SCHOOL Project

Substation &

Circuit

History

Of

Operational

Loads

"It's where we go
to learn about
our system."

SCHOOL - Key Business Drivers

- ❑ Quality Load Data Is Critical for the Business
  - ❑ Required to Manage Peak Demand
    - ❑ Forecast for long-term planning
    - ❑ Day-to-day load balancing
    - ❑ Key variable to Distribution Capital Budget
  - ❑ Failure to have access to quality data can lead to overloads and outages

- ❑ Existing Load Data Systems:
  - ❑ Are legacy systems at the end of their useful life
  - ❑ Need external expertise for support
  - ❑ Do not comply with PacifiCorp IT and Technology Blueprint Standards
  - ❑ Have become "silos" for data
  - ❑ Cannot be integrated into the overall PacifiCorp information backbone

- ❑ Business Processes Are Inefficient, Leading to Delayed Tasks and Poor Quality Data

Project Objectives

☐ Enable Transition Plan Efficiencies

☐ Replace SUBVIEW, EMS-Sigma Database and Hand-Held Data Collection Devices

☐ Provide Load Data and Analytical Tools Across PacifiCorp from a Central Historian Application

☐ Improve or Eliminate Manual Processes Supporting Load Studies, Load Forecasting, Infrastructure Planning, and Substation Inspections

☐ Facilitate Planning and Analysis Functions With Consistent Load Data Within PacifiCorp

Key Project Deliverables

The primary deliverable is the implementation of SCHOOL and will include:

- Develop a multi-phased solution strategy
- Replace existing "SUBVIEW" system with new load data management system.
- Replace "Handheld" data collection devices for capturing load data and maintenance information
- Replace EMS-SIGMA load data historian
- Integrate with MV-90 for additional load data
- Enhanced analytical capabilities utilizing load data sources.
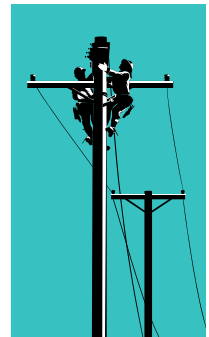
Multi-Phase Vision

The SCHOOL Curriculum for better load data is broken up into three phases:

6/1/02 3/31/03 12/31/03 6/30/04

Phase 1 **Phase 2** **Phase 3**

| Business Case & Basic SCHOOL | Advanced SCHOOL | Future SCHOOL |

Scope
- Strategy & Business Case
- Implement OSI-PI Infrastructure
- Perform Legacy System Data Migration & EMS/SIGMA Transition
- SUBVIEW Replacement
- Evaluate & Implement Hand Held Solution
- Implement Hourly Load Peak at 110 Substations (Critical)
- Develop Data Expansion Criteria & Quality Standards
- Integrate with Legacy SCADA & MV-90

OSI Solutions
- Universal Data Server
  - PI DataStorage
  - PI Module Database
- PI Server Applications
  - PI Batch
  - PI Totalizer
  - PI ACE
- PI Process Book
- PI Datalink
- PI Data Access Pack
- PI Interfaces
- PI Handheld Terminal

Scope
- Integrate SCHOOL with new EMS (ABB Ranger)
- Integrate with "Frontline" Work Management and Hand Held Solution
- Expand Data to Remaining Substations and Circuits
- Incorporate Weather Data and Advanced Data Content

OSI Solutions
- Sigmafine
- RI Link

Scope
- Power Quality Functionality
- Expand Integration with other Related Systems
- Expand Asset Management Reporting

