Energy Development Corporation: Natural Catastrophe Project

CSR, Sustainability & AVEVA™ PI System™ Analytics

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Energy Development Corporation (EDC)

- 40 years of Geothermal Operations in the Philippines
- 4 Sites nationwide with a total of 25 Operating Turbine Units
- EDC is part of the First Gen Corporation (“First Gen”) Group, which has the largest portfolio of power plants using clean and renewable technology in the Philippines with capacity of 2,763 MW – about 10% of the total Philippine Capacity 13,272 MW.
Energy Development Corporation (EDC)

EDC’S WAY TO PLAY

1,189.34 MW
Geothermal Power Plants

150 MW
Wind Plant

11.99 MW
Solar Plants

132.80 MW
Hydro Plants

Sustainable Generation – expansive understanding and management of geothermal resource to develop and optimize resilient assets

Our 100% Renewable Energy Portfolio

1,484.13 MW Overall total
EDC: Decarbonizing the country through 100% renewable energy

We power businesses and communities with clean, reliable, and affordable energy in our mission to decarbonize the planet for our regenerative future.

Our REgenerative Power.

EDC strives to create a world that can thrive and flourish in the years to come. Beyond generating clean energy, we are working to bring everyone together, from our employees, customers, and partners to our communities and the environment, to move toward this goal.

This is what #OurRegenerativePower is all about.

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- 4 Sites nationwide with a total of 25 Operating Turbine Units
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Digital Transformation Vision and Strategy

IMPROVE O&M BY DIGITIZING THE VALUE CHAIN

<table>
<thead>
<tr>
<th>UPSTREAM</th>
<th>DOWNSTREAM</th>
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<tbody>
<tr>
<td>Drilling</td>
<td>Reservoir Management</td>
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<tr>
<td>Steam Field</td>
<td>Power Plant</td>
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5C STRATEGY

- Digital Drilling
- Digital Reservoir
- Digital Steam Field
- Digital Power Plant
- Digital Geo Sciences
- Digital Solar
- Digital Wind

CONNECT
- Real-time Data
- Situational Awareness
- Operational Insight

COLLECT
- Data Driven Decisions
- Automated Reports

COMPUTE
- Quick Access to Info

COMMUNICATE
- Analytics
## EDC Digital Transformation Roadmap

<table>
<thead>
<tr>
<th>Year</th>
<th>Visibility</th>
<th>Role-Based Dashboards</th>
<th>Operational Insight</th>
<th>KPI Management</th>
<th>Technical Monitoring</th>
<th>Condition Based Maintenance</th>
<th>Predictive Maintenance</th>
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<td>Reservoir Decline</td>
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**INCREASING COMPLEXITY**

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Cost Effective Solution across the Fleet

People Empowerment

Correlation to all data that is being collected

Better Planning for All Assets & Facilities

Future Proof Solution that will be rolled out across the fleet
  • NO Excuse for Data Collection
  • PI UFL via IoT Gateway
  • Manual Data or Batch Inputs
  • Internal expertise can be a shared resource across

Corporate and Community Services

Sustainability – proving that People, Process, Technology can produce results

Insurance Premium Savings

Local Government
Well Monitoring: Fluid Collection Reinjection System (FCRS)

Challenges
- There are no Steam Flow, Mass Flow and Water Flow, calculation for each Well. Only Pressure sensors are available.

Solution
- Display all well parameters that are available
- Use Bore Output Curve (BOC) Coefficients to calculate the estimated Steam Flow, Mass Flow and Water Flow of each well
- Use AF Function like Steam_TPH to calculate Flows

Results
- Real time Well Data
- Able to compare Sensor Data with Computed Well BOC Data
- Estimated MW Output per well
Steamfield Monitoring: WeSEE

Challenges

- Temporal changes of the temperature profile of a geothermal well
- Calciting wells
- Inadequate and not user-friendly access to values of well parameters

Solution

- Display all well parameters that are available
- Study parameters, how are they affecting each other
- Create well status analysis or remarks for the alarms (e.g. WHP is below SV, Below/Above Target WHP)

Results

- Real-time data visualizations
- Do interventions when they observed a certain alarm (maximize downtime)
- Water level is determined using Pressure profile
**Dissolved Gas Analysis**

**Challenge**
- Data are being collected manually
- Analyses and Interpretations are conducted manually
- Difficulty to monitor asset health real-time

**Solution**
- Data concentrator to pull data together from multiple sensors.
- Real-time data update for asset health monitoring
- Integrate analysis and dashboards for faster decision making and assessment.

**Results**
- Quickly identify frequent triggering parameters and its impact to performance
- Being able to identify asset aging for reliability monitoring
Minimum increase of 1 MW hourly
Is it enough?

