

Welcome to the: OIE Australia Working Group Formative Webinar

Presented by NERA and MIMOSA

Francis Norman: NERA

Don Sands: MIMOSA and Synengco

Markus Stumptner: MIMOSA, UniSA, FEnEx CRC

Alan Johnston: MIMOSA, ISO, ISA95 and Assetricity

April 21, 2020

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What is Critical Infrastructure?

- **Critical infrastructure** (or **critical national infrastructure (CNI)** in the UK) is a term used by [governments](#) to describe [assets](#) that are essential for the functioning of a society and economy – the [infrastructure](#). – Wikipedia
- Government led efforts have addressed key aspects of **Security** (physical and cyber) and **Resilience** (usually focused on disaster and emergency preparedness).
- A key aspect of Critical Infrastructure is that it is **Highly Interdependent**.
- Since the consequences of failure of the key sectoral activities is potentially catastrophic (no matter the cause of the failure), we propose a more inclusive approach to **Model**, **Monitor** and **Manage** the associated **risks**.

Critical Infrastructure: Key Sectors



Critical Infrastructure Sectors – From US PPD 21-2013

➤ Chemical

- Commercial facilities
- Communications

➤ Critical manufacturing

➤ Dams

➤ Defense industrial base

- Emergency services

➤ Energy

➤ Asset Intensive Industries

- Financial services

➤ Food and agriculture

- Government facilities

- Healthcare and public health

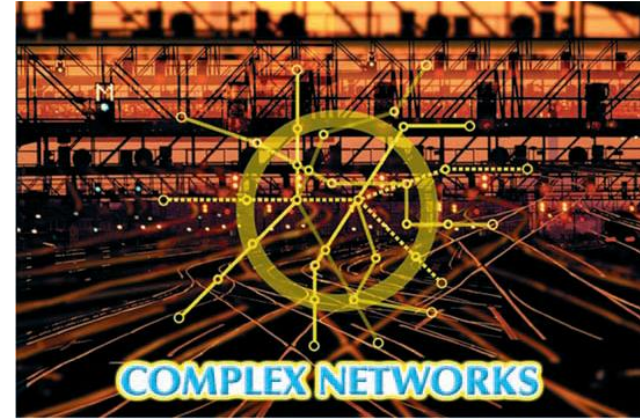
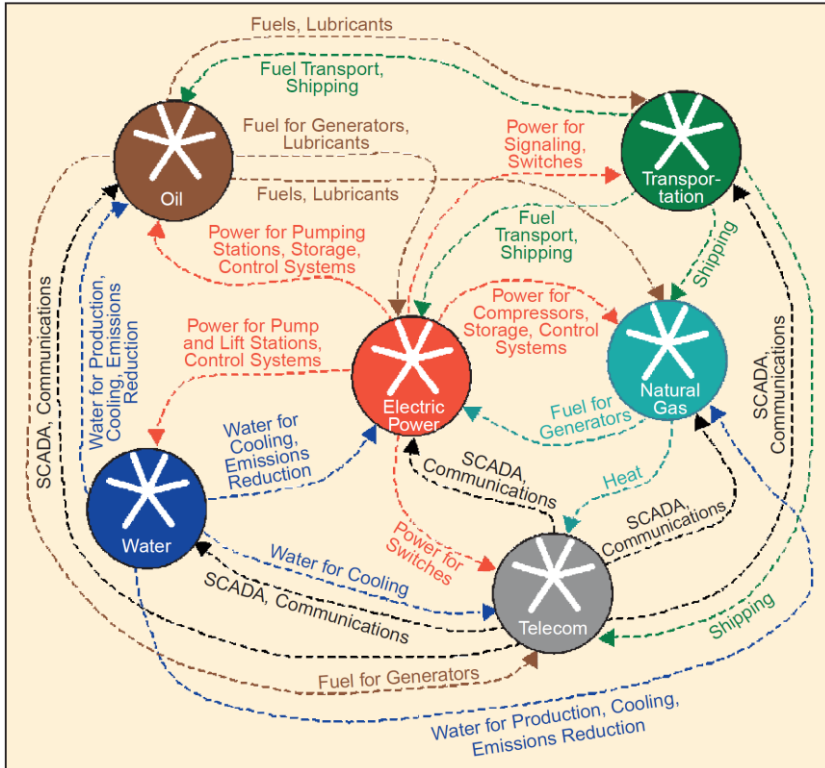
➤ Information technology

➤ Nuclear reactors, materials, and waste

➤ Transportation systems

➤ Water and wastewater systems

Critical Infrastructure Interdependencies-1



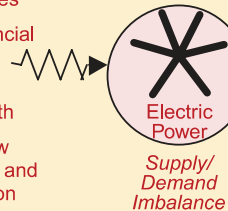
IEEE Journal- Dec 2001
Identifying, Understanding, and Analyzing
Critical Infrastructure
Interdependencies

Steven M. Rinaldi
James P. Peerenboom
Terrence K. Kelly

Critical Infrastructure Interdependencies-1a

Factors/Forces Contributing to Energy Crisis in California

- Deregulation Policies
- New Energy Marketplace Dynamics
- Tight, High-Cost Gas Supplies
- Utility Financial Crisis
- Substantial Load Growth
- Lack of New Generating and Transmission Capacity
- Aging Fleet of Power Plants
- Low Hydro Conditions
- Transmission/ Environmental Constraints



