

An Architecture Scaffolding for Analyzing Overlap and Conflict Between Laws

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Agenda

- Problem Statement
- Enterprise Architecture Techniques
- Scaffolding Approach
 - Comparison of Laws
- Example Situation: Small Modular (Nuclear) Reactors
 - Scaffolding by Viewpoints
 - Analysis
- Summary

Problem Statement

- Laws are comprised of narratives making them hard to analyze for refactoring or comparison with other overlapped or complementary laws
- Multiple laws may have overlapped scopes, and/or overlapped but differently named content
- Lawmaking typically lags behind Technology Innovation – when the negative impacts are already beginning to appear
- How can we compare laws (couched in narratives) using some normalizing schema that allows for apples to apples comparisons?

Enterprise Architecture Definitions

- An *enterprise* is: a collection of resources and performers performing complex activities directed towards a common purpose
- *Enterprise Architecture* is: the representation of the structure and behavior of the enterprise and its relationships to elements outside the enterprise.

Enterprise Architecture Techniques

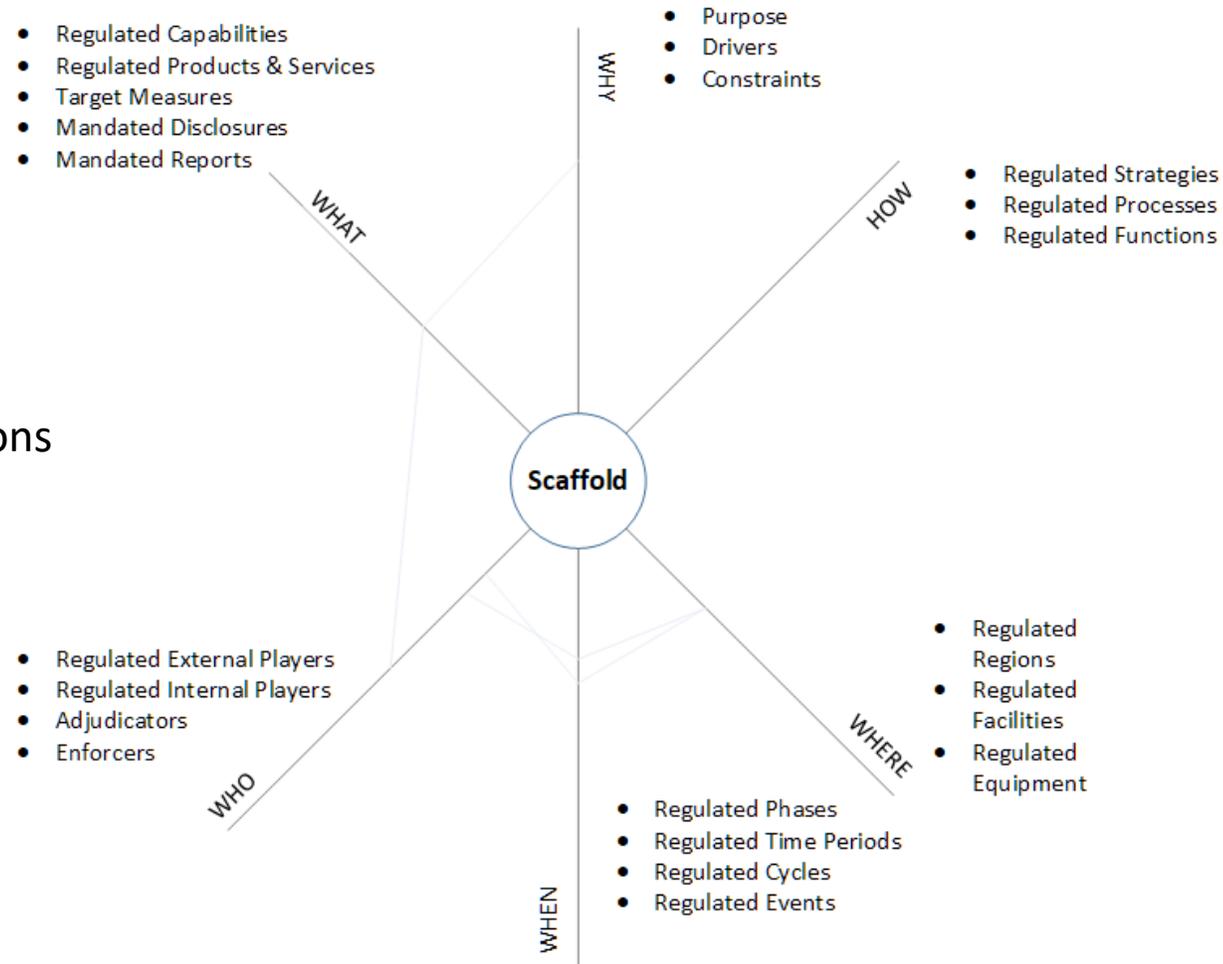
- Techniques from Enterprise Architecture
 - Closed Six-dimensional Analysis and Synthesis Framework (Scaffolding)
 - Systematic application of analysis to data gathering
 - Use of models and graphical representations for representing structure and behavior aspects
- Benefits:
 - Comparisons – Similarities and Differences
 - Aggregation – Federation, Mergers
 - Problem Analysis/Synthesis – breaking down a complex problem into simpler sub-problems and synthesizing new solutions
 - Fine grain modeling of aspects for more detailed analysis

