IoT and Big Data in Asset Management

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Capítulo Cundinamarca

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Big Data Evolution

- **Evolution in storage media**





- **Evolution in corporations changing? How has big data driven the change and is it integrated or in silos?**
  - **Consider the following; iPhones, Blackberry, Androids, Google, Tablets, Apps, Xoom, 4G/5G cell service, etc.**






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Which Platform in Big Data?

- **System Platforms are like Smart Phones, how to choose?**

- **Only 20% of Smart Phones capabilities are really used… Think about it?**
- **IoT** is the extension of Internet connectivity into physical devices and everyday objects (embedded in electronics, hardware, etc.). The App?

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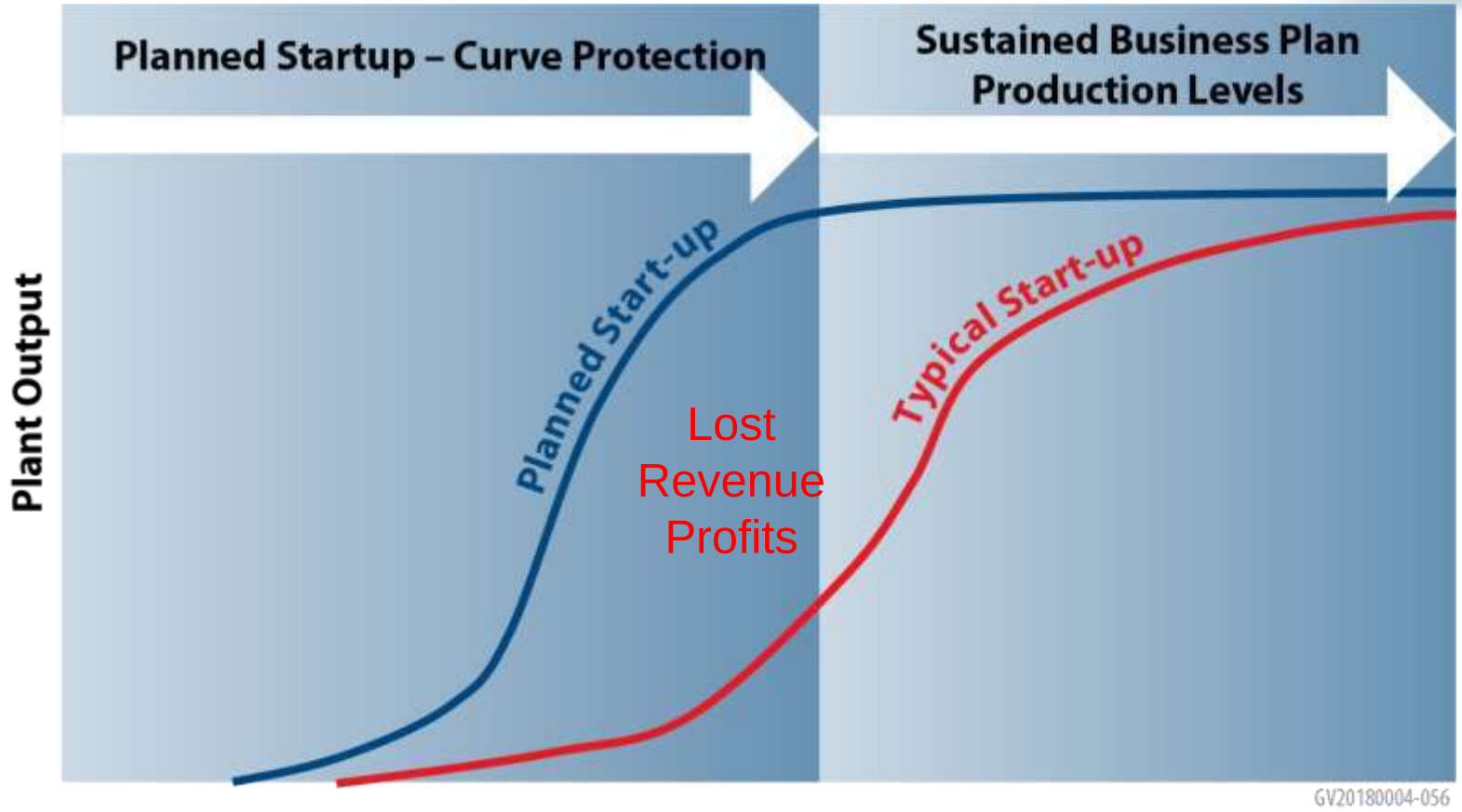
Using Big Data… and Why