First-Order Effects

Gas Supply

Curtailed Natural Gas Production

Oil Pipelines

Disruption of Product Pipelines

Water

Disruption of Irrigation Pumps

Power Disruption
Reduced Gas Supply

Power Disruption

Second-Order Effects

Cogen-eration

Reduced Steam Injection for Heavy Oil Production

Refineries

Inventory Buildup; Curtailed Operations

Storage Terminals

Inventory Drawdown; Shortages of Gasoline and Jet Fuel

Agriculture

Crop Losses

Third-Order Effects

Oil Production

Reduced Heavy Oil Production

Road Transportation

Shortages of Specially Formulated Gasoline

Air Transportation

Disruption of Flight Schedules

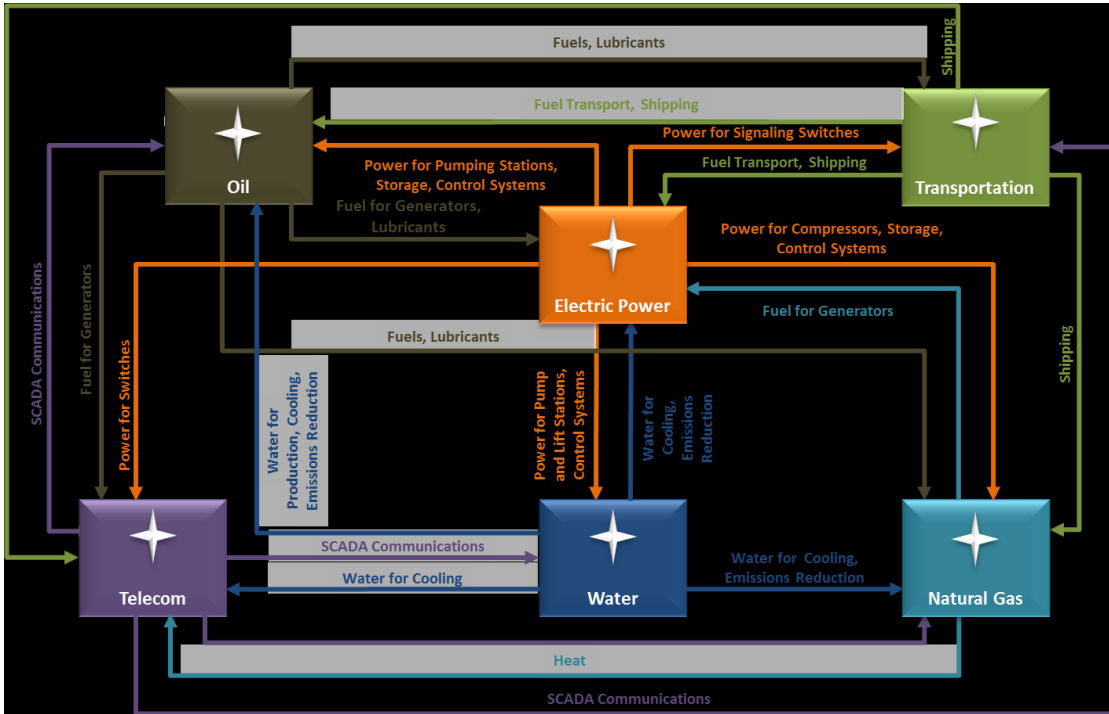
Banking and Finance

Financial Losses

IEEE Journal- Dec 2001
Identifying, Understanding, and
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Critical Infrastructure Interdependencies-2

NIST Special Publication 1190
Community Resilience Planning Guide
For Buildings and Infrastructure Systems
Volume II
October 2015

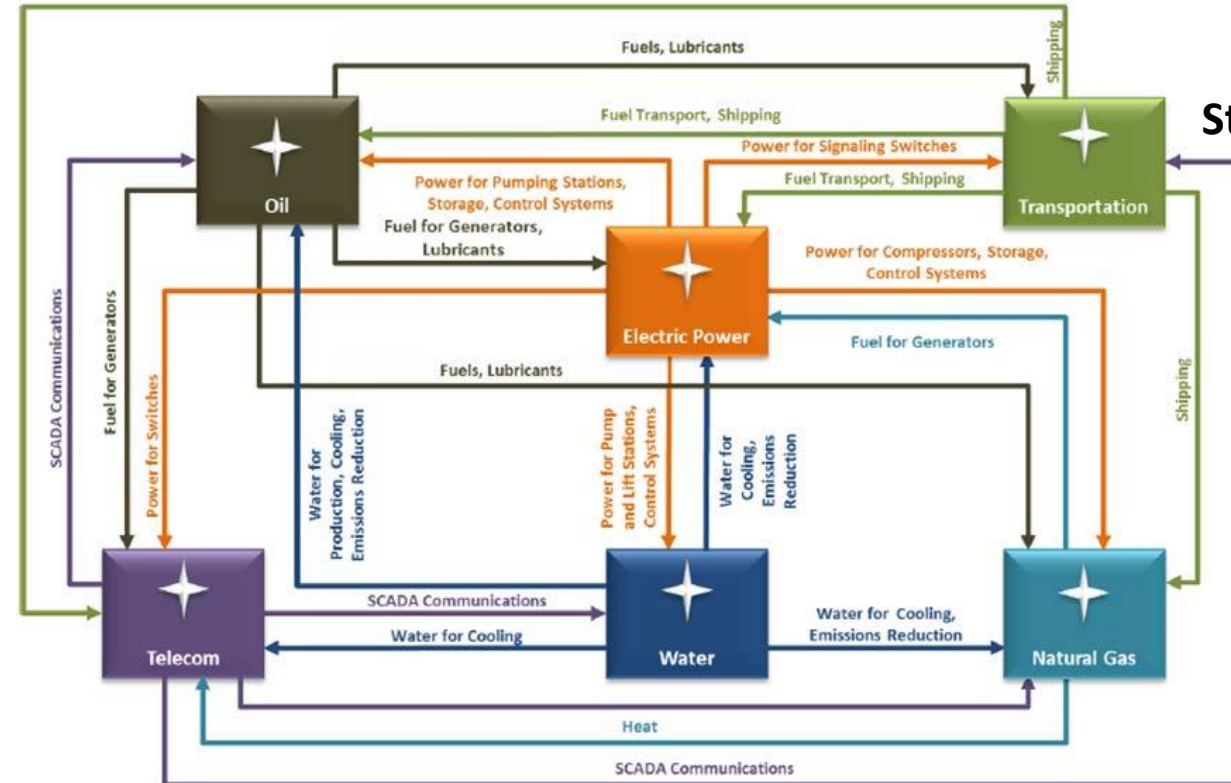


Critical Infrastructure Interdependencies-3



State Energy Resilience Framework
Global Security Sciences Division
December 2016