View of Laws as Architecture Patterns

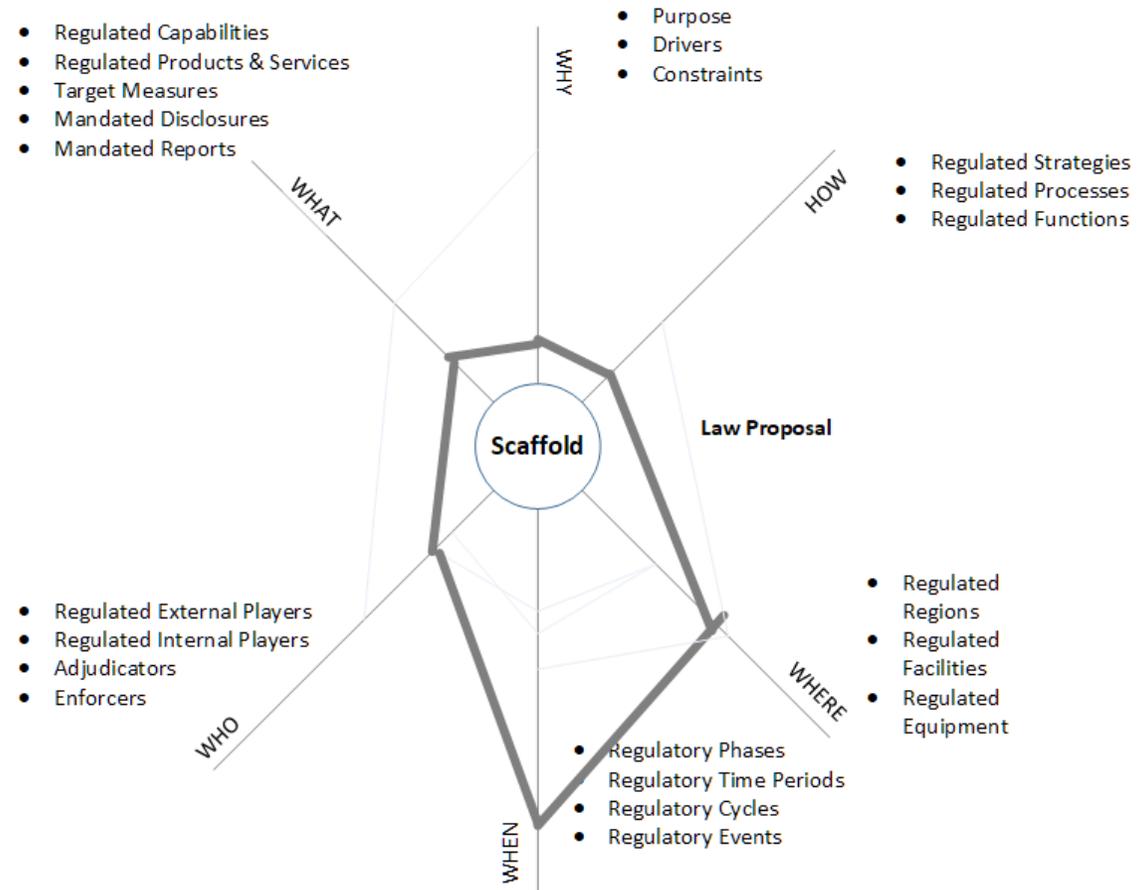
- Structural Components
 - Elements of purpose, rationale, drivers (WHY)
 - Elements of constrained activities (HOW)
 - Elements of constrained locations, equipment, tools (WHERE)
 - Elements of constrained roles and responsibilities (WHO)
 - Elements of constrained time periods, events and cycles (WHEN)
 - Elements of constrained products, services, materials, information (WHAT)

