Membership Update

JUNE 2025
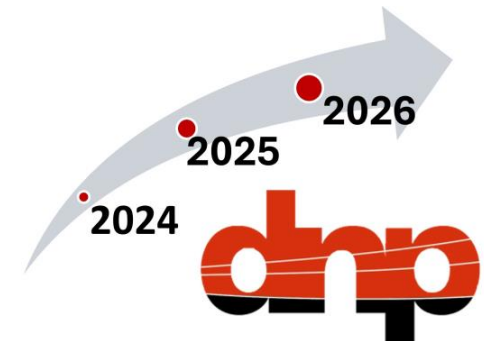
RONALD FARQUHARSON, DNP USERS GROUP (PRESIDENT, COO)

Topics*

* - Click on the underlined topic to jump to the slides
DNP Users Group = DNP-UG

Disclaimers

- The following presentation (material) is the opinion of the presenter (DNP-UG) and/or their affiliations and does not necessarily reflect that of IEEE, IEEE SA, IEC or the applicable IEEE committees and working groups.

- The standard(s) and specifications referenced are quite large. This presentation is not intended to be comprehensive. As always, the standard(s) and specifications themselves should be considered authoritative.

Executive Summary – Why DNP-UG?

- **Cost / Risk Reduction and Feature Enhancement:**
  - DNP-UG leadership has resulted in _maximum interoperability and product quality, while lowering development costs and deployment risks._
  - DNP-UG continues to develop innovative _enhancements such as cybersecurity._

- **DNP-UG Services:**
  - Member training and industry workshops - _a great way to keep staff updated._
  - SME technical support, troubleshooting guidance, custom training – _assistance when you need it._
  - Standards, test procedures, bulletins, guides, application notes – _essential tools for our members._
  - Conformance Certification services – _improves product quality and interoperability._

- **DNP-UG Active Developments:**
  - New standard IEEE 1815.2^{TM} – _comprehensive profile for DER communications._
  - New update to IEEE 1815^{TM} (DNP3) – _important revisions and enhancements._
  - Next generation OT cybersecurity with SAv6 and AMP – _by leading cyber security experts._
    - Secure Authentication Version 6 and Authorization Management Protocol.
    - Important and unique features for utility OT cybersecurity.
    - US Department of Energy and EPRI – development and commercialization funding (no funds to the DNP-UG).

- **DNP-UG Leverages Expert SME Volunteers:**
  - Experienced and knowledgeable _SMEs volunteered over 4,100 hours in 2024._
  - Four technical committees and our Board of Directors.
  - Close alignment and license/sharing agreement with the IEEE.

- **Industry Impact:**
  - A growing number of vendors as well as utilities are engaged as members and active participants.
  - DNP-UG provides speakers and expert trainers at key industry events such as DTECH and PACWorld.
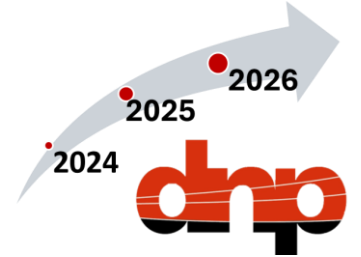
Your membership matters and pays for itself.*

*****most member categories**

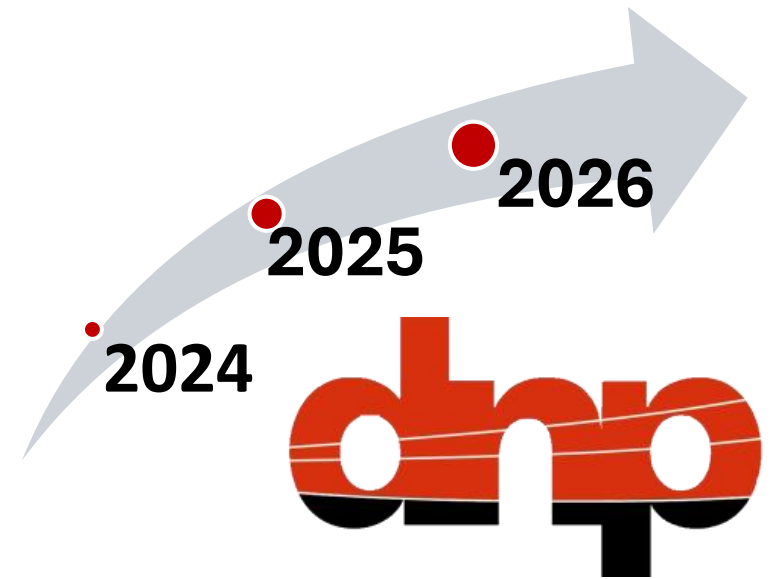**Vendor/Consultant support is essential.**

Industry Trends

- **Clear need for training - standard and custom**
- **Growing gap in SME technical support**
- **Pressing need for defense in depth – OT Cybersecurity**
  - The DNP-UG's next generation cybersecurity specifications are uniquely applicable to the critical OT communication link(s) usually using DNP3
- **Highly interoperable and secure DER communications is a growing imperative**
- **Interoperability is an ongoing challenge for the industry**
- **From devices/system to holistic solutions**
  - Highest value is derived from holistic approaches and applications.
  - Holistic solutions from multiple vendors must be standards-based integrate/interoperate well.
  - Best in class interoperability requires comprehensive standards, active users' groups and test & certification programs.
  - Minimize the number of protocols used.

> **DNP-UG is addressing key industry needs and trends**
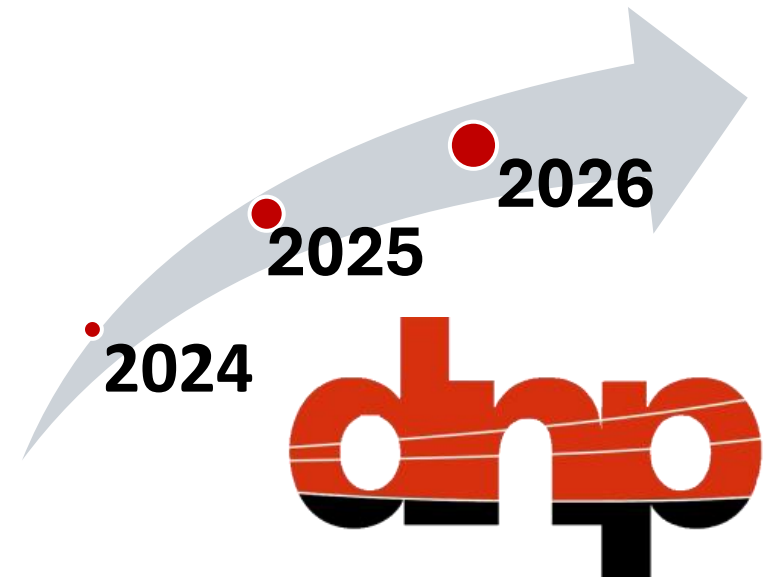
Top 2025-2026 Activities

Top 2025 - 2026 Activities, Developments and Publications in Process

- Industry workshops – twice yearly (recorded and posted).

- Member training courses – twice yearly (recorded and posted).

- SME Technical Support

- New standard – IEEE 1815.2TM – Profile for DER Communications:
  ◦ IEEE publication is pending.

- Significant update to IEEE P1815 (DNP3) ~ 2026:
  ◦ IEEE PSCCC - Working Group P2 is manages the 1815 standard including the ballot process.

- Secure Authentication Version 6 (SAv6):
  ◦ Draft specification is complete and will be released with IEEE P1815~2026.

- Authorization Management Protocol (AMP) – Device and Authority.
  ◦ AMP Authority specification is nearing completion. AMP Device specification is under development.

- New test procedures pending for SAv6 and AMP.

- Technical Bulletins and Application Note – periodic releases.

DNP-UG = High value to our members and the industry.
In 2024, our SME volunteers worked over 4,100 hours.

