Using PI as a Transitioning Tool to RTPM

A presentation by Calpine Geothermal for the 2004 OSI Users Conference

Introducing - Calpine Geysers

First Electricity Generated at Geysers

1922 - First Electrical Generation From Geothermal Steam in the U.S.

Commercial Operations Begin

1960 - Pacific Gas and Electric Company Begins Commercial Operation of the First Geothermal Electric Generating Station Run by a Utility in the U.S.

Geysers Becomes Largest Geothermal Power Facility

- **1973**

  The Geysers Becomes the Largest Geothermal Power Facility in the World, Surpassing Larderello, Italy

- **1984**

  Calpine Founded

Calpine Acquires First Megawatt

1989 – Calpine Acquires 5% Interest in the 20-mw Aidlin Plant (First Megawatt)

Calpine Expands Interest

By 2000 Calpine had Acquired Freeport McMoRan's, Thermal's, Unocal's, PG&E's, SMUD's, FPL's and Mission Energy's Interests in Plants and Wells at the Geysers

The Geysers Today

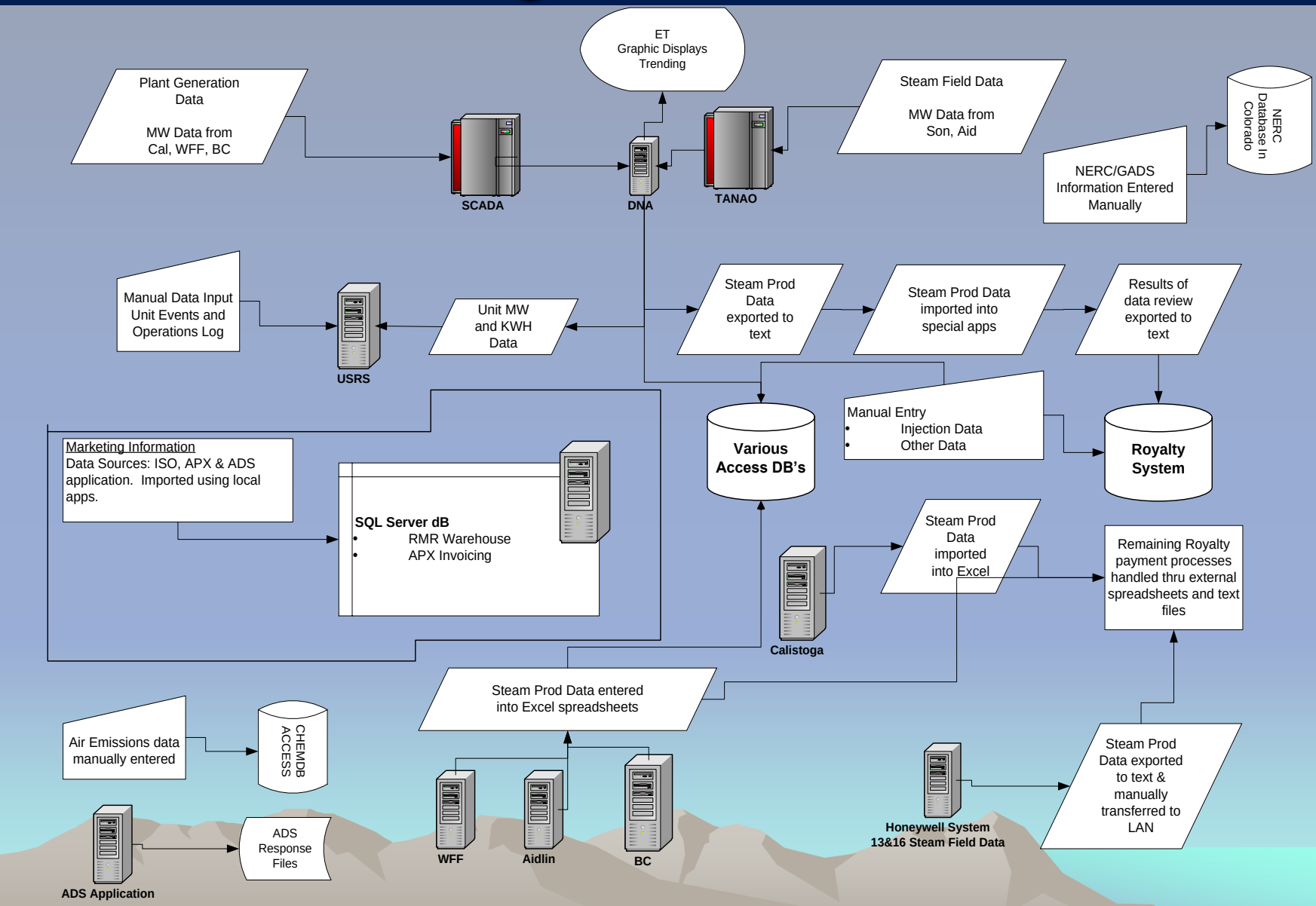
- 21 Power Plants
- 425 Production Wells, 53 Injection Wells
- 30 Square Miles in Lake and Sonoma Counties
- Approx 350 Employees

The Geysers Geothermal Field

Objectives

- Integrate Operations and Processes developed by five different companies without disruption
- Automate and streamline processes where possible to increase accuracy, reduce cost, decrease delay of information, and increase information access for Decision Makers
- Develop and Implement an Integrated Centralized Operations Capability for all Generation and Production Assets

Original Situation



Challenges

- Multi-Vendor Environment
- Must Not Disrupt Data Flow or Accuracy
- Processes must be approved by outside Agencies
- Training and Operational Understanding
- Collection and Reporting Systems are Changing

Keys to Success

- Reliability
- Accessibility
- Solid Communication Infrastructure
- Central Repository
- Easy to Use
- Customizable
- Flexible