OSI Solutions
- PI Process Templates
- PI ICE

Other Initiatives within PacifiCorp

Data Management & Infrastructure
- *Frontline Program*
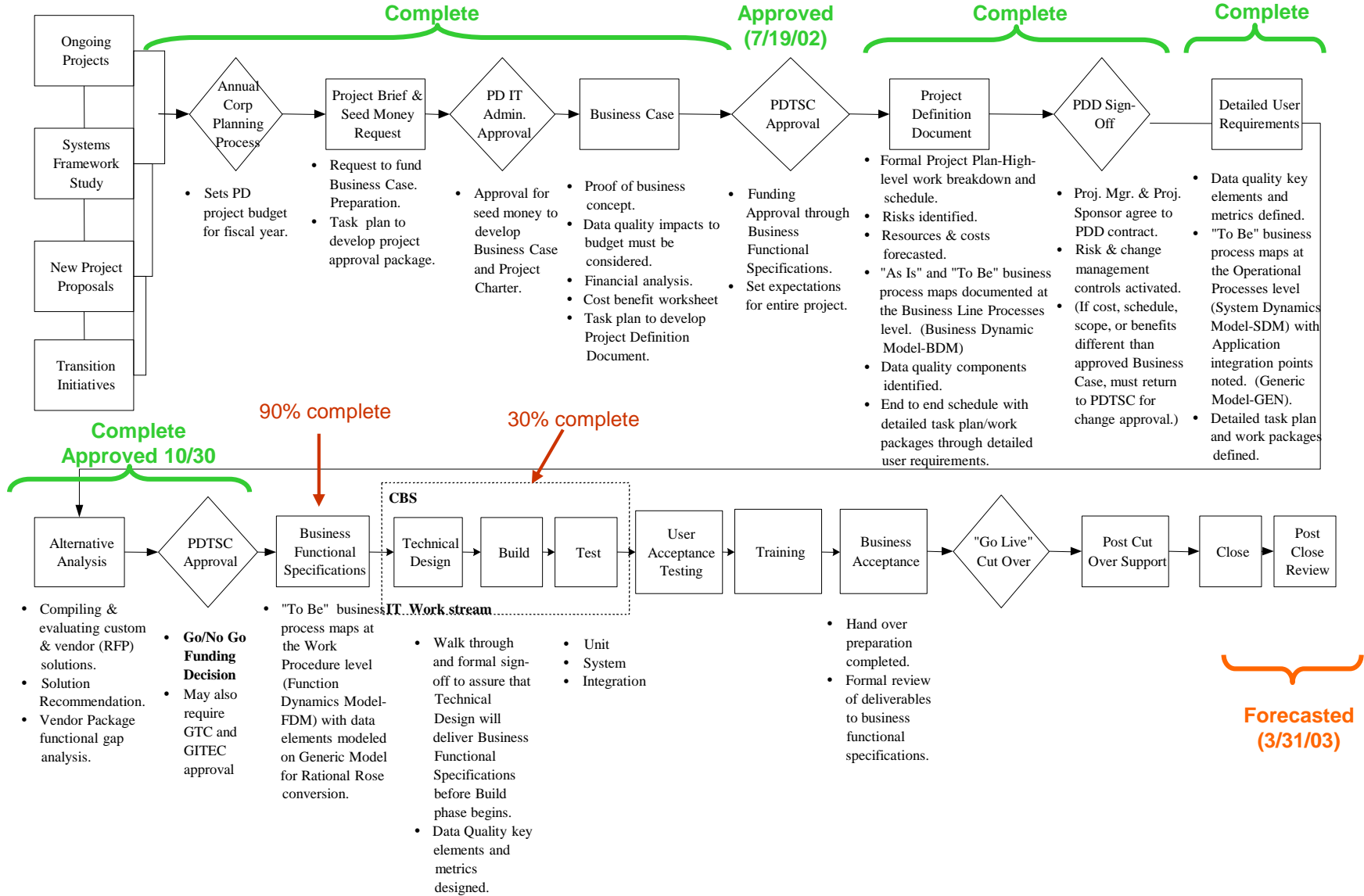- *ERP (SAP)*
- *GIS*
- *Metering*

Phase 1 Scope

Scope:

- **Strategy & Business Case**
- **Implement Load Data Management System Infrastructure**
- **Perform Legacy System Data Migration and EMS/SIGMA Transition**

  (including data quality clean-up)
- **SUBVIEW Replacement**
- **Evaluate & Implement Hand Held Solution**
- **Implement Hourly Load Peak at 110 Substations (Critical)**
- **Develop Data Expansion Criteria & Quality Standards**
- **Integrate with Legacy SCADA and MV-90**
- **User, Developer, and System Administration Training**

SCHOOL Project Lifecycle Status

Complete   **Approved (7/19/02)**   **Complete**   **Complete**

Ongoing Projects

Systems Framework Study

New Project Proposals

Transition Initiatives

Annual Corp Planning Process

- Sets PD project budget for fiscal year.

Project Brief & Seed Money Request

- Request to fund Business Case. Preparation.
- Task plan to develop project approval package.

PD IT Admin. Approval

- Approval for seed money to develop Business Case and Project Charter.

Business Case

- Proof of business concept.
- Data quality impacts to budget must be considered.
- Financial analysis.
- Cost benefit worksheet
- Task plan to develop Project Definition Document.

