Manage Bypass of Safety Protection Elements with the PI System

Presented by **Pavel Lineros** and **Reinaldo Jimenez**

REPSOL

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Company Profile

Positioned to **Grow**

High potential Investment to generate **Value**

Strong Financial **Commitment**

- **Repsol** is an integrated energy company that strives to guarantee the well-being of society whilst complying with sustainability criteria
- With participation in 28 E&P blocks, Repsol has completed over 195 test drills, with a success rate of 31% tangible **Value** to Stakeholders
- **E&P**, our Upstream, has become the engine of **Growth** in the company and it accounts for 77% of the total investment for the coming years
- **GOAL:** A production growth by 7% (500,000 boe/day by 2016) with Reserve replacement rate over 120%

Source: Repsol Web-Site

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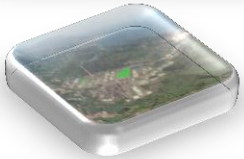
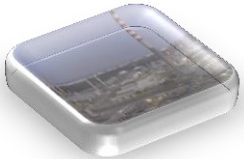
Some examples of our Activity

Downstream



Bilbao (Spain)

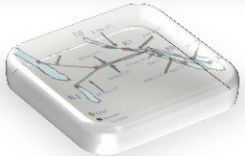
Cartagena (Spain)



Sines (Portugal)

Upstream and LNG

Shenzi (USA off-shore at Golf of Mexico)

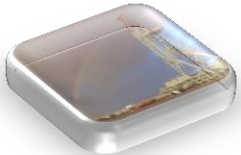


Reggane (Algeria)

Canaport LNG (Canada)

Carioca (Brazil)

Part of the LNG Supply Chain



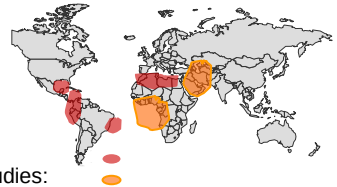
I/R (Libia)

Bloque 39 (Perú)

Peru LNG (Peru)

Other Key Projects for Growth:

- Guará (Brazil)
- Piracucá (Brazil)
- Kinteroni (Peru)
- Margarita-Huacaya (Bolivia)
- Cardón IV (Venezuela)



Previous Studies:

- Panoramix (Brazil)
- Iguazú (Brazil)
- Abaré Oeste (Brazil)
- Buckskin (USA – Golf of Mexico)
- Montanazo-Lubina (Span)
- NC-200 and NC-186 (Libia)
- Tánger-Larache (Marruecos)
- Venus (Sierra Leona)

Source: Horizontes - Repsolnet

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LNG Supply Chain

The receiving/regasification terminal plays a critical role in storing and converting back the LNG received into a gaseous state prior to being dispatched to the end-user such as a power plant

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Receiving/Regasification Terminal

- **Canaport LNG** is a state-of-the-art liquefied natural gas (LNG) receiving and regasification terminal in Saint John, New Brunswick – the first in Canada. Supplying natural gas to Canadian and American markets, Canaport LNG has a maximum send-out capacity of 1.2 billion cubic feet (BCF) or **28 million cubic meters** of natural gas per day.

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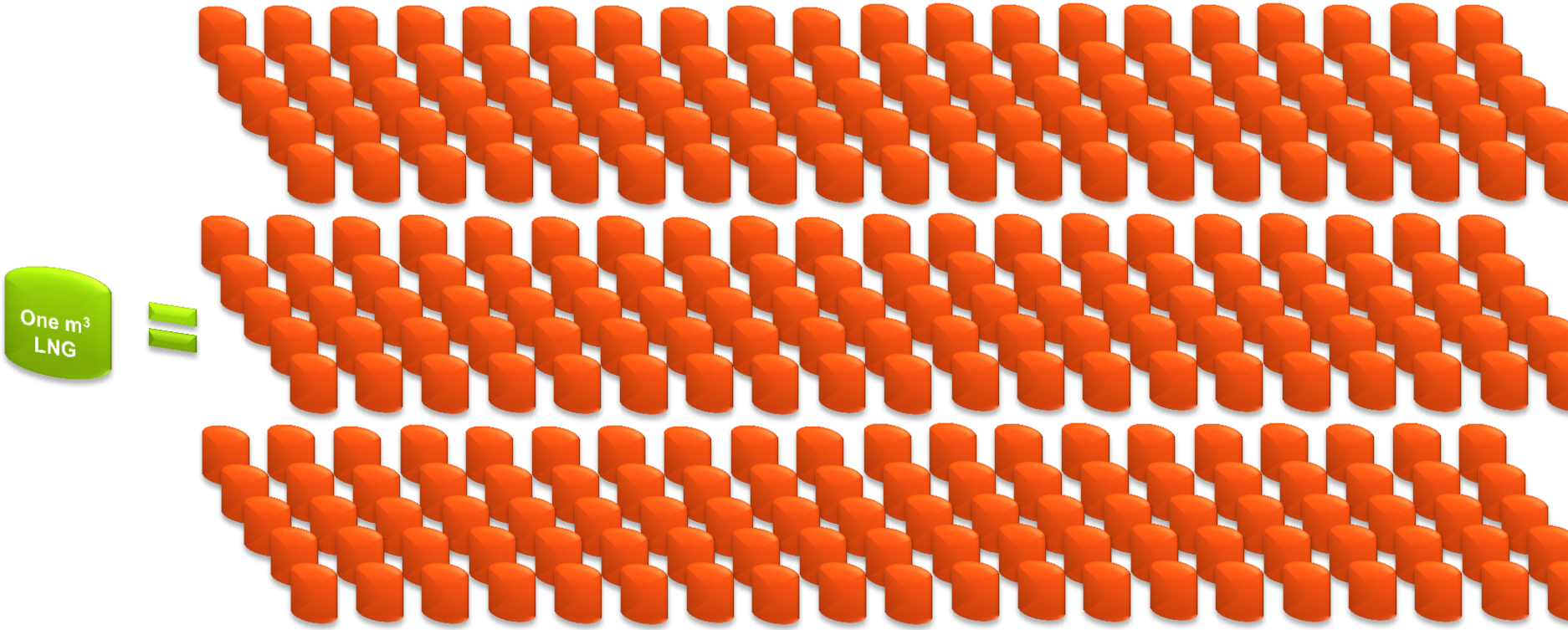
Why Liquefy and then Re-gasify?



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Why Liquefy and then Re-gasify?

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Receiving/Regasification Process

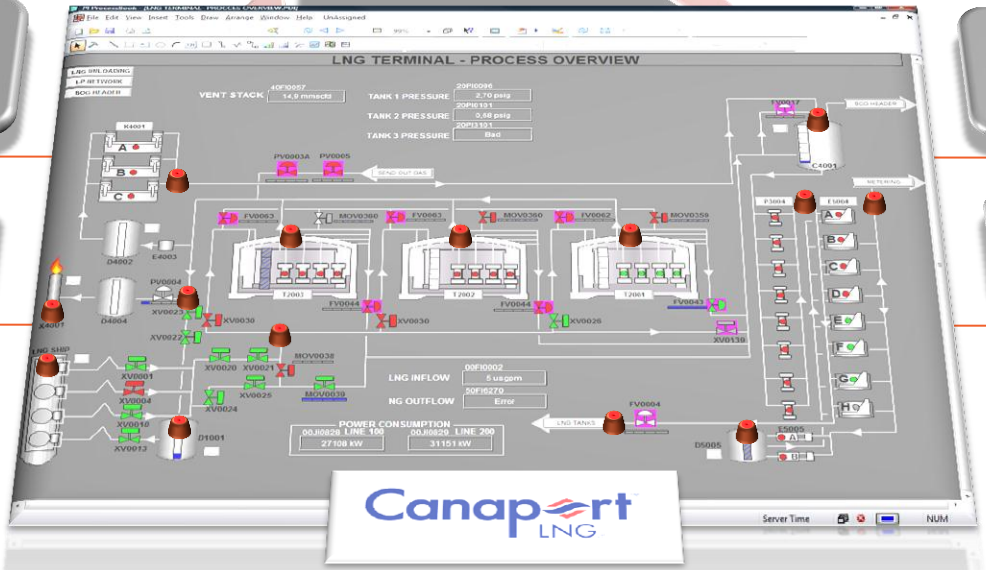
91-191 Section 240 | SCOR N-12 | SCOR N-13 | SCOR P-02 | CLNG HSSE