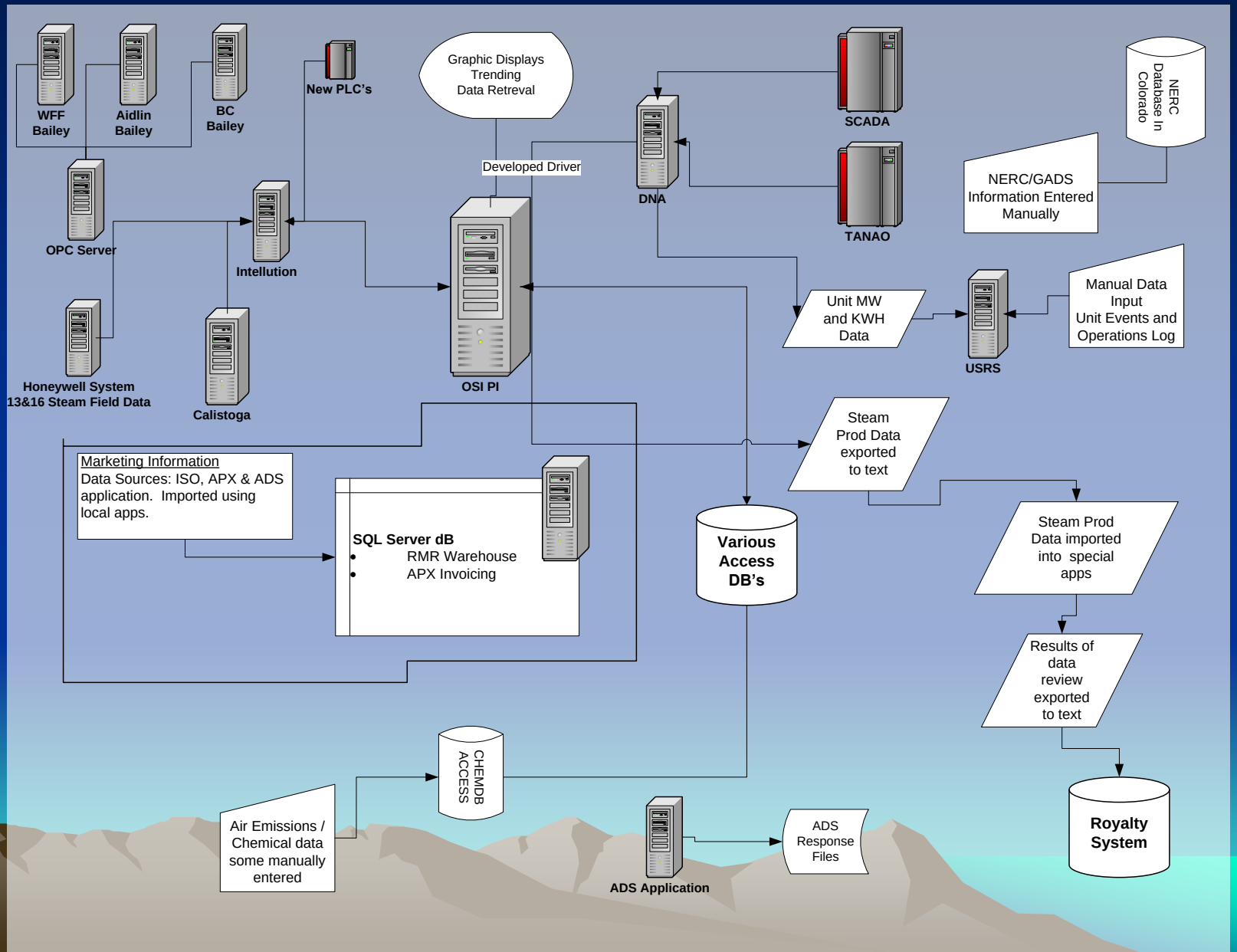
Solution PI

- Used initially as a bridge between data collection and SCADA to reporting systems
- Transition to the Central Data Repository
- Not a SCADA or DCS System!
  - Used for Historical Data

Process

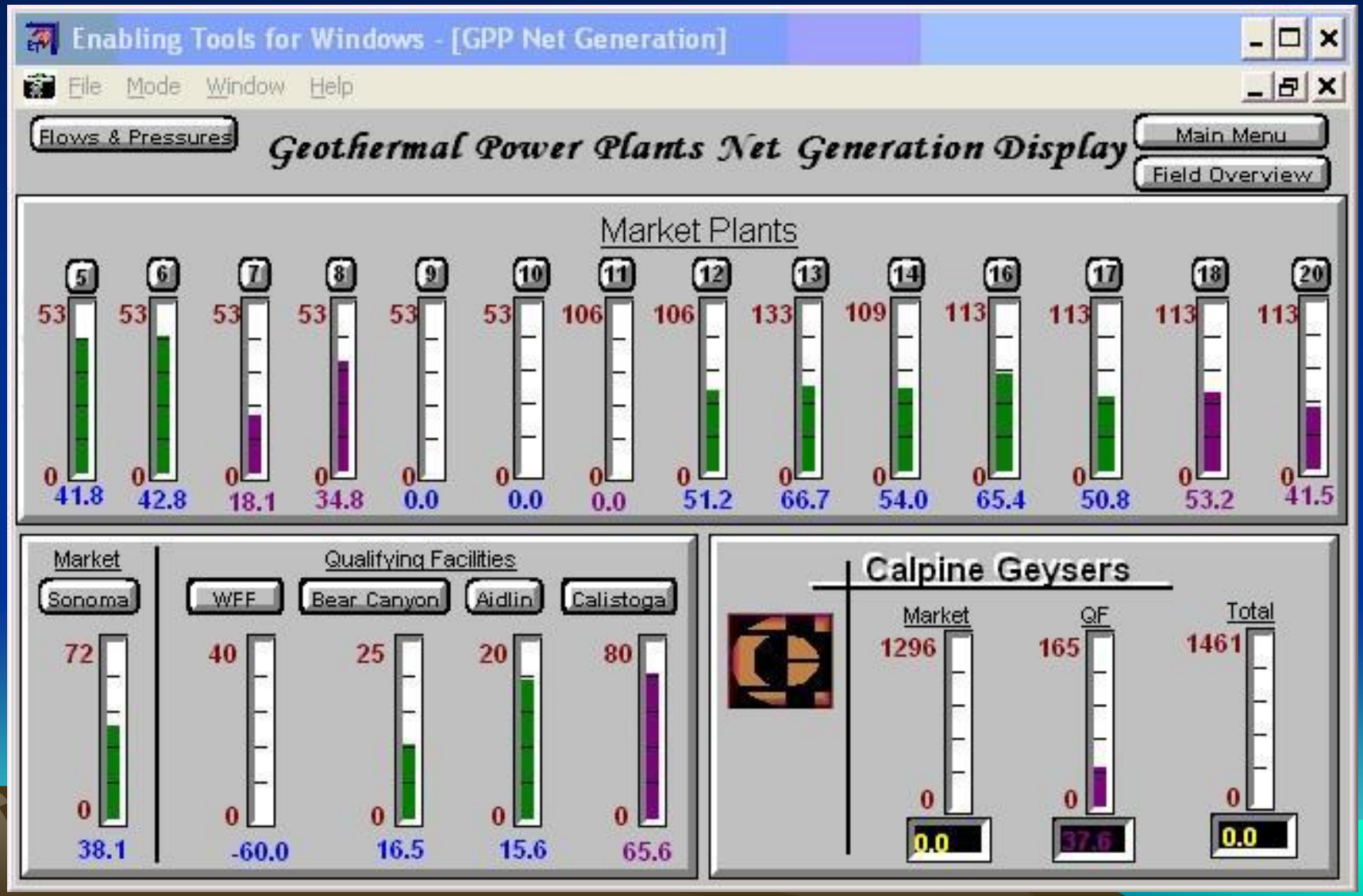
- Implemented PI server in between the data collection systems and the reporting systems
- Develop non-standard PI interfaces if required
- Created Process Book Displays to mimic existing Operational Displays
- Redirect Reporting Systems to retrieve data from PI

