1. **Areas of Investigation**

*This section would identify and describe areas that we reviewed. If there are areas that are self-evident to the scope of a digital committee that we did not review, then we should say why we did not review those areas. If there are areas that are premature for our review now, but may be pertinent later, we should describe those.*

**Introduction**

* Define “Digitalization” in greater detail
  + Broad Definition by Gartner’s: Digitalization is the use of digital technologies to change a business model and provide new revenue and value-producing opportunities; it is the process of moving to a digital business
  + Energy Specific Definition by International Energy Agency: Digitalization describes the growing application of information and communications technology across the economy, including energy systems, that has resulted from an increased amount of data available due to declining costs of data storage, greater progress in advanced analytics of data, such as machine learning and greater connectivity with faster and cheaper data transmission.
* Describe the benefits on a global scale and specific to the energy industry as provided in other reports concerning “digitalization”
* Describe current investment areas and estimates on a global scale and specific to the energy industry as provided in other reports concerning “digitalization”

*To date we have identified 11 areas:*

1. *Distributed ledger technology (some standards efforts already underway at NAESB)*

*As a basic definition provided by the World Bank, distributed ledgers use independent computers (referred to as nodes) to record, share and synchronize transactions in their respective electronic ledgers (instead of keeping data centralized as in a traditional ledger). As applied to the energy industry, NAESB is currently work on smart contracts for natural gas and has other requests for standards development underway,*

1. *Cybersecurity – very broad and pervasive throughout all areas*

*From NAESB’s and GISB’s inception, we have been addressing standards development to support market needs for protection of electronic transactions, including the application of PGP and PKI.*

1. *Cloud computing –hosting, data processing, data transit and data storage requirements*
2. *Deployable Shareware*
3. *5G Technologies and Implementation*
4. *Energy Usage Data – how it is managed, provided and the privacy issues that are necessarily to be addressed*
5. *Data Governance Requirements – Everything may be in this grouping*
6. *Distributed Energy Resources – focused on communication protocols*
7. *Renewable energy certificate/credit tracking and related data.*
8. *Internet of Things - needs boundaries – very broad*
9. *Data analytics*

**Areas of Evaluation**

* Provide a high-level description of the 11 areas identified by the Committee and included in the report.
* Explain how each is area is to be viewed through the lens of digitalization.
* Describe the methodology for evaluation
  + 1. Energy Use Case / Business Case
    2. Benefits to the Energy Markets
    3. Issues & Concerns
    4. Existing Standards and Efforts
    5. Recommendation – Relevancy and Urgency

**Categorization / Relationship of Areas**

* Describe relationship between the 11 areas identified by the Committee
  + Areas Enabled by Digitalization or Digital Technology
    - These technology areas are a benefit of OR an integral part of the digitalization process. They may be broad and impact many markets but need to be shaped to suit our specific energy market needs
  + Areas Impacted by Digitalization
    - These are market functions that define our energy transactions and could benefit from digitalization or are already digitalized
  + Areas that Impact Digitalization
    - These areas are broad and impact many markets but need to be shaped to suit our specific energy market needs

*These areas can be considered in four categories and several of the areas fall into multiple categories:*

*1) High Interest & Value – these are the topics that gained a lot of interest in our initial discussions. One could argue that all the topics are high interest, but some of the NAESB members have already begun investigations and expended funds and resources, or are considering investments in these particular areas*

*2) Emerging Areas – these are hot topics, but still dynamic in the market space. These have unknown aspects and we may want to observe or obtain more info before we jump in. Some examples are new market areas, IoT, Integrated Command and Control Across controlling entities, data integration and complex event processing referred to as stream processing, real time monitoring and forecasting, and advanced statistical and analytic methods and techniques also referred to as machine learning and deep learning.*

*3) Existing Standards or Research Exist – these topics are included in other industry (or infrastructure sector) standard, or research products are available for NAESB’s use. In this case, there may be considerable we can pull from, and then focus on applying that to our specific space and application*

*4) Data Related – the integrity of data is so vital, and so many successful technology applications are completely dependent on accurate data, that this may warrant its own category. Although topics in this category may have different objectives, they are interrelated due to the value of the data. In other words, a little work in this area may have big impacts for the members.*

* Describe the Relevancy of the Area to NAESB Activities and the Urgency of Standards Development

Relevancy to NAESB Activities

* + 1 – Relevant to processes/transactions that NAESB standards *currently* address
  + 2 – Relevant to processes/transactions that NAESB standards *may* address in the future
  + 3 – Not relevant to the processes/transactions that NAESB standards currently address or may address in the future.

