

TRANSPORT ENERGY WATER TELECOMMUNICATIONS

infrastructure report card 2010
South Australia



ENGINEERS
AUSTRALIA

APPENDICES

Appendix A: Rating methodology

The rating methodology is designed to provide a standardised approach to developing evidence-based rating of infrastructure that is credible, defensible, and explainable.

The Report Card's rating scheme is predicated on the principle that infrastructure policy, regulation, planning, provision, operation and maintenance are optimal if the infrastructure meets the current and future needs of the community, economy and environment in terms of sustainability, effectiveness, efficiency and equity.

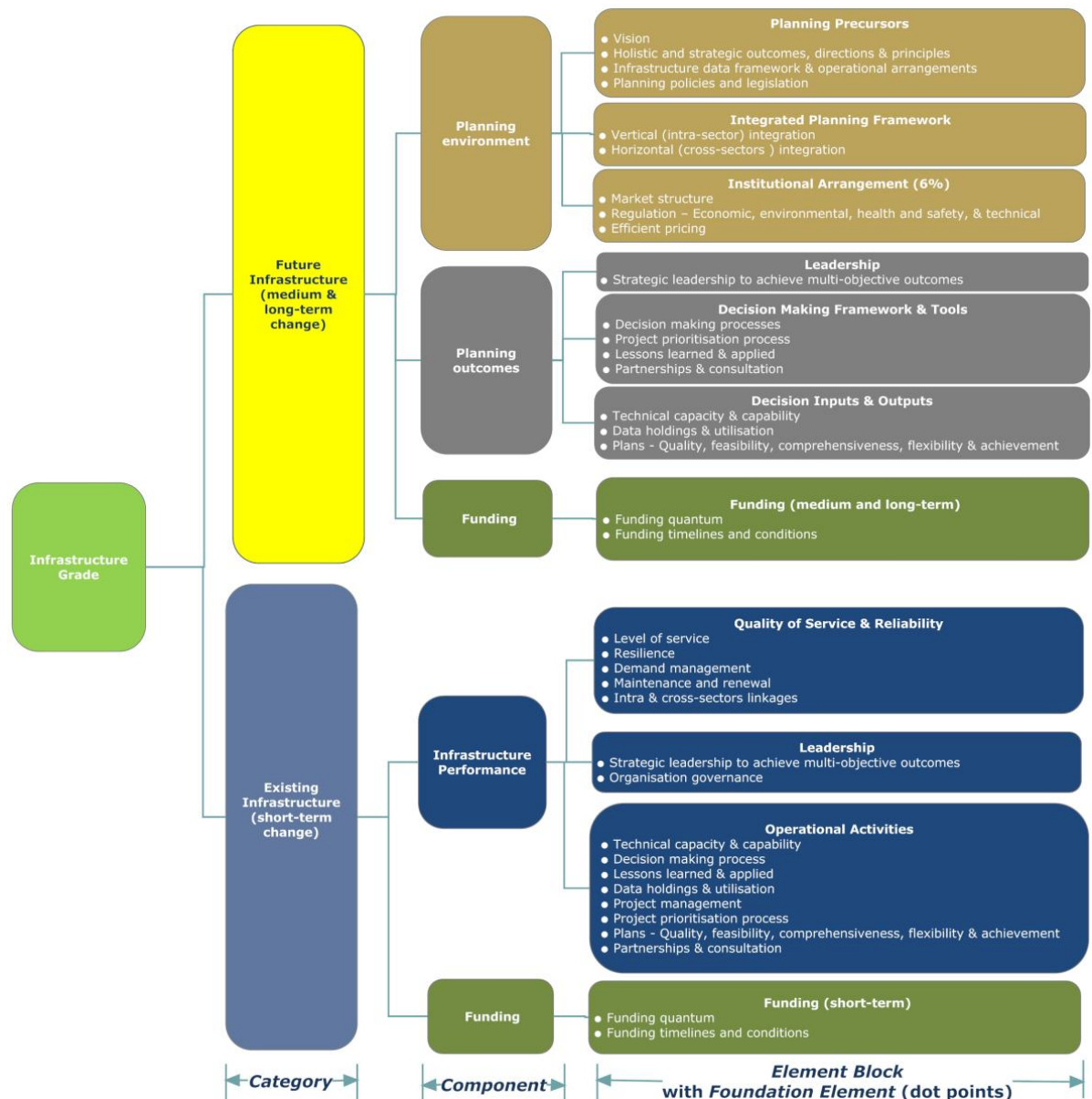
The infrastructure rating principles are based on the view that:

