RESIDENTIAL DATA VERIFICATION

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FIRST LAW OF ELCAP

IT IS EASIER TO RECOVER FROM A BAD ANALYSIS THAN TO RECOVER FROM BAD DATA
SECOND LAW OF ELCAP

1000 $>>$ 10
BASIC SYSTEM RELIABILITY

GOALS

○ AUTOMATIC DATA ACQUISITION
○ AUTOMATIC CONVERSION TO ENGINEERING UNITS
○ AUTOMATIC END-USE AGGREGATION
○ DATA OF KNOWN AND REASONABLE QUALITY
VERIFICATION MUST ADDRESS ALL SYSTEM COMPONENTS

- HARDWARE
- MEASUREMENT PLAN
- INSTALLATION
- DATA ACQUISITION INTERFACE
- ENGINEERING UNIT CONVERSIONS
- ON-LINE QUALITY CHECKING
- END-USE AGGREGATION EQUATIONS
SYSTEM IS EXTREMELY COMPLEX

e.g. CT INSTALLATION
(1 CURRENT TRANSFORMER)

3 CHOICES OF CURRENT TRANSFORMER
6 CHOICES OF SCALING RESISTOR
5 BINARY CHOICES SUBJECT TO ERROR

10–60 CTs PER INSTALLATION
ELCAP NETWORK STATUS
pilot programs

- Co–instrumentation sites
  2 on–line for SCL comparison

- Residential pilot — 20 sites
  * hardware tests — 10/29 certification
  * installation procedure test —
    Contractor award
  * verification — 11/13 implementation

- Commercial pilot — 16–1=15 sites
  * installation procedures — continuing review
  * verification — in progress
STEPS IN DATA VERIFICATION

- INSTALLATION CHECK-OUT
- INSTALLATION VERIFICATION
- ONGOING DATA REVIEW
INSTALLATION VERIFICATION

I. OUTLINE OF PROCESS

II. DETAILS OF THE CHECK

III. QC REPORT
VERIFICATION FLOW

DAS INITIALIZED
4 DAYS 5 MIN. DATA > VAX

PIF TEAM

TEST 1
FAIL

PIF GENERATED

END USE AGGREGATION

TEST 2
FAIL

QC/QA REPORT
CLASSES OF VERIFICATION TEST

- ROBUST TESTS
- REASONABLENESS TESTS
CHECK 1

SUM RULE
\[ E_A = e_1a + e_2a + \ldots + e_{na} \]

SUM CHECK
\[ | E_A - e_1a - e_2a - \ldots - e_{na} | \leq \hat{E} \]

DIAGNOSIS
WHICH CHANNELS RESPONSIBLE?
OFFSET OR CALIBRATION PROBLEM?
INSTALLATION PROBLEM?
PASSING CRITERION:
NO MORE THAN M% OF THE RECORDS
FAIL SUM CHECK
DIFFERENCES BETWEEN MAIN B AND ITS FEEDERS

SITE X

PLOT OF DIFFB*MIN  LEGEND: A = 1 OBS, B = 2 OBS, ETC.
Differences between Main A and its feeders

Site Y

Plot of Diffa*min  Legend: A = 1 obs, B = 2 obs, etc.
DIFFERENCES BETWEEN MAIN B AND ITS FEEDERS
SITE Y

PLOT OF DIFFB^MIN
LEGEND: A = 1 OBS, B = 2 OBS, ETC.

DIFFB

800 +
700 +
600 +
500 +
400 +
300 +
200 +
100 +
0 +
-100 +
-200 +
-300 +
-400 +
-500 +
-600 +
-700 +
-800 +

BA A A A A A A A AAABAB B B ABA B C ABB B A BA B AA B B A A AA A A A AAAAA AAA A A A A A A A A AA A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A
CHECK 2

IS MEASUREMENT PLAN CONSISTENT WITH DATA?

ARE DIURNAL PATTERNS REASONABLE?
ARE SHORT-TERM CYCLES REASONABLE?
ARE CONSUMPTION LEVELS REASONABLE?

IF THERE ARE FAILURES, DIAGNOSE PROBLEM

MISIDENTIFIED CHANNEL?
IS UNREPORTED MAJOR EQUIPMENT PRESENT?
QUALITY CONTROL REPORT

1) STATISTICS ON SUM CHECKING
2) PLOTS OF TIME SERIES DATA FOR EACH END USE
3) COMMUNICATIONS STATISTICS
4) PERFORMANCE SUMMARY
LEARNED FROM VERIFICATION DEVELOPMENT

- IMPORTANCE OF ROBUST TESTS
- UNBALANCED 2-PHASE LOADS
- IMPORTANCE OF A/D OFFSET STABILITY
ACCURACY AND PRECISION CONSIDERATIONS

- A/D CONVERSION
  255 BIT – FULL SCALE

- AVERAGED ON-LINE WITH TRUNCATION

- CONSTANT PRECISION RELATIVE TO FULL SCALE

- ALL CHANNELS LAB CALIBRATED