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FINAL REPORT ON THE USE OF THE
MODULAR-LOGIC-NOMENCLATURE APPROACH
FOR THE N-REACTOR PROBABILISTIC RISK ASSESSMENT

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INTRODUCTION

The N-Reactor probabilistic risk assessment adaption of the modular logic approach for fault tree modeling has led to the update of the master logic diagram (MLD) nomenclature to conform with a standard modular-logic-model-nomenclature format. This report describes the MLD nomenclature system and provides a listing of the updated MLD label codes, along with the original codes.

N-REACTOR MLD NOMENCLATURE DOCUMENTATION

The format that was used to incorporate modular-logic-model (MLM) nomenclature into the master logic diagram (MLD) is conceptually consistent with the format developed for light-water reactors. In general, event labels for the N-Reactor MLD now follow the format:

COMPIDEN-TYP-FM

with a maximum string of 15 characters. (When necessary, dashes are suppressed in order to limit string length to 15 characters.)

"COMPIDEN"

The first portion of the event label for most of the basic events in the fault tree modular logic has the general form "COMPIDEN". This eight (8) character code is used to define the system, the component number, and the electrical load group associated with the component.

"COM"

The first three letters of this code, "COM", are used to designate the system to which the component belongs. Examples of substitutions that can be made for the code "COM" are shown in Table 1. Note that Table 1 also includes system codes from the original MLD.

"PIDE"

The next four letters, "PIDE", are used to designate the component number. This number can be extracted directly from the system piping and instrumentation drawings (P&IDs) or other plant drawings. In some cases, acronyms must be used to identify components. For example, the "PIDE" substitution for Drive Turbine Pump 1 is "ODT1" because the plant P&IDs do not yield a unique identification number for that pump. Table 2 is a list of codes for "PIDE" (called "subsystem designators").

"N"

The last letter in the code, "N", is used to designate the load group or the portion of the electric power system associated with the component. If no load group is associated with the component, the letter X is used to signify this fact. Letters used to identify load groups should be A or B.

EXAMPLE, "COMPIDEN"

As an example, "COMPIDEN" for condensate and feedwater motor-operated valve number HV4312 which is powered by load group "B" of the electric power system would be:

COM =	CFW	(see Table 1)
PIDE =	4312	(component number)
N =	B	(electrical load group)

COMPIDEN = CFW4312B

Similarly, a manual valve number HV4021 in the same system would have a COMPIDEN substitution of:

CFW4021X

The identifier COMPIDEN does not indicate the type of component, but only its system, component number, and load group. Another code is included in the event labels to supply component information.

"TYP"

The code, "TYP", is the general form of the component type code and it appears in the event labels in conjunction with the code COMPIDEN as follows:

COMPIDEN-TYP

"TYP" is a three-character code identifying the class of component that has failed. For example, the TYP code for a transformer is TFM. For some components, "TYP" specifies fault information as well as component class. The generic "TYP" code for a motor-operated valve is MXX, where M indicates that the component is a motor-operated valve and XX are designators indicating the normal and failed positions of the valve. The letters "O" and "C" represent "open" and "closed," respectively, and are substituted as appropriate in the TYP code for the designators XX. The previously described auxiliary-feedwater-motor-operated valve number HV4312 which is normally closed and fails closed would thus be identified as follows:

AFW4312B-MCC

A list of "TYP" codes is given in Table 3.

"FM"

The final portion of the event label, "FM", is a two-character code that indicates the failure mode of the equipment. Examples of "FM" codes that appear in the MLD base events are "FL" (fails), "OE" (operator error), and "MF" (mechanical failure). A list of "FM" codes that are used for MLD basic events is provided in Table 4.