2026
2025
2024
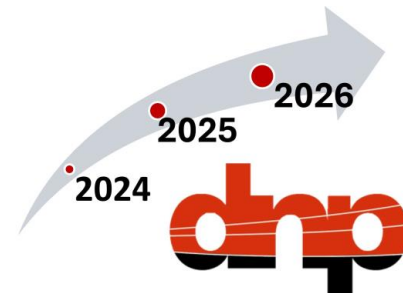
Overview and Mission

2024

2025

2026

Overview of the UG

- The UG actively manages DNP3:
  - **New** standard IEEE 1815.2^{TM} (DER communications) due 2025
  - **Next** edition of IEEE 1815^{TM} (includes SAv6) due 2025
  - **New** Authorization Management Protocol (AMP) development continues
  - Promotion and standards involvements
  - Technical Committee develops enhancements and corrections in the form Technical Bulletins
  - Technical Bulletins and other updates are merged into revisions of IEEE 1815^{TM}
  - Application Notes published to address specific applications
  - Guides provide additional information and help
- Four technical teams:
  - Technical Committee
  - Cybersecurity Task Force
  - Test Management Committee
  - Test Procedure Committee
- Board of Directors
- Funding sources:
  - Membership fees (primary)
  - Partnership Program

Image by storyset on Freepik
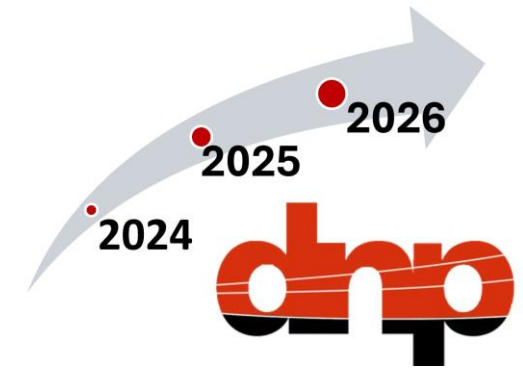
DNP-UG Mission Statement

- We actively develop and support measures to improve interoperability and cybersecurity in DNP systems by developing technologies and standards, implementing a conformance program, and providing education to the industry.

- **Our over-arching goals:**
  - **Reduce utility project cost and risk.**
  - **Reduce vendor development cost and risk**
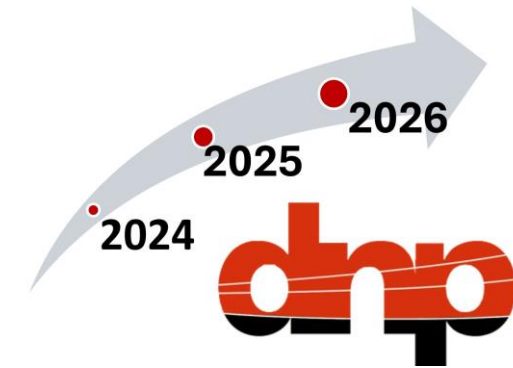
Mission of the DNP-UG

To Actively Develop and Support Improved:

1. Interoperability
- New update to P1815 (DNP3)
- Test procedures
- Conformance certification
- Device profile (XML and Word formats)
- Application specific profile (DER)
- Technical bulletins and standard updates
- Application notes
- Guides

2. Cybersecurity
- Secure Authentication Version 5 (SAv5)
- Secure Authentication Version 6 (SAv6)
- Authorization Management Protocol (AMP)
- Technical bulletins and standard updates
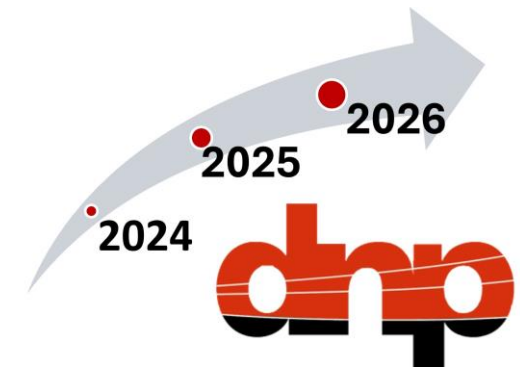- Application notes
- Guides

3. Education
- New workshops and training courses
- User forum (website)
- SME technical support and assistance (per membership level)
- Technical bulletins
- Application notes
- Guides

Key Focus Area - DER Communications
- IEEE 1815.2 – DNP3 Profile for DER Communications
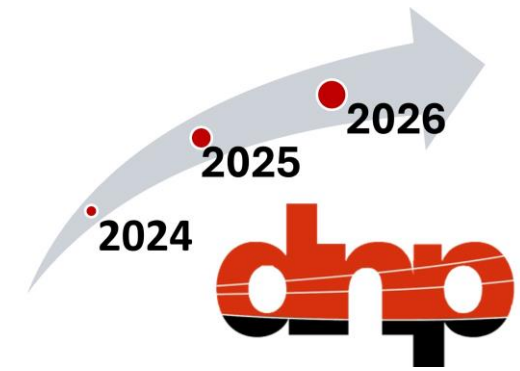- Conformance certification
- MOU with MESA

A Fresh Vision – VISION 2024

- A call to our UG leadership and teams to raise the bar on our efforts in these ways:
  - **Faster Developments (e.g., cybersecurity)**
  - **New Education Initiatives**
  - **Key Focus Area – DER Communication**
  - **Better Support, Closer Contact, Improved Website**
- A call to our members and the industry to raise the bar by expanded participation and support of the DNP-UG.

The Need for VISION 2024

- Cybersecurity and other developments must be provided faster.

- Improve support for DER communications by developing (jointly) a new standard and expanding our Conformance Certification Program.

- The UG needs to do a better job of staying in touch with and communicating with our members and the industry.

- Members are asking for better access to our experts through training (tutorials), workshops and technical support.

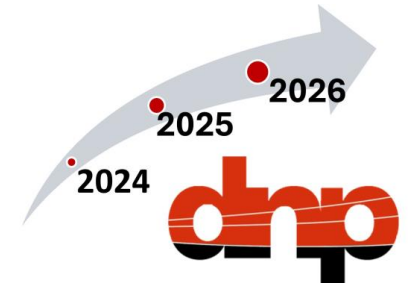- Our website needs to provide our members and the industry with more information, faster and easier.

2024

2025

2026
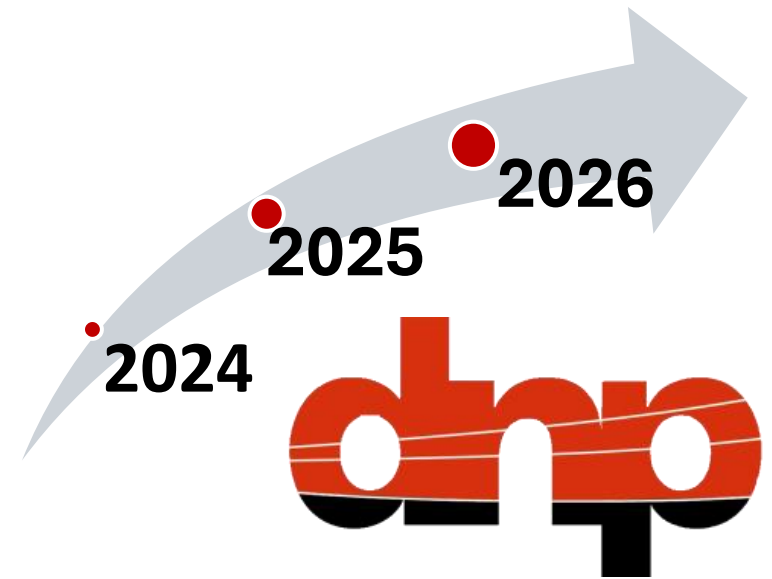
Interoperability
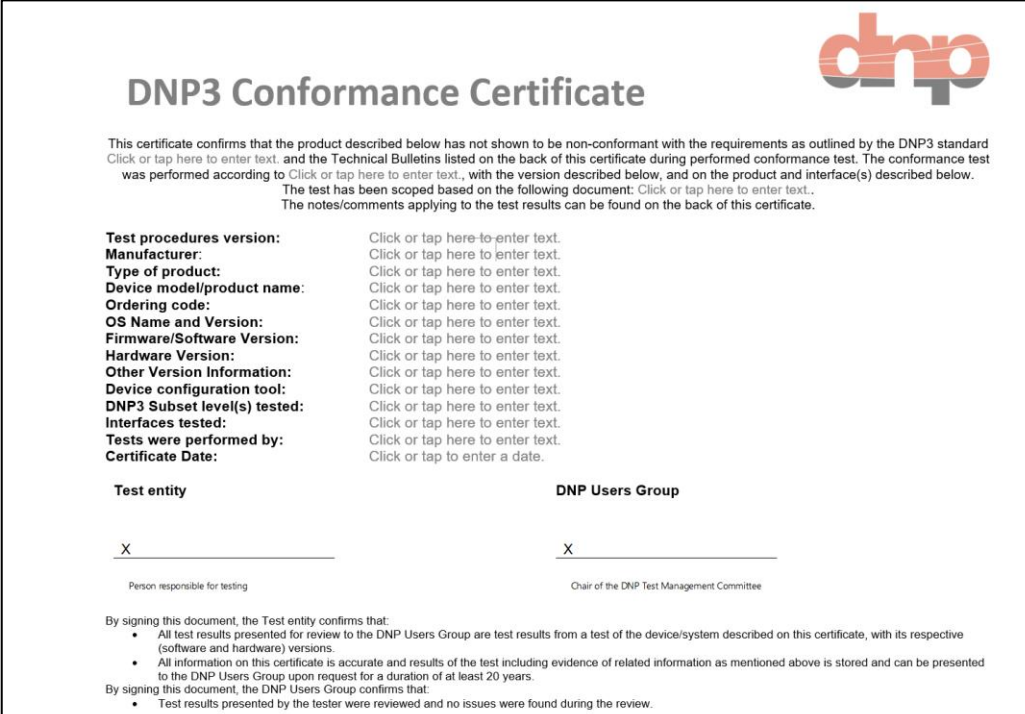
Interoperability Related Activities