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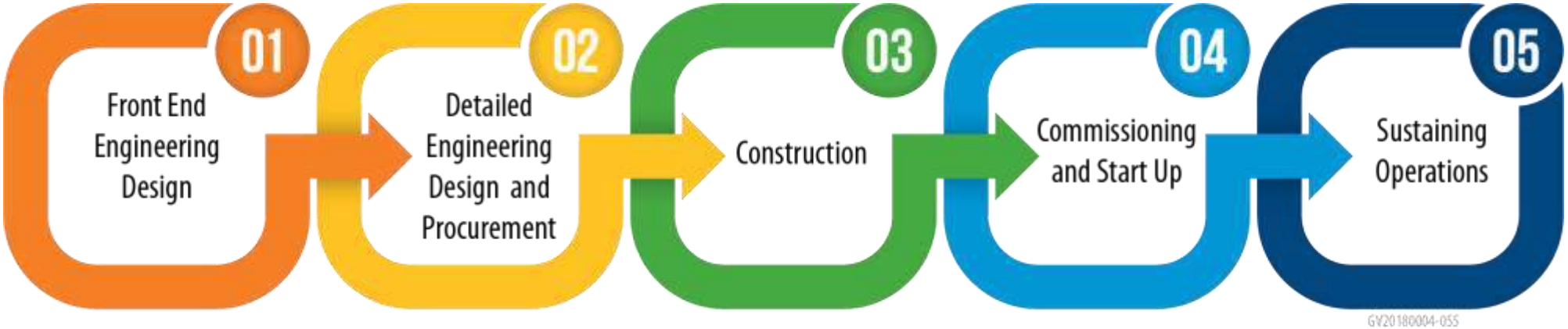
Risk Mitigation & Added Value