PDTSC Approval

- Funding Approval through Business Functional Specifications.
- Set expectations for entire project.

Project Definition Document

- Formal Project Plan-High-level work breakdown and schedule.
- Risks identified.
- Resources & costs forecasted.
- "As Is" and "To Be" business process maps documented at the Business Line Processes level. (Business Dynamic Model-BDM)
- Data quality components identified.
- End to end schedule with detailed task plan/work packages through detailed user requirements.

PDD Sign-Off

- Proj. Mgr. & Proj. Sponsor agree to PDD contract.
- Risk & change management controls activated. (If cost, schedule, scope, or benefits different than approved Business Case, must return to PDTSC for change approval.)

Detailed User Requirements

- Data quality key elements and metrics defined.
- "To Be" business process maps at the Operational Processes level (System Dynamics Model-SDM) with Application integration points noted. (Generic Model-GEN).
- Detailed task plan and work packages defined.

Complete Approved 10/30   **90% complete**   **30% complete**

Alternative Analysis

- Compiling & evaluating custom & vendor (RFP) solutions.
- Solution Recommendation.
- Vendor Package functional gap analysis.

PDTSC Approval

- **Go/No Go Funding Decision**
- May also require GTC and GITEC approval

Business Functional Specifications

- "To Be" business process maps at the Work Procedure level (Function Dynamics Model-FDM) with data elements modeled on Generic Model for Rational Rose conversion.

CBS

Technical Design

- Walk through and formal sign-off to assure that Technical Design will deliver Business Functional Specifications before Build phase begins.
- Data Quality key elements and metrics designed.

IT Work stream

Build

Test

- Unit
- System
- Integration

User Acceptance Testing

Training

Business Acceptance

- Hand over preparation completed.
- Formal review of deliverables to business functional specifications.