1. Infrastructure needs to be optimised in a systems context that requires:
 - ◆ complementarity in national, State/Territory and local government decisions
 - ◆ best-practice governance arrangements across the infrastructure policy, regulation, planning, provision, operation and maintenance activities
 - ◆ competitive and efficient markets (which includes infrastructure reflecting the true cost of provision, including externality costs and benefits)
 - ◆ a minimum set of sector legislation, regulation and standards
 - ◆ the efficient use of existing infrastructure and resources (requires long-term focus on maintenance, renewals and demand management)
 - ◆ a sustainability approach, which gives due regard to economic, social and environmental factors
 - ◆ planning that is based on data, evidence and informed decision-makers working in partnership with stakeholders.
2. Infrastructure should be planned, designed, built, operated and maintained in a sustainable, cost-effective, efficient and equitable manner over its life-cycle, which is typically 30 to 100 years depending on the infrastructure.
3. Decisions on infrastructure need to recognise that it both shapes and is shaped by the social, economic and environmental objectives set by the community.
4. Infrastructure decisions should balance the costs and benefits on the economy, society and environment by simultaneously optimising the following objectives:
 - ◆ economic growth, efficiency and effectiveness
 - ◆ health, safety and security
 - ◆ access and social justice
 - ◆ environmental responsibility
 - ◆ liveability, connectivity and amenity.
5. Infrastructure should be provided by both the public and private sectors to optimise taxpayer and infrastructure stakeholder best value.
6. Governments and infrastructure organisations should have the relevant skills to effectively oversee the provision of infrastructure, whether the actual infrastructure policy, regulation, planning, provision, operation and maintenance are done by the public or private sector.
7. Infrastructure decisions should reflect current and anticipated challenges, such as demographic shifts, ageing, climate change adaptation, greenhouse gas mitigation and resilience.
8. Infrastructure decisions should be accountable and transparent.

Rating scheme

The rating scheme is based on a cascading structure that details, at various levels of granularity, the key elements deemed to be essential to optimal infrastructure policy, regulation, planning, provision, operation and maintenance.

The scheme has two high level *Categories* – future infrastructure and existing infrastructure. For each of these, there are three *Components*, which further divide into *Element Blocks* and finally *Foundation Elements*. This is illustrated in the figure below.



Rating scale

Ratings given are based on the scale in the table below:

Table: Rating scale

Letter grade	Designation	Definition*
A	Very good	Infrastructure is fit for its current and anticipated future purposes
B	Good	Minor changes required to enable infrastructure to be fit for its current and anticipated future purposes
C	Adequate	Major changes required to enable infrastructure to be fit for its current and anticipated future purposes
D	Poor	Critical changes required to enable infrastructure to be fit for its current and anticipated future purposes
F	Inadequate	Inadequate for current and anticipated future purposes

* Defined as infrastructure meeting the current and future needs of the community, economy and environment in terms of sustainability, effectiveness, efficiency and equity.

Appendix B: Units and acronyms

Units

J	Joule, a unit of energy
W	Watt (1W = 1 joule/second), a unit of power
Wh	watt-hour (1Wh = 3600J), a unit of electricity energy
V	Volt, a unit of voltage
l	Litre, a unit of volume

Prefixes

m	milli, meaning 10^{-3}
k	kilo, meaning 10^3 (thousand)
M	mega, meaning 10^6 (million)
G	giga, meaning 10^9 (billion)
T	tera, meaning 10^{12} (trillion)
P	peta, meaning 10^{15} (quadrillion)

Acronyms

ACCC	Australian Competition and Consumer Commission
AEMO	Australian Energy Market Operator
AEMC	Australian Energy Market Commission
AER	Australian Energy Regulator
ARTC	Australian Rail Track Corporation
BITRE	Bureau of Infrastructure, Transport and Regional Economics
CBD	Central Business District
COAG	Council of Australian Governments
CPRS	Carbon Pollution Reduction Scheme
DIRN	Defined Interstate Rail Network
DITRDLG	Department of Infrastructure, Transport, Regional Development and Local Government, formally DOTARS
ESCOSA	Essential Services Commission of South Australia
ESIPC	Electricity Supply Industry Planning Council
EPA	Environment Protection Authority
GPG	Gas power generation
IRI	International Roughness Index
ITS	Intelligent Transport Systems
KPI	Key Performance Indicator
LNG	Liquefied Natural Gas
LPG	Liquid Petroleum Gas
MAIFI	Momentary Average Interruption Frequency Index
MRET	Mandated Renewable Energy Target (scheme)
MW	Megawatts
NEM	National Electricity Market
NWC	National Water Commission
NWI	National Water Initiative
RET	Renewable Energy Targets
SAIDI	System Average Interruption Duration Index
SAIFI	System Average Interruption Frequency Index
TEU	Twenty-foot Equivalent Unit (container)
WWTP	Wastewater treatment plant