Terminal Overview

Process Area (BOG, Recondenser, Fuel Gas)

LNG Tanks (Storage)

Marine Facilities (Jetty & Unloading Arms)



Vaporization (Regasification) Area

Flare

Low Pressure and High Pressure pumping systems

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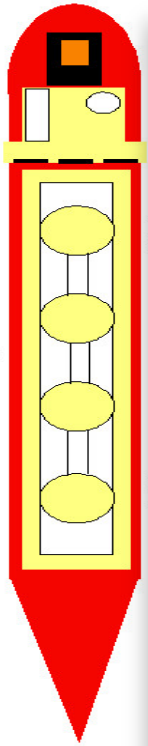
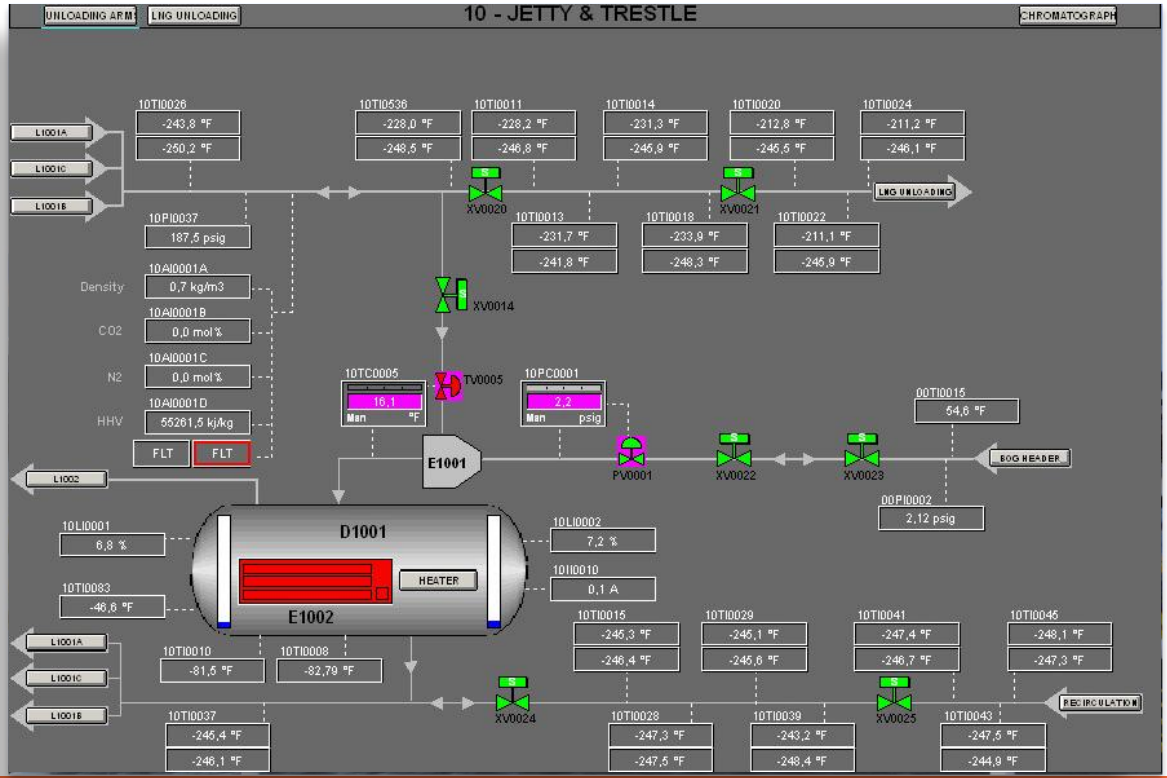
Jetty & Unloading Arms PI ProcessBook Displays





- Jetty and unloading Arms are required to transfer shipped LNG to the LNG Storage Tanks
- Unloading process lasts about 18 hours
- Ship and all Arms are connected to F&G and ESD. Can visualize in the PI System
- One or Two Arms as backup

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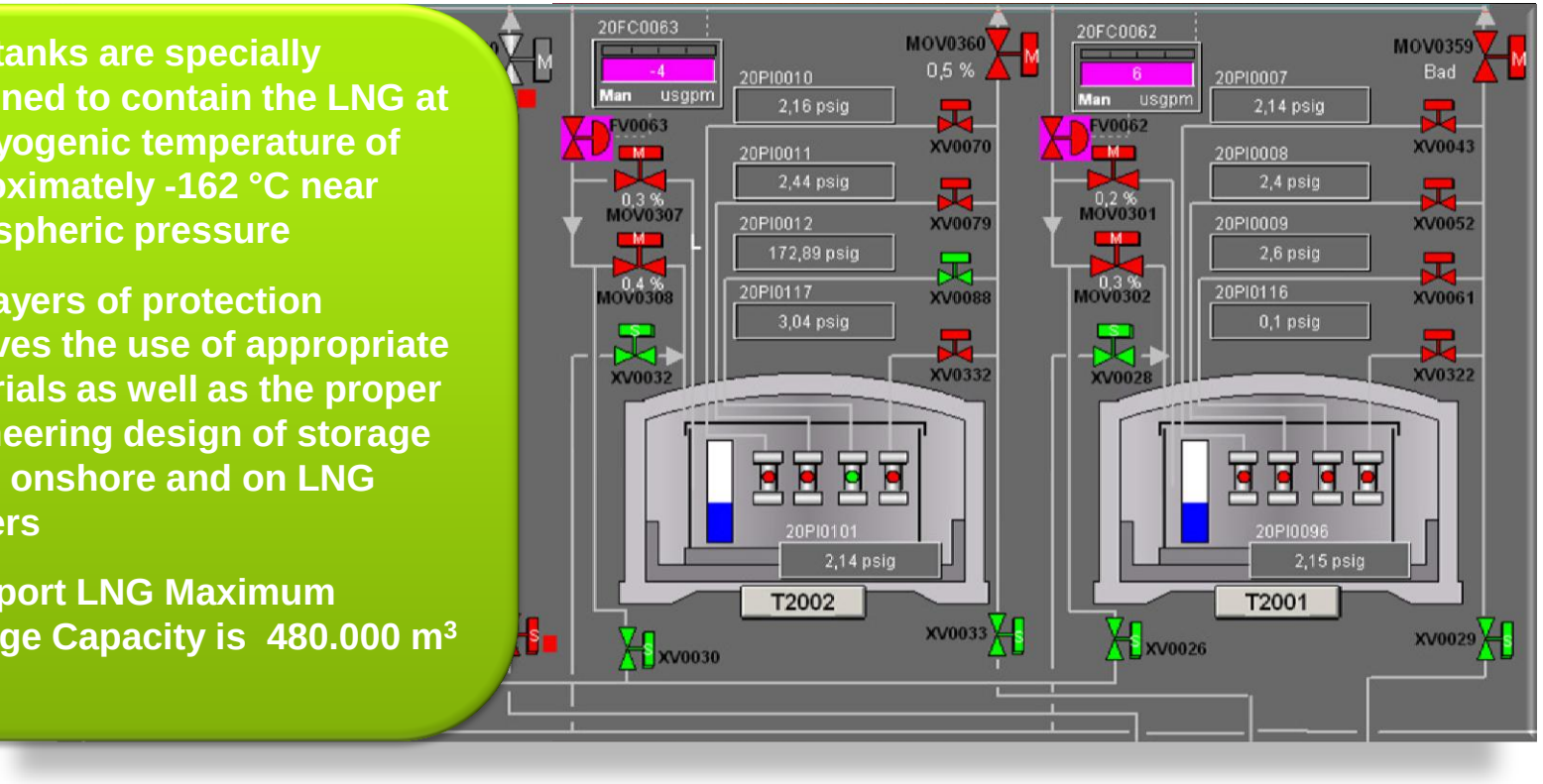
LNG Tanks (Storage) PI ProcessBook Displays

- LNG tanks are specially designed to contain the LNG at its cryogenic temperature of approximately -162 °C near atmospheric pressure
- The layers of protection involves the use of appropriate materials as well as the proper engineering design of storage tanks onshore and on LNG carriers
- Canaport LNG Maximum Storage Capacity is 480.000 m³



