



LES BRAND

Director and Principal Consultant

PERSONAL DETAILS:

Name: Leslie (Les) Neil Brand
Date of Birth: 23 October 1971
Nationality: Australian
Languages: English
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PROFESSIONAL QUALIFICATIONS:

- Bachelor of Engineering (Electrical) with First Class Honours, University of Western Australia, 1993.
- Bachelor of Commerce (Management), University of Western Australia, 1993.

PROFESSIONAL AFFILIATIONS:

AUSTRALIA

- Fellow, Engineers Australia (FIEAust)
- Chartered Professional Engineer, Engineers Australia (CPEng)
- Registered Professional Engineer of Queensland (RPEQ)
- National Professional Engineers Register, Australia (NPER) - Electrical

INTERNATIONAL

- Member, Institute of Electrical and Electronics Engineers
- Registered APEC Engineer in Electrical Engineering (Australia)
- Individual Member, CIGRE
- Convener of Cigre AP (Australian Panel) B4 Panel "HVDC and Power Electronics"
- Convener of Cigre Working Group B4.63 "Commissioning of VSC HVDC Schemes"
- Convener, IEC TC99 / JMT 7 – IEC TS 61936-2 "Power installations exceeding 1kV a.c. and 1.5kV d.c. – Part 2: d.c."

EMPLOYMENT SUMMARY:

2015 – Present	Director and Principal Consultant Amplitude Consultants Pty Ltd
2013- 2015	General Manager – Power Networks and HVDC, Asia/Australia Power Systems Consultants Pty Ltd (Australia)
2011- 2013	CEO, Transmission Lines and HVDC Manager Power Systems Consultants Pty Ltd (Australia)

2010 – 2011	Electrical Engineering Manager Power Systems Consultants Pty Ltd (Australia)
2008 – 2010	Operations Manager, Commissioning Engineer and Submarine Cable Installation Manager, Trans Bay Cable HVDC Project TBC Operations LLC (USA)
2006 – 2008	Director – Power Networks and Renewable Energy (Singapore) PB Power Asia (Singapore)
2004 – 2006	Manager, HV Networks Group PB Power (Brisbane)
2003 - 2004	Senior Electrical Engineer PB Power (Brisbane)
2002 – 2003	Manager – Operations, Maintenance and Trading TransÉnergie Australia
2000 – 2002	Project Manager - Murraylink HVDC Light Project TransÉnergie Australia
1999 – 2000	Project Engineer – Directlink HVDC Light Project NorthPower
1996 – 1999	Site Electrical Engineer – Pannawonica Robe River Mining Company
1996 – 1996	Electrical Project Engineer Robe River Mining Company
1993 – 1996	Graduate Engineer Western Power Corporation
1992 – 1993	Cadet Engineer (Part Time) Western Power Corporation

EXPERIENCE DETAILS:

HIGH VOLTAGE DIRECT CURRENT (HVDC):

- Owner's Engineer for the development of a proposed 600MW bipole VSC HVDC system, including converter stations, land and submarine cables, to connect to a remote wind farm. Included development of technical specification, addressing technical issues with vendors, developing scope for marine survey and draft marine cable repair plan.
- Front End Engineering Study and development of technical specification for proposed fire system in existing HVDC converter station.
- Investigation and root cause analysis of electrical issues associated with primary plant within an existing VSC converter station.
- Conceptual scope and development of regulatory paper for proposed control and protection system upgrade for HVDC VSC converter stations.
- Owner's Engineer for the replacement of 60MW VSC HVDC converter station, including development of technical specification, design review, witness of factory testing, site supervision and commissioning manager.
- Design review for alternative phase reactor cooling system for VSC HVDC converter stations.
- Owner's Engineer for retrospective installation of fire detection and suppression system in existing voltage source converter stations, including development of technical specification and design review.

