

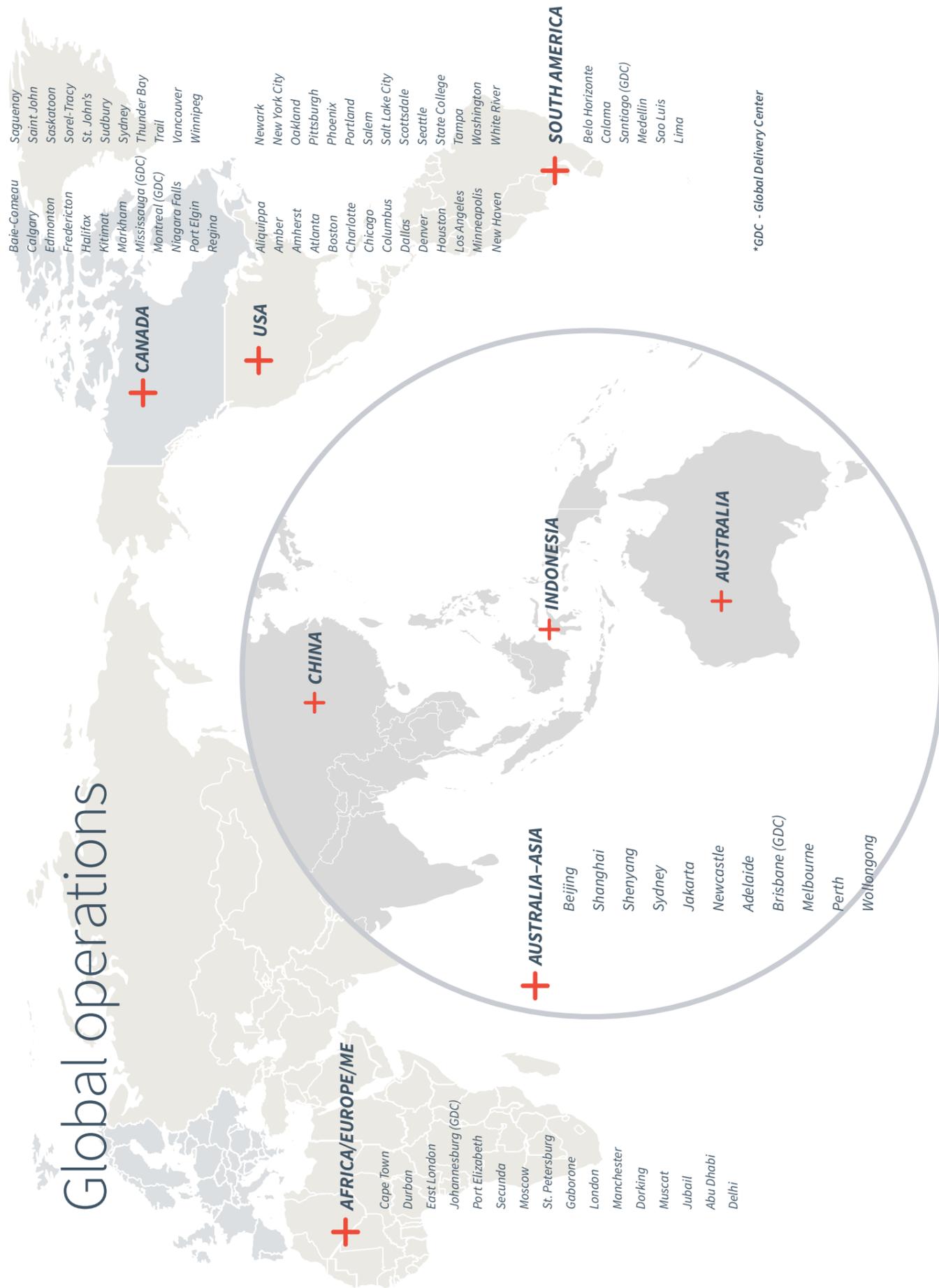


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Sustainable
Energy Solutions