TABLE 1

"COM" Codes for
Basic Event Labels

UPDATED CODE	SYSTEM	ORIGINAL CODE
A14	13.8 kV Onsite AC Power	AC14
A41	4160 volt Onsite AC Power	AC4
A48	480 volt Onsite AC Power	AC480
AHR	After Heat Removal	AHR
BLC*	Bottom Insulation Layer Cooling	LC
BSS*	Ball Safety	BSS
CAE	Diesel Starting Air	CAE
CFV*	Confinement Filtered Vent	CFV
CFW	Condensate & Feedwater	CF
CHM	RC Chemical Addition	CHEM
CNF	Confinement	CONF
CPA	Compressed Air	CA
CRH*	Control Room Habitability	CRH
CRW	Circulating Raw Water	CRW
CSV*	Confinement Steam Vent	CSV
DC*	Onsite DC Power	DC
DCN*	Dump Condensers	DCN
DCW*	Diesel Engine Cooling Water	DCW
DHP	Deaerator Heater Pressure Control	DHPC
DLB*	Diesel Lubrication	DLUB
DMW	Demineralized Water	DW
DOS*	Diesel Fuel Storage & Transfer	DOS
DST*	Diesel Starting	DS
DTL	Deaerator Tank Level Control	DTLC
ECC	Emergency Core Cooling	ECC
ESF	Engineered Safety Features Actuation	ESFA
FCF	Fuel Cladding Failure Detection	FCFD
FW1	Low Pressure Filtered Water	FW-1
FW2	High Pressure Filtered Water	FW-2
GIC*	GSC Instr. & Control	GSCIC
GSC	Graphite & Shield Cooling	GSC
GST	Graphite Structure	GS
HCC	HCR Cooling	HCRC
HCR	Horizontal Control Rod	HCR
HPI	High Pressure Injection	HPI
HPP	HPI Pump Control	HPIC
IBH	Interbuilding Header	IBH
INA	Instrument Air	IA
MSH	Mainstream Header	MSH
MSS	Main Steam Supply	MSS
NCS*	Non Safety Control	NCS
PCF*	Primary Coolant Flow Control	PCF
PCP	Primary Coolant Pressure Control	PCP
PLC	Pressurizer Level Control	PL

* = These abbreviations do not appear in basic events.

TABLE 1 (Cont.)
 "COM" Codes for
 Basic Event Labels

UPDATED CODE	SYSTEM	ORIGINAL CODE
O14	13.8 kV Offsite AC Power	OAC14
O23	230 kV Offsite AC Power	OAC230
PMS*	Pony Motor Start	PMS
PSB*	Plant Service Boilers	PSB
PSP	Primary Spill	PS
RCT	Reactor Coolant	RC
RGS*	Reactor Gas	RG
RSW	Raw Service Water System	RSWS
RTR	Reactor Trip	RT
RW1	Low Pressure Raw Water	RWS-1
RW2	High Pressure Raw Water	RWS-2
SBF*	PSB Fuel	SBF
SCA	Service Air	SA
SGL	Steam Generator Level Control	SGLC
SLM	Secondary Loop Makeup	SLM
SPC	Secondary Pressure Control	SPC
SSE	Secondary Surge Tank Emergency Fill Control	SSTEF
STL	Secondary Surge Tank Level Control	SSTLC
STP	Secondary Surge Tank Pressure Control	SSTPC
SVC	Constant Spill Valve Control Chain	SVC
WTG	WPPSS TG	WTG

* = These abbreviations do not appear in basic events.

TABLE 2

"PIDE" Codes for Basic Event Labels

(Subsystem designator codes that are required for components without unique component numbers.)

<u>UPDATED</u> <u>CODE</u>	<u>SUBSYSTEM</u>	<u>ORIGINAL</u> <u>CODE</u>
ALPX	Auxiliary Lube Pump X	AUXLUB
MLPX	Main Lube Pump X	MLUB
OBFX	Boiler Feedwater Component X	BF
ODTX	Drive Turbine Component X	DT
OTGX	Turbogenerator Component X	TG

TABLE 3

"TYP" Codes for
Basic Event Labels

UPDATED CODE	VALVES	ORIGINAL CODE
A	Air Operated Manual	A
C	Check	C
E	Explosive	E
H	Hydraulic Operated	H
M	Motor Operated	M
R	Relief	R
S	Safety	S
X	Manual	X
VLV	Valves (General)	VLVS
V	Valves (Unknown Type)	V

