



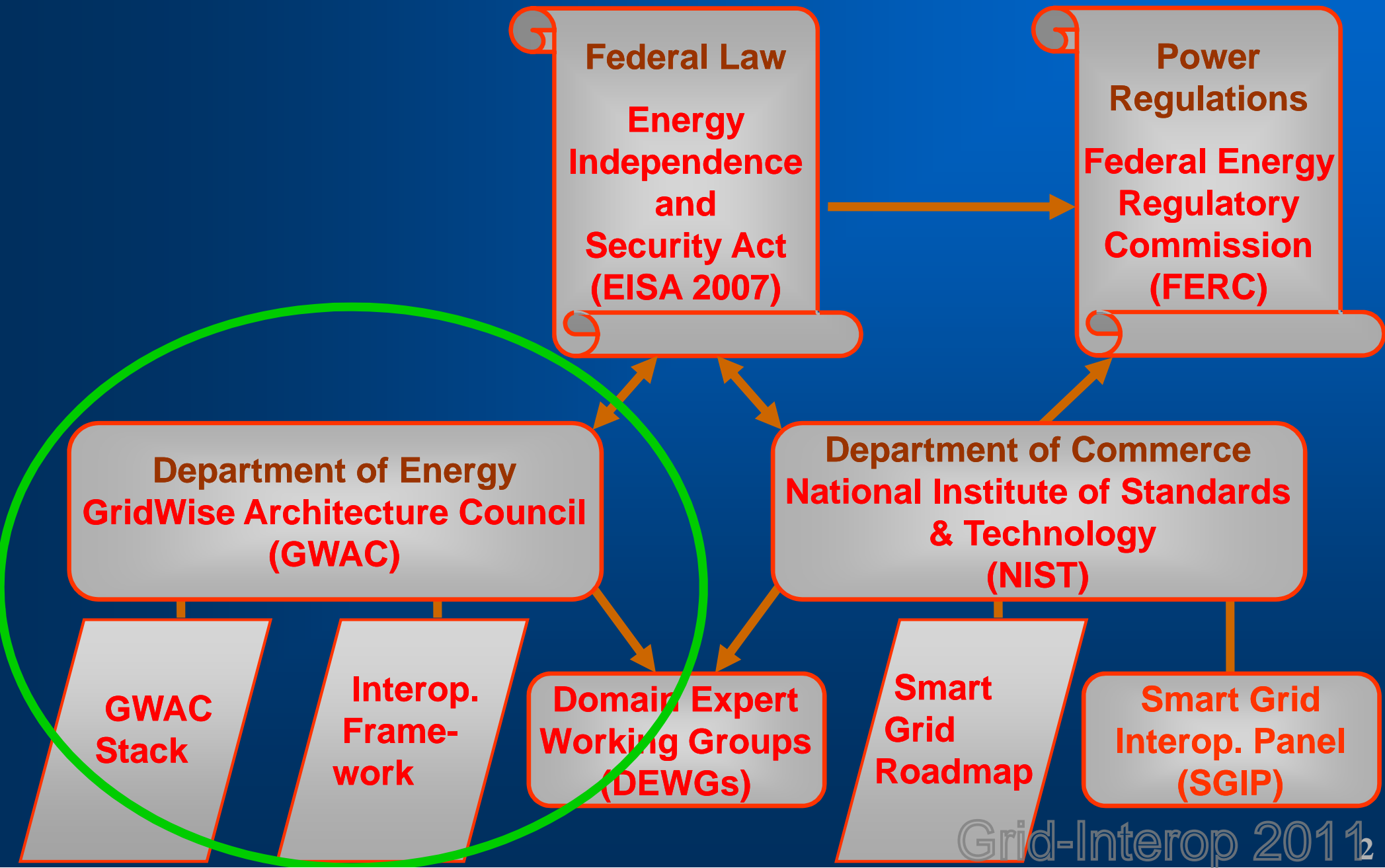
GridWise Architecture Council Smart Grid Tools for Regulators