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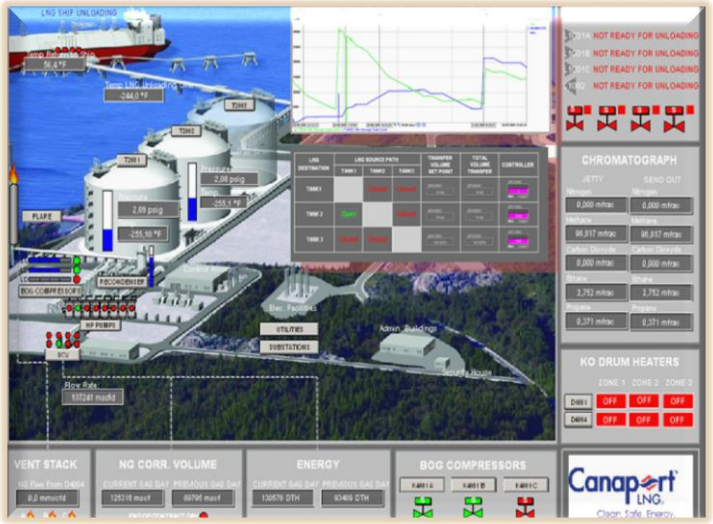
Controlling Bypass of Safety Protection Systems at the Plant

It is our day-to-day priority to monitor very closely all facility control functions where all spill, fire and combustible gas alarm and control systems are centralized in order to keep the receiving/regasification terminal safe



Business Challenge	Solution	Benefits
Comply with HSE policies and procedures to fully manage all temporary disabling or bypassing of safety protection systems at the plant to minimize risk to people and assets	Use the PI System to automate this procedure for all activities that require the disabling or bypassing of a Safety Protection System within the control of plant personnel	Improved time response to analyze bypass information deviations by all levels within the organization, and increased accuracy of Safety Protection System conditions at the Plant

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Scope

Requirements

- Capability of reading and historizing all tags that advise when a Maintenance bypass is engaged
- Association of these tags to PI AF attributes in order use them in PI Notifications.
- Development of a logic to send escalation emails to proper management personnel with the option to respond (acknowledge) these emails
- Development of reports and visualization screens to track these bypass element conditions and notification history
- Development of PI AF hierarchy for Bypass Element (one parent and all attributes) to manage as ASSETS

Deliverables

- Read in real-time bypass condition from DCS
- Accept manual bypass entries not in DCS through PI Manual Logger
- Send email to OS and TL to enter bypass reason and justifications
- Display real-time bypass status in PI ProcessBook, PI WebParts and PI DataLink
- Send email to OM in 10 days if bypass persists for acknowledgement and approval
- Send email to GM in 30 days if bypass persists for acknowledgement and approval
- Maintain logs of all bypass historical conditions and follow Real-Time analysis philosophy with existing end-user knowledge (no need to learn a new application)

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Considerations

Safety Protection Systems (S.P.S.)

- Need to be permanently in operation to protect people, environment and facilities.
- For example, fixed fire protection systems and equipment, flammable or toxic gas detectors, VESDA system , PSV, TSV and all maintenance override

Safety Protection Elements (S.P.E.)

- Electronic, mechanical, hydraulic, or pneumatic instruments which correct for process deviations by initiating emergency actions such as plant shutdown, equipment stoppage, evacuation of the plant
- Provide the operator with High and Low alarms related to process parameters when innaproprately bypassed may present serious risk to people, environment and facilties.
- High/High or Low/Low alarms shall never be overridden for operating reasons without a Management of Change request

Designate

- In absence of the Team Leader, the designate authorizes the temporary disabling or bypassing of any Safety Prtection Systems or Elements

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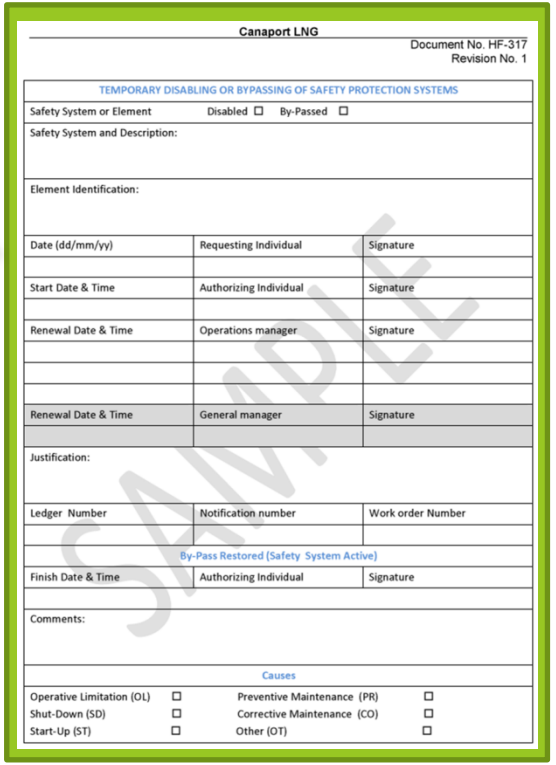
Process Flow

Elements of Bypass Process

BYPASS REQUIREMENT → **BYPASS INITIATION** → **BYPASS ANNOUNCEMENT** → **BYPASS LOGGING**

- PO is informed and approves the bypass request
- PO / TL inititate bypass on DCS console or in manual mode
- PO / TL notifies bypass condition and fills PI form
- Bypass is logged in Excel
- After 10 days OM approves bypass condition
- After 30 days GM approves bypass condition

PO – Panel Operator
TL – Team Leader
OM – Operations Manager
GM – General Manager



Canaport LNG

Document No. HF-317
Revision No. 1

TEMPORARY DISABLING OR BYPASSING OF SAFETY PROTECTION SYSTEMS

Safety System or Element — Disabled ☐ By-Passed ☐

Safety System and Description:

Element Identification:

Date (dd/mm/yy)	Requesting Individual	Signature
Start Date & Time	Authorizing Individual	Signature
Renewal Date & Time	Operations manager	Signature
Renewal Date & Time	General manager	Signature

Justification:

Ledger Number	Notification number	Work order Number

By-Pass Restored (Safety System Active)

Finish Date & Time	Authorizing Individual	Signature

Comments:

Causes

Operative Limitation (OL)	☐	Preventive Maintenance (PR)	☐
Shut-Down (SD)	☐	Corrective Maintenance (CO)	☐
Start-Up (ST)	☐	Other (OT)	☐

SAMPLE

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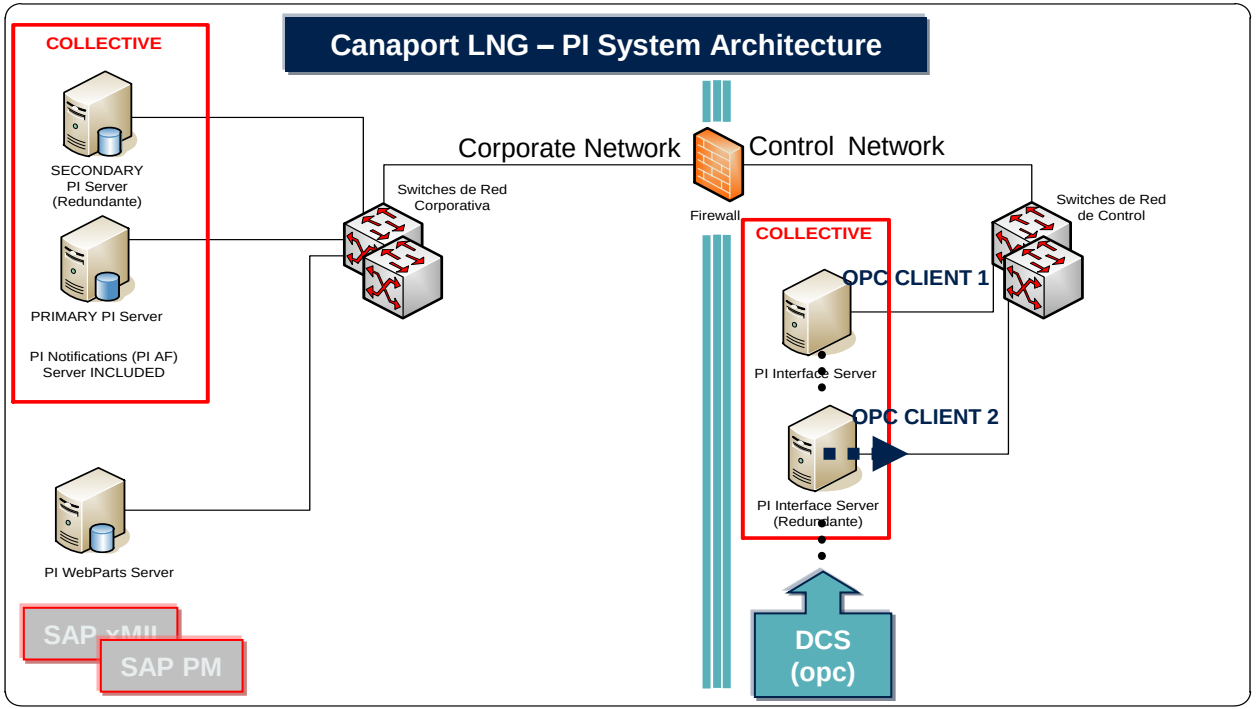
OSIsoft Products at Canaport LNG