- New update to P1815 (DNP3)
- Test procedures – updates and new
- Conformance Certification Program
- Device profile (XML and Word formats)

- Application specific profiles e.g. P1815.2 for DER Communications
- Technical Bulletins and standard updates
- Application Notes and Guides

DNP-UG provides an essential service to vendors by supporting maximum interoperability and product quality, while lowering development costs and deployment risks. This is accomplished by providing vendors, stack and test tool suppliers with updated standards, technical bulletins, test procedures and other materials. Vendors are also encouraged to participate with our technical teams. DNP-UG also operates our Conformance Certification Program.

Conformance Certification Program (CCP)

Test Review (CTR) Process

- Improved assurance of interoperability including SAv5

- Reduced program risk

- Recommended for all new or updated products

- Expert review of Device Profile and Test Logs

Most vendor membership categories include a discount (up to 100%) for our CCP service on top of their SME Technical Support hours.

DNP-UG Protocol Conformance Issue Tracking Summary

No.	Device Type	Issue Found	Impact
1	Outstation	No class support	Master is not able to read data from outstation
2	Outstation	Partial Event Class Polling	Outstation fails when polled by master
3	Outstation	Data Link Reset is incorrectly required	Outstation will not communicate with some masters
4	Outstation	Broadcast not supported	Outstation will not participate in a system-wide freeze commands and might not permit correct time setting via DNP3
5	Outstation	No support for UDP	Some expected functions will not work
6	Outstation	SBO command process not implemented correctly	A command may be operated in response to receiving an invalid or corrupted message
7	Outstation	Incorrect unsolicited configuration	Depending on network topology, configuration of timeouts, etc., all communications between the master and outstations stopped
8	Outstation	When replying to an integrity poll, static data is sent before event data	Operators could be shown incorrect data on their displays, which could lead to wrong actions.
9	Controlling Station	Unable to issue valid integrity poll	Operators could be shown incorrect data on their displays, which could lead to wrong actions.
10	Controlling Station	Reads frozen counter, never issues counter freeze	Unable to read frozen counter data from some devices

Cybersecurity

2024

2025

2026
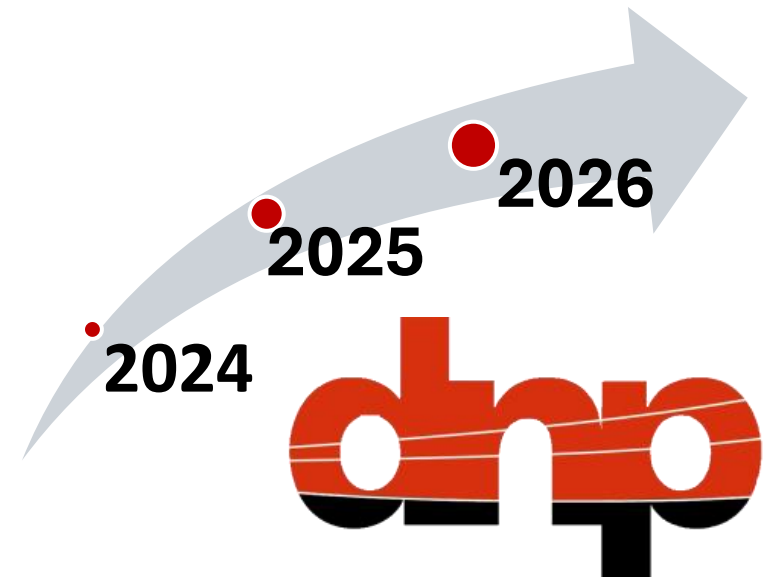
Cybersecurity Related Activities
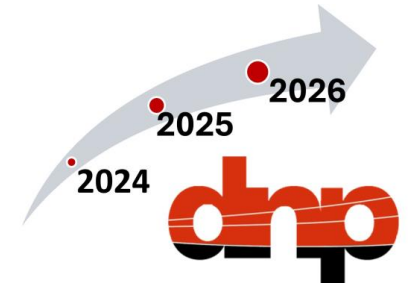
- Secure Authentication Version 5 (SAv5) – included in IEEE 1815-2012
- Secure Authentication Version 6 (SAv6) – included in IEEE P1815 update pending
- Authorization Management Protocol (AMP)
- Technical bulletins and standard updates
- Application notes and Guides
- Workshops and training courses
- US Department of Energy and EPRI development funding will accelerate our work. Includes commercialization scope (no funds to the DNP-UG).

DNP-UG continues to develop innovative new cybersecurity solutions and update our standard(s) to improve cybersecurity. SAv6 and AMP include important and unique features for utility OT cybersecurity.

Benefits and Features
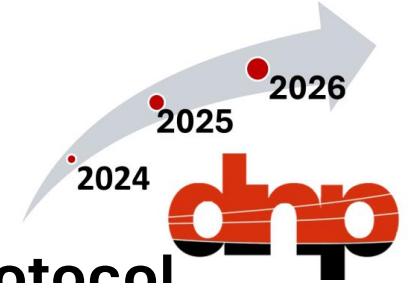
Secure Authentication v6 (SAv6)

- Authentication, integrity and RBAC between devices at *application layer*
- Uses Hashed Message Authentication Code (HMAC)
- Now also supports *encryption*
- Defined as *separate layer* that can be used for other protocols
- *Elliptic curve* algorithms to minimize processing power
- Simplified procedures and new algorithms in this version
- Can be used with AMP or other PKI

Authorization Management Protocol (AMP)

- Central authorization for *both IP and hierarchical serial* networks
- Promptly revokes authorization and/or privileges through RBAC
- Allows devices to generate their own keys, *avoiding human interaction*
- Accommodates redundant connections, masters and authorities
- Prevents tunneling of non-DNP3 messages
- Can be used *separately* with other protocols

Integration with the Enterprise

IEC 62351-8
Certificates
(PKI)