- Development of detailed report for independent technical panel for HVDC options for proposed long distance transmission projects in Ireland, including development of HVDC options, techno-economic analysis of options and development of preferred options (Grid Link and Grid West projects, Ireland).
- Technical advisor to the developer of a proposed Voltage Sourced Converter (VSC) HVDC project in the USA.
- Independent assessment of commissioning test program and final commissioning test results to determine the adequacy of the commissioning program for a major HVDC project (confidential).
- Develop an O&M Integration Plan for incorporating a new HVDC facility into the existing organization of a transmission utility in Canada, including facilitation of stakeholder interviews, discussion workshops and presentation of final outcomes in Alberta, Canada.
- Investigation of and report on the scope and cost of UHVDC projects in China, including 800kV and 1,100kV.
- Detailed review of the costs determined at the feasibility stage of a proposed major HVDC project in Australia (confidential).
- Independent review of options for replacement of Directlink HVDC converter stations.
- Technical advisor in the investigation of the cause of tracking in HVDC phase reactors (confidential).
- Trans Bay Cable Project, San Francisco, USA - TBC is a 400MW HVDC Link from Pittsburg CA to San Francisco CA, utilizing the Siemens HVDC "Plus" VSC Technology.
 - Preparation for operations and maintenance of the Trans Bay Cable HVDC facility in San Francisco, CA. Tasks include development of manning and recruitment strategies, interfacing with CAISO and PG&E, development of operating and maintenance procedures and monitoring of design and manufacturing progress.
 - Management of TBC Operations LLC, a new Californian company under contract to operate and maintain the Trans Bay Cable HVDC Facility. The role included setting up the company structure, procurement of furniture, tools and equipment, establishment of credit rating, development of personnel and employment policies and development of quality procedures for the company.
 - Technical assistance to the EPC Contract, including reviewing technical documentation, factory inspections in Germany and Italy, review of critical studies including RAM Study, analysis of design to local OH&S requirements.
 - Witness of FPT/DPT testing of control and protection systems for the Siemens HVDC Plus system in Erlangen, Germany.
 - Recruitment, manning and training of the commissioning and operations team for the project.
 - Analysis of design studies and test reports for the primary and secondary equipment for the converter stations.
 - Development of all operational procedures and training program for personnel for ongoing operations of the facility.
 - Development of Operation and Maintenance budgets and documentation for regulatory rate case.
 - Commissioning Support – Supporting the Owner's Commissioning manager during commissioning of the converter stations, including witnessing of testing, technical

investigations, troubleshooting and management of the EPC Contract.

- Basslink HVDC, Tasmania-Victoria Australia Interconnector – Basslink is a HVDC Link from Victoria to Tasmania, Australia - Project Inspector Technical Services. Conventional HVDC project, including review of technical documentation, monitoring of construction and cable laying progress and certification of major project milestones. The role included:
 - Review all aspects of design, including study reports provided by the EPC Contractor.
 - Detailed investigation into damage incurred on the converter transformers.
 - Detailed investigation into the laying methodologies and issues associated with the installation of HV submarine cables.
 - Analysis and review of the reliability, availability and capacity issues for the link.
 - Witnessing of commissioning tests and investigation into major issues identified.
 - Analysis of all technical issues to determine cause and comment on proposed solutions.
 - Attendance to HVDC cable testing laboratory at CESI, Milan, Italy to witness cable type testing.
 - Review and analysis of submarine cable issues.
 - Development of detailed reports for completion of commissioning and project completion.
- Murraylink HVDC Facility, Victoria-South Australia Interconnector – Management of the operations and maintenance for the Murraylink facility and for trading of electrical energy. This included the development of all operating protocols with third parties including TNSPs, operating procedures, maintenance procedures, HV switching procedures and training of O&M staff for the new facility.
- Directlink HVDC Facility, NSW-QLD Interconnector – Technical support to O&M operations. Responsible for trading of electrical energy.
- Murraylink HVDC Facility, Victoria-South Australia Interconnector – Owner’s Commissioning Manager. Responsibilities included the development of commissioning schedules, procedures and liaison with NEMMCO and other third party control centres during system and transmission tests. Supervision and coordination of Owner and Contractor personnel during commissioning and review and analysis of commissioning test results.
- Murraylink HVDC Facility, Victoria-South Australia Interconnector – Owner’s Project Manager. Responsibilities included Owner’s representative to EPC Contractor, review of technical capabilities of the plant, quality, OH&S, environmental control and compliance of construction and design to Australian Standards and permit conditions during construction, negotiations with TNSPs on technical schedules for connection agreements, liaison with NEMMCO and TNSPs on technical requirements for connection to NEM, development of remote control “run-back” schemes in SA, Victoria and NSW.
- Murraylink HVDC Facility, Victoria-South Australia Interconnector – Owner’s Engineer for the design, installation and commissioning of the Monash Substation in South Australia, including a 6km 132 kV transmission line and 132 kV distance protection modifications to incorporate a “tee” section. Investigation into network augmentations, including the installation of current limiting reactors at Mildura, and protection modifications required on the 66 kV network in Victoria.
- Murraylink HVDC Facility and Directlink HVDC Facility – Manager Physical Trading. Works included the development and operation of NEM bidding systems, written submissions on NEM consultations affecting the operation of Market Network Service Providers (MNSP) in the NEM, development of daily trading strategies and opportunities for MNSPs. I developed a working knowledge of the NEC and NEM dispatch processes including the dispatch of MNSPs in the NEM.