for Enlit Conference 2022

HATCH

Global operations



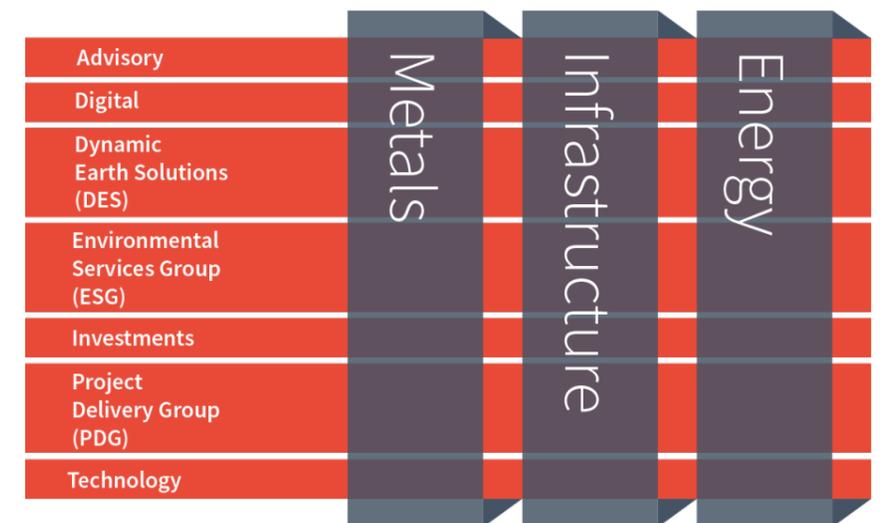
About us

Hatch is passionately committed to the pursuit of a better world through positive change. Our exceptional and diverse teams combine vast engineering and business knowledge to build safe, innovative and sustainable solutions to tackle the world's toughest challenges.

A global engineering, project management, and professional services company, Hatch is leading complex technical solutions in Mining and Metallurgical, Energy, Infrastructure and Digital Technologies sectors. Having served clients for over 65 years, Hatch fosters a diverse portfolio of experience that stretches across 150 countries with local offices in Melbourne, Sydney, Brisbane, Perth, Adelaide, Wollongong and Newcastle.

A valued partner in solving our clients toughest challenges, Hatch delivers unprecedented business outcomes through our commitment to quality, efficiency, utilisation, safety and risk management and positive change - Bridging the gaps between research and innovative technologies, engineering and reliable operations.

Hatch is committed to designing and building practical solutions that reduce the presence of greenhouse gases (GHG) in our atmosphere and adapt our built and natural environments to unavoidable climate change-related impacts. This commitment encompasses the following strategies: avoiding carbon combustion; reducing and efficiently using carbon; removing carbonaceous gases from our atmosphere; and improving society's resilience to earth's changing climate. We operate our business and carry out engagements for our clients with methodologies, tools, and teams that enable us to achieve these strategies with the goal of continuous improvement.





Essential services, sound strategies

Whether planning a system upgrade, or implementing major integrated works and developments, our objective is always the same – to solve your toughest challenges through innovative and sustainable means.

Power system performance analysis and system planning studies

Our leading team of professionals uphold over 50 years of experience in analysing the performance of power systems and optimising development, supporting the development of industry-leading analytical systems and fostering the know-how knowledge to improve your power grid facilities.

Engineering and project delivery services

Safety, quality, and environmental compliance are the cornerstones of our project delivery process, beginning at the concept stage. State-of-the-art 3D modelling, design techniques, and advanced software tools minimise project risk and maximise profitability.

We bring world-class expertise in the design of ac and dc transmission systems, substations, and distribution systems, known for our intimate industry knowledge of grid expansion and strengthening, and integrating generation and storage.

Route and site selection studies; environmental planning and permitting

We draw on a pool of skilled, multinational professionals who can solve your industry-relevant challenges from anywhere in the world. With a unique combination of engineering, construction, environmental, and socioeconomic expertise, Hatch teams can manage your strategy, financing, construction, and social license risks with efficiency.

Due diligence, independent engineer and lender's engineer services

Our power industry experts have worked with organisations globally, in every type of climate and environment. Proving a world leader in power services, we can offer a full range of assistance to buyers, sellers, and financiers of power delivery assets.