**J. Philips, M. Finster, J. Pillon,
F. Petit and J. Trail**



Critical Infrastructure Interdependencies-4

Incorporating Prioritization in
Critical Infrastructure Security
and Resilience Programs
Homeland Security Affairs 13, Article 7
(<https://www.hsaj.org/articles/14091>)

October 2017

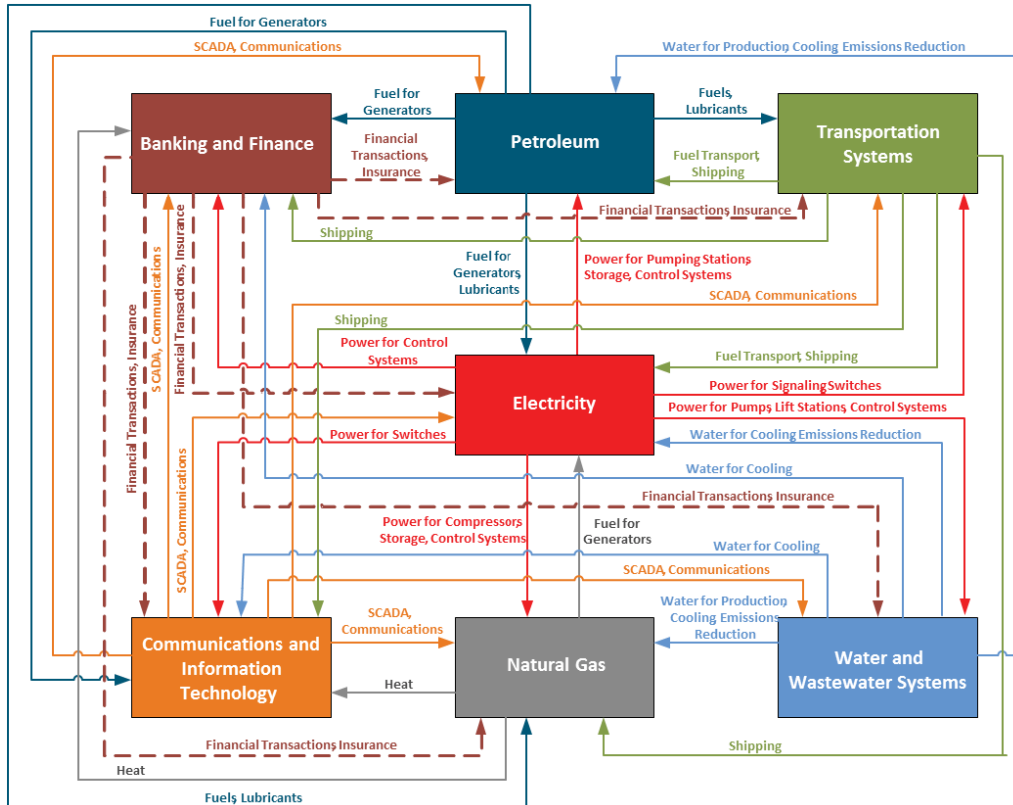
Duane Verner, Frederic Petit,
and Kibaek Kim