Scaffolding Approach

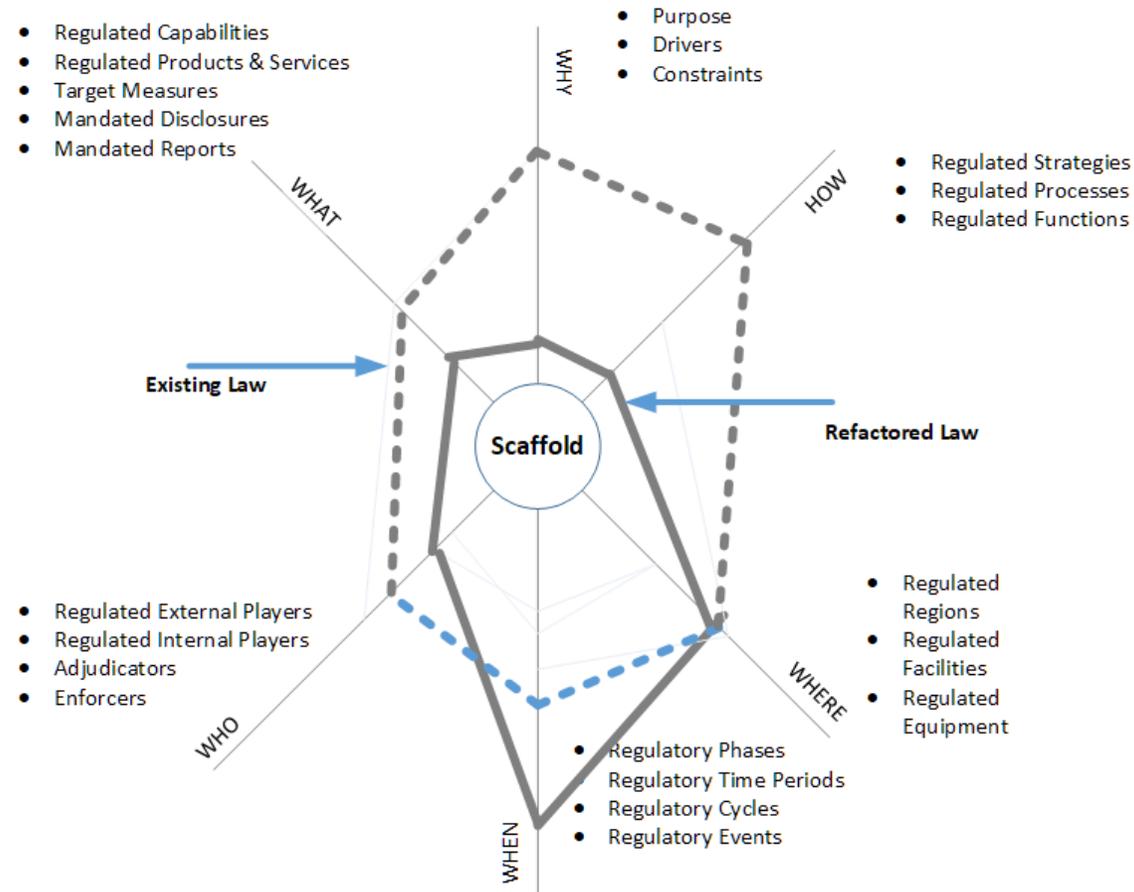
6 Mutually Exclusive Dimensions