Management consulting services

We advise on power sector reform, institutional change and capacity building, business strategy and regulatory affairs. When you partner with us, you get trusted advisors with experience in every aspect of power transmission, at every stage of development or operation.

Asset management and operational performance

Our experts manage and assist with asset management process reviews; audits and improvement plans; asset condition assessments, process developments and studies; asset risk-assessment studies; and risk-based investment plans. Our professionals are experienced in developing O&M process reviews, improvement plans, and feasibility studies for investments in facilities, systems, and processes. In operational risk management, we're your experienced, trusted partner.



Hatch commitment to the power Industry

Hatch has been actively supporting the Australian power industry for over 20 years. Recognising the unparalleled changes in the electricity industry, Hatch has increased its capacity to offer assistance to all the sectors of the power industry in the booming region.

Powering the energy needs of tomorrow, Hatch provides EPCM, consulting and technologies for the planning, engineering and delivery of infrastructure in the power and energy sectors.

Business units draw on the resources of the project delivery group, which encompasses engineering and project execution disciplines: civil, electrical, geotechnical, hydraulic, mechanical and procurement. Other specialties include economics, planning, environmental and community interface.

We are finding new ways to generate, distribute, and use energy to achieve the profound transformation.

Sub-Sectors

- Hydroelectric and water resources
- Solar/Wind power
- Geothermal, ocean and other alternative energies
- Thermal power
- Nuclear power
- Integration – Planning, Design, Engineering, and Development
- Battery Energy Storage Systems
- Stand Alone Power Systems and Micro Grids
- Power business management consulting
- Energy technologies, including gasification and coal-to-liquids
- Industrial Power Systems
- Renewable power resources optimisation
- Industrial and power plant decommissioning and re-purposing
- H2 and liquefied natural gas.

Partnering to solve your toughest challenges

The world's need for power transmission and distribution infrastructure continues to grow, mainly driven by the transition to renewable energy and the optimisation of existing assets to accommodate new technologies, generation sources, and distributed generation.

Regardless of your project requirements, power delivery infrastructure is becoming more challenging and expensive to site, design, and construct.

With over 80 years of experience in planning, designing, and executing power delivery projects (voltages up to 500 kV ac and +/- 500 kV dc), we have the experience and expertise you need. We've worked with global organisations to develop more than 300 HV substations and converter/FACTS stations, integrating thousands of megawatts of generation and storage into transmission and distribution networks, in on-grid connections and isolated microgrids.

Our experienced experts are ready and able to assist you with strategic advisory services, strategic or system planning, or full project delivery services. From asset and operations management through upgrades, decommissioning, and refurbishments, you can count on us for support throughout the full life cycle of your assets.



Decarbonisation: Power Generation

Energy is a major operating cost in every industry. Disrupting the power supply can be costly, interrupting production and driving down revenue.

With the right combination of the best technology and an optimal fuel source, you can have reliable, economical electricity for your business—an edge that can give you a clear competitive advantage.

Renewable Power

Solar and wind power are now commonplace across the world and account for considerable portions of Australasian countries total energy capacity. The integration of energy storage systems and the development of new clean fuels like hydrogen and new technologies moves the power industry into a new and exciting era.

Hatch's Power team is pleased to be at the forefront of this transition, including:

- Solar – Photovoltaic and Thermal
- Wind
- Hydro power
- Biogas
- Biomass
- Hydrogen
- Energy Storage – Battery, Pumped Hydro and Thermal
- Synchronous Condensers
- Hybrid Power.

With a growing desire to effectively decarbonise operations and industry mindset, our energy-intensive clients are seeking our support to integrate electricity from renewable source, and often revoke dependency on local transmission infrastructure.

Combining the knowledge of our industrial and process teams with our energy expertise, we are providing optimal energy solutions to clients that significantly improve energy efficiencies whilst reducing the carbon intensity of their assets.

Hatch brings a wealth of experience developing renewable and hybrid solutions in remote locations, remote from any form of high voltage transmission infrastructure.