Risk mitigated early brings added value and team buy in



Value, ROI, Risk Management and Up Time Protection

Planning early positions the Value

Introduce Operations to Operations

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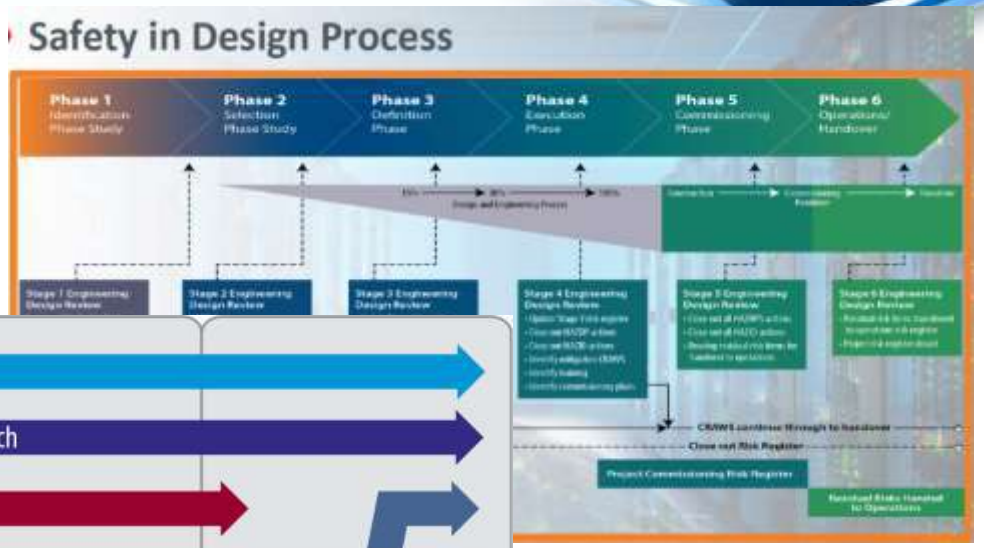
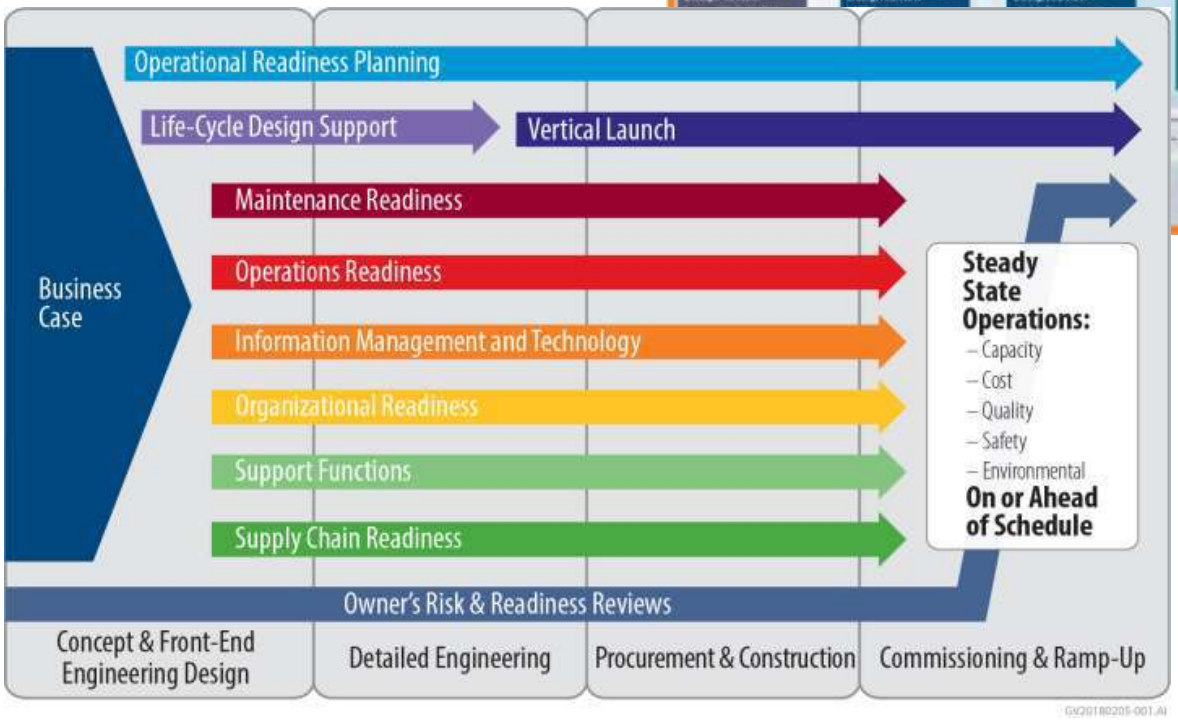
Mitigate Risk, drive Big Data, think Operational Readiness Methodology

UpFRONT
- 10 Modules
- 70+ Activities
- 500+ Deliverables
- Sequenced and integrated by project phase





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WHY….. Operational Readiness?

Business Case Development

Combines project risk management with **early** Operational Readiness to plan for optimization of the project ROI:

ROI Optimization Plan

- Business strategy
- Finance plan
- Off-take strategy
- Commodity plan
- HR strategy
- OR project plan
- Supply chain strategy
- Technology strategy
- Risk mitigation plan

