全世界 發送電系統의 에너지管理시스템調査

SURVEY OF ENERGY MANAGEMENT SYSTEMS FOR GENERATION AND TRASMISSION SYSTEMS THROUGHOUT THE WORLD

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Abstract

This paper provides a primer for the Enengy Control Center designers and a comprehensive overview for utility management personnel that desire an understanding of the Energy Management System for a Generation-Transmission System.

Any errors or apparent misrepresentation of facts that may appear in the list are entirely unintentional. I would greatly appreciate being informed of any such omissions and errors.

1. SCOPE

1) Characteristics
   (1) Multi-computer configuration
   (2) Color CRT displays
   (3) Security monitoring
   (4) Automatic generation control

2) Number of Companies ; 196
   (1) Africa ; 3
   (2) Asia ; 31
   (3) Europe ; 27
   (4) North America ; 115
   (5) Oceania ; 3
   (6) South America ; 17

3) Number of Systems ; 260
   (1) Old ; 44 (1961-1982)
   (2) In-service ; 154 (1961-1982)
   (3) Planned ; 62 (1983-1986)

4) Number of Expansion or Replacement System ; 56

Years	Counts	Average years
Below 5	25	3.48
6-10	33	7.94
11-15	13	12.15
Above 16	8	17.5
Total	79	8.11

2. DATA ACQUISITION SUBSYSTEM

1) Data Links
   (1) General communication protocal
      (i) master station to remote terminal unit
         Basic
         ASC II
         RS232C, etc.
      (ii) computer to computer
         BSC,
         HDLC,SDLC,X.25,DDCMP,
         ANSI X3.28,ADCCP,CDCCP,etc.
      (iii) computer to peripheral
         EIA RS232(C)
         CCITT V.24
         RS 422, etc.
   (2) Error detecting message formats
      (i) CDT; cyclic digital data transmission
      (ii) BCH or BCC; bose-chaudhuri code
      (iii) ECC; error control code
      (iv) CRC; cyclic redundancy check

(3) Signaling speed

(i) asynchronous modem (baud)
50,100,200,300,600,1200,1800,
2400 but actual upper limit :
1800

(ii) synchronous modem (BPS)
2400,4800,9600

2) Hierarchical Structure

Number of Levels	Old	In-Service	Planned
1	41	94	40
2	3	41	19
3	-	16	3
4	-	3	-

3) Number of RTU's

Number	Old	In-Service	Planned
1- 10	6	9	1
11- 20	8	21	5
21- 40	5	29	15
41- 80	1	34	14
81-160	-	22	16
161-320	-	9	3
Unknown	24	30	8

3. COMPUTER SUBSYSTEM

1) Real-Time Computer Characteristics

(1) Memory cycle times of microsecond or lower

(2) Multiple external interrupt structure with a fair number of interrupts

(3) Fast access disk in the order of less than 20 milliseconds access time and transfer rate of better than 250 kbytes per second

(4) Multiport memory banks with provision for interleaving

(5) Memory expandability to, at least, 64K 32bit words or equivalent

(6) Direct memory access (DMA) with multiplexer for several peripherals sharing the DMA channel

(7) Floating point hardware

(8) Internal intterrupts for various trap conditions

(9) Internal real-time clocks

(10) Watchdog timer

2) Computer Configuration

Configuration	Old	In-Service	Planned
Simplex	33	14	-
Duplex,Two	7	10	1
Dual	3	72	25
Triple,Three, Dual+Simplex	-	15	2
Dual+Duplex, Dual+Front-End, 2 Dual, Quad, Four	1	22	19
2 Dual+Simplex, Triple+Dual	-	7	6
Quad+Dual, Quad+Dual+Simplex	-	11	5
Quad+2Dual, 2Four+Simplex	-	1	1
4Dual+Dual, Dual+Eight, Seven+Three	-	2	1
3Quad+Dual, Eleven+Three	-	-	2

3) Main Memory Size in Kilowords

Kilowords	Old	In-Service	Planned
below 32	40	23	-
33-64	-	32	1
65-128	-	47	7
129-256	-	28	16
257-512	-	13	26
513-1024	-	2	9
Above 1025	-	4	3
Unknown	4	5	-

4) Bulk Storage in Megabytes

Megabytes	In-Service	Planned
Below 6	38	-
7-24	39	1
25-96	35	23
97-384	19	30
385-1536	4	6
Above 1537	4	1
Unknown	6	1

4. MAN-MACHINE SUBSYSTEM

1) Number of CRT's

Number	Old	In-Service	Planned
1- 2	1	19	-
3- 4	1	23	2
5- 8	-	47	21
9-16	-	32	10
17-32	-	12	16
33-64	-	5	1
65-128	-	-	2
Unknown	42	11	1

2) Dynamic Wall Display

Item	In-Service	Planned
Mosaic	56	34
Mosaic*	13	2
Backlighted	10	-
Static	30	10
Dynamic	3	1
Others	6	3
None	6	2
Unknown	30	10

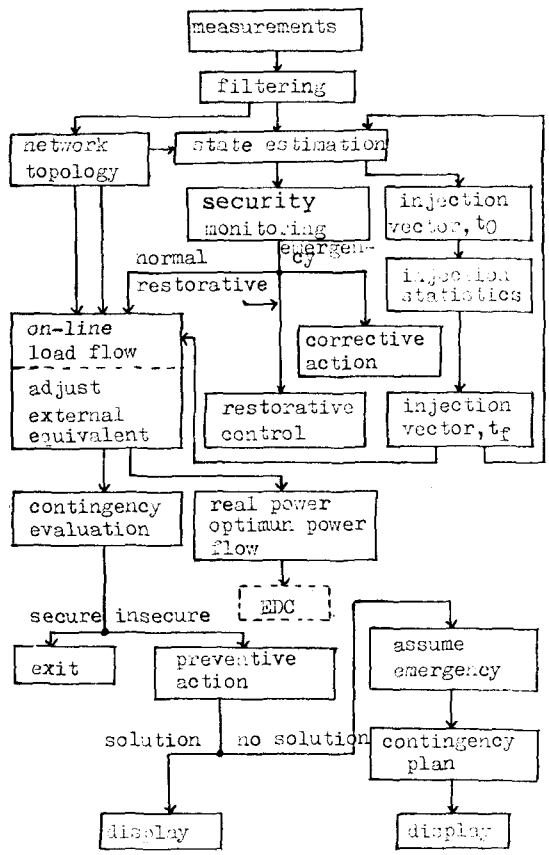
* Driven by hard wired logic independent computer

5. SOFTWARE SUBSYSTEM

1) On-Line Functions

Functions	Old	In-Service	Planned
AGC	37	135	57
ASTA	-	2	3
AVC	4	6	10
CE	2	55	49
DTA	-	1	2
DTS	-	3	12
EC	-	4	4
ECD	-	-	4
EDC	34	124	50
NOX	-	2	1
OLF	1	49	57
OPF	-	10	14
OSC	-	7	6
SDC	7	99	44
SE	1	43	53
SM	34	138	55
SVC	-	44	25

2) Security Functions in Power System Control Centers



References

1. Kap-Koo Yoon, Sung-Hak Kim; "State-of-the-Art Energy Management Systems", KIEE, Nov. 1981.
2. T.E. Dy Liacco, D.L. Rosa ; "Survey of system control centers for generation - transmission systems", April, 1983.