**Certificate
Authority**

Authority

**Other Enterprise Credential
Management Systems**

RADIUS, Kerberos,
AD or others

AMP

DNP3-SA

**DNP3
Controlling
Stations**

DNP3-SA

Outstations

2024 2025 2026
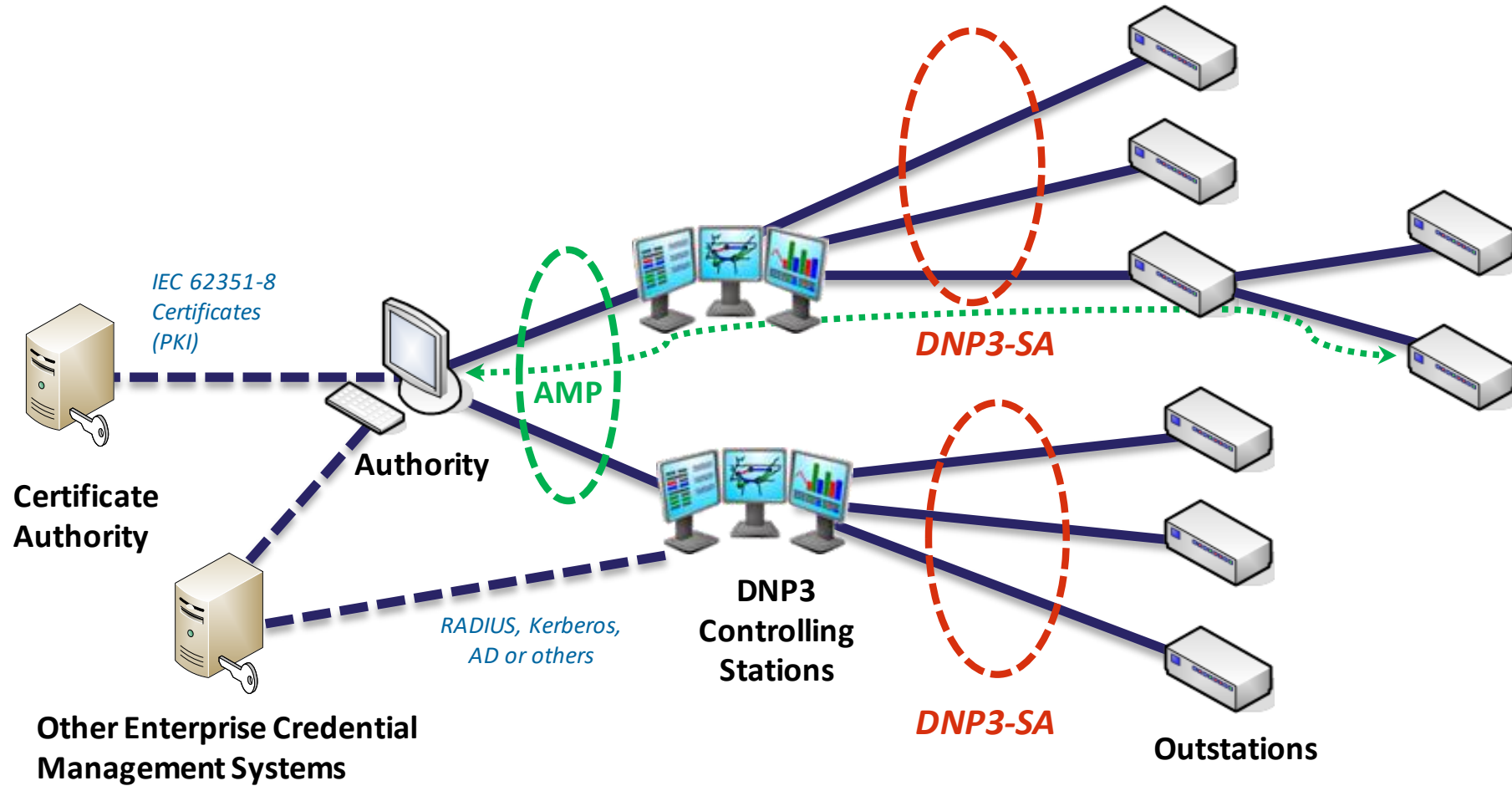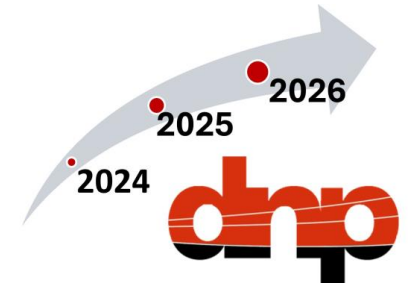
Why Not Use TLS or IPSec?

- They only reach to the borders of the IP network

- Do not reach serial devices

- Not well-suited for low-bandwidth or low-processing-power

DOE Announcement – FOA 2500

CESER News & Updates

U.S. DEPARTMENT OF ENERGY | Office of Cybersecurity, Energy Security, and Emergency Response

The Latest From CESER

DOE Announces $45 Million to Protect Americans From Cyber Threats and Improve Cybersecurity in America's Energy Sector

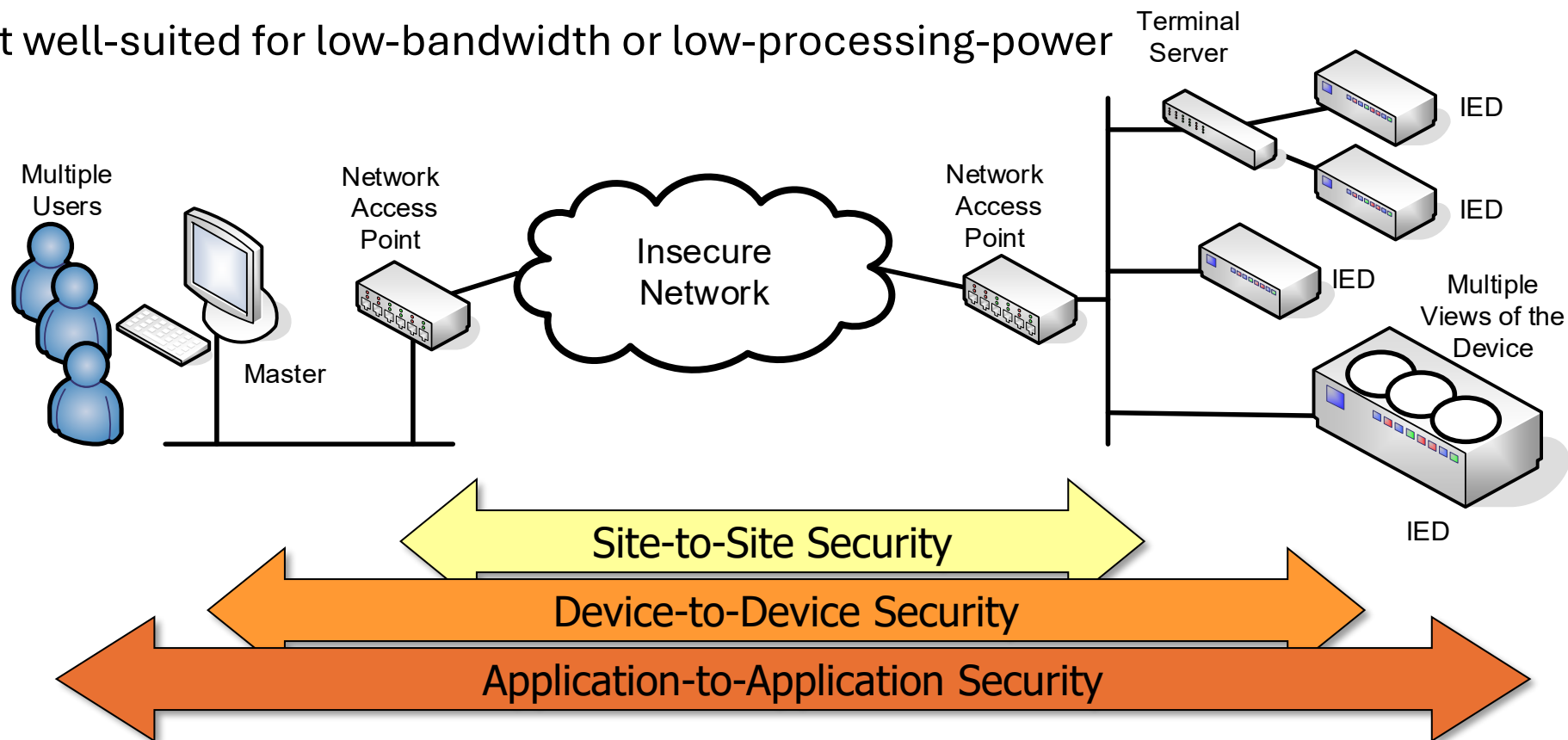On February 26, DOE awarded $45 million to 16 projects to protect the nation's energy infrastructure from future cyber-attacks. The selected projects will help develop new cutting-edge cybersecurity tools and technologies to reduce cyber risks and ensure America's energy systems remain durable and resilient to evolving cyber threats.

Topic Area 3 – Authentication Mechanisms for Energy Delivery Systems

- **EPRI (Palo Alto, CA)** will develop and/or accelerate two communications standards to perform centralized management of authentication and authorization services in a zero-trust architecture.
- **Texas A&M University-Kingsville (Kingsville, TX)** will research, develop, and demonstrate a zero-trust authentication mechanism with post-quantum cryptography to reduce the cyber-physical security risks to DER devices and networks.
- **Kansas State University (Manhattan, KS)** will address the security vulnerabilities of existing standards by integrating authentication, secret key establishment, and encryption-based secure communication mechanisms with existing standards for reliable authentication and communication between smart grid nodes, inverters' gateways, and other grid-edge devices.