Appendix C: Glossary

Roads

Road infrastructure: Road infrastructure consists of:

- ▶ the road pavement—the structure that carries traffic
- ▶ other structures—bridges, pathways, barriers, walls
- ▶ roadside assets—including engineering features such as traffic signs and guideposts, cuttings and embankments, and environmental features such as vegetated areas situated within the boundaries of the road reserve
- ▶ roadside traffic signs—which regulate speed, warn of hazards and provide information
- ▶ pavement markings—designating the edges of the road and traffic lanes and providing directional and warning information.

Road maintenance: Pavement maintenance can be divided into the following classes:

- ▶ routine maintenance which is reactive, addressing minor defects. This includes fixing potholes and rough patches on the pavement.
- ▶ periodic maintenance to resurface and reseal the pavement to prevent water infiltrating the pavement structure, to address some aspects of surface roughness and to improve the traction of the pavement surface.
- ▶ rehabilitation which involves a more significant treatment to improve the structural condition of the pavement and bring the surface back to within an acceptable level of roughness and traction.

Rail

Above rail: Those activities required to provide and operate train services such as rolling stock provision (ie. trains, carriages), rolling stock maintenance, train crewing, terminal provision, freight handling and the marketing and administration of the above services.

Below rail: Those activities associated with the provision and management of rail infrastructure, including the construction, maintenance and renewal of rail infrastructure assets, and the network management services required for the safe operation of train services on the rail infrastructure, including train control services and the implementation of safe working procedures.

Broad gauge: The distance of 1,600mm (5'3") between two rails.

Narrow gauge: The distance of 1,067mm (3'6") between two rails.

Rail infrastructure: Consists of both above and below rail infrastructure.

Standard gauge: The distance of 1,435mm (4'8½") between two rails.

Ports

Berth: The wharf space at which a ship docks. A wharf may have two or three berths, depending on the length of incoming ships.

Break Bulk Cargo: Cargo that is not containerised, e.g. timber, paper, steel, vehicles, vehicle components.

Common-User Facility: A port facility not dedicated to a particular use and available for short-term hire.

Container terminal: A specialised facility where ocean container vessels dock to discharge and load containers.

Container: A metal container designed for cargo transport. Most containers are either 20 feet (six metres) or 40 feet (twelve metres) long and referred to 20 TEU or 40 TEU respectively.

Dead Weight Tonnage (DWT): Maximum weight of a vessel including the vessel, cargo and ballast.

Pilot: A licensed navigational guide with thorough knowledge of a particular section of a waterway, whose occupation is to steer ships along a coast or into and out of a harbour. Local pilots board the ship to advise the captain and navigator of local navigation conditions.

Stevedores: Labour management companies that provide equipment and hire workers to transfer cargo between ships and docks.

Twenty Foot Equivalent Unit (TEU): A unit of measurement equal to the space occupied by a standard twenty foot container.

Airports

Airport Master Plan: Airport Master Plans are a requirement of the *Airport Acts 1996* and are prepared by major Australian airports every five years to provide a clear direction for the growth and development of the airport.

Airport Operator: The airport lessee or owner.

Curfew: A restriction on flights that can take off or land from specified airports at designated times.

General aviation: All civil operations other than Regular Public Transport operations.

Leased federal airports: The 21 Australian airports covered by the *Airports Act 1996* where the Airport Operators lease the airport land from the Australian Government.

Non-aeronautical developments: Non-aviation commercial developments, such as retail outlets and office buildings, on airport sites.

Regular Public Transport operation (RPT): An operation of an aircraft for the purposes of an air service that is provided for a fee payable by persons using the service, is conducted in accordance with fixed schedules to or from fixed terminals over specific routes, and is available to the general public on a regular basis (synonymous with 'scheduled services').

Water

Annual Exceedance Probability (AEP): The statistical likelihood of occurrence of a flood of a given size or larger in any one year, usually expressed as a percentage.