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Federal Role in Smart Grid



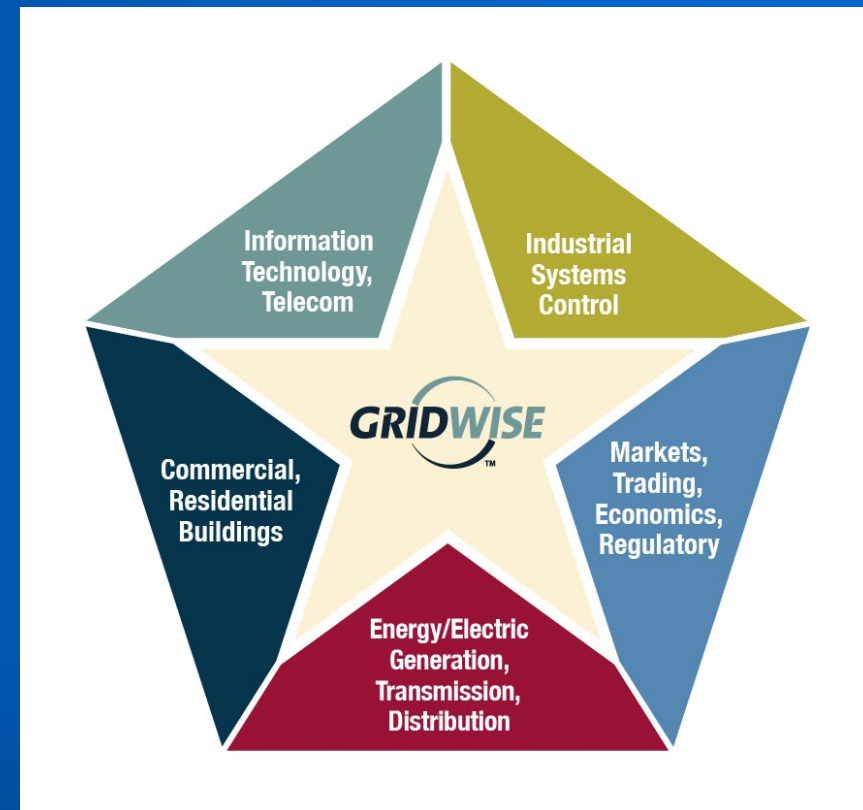
The GridWise View

- **The electricity challenges**

- Ensure reliable electricity
- Integrate local generation
- Accommodate energy storage
- Adjust demand to meet available supply

- **The GridWise solution**

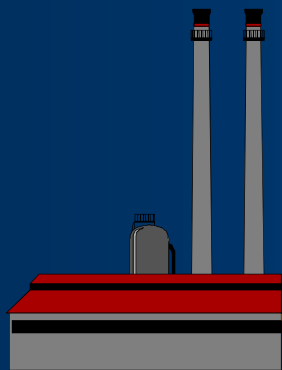
- Overlay IT and sensors on the power grid
- Include end-devices in the power grid
- Incorporate high-tech and innovative products