- Directlink HVDC Facility, NSW-QLD Interconnector – Owner’s Commissioning Engineer. Responsibilities included the development of commissioning schedules, procedures and liaison with NEMMCO and other third party control centres during system and transmission tests, review and analysis of commissioning test results.
- Directlink HVDC Facility, NSW-QLD Interconnector – Senior Electrical Engineer for Owner. Responsibilities included the coordination and design of Directlink’s ControlNet interface to NEMMCO, technical input with the Owner’s and Contractors Engineering Departments, responsibility for Environmental, Health, Safety and Quality issues, all communications for the converter sites, development of safety and quality plans, and project management procedures including document and drawing controls for the project, witnessing and supervising the factory system testing (FST) of the control system in Sweden. Also included the determination of MNSP trading strategies, the development of O&M procedures and training of O&M staff.
- Directlink HVDC Facility, NSW-QLD Interconnector – Owner’s Engineer for the design, installation and commissioning of AC network augmentations, including a new substation at Bungalora in NSW, and extensions to the existing substations at Mullumbimby (132 kV) and Terranora (110 kV).

HIGH VOLTAGE CABLES:

- Investigation and recommendations for repair and rectification of underground cable faults for transmission cables in NSW (confidential).
- Independent technical assessment and expert opinion in the analysis of 132kV HVAC transmission cable with notable defects (confidential).
- Trans Bay Cable Project, San Francisco, USA - TBC is a 400MW HVDC Link from Pittsburg CA to San Francisco CA, utilizing the Siemens HVDC “Plus” VSC Technology.
 - Witness of submarine cable Factory Acceptance Tests in Arco Felice, Naples, Italy.
 - Submarine cable installation manager – monitor and inspect manufacturing progress for the XLPE submarine cable at Arco Felice in Italy. Review of cable installation methodologies and management of on-board representatives. Addressing technical issues associated with the manufacture, loading, transportation and installation of the submarine cables.
- Basslink HVDC, Tasmania-Victoria Australia Interconnector –
 - Detailed investigation into the laying methodologies and issues associated with the installation of HV submarine cables.
 - Attendance to HVDC cable testing laboratory at CESI, Milan, Italy to witness cable type testing.
 - Review and analysis of submarine cable issues.
- Murraylink HVDC Facility, Victoria-South Australia Interconnector – Owner’s Project Manager – 180km underground high voltage cable.
- Directlink HVDC Facility, NSW - Queensland Interconnector – Owner’s Project Manager – 56km underground cable (3 circuits in parallel).

HIGH VOLTAGE AC TRANSMISSION AND GENERATION:

- Coordination and management of negotiation of Generator Performance Standards for proposed 600MW wind farm and associated HVDC connection asset in South Australia.
- High level analysis of potential connection points for proposed interconnection into South Australia using HVDC interconnectors to other states of Australia (Queensland, NSW, Victoria)

and Tasmania).