CENTER FOR HOMELAND
DEFENSE AND SECURITY
NAVAL POSTGRADUATE SCHOOL



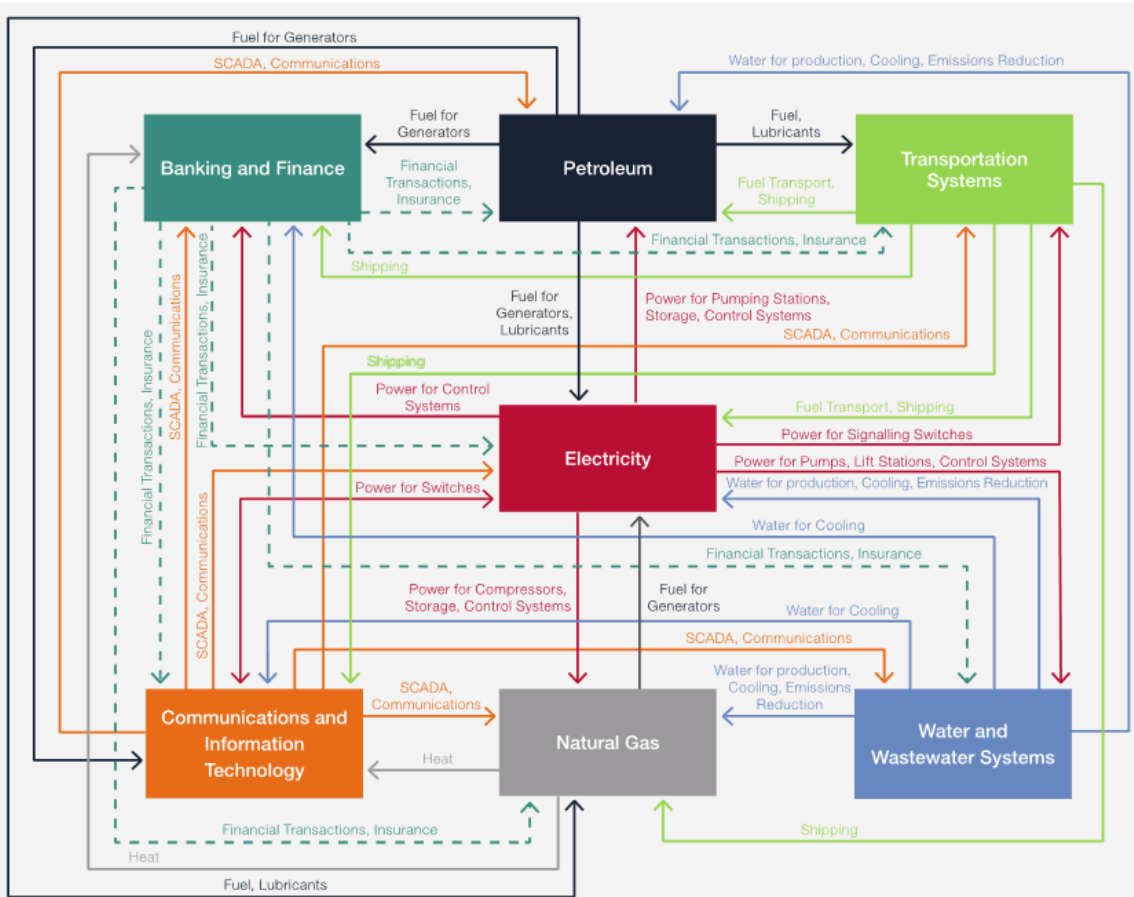
FEMA



Critical Infrastructure Interdependencies-5



NSW Critical Infrastructure
Resilience Strategy
Partner, Prepare, Provide
NSW Department of Justice | Office
of Emergency Management
2018



The Critical 5

- The Critical Five was established in 2012 to enhance information sharing and work on issues of mutual interest between Australia, Canada, New Zealand, the United Kingdom and the United States.
- One of the first efforts was to understand how each country addresses critical infrastructure as a basis for clearly articulating and communicating a common message on the value, meaning, and importance of critical infrastructure.
- “Forging a Common Understanding of Critical Infrastructure” published March 2014.
- “The Role of Critical Infrastructure in National Prosperity” published October 2015



Australia, Japan and United States Trilateral Partnership

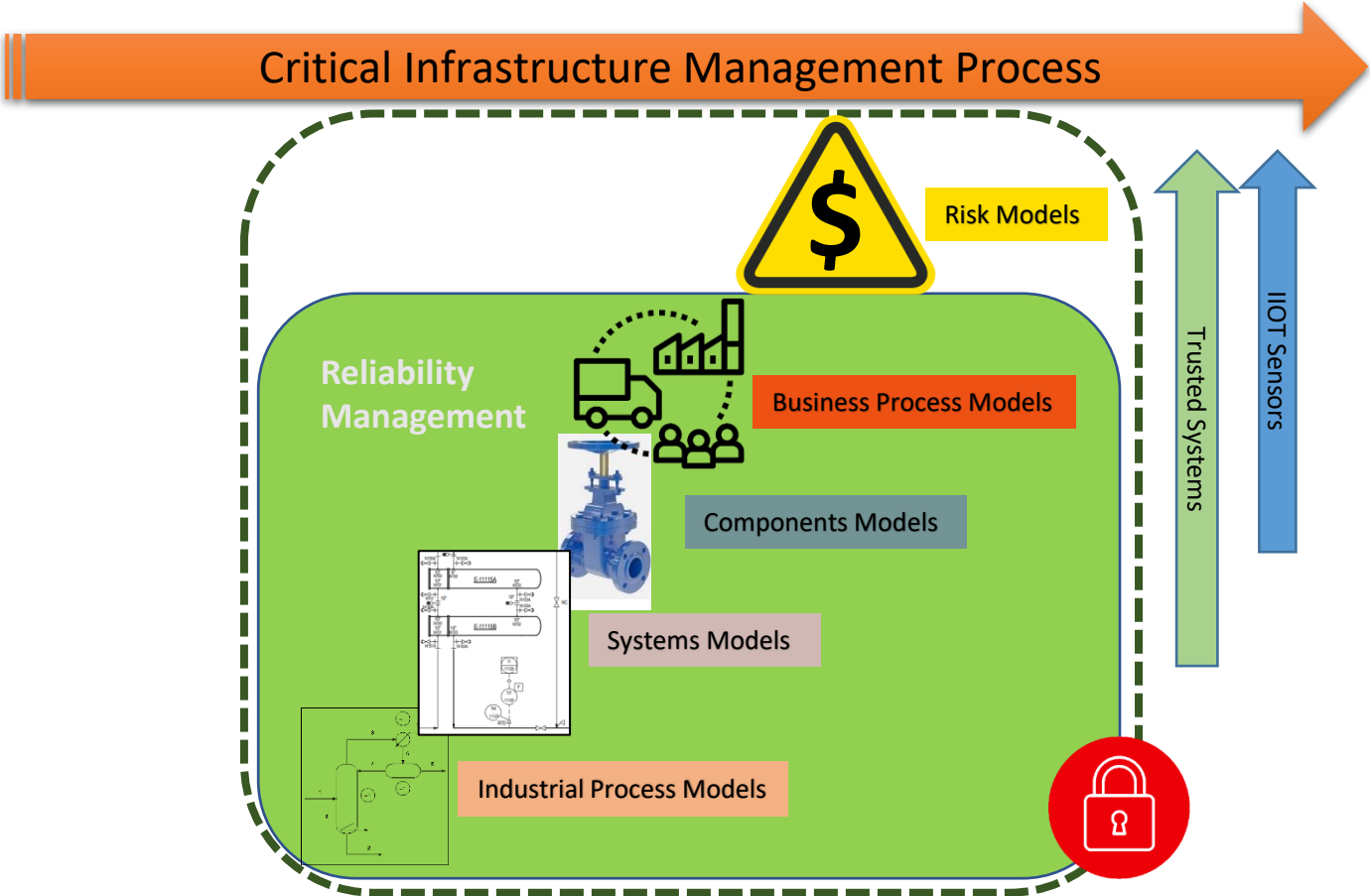
- Announced July 31, 2018
 - Australia: Minister for Foreign Affairs-The Hon Julie Bishop MP
 - Japan: Japanese Bank for International Cooperation
 - United States: United States Overseas Private Investment Corporation (OPIC)
- Indo-Pacific region
- Cooperation on Investment to:
 - Build infrastructure
 - Address development challenges
 - Increase connectivity
 - Promote economic growth



