POWER CONTROL
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# Capability Statement

Celebrating 20 years

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**Power Control Engineers (PCE) is a leading electrical design, consulting, and project management company specialising in electrical power systems. Founded in Newcastle, with additional offices in Melbourne and Perth, we are dedicated to delivering innovative and reliable solutions across various sectors, including mining, manufacturing, and power industries.**

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**We have over 300 years of combined electrical engineering experience and pride ourselves on providing practical power engineering solutions; delivering excellence and value to our clients.**

Celebrating 20 years

PCE was founded in Newcastle in 2003 by the late Ken Bode, with a focus on servicing local heavy industry. Initially, the company provided electrical engineering services to the two aluminium smelters in the Hunter Valley: being Tomago Aluminium Company and Hydro Aluminium in Kurri Kurri.

In 2006, as local demand for electrical engineering services increased, particularly in the Hunter Valley, PCE took on a number of senior engineers and began to expand its service offering. Today, with a presence in Newcastle (PCE HQ), Melbourne and Perth, we service a range of clients and industries throughout Australia including primary metals, port, mining, rail, manufacturing, water, energy, construction, and local government.

### Commitment to Quality

PCE is committed to delivering the highest quality of service and value. We are proud of our ability to meet client needs efficiently and effectively, as evidenced by our strong client testimonials and longstanding relationships.

### Partnerships and Clients

Our esteemed client portfolio includes AGL Energy, Iberdrola, Newmont, Transport for NSW, Origin, and many other reputable organisations. These partnerships reflect our expertise and the trust placed in our services.

### Contact Us

For enquiries or custom solutions, please contact us at our Newcastle headquarters, Melbourne, or Perth office. Visit our website www.pceng.com.au for more information.

**‘We are industry-based electrical engineers providing practical power solutions, rolling up our sleeves since 2003’**

# Count on us

## Philosophy

We are driven by an innate need to develop great humans and deliver superior engineering solutions – in a consistent and professional manner – we achieve this by; caring for and contributing to our local communities; prioritising our physical and mental health; respecting each other and recognising the worth in every person; and being transparent and ethical in everything we do.

For that, you can **Count on Us!**

### Make the best decisions for business.

We pride ourselves on being transparent and ethical in everything we do.

Our experts are eager and available to help you achieve your business objectives.

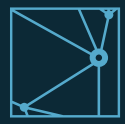
### Together we are stronger.

We understand that everyone has their own talents and we work together to make sure that everyone can share their gifts.

We respect each other and see the worth in every person.

### Celebrating health and wellbeing.

The health and wellbeing of our team comes first - they are the ones who create and maintain our culture.



### Promote connection and community.

We make long-term difference in our communities by genuinely caring for, supporting, and serving others.

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# Power System Studies & Protection System Design

PCE excels in conducting comprehensive power system studies and designing protection systems. With a profound understanding of the challenges and intricacies of power systems, we offer tailored solutions that ensure the safety, reliability, and efficiency of electrical systems. Whether it's for a new installation or an upgrade, our team of skilled engineers use cutting-edge tools and techniques to analyse and design systems that meet your specific needs. Our expertise spans a wide range of industries, ensuring your power system is optimised for peak performance.

## Count on us

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# Power System Studies & Protection System Design

## Our services include

**Power system modelling, using ETAP, PTW and PowerCad software.**

**Protection system studies and design**, including coordination and selectivity analysis. Protection schemes include overcurrent and earth fault, directional and non-directional, motor, high and low impedance differential, distance protection, and IEC 61850 communication systems including goose messaging implemented in a large and growing number of relay makes and models. Services typically consist of:

- Protection design, including detailed analysis of fault data and customising of protection schemes to suit, developing relay setting files, or evaluating existing settings, and specifying CTs.
- Testing support including detailed Inspection & Test Plan (ITP) development, Factory (FAT), and Site Acceptance Testing (SAT).

**Arc flash studies**, including IEEE1584 incident energy calculations, hazard and risk assessments and labelling, mitigation measures and protection optimisation.

**Load flow studies**, including steady state and dynamic analysis such as motor starting studies, analysis of load diversity, equipment rating checks and sizing, voltage and tap changer position analysis, effect of power factor correction (PFC).

