

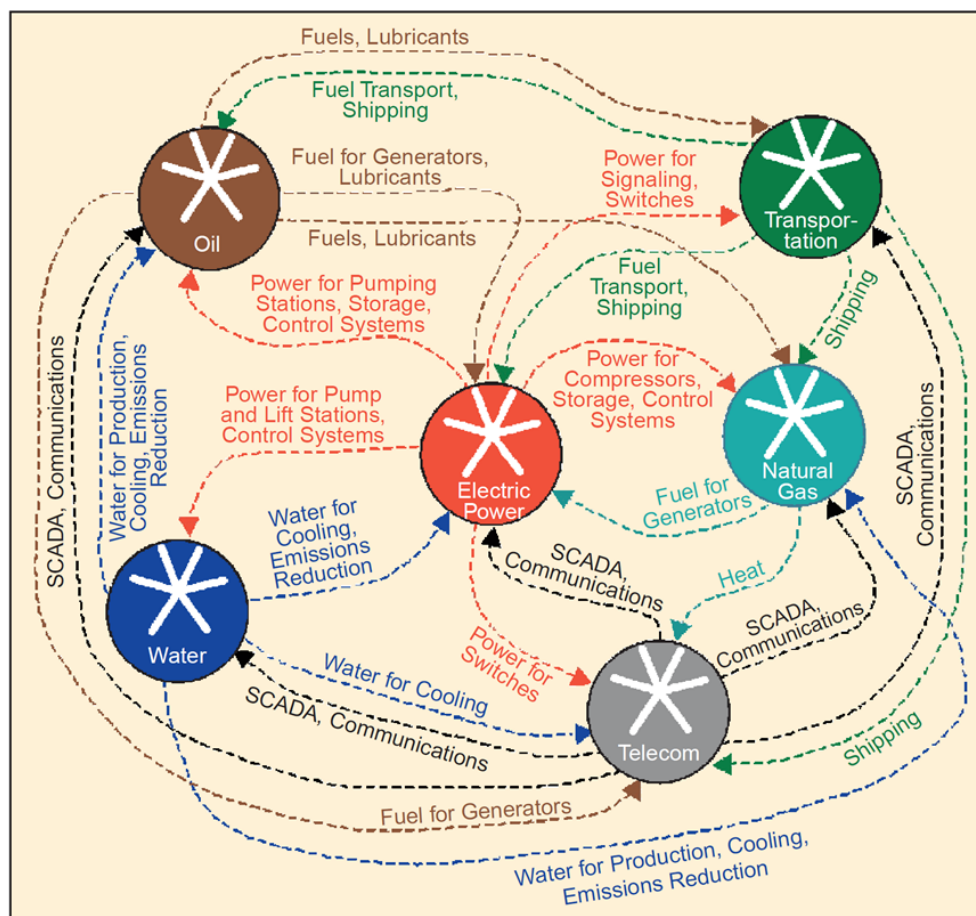
The Open Industrial Interoperability Ecosystem and Critical Infrastructure Management

I. Critical Infrastructure

Critical infrastructure encompasses a complex mix of public and private sector resources which collectively differentiate first-world societies from less developed societies. Sectors such as integrated energy, chemicals/petrochemicals, public utilities (e.g. water and energy), transportation, communications, healthcare/pharmaceuticals, and agriculture, as well as their critical manufacturing supply chains, are included. Many of these sectors also fall under the umbrella of asset intensive industries, which is the scope of the Open Industrial Interoperability Ecosystem (OIIE) and ISO 18101.

II. The Interdependent Nature of Critical Infrastructure

Analysis of critical infrastructure interdependencies has existed for many years; this includes seminal work published by IEEE Journal, Dec 2001 as is shown in Figure 1 below. This analysis was expanded upon in subsequent work to show why and when all sectors begin to fail if any of them fail. This helps to show the value of the cross-sector approach to digitalization and interoperability provided by the OIIE.



III. The Critical 5

The Critical 5 nations have a special set of trusted relationships with each other, where information about critical infrastructure and associated risks is shared more comprehensively than with other nations. This creates an opportunity for mutually beneficial ways of modeling, monitoring, and managing the critical infrastructure and associated risks in these five nations. The OIIE provides a set of specifications for digitalization and interoperability which can be used for this purpose on a cross-sector, intersectional and international basis. The Critical 5 nations are:

1. Australia
2. Canada
3. New Zealand
4. United Kingdom
5. United States

IV. Networks of Networks form Vendor Neutral Industrial Digital Ecosystems

Like the internet itself, the OIIE is designed to support networking individual nodes into complex networks of networks. The OIIE focuses on helping industry sectors to operate more efficiently, with intranets for single organizations networked into managed extranets. These extranets can be networked with each other in a repeatable, scalable, sustainable, secure, and vendor-neutral manner. These intranets and extranets share key specifications for APIs, data models, and service definitions, and collectively form industrial digital ecosystems which can incrementally evolve as industrial sector requirements are modeled and corresponding capabilities are developed. This approach is scalable across multiple industry sectors in Australia, the Critical 5, and beyond.



V. A leadership role for the OIIE Australian Working Group

In many other parts of the world, globally dominant suppliers have tried to force industry sector participants into vendor-specific digital ecosystems which compete and do not interoperate with each other. While this strategy has worked very well in certain consumer sectors, it has largely failed in industry. Asset intensive industries and critical infrastructure are inherently heterogeneous due to the scale, complexity, cost, and lifecycles of the systems of systems, systems and systems elements which are involved. Because Australia has no globally dominant suppliers, it has a particularly interesting opportunity to not only free itself from this legacy model, but also to help show the way for much of the rest of the world.

VI. NERA, FEnEx CRC and OIIE Alignment

Having NERA as a sponsor of the OIIE will help Australia to establish a critical mass for the OIIE, starting with the integrated energy sector. The intent is to push forward in advance of the startup of the FEnEx CRC, so that Australian energy sector participants and their extended supply chain partners will already be preparing to use the OIIE as the standard way to collaborate and cooperate.