"Go Live" Cut Over

Post Cut Over Support

Close
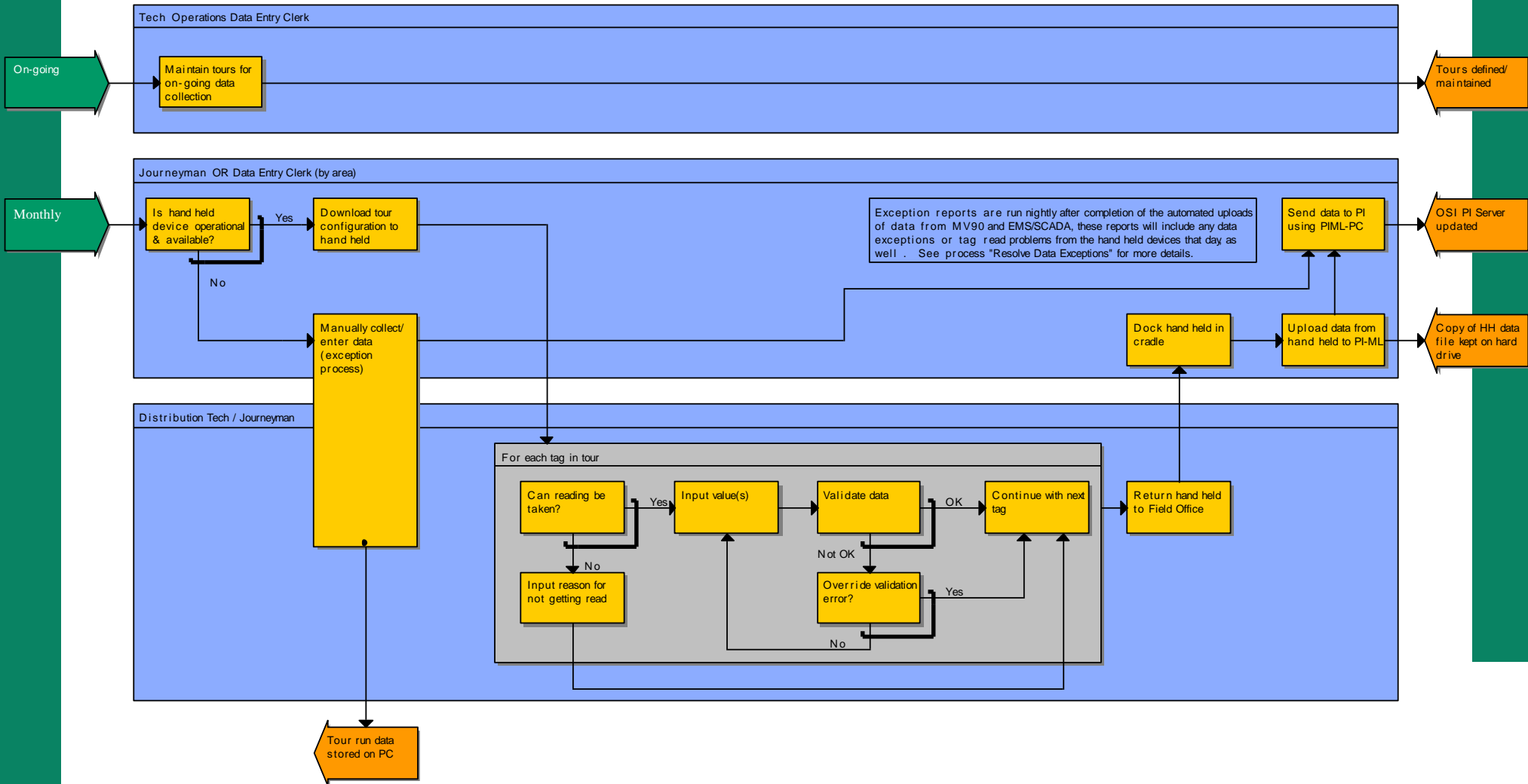
Post Close Review

Forecasted (3/31/03)

Detailed User Requirements

- Drive the Business Functional Specifications and Process Maps
- ~167 Detailed User Requirements identified by Core Project Team
- Examples:
  - One handheld device for all substation data gathering needs
  - All substation inspection data and load data gathered in one visit, by one person
  - SCHOOL to provide inspector with SAP time order # and automatically enter time and close order when inspection complete
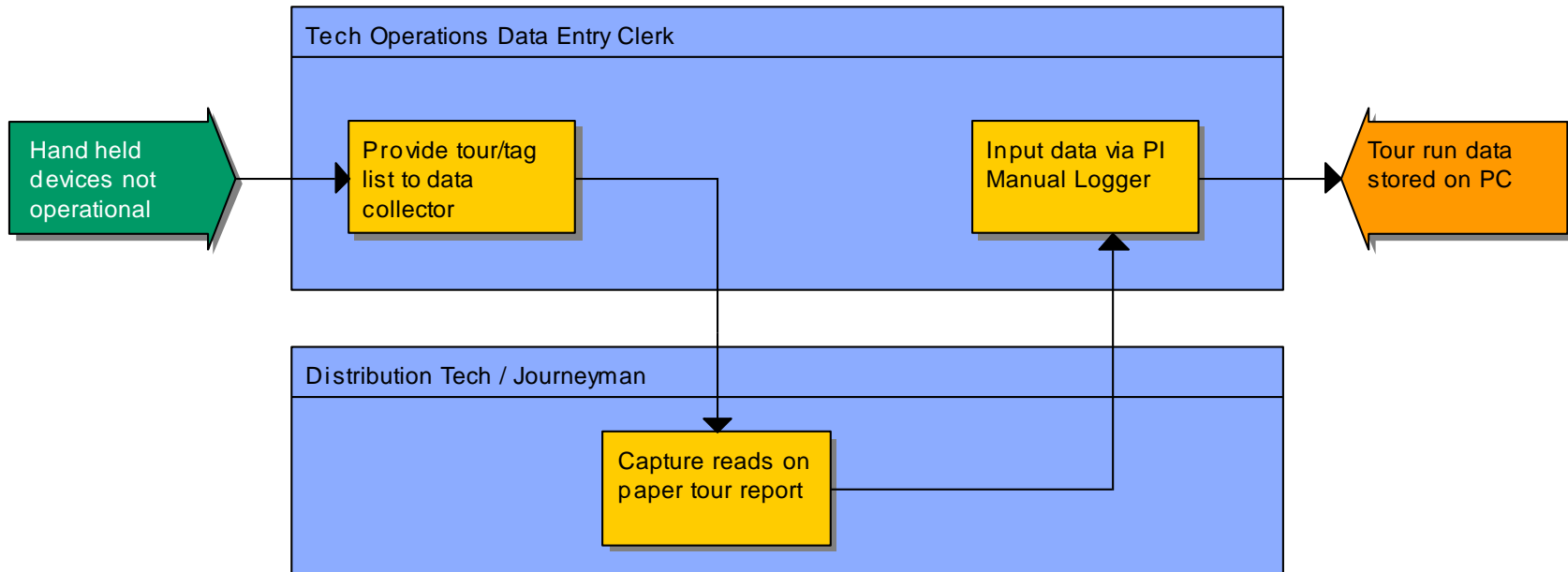
Example Process Map

2. UPLOAD DATA TO SCHOOL PI FROM HAND HELD DEVICES

Tech Operations Data Entry Clerk

On-going

Maintain tours for on-going data collection

Tours defined/ maintained

Journeyman OR Data Entry Clerk (by area)

Monthly

Is hand held device operational & available?