Interim Solution



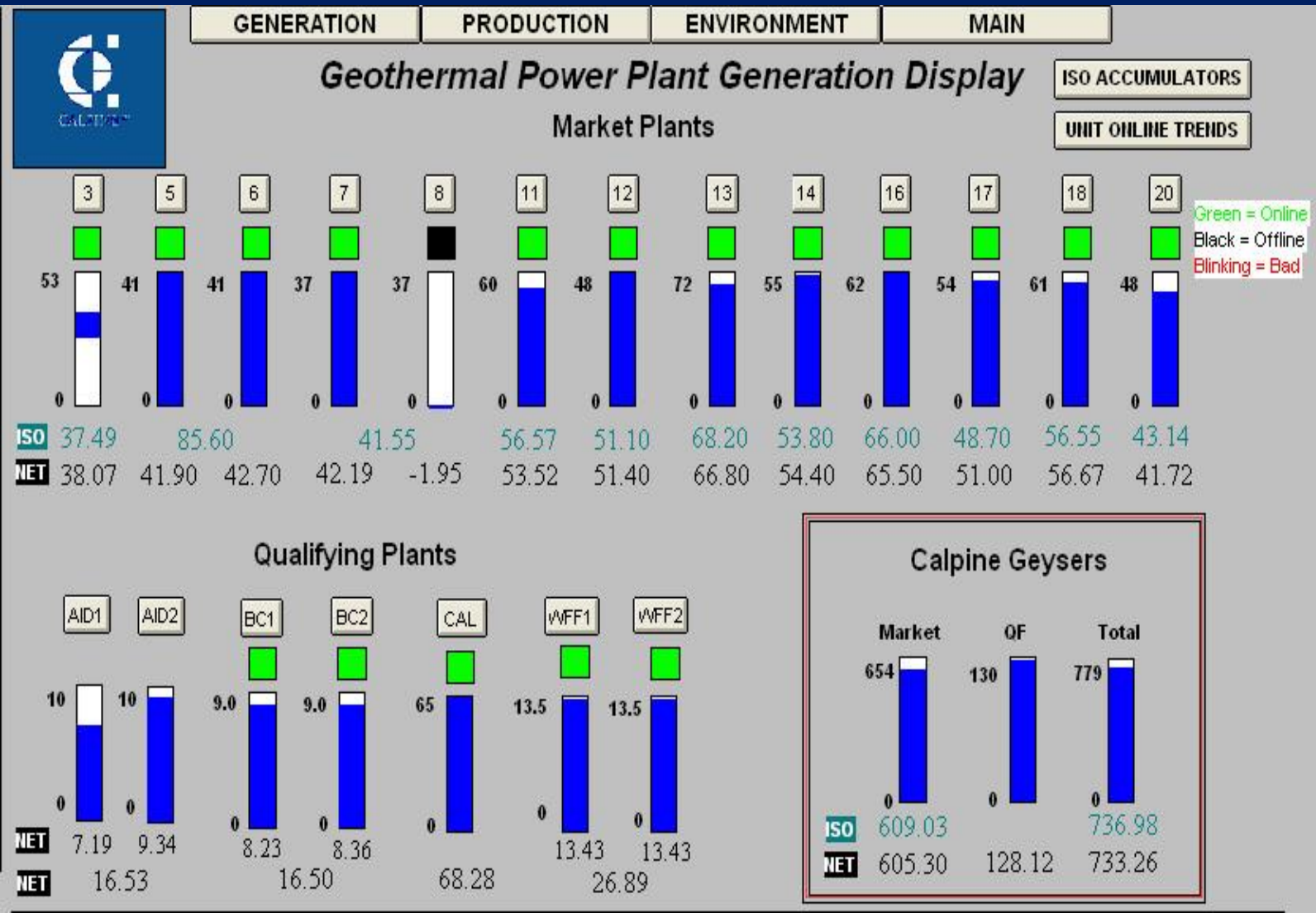
Sample Screens

OLD



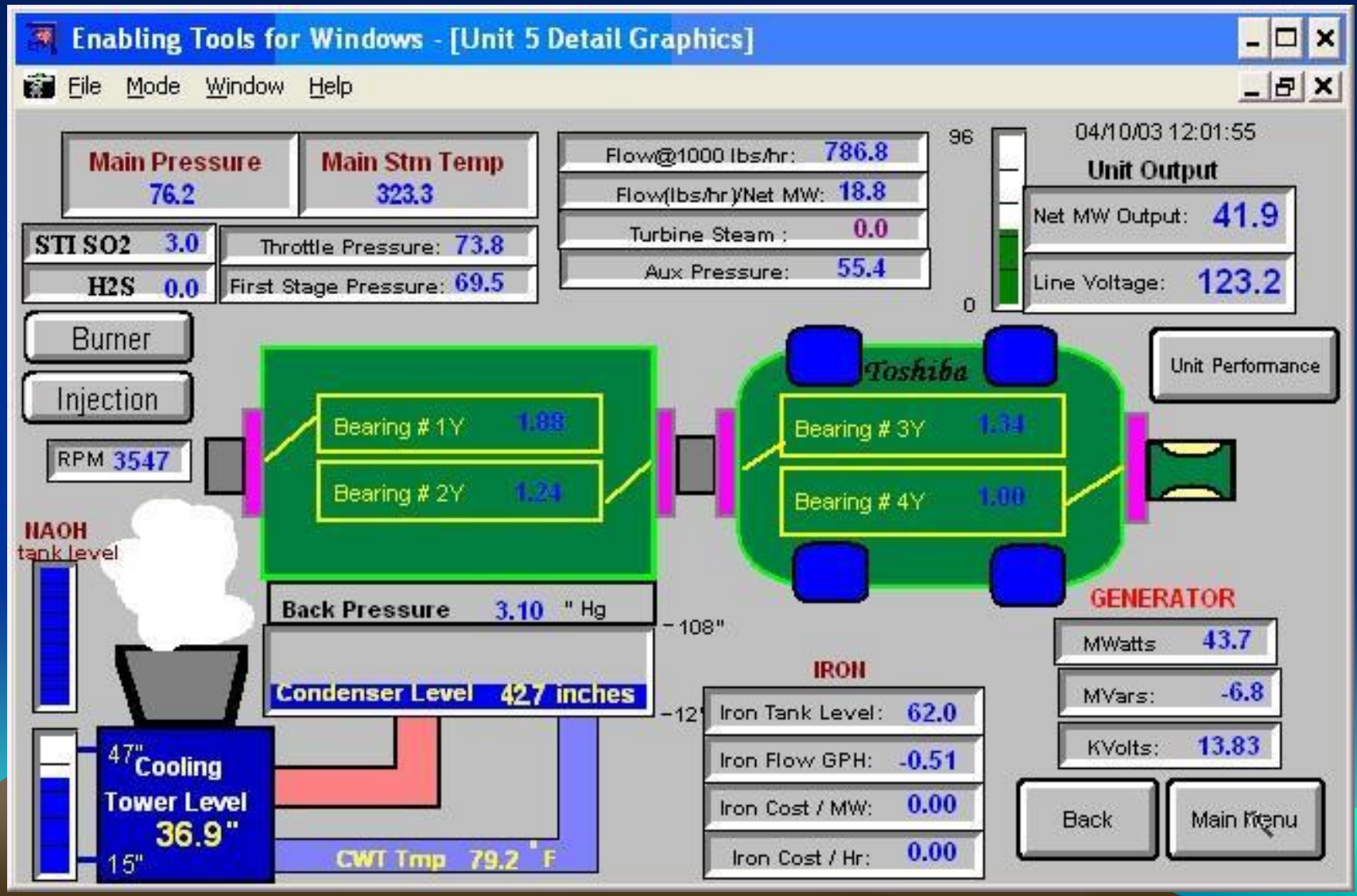
Sample Screens

NEW



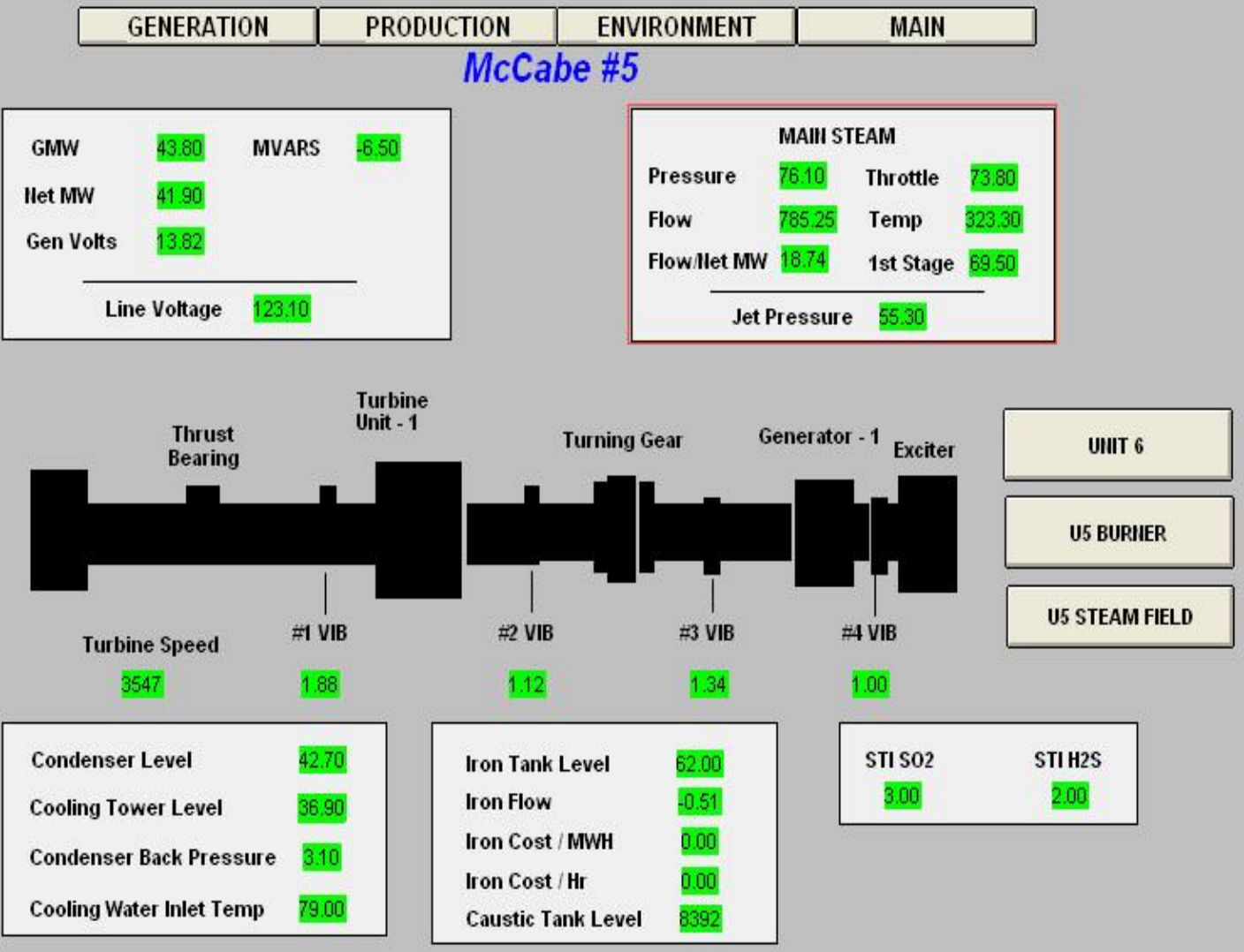
Sample Screens

OLD



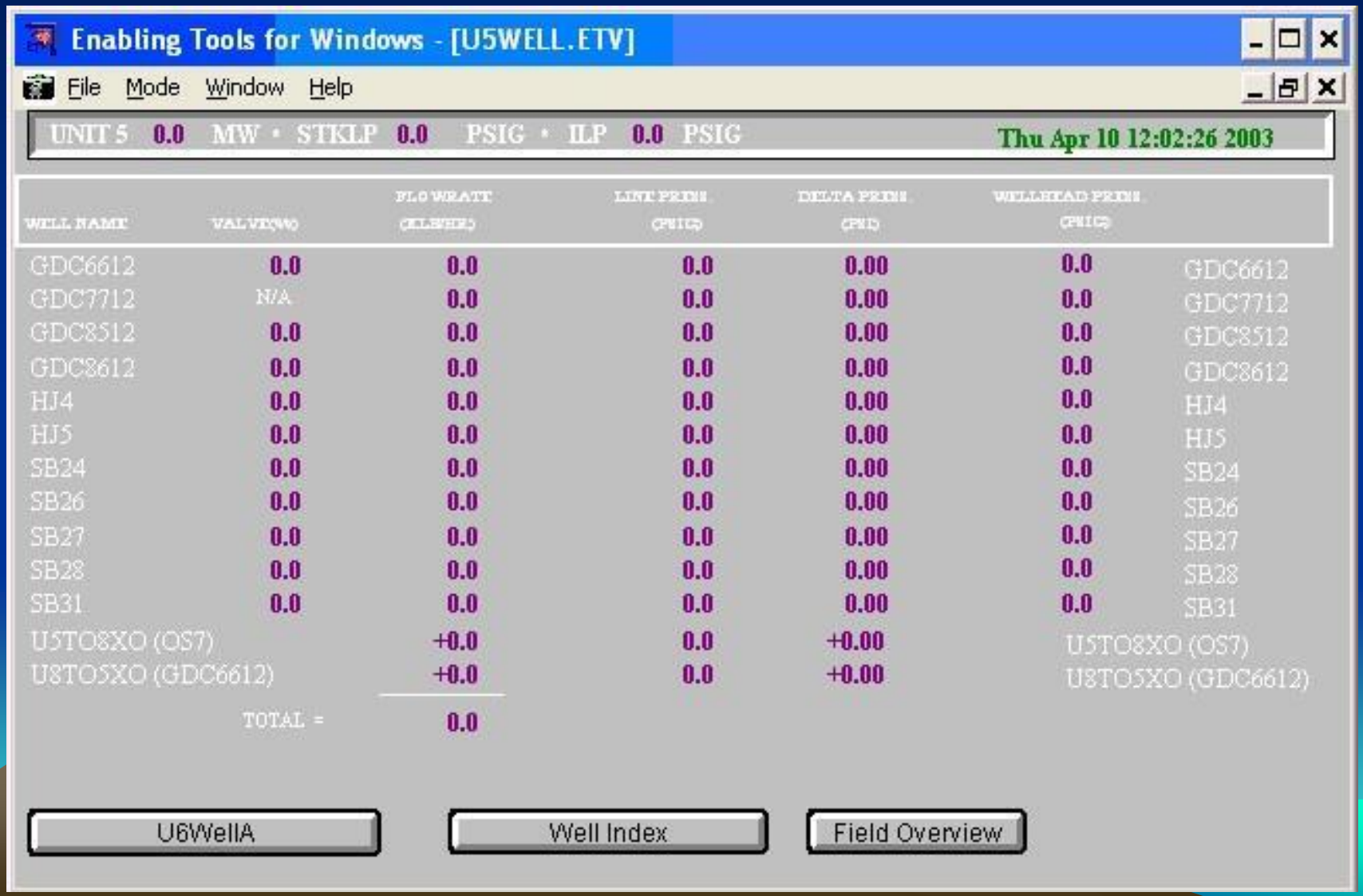
Sample Screens

NEW



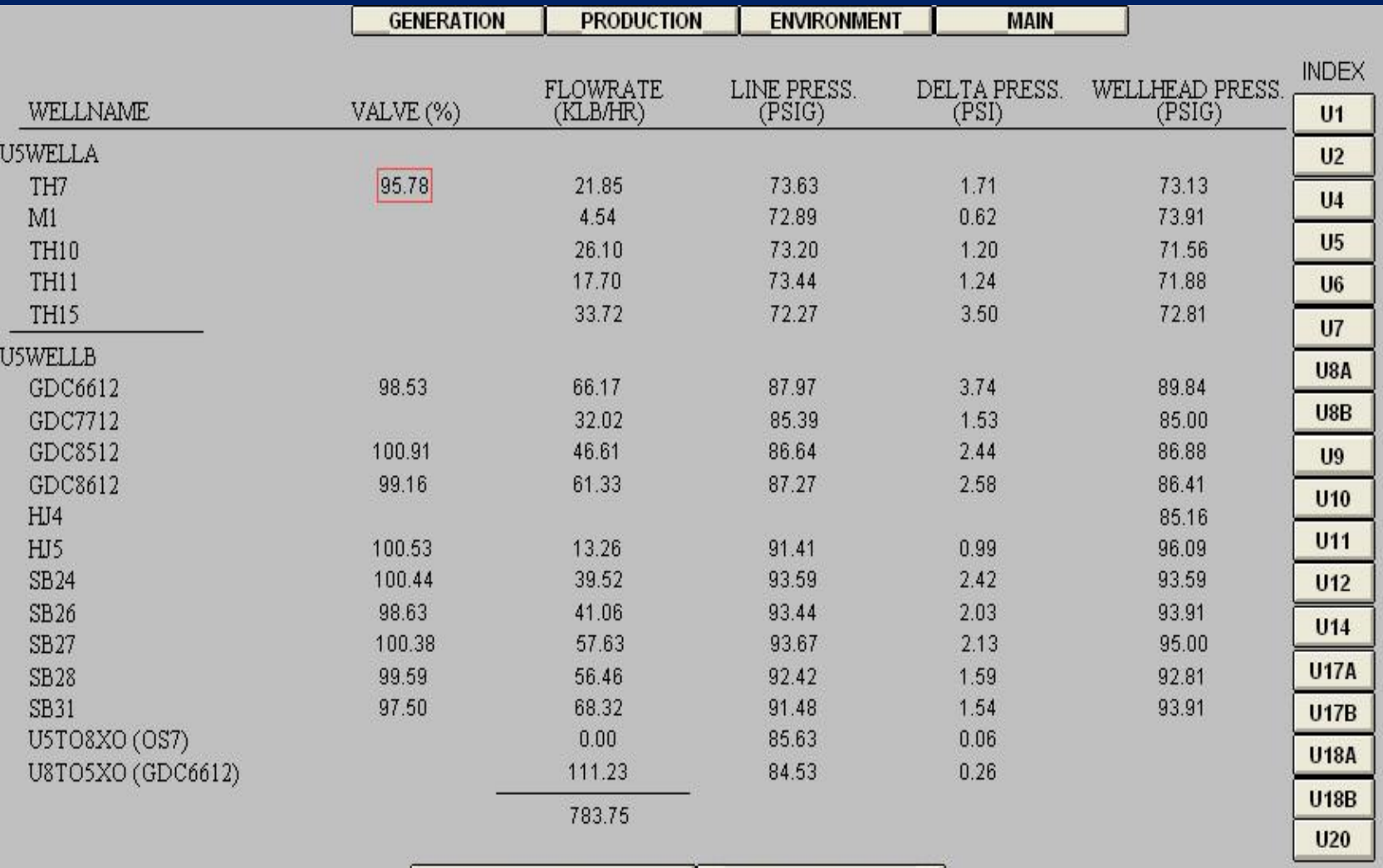
Sample Screens

OLD



Sample Screens

NEW



GENERATION | PRODUCTION | ENVIRONMENT | MAIN