**Harmonic studies**, including source identification and mitigation recommendations. Analysis includes establishing resonance points, effects on Ripple Control schemes, effects of and on PFC schemes, filter analysis and specification, and Connection Point limit checks.

**Insulation coordination studies**, including equipment and system Surge Protection evaluation and specification to protect transformers, switchboards, and downstream equipment.

**Short circuit studies**, including fault current calculations and equipment rating checks typically using IEC60909 methods and checking switchboard peak ratings, CB peak and breaking ratings, cable ratings. Studies often require an analysis of supply configurations, generation combinations and motor contributions.

**Transient Stability studies** analysing effects of system disturbances such as generation changes, faults, and load addition/rejection, results typically being used for optimising of Load Shedding schemes.

**Equipment Reliability studies** allow recommendations to be made on upgrades and protection improvements, spares options and optimising switching configurations. Evaluation uses published or actual reliability figures for installed equipment and provides results such as time between failures and cost of failures per year.

**We have a proven track record of successfully delivering projects on time and within budget, and we pride ourselves on our attention to detail and commitment to safety. We strive to provide our clients with the highest level of service and support throughout the entire project lifecycle.**

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# High Voltage System Design

At PCE, we specialise in high voltage system design, providing services up to 132kV for both private and utility-owned assets. Our experienced team is adept in handling the complexities of high voltage systems, offering design and specification services that cater to both greenfield and brownfield projects. Our commitment to delivering robust and efficient high voltage solutions ensures that we meet the highest standards of safety and reliability. Our designs are tailored to suit diverse industrial needs, reflecting our extensive expertise and adaptability across various sectors.

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# High Voltage System Design

### Pre-feasibility and consultancy

Our pre-feasibility assessments provide critical insight into the technical and financial viability of proposed high voltage networks, helping our clients make informed decisions. Our consulting services provide expert advice and guidance throughout the entire process, from initial design through to procurement and implementation.

### Detailed design

Our team of experienced engineers have extensive knowledge and expertise in the detailed design of high voltage systems. We understand the importance of safe, reliable, high-quality outcomes and our detailed designs reflect this. This, coupled with our commitment to customer satisfaction, sets us apart as a trusted advisor within the industry.

**Our team have a proven history in detailed design and specification of:**

- Indoor and outdoor substation design and equipment configuration.
- Detailed design of HV protection schemes and intertripping systems.
- Selection and specification of transformers, indoor/outdoor GIS switchgear, indoor/outdoor AIS switchgear and/or switch-disconnectors.
- Power transformers, bunded transformer compounds, kiosk transformers, transformer replacements and upgrades.
- Detailed design of HV switch rooms and auxiliary support systems.
- Detailed design of outdoor switch yards and bunded enclosures.
- Detailed design of power factor correction and reactive power support.
- Detailed design of underground high voltage cable routes and trench cross sections.
- Detailed design of overhead / underground lines.
- Integration of cogeneration sources into both utility owned and privately owned high voltage networks.

### Project management and commissioning support

Project management is a critical component of any high voltage project ensuring adequate planning, coordination, and execution of resources to achieve the project goals and objectives. Commissioning support services provide a seamless transition from construction to operation, ensuring that your high voltage system is fully functional, reliable and operates as per the original design intent.

**Project management and commissioning support capabilities include:**

- Coordination, planning and management of high voltage installation and system commissioning.
- Coordination and planning of primary and secondary injection testing of protection systems.
- Factory and site acceptance testing.
- Assistance with tendering and procurement of high voltage equipment and installation works
- Site supervision and commissioning.

### Utility Liaison

Our team of experienced engineers and project managers have extensive knowledge and expertise in navigating the regulatory and compliance requirements of working with distribution network service providers and their stakeholders. We understand the complexities of working with these organizations and have established strong working relationships that help facilitate successful project outcomes.

### Documentation, maintenance, and reliability

We provide a full range of documentation services developing comprehensive and accurate documentation related to high voltage networks including HV Installation Safety Management Plans and HV Site Master Plans. PCE have a long-standing history in coordinating and planning high voltage maintenance, repairs, upgrades, and testing tailored to your site's specific needs. Our agile approach ensures a high standard of maintenance is completed with minimal disruption to site operations.