Creating a Smart Grid

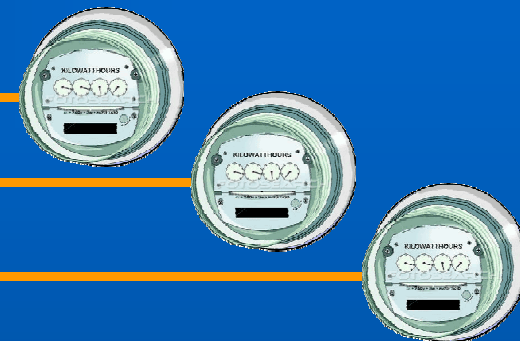
Conventional Grid

Electric Generator



Transmission

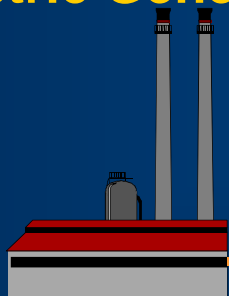
Distribution



Customer Meters

Smart Grid

Electric Generator



Transmission

Distribution



Local Generators & Storage

Customers

Residential Gateway

Server

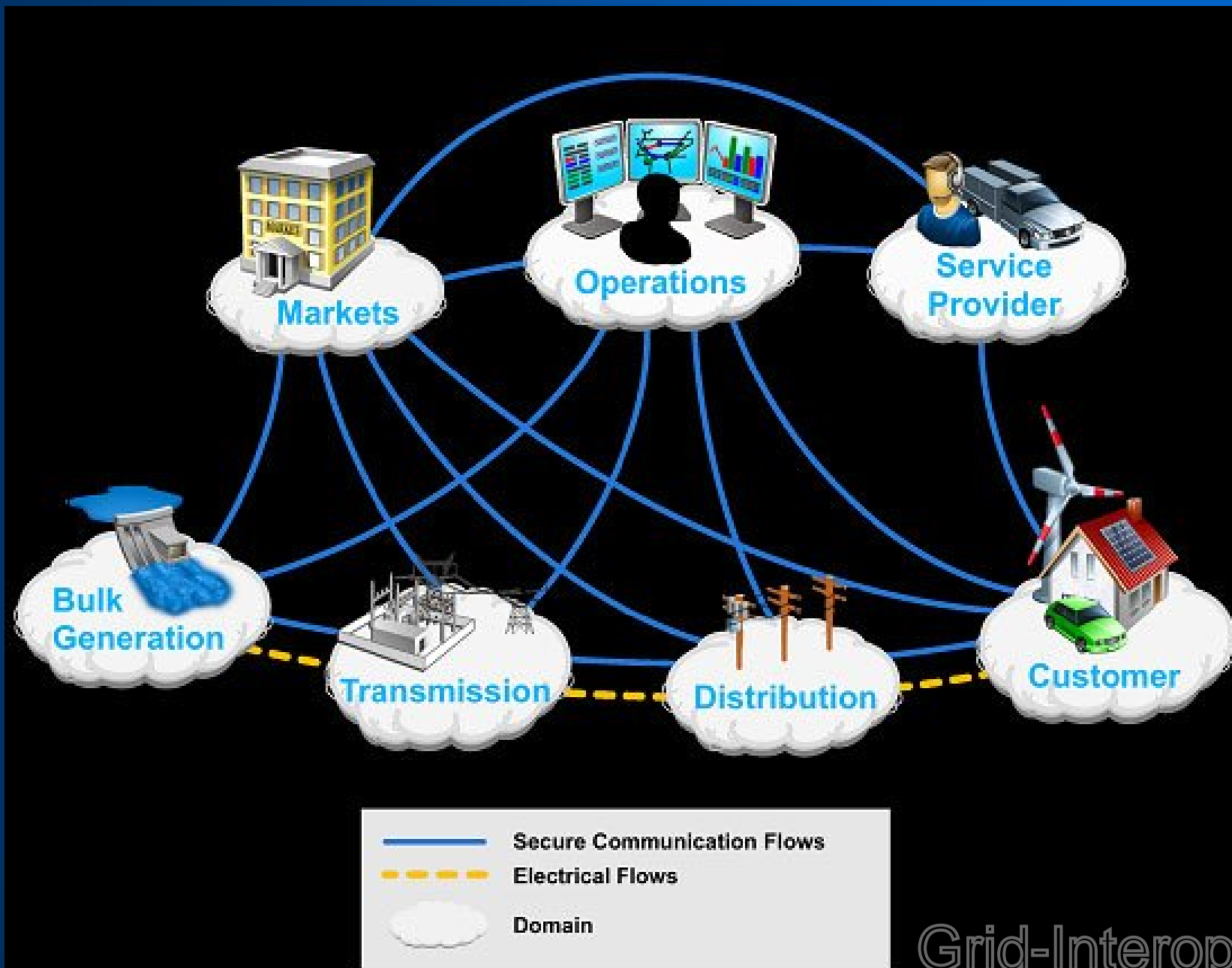


Sensors

Communications Network

Grid-Interop 2011

Interoperable Smart Grid Domains