OTHER COMPONENTS

ASM*	Assemblies	ASSYS
AUX*	Auxiliary	AUX
BUS	Bus	BS
BXX	Circuit Breaker (XX=normal/ failed state)	CB
CBL	Cable	CAB
CND	Condenser	CND
CNT*	Contacts	CONT
COMP	Components (General)	COMP
CTR	Controller	CONT
DEA	Deaerator	DEAR
DGN*	Diesel Generator	DG
DOR*	Door	DR
DSL*	Diesel (without generator)	D
EMX	Compressor (X: R=fail to run, S=fail to start)	CMP
HDR	Header	HDR
HTR	Heater	HTR
HTX*	Heat Exchanger	HX
INH	Inlet Header	INHDR
INR	Inlet Riser	INRIS
LSW*	Level Switch	LS
LXT	Crosstie	XTIE
MCC**	Motor Control Center	MCC
MISC	Miscellaneous	MISC

* = These abbreviations do not appear in basic events.

** = These abbreviations were used in original labels but
have not been used in present basic event labels.

TABLE 3 (Cont.)

"TYP" Codes for
Basic Event Labels

OTHER COMPONENTS (Cont.)

UPDATED CODE		ORIGINAL CODE
MST	Motor Starter	MSTA
OUH	Outlet Header	OUTHDR
OUR	Outlet Riser	OUTRIS
PIP	Pipe	PP
PMP	Pump	P
PMX	Pump Motor (X: R=fail to run, S=fail to start)	PM
PRI*	Primer	PRI
PRZ	Pressurizer	PRZ
PTB	Pressure Tube	PRTB
REL*	Relay	RY
RFL*	Reflector	RFLT
SEAL	Seal	SEAL
SJE	Steam Jet Air Ejector	SJAE
SPR	Spray	SPR
SRG*	Surge Tank	SRG
STG*	Steam Generator	SG
STR*	Strainer	STR
SWG	Switchgear Bus	SWGR
TFM	Transformer	TR
TNK	Tank	T
TRB	Turbine	TRB
VTR*	Voter	VT
ZBT*	Battery	BT

* = These abbreviations do not appear in basic events.

TABLE 4

"FM" Codes for
Basic Event Labels

UPDATED CODE	FAILURE MODES (GENERAL)	ORIGINAL CODE
AL*	Align	ALGN
BL	Block	BLK
BR	Breach	B
CB*	Calibrate	CALIB
CG	Clog	CLG
CM*	Common Mode	CM
CS*	Closed	CLS
DF*	Decrease Flow	DCR
EJECT	Fuel Ejection	EJECT
FL	Failure (catch-all category)	F
GD	Ground	GND
GS	Graphite Shrinks	
HDOE	Hydraulically Operated Valve Fails Because of OE and Decreases Heat Removal	
HIOE	Hydraulically Operated Valve Fails Because of OE and Increases Heat Removal	
IM	Improper	IMP
L**	Loss (catch-all)	L
LA	Loss of Air	AIR
LC	Loss of Cooling	COOL
LH	Loss of Hydraulics	HYDR
LK	Leak	LK
LS	Loss of Support System	SUP
LW	Loss of Water	WTR SUPPLY
MF	Hardware/Mechanical Failure	HF
MN**	Manual	MAN
OE	Operator Error	OE
OF**	Off	OFF
ON**	On	ON
OUT**	Outside Confinement	OUT
PR	Power	PWR
RE	Failure to Restore After Test/Maintenance	TMOE
RN**	Run	RN
SF**	Shift	SFT
SG**	Signal	SIG
SH**	Short	SHT
SP	Spurious	SPUR
ST**	Start	ST
TM	Test/Maintenance	TM

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have not been used in present basic event labels.

TABLE 4 (cont.)
 "FM" Substitutions

FAILURE MODES (VALVES, CIRCUIT BREAKERS)

UPDATED		ORIGINAL
CC	Normally Closed, Failed Closed	CC
CO	Normally Closed, Failed Open	CO
OC	Normally Open, Failed Closed	OC
OO	Normally Open, Failed Open	OO
FO	Normally Partially Open; Operator Fully Opens	OOE