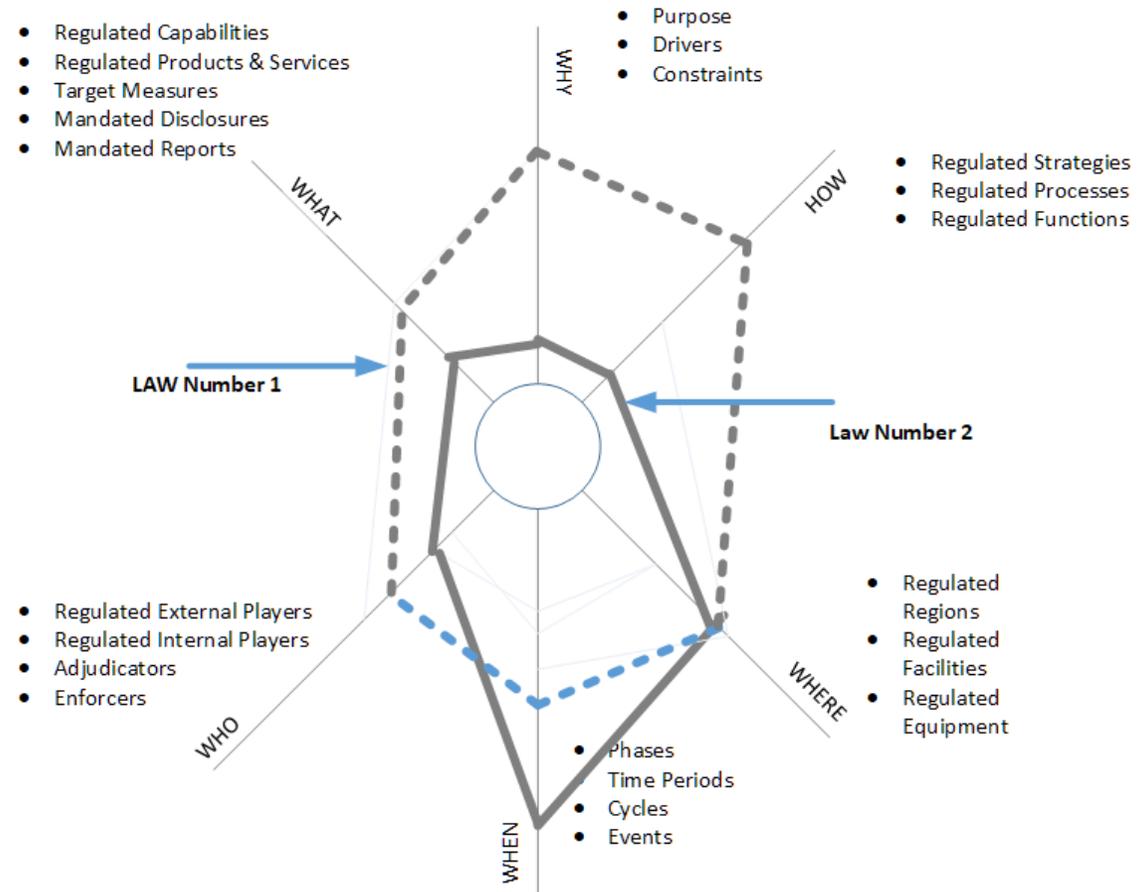
New Law Proposal (Conceptual)