Carrier (irrigation): A conduit for the supply or drainage of water. The key types are lined channel (an earthen channel lined with a low permeability material), unlined channel (an earthen open channel without internal lining), natural waterway (a stream or other naturally-formed watercourse), and pipe (a closed conveyance or carrier regardless of material, size or shape that conveys water, typically for supply service).

Catchment: An area of land where run-off from rainfall goes into one river system.

Consumptive use: The use of water for private benefit consumptive purposes including irrigation, industry, urban, stock and domestic use.

Effluent: Treated sewage that flows out of a sewage treatment plant.

Greywater: Water from the kitchen, laundry and bathroom. It does not include toilet waste.

Headworks: Dams, weirs and associated works used for the harvest and supply of water.

Indirect Potable Reuse (IPR) water: Recycled water used as a source of potable water, typically by injecting it into a water reservoir.

Integrated urban water cycle management: The integrated management of all water sources so that water is used optimally within a catchment resource, in a state and national policy context. This approach promotes coordinated planning, sustainable development and management of the water, land and related resources linked to urban areas, and the application of water sensitive urban design principles.

Irrigation: The artificial application of water to land for the purpose of agricultural production.

Potable: Suitable for drinking.

Recycled water: Water derived from sewerage systems or industry processes, treated to a standard appropriate for its intended use.

Reticulation: The network of pipelines used to take water into areas of consumption; includes residential districts and individual households.

Run-off: Precipitation or rainfall that flows from a catchment into streams, lakes, rivers or reservoirs.

Sewage: The waste and wastewater discharged into sewers from homes and industry.

Sewerage: Infrastructure system for the collection, removal, treatment and disposal of sewage.

Stormwater: Urban rainfall that runs off roofs, roads and other surfaces where it flows into gutters, streams, rivers and creeks or is harvested.

Third pipe systems: A reticulated pipe network that distributes recycled water for use in gardens, etc.

Trade waste: Industrial and commercial liquid waste discharged into the sewerage system.

Urban runoff: Water deposited by storms or other sources that passes through stormwater drains or is harvested. Urban runoff may contain substantial level of pollutants such as solid wastes, petroleum-based compounds, heavy metals, nutrients, pathogens, sediment, organic chemicals, pesticides, insecticides and other lawn care and cleaning materials.

Wastewater: Water that, following capture or use by the community, does not currently have a form of beneficial recycling; includes greywater, sewage and stormwater.

Water allocation: The specific volume of water allocated to water access entitlements in a given season, defined according to rules established in the relevant water plan.

Water businesses: Organisations charged with supplying water to towns and cities across the State for urban, industrial and commercial use. They administer the diversion of water from waterways and the extraction of groundwater.

Water Sensitive Urban Design (WSUD). The integration of urban planning with the management, protection and conservation of the urban water cycle, ensuring that urban water management is sensitive to natural hydrological and ecological processes. This involves the integration of water cycle management into urban planning and design so that it minimises the risks to the water bodies that supply water or receive the stormwater or recycled water.

Wholesale market: A competitive market where a commodity such as water can be sought from multiple suppliers.

Electricity

Carbon Pollution Reduction Scheme (CPRS): The CPRS is the Australian Government's emissions trading scheme which has two distinct elements, the cap on carbon pollution and the ability to trade.

Contingency events: Events that affect the power system's operation. Their categories are:

- ▶ credible contingency events, events whose occurrence is considered 'reasonably possible' in the circumstances. For example, the unexpected disconnection or unplanned reduction in capacity of one operating generating unit, or the unexpected disconnection of one major item of a transmission plant.
- ▶ non-credible contingency event, events whose occurrence is not considered 'reasonably possible' in the circumstances. Typically, a non-credible contingency event involves simultaneous multiple disruptions, such as the failure of several generating units at the same time.

Demand-side management (DSM): The planning, implementation and monitoring of utility activities designed to encourage consumers to modify patterns of electricity usage, including the timing and level of electricity demand.

Generator (Baseload and peaking): Baseload generators provide the continuous ongoing electricity supply while peaking generators provide supplemental power to meet energy demand peaks.

Interconnector: Transmission line/s that connects transmission networks in adjacent regions.

Load shedding: Reducing or disconnecting load from the power system either by automatic control systems or under instructions from the AEMO.

Reliability of supply: The likelihood of having sufficient capacity (generation or demand-side response) to meet demand.