Important note: NO funding flows to the DNP Users Group

Education and SME Support

Education Related Activities

- Industry workshops on compelling current topics

- Training courses address member needs for staff updating, on-boarding and deeper treatment of workshop topics (members)

- User discussion forum (website) (members)

- Custom courses and technical support and assistance (members)

- Technical bulletins, Application notes and Guides (members)

- Conference papers, presentations and training courses

DNP-UG provides a valuable service to the industry by providing DNP-UG training, workshops and our User Forum. Custom SME support can also assist vendors help utilities stay current with new features, changes and trends.

Training and Workshops (Current and Planned)

- **Member Training (on-line)**
  - IEEE 1815 Update
  - OT Cybersecurity – theory and practice
  - IEEE 1815.2 Overview
  - SAv5, SAv6, AMP Updates
  - 1815.1 – Mapping to IEC 61850
  - Development Updates
  - Fundamentals of DNP3
  - Advanced topics for DNP3
  - Using the DNP3 Device Profile
  - SCADA fundamentals
  - SCADA advanced topics
  - Troubleshooting
  - Lessons Learned

- **Industry Workshops (on-line)**
  - DER Communications – Comparing Protocol Options
  - OT Cybersecurity – Industry Trends
  - Test and Certification for DER Communications
  - Industry trends
  - Cybersecurity for DER Communications
  - Migrating from DNP3 to IEC 61850
  - DER communications Overview
  - OT Cybersecurity overview
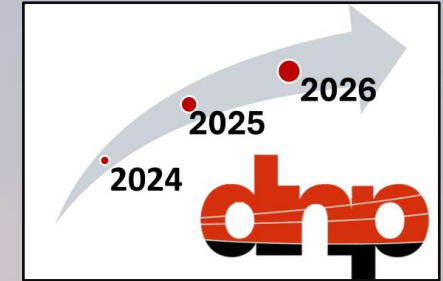
Trends in Technologies for OT Cybersecurity
Identifying and Addressing Gaps with Conventional/Common Cybersecurity Methods

Thursday, October 31, 2024, 3:00 - 4:30 PM ET
No Charge Workshop

[Recording]
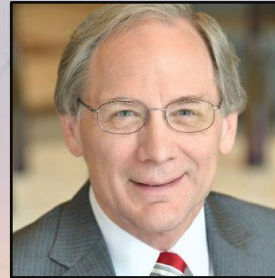
Panel Chair:
John D. McDonald, P.E.,
Founder & CEO of JDM Associates, LLC

Matthew Rogers, PhD,
Cybersecurity Expert,
DHS, CISA

Virginia Wright,
CIE Program Manager,
Idaho National Laboratory,

Ben Sooter,
Program Manager,
Cyber Security,
EPRI

Frances Cleveland,
Principal Consultant,
Xanthus Consulting Int'l

Grant Gilchrist, P.Eng,
Systems Engineer, Tesco
Founding Member, TC, CSTF

[Notes]   [Details]

27
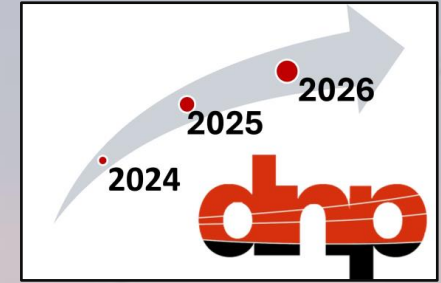
Operational Technology (OT) Cybersecurity, Key Insights

Walking Through Best Practice Requirements for Utility OT Cybersecurity

Tuesday, January 28, 2025, 3:00 - 4:30 PM ET
Member-Only Training
Session will be recorded and posted for later viewing

Session Chair:
John D. McDonald, P.E.,
Founder & CEO of JDM Associates, LLC

Instructor:
Grant Gilchrist, P.Eng,
Systems Engineer, Tesco
Founding Member, DNP-UG TC, CSTF

Recording

Available to Our Members - Contact membership@dnp.org and on Our Website Soon

Details

Notes

Available to Our Members - Contact membership@dnp.org and on Our Website Soon

Operational Technology (OT) Cybersecurity, Key Insights – Part II (Continuation of Part I on January 28, 2025)

Walking Through Best Practice Requirements for Utility OT Cybersecurity

Tuesday, June 17, 2025, 3:00 - 4:30 PM ET
Member-Only Training
Session will be recorded and posted for later viewing

Session Chair:
John D. McDonald, P.E.,
Founder & CEO of JDM Associates, LLC

Instructor:
Grant Gilchrist, P.Eng,
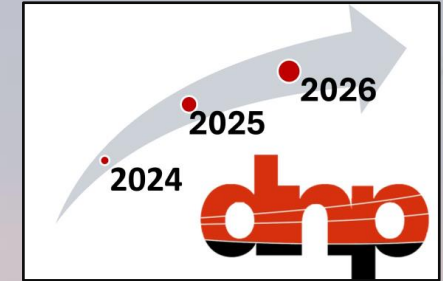Systems Engineer, Tesco
Founding Member, DNP-UG TC, CSTF

Recording

Will be Available Shortly for our Members
- Contact membership@dnp.org

Notes

Will be Available Shortly, for our Members
- Contact membership@dnp.org

Details

29

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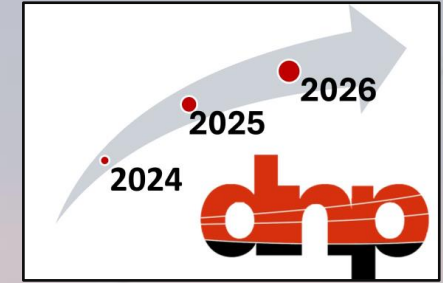
IEEE P1815.2™ (DNP3) vs IEEE Std 2030.5™ vs SunSpec Modbus – Friends or Foes?"

Distributed Energy Resource (DER) Communications for the Energy Transition

Tuesday, June 24, 2025, 3:00 - 4:30 PM ET
No Charge Workshop
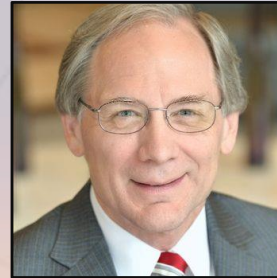
Recording

Panel Chair:
John D. McDonald, P.E.,
Founder & CEO of JDM Associates, LLC

**Ben Ealey,
Principal Team Lead,
EPRI**

**Frances Cleveland,
Principal Consultant,
Xanthus Consulting Int'l**

**Robby Simpson, Ph.D. ,
Principal and Co-Founder,
Enetrics**

**Bob Fox,
Principal and Co-Founder,
Enetrics**

Slides

Details

DNP Users Group Workshop Series – WS-3
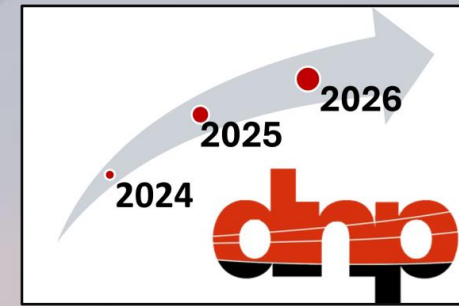
DER Cybersecurity Implications: IEEE P1815.2^{TM} (DNP3) vs IEEE Std 2030.5^{TM} vs SunSpec Modbus – Friends or Foes?

DER Communications Cybersecurity for the Energy Transition
Tuesday, November 18, 2025, 3:30 - 5:00 PM ET
Plus: Optional 30 minutes for open Q&A
No Charge Workshop

Register
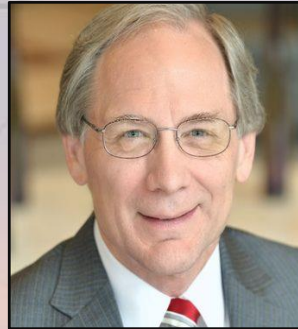
Panel Chair:
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EPRI

Grant Gilchrist, P.Eng,
Systems Engineer, Tesco
Founding Member, DNP-UG TC, CSTF

Robby Simpson, Ph.D. ,
Principal and Co-Founder,
Enetrics

Tylor Slay,
Electrical Engineer,
PNNL

Details
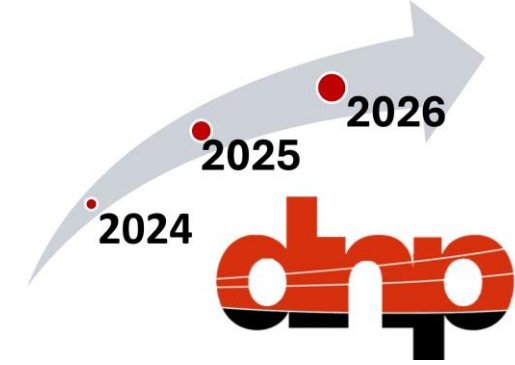
Member Support (on-line)

- **SME Technical Support (on-line)**
  - Dedicated access to our expert team of subject matter experts (SMEs).
  - Our SMEs typically have more than 20 years of applicable experience and are active members of one or more of our technical committees.
  - Technical guidance and assistance with troubleshooting.
  - Custom training courses.
  - Member forum (on-line).
  - Hours are included depending on the membership category.
  - Additional hours can be purchased at a discount.