- Development and maintenance of:
  - High Voltage Installation Safety Management Plan (HVISMP) for high voltage customers.
  - High Voltage System Configuration Manuals (HVSCM) for defence establishments.
  - Site master plans for High Voltage installations.
  - High voltage safety management plans.
- Coordination and planning of high voltage maintenance, repairs, upgrades, and testing.
- Site supervision.
- High voltage compliance audits.
- Partial discharge testing.
- Coordination of transformer oil sampling and testing.
- Earthing system baseline testing and maintenance.

**We have a proven track record of successfully delivering high voltage private network projects, on time and within budget, and we pride ourselves on our attention to detail and commitment to safety; throughout the entire project lifecycle.**

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# Low Voltage & Control System Design

Our low voltage and control system design services are at the heart of PCE's expertise. We focus on delivering safe, reliable, and cost-effective design solutions that range from extra-low voltage to 415V switchboards. Our approach is client-centric, ensuring that each design is customised to meet the specific requirements of your project. Our team's proficiency in contemporary design practices, combined with a deep understanding of industry standards, makes us a preferred choice for clients in Newcastle, Melbourne, and across Australia.

## Count on us

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# Low Voltage & Control System Design

### Initial Concept & Consultation

Here at PCE, we strive to provide our clients with quality low voltage system designs that are customised to meet their requirements. It is therefore critical to work with our clients and fully understand their expectations at an early stage. We achieve this through:

- Concept designs.
- Feasibility studies and cost estimates.
- Site visits for project scoping and to build client relationships.

### Detailed Design

Our team of engineers have extensive knowledge and experience in the detailed design of Low Voltage (LV) systems. We provide detailed design packages in accordance with relevant Australian Standards and Client Specifications.

- Low Voltage Installations / System design including:
  - Power System Modelling and reporting.
  - Load flow, short circuit and arc flash studies.
  - Protection studies.
  - Detailed design and specification of main switchboards, motor control centres, distribution boards, control panels and local control stations.
- Detailed electrical and instrumentation design including:
  - Equipment specification and Bill of Materials.
  - Electrical load list management.
  - Cable sizing and routing proposals.
  - PLC I/O allocations.

We also complete design reviews and design risk assessments, both internally to PCE for quality purposes, and externally, with clients and other stakeholders.

### Drafting of Electrical & instrumentation drawing packages

- Single line diagrams.
- Schematics.
- Terminations.
- Network diagrams.
- P&IDs and loop diagrams.
- Equipment general arrangements.
- Site general arrangements.

### Functional Safety systems

Our team of experienced TUV Rheinland Certified Engineers assist with providing Certified designs to meet our clients' requirements. These include:

- Detailed design concepts.
- Design and testing documentation.
- Facilitate and attend LOPA meetings (Layers of Protection Analysis).
- Testing and Commissioning support.

### Functional specification and system programming

Our Control System Engineers provide a wide range of documentation and control system packages that are critical to the everyday operation of the electrical equipment.

- Functional specification documentation for process and control systems.
- Implementation of control systems to meet our clients' requirements including programming and testing of:
  - PLC.
  - HMI.
  - Network switches.
  - Drive systems including VSD's and Soft Starters.

All from a wide range of vendors including Allen Bradley, Schneider, Omron, Siemens etc.

### Project management and commissioning support

Project Management is a critical component to ensure each project remains on track to meet key milestones and delivery dates. This includes planning, coordination and execution of resources to achieve the project goals and objectives.

- Coordination, planning and management of resources and key deliverables associated with each LV system design.
- Development of quality testing and commissioning documentation.
- Factory and site acceptance testing assistance.
- Site commissioning support.

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# Earthing & Lightning Protection Design

PCE's earthing and lightning protection design services are crucial for ensuring the safety and integrity of industrial plants. Utilising advanced modelling software, our team provides practical, customised solutions that effectively mitigate risks associated with electrical systems. Our designs adhere to stringent safety standards, ensuring the wellbeing of personnel and the protection of equipment. This service underscores our commitment to delivering solutions that are not only efficient but also safeguard against unpredictable environmental factors.

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# Earthing & Lightning Protection Design

### Design and consultancy

Our engineers are equipped with the latest modelling technology and knowledge to provide you with a tailored design solution for your earthing and lightning protection needs. We work closely with you to understand your specific requirements and develop a design that meets international and Australian standards so increasing site safety and mitigating risk.