Reliability Standard: The requirement that there is sufficient generation and bulk transmission capacity so that, over the long term, no more than 0.002% of the annual energy of consumers in any region is at risk of not being supplied, i.e. the maximum USE is 0.002%.

Unserviced energy (USE): The amount of energy that cannot be supplied because there are insufficient supplies (generation) to meet demand.

Gas

Coal seam methane (CSM): Methane absorbed into the solid matrix of coal beds, and then extracted.

Linepack: Gas maintained in a gas transmission line to maintain pressure but also as a buffer to provide an uninterrupted flow of gas to customers.

Liquefied Natural Gas (LNG): Natural gas that has been converted temporarily for ease of storage or transport. LNG takes up about 1/600th the volume of natural gas in the gaseous state.

Natural gas: Gaseous fossil fuel consisting primarily of methane but including significant quantities of ethane, butane, propane, carbon dioxide, nitrogen, helium and hydrogen sulphide.

Unaccounted for gas (UAFG): The difference between metered injected gas supply and metered and allocated gas at delivery points. UAFG comprises gas losses, metering errors, timing, heating value error, allocation error and other factors.

Telecommunications

2G: Second generation mobile telecommunications, digital mobile service that provides voice communications and a low level of data transmission.

3G: Third generation mobile telecommunications, digital mobile service that provides voice communications, high-speed data transmission and Internet access.

Asymmetrical digital subscriber line (ADSL): A technology that converts telephone lines to paths for high-speed data services; enhancements to this technology include ADSL2 and ADSL2+.

Backhaul networks: Backhaul transmission networks connect the central point of an access network (such as telephone exchange, HFC hub or mobile tower) to the rest of the network. Backhaul transmission is provided on either optical fibre or microwave. The majority of backhaul transmission networks are provided by Telstra and Optus with other operators including AAPT, Amcom, Ergon, Nextgen, PIPE Networks, Primus, QLD Rail and Soul. While there is competition in backhaul networks between all capitals and within many inter-exchange routes, many regional routes are served by Telstra alone.

Bandwidth: The maximum data transmission rate, measured in bits per second (bps)

Broadband: 'Always on' high data speed connection. Technologies used to deliver broadband include ADSL, HFC, fibre-optic cable, wireless and satellite.

Broadband over power line (BPL): A communications technology that uses electricity networks for the transmission of data, voice and video.

Customer Access Network (CAN): The link between the telephone exchange and the consumer.

Code division multiple access (CDMA): A digital standard that separates calls from one another by code.

Digital subscriber line (DSL): A transmission technology that enables digital data services. DSL describes several technologies including ADSL, ADSL2 and ADSL2+.

DSLAM (Digital Subscriber Line Access Multiplexer). Technology located at exchanges or in roadside cabinets that take the copper lines from a customer premises and convert signals on/off them into a high speed pipeline to the internet.

Fibre-to-the-x (FTTx): A generic term for the configuration of a broadband network that uses optical fibre to replace all or part of the usual metal connection to the consumer.

- ▶ (FTTB) Fibre-to-the-building: fibre reaches the boundary of the building.
- ▶ (FTTH) Fibre-to-the-home: fibre reaches the boundary of the living space.
- ▶ (FTTK) Fibre-to-the-kerb: fibre reaches typically within 300m of the consumer's premises.
- ▶ (FTTN) Fibre-to-the-node: fibre reaches a street cabinet typically further than 300m from the consumer's premises.

Global system for mobile communication (GSM): A digital cellular standard operated by Telstra, Optus and Vodafone.

Hybrid fibre coaxial cable (HFC): A telecommunication connection that consists of optical fibre on major routes and coaxial cable connections to consumers.

Long Term Evolution (LTE). LTE is an advanced mobile telecommunications standard and considered a pre-4G system.

Microcell: An antenna and associated box that supplements the mobile network in heavy usage areas. A microcell may minimise the need for a larger facility.

Public switched telecommunications network (PSTN): The network of the world's public circuit-switched telephone networks.

Speed: Typical speeds are kilobits per second (kbps) and Mbps (Megabits per second).

Telecommunication facility: Any part of the infrastructure of a telecommunications network; or any line, equipment, apparatus, tower, mast, antenna, tunnel, duct, hole, pit, pole or other structure or thing used, or for use, in or in connection with a telecommunications network.

Voice over internet protocol (VoIP): A protocol for transmitting voice over data networks, also known as 'Voice over DSL'.

WiMAX (Worldwide Interoperability for Microwave Access). A wireless digital communications system which can provide broadband wireless.

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