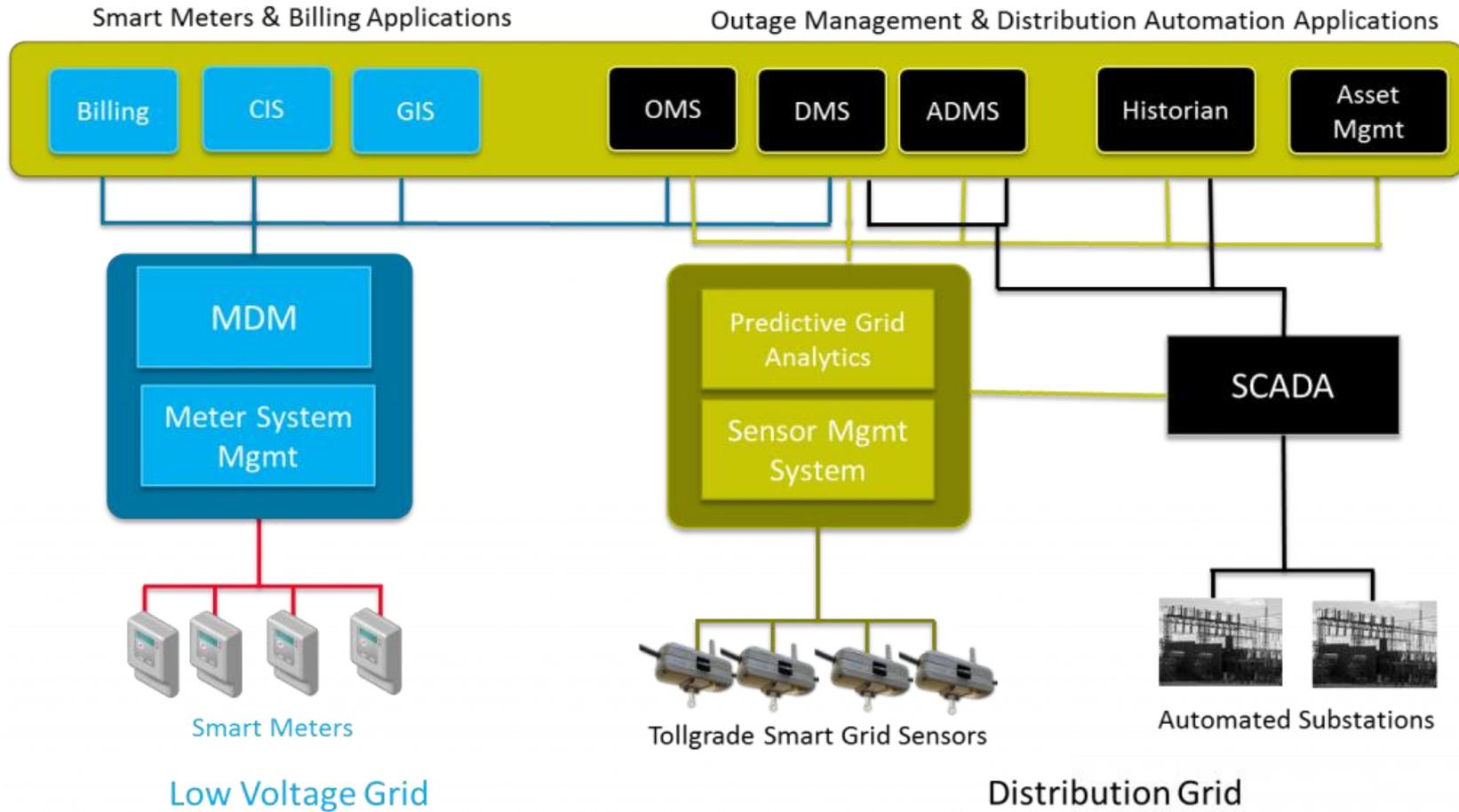
- Role of Electric Storage to flatten duck curve
- Role of DR to flatten duck curve
- What happens to central generation with low RE pricing?