Yes

No

Download tour configuration to hand held

Manually collect/ enter data (exception process)

Exception reports are run nightly after completion of the automated uploads of data from MV90 and EMS/SCADA, these reports will include any data exceptions or tag read problems from the hand held devices that day, as well. See process "Resolve Data Exceptions" for more details.

Send data to PI using PIML-PC

OSI PI Server updated

Dock hand held in cradle

Upload data from hand held to PI-ML

Copy of HH data file kept on hard drive

Distribution Tech / Journeyman

For each tag in tour

Can reading be taken?

Yes

Input value(s)

Validate data

OK

Not OK

Continue with next tag

Return hand held to Field Office

No

Input reason for not getting read

Override validation error?

Yes

No

Tour run data stored on PC

Example Process Map

MANUALLY COLLECT & INPUT DATA
(Exception Processing -   In the Event of Hand Held Device Failure)

Tech Operations Data Entry Clerk

Hand held devices not operational

Provide tour/tag list to data collector

Input data via PI Manual Logger

Tour run data stored on PC

Distribution Tech / Journeyman

Capture reads on paper tour report

OSI-PI & Business Needs

Priority

	OSI-PI Feature	User Benefit / Need
1	Designed to grab real-time equipment signatures and present that data immediately to users and applications	Without equipment signatures, Enterprise Asset Management (EAM) is simply an automated work order process.
2	Proactive, trending alarms can be presented to the user.	Anyone can receive the alarms, view data leading up to event and schedule mitigation action.
3	Application Programming Interface (API) library	Accelerated solution implementation and integration. Over 300 integration processes in the library.
4	Simple creation of any kind of connectivity / topology model or import other models real-time	Prevents painful, expensive connectivity creation
5	Becomes an integration tool for disparate databases that have information needed for condition-based calculations	Easy connectivity to multiple databases
6	Packaged reports with the ability to present asset data in many forms; performs pattern or event searches through data.	Can use any model from a EAM system
7	Does not sample or average incoming data	No loss of granularity; maintenance / planning does not have to "live" with what's provided
8	Advanced calculation engine (ACE)	Modular and straightforward to write ACE calculations that apply to specific classes of assets and attach triggering of an event through the alarm function.