SME Support Is included / discounted for most active members

Key Focus Area - DER Communications

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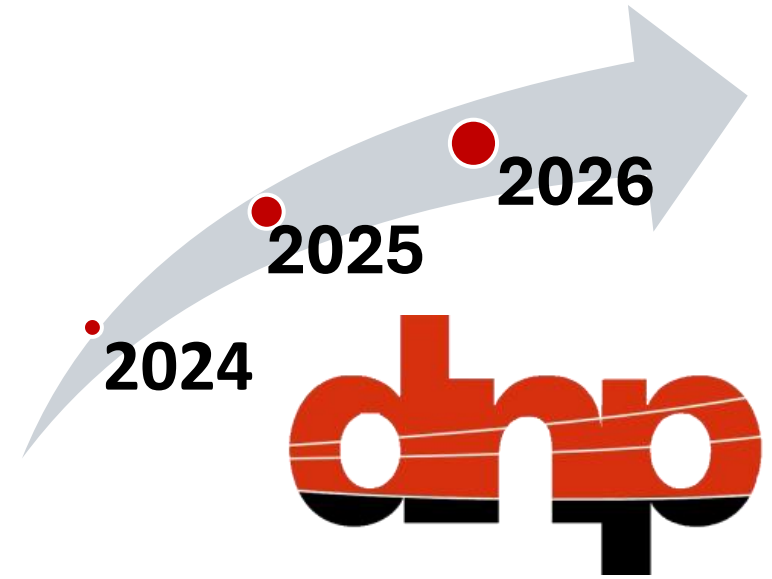
Key Focus Area - DER Communications
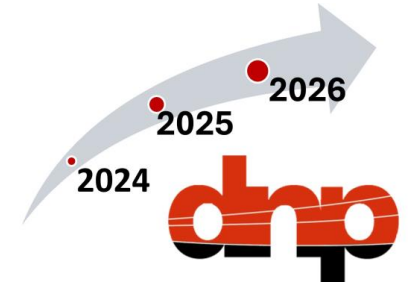
- IEEE 1815.2 – DNP3 Profile for DER Communications
  - Jointly developed with MESA and the IEEE.
  - Publication is anticipated in late 2025 or early 2026.
- Conformance certification
- MOU with MESA
- Workshop(s)

> *DNP-UG continues to respond to industry trends. DNP-UG partnered with MESA Standards Alliance and IEEE to develop IEEE P1815.2. This standard builds upon previous DNP-UG application notes to provide feature-rich interoperability between DER devices and systems. Importantly, DER cybersecurity is addressed by SAv6 and AMP.*

What is IEEE 1815.2?

- IEEE 1815.2 establishes a **Standard Profile for Communications with Distributed Energy Resources (DERs) using IEEE Std 1815™ [Distributed Network Protocol (DNP3)]**

- **DNP-UG App Note AN2018-001 was used as the source of IEEE 1815.2**

- The purpose of defining this standardized profile is **interoperability** to make it easier for a utility (or other entity) to communicate with a variety of DNP3 outstations supplied by many different DER manufacturers and to make it easier for manufacturers to build systems that can interoperate with various utility systems.
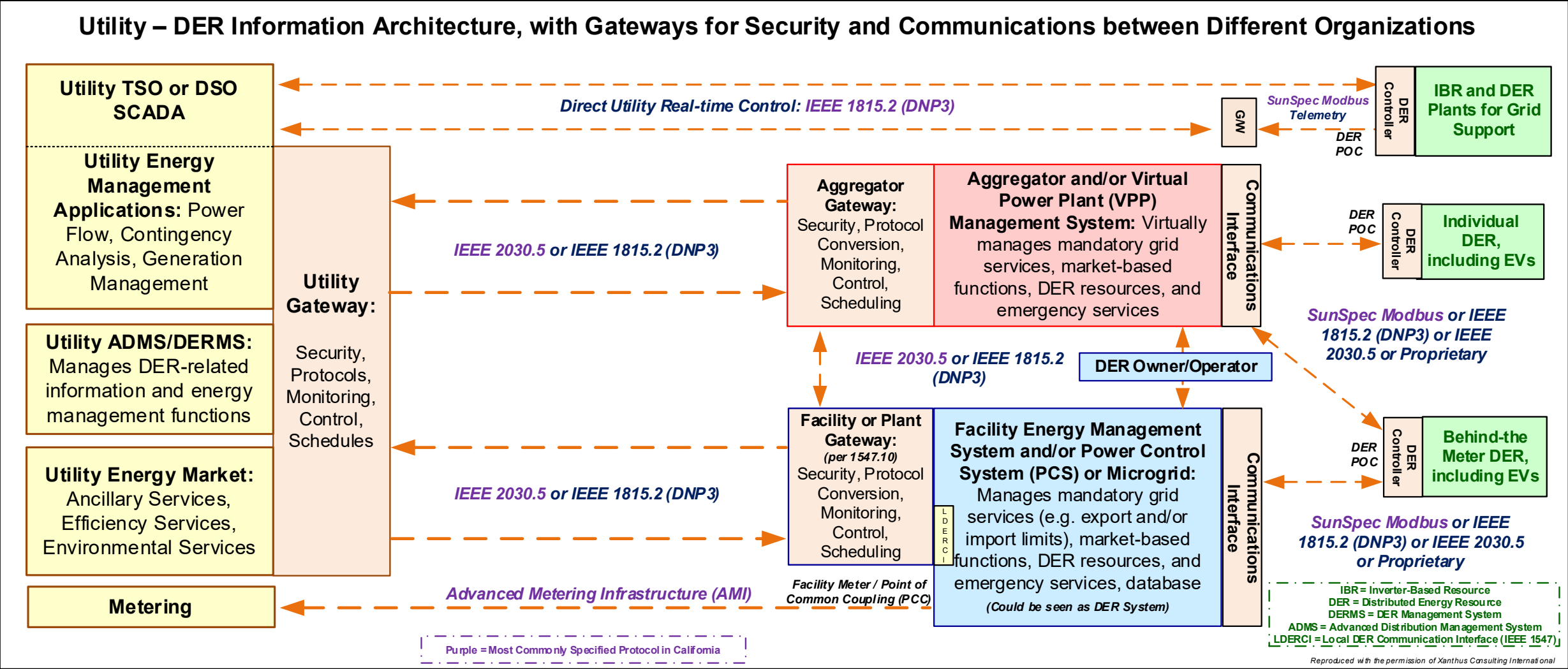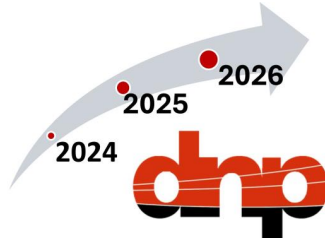
- **It specifies the data objects needed for many DER functions and IBR functions**, including those in IEEE 1547-2018 and IEEE 2800, as well as additional functions needed for storage systems. These are based on selected data objects from IEC 61850-7-420 Ed2 2021 data model, mapped to a fixed list of DNP3 data points, thus providing interoperability across utilities and across DER implementations.

- It provides **complete cybersecurity**, using DNP3's SAv5 (eventually SAv6)

- It provides **full scheduling capabilities**, including for export and import limiting.