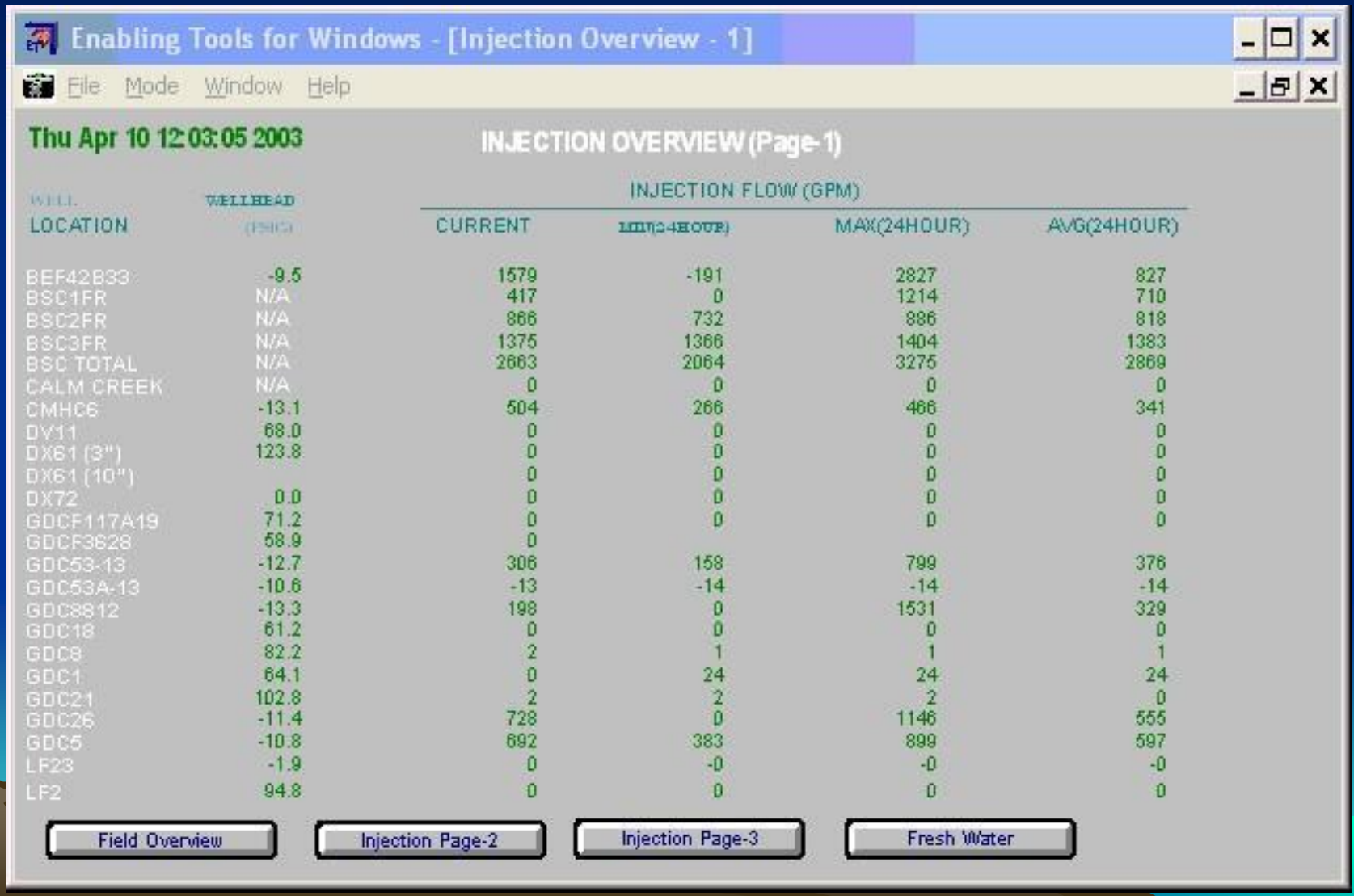
WELLNAME	VALVE (%)	FLOWRATE (KLB/HR)	LINE PRESS. (PSIG)	DELTA PRESS. (PSI)	WELLHEAD PRESS. (PSIG)
U5WELLA					
TH7	95.78	21.85	73.63	1.71	73.13
M1		4.54	72.89	0.62	73.91
TH10		26.10	73.20	1.20	71.56
TH11		17.70	73.44	1.24	71.88
TH15		33.72	72.27	3.50	72.81
U5WELLB					
GDC6612	98.53	66.17	87.97	3.74	89.84
GDC7712		32.02	85.39	1.53	85.00
GDC8512	100.91	46.61	86.64	2.44	86.88
GDC8612	99.16	61.33	87.27	2.58	86.41
HJ4					85.16
HJ5	100.53	13.26	91.41	0.99	96.09
SB24	100.44	39.52	93.59	2.42	93.59
SB26	98.63	41.06	93.44	2.03	93.91
SB27	100.38	57.63	93.67	2.13	95.00
SB28	99.59	56.46	92.42	1.59	92.81
SB31	97.50	68.32	91.48	1.54	93.91
U5TO8XO (OS7)		0.00	85.63	0.06	
U8TO5XO (GDC6612)		111.23	84.53	0.26	
		783.75			