Renewables



Solar Farm

Solar Energy Production Estimates & Layout Design

Hatch solar specialists provide system modelling and energy production estimates using recognised industry software, including PVsyst. We use solar resource data derived from publicly or commercially available sources or from on-site measurement using purpose-built equipment to minimise project risk associated with relevant resources. Our skilled professionals prove efficient, developing a transparent uncertainty analysis approach that accounts for uncertainty in the solar resource, system losses, and other key project factors.



Wind farm

Wind Resource Assessment

Wind resource assessment is perhaps the most critical step in developing a successful wind power project. A detailed valuation and quantification of the available wind energy guides the design and layout of the project, inform turbine election and procurement, and enables accurate energy yield and financial projections.

Environmental Assessments & Approvals

During the feasibility and pre-feasibility phases, we complete Environmental Constraints Analyses to determine environmental considerations, constraints and opportunities to project sites. We undertake studies to gather relevant information for the Environmental Assessment, including support in consent approvals application and process.



Front-End and Detailed Engineering

Hatch provides complete design, engineering, cost estimation services and preparation of tender documents for both EPC and EPCM style contracts. We diligently work with the client to understand needs, constraints and opportunities unique to each project

We provide unique engineering services to project owners, developers, EPC contractors, and vendors to solve challenges encountered during construction, commissioning and operation. These include:

- Operational Performance Services
- Remediation and Operational Improvements
- Root Cause Analysis
- Construction & Project Management.

Hydro Power



Karun III

No hydro-power project has the same challenge as another. Every site is unique and dependent on local topography, hydrology, geotechnical risks, logistical constraints and environmental regulations.

Our hydro-power specialists carefully examine the distinctive requirements of each engagement, combining proven capabilities with proprietary technologies and innovative thinking to deliver safe, reliable, and cost-effective solutions.

Since the inception of Hatch's power sector, we have been responsible for over 45,000 MW of water power constructed in 110 countries worldwide. Hatch expands on diverse expertise to solve the toughest challenges and create unprecedented outcomes for hydro-power projects: conventional large storage hydro-power, run-of-river water power, and pumped storage.



Ham Thuan Spillway

At the forefront of engineering for both very large and small hydro projects, Hatch has worked with dams as high as 230 m to as low as 3.0 m, and with powerhouses ranging from 10,800 MW to 0.5 MW. Other project complexities have been as large as 5,000 MW in capacity, including pumped storage, both high- and low-head plants, a large reservoir, and run-of-river projects.

Our hydro-power team prove a diverse expert group that cover all disciplines – civil, structural, hydro-technical, geotechnical engineering, electrical, mechanical, environmental, socioeconomic, and project management services. In addition to these engineering services, our staff have hands-on experience with the supervision and management of the construction of water power facilities and can assist our clients with global procurement services.



Bear Swamp Generating Station/
Jack Cockwell Station

Hatch has utilised expertise in conventional hydro-power to develop capabilities for large, high head pumped hydro storage projects. Hatch has experienced designers that work with our state of the art technology to design large underground caverns, tunnels and rock support, proving excellence in capabilities to select and design industry-leading pump hydro turbines, generators and balance of plant.

Undertaking all phases of water power projects, from reconnaissance level studies to prefeasibility, feasibility, basic and detailed design, and construction management, Hatch further expands on their global sourcing and procurement group to ensure reduced costs and mitigated quality and schedule risks.

Our range of services in hydro-power covers all contractual arrangements including full EPCM projects, EPC Design, Owner's Engineer role, Early Contractor involvement Strategies, and Operational Assistance.

Our capabilities on water power include:

- Dam and spillway engineering
- Rock mechanics and underground structures
- Life extension and enhancement
- Dam safety
- Tunnel engineering
- Gate design and rehabilitation.



Lake Limestone

Power System Planning



In-depth knowledge of policy and regulatory frameworks is combined with state-of-the-art technologies and techniques to plan and deliver power grid networks that are sustainable and meet public needs at least cost.

Innovation, experience, and expertise is the key to meeting the unparalleled developments in our industry - driven by the abundant availability of natural resources solar, wind, and hydro, in our region. As we have for the last 20 years, Hatch continues to support our client's needs as their trusted advisers and project development partners.

Our commitment to the region has culminated in developing a dedicated team of capable and expert engineers located in the main centres of Australia, further supported by our extensive global experience and resources.