The Proposed Solution

- We propose a standardized approach to Model, Monitor and Manage the associated Processes, Systems, Components and Risks
- Use Supplier-neutral Standards for Digitalization and Interoperability
- Cooperation between Public and Private Sectors and Academia
- Cooperation with NIST, DOE, NERA and others
- Results flow to ISO

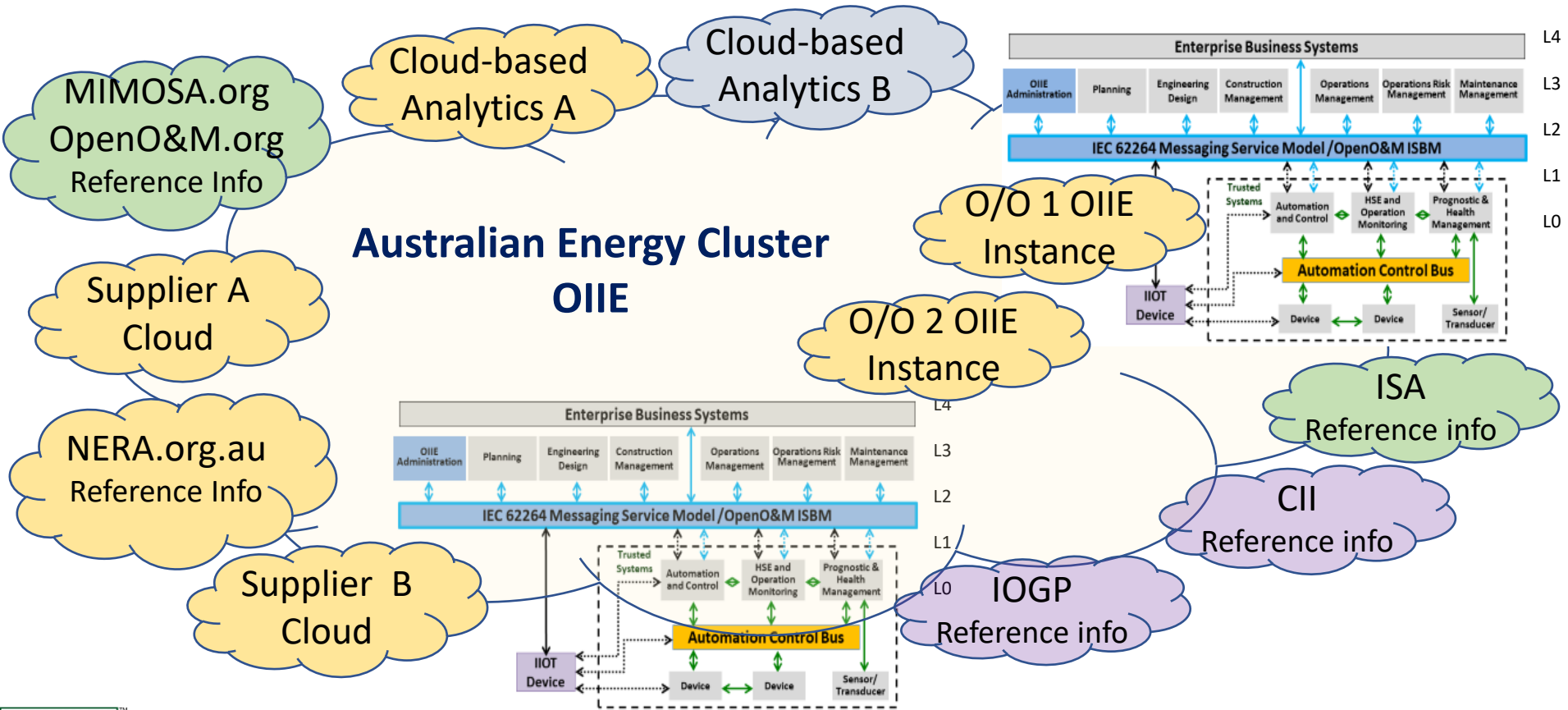
Critical Infrastructure Risk Management



OIIE Australia Working Group Purpose and Relevance

Capture Australian Industry Requirements
and Priorities for OIIE

The Open Industrial Interoperability Ecosystem (OIIE) and ISO 18101 Australia Energy Sector OIIE Network (Subnet of AU Critical Infrastructure)