- **After successfully balloted, final publication by IEEE is expected before the end of 2025**

- **Remains backward compatible with the DNP3 Application Note 2018**, since there have been **several implementations**

- **IEEE 1815.2 will be the reference for the DNP3 requirements in the IEEE 1547.1 amendment currently underway and the revision to IEEE 1547**

Information Exchanges in Utility and DER Architecture, Including the Communication Protocols Identified in IEEE 1547

Utility – DER Information Architecture, with Gateways for Security and Communications between Different Organizations

Top Five Strengths

IEEE P1815.2	IEEE Std 2030.5	SunSpec Modbus
DNP3 is widely used by utilities	Internet Native	Well understood and broadly deployed in DER devices
Semantics provide complete interoperability of DNP3 for DER	Highly Secure	Relatively easy and inexpensive to implement
SCADA performance supports large numbers of DER devices, rapidly, securely, and without loss of data	Supports a Variety of Applications and Functions	Supports both TCP and serial communications (RTU) options
Focus is on larger DER and IBR plants	Utilizes Well-Known Protocols and Technologies	Widely adopted in DER devices
Scheduling of functions, including for Limited Generation Profile (LGP) Firm and Non-Firm Export	Robust Global Ecosystem	Standards are freely available to all

Membership Categories and Benefits

2024
2025
2026

DNP Users Group - Member Service and Fee Table (2024) - Member Values

| Category No.	Membership Category	Fees	User Accounts	Workshops	Workshop Values	CCP/CTR P1 Discount	CCP/CTR P1 Value	CCP/CTR P2 Discount	CCP/CTR P2 Value	Tech Support Hours	Tech Support Value	Total Member Value
Member Fees and Services												
1	Individual (personal non-commercial use only)	$400	1	✓	$1,000	0%		0%		0		$1,000
Utilities												
2	Water Utility	$1,000	5	✓	$5,000	50%	$600	0%	$0	1	$250	$5,850
3	Small Muni/Coop	$1,000	5	✓	$5,000	50%	$600	0%	$0	1	$250	$5,850
4	Large Muni/Coop (> $500 million)	$3,000	10	✓	$5,000	100%	$1,200	20%	$960	2	$500	$7,660
5	Small utility (< $1 billion)	$2,000	5	✓	$5,000	50%	$600	20%	$960	1	$250	$6,810
New - 6	Medium utility ($1 billion to $10 billion)	$6,000	15	✓	$5,000	100%	$1,200	50%	$2,400	5	$1,250	$9,850
7	Large utility ($10 billion to $20 billion)	$9,000	20	✓	$5,000	100%	$1,200	75%	$3,600	10	$2,500	$12,300
New - 8	Very large utility (>$20 billion)	$15,000	25	✓	$5,000	100%	$1,200	100%	$4,800	15	$3,750	$14,750
Vendors and Consulants												
9	Micro vendor (0-$1 million)	$500	1	✓	$1,000	50%	$600	0%	$0	0	$0	$1,600
10	Small vendor (1-$20 million)	$2,000	5	✓	$5,000	50%	$600	20%	$960	2	$500	$7,060
11	Medium vendor ($20 to 100 million)	$6,000	15	✓	$5,000	100%	$1,200	50%	$2,400	5	$1,250	$9,850
12	Large Vendor (> $100 million)	$15,000	25	✓	$5,000	100%	$1,200	100%	$4,800	15	$3,750	$14,750
13	Vendor - revenue not declared	$15,000	25	✓	$5,000	100%	$1,200	100%	$4,800	15	$3,750	$14,750
Research Related (e.g. National Labs)												
New - 14	Research organization	$5,000	10	✓	$5,000	100%	$1,200	50%	$2,400	4	$1,000	$9,600
Program and UG Support												
New - 15	Silver UG Support Option	$5,000	5	✓	$5,000	0%	$0	0%	$0	10	$2,500	$7,500
New - 16	Gold UG Support Option	$10,000	10	✓	$5,000	0%	$0	0%	$0	20	$5,000	$10,000
Sponsored (free) Categories												
17	Academic (Student/Research) - (personal non-commercial use only)	$1	1	✓	$1,000	0%	$0	0%	$0	0	$0	$1,000
18	Emeritus Member - (personal non-commercial use only)	$0	1	✓	$1,000	0%	$0	0%	$0	0	$0	$1,000
Non-Member Fees and Services												
19	Non-Member option to access the Conformance Certification Program	$15,000	0	0		0%		0%		0		0

Notes:
- Currency: US dollars

This version of the Service and Fee Table shows the values accrued to each category of membership. For all categories, the values exceed the cost of membership. For more information refer to the notes following the tables.
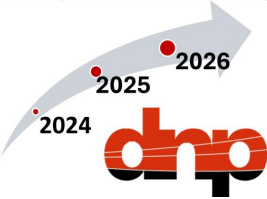
VISION 2024 – Member Service and Fee Guide

The DNP-UG is grateful for the support and participation of our members which enables us to continue as a vital entity serving our members and the industry. _In most cases, membership pays for itself!_

Our member benefits, services and fees changed effective July 1, 2024.

The VISION 2024 – Member Services and Fee Guide is available [here.](#)

- The notes in the Guide relate to the columns in the Member Services and Fee Tables above.
- The table (above) showing Member Values includes the normal industry value (workshops and tech support) and normal UG pricing for services (Conformance Certification Program).

More information on VISION 2024 is provided in an announcement [here.](#) An endorsement and a separate background document are also included.

2026
2025
2024

2026

2025

2024
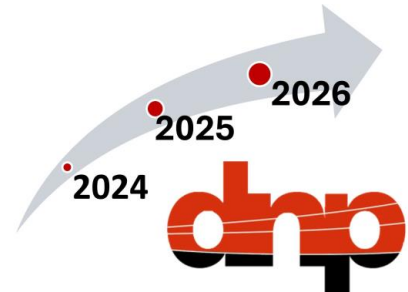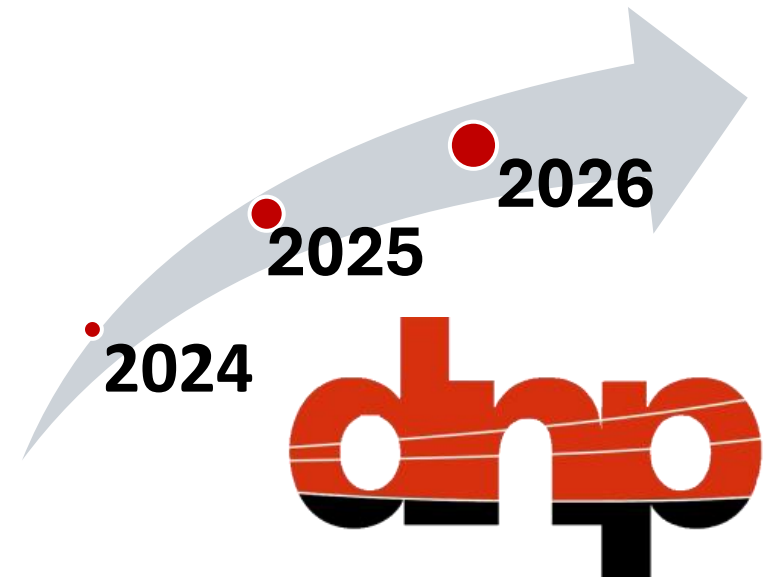
Member Support

Primary Member Support Contacts

Sara Yuill, Membership Coordinator

- Excellent support of our members

- Membership promotion

- Chief "Duck Whisperer"

- Email: membership@dnp.org

Ronald (Ron) Farquharson, President, COO

- Operational leadership, strategic alliances, membership promotion

- Board of Directors

- IEEE WG Chair

- Email: president@dnp.org or r.farquharson@ieee.org

Back-up Material

Rationale for Membership (1)

- **Engineering level benefits:**
  - Continued availability to our <u>standards including updates</u>.
  - Access to our Technical Bulletins, Application Notes and Test Procedures.
  - The key industry suppliers of protocol stacks and test tools base their products on our work.
  - <u>A</u>wareness of tools and documents the UG provides such as the <u>Device Profile Guide</u>.
  - Access to other related documentation such as <u>training courses.</u>
  - On-going enhancements with <u>new features and updates</u>.
  - <u>List of Conformance Certified Products</u>
  - The opportunity to participate in one or more of our operating committees to <u>learn and contribute</u>.
  - **Access to <u>training, forum, workshops and lessons learned</u>.**

Rationale for Membership (2)

- **Strategic level benefits:**
  - A holistic system approach, when using multiple vendor's products, assumes a <u>higher degree of interoperability, reliability and security of communications provided by DNP3</u>.
  - Lower product development (vendors) and <u>project deployment costs and risks (utilities)</u> are the result of the work of the DNP-UG (e.g., test procedures, guides, Conformance Certification Program).
  - Utilities gain from using <u>the latest technology with the most functionality</u> providing the greatest economic and operational benefits.
  - Other utilities are participating in the UG and implementing and benefiting from the most current functionality.
  - DNP3 is widely used (~94% of utilities) which provides <u>economies of scale</u> with the lowest possible costs to all users.
  - Industry visibility and reputational benefits a partner of the DNP-UG.