INDEX: U1 | U2 | U4 | U5 | U6 | U7 | U8A | U8B | U9 | U10 | U11 | U12 | U14 | U17A | U17B | U18A | U18B | U20

STEAMFIELDS OVERVIEW | U5 - GENERATION

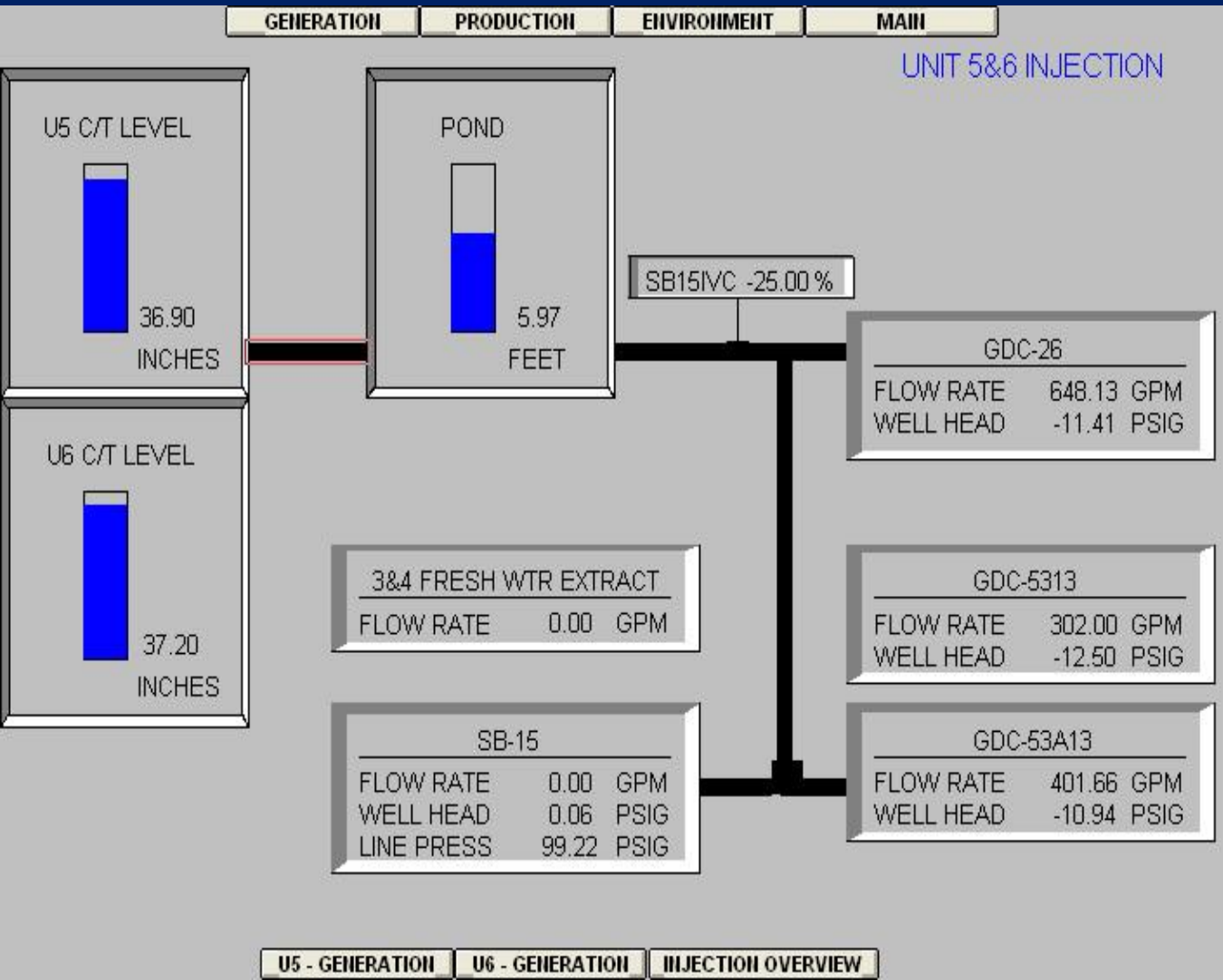
Sample Screens

OLD



Sample Screens

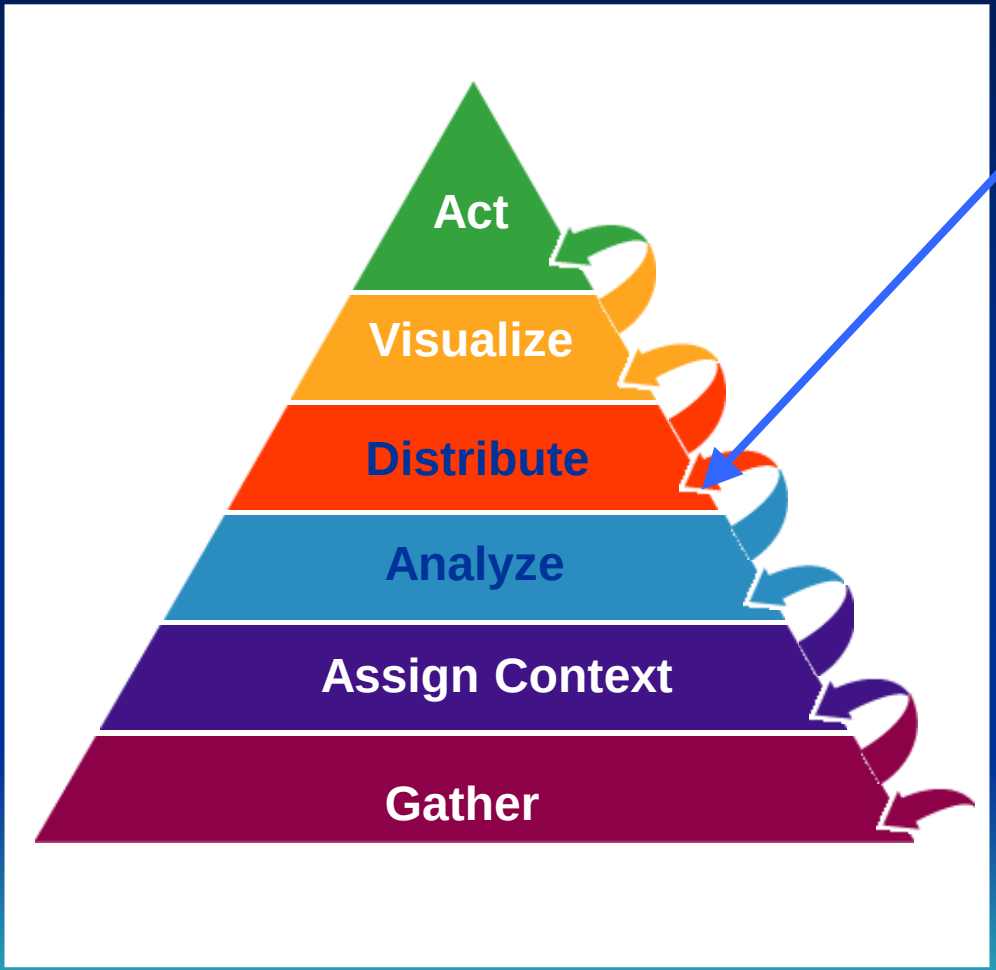