- PI Server (20,000 Tags)
- PI HA (High Availability)
- PI Asset Framework (PI AF)
- PI ProcessBook/ PI DataLink
- PI Interface for OPC DA
- PI Manual Logger
- PI Notifications
- PI OPC DA/HDA Server
- PI SDK
- PI System Management Tools (PI SMT)
- PI WebParts



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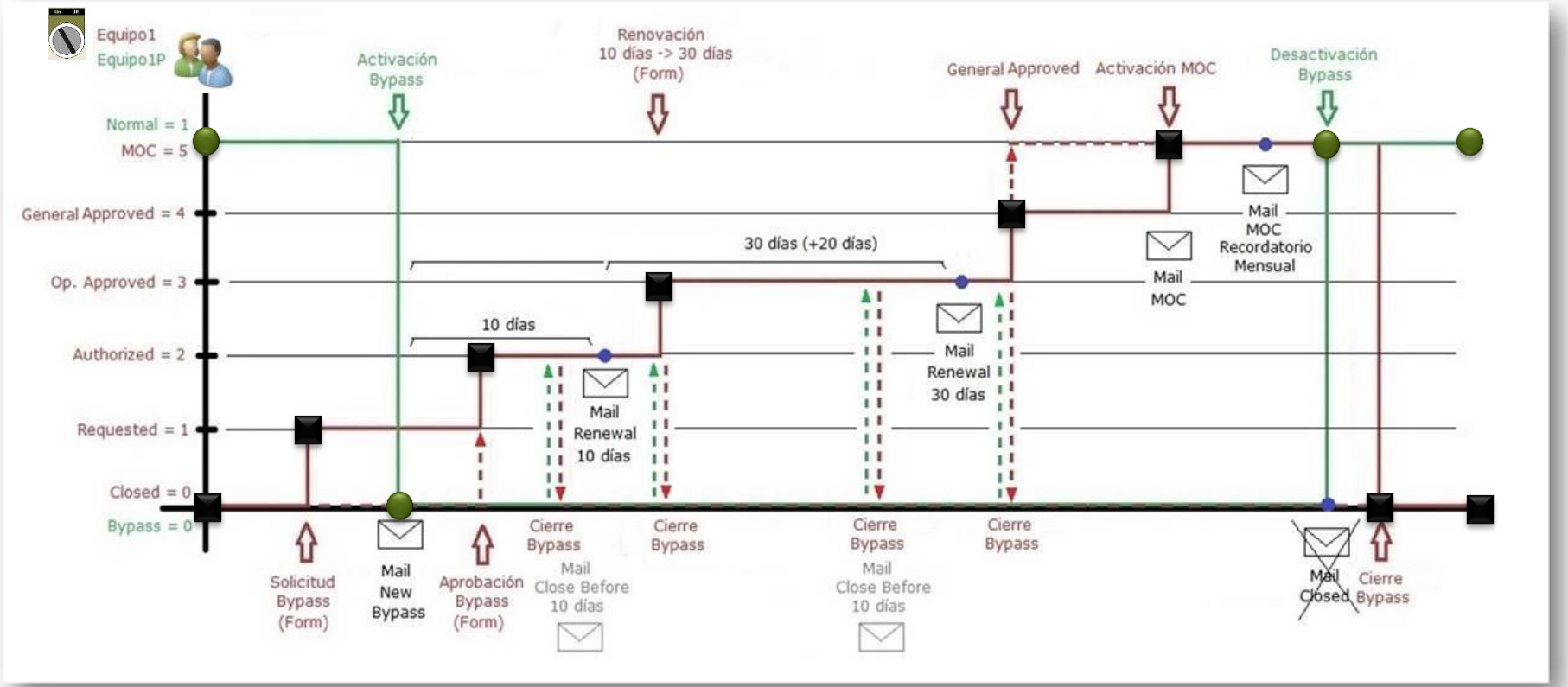
PI Notifications Embedded in Process Flow



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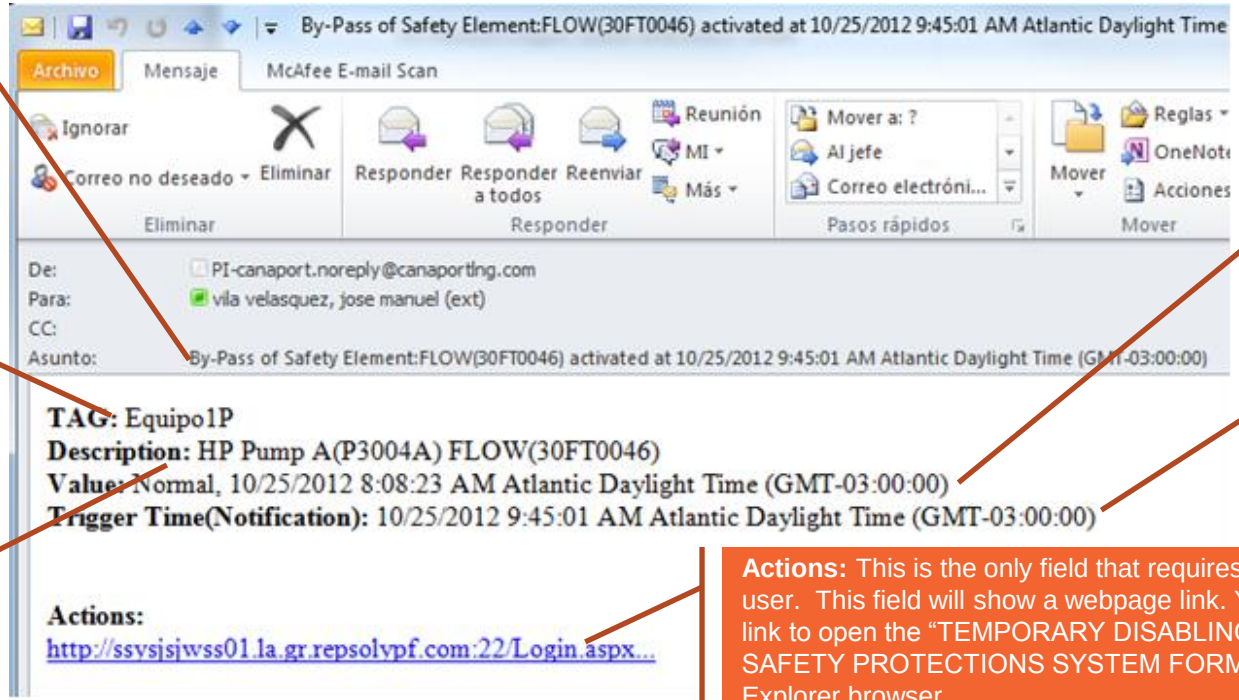
PI Notifications for Bypass Acceptance

Indicate the name of the equipment, the PI-AF element triggered and the date and time in which the Bypass condition was activated

Tag Name of the equipment that has been Bypassed in the PI System

Description of the equipment that has been Bypassed (as defined in the PI System)



The digital state value of the bypass. It should only indicate either “Bypass” or “Normal”, followed by the time when the PI server has received the value from DCS

Trigger Time (Notification): Timestamp when the PI-Notification trigger was activated

Actions: This is the only field that requires an action from the user. This field will show a webpage link. You must click on this link to open the “TEMPORARY DISABLING OR BYPASSING OF SAFETY PROTECTIONS SYSTEM FORM” on your Internet Explorer browser.