Business Case Rationale and Project Optimization

An opportunity to integrate value engineering without de-scoping

Project ROI Optimization Levers

Strategic	Finance	Supply Chain	Human Resources	EPC	O&M

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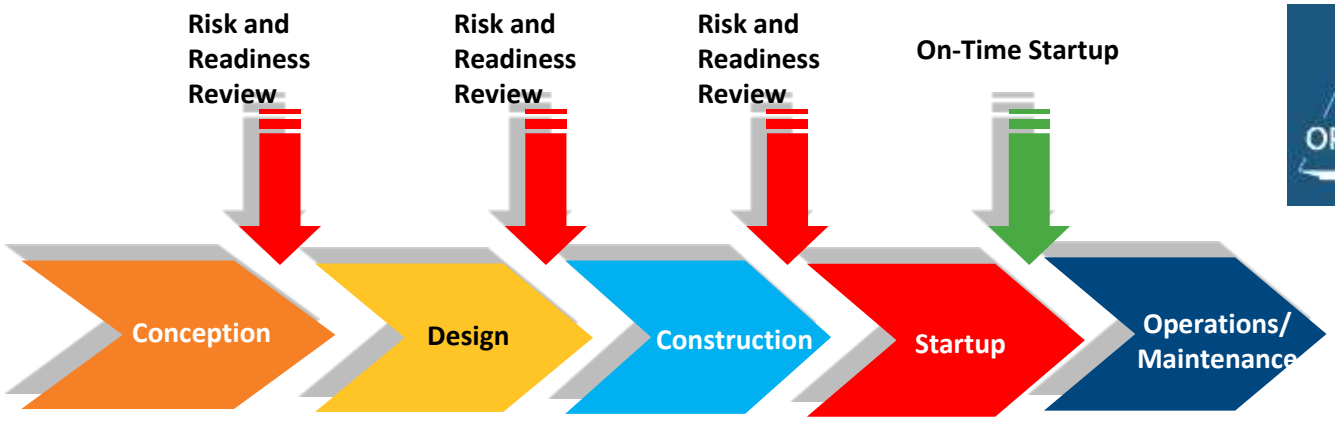
Big Data Risk & Readiness Review

Identifies Support Needs and Priorities

- Prepares the owner for lender audits
- Guides the owner through a structured risk identification and mitigation planning process (Hand-over O&M)
- Provides O&M gap analysis and recommendations
- Revisited and updated at various phases of the project (to help develop O&M programs/procedures)
- Confirms timing and status of operational readiness preparations as startup nears (O&M checklist)



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Operational Readiness Methodology & Big Data mitigates a GAP

Design/Construction/O&M

Project and Operations Liaison Leadership

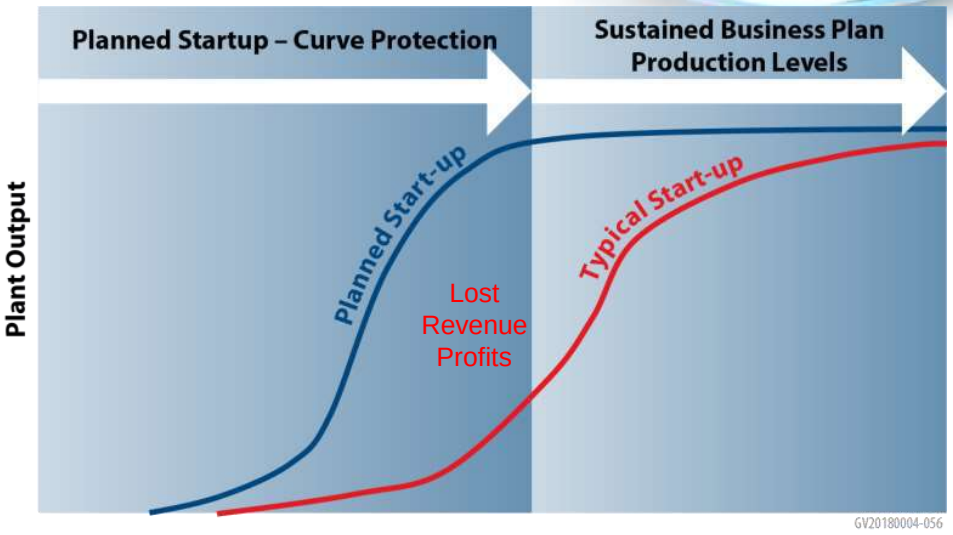
- Overall risk management (audits, KPI's)
- Senior level resolution and reporting platform