### Our design and consulting services include:

#### Earthing

- High voltage earthing system modelling, design, and specification.
- Design and specification of earthing systems for low voltage electrical installations.
- Design and specification of earthing systems for telecommunications installations.
- Assessment of pipeline electrical hazards and mitigation measure design.
- Audits and review of existing installations.
- Mitigation strategies for management of complex earthing installations with high SLG fault levels.
- Compliance with relevant standards and regulations.
- Incident investigation.

#### Lightning Protection

- Detailed risk assessment and specification of required lightning protection control measures as per the guidance of AS 1768:2021.
- Lightning protection system design for all structure types, including detailed design of:
  - Direct strike protection.
  - Transient voltage surge protection.
  - Equipotential bonding.
  - Lightning protection earthing / grounding systems.
  - Insulation coordination studies.
- Compliance with relevant standards and regulations.
- Incident investigation.
- Development of lightning risk management plans and site policies to reduce risk to personnel.

### Testing and inspection

Our comprehensive testing and inspection services ensure that your earthing system and/or lightning protection system is performing as it should.

### Our testing capabilities include:

- Soil resistivity testing using the Wenner Method.
- Low current off-frequency injection testing.
- Fall of potential testing.
- Current distribution in cable screens and overhead earth wires.
- Earth continuity testing.

### Maintenance and upgrades

Regular maintenance and baseline earthing testing are essential to maintain original intended design risk levels throughout the lifecycle of installed earthing and lightning protection systems. Our team have proven capability in establishing practical and effective maintenance regimes for your sites earthing and lightning protection infrastructure.

**We have a proven track record of successfully delivering projects on time and within budget, and we pride ourselves on our attention to detail and commitment to safety. We provide our clients with the highest level of service and support throughout the entire project lifecycle.**

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# Grid Connections & ASP3 Contestable Design

As a Level 3 Accredited Service Provider (ASP3), PCE is proficient in managing grid connections and performing contestable design works. Our team is well-versed in the regulatory and technical aspects of grid connections, offering seamless and compliant solutions. Our capability in this area reflects our broader commitment to providing end-to-end services in electrical engineering, ensuring that your projects are handled with utmost expertise and professionalism, no matter the location.

## Count on us

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# Grid Connections & ASP3 Contestable Design

**Our grid connection and contestable services include:**

### Design

- Asset relocations
- Overhead and underground connections
- LV & HV networks
- High Voltage customer connections (HVC)
- Street lighting
- Direct supplies
- Kiosk and pad mount substations
- Chamber and indoor substations
- New subdivisions
- Commercial & industrial developments
- Underground overhead powerlines
- Network augmentations up to 132kV

### Consulting

- Supply authority liaison
- Site investigations
- Feasibility studies
- Property prepurchase due diligence
- Working near powerlines
- Clearance assessment
- Maximum demand calculations
- Connection applications
- Relocation applications
- Electrical due diligence studies
- DBYD map consolidation
- Advice on 3rd party asset relocations
- Power monitoring/logging

### Construction

- Work as executed drawings
- Technical Support
- Project planning
- Construction management
- Tender evaluations
- Construction advice

### Co-Generation and Renewable Energy System Integration

- Biogas
- Wind
- Solar
- Battery Energy Storage Systems (BESS)

### Technical Review and/or Preliminary Enquiry submissions

We have a vast knowledge and experience in network planning and connection application assessment, allowing us to foresee likely issues, and better plan and negotiate with Distribution Network Service Providers (DNSP's) on the client's behalf.

### High Voltage Connections (HVC)

Power Control Engineers can support organisations with a HVC to the utility with the following services;

- Undertake a high voltage installation assessment to verify the site's compliance against statutory requirements and installation condition.
- Develop a high voltage installation maintenance strategy including specific maintenance tasks to ensure ongoing safe operation of the high voltage installation.
- Produce a detailed high voltage operating procedure including high voltage safety rules which can be implemented on site.
- Provide guidance in understanding the role of the high voltage installation responsible person and develop required documentation.
- Facilitate the execution of the maintenance strategy including engaging subcontractors and specialists to perform maintenance tasks.
- Provide guidance for planned end of life replacement strategies.