The GWAC Stack



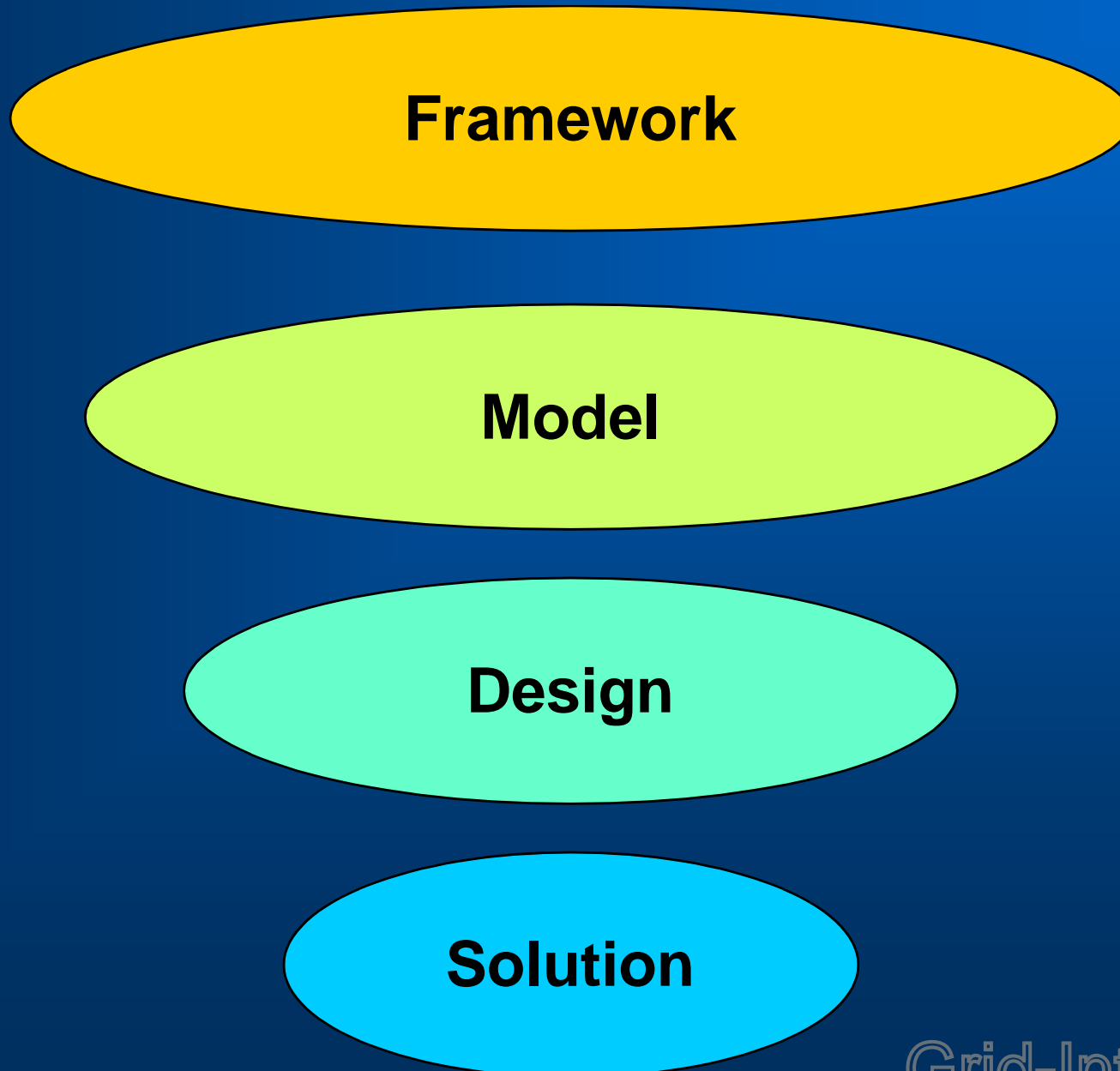
GridWise Constitution

- Statement of **principles & framework**
- Promote consensus on **interoperability**
- Attributes of principles
 - Simplicity
 - Choice
 - Physical reality
 - Consistency
- Constitution principles
 - **Business** 5 principles
 - **Usability** 3 principles
 - **Information Technology**10 principles
 - **Regulatory** 6 principles
 - **Policy** 3 principles
 - **Governance** 5 principles