Operations & Project Assurance

- Design for project cost/life cycle design
- Quality and schedule
- Commissioning and start-up

Operations & O&M Operations Readiness

- **G**enerate detailed operations/maintenance plan
- **A**pply focus on weak and/or high-risk areas
- **P**re-positions the start up curve
- Positions the O&M team to succeed
- Mitigates risks associated with start up/ops
- Delivers PM, PdM, O&M safety training before start up, before live operations



Overall project risk management and ROI protection through:

- **Employee Safety**
- **Safety Awareness**
- **Team Acceptance**
- **Lower Operating Costs**

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Big Data: Filling the Gap
Integrate, Influence and Mitigate

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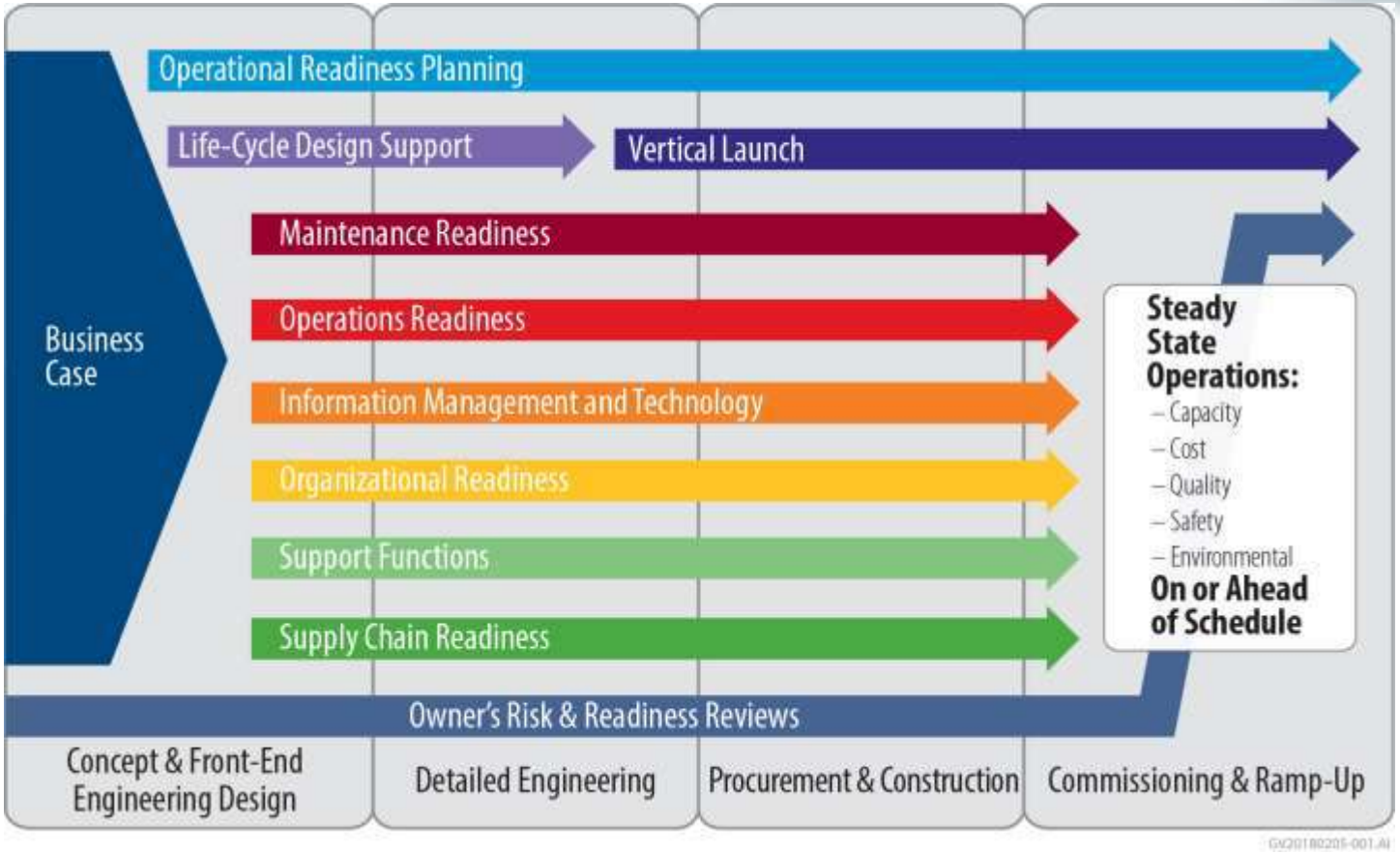
- 10 Modules
- 70+ Activities
- 500+ Deliverables
- Sequenced and