Area Station View : Bar Chart
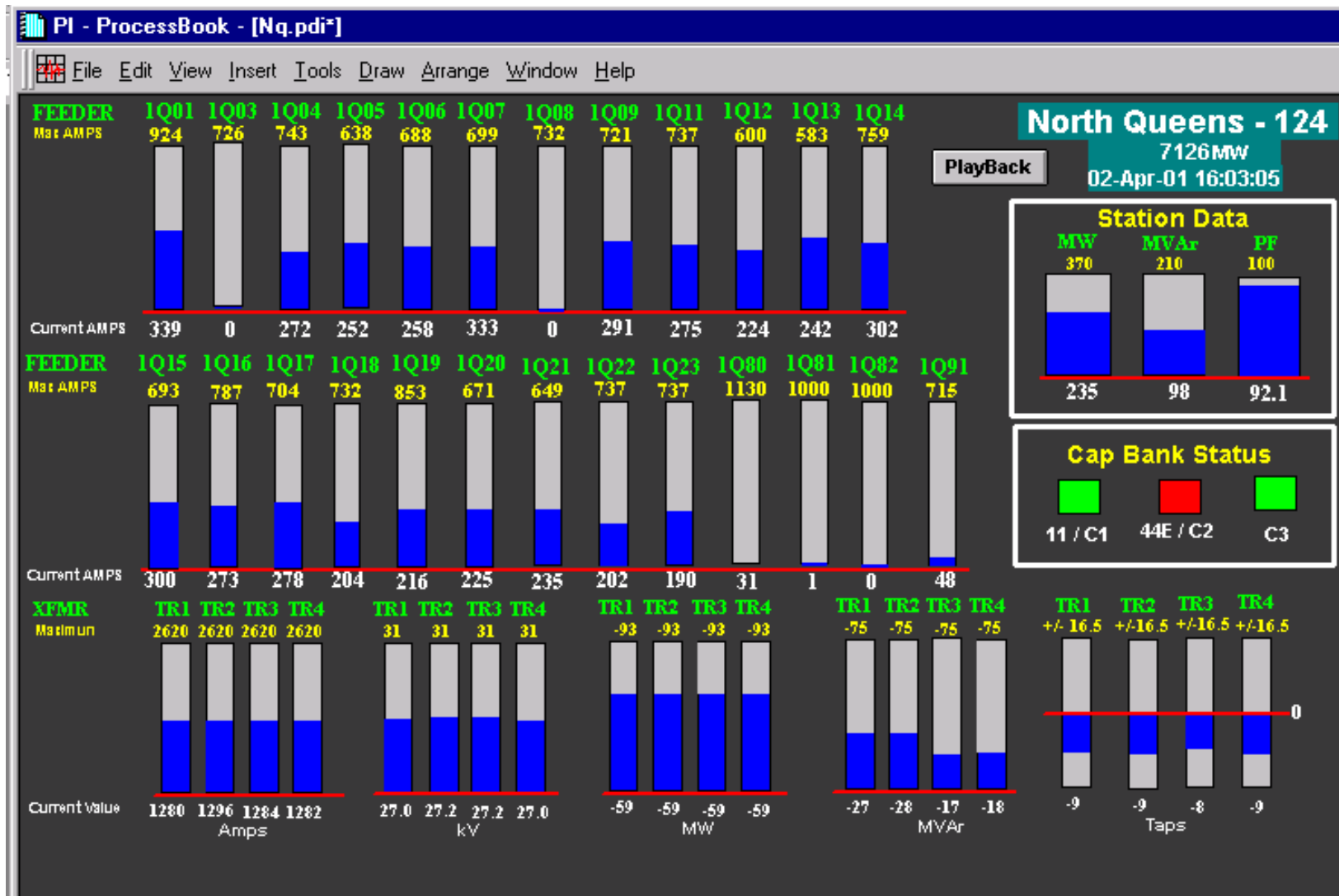
138/13.8 kV Station -- Aerial View

Equipment Query: Transformer LTC Usage

TAP POSITION CHANGE			
Tap Name:	*HNTT2.M*	HARR TR 2 TAPS	
Succesive Metered Value Change Greater Than:		0.6	
Begin Search On: 01-Mar-99 00:00		End Search On: 01-Apr-99 00:00	