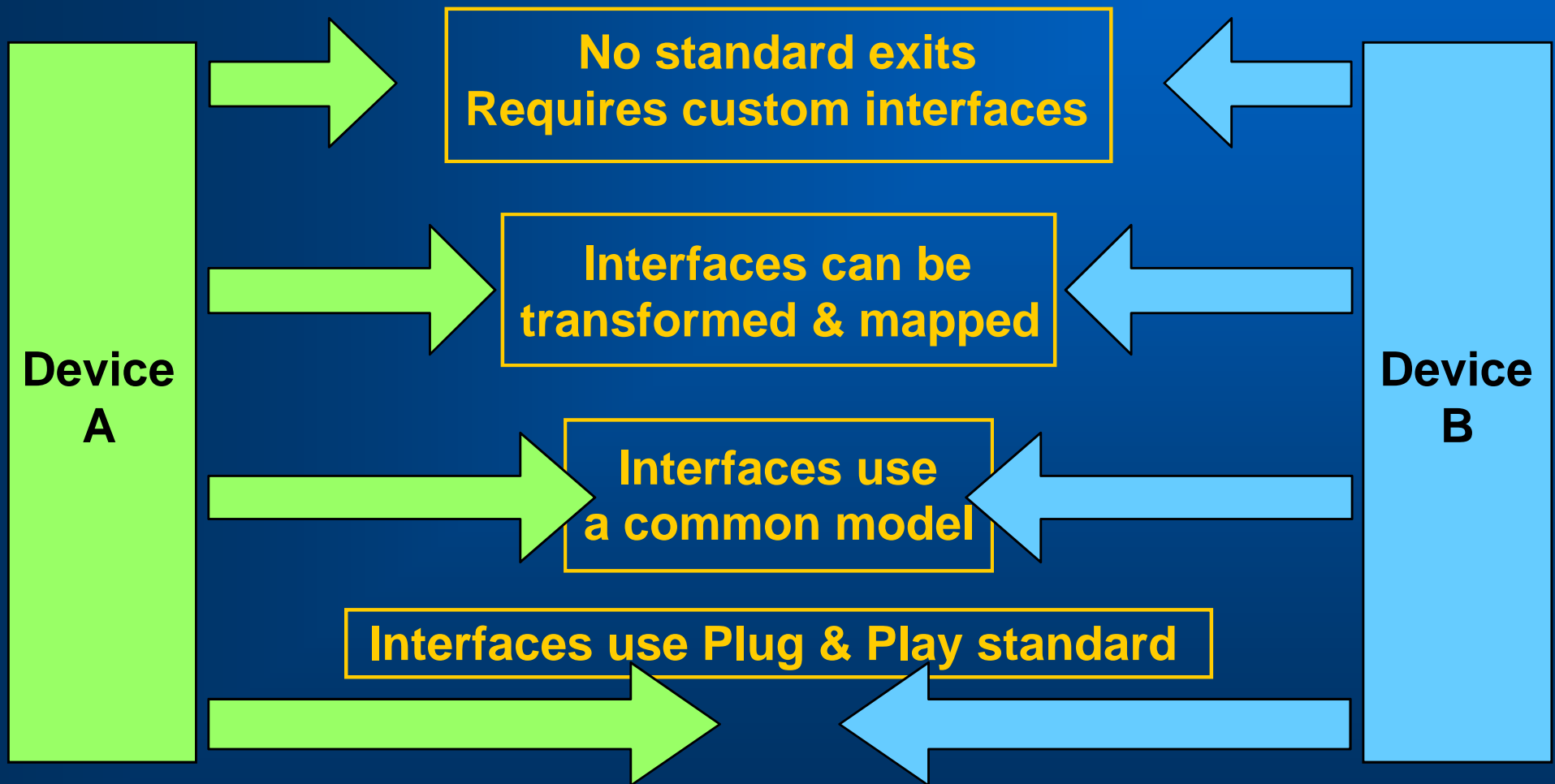
Constitution Principles: Regulators

- **Context:** “Business interactions ... are monitored by regulatory bodies ... to ensure a viable electric system that supports our economy and balances issues of social equity.”
- **R1: Interoperability must be understandable**
- **Interoperability enables regulators to:**
 - **R2: Verify business rules; audit transactions**
 - **R3: Verify cost-effectiveness of transactions**
 - **R4: Provide consumer choices of services**
 - **R5: Offer reliable, safe service & privacy**
 - **R6: Define information & skills for consumers**

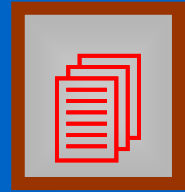
The Context-Setting Framework



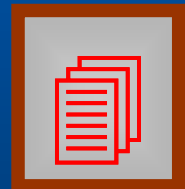
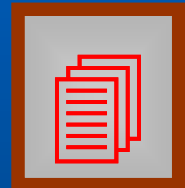
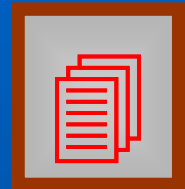
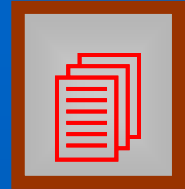
Interoperability Options



Interoperability Checklist



- **GWAC guidance for utility decision-makers**
 - Energy equipment
 - Information technology
 - Investments and finance
- **Does the project advance interoperability?**
- **14-point checklist**
 - Architecture & design
 - Interconnectivity & security
 - Evolutionary capability & service life
 - Collaborator independence



- **10-point supplemental checklist for utilities & vendors**

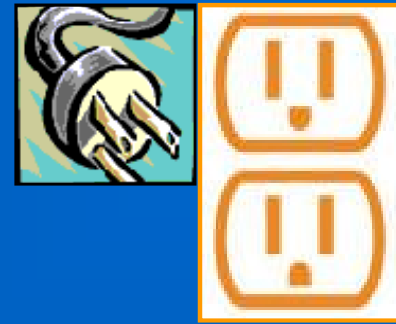
Checklist Topics

- **Architecture & design**
 - Clear interfaces
 - Open architecture
 - Technology neutral
 - Multiple vendors
 - Standards-based
- **Interconnectivity & security**
 - Link capability
 - Standard protocols & models
 - Data accessibility
 - Manage devices & users
 - Security & privacy
 - Redundancy & fail safe
- **Evolutionary capability & service life**
 - Device updates
 - Integrate legacy devices
- **Collaborator independence**