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Integrating Data into Results

How/Why the pieces of design, construction, commissioning, maintenance/operational readiness and start up should be integrated through a team and partner

Case Studies & Examples

High Tech issues using data to deliver low tech solutions through:

- Developing a baseline to track from
- Viewing the entire issue, not a single component
- Optimize to better use assets
- Employee Safety
- Safety Awareness
- Team Acceptance
- Lower Operating Costs

Power Plant Energy Planning

Colombia

Through trending & analysis:

- Define and measure a baseline to track the energy supply plans.
- Ensure low power generation costs (COP$/kWh), with projects and strategies like:
  * Apiay Gas Treatment Plant: It reduced the gas transportation cost to Suria Power Plant in UD$150.000/month, and allowed to use the full gas transportation capacity of the plant.
  * Gas supply and transportation negotiation: Stork supported to negotiate quantities and costs of the gas supply and transportation to Apiay power plants, ensuring supply and lower cost according to local regulation, for longer periods.
- Power generation main equipment optimization.
- Additional turbo-groups and energy sources to improve power delivery.

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Power Plant Optimization

Colombia

IMPLEMENTED PROJECTS

- Main power generation equipment optimization by:
  1. Implementation of a Chiller for air-cooling.
  2. Water injection for emissions control.

- NOx emmissions control systems implementation for TermoSuria 1.

Chiller Air Cooling System

Nox Emission Control System

Nox Water Injection System

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Power Plant Optimization

Colombia

IMPLEMENTED PROJECTS

Solar Energy Project:
- Offsets the offices' demand
- Installed on offices' roof
- 35kW installed
- Delivers peak demand reductions

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Power Plant Optimization

Colombia

IMPLEMENTED PROJECTS

Remote Tele-metering monitoring project:

- Supported the energy tele-metering project to remotely monitor the Ecopetrol electrical commercial borders to measure energy import/export in real time.
- Obsolete energy meters replacement, to improve accuracy.

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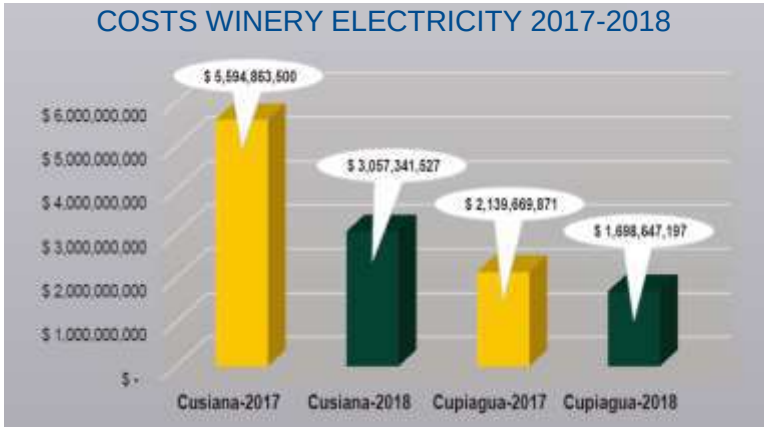
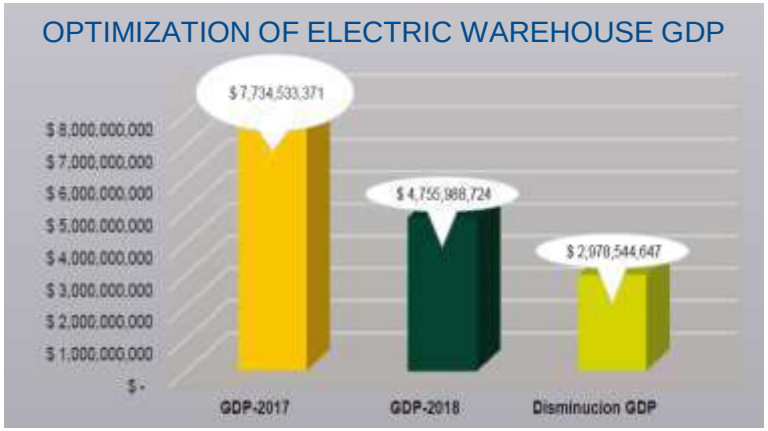
Warehouse Optimization