PCE can also provide high voltage infrastructure owners with High Voltage Installation Safety Management Plans (HVISMP's) which are required by utilities for compliance to the Service and Installation Rules of NSW. Similarly, PCE are able to produce HV submissions required by other utilities in other states and territories under similar legislation.

**PCE's professional ASP3 team are experienced in managing the complete project lifecycle. From the application for a new connection, to design certification with the relevant DNSP, you can rest assured that PCE's team will support you through the entire design process and provide you with the most cost effective and efficient design solution.**

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# Overhead / Underground Line Design

Our expertise in overhead and underground line design is a testament to PCE's comprehensive approach to private HV network solutions. We ensure that each design meets the specific needs of the project while complying with all regulatory standards. Our approach combines technical excellence with practical know-how, resulting in designs that are efficient, safe, and tailored to the unique challenges of each site.

## Count on us

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# Overhead / Underground Line Design

### Power Line Design - Overhead and Underground

The Design team at PCE offers years of design experience together with a practical knowledge of power line construction practices. Most of the team have gained their experience with Distributed Network Service Providers (DNSPs), designing feeders from the Low Voltage level to the sub-transmission (33kV, 66kV and 132kV) level. And with years spent project managing the construction of power lines, our team will deliver you exceptional outcomes throughout the project cycle.

**Power line design is often required for:**

- The development of large-scale land sites.
- Alterations to mining sites requiring asset relocation.
- Up-rating a private feeder to suit new power demands.
- Large commercial expansions.
- The development of residential property.
- Road widening projects.
- Relocation of utility assets.

Whether you are at pre-tender stage or are ready to talk to a Network Service Provider (NSP), contact PCE so we can assist you with your design requirements. If you require our Contestable Design services as a Level 3 Accredited Service Provider (ASP3), refer to our Level 3 ASP page for more details.

### Overhead Line Design

PCE prides itself on delivering outstanding Overhead Line (OHL) design solutions using the latest Engineering Design software. With our extensive OHL design experience, the team at PCE will not only comply with AS/NZS 7000 and NSP Design Standards, but deliver you a design solution that considers the construction methods to be employed. And we don't just own the latest Engineering Design software, like Power Line Systems PLS-CADD, we have extensive real-world experience in using the software. This will ensure that we can model and analyse your most complex arrangements to both your satisfaction and that of any certifying authority. PCE also offer our design expertise to other engineering firms that require assistance with power line design modelling.

When you engage PCE, you can expect that all aspects of the OHL design will be managed professionally, including:

- Assessment of the route with you – our client.
- Environmental assessments.
- Modelling the electrical network with the latest engineering software - Power Line Systems PLS-CADD, PowerMation Poles 'n Wires, and Neara electric utility software - ensuring compliance with AS/NZS 7000 and the relevant NSP Design Standards.
- Calculation of forces on poles and conductors
- Specification and analysis of timber, concrete and steel poles.
- Analysis of clearances and conductor blowout.
- Specification of stay wires, pole footings, and earthing measures.
- OHL Design drawings to NSP Standards, including route plans, construction schedules, stringing tables, clearance profiles, pole arrangement and fabrication drawings, and other details as required by the constructor.

### Underground Line Design

Underground (UG) Line Design is a complex task often requiring deep analysis (pun intended!). Some consider UG design to be as simple as drawing a line on paper, but this could not be further from the truth. PCE understands the intricacies of UG design gained from years of experience in designing underground power systems from Low Voltage to 132kV.

When you engage PCE, you can expect that your UG design will be thoroughly considered, including:

- Assessment of the route with you – our client.
- Environmental assessments.
- Electrical network modelling.
- Analysis of existing underground and above ground impediments.
- Calculation of cable ratings to IEC60287 and NSP Design Standards.
- Calculation of cable installation tensions and pressures.
- Specification of underbores (where required).
- Specification of cables, conduits, back-fill, Underground-to-Overhead (UGOH) poles, and associated materials.
- Underground Line Design drawings to NSP Standards, including route plans, trench sections, cable pulling schedules, and other details as required by the constructor.

**We have a proven track record of successfully delivering overhead line and underground HV cable installation projects on time and within budget, and we pride ourselves on our attention to detail and commitment to safety. We provide our clients with the highest level of service and support throughout the entire project lifecycle.**

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