- Technical analysis of proposed solar inverters for solar farms in Queensland and South Australia and determination of compliance of those inverters with generator performance standards (automatic standards).
- Scoping and cost estimation of selected substation and transmission lines projects in Queensland.
- Scoping and cost estimation of transmission line O&M projects and upgrades in South Australia.
- Concept design and cost estimate for proposed 110kV transmission line from Hangatiki to Te Awamutu in North Island, New Zealand.
- Concept design and project management of system studies for a proposed 275kV transmission line to a new mine site in Mauritania, West Africa.
- Analysis and review of technology for the routine inspection of transmission lines, including video, still photographs, corona and thermographic equipment.
- Technical Advisor insurance company regarding transmission line damage caused by Rime Ice during ice storms in Southern China during January-February 2008.
- 500kV Transformer Bushing Failure Investigation, Vietnam – Root Cause analysis of transformer bushing failure, including investigation, inspection off condition of transformer, inspection of dismantled transformer in the factory and final recommendations on way forward.
- Lenders Engineer and final certification for 115kV AC interconnection between Thailand and Cambodia on behalf of the ADB including three 115/22kV substations. This is the first transmission connection to Siem Reap and surrounding cities.
- Develop conceptual design, scope of works and cost estimate, including development of scope, high level project schedule and outage planning for the following projects in South Australia:
 - Brinkworth Substation – 275kV and 132kV augmentation works, including new 200MVA 275kV/132kV transformer.
 - Cherry Gardens Substation – 275kV and 132kV substation augmentation works.
 - Tungkillo Substation – Greenfields 275kV switching station.
- Rowville and Moorbool 1000MVA Transformer Tender – Owners engineer and technical advisor to the Client in the development of a bid to build, own and operate two 500kV/220kV 1000MVA transformers in Victoria, including review of fire protection requirements and review of proposed EPC Contractor's technical submission.
- Review of 132kV transmission line technical specification for electricity authority in Fiji.
- Lender's engineer, transmission connection for the Walkaway Wind farm in Western Australia.
- Tomago Peaker Plant – Owners Representative to the transmission utility to negotiate technical access standards and develop connection requirements for a 250MW gas turbine in NSW at 330kV. Project Manager for the system studies (load flow, stability and fault level) and for development of the technical specifications for the connection substation (330kV).
- Development of electrical specifications for high voltage plant for upgrading of existing hydro plants at Pantabangan and Masiway in the Philippines.

DISTRIBUTION NETWORKS:

- Development of a strategic plan for the improvement of distribution network power system

performance for a utility in Malaysia, including facilitation of workshops with client staff, final report and development of roadmap of activities to achieve the desired performance levels.

- Facilitation of workshops to identify technical requirements and development of a Quality Plan for a Fault Location Isolation and System Restoration (FLISR) scheme for the distribution network in South Australia.
- Feasibility Study for power generation and supply options for a major resort island development in far north Queensland. Lead engineer for technical and economic comparison of options including diesel and gas generation, wind power, solar power and submarine cable including combinations of technologies. Selection and recommendation of preferred alternative.
- HV System Integrity review of Rutile mining operations on North Stradbroke Island, Queensland including review of earthing installation, modelling of the networks and review of HV safety signage.
- Technical quality audit of Nulec Recloser Factory in Queensland.
- Design, project management and installation supervision of 2 x 1.35MVA emergency gensets, complete with new substation, fuel system, transformer and switchgear.
- Overhauling of low voltage padmount transformers for remote town in Western Australia.
- Design, scope of work and tender document for 6.6kV metal clad switchgear suite at shiploader (Cape Lambert, WA).
- Re-design of mine site substation layouts and earthing grid design for Pannawonica Mesa J minsite in Western Australia.
- Design and implementation of lightning protection strategy for mine site, installation of lightning protection equipment for minesite.
- Upgrade of earthing of all mine site substations including research into the most cost effective earthing methods and trials of earth enhancing compounds.
- Investigation, purchase and installation of 75kVA genset for West Angeles Exploration Camp Site.
- Design, project management and installation of 33kV power line (3 off) for the new Process Plant, including Nu-Lec recloser and all peripheral switchgear and 650kVA gensets at two major substations to provide total emergency power to the mine in the event of an extended power outage.
- Modelling of Robe 132kV system and Pannawonica 11kV and 33kV systems including fault level analysis.
- Power distribution design and costing for proposed West Angeles and Bungaroo Creek minesites.
- The development of and training of personnel in a windows program called "LVDESIGN" used to calculate voltage drop, current flows and protection requirements for LV (415V) power reticulation systems. This program is now available commercially.
- Modelling, testing and commissioning of LV capacitor banks to improve voltage profile.