Colombia

ELECTRICAL WAREHOUSE OPTIMIZATION





PERFORMANCE ANALYSIS

* Cusiana: 45% value reduction, compared to December 31st, 2017.
* Cupiagua: 21% value reduction, compared to December 31st, 2017.
* 39% Total Ecopetrol GDP electrical warehouse value reduction, compared to
December 31st, 2017

PERFORMANCE TOPICS

* After checking 70% of the materials loaded to the electricity discipline in Cusiana, 20% of the items were found to be of other disciplines, so there is a correction on the registry.
* 2018 optimization goal was exceeded by 400%.
* Optimization comes from materials that are no longer necessary for the operation, and the revision of over-stock.

FOLLOWING ACTIONS

Quarterly monitoring of PXQ 2019, ensuring that the requested spare parts are executed, according to planned and not stored in the warehouse, making that the value of it increases.
- Check 30% of missing materials in Cusiana

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Cusiana Relamping Campaign

CUSIANA LIGHTING SYSTEM

PERFORMANCE ANALYSIS

* During week No. 49, 37x 70W LED luminaires were installed in the Gas Plant & LPG area and 15x in the Amine Area.
* 92% total completion In the Gas Plant and LPG area.
* 21% total completion of LED light installation in the CPF 21%
* Total lamps installed to date: 165. Pending: 638

PERFORMANCE TOPICS

- Staff: In Week No. 51 It is planned to install the
luminaires in amine contactor towers.
- Materials: Luminaires are available to complete the
Gas Plant area. It is removed from the cellar of
the total number of LED luminaires.
- Equipment: The use of Man Lift is planned and coordinated for
installation of luminaires in week 51.
Work in heights.

FOLLOWING ACTIONS

* The plan is to recover all Gas Plant Area lighting by the end of 2018.
* Migration to LED-type luminaires is planned to around 6 years for the whole CPF CUSIANA: In 2018 Gas Plant and 2019 Gas Reinjection.

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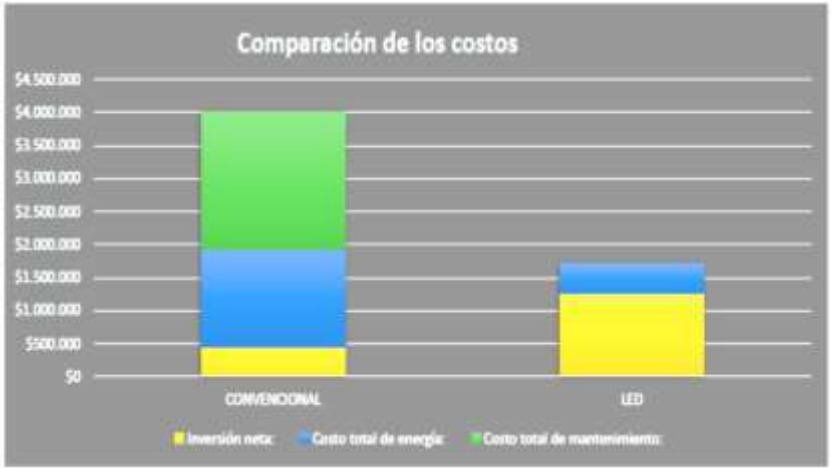
Cusiana Relamping Campaign

PROCESS AREA LIGHTING SYSTEM CUPIAGUA



PERFORMANCE ANALYSIS

* Return On Investment of the system migration (conventional to LED) is around 5,8 years.
* 438 LED lamps are included in the lighting system migration plan.