Verifying Vendor Claims

- Cannot expect checklist users to verify claims
- Key verification elements
 - Dependence on national & international **standards**
 - Test **conformance** to standards
 - Test **interoperability**
 - Independent testing preferred over self-certification
- Decision Makers must **challenge the answers**
 - Are the checklist answers accurate?
 - Are the checklist answers verifiable?
 - Does the vendor actively support standards?
 - Are there multiple sources from competing vendors?

What are Standards?



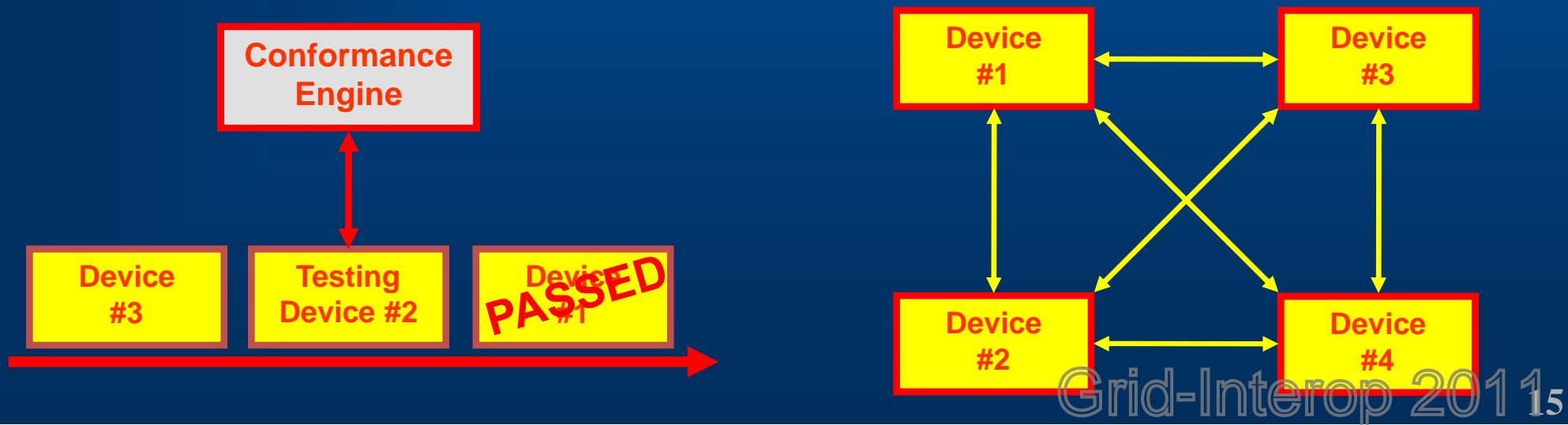
A formal set of rules

- Who creates and owns the rules (specifications)?
 - **Proprietary** ... Company owned; may be secret
 - **Open** ... Company owned; publicly disclosed
 - **Standard** ... Created by an authorized organization
- IEC ... **International Electrotechnical Commission**
- ISO ... **International Org. for Standardization**
- ISO/IEC ... **Information Technology standards**
- ITU-T ... **International Telecommunications Union (U.N.)**
- ANSI ... **American National Standards Institute**
 - ASHRAE **American Society of HVAC Engineers**
 - CEA **Consumer Electronics Association**
 - NEMA **National Electrical Manufacturers Association**



Key Steps to Interoperability

1. **Standard** ... Well-written, easy to test
2. **Profiles** ... Specification options are clearly delineated
3. **Conformance** ... Solid testing regime established
4. **Interoperability** ... Solid testing regime established
5. **Life-cycle** ... Installed product maintenance plan for years



GridWise Resources

- Visit www.gridwiseac.org; click on **Publications**
- GridWise Architecture Council products
 - **Constitution**
 - **Context-Setting Framework**
 - **Decision-Maker's Interoperability Checklist**
- Proceedings of **Grid-Interop** and workshops
- Information, reports, and white papers
- Benefits of interoperability
 - Environmental
 - Financial
 - Reliability