Refactoring an Existing Law (Conceptual)



Comparison of Laws (Conceptual)



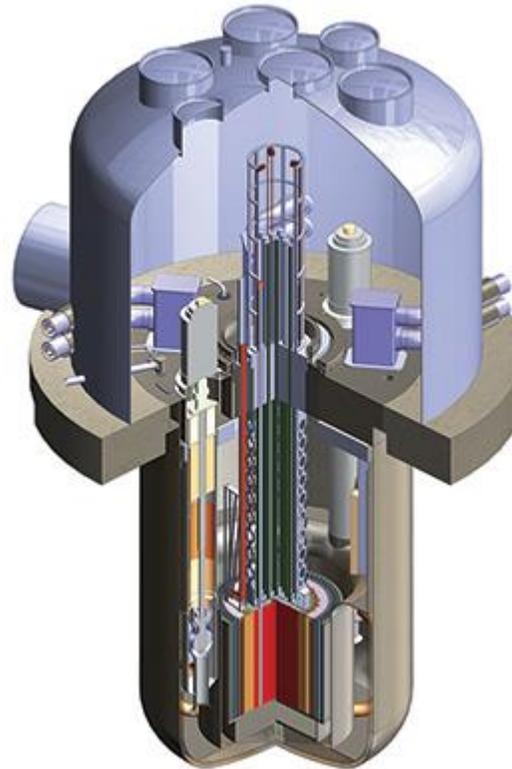
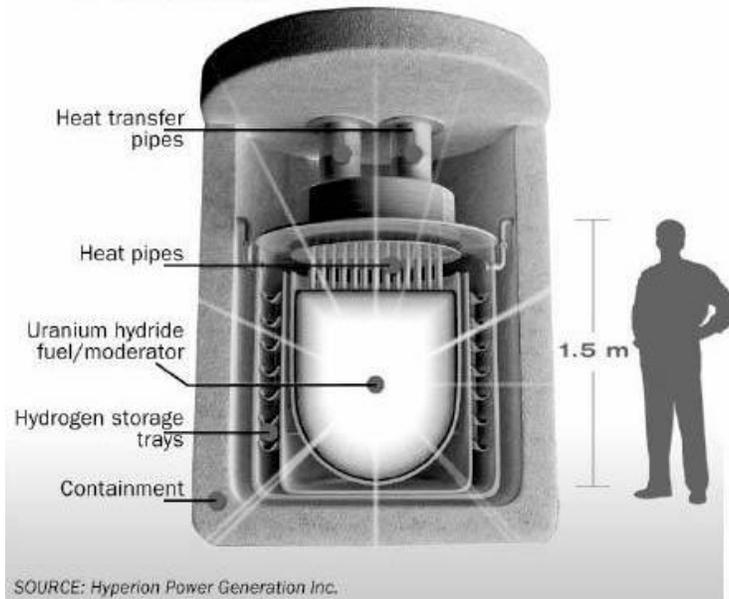
Laws Example: Small Modular (Nuclear) Reactor Technology

HYPERION SMALL-SCALE COMMERCIAL NUCLEAR REACTOR

The key to Hyperion's tiny nuclear power plant is the non-weapons grade uranium that makes it run.

Uranium hydride — uranium plus hydrogen — both fuels the reactor and controls its nuclear activity. If it gets too hot, the uranium sheds hydrogen, slowing down the nuclear fission.

The reactor would power a steam turbine that could produce enough electricity for 20,000 American homes at a cost of 6-8 cents per kilowatt hour.