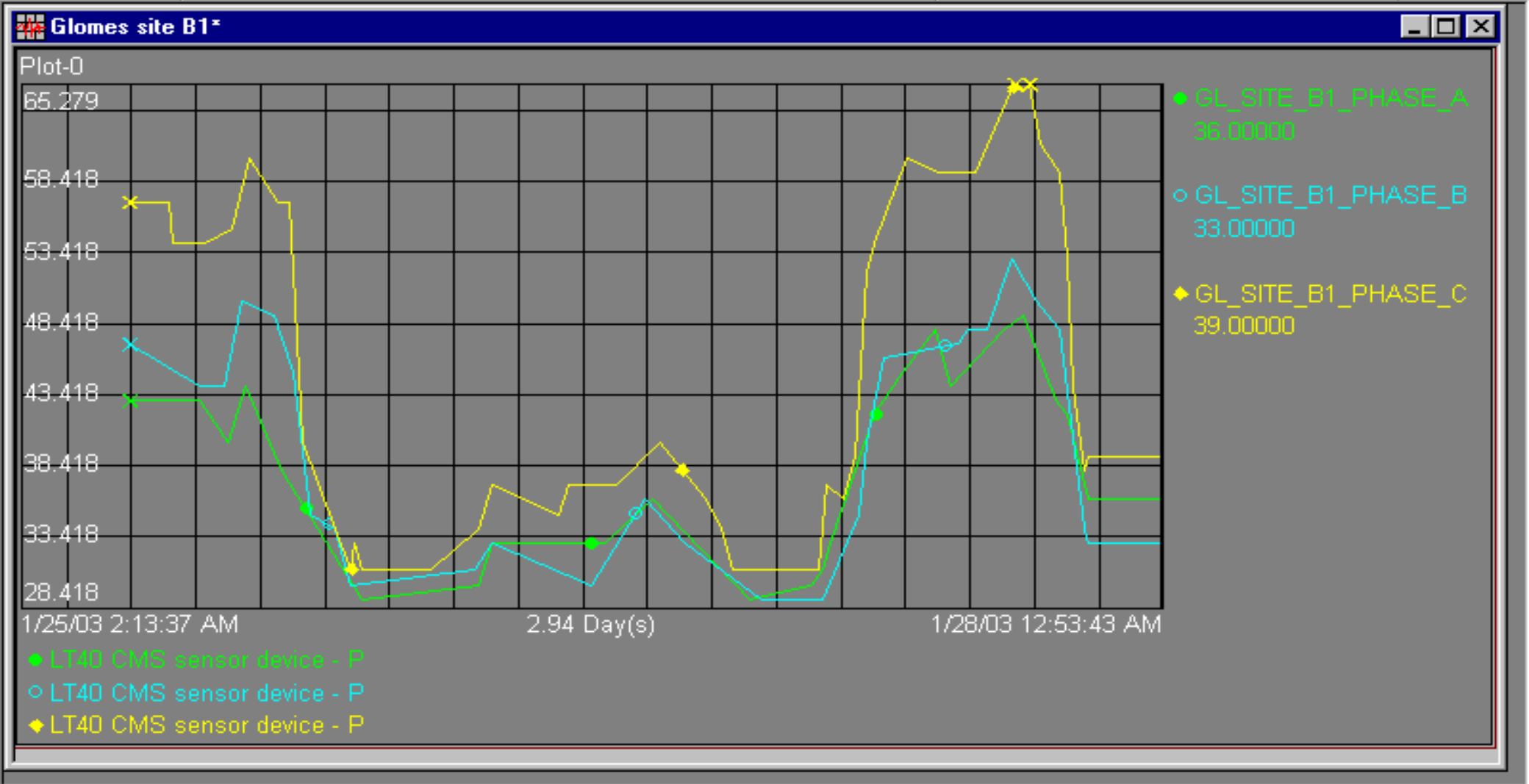| TAP CHANGE		TAP GOING THRU NEUTRAL	
Count =476		Count =6	
Tap Changed On	**Tap Position**	**Tap Changed On**	**Tap Position**
01-Mar-99 00:06:35	-6.936	01-Mar-99 18:59:55	0.024
01-Mar-99 01:41:44	-7.992	01-Mar-99 22:29:54	-1.000
01-Mar-99 05:16:44	-7.000	04-Mar-99 18:13:36	0.008
01-Mar-99 05:41:44	-8.000	04-Mar-99 21:14:05	-1.000
01-Mar-99 05:42:44	-9.000	08-Mar-99 18:55:22	0.024
01-Mar-99 05:46:54	-9.992	08-Mar-99 21:40:21	-0.992
01-Mar-99 06:56:45	-9.000	#N/A	#N/A
01-Mar-99 09:31:25	-7.000	#N/A	#N/A
01-Mar-99 17:59:15	-6.000	#N/A	#N/A
01-Mar-99 17:59:44	-4.984	#N/A	#N/A
01-Mar-99 18:00:05	-3.976	#N/A	#N/A
01-Mar-99 18:00:45	-3.024	#N/A	#N/A
01-Mar-99 18:01:04	-2.000	#N/A	#N/A
01-Mar-99 18:59:34	-1.000	#N/A	#N/A
01-Mar-99 18:59:55	0.024	#N/A	#N/A

Substation Asset Utilization

CULLY T-3704 DAILY LOAD PROFILE (MVA)