STRATEGIC CONSULTING AND DUE DILIGENCE:

- Technical Due Diligence for 300MW coal plant in Philippines, addressing grid connection and transmission line aspects.

- Technical Due Diligence of a Copperstring transmission line project in Australia.
- Technical review of the Electrical Statement of Opportunities 2010 on behalf of AEMO.
- Project Manager and lead engineer for the technical due diligence of the National Transmission Corporation (Transco) in the Philippines for a confidential Client. Developed the due diligence report, Opex and Capex scenarios and technical inputs to the financial model. Presented the results to the Client's CEO and senior management team.
- Technical due diligence of the Mindanao coal fired power plant in the Philippines for a confidential Client. Reviewed any electrical issues associated with the grid connection, the transmission network and the power transformers.
- Technical due diligence of the Masinloc coal fired power plant in the Philippines for a confidential Client. Reviewed any electrical issues associated with the grid connection, the transmission network and the power transformers.
- Technical due diligence for the Basslink HVDC facility in Australia. Lead engineer, including review of technical documentation, development of the report, review of Capex and Opex figures, investigations into link capacity.
- Technical Due Diligence – Murraylink HVDC facility, including full technical due diligence and development of the projected Capex and Opex plans.
- Development of capital expenditure requests for major Victorian distribution utility, including both technical and NPV justification.
- Review of year 04/05 capital plan for major transmission and distribution utility in Western Australia. Investigation into solutions proposed for network constraints and issues, review of costs and justification for individual transmission, distribution and SCADA projects.
- Review of 10-year planning report and capital expenditure for major distribution utility in South Australia. Investigation into solutions proposed for network constraints and issues, review of costs and justification for the distribution projects proposed to remove these constraints/issues.
- Review the relevant sections in the National Electricity Code and Victorian Electricity System Code in relation to new connections, and assist a utility in the development of procedures for connection applications.
- Technical due diligence for wind farm in Tasmania, Australia for the connection substations and connection technical requirements.
- Technical due diligence for wind farm in Korea including for all electrical works, including wind farm transformer and cabling, connection substations, 154kV transmission line and cable, SCADA, communications and the connection technical requirements.
- Technical due diligence for new wind farm in Victoria, Australia for electrical works, including wind farm transformer and cabling, connection substations and connection technical requirements.

INDUSTRY PARTICIPATION:

- Convener, Cigre Australian Panel B4 "HVDC and Power Electronics" from November 2013.
- Convener, Cigre Working Group B4.63 – Commissioning of VSC Projects – Convener of an international working group created in 2013 to develop guidelines for the commissioning of Voltage Source Converter based HVDC projects.
- Convener, IEC Technical Committee 99 "System engineering and erection of electrical power

installations in systems with nominal voltages above 1 kV a.c. and 1,5 kV d.c., particularly concerning safety aspects”, JMT 7 – Revision of IEC TS 61936-2 “Power installations exceeding 1kV a.c. and 1.5kV d.c. – Part 2: d.c.”

- Regular member, CIGRE Working Group B4.54 “Lifetime Extension of HVDC Assets”.
- Presentation of a tutorial “HVDC in AC Networks - Australian Experiences” at the SC B4 2011 Colloquium, Brisbane Australia in October 2011.
- L. Brand and M. Eccles, “Transition from Project Delivery to Operation of HVDC Facilities”, presented at the CIGRE SC B4 2011 Colloquium, Brisbane Australia in October 2011.
- C. Duerr and L. Brand, “Planning for the Integration of HVDC Facilities” presented at the 2013 CIGRÉ Canada Conference in Calgary, Canada in September 2013.