<https://www.albertaoilmagazine.com/2014/05/mini-nuclear-reactors/>

Example: Small Nuclear Reactors

- A cross organizational enterprise
 - Involves introduction of a new innovation
- Many potential players
 - Legislators and Regulators
 - Power Companies
 - Small Reactor Manufacturers
 - Small Reactor Leasing Companies
 - Small Town or Neighborhood Power Cooperatives
 - Emergency Responders/Defense Services
 - Operators
 - Nuclear Fuel Carriers and Storage Operators

Need for Regulation (Regulator's Viewpoint)

- Why Regulated: Health and Safety
- What Regulated: Small Reactor Design & Construction; Nuclear Fuel Transport and Storage; Small Reactor Transport and Placement
- Who Regulated: Small Reactor Manufacturers, Small Reactor Owners and Operators, Nuclear Fuel Transporters and Storage Managers, Small Reactor Transporters
- How Regulated: Law and Regulation; Inspection and Certification
- Where Regulated: Small Reactor Manufacturing Facilities; Transport and Storage Facilities; Small Reactor Placement Sites; Operator and Owner Facilities
- When Regulated: Starting Within Next 5-10 years

Reactor Management Viewpoints

Traditional Power Company

- WHY: Profit
- WHAT: Electrical Power
- HOW: Power Generation
- WHO: Public Utility Company/Management
- WHERE: Fixed, Centralized Facilities (old); Distributed, Potentially Mobile Facilities (new)
- WHEN: As soon as technology is ready

Cooperative Power Company

- WHY: Lowest Cost Power; Local Control
- WHAT: Electrical Power
- HOW: Power Generation
- WHO: Small Town/Neighborhood Power Co-op or Contracted Management
- Where: Local Facility, Potentially Relocatable in Response to Growth
- WHEN: As soon as technology is ready

Reactor Builders' Viewpoints

Traditional Power Companies

- WHY: Effective Power Generation; Controlled Costs
- WHAT: Nuclear reactors
- HOW: In-house and contracted design and construction (old) and leasing of small reactors (new)
- WHO: Public Utility Company/Management
- WHERE: Fixed facilities for design and on-site construction (old) and flexible siting for small reactors (new)
- WHEN: As needed to meet power generation needs

Small Reactor Manufacturers

- WHY: Profit
- WHAT: Small nuclear reactors
- HOW: In-house design and construction; sales, marketing, and leasing
- WHO: Manufacturing management
- WHERE: Fixed facilities
- WHEN: As soon as technology is ready and company can start up

Note: Traditional Power Companies may want to expand the business to become small reactor manufacturers. Public Utility laws may also be involved here.

Conflicts/Issues Identified- Traditional Power Companies vs Neighborhood Co-ops

- **WHY: Profit vs Non-profit**
 - Will non-profit power generation with (very) local control be allowed?
 - Should there be limits on how large non-profit power generation co-ops can be allowed to grow?
- **WHO: Contracted Management vs Local Co-op Board**
 - Is there a need for additional regulations for contracted management for Co-op, local power generation?
- **WHERE: Both**
 - How should the siting of small nuclear reactors in residential areas be regulated?
 - What should the constraints on relocating small reactors be?

Note: Some of these issues are national, some are state and local. Regulations at all governmental levels need to be coordinated.

Conflicts/Issues Identified - Reactor Manufacturers

- HOW: Traditional Power Companies vs Small Reactor Manufacturers
 - Are additional regulations needed for small reactor manufactures?
 - Are restrictions need on Traditional Power Companies that want to also manufacture and sell small nuclear reactors? How should this potential conflict in mission (using vs selling) be addressed in laws/regulations?
 - Are additional regulations needed for leasing small nuclear reactors?

Summary

- Enterprise Architecting uses a normalizing technique and visualization graphics to deal with multi-viewpoint, multi-stakeholder problems
- These techniques are applicable to the analysis of existing laws and the creation of new law proposals
- Laws have implicit structure and behavior specifications (architecture) that must be made explicit using some of the architecture techniques
- Use of architecture techniques provides the capability to refactor existing laws, combine or split laws, detect overlaps between laws and also to make proposals for new laws

Future Research

- Review additional Enterprise Architecture techniques for application to analysis of laws
 - Rules Models: capture behavior (i.e., constraints) in a formal model
 - Patterns: document common scaffolding elements for classes or types of laws
 - Ontology: standardize vocabulary and relationships in order to make scaffolding contents comparisons more effective