NEW



Next Steps

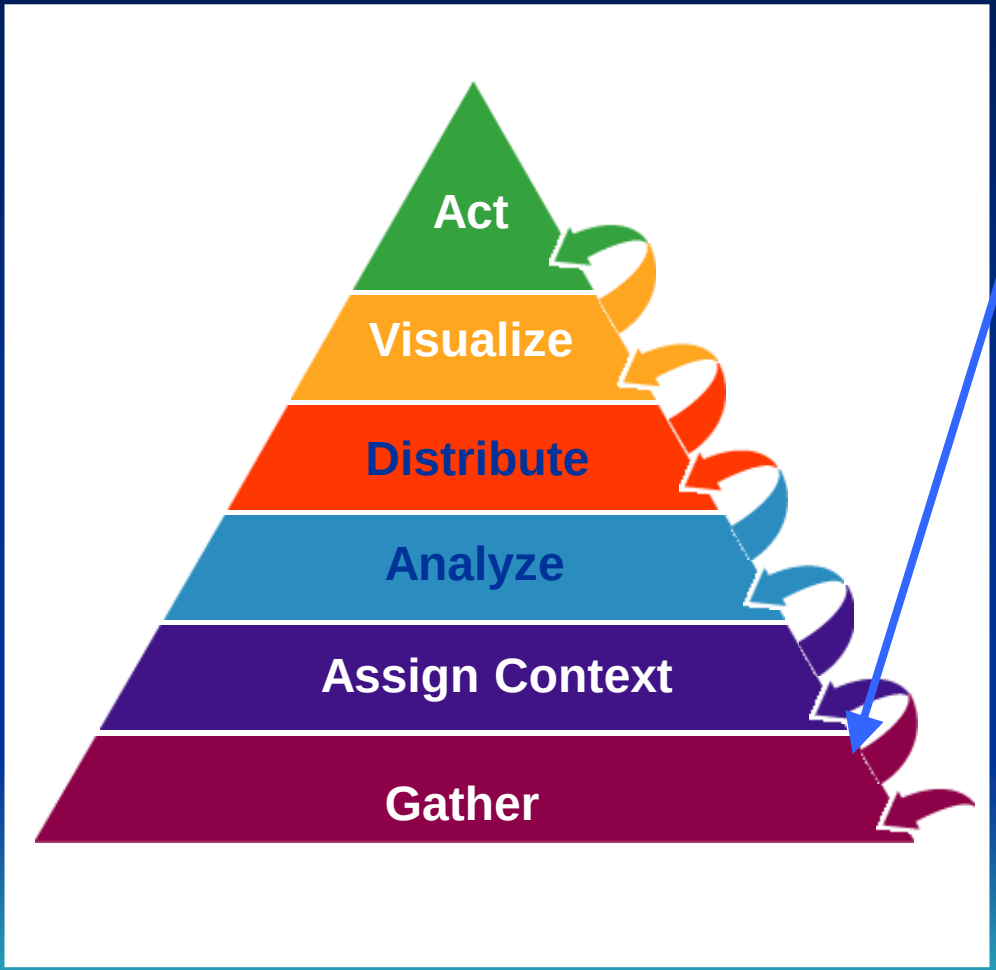
- Retire Legacy Systems
- Transition PI from Data Bridge to Total Data Repository
- Automate while Maintaining Data Accuracy
- Import Legacy Data
- Remember Don’t Break Anything!!!!