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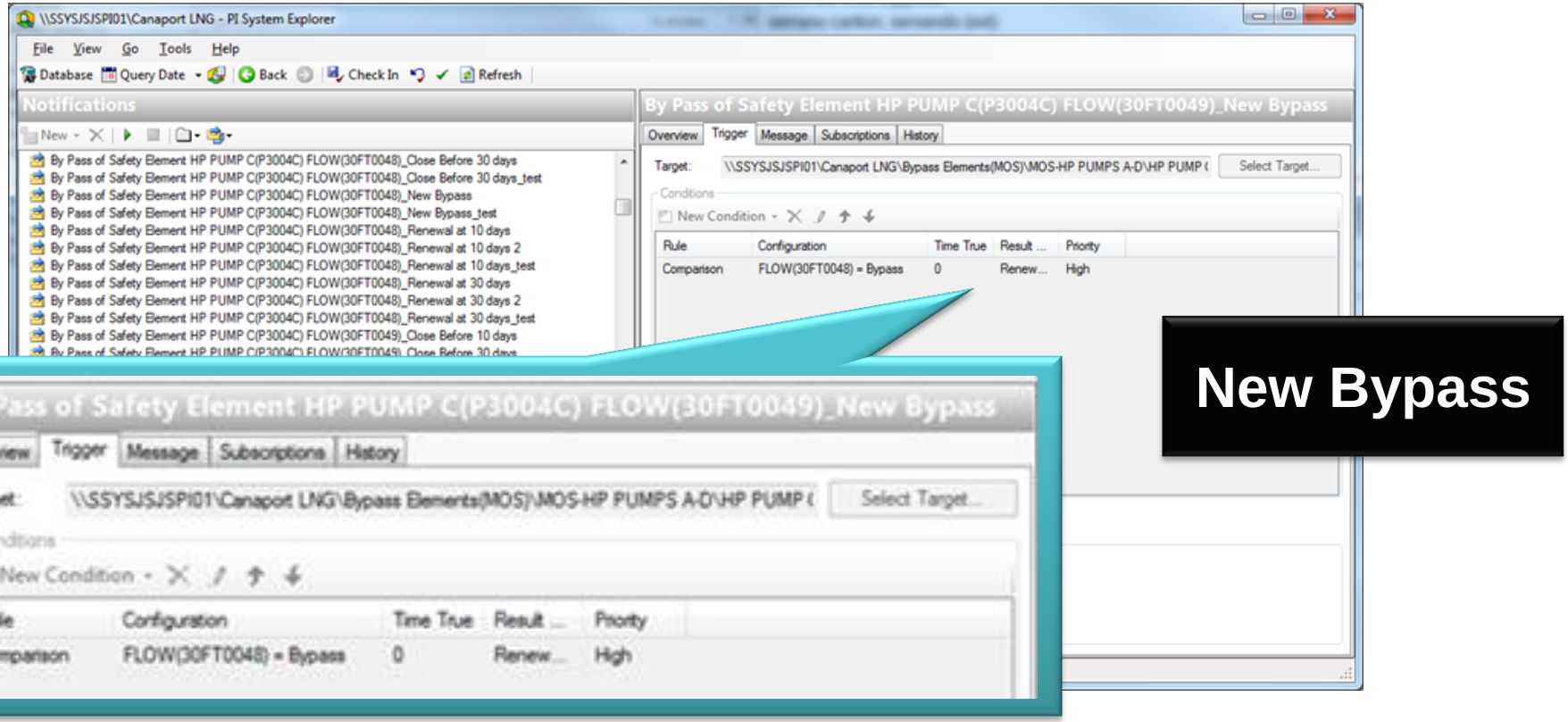
PI System Explorer (1)



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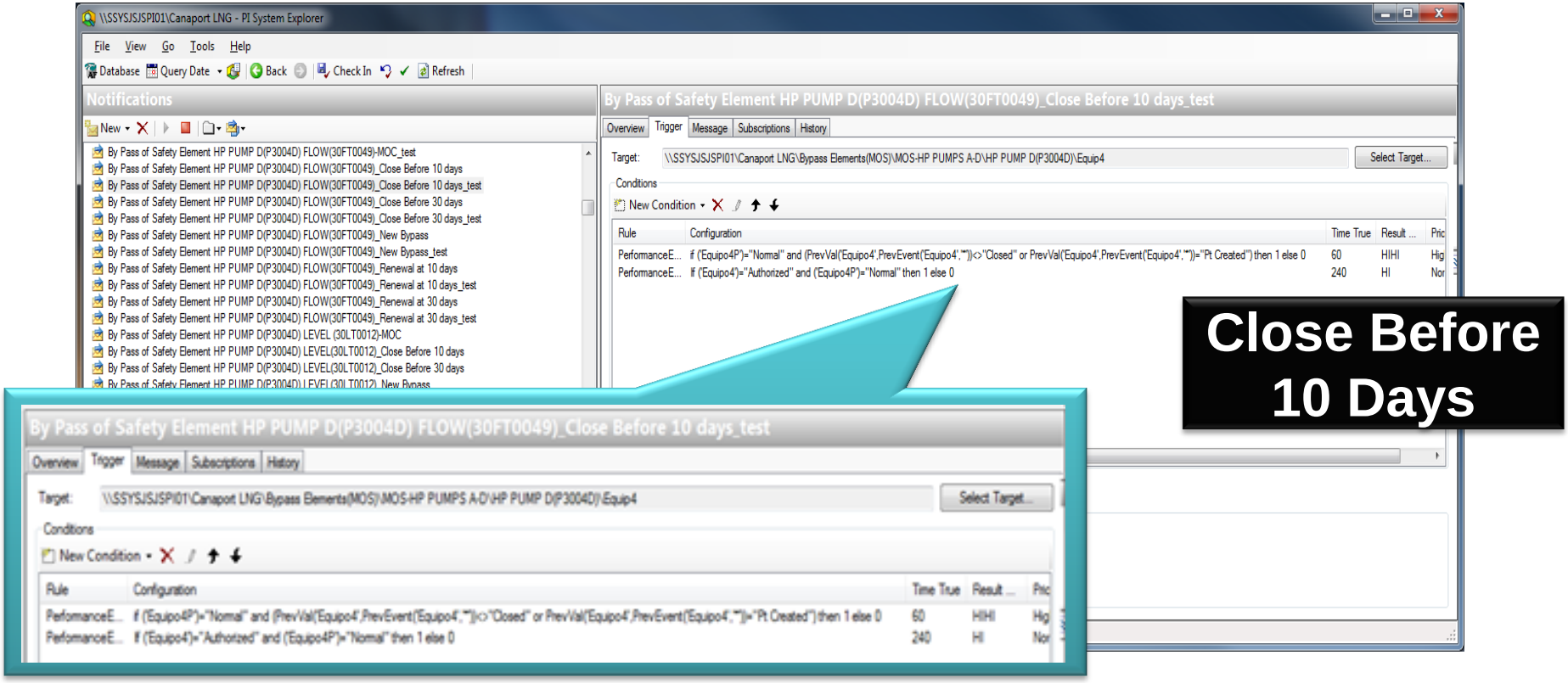
PI System Explorer (2)