Electric Vehicles



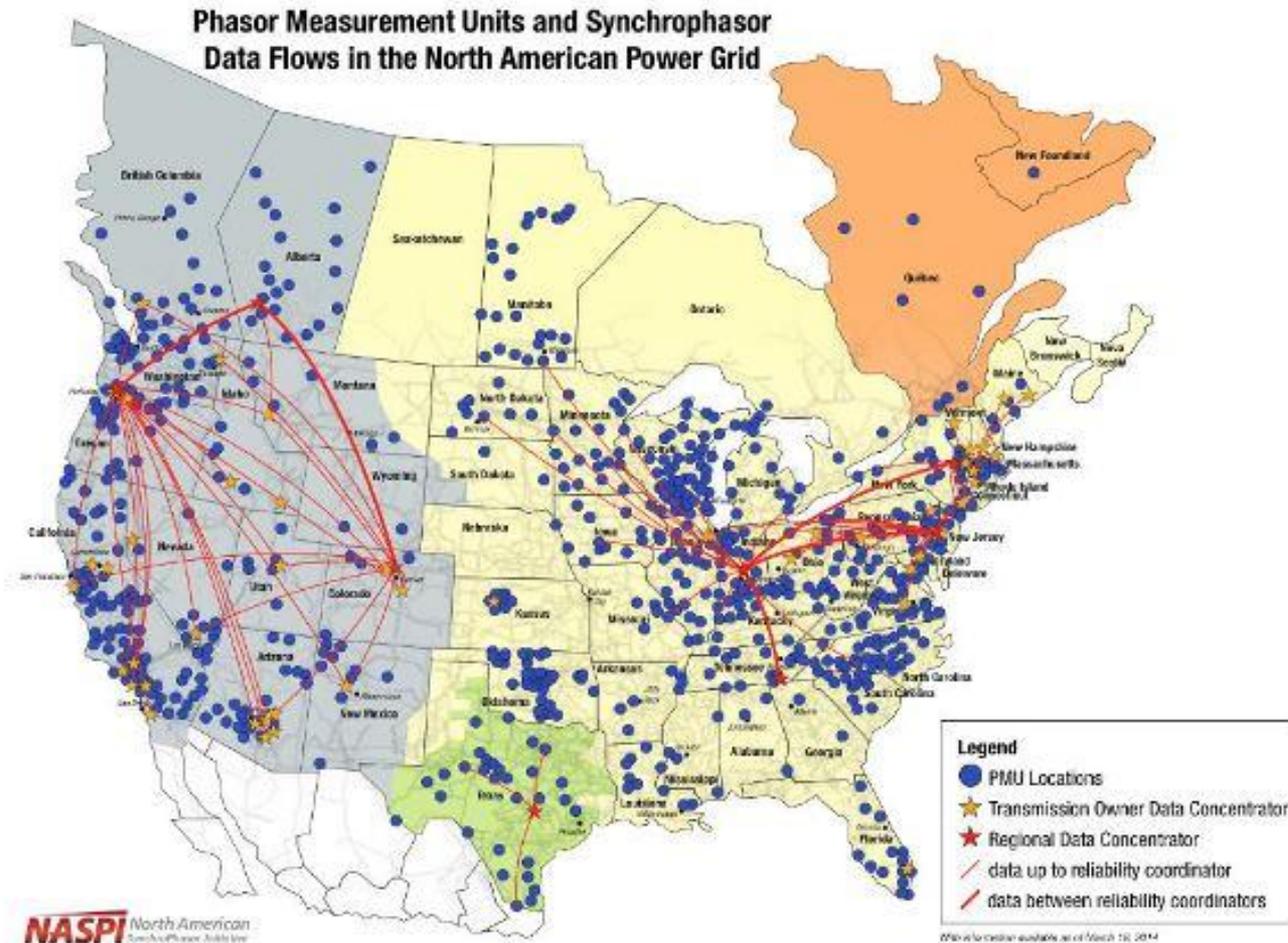
- Standards for communications with EV (SEP, SAE, CIM)
- Impact of EV charging on distribution infrastructure
- Cybersecurity issues with charging infrastructure and onboard computers

Distribution Grid Management



- Auto-sectionalizing and restoration
- Volt-Var optimization / CVR
- Frequency regulation
- PV smoothing

