FOREWORD

The nuclear reactor is a fine example of technology and of the art of reason. In fact, all of our present technology owes its existence largely to the powers of reason. Aristotle, generally regarded as the forefather of reason, would have been proud. The precise formulation of concepts in the form of mathematics and logic form the language upon which technology relies. So overwhelming has the progress of reason been, that the world outside reason has all but disappeared in our language, our thoughts, our actions. Yet, as important as reason has been in providing the motive power behind technology, that motive power would have been applied without direction were it not for that small vestige beyond reason that still remains in humans. This small vestige, though suppressed almost to the point of extinction in Western society, remains powerful as the guiding light for the train of thought.

That guiding light is quality, for lack of a better word. What does insisting on quality mean? How does one insist on quality? The only route I know is to question everything. By questioning, knowledge (facts) is gained. But much more importantly, wisdom is gained by the process or the act of questioning.

So, with this in mind, one can begin to appreciate what this manual represents and how it should be used. This is more than a manual on how to design nuclear process systems. It is a manual on why the systems should be designed that way in order to form the philosophical basis for design. Words, however, cannot do justice to philosophy. Thus, this manual can, at best, give the roots of the knowledge required for a deeper understanding of the design and the design process. This manual can only form the basis for an individual's understanding and act as a springboard to the goal: wisdom of the design process.

Thus, the study of the process of process design begins: a process whose final outcome, the operating reactor, is best viewed as the tail-light of the caboose on the train of thought which is guided by the wisdom of the individual designers, by the quality of their decisions. A not incidental side effect is actually the effect for the individual. The pursuit of quality, the growth of wisdom in the individual is the key to the individual and to a meaningful co-existence with this environment, of which reactors are but a part.

GLOSSARY OF ABBREVIATIONS AND ACRONYMS

AE	Acoustic Emission
AECB	Atomic Energy Control Board
AESOP	Atomic Energy Simulation of Optimization (computer code)
ASDV	Atmospheric Steam Discharge Valve
ASSERT	Advanced Solution of Subchannel Equations in Reactor Thermalhydraulics (computer code)
ASTM	American Society for Testing Materials
BLC	Boiler Level Control
BLW	Boiling Light Water
BPC	Boiler Pressure Controller
CCP	Critical Channel Power
CHF	Critical Heat Flux
CPR	Critical Power Ratio
CRL	Chalk River Laboratories
CRT	Cathode Ray Tube
CSA	Canadian Standards Association
CSDV	Condenser Steam Discharge Valve
CSNI	Canadian Standards for the Nuclear Industry
DBE	Design Base Earthquake
DCC	Digital Control Computer
DF-ET	Drift Flux-Equal Temperature
DF-UT	Drift Flux-Unequal Temperature
DNB	Departure from Nucleate Boiling
ECC	Emergency Core Cooling
ECI	Emergency Core Injection
EFPH	Effective Full Power Hours
EVET	Equal Velocity Equal Temperature
EVUT	Equal Velocity-Unequal Temperature
EWS	Emergency Water Supply
FBR	Feed, Bleed and Relief
FP	Full Power
HEM	Homogeneous Equilibrium Model
HTS	Heat Transport System
HWP	Heavy Water Plant
HYDNA	Hydraulic Network Analysis (computer code)
I&C	Instrumentation and Control
IBIF	Intermittent Buoyancy Induced Flow
ICRP	International Commission on Radiological Protection
LOC	Loss of Coolant
LOCA	Loss of Coolant Accident
LOC/LOECC	Loss of Coolant with Coincident Loss of Emergency Core Cooling
LOP	Loss of Pumping
LOR	Loss of Regulation
MCCR	Ministry of Corporate and Consumer Relations
MCS	Maintenance Cooling System
MHD	Magneto hydrodynamics

milli-k	Unit of reactivity for reactor physics
NPD	Nuclear Power Demonstration
NPSH	Net Positive Suction Head
NUCIRC	Nuclear Circuits (computer code)
OECD	Organization for Economic Co-operation & Development
PGSA	Pickering Generating Staiton A
PHTS	Primary Heat Transport System
PHW	Pressurized Heavy Water
PHWR	Pressurized Heavy Water Reactor
PRESCON2	Pressure Containment (computer code)
QA	Quality Assurance
RAMA	Reactor Analysis Implicit Algorithm
R&M	Reliability and Maintainability
RB	Reactor Building
rem	röentgen or rad equivalent mammal or man?
RIH	Reactor Inlet Header
ROH	Reactor Outlet Header
RTD	Resistance Temperature Detectors
SDM	Safety Design Matrices
SOPHT	Simulation of Primary Heat Transport (computer code)
SRV	Safety Relief Valve
TMI	Three Mile Island
TOFFEA	Two Fluid Flow Equation Analysis (computer code)
UVUT	Unequal Velocity Unequal Temperature
VB	Vacuum Building
VC	Vacuum Chamber
WRE	Whiteshell Research Establishment