MAXIMUM TRANSFORMER MVA RATING

MAXIMUM: 22.0

AVERAGE: 15.2

PEAK LOADING: 88.0%
AVERAGE LOADING: 60.8%
LOAD FACTOR: 69.1%

MVA LOADING

HOURLY LOAD READING
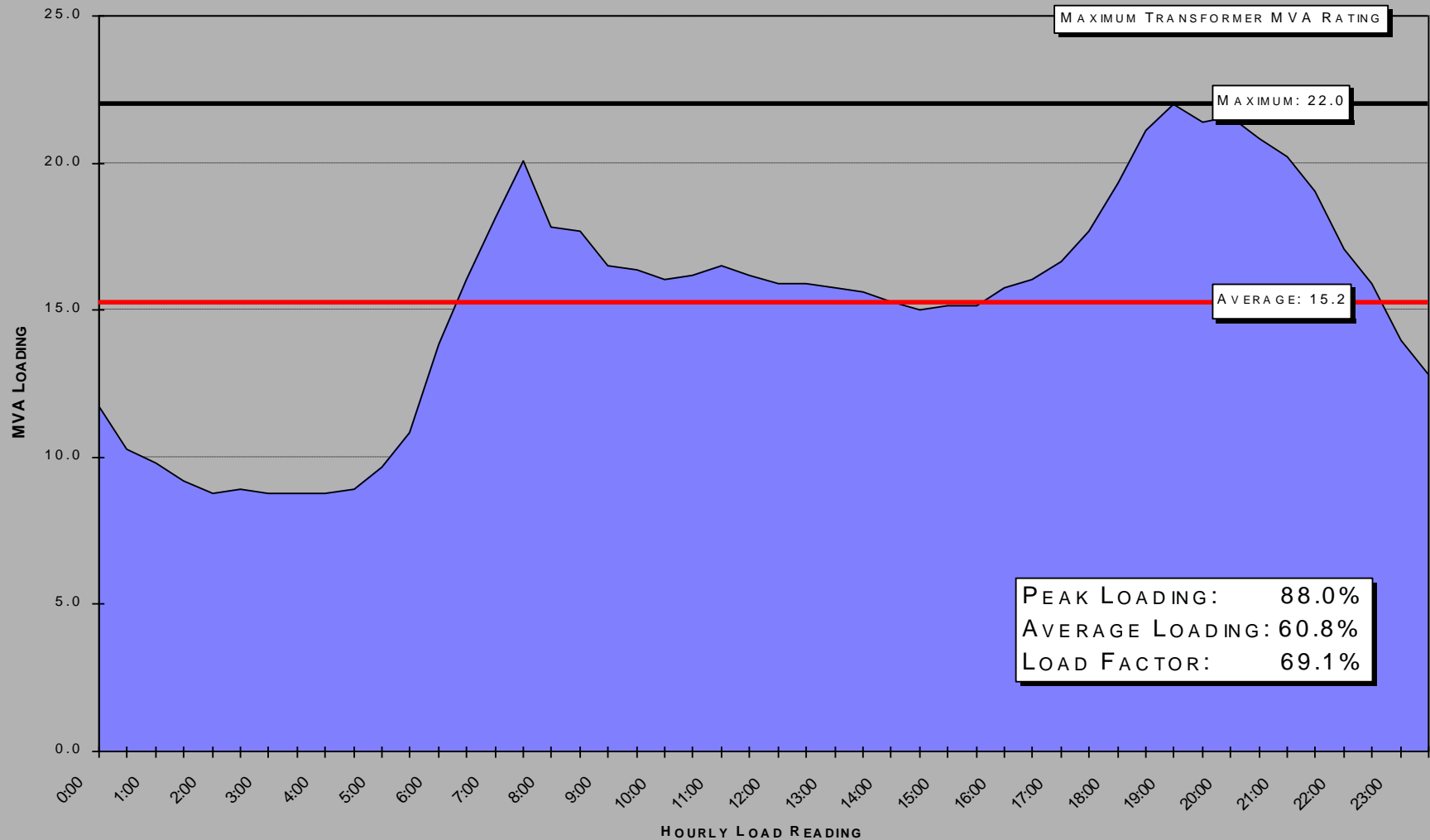
File   Edit   View   Insert   Tools   Draw   Arrange   Window   Help

Glomes site B1*

Plot-0

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53.418

◆GL_SITE_B1_PHASE_C
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43.418

38.418

33.418

28.418

1/25/03 2:13:37 AM   2.94 Day(s)   1/28/03 12:53:43 AM

●LT40 CMS sensor device - P
○LT40 CMS sensor device - P
◆LT40 CMS sensor device - P

Ready   NUM

Key Project Benefits

The SCHOOL project provides a solution that will:

- Improve Operational Efficiency (enable Transition Plan efficiencies)

- Better rationalize capital expenditure ($540k per year)

- Use an open and flexible integration architecture

- Capture quality information on assets

- Support sound procedures for data management

- Incorporate methodologies from Technology Blueprint

- Leverage technology already used by ScottishPower, Power Supply, Hydro, Future EMS/SCADA and 200+ U.S. T&D Utilities