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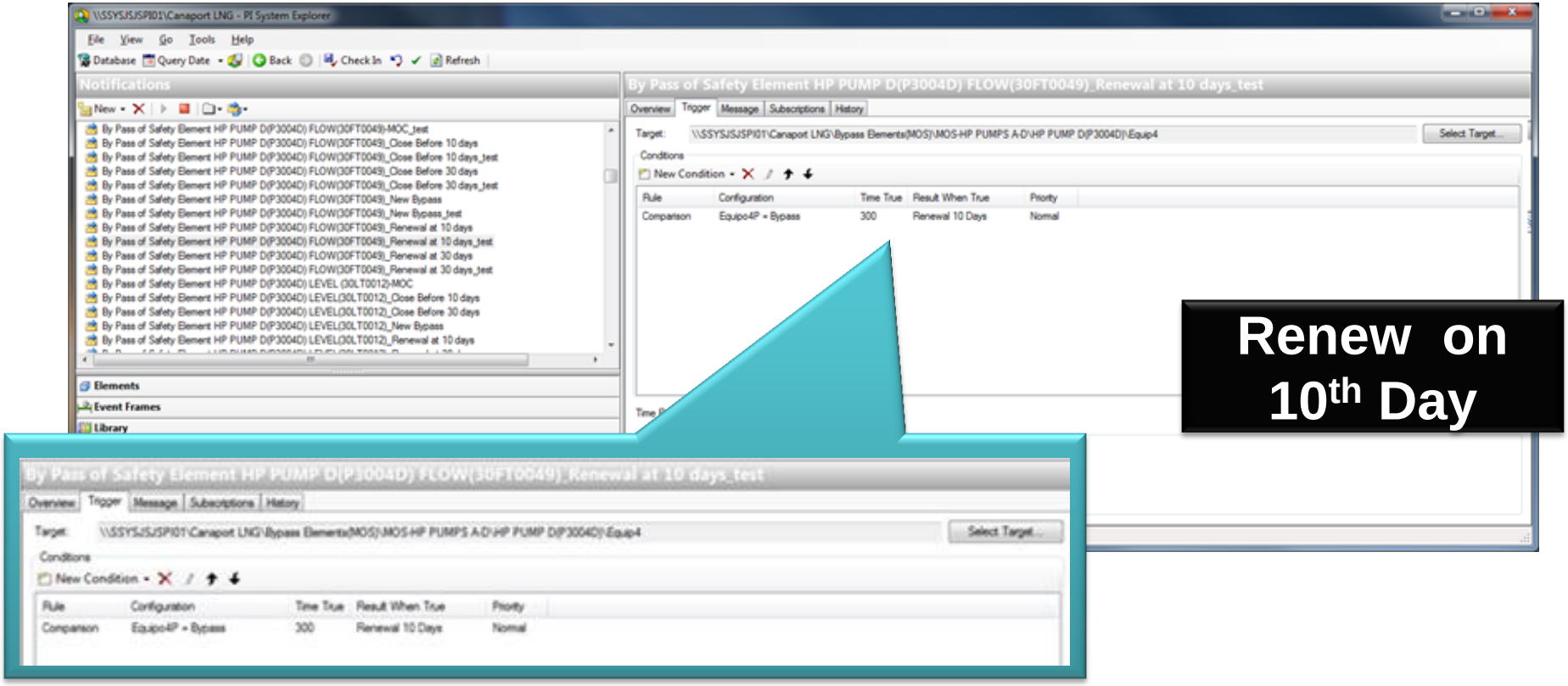
PI System Explorer (3)



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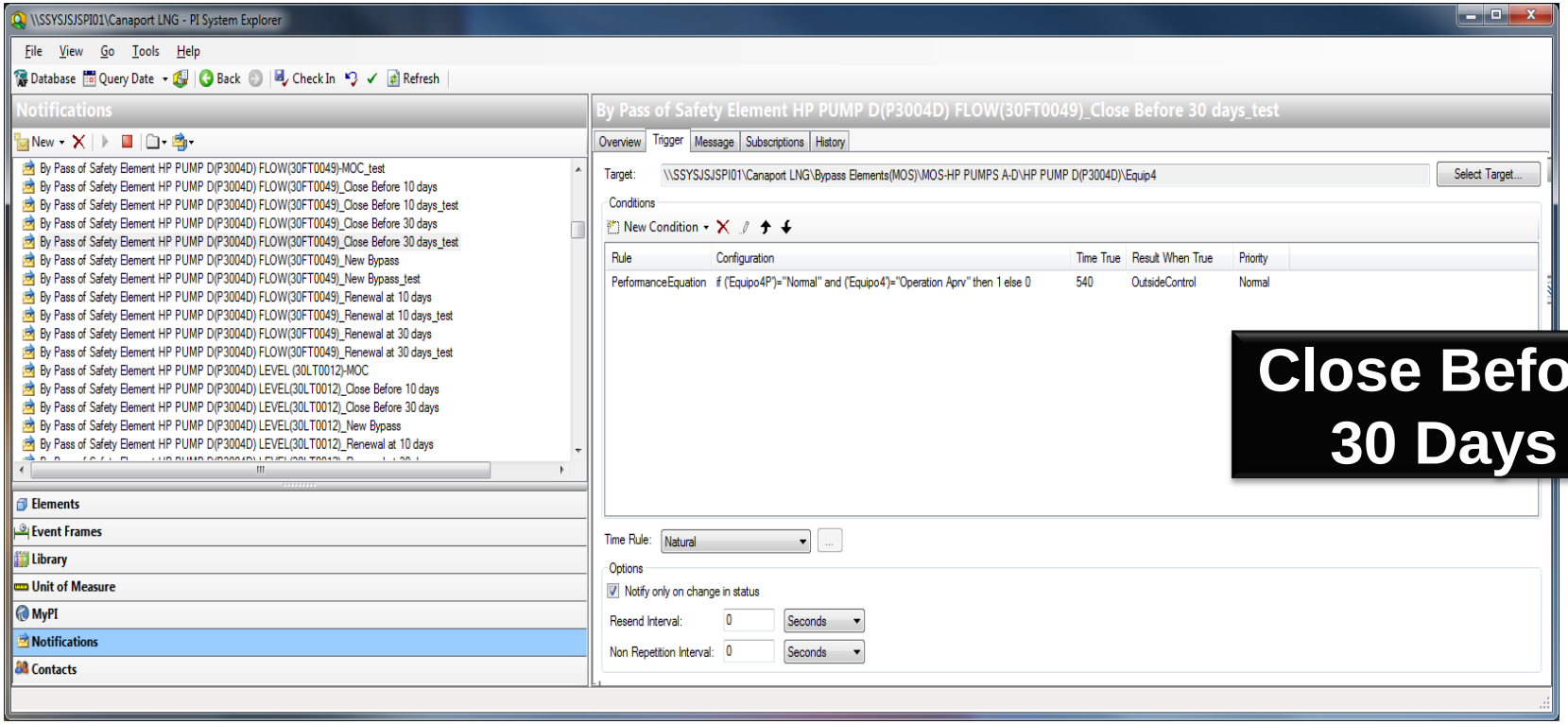
PI System Explorer (4)



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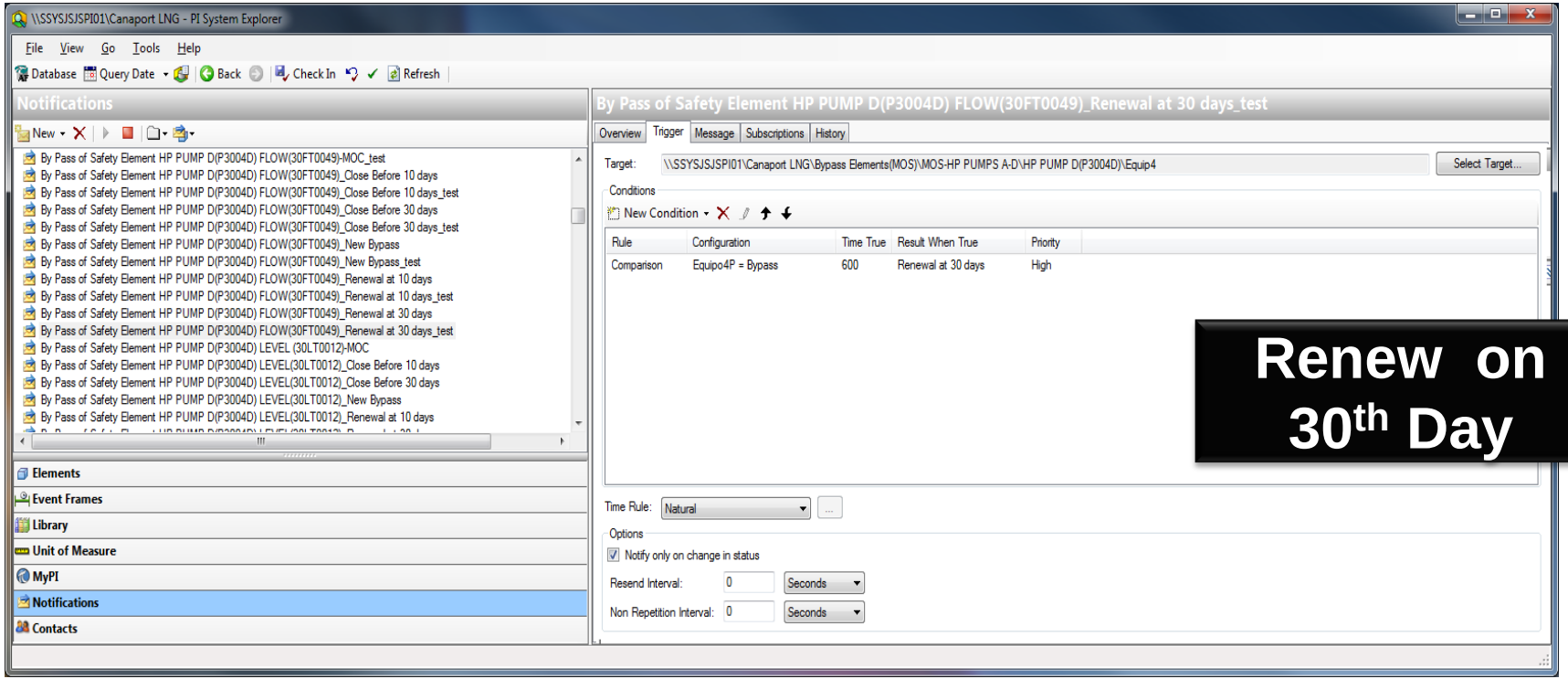
PI System Explorer (5)