Hatch's ability to provide high-quality power system analysis services is supported by our Power System Modelling & Analysis Centre of Excellence, located in Winnipeg, Canada. Together, this brings many decades of global power system planning experience through state-of-the-art tools and utility-trained professionals. Our in-depth knowledge of the regulatory and commercial business environment in Australia, and our close working relationships with clients, ranging from network service providers to system operators and generation developers, allow us to provide a complete range of development planning and analytical services.

Generation Connection Studies

Hatch advises on the connection of renewable and fossil-fueled generators, ranging from site identification to the completion of commissioning and testing. Our expert professionals optimise investments and reduce the project risks based on prevailing policy and regulatory frameworks, coupled with in-depth analysis of technical, regulatory and economic considerations. We use our knowledge and experience with generation technologies, including solar, wind, pumped hydro, battery storage, hydrogen, and thermal, for modelling and analysis.

Hatch's services for supporting our generation development clients include:

- Conceptual design and project feasibility studies, covering system expansion, rehabilitation or upgrading
- Generation performance standard development, generator model development, testing and benchmarking, power quality assessment
- Generator performance testing, studies for verification of generator models and generation performance
- Technical due diligence studies
- Stand alone power systems and micro-grid, design and integration
- Use of commercially available power system analysis software with sophisticated modeling and simulation capabilities, to deliver regulatory compliant projects within the shortest time.



Power System Studies

Hatch provides engineering services through expert modeling and analysis using state-of-the-art planning tools including:

- Feasibility studies for bulk power transfers and system reinforcement needs
- Generator interconnection studies and system impact analysis
- Power system operation analysis, operating procedure and process development
- Power system stabiliser tuning
- Transient switching analysis
- Protection and control studies
- Review of transmission constraints and development of constraint equations
- Expertise in state-of-the-art software tools for power system planning and analysis.

Transmission System Planning

Hatch provides expert decision analysis support leading to optimised capital investments including:

- System load forecasting
- Development of expansion plans
- Environmental impact analysis
- Least-cost analysis of alternative plans based on regulatory investment tests
- Economic and financial analysis for major investments

Expert decision analysis support is used to optimise capital investments.

- Preparation of master plans for system development, defining schedule and budget costs for combinations of facilities investments, operational program requirements, and demand side management initiatives

- Regional transmission interconnections
- Investigation and assessment of effectiveness and viability of non-network solutions as alternatives to transmission augmentations.

Analytical Techniques

- Power flow analysis
- Short-circuit analysis
- Transient stability investigations
- Small signal stability analysis
- Electromagnetic transient analysis
- System reliability performance evaluation
- Switching surges and resonance phenomena
- EMF analysis
- Financial and economic analysis with benefit/cost ratios, internal rates of return and life-cycle cost comparisons.

Analytical Tools

- PSS®E
- DlgSILENT Power Factory
- Aspen One-Liner
- PSLF
- PSS-ADEPT
- PSCAD
- EDSA
- ETAP
- ATP
- EMTP
- Matlab
- ESKAM
- EasyPower.



Simon Malin

Director Energy
Australia-Asia
+61 422 104 890
simon.malin@hatch.com

Steve Bond

General Manager, Power
Australia-Asia
+61 421 696 355
steve.bond@hatch.com

Nalin Pahalawatta

Power Delivery and
Integration Lead
Australia-Asia
+61 437 283 298
nalin.pahalawatta@hatch.com

Anurag Gupta

Transmission Systems Lead
Australia-Asia
+61 450 330 774
anurag.gupta@hatch.com

Ajay Sharma

Regional Manager, Water Power
Australia-Asia
+61 429 305 589
ajay.sharma@hatch.com

About Hatch

Whatever our clients envision, our engineers can design and build. With over six decades of business and technical experience in the mining, energy, and infrastructure sectors, we know your business and understand that your challenges are changing rapidly. We respond quickly with solutions that are smarter, more efficient and innovative. We draw upon our 9,000 staff with experience in over 150 countries to challenge the status quo and create positive change for our clients, our employees, and the communities we serve.

hatch.com