OIIE Australia Working Group Purpose and Relevance

Structure and Relationship to NERA Priorities,
FEnEx CRC, and MIMOSA Ecosystems

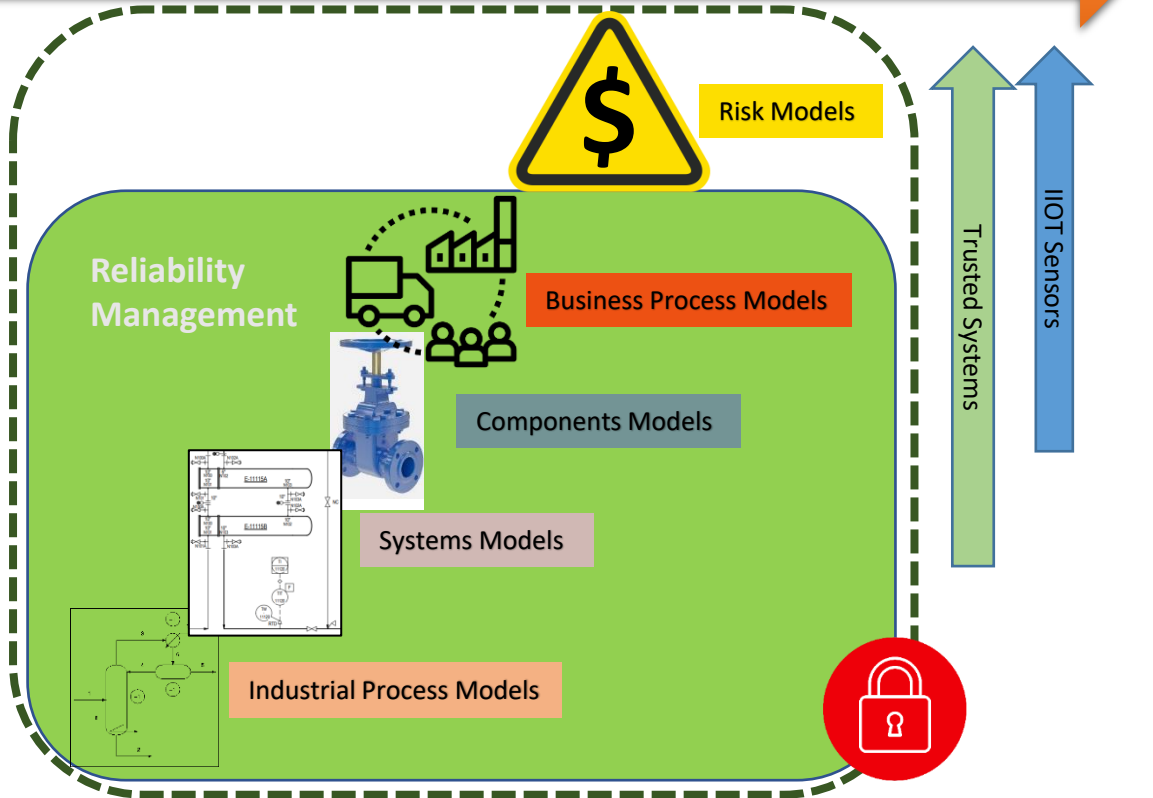
NERA Knowledge Priorities and OIIE Alignment

- ✓ Develop new markets and business models
- ✓ Enhance skills and business capability to support automation and digitisation
- ✓ Build talent and enable effective collaboration and innovation
- Pursue a sustainable and low carbon energy future
- Understand and unlock Australia's resource base
- ✓ Commercialise technology and research
- ✓ Enhance efficiency in operations and maintenance
- ✓ Optimise the regulatory framework and reputation

Critical Infrastructure Risk Management & Regulatory Framework

Critical Infrastructure Management Process

- Regulatory Framework should leverage the same IT/IM Framework as other risks.
- Integrated approach for risk management should require fewer regulations and be easier to implement, monitor and manage.
- OIIE will provide a consistent framework to model, monitor and manage all industrial risks.





**FUTURE
ENERGY
EXPORTS**

Cooperative Research Centre

FEnEx CRC Introduction

Markus Stumptner

April 2020

Future Energy Exports CRC: *Vision & Objectives*



FUTURE
ENERGY
EXPORTS
Cooperative Research Centre

1. Innovation for higher levels of efficiency in the LNG industry
2. Grow Australia's hydrogen export industry
3. Unlock value with interoperable digital technologies



*Future-proofing Australia's energy exports
through industrial-scale innovation*

Current Partner Organisations:

Australian-Based Global Companies



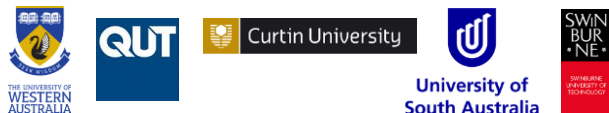
Australian Companies



Government, Regulatory & Peak Bodies



Australian Research Capabilities



International Collaborators



\$127M

Total partner contributions

\$39M

Committed partner cash

183

Committed in-kind FTEs

\$40M
Federal Funding
Approved 3/2020

Unique Infrastructure: Industry 4.0 Testlab

Digital Interoperability for the Energy & Resources Sector

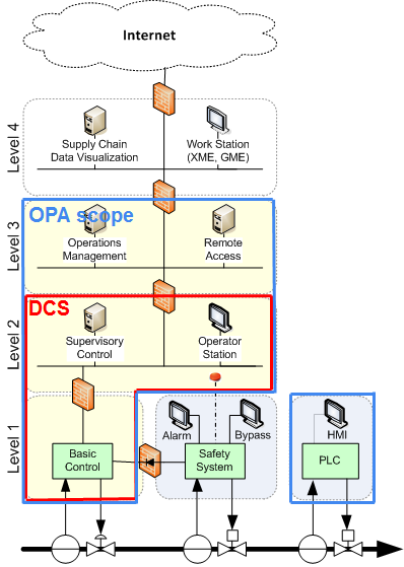


November 2017: UWA, UniSA, Swinburne receive Siemens software grant (\$450 million value) to support I4.0 Testlabs

December 2018: UWA, UniSA, Swinburne each awarded \$1 million from Dept of Industry to establish I4.0 Testlabs.

