



# Delivering Human Factors Services That Improve The Design Of Plant, System And Equipment At US and Canadian Nuclear Utilities



## Our Human Factors Consultants

Kinectrics has been providing Human Factors services to the nuclear industry for over ten years. Our HF consultants are experienced professionals with backgrounds in engineering, kinesiology, psychology and health & safety, and consultants on the team have contributed to the development of national (CSA N290.12-14) and International Standards (IAEA DS-492). Our consultants hold professional memberships with the following organizations: Professional Engineers of Ontario (PEO), Association of Canadian Ergonomists (ACE), Chartered Institute of Ergonomics and Human Factors (UK), Human Factors and Ergonomics Society (HFES, U.S.), and Board of Certification of Professional Ergonomics (BCPE, U.S.).

### HUMAN FACTORS ENGINEERING SERVICES

Since 2005, the Human Factors team at Kinectrics has provided Human Factors capabilities across industry sectors including nuclear, transportation, rail, healthcare, software, defence, and aerospace. We work with a range of utility, government and industry clients; applying HF principles in the specification, design, evaluation, operation and maintenance of processes and equipment.

The following are examples of the services we provide for nuclear utilities in the US and Canada:

- Human Factors Regulatory Reviews for NPPs and SMRs, per CNSC and US NRC requirements.
- Human Factors Engineering as part of the Modification Design Process
- Human Factors Integration Support for NPP Replication Projects and Refurbishment/Life Extension
- Licensing Support related to NPP Staffing Complement and Severe Accident Management Planning
- Human Factors Integration Support for Decommissioning activities
- Hazard and Operability (HAZOP) studies, and Failure Mode and Effects Analysis (FMEA)
- Incident Investigation using human error analysis methodologies

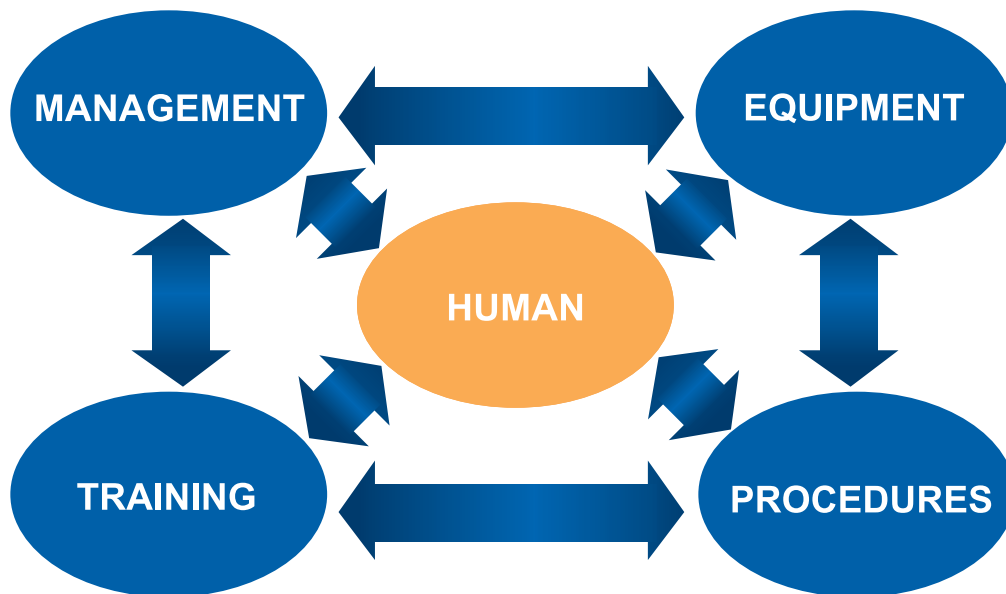
### HUMAN FACTORS ENGINEERING EXPERIENCE

Our team has the combination of expertise, experience, and drive to ensure the efficient and timely execution of services required by our clients. The Human Factors team has executed work under both US and Canadian Human Factors regulatory requirements and has relevant experience with nuclear processes, procedures, systems, and equipment, for example:

- Knowledge and experience with Canadian and US regulatory framework as pertinent to HF requirements (e.g. P-119, G-276, G-278, CSA N290.12-14, NUREG-0711, NUREG-0700).
- Evaluating NPP design against Canadian and US requirements (e.g. NUREG-0800, Chapter 18 'Human Factors Engineering').
- Assessing and scoping the level of Human Factors involvement required for a design modification
- Preparing and executing Human Factors Engineering Program Plans (HFEPPs)
- Identifying suitable industry standards and guidelines for a particular project,
- Conducting Operational Experience Reviews (OERs)
- Performing HFE analysis based on the technical elements identified in the HFEPP (e.g. function analysis, task analysis etc.)

- Liaising with Client staff including system designers, project engineers, operators, maintainers and system engineers to identify the relevant functions, tasks, failure modes etc. for the specific system
- Making recommendations on human factors design requirements for Main Control Room panel designs, field control panel design, CRT based displays, component selection, room layout, and procedures and training
- Preparing Human Factors Engineering Summary Reports (HFESRs) to document the results of HFE analysis
- Preparing Human Factors Verification and Validation (V&V) Plans and executing V&V activities
- Attending project meetings to represent Human Factors
- Reviewing and commenting on design documents
- Performing Human Factors oversight and programmatic reviews on behalf of our clients
- Addressing licensing and regulatory issues through HFE analysis and methods

Human Factors Engineering (HFE) is the application of knowledge on human capabilities and limitations to plant, system, and equipment design. HFE ensures that the plant, system, or equipment designs are compatible with the personnel who operate, maintain, and support them.





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