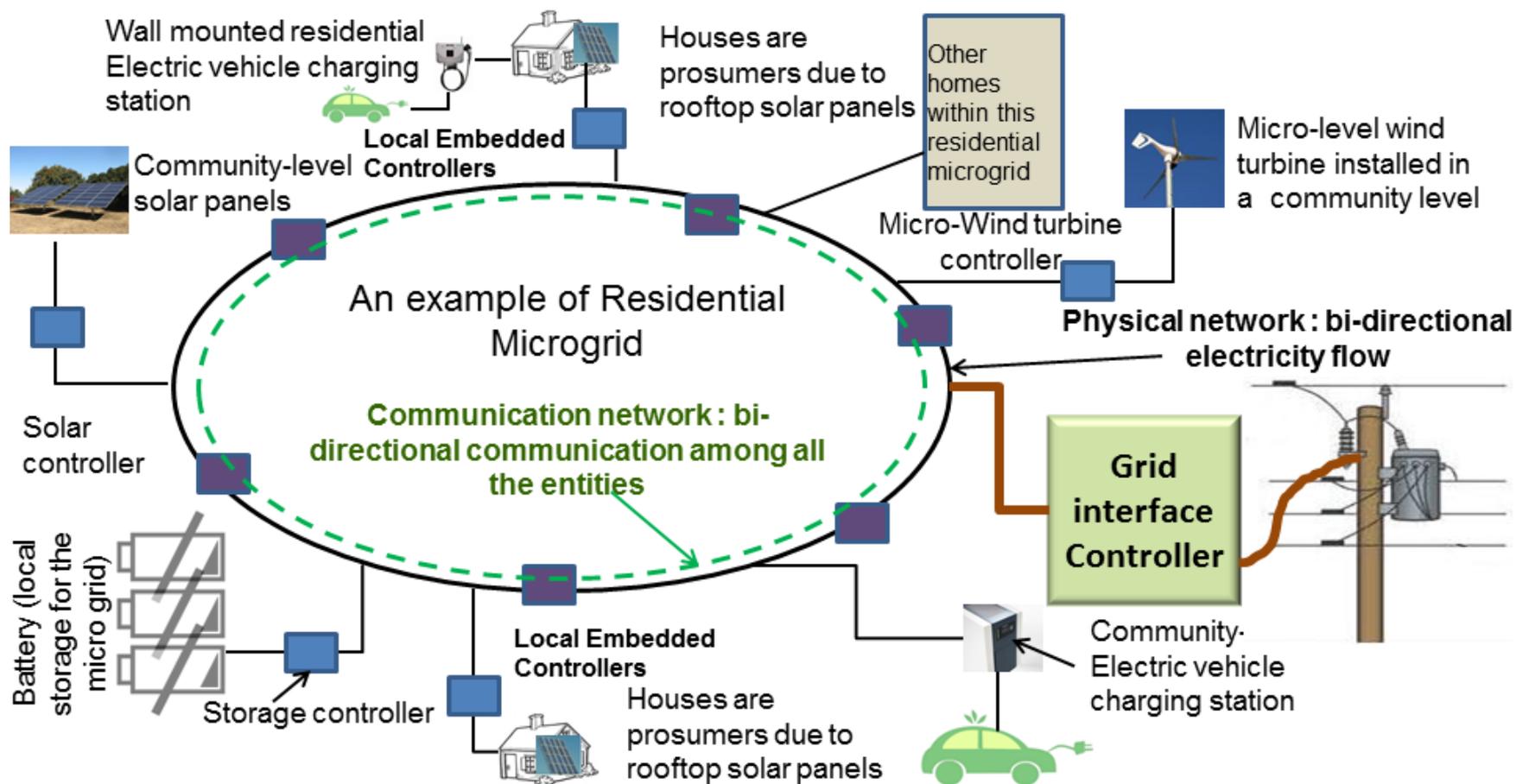
Wide Area Monitoring Protection & Control



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- PMU sample rate
- Wide Area Network Bandwidth Utilization
- Data Integrity
- Cyber intrusion

Micro Grids



- High penetration PV
- Trade off between DR and Storage

- Standards for Micro Grid Protocol
- Cybersecurity of Micro Grids

Next Steps & Final Remarks

- **Outlook for Smart Grid standards**
 - SGIP
 - IEC
 - IEEE
 - DNP User Group
 - NASPI
 - SAE
 - ASHRAE
- **Smart Grid R&D gaps**
 - What still needs to be done?
 - Who will do it?
 - How we can collaborate effectively in post ARRA period?

Contact Info



Thank You!

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