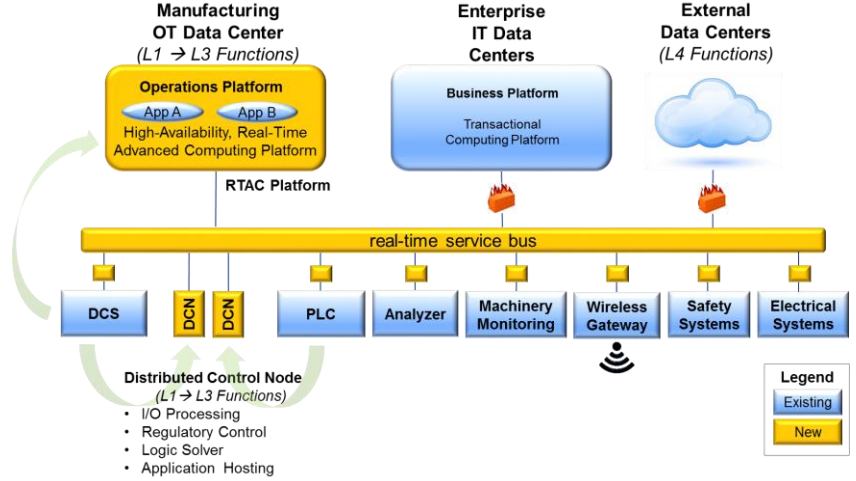
UWA TestLab for Digital Interoperability integrated with LNGFF

Current DCS architecture



- Proprietary hardware, interfaces and networks
- Vendor-controlled software access
- Security not intrinsic: bolted-on, not built in

OPA reference architecture



- Industry standard interfaces and networks
- Interoperable hardware
- Open software access
- Designed-in security

Images courtesy of ExxonMobil

Structure



Chair



CEO



COO



Research Director

RP1: Efficient LNG Value Chains



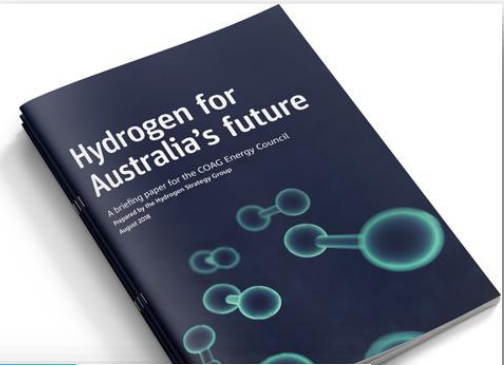
RP2: Hydrogen Exports & Value Chains



RP3: Digital Technologies & Interoperability



RP4: Market & Sector Development



Research Program 3: Digital Technologies & Interoperability

CHALLENGE

Digital technologies have tremendous potential but need validation and must be interoperable if they are to deliver value. Successful deployment of interoperable digital technologies will:

- Increase throughput & efficiency from advanced sensors, data and digital twin validation
- Reduce maintenance & inventory costs through reliable predictions of equipment failure
- Reduce costs of DCS upgrades & inefficient decision processes via interoperable systems

PROSPECTIVE PROJECTS

- Interoperability standards for I4.0 systems
- Self-tuning advanced process control
- Reliable remote operations
- Digital twins for asset management & robotic infrastructure monitoring
- Reduced spares inventories and downtime