Beyond sustainability: Here’s how EDC is making a difference

We are the largest vertically-integrated company in the world

EDC has put the Philippines on the map as the third-largest geothermal energy producer and the world’s largest vertically-integrated geothermal company.

We are the only 100% renewable energy company in the Philippines

EDC is the largest and only 100% renewable energy company in the Philippines, with an installed capacity of 1,484.13 MW. For over four decades, we have continued to deliver clean, renewable, and affordable energy to Filipino businesses and communities.

Forging collaborative pathways to a decarbonized and regenerative future

Beyond providing 100% renewable energy, EDC elevates its customers, partners, the environment, communities, and employees with the regenerative touch by forging collaborative partnerships.
USE CASE

Resiliency and Sustainability (Natural Catastrophe)

Is an application developed to have visibility on occurrence of Earthquake, Typhoon and Landslide around the area powerplant and steamfield
Resiliency (Natural Catastrophe): Meteorological Station Data

Challenge

- Power plants are commonly located on remote areas. For safety precautions, company wants visibility and awareness if there are typhoons that might affect the location and its operations.

Solution

- Integrate visual representation for weather and its forecast
- Analysis of contributing factors for weather assessment.
- Notify if a parameter breached its limit.

Results

- Situational Awareness
- Quickly Notify respective departments
Resiliency (Natural Catastrophe): Slope Data Monitoring

Challenge:
- Power plants are commonly located on remote mountainous areas. For safety precautions, various contributing factors to landslides are monitored.
- Integrate visual representation for rain, soil moisture content, and slope tilt values
- Notify if a parameter breached its limit.

Solution:
- Situational Awareness
- Quickly Notify respective departments

Results:
Resiliency (Natural Catastrophe): Seismic Data Monitoring

**Challenge**
- Seismic events in the power plant location are vital to the operations whether the event is small or strong. These events are recorded and are mapped for visual analysis.
- Record parameters about the seismic events
- Map seismic events for visual analysis
- Tallying seismic event frequency for a given time
- Notify when a seismic event occurs

**Solution**
- Situational and Spatial Awareness
- Quickly Notify respective departments

**Results**
- No specific results mentioned.
Connect Data Sources

• Without integration to the DCS
• Via IoT Gateway and AVEVA PI System Interfaces
  • PI UFL
  • PI HTML
  • PI MQTT
  • PI Modbus
• Calibr8 Offline Loggers

Integrate into the AVEVA™ PI Server™ Asset Framework

• All Algorithms was imputed into PI AF

Develop Custom Symbols in AVEVA™ PI Vision™

• Developed by Calibr8 Systems – Services Provider
  • Integration to Maps
  • Special Symbols
The AVEVA PI Vision Extensibility Framework is a powerful model that enables you to write custom symbols and tool panes for use in PI Vision displays, including unique or industry-specific ways of visualizing PI data.
Leyte Peak Ground Acceleration Monitoring

Station ID: 3982
Location: T&D

**WARNING LOG**

<table>
<thead>
<tr>
<th>Last Recorded Event</th>
<th>Earthquake Records</th>
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<tbody>
<tr>
<td>9/13/2019 12:26:46 PM</td>
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<table>
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<tr>
<th>pga [mm/s^2]</th>
<th>a</th>
<th>b</th>
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<tr>
<td>2,013.82</td>
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Intensity: 7

Note: If trend is not displaying after 5 seconds, click "Now" to display latest trends
What’s Next – More Data, More Visibility

Asset Framework/PI Analytics Database

Data Archive Collective (EGH)

CUSTOM API

Datalake

Asset Synch

PI Vision

Transactionally Data Acquisition

Transactionally Data Acquisition

H2scan

SUBSTATION / STEAM PIPELINE
Real-Time Data Values from Thermal Cameras

Manual Loggers And Other Data

What’s Next – More Data, More Visibility
Data = Optimization = Sustainability

The power is in your hands
Energy Development Corporation improves resiliency, sustainability and safety with AVEVA

Challenge

• Power plants are commonly located in remote areas. For safety precautions, Energy Development Corporation (EDC) wanted visibility and awareness of natural catastrophes such as typhoons, landslides, and seismic events.

• EDC wanted to improve operations and maintenance (O&M) by digitizing the entire value chain including drilling, reservoir management, steam fields, and power plants.

Solution

• Worked with local system integrator Calibr8 to implement AVEVA™ PI System™ to enable better data management and the realization of EDC’s digital transformation roadmap from improved data visibility, to operational insight, and eventually predictive maintenance.

Results

• Improved visibility to remote assets

• Enhanced collaboration and people empowerment

• Increased trust in data validity, with futureproofing for further developments

• Better planning for all assets and facilities

• Reduced O&M costs, including reduction in insurance premiums

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Questions?
Please wait for the microphone.
State your name and company.

Please remember to...
Navigate to this session in the mobile app to complete the survey.

Thank you!