Data Accuracy Issues



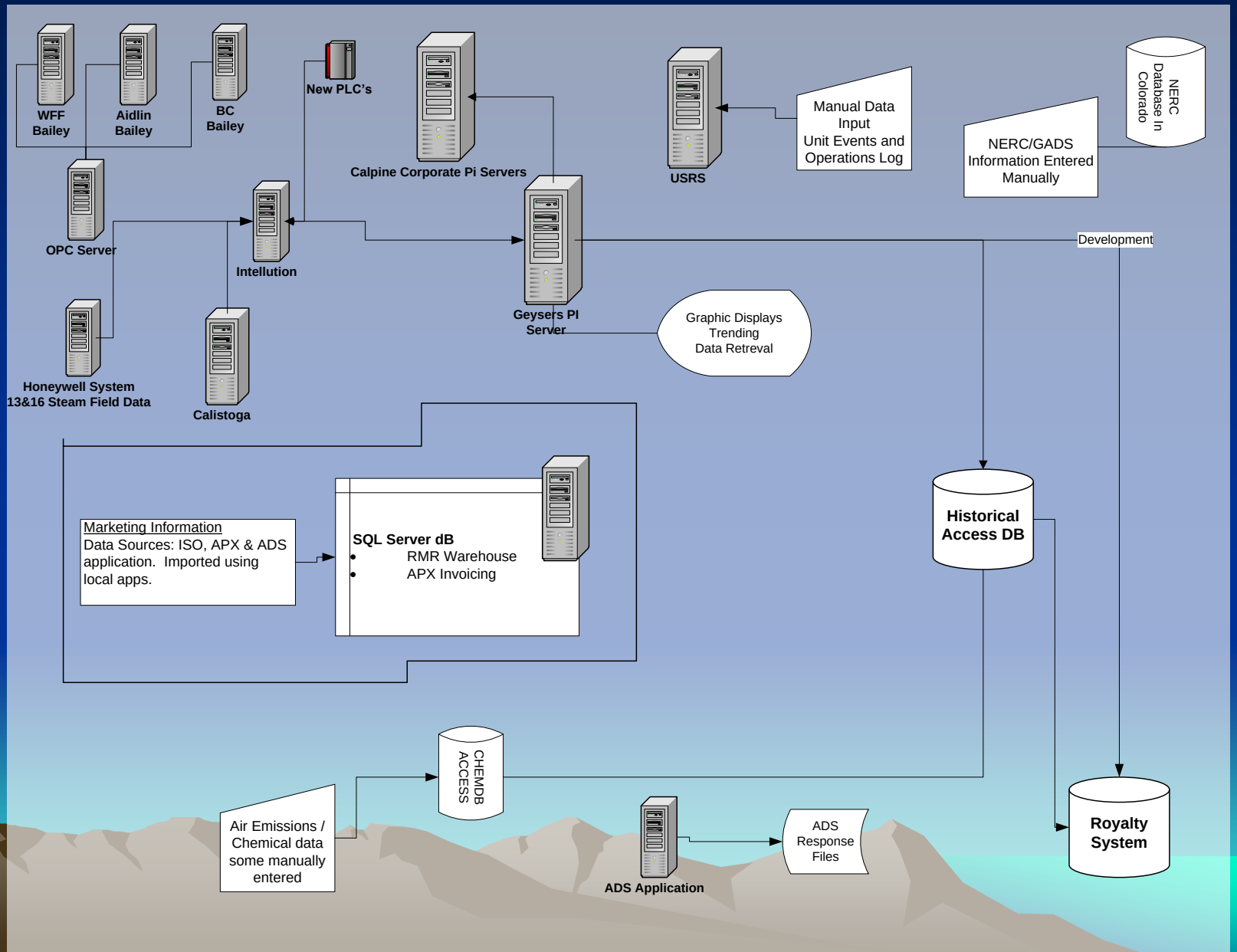
- Historically some data verification wasn't accomplished until the Analyze and Distribute Phases on a Monthly basis

Data Accuracy Solution



- To obtain desired accuracy level all data must be initially checked as close to the Gather stage as possible!

Today's Snapshot



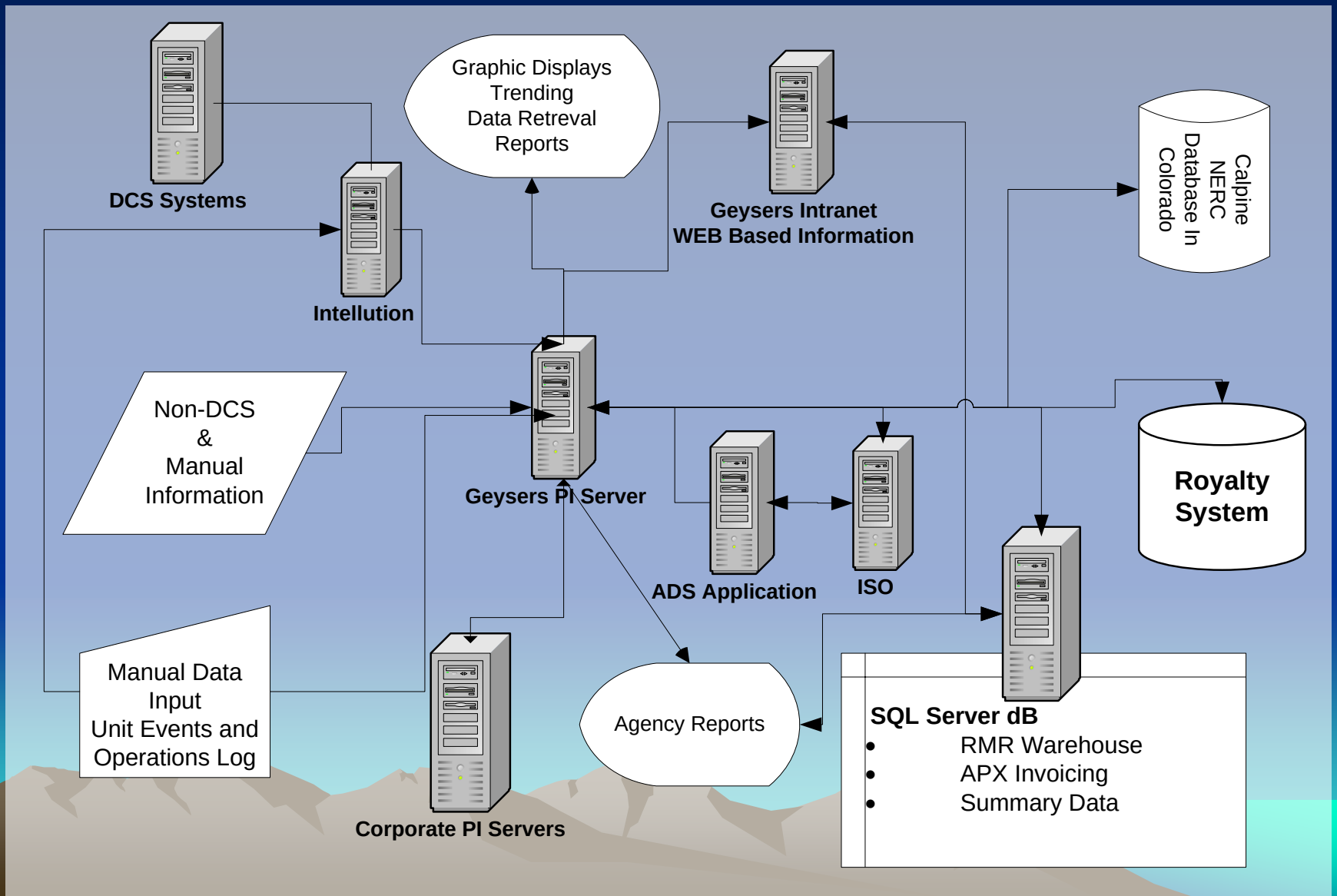
Current Snapshot

- PI Tag count = 10,320
- Average Scan Rate = 5 Seconds
- PI interfaces
  - DCS to PI
  - PI to PI collecting data into PI test server from PI production
- Archives
  - Count = 204
  - Date Range = From Jan 1, 1990 to present (includes data backfilled from production archives)

Future Visions

- Assign Context
  - Transition to Modular Database
- Analyze & Distribute
  - Transition PI from One to Many Data Bridge to Total Data Repository
  - Continue to Automate while Maintaining Data Accuracy
- Visualize
  - Increase Accessibility and Flexibility of Reporting Tools (WEB Based)

Future Vision



Observed Benefits - ACT

- Ability to see the whole picture with one view
- Ability to View Geothermal Plants as part of the entire Calpine Fleet
- Able to quickly react to changing conditions in resources or market ($$$)
- Able to improve performance and monitor or improve environmental effects while reducing cost of operations
- Enable decision-makers to make more informed decisions

Summary

- PI met our needs based on our requirements
- PI not only allowed us to transition but also positioned us to reap further benefits for years to come utilizing the exact same technology.


THANK YOU
FOR YOUR TIME
QUESTIONS?