**FUTURE
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Cooperative Research Centre

NERA

NATIONAL
ENERGY RESOURCES
AUSTRALIA

Creating connections for growth



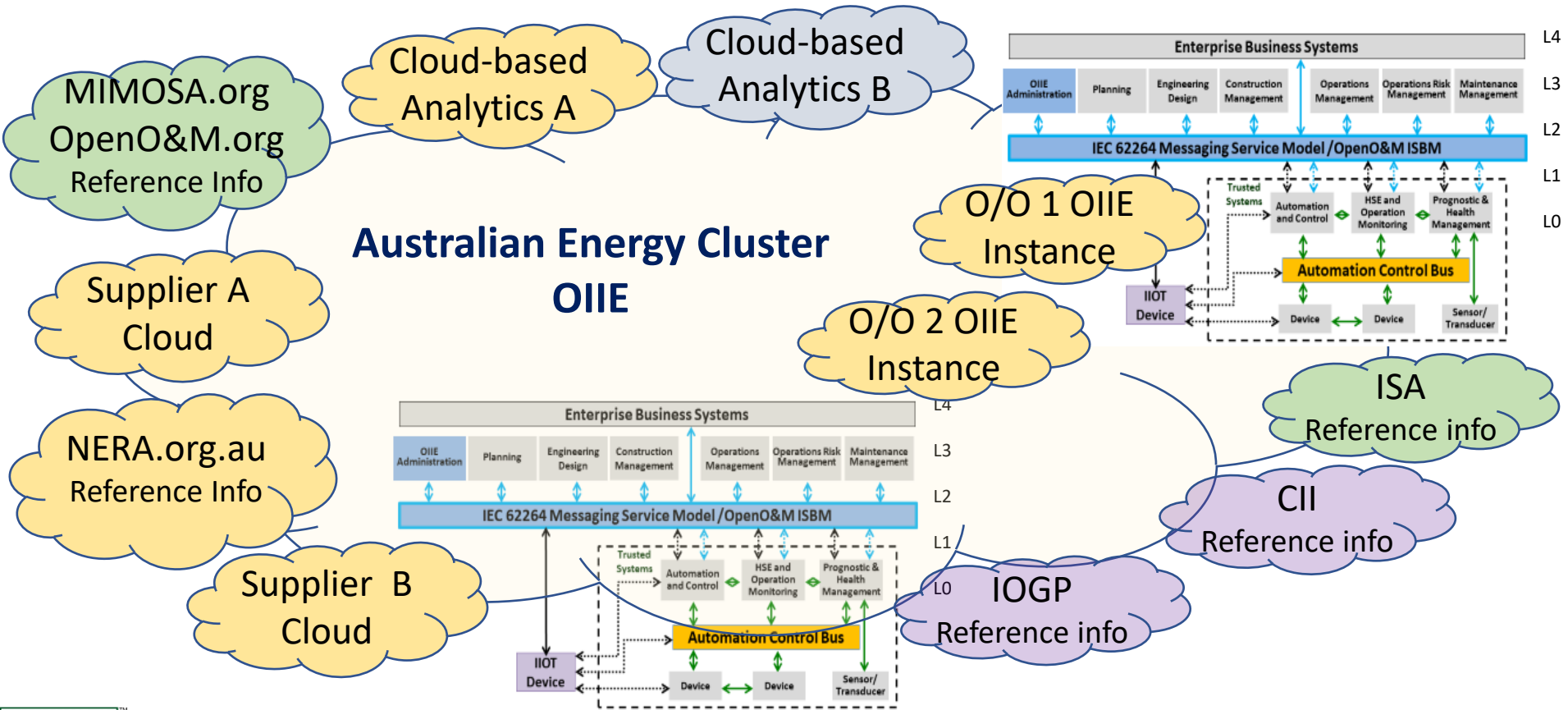
THANK YOU



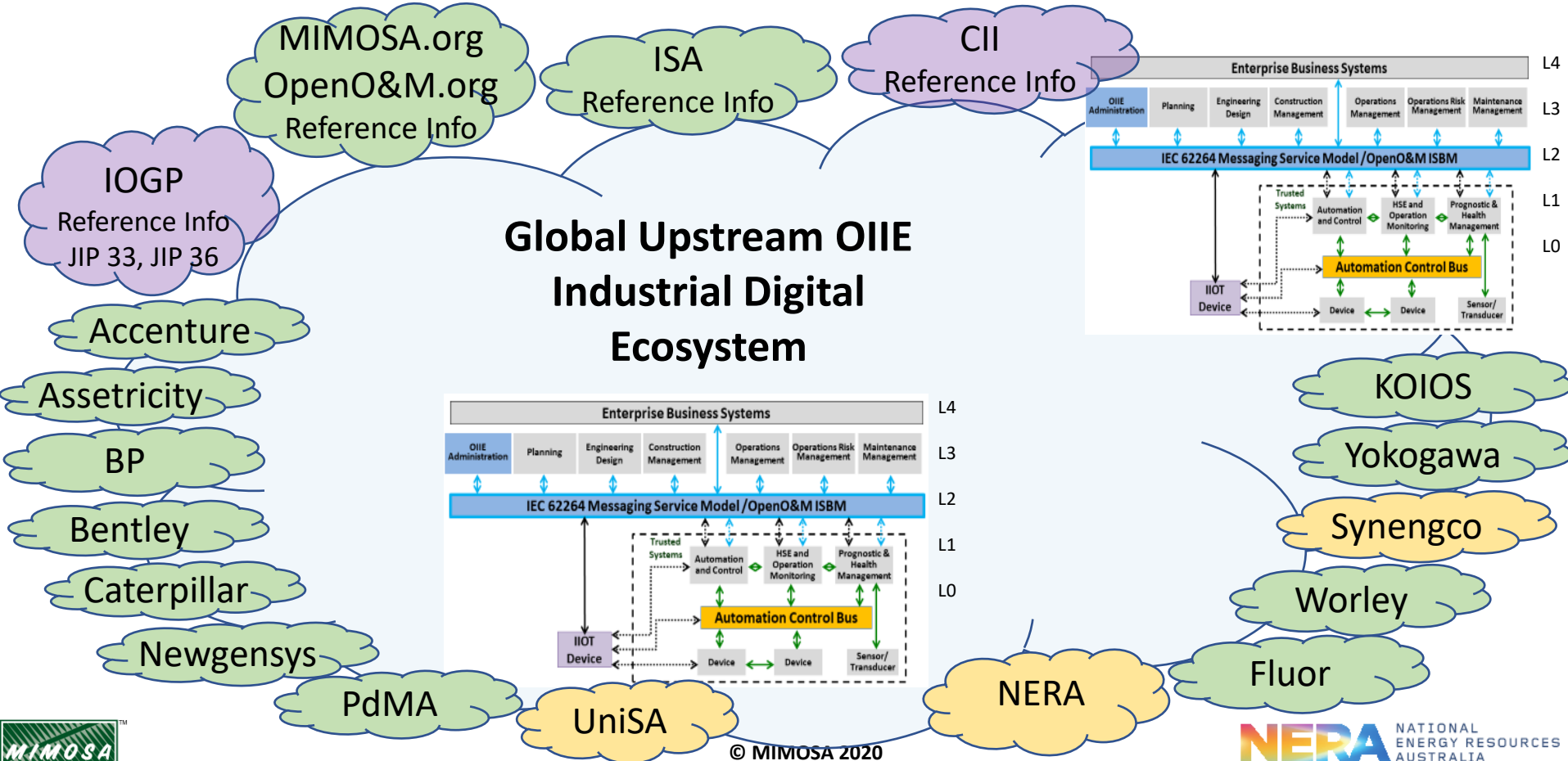
Australian Government

Australian Research Council

The Open Industrial Interoperability Ecosystem (OIIE) and ISO 18101 Australia Energy Sector OIIE Network (Subnet of AU Critical Infrastructure)



The Open Industrial Interoperability Ecosystem (OIIE) and ISO 18101 MIMOSA Members connecting with the OIIE



OIE Australia Working Group

BREAK TIME