Urgency of Standards Development

* + 1 – Standards in the area would be helpful and are not currently emerging for the energy industry
  + 2 – Standards in the area would be helpful and are currently emerging for the energy industry
  + 3 – Standards currently exist that adequately address the area for the energy industry
  + 4 – Standards to support the area are not needed for the energy industry

*In mapping our discussions/areas into these categories, a preliminary take is:*

1. *Distributed ledger technology - (Categories 1, 2) – This is a hot topic that many have interest in, and I would say that with the existing efforts ongoing at NAESB, it will fall out of category 2 fairly quickly.*
2. *Cybersecurity – (Category 3) – Trends suggest that regulation is unlikely but we see a general increase in oversight and federal expectation of the industry to comply with best practices, particularly preparedness, detection, and incident response.  A lot of work we can pull from here – NIST, IEC, ISA, etc.*
3. *Cloud computing –hosting, data processing, data transit and data storage requirements – (Category 3) – Many best practices in this space, including energy, infrastructure and high risk areas.  Our task would be to apply this to the energy transaction space, understanding the risks in ‘outsourcing’ data processing and storage space.*
4. *Deployable shareware – (Shareware in general presents some challenges and risk but those are primarily related to the Cybersecurity bullet above and may be combined as an aspect of cybersecurity, unless there are aspects that are separate – such as tools needed, standards for providing shareware, etc.).*
5. *5G technologies and implementation – (Category 2) –This may be a space to watch.  Scientifically, we have 5G information we can analyze, but implementation strategies are still very dynamic.*
6. *Energy usage data – how it is managed, provided and the privacy issues attached – (Categories 1, 4) – Big data, data in storage, data in transit, etc., are major topics.  There are some existing best practices we can pull from regarding encryption, etc., but addressing these topics in the context of energy transactional data would yield a huge benefit.  This may be the most impactful topic.*
7. *Data governance requirements – (Category 4) – Data storage, protection, required technical controls, handling, policy, this area is huge and related directly to the bullet above.*
8. *Distributed Energy Resources – focused on communication protocols – (Categories 3, 4) – research exists in this area with recommendations on reliable and secure protocols in high value data transit.  We may want to apply this research to our space.*
9. *Renewable energy certificate/credit tracking and related data. – (Categories 3, 4) – while it is about 5 years old, NREL did significant research in this area. I think we could leverage this and ‘refresh’ the research.*
10. *Internet of Things – (Categories 1, 2) – there is rapid growth in this area, the key here is focusing IoT to the energy transaction space and ensuring our scope is narrow.*
11. *Data analytics – (Category 4) – this may be part of Energy Usage Data and Data Governance topics.  The vendor space for data analytics is huge, helping members understand how to proceed with technology while maintaining data integrity, privacy, and meeting governance goals.*

**Evaluation**

* Areas Enabled by Digitalization or Digital Technology
  + Distributed Ledger Technology
    - Energy Use Case / Business Case
    - Benefits to the Energy Markets
    - Issues & Concerns
    - Existing Standards and Efforts
    - Recommendation – Relevancy and Urgency
  + Internet of Things
    - Energy Use Case / Business Case
    - Benefits to the Energy Markets
    - Issues & Concerns
    - Existing Standards and Efforts
    - Recommendation – Relevancy and Urgency
  + 5G Implementation
    - Energy Use Case / Business Case
    - Benefits to the Energy Markets
    - Issues & Concerns
    - Existing Standards and Efforts
    - Recommendation – Relevancy and Urgency
  + Data Analytics [Improved]
    - Energy Use Case / Business Case
    - Benefits to the Energy Markets
    - Issues & Concerns
    - Existing Standards and Efforts
    - Recommendation – Relevancy and Urgency
* Areas Impacted by Digitalization
  + Renewable Energy Certificate Tracking/Accounting
    - Energy Use Case / Business Case
    - Benefits to the Energy Markets
    - Issues & Concerns
    - Existing Standards and Efforts
    - Recommendation – Relevancy and Urgency
  + Distributed Energy Resource Communication Protocols
    - Energy Use Case / Business Case
    - Benefits to the Energy Markets
    - Issues & Concerns
    - Existing Standards and Efforts
    - Recommendation – Relevancy and Urgency
  + Deployable Shareware
    - Energy Use Case / Business Case
    - Benefits to the Energy Markets
    - Issues & Concerns
    - Existing Standards and Efforts
    - Recommendation – Relevancy and Urgency
* Areas that Impact Digitalization
  + Cybersecurity
    - Energy Use Case / Business Case
    - Benefits to the Energy Markets
    - Issues & Concerns
    - Existing Standards and Efforts
    - Recommendation – Relevancy and Urgency
  + Data Governance
    - Energy Use Case / Business Case
    - Benefits to the Energy Markets
    - Issues & Concerns
    - Existing Standards and Efforts
    - Recommendation – Relevancy and Urgency
  + Cloud Computing
    - Energy Use Case / Business Case
    - Benefits to the Energy Markets
    - Issues & Concerns
    - Existing Standards and Efforts
    - Recommendation – Relevancy and Urgency
  + Energy Usage Data Management/Communication
    - Overview/Industry Definition
    - Energy Use Case / Business Case
    - Benefits to the Energy Markets
    - Issues & Concerns
    - Existing Standards and Efforts
    - Recommendation – Relevancy and Urgency

**Matrix**

**Relevance**

**Urgency**

*Tools and services such as certification may be a possible direction for review:*

* *Vendor certifications (vendor due diligence) as much of the energy industry may be relying on outside services and software applications.*
* *Strong take away – will need some way to secure access to third party software and services, to avoid introduction of risks.*