Rationale for Membership (3)

- **Summary:**
  - Broad input by experts and thought leaders improves our developments!
  - Without the DNP-UG supporting DNP3, successful interoperability among different vendor's devices would be much more expensive or not possible at all.
  - Strong support of the DNP-UG will enable thousands of volunteer hours (over 4,000 hours in 2023) per year by industry experts in key programs driving improved cybersecurity and interoperability.
  - A viable DNP-UG will continue to execute on our mission of maximizing interoperability, improving cyber security, optimizing DER communications.

Conformance Certification Program – Getting Started

- DNP-UG has a dedicated CTR coordinator to handle the day-to-day management of the CTR process, as overseen by the Test Management Committee (TMC)

- DNP-UG strongly recommends that devices are certified periodically to ensure compliance

- Two phases in the CTR Process:
  - Device Profile review
  - Test Logs review

- Get started by contacting: conformancetesting@dnp.org or contact:
  - Deryk Yuill at deryky@ieee.org
  - Ron Farquharson at r.farquharson@ieee.org

The SCADA Environment

- Very challenging for implementing security

- Mixed IP-based and serial networks

- Serial is low-bandwidth, unreliable, sometimes pay-per-byte

- Devices typically have low processing power

- Use data concentrators, not routers

- Security server access available only at topmost nodes
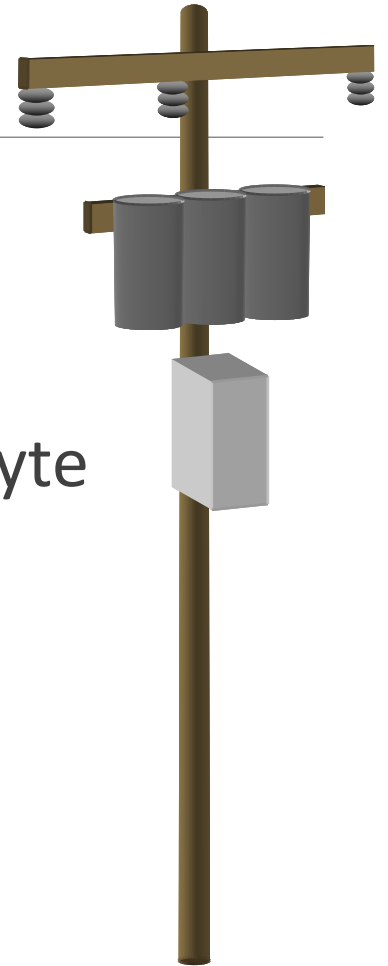
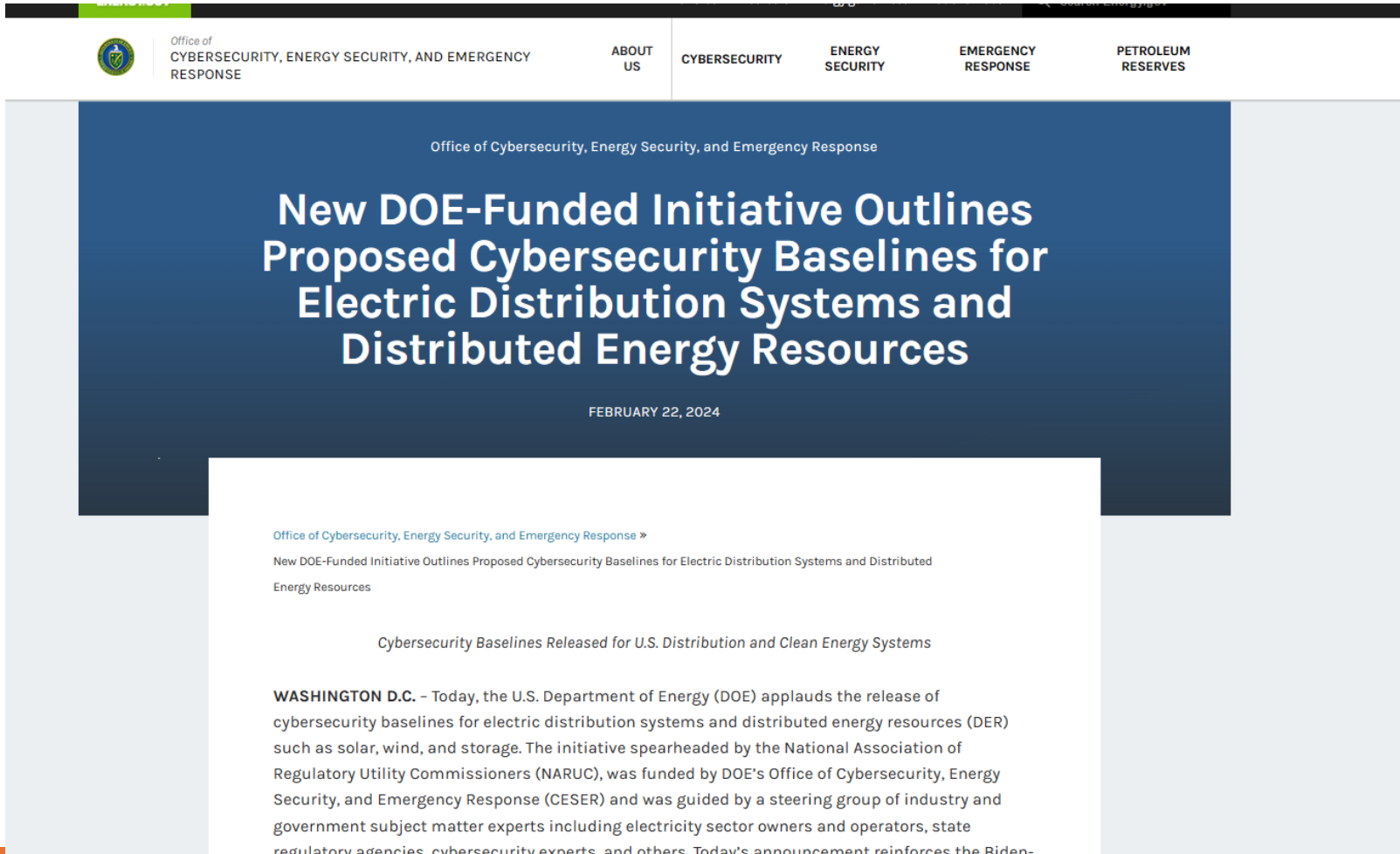# Solution: The DNP3 Security Architecture

- To be published in IEEE Std 1815

Legend:
- Security components Out of Scope of this standard
- Security components specified in this standard
- External Protocol
- Internal Configuration / Software Interface

Components shown:
- SCADA Application / Database
- DNP3 Application Layer
- Routing Tables
- Access Control List
- Logging
- Authorization Management Protocol
- Keys
- Security Controller
- DNP3 Secure Session Layer
- DNP3 Transport Layer
- DNP3 Data Link Layer
- DNP3 Communications Service Interface
- Serial
- Internet Protocol Suite

DOE 2500 Project Work Plan - Preliminary

- In partnership with EPRI (prime and DER gateway)
- Completion of AMP device specification (core team development)
- Development of the AMP authority (commercial partner offering)
- Test procedures for SAv6 (core team development)
- Test procedures for AMP – Device and Authority (core team development)
- Development of the Protocol stack (commercial partner offering)
- Development of (extension to) test tool (commercial partner offering)
- Online testing – multi-vendor (core team development)
- Utility demonstration – multi-vendor (Salt River Project)
- Zero Trust Architecture – roadmap (core team development)

DOE – Cybersecurity Baselines

Authentication and Encryption of Messages

- Key is never transmitted

- Tag is created by scrambling and truncating the message

- The tag sent with the message must match that calculated with local copy of the key

- Nonce prevents replay attacks

- Called a MAC if not encrypted

Kept Secret

Header Information

Message

Key

Other Header Fields	Seq Num

Length	Application Layer Fragment

Key

Additional Data

Nonce

Plaintext

AEAD

Tag

Ciphertext

Security Header	Seq Num	Message Body	Tag

Transmitted