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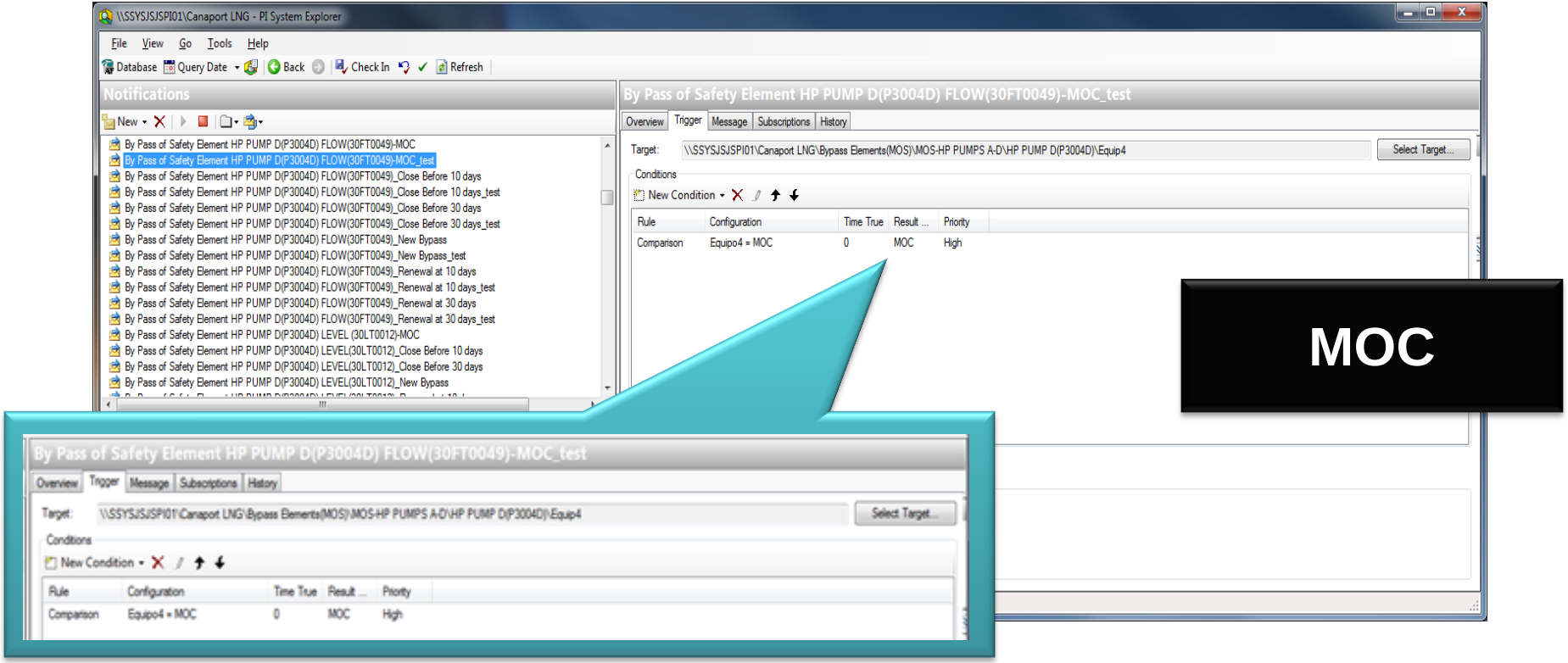
PI System Explorer (6)



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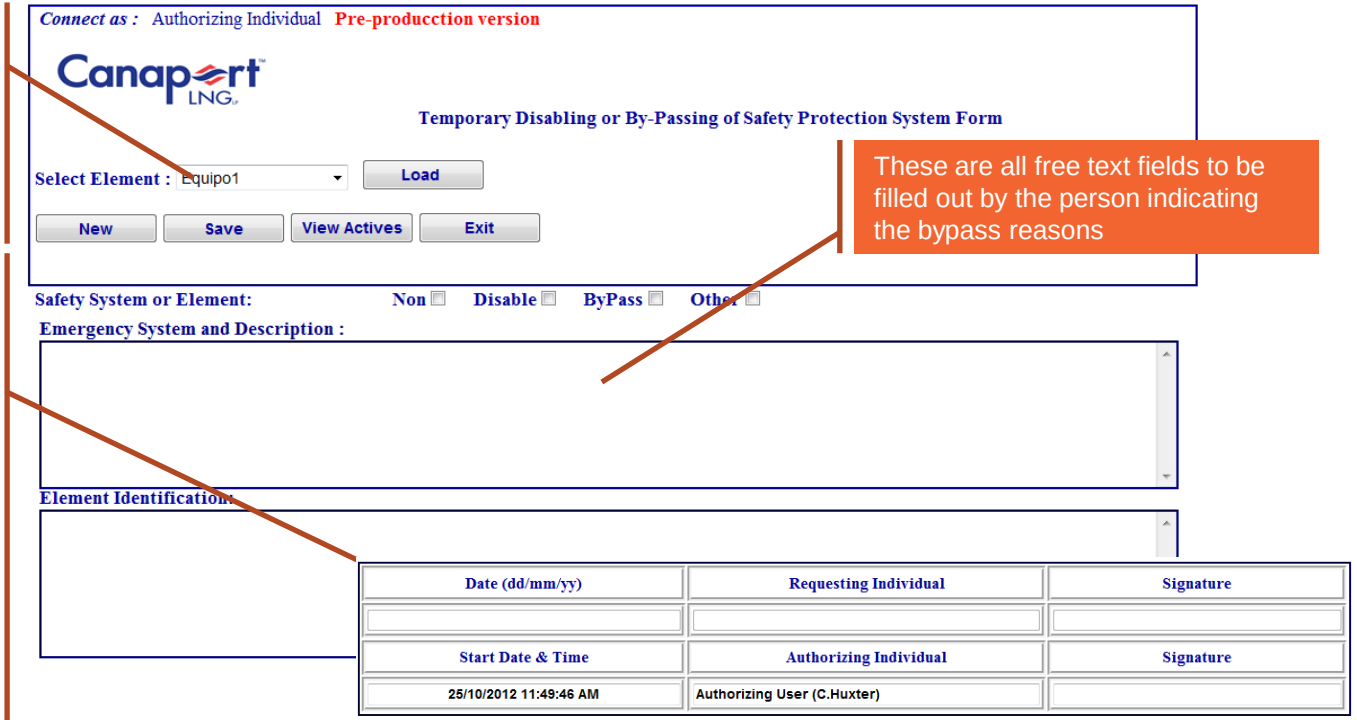
PI WebParts

Name of the equipment to be bypassed. If we enter via the e-mail sent by the de PI Notifications, this is written automatically with the corresponding element and the corresponding data

- The request user authorizes a request Bypass in the Form when it is not enabled from the DCS
- The user who enables a Bypass into DCS without Bypass request due to special reason
- Operation Manager authorizes the renewal of a Bypass after 10 days or close it
- General manager authorizes the renewal of a Bypass after 30 days or close it and can enable the MOC condition for an equipment in Bypass.



