Power system analysis, modelling and design

Leading expertise for intelligent and faster planning decisions

Mott MacDonald is a global management, engineering and development consultancy with a strong engineering base. With annual revenue of £1 billion, we combine the skills of over 14,000 staff with a strong presence in 140 countries. Designing power systems correctly from the outset facilitates successful implementation and lifetime operation. Mott MacDonald has comprehensive expertise and many years of experience in designing and optimising power systems while taking into account every relevant parameter to minimise capital and operating expenditure.

Our services in power systems design and modelling cover:

- Creating the options
- Assessing their performance using system models as appropriate
- Costing the feasible options
- Optimising them technically and financially

This work is carried out not only as part of large power systems projects but also on small systems where design integrity and cost effectiveness are important. Embedded generation and connection issues are a particular speciality, covering all generation types.

The process

The first step in power system projects is assessing the design requirements and what type of modelling is required. Assessing what data is available and what assumptions will be required are also vital and require a high level of systems expertise. Early designs and analysis are rooted in the practicalities of good engineering practice, facilitating a smooth design process after the concept design stage is complete.

Analyses are carried out at the detailed design stage to ensure that the effect of any design changes is tracked and either acceptable or modified to make the performance acceptable.

Mott MacDonald's expertise is often applied to existing systems to assess the possibilities for extension or modification and to determine whether technical requirements – such as fault levels – are within ratings or that DOL motor starting can be carried out.

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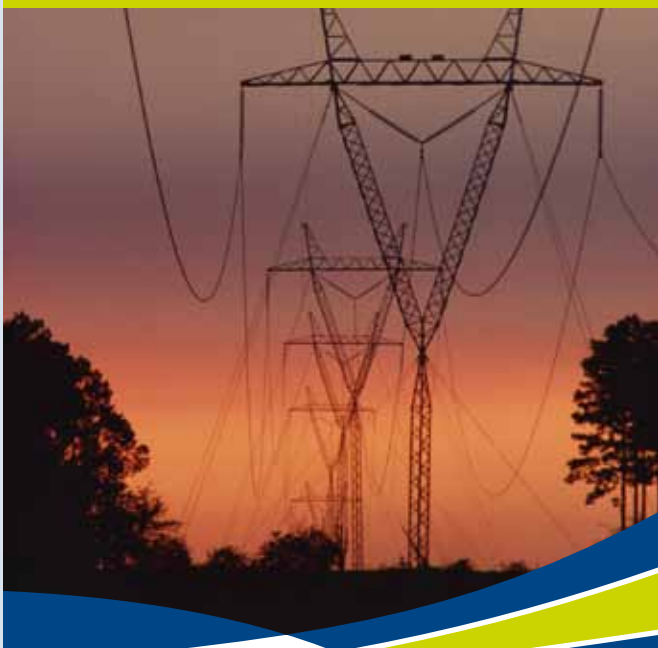
- Concept design and options engineering for power systems
- System modelling and performance assessment for design confirmation
- Control and protection options to optimise system performance and reliability



We have modelled and analysed industrial, offshore and utility systems from LV to 400kV for projects worldwide.

Mott MacDonald

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Types of systems and analysis

We model utility and industrial networks up to the highest voltages to analyse system behaviour and how systems should be controlled and protected to maximise reliability and availability. This covers insulation co-ordination issues and steady state, fault level and transient analyses. We also plan the technical and financial aspects from concept to completion.

Software

We select the most appropriate tool from a range of power systems software to maximise benefit to the system design, including:

- Captor
- Cyme
- DigSilent – PowerFactory
- EDSA
- ERACS
- ETAP
- FASAR
- IPSA
- PSCAD/EMTPDC
- PSS/Adept
- PSS/e
- PTW

Harmonic distortion

As power electronic device ratings increase, the issue of harmonic distortion has become more prominent. Mott MacDonald is skilled in using models as a tool to design systems that avoid these harmonic problems from the outset and, where necessary, include remedial measures such as filters. When acting as design overseers we provide expert advice on system distortion issues and recommend fit-for-purpose remedial measures.

Transients

System transients on all types of plant are of key importance where stability issues due to voltage and frequency dips can occur. Large motor starting and short circuit recovery are key system design issues. Mott MacDonald has experience of these issues and in the assessment of the best solutions for new build and retrofit projects. Switching and lightning surges also have to be predicted, analysed and catered for in the design of new systems, and sometimes in existing networks.

Control and protection

Control and protection issues have to be considered at the design stages and knowledge of system behaviour is a pre-requisite when taking these issues into account. Our system analysis experts possess in-depth understanding of these functions and how they are best applied to systems.

Our engineers work closely with clients to deliver the best results for power system projects.