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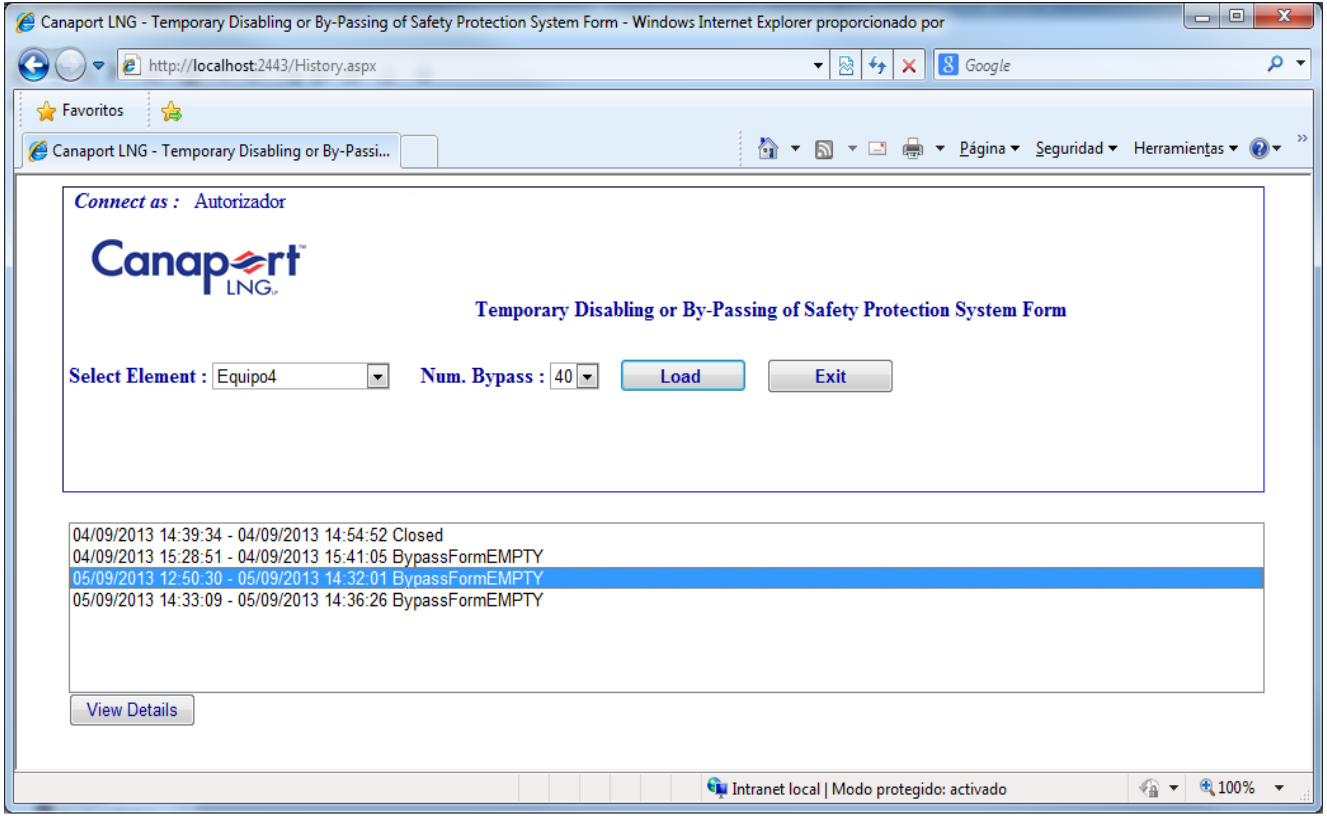
PI WebParts



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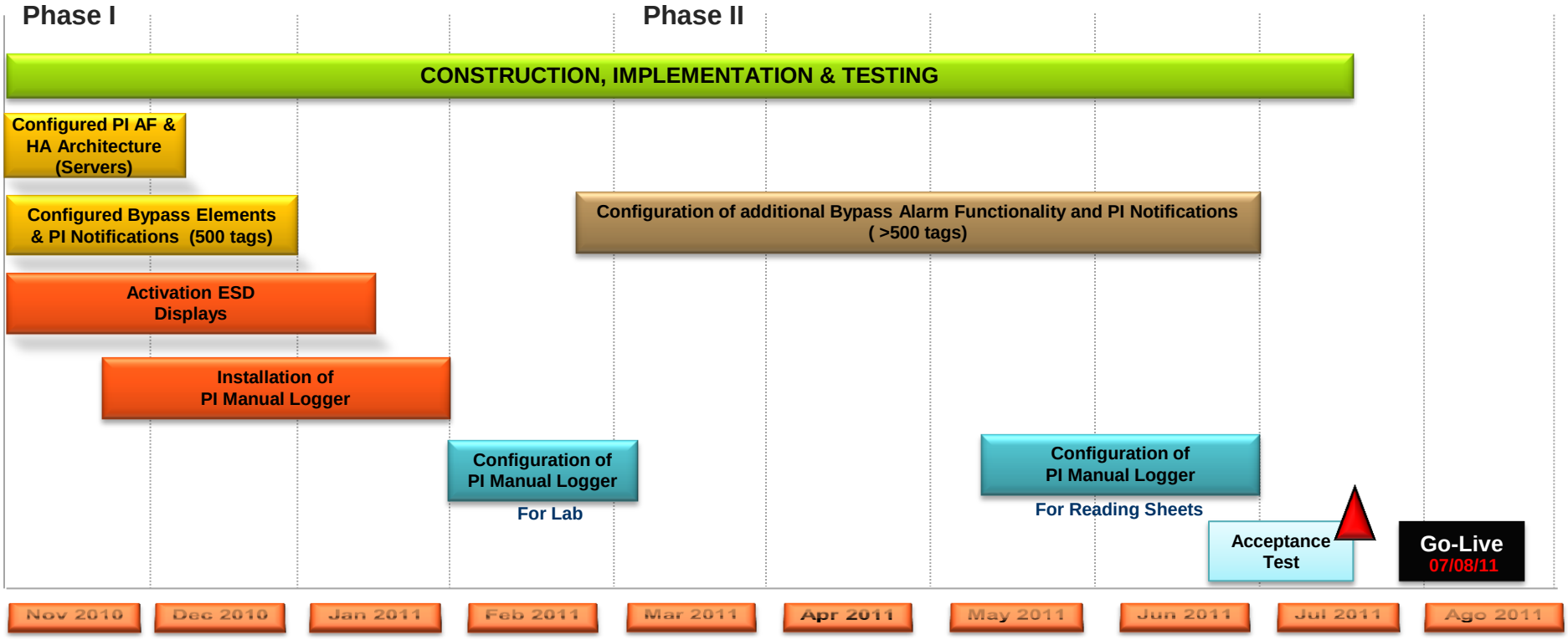
Planning



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Benefits

- Reduction of Costs in licenses and consulting fees on new software (100K€)
- Reduction of Costs for integration of bypass trigger values to SAP PM Master Data (150K€)
- Saving in Operations and HSSE personnel time by replacing a manual process with this PI System solution (100K€/year)
- Increment of process traceability, data accuracy and plant safety (No calculated value, but imagine without it)

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Conclusions

- With a simple PI Notifications configuration we can improve data visibility throughout all levels of the organization when a bypass is engaged
- No additional applications are needed to add process monitoring and intelligence with PI AF
- A project like this one can be tailor-made to specific requirements to increase end-user satisfaction without additional training on new tools or applications

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Next Steps

- Integrate Bypass Element controlling with Canaport LNG Work Order Management System (SAP PM)
- Standardize the solution in all Repsol E&P/LNG Plants with the PI System in use
- Increase the amount of Bypass Element Status Indicator Reports and consolidate all E&P/LNG Plants into a centralized PI WebParts Portal

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