COMPARISON OF TOTAL COSTS

	CONVENCIONAL	LED
Initial Investment:	$443.650	$1.272.383
Return in Earnings: 0	$0	$0
Tax deductions: 0	$0	$0
Net Investment:	$443.650	$1.272.383
Total Energy Cost:	$1.496.584	$435.782
Total Maintenance Cost:	$2.066.783	$0
Total Cost (COP$thousands)	$4.007.017	$1.708.165
1USD = 3,2 COP$thousands		

	TOTAL SAVING
Energy Savings:	$1.060.802
Maintenance Savings:	$2.066.783
Total Savings:	$3.127.585
Initial Investment:	($1.272.383)
	$0
Tax deduction:	$0
Total Return (COP$thousands)	$1.855.202

EQUIVALENT ENVIRONMENTAL IMPACTS*.

CO2 EMISSION (LBS)	1.633.635
(TONS)	817
CARBON EMISSION (LBS)	793.027
(TONS)	397

Equivalent less cars on the road:	142
Equivalent planted trees:	203
Equivalent homes with electricity:	153

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Example: Operational Savings

Cost/Benefit Analysis: Group Relamp Interval (GRI) for Lighting (Component of Safety, Security, Productivity and Environment)

Assumptions:

- Typical metal halide high intensity discharge (HID) light fixtures
- Annual fixture operation = 8,760 hrs (24 hrs x 365 days)
- Typ. bulbs, 400 W each, 10,000 hr rated life (HID), 50,000 hr life LED (400W equiv)
- Group relamp at 80% of rated life (HID) vs. 90% for LED

Solution:

Current 400W Metal Halide lights ($25 ea) on 24 hr/365/year

GRI = 10,000 hr rated life x 80% relamp divided by 8,760 hrs per year = **0.91 years or 11 months** relamping

https://www.bulbamerica.com/products/luxrite-mh-400w-u-mogul-metal-halide-bulb

Proposed 100W LED ($140 ea) on 24 hr/365/year

GRI = 50,000 hr rated life x 90% relamp divided by 8,760 hrs per year = **5.1 years** relamping if the lights are converted to LED in lieu of HID

http://www.satco.com/s9676.html

The LED lamp last 5.6 times longer then HID

- **Saving 5x labor costs**
- **Saving 5x disposal costs (Carbon)**
- **Mitigating 5x labor safety risks**
- **Saving 4x Energy (Carbon)**
- **Same Material Costs**

http://solutions.borderstates.com/guest-post-ge-lightings-take-on-planned-maintenance-and-group-relamping

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Example: Operational Savings

- Energy Payback Calculation: 2,000 lamp replacements
  - First Cost: $125 x 2,000 = $250k small cap + Labor
  - Cost delta per lamp is $140 - $25 = $125 (material only)
  - Energy Savings: 400W HID vs 100W LED = 300W savings
  - Energy Saved: 300W x 2,000 bulbs x 24 hrs/day x 365 days/year
  - = 5,256,000 kWh/yr or 5,256 MWh/year
  - @ $0.05/kWh = $262,500 energy savings per year
  - 2,000 lamps x $125 ea = $250,000 material only delta
  - Payback is less than (1) year on energy savings alone

Benefits:

- Over a five year period the client spends the same amount on lighting materials, yet spends less on power, waste hauling, equipment rental, insurance
- Client has instant Public Relations story for their annual Sustainability Report
- Reduces employee risks and drives client value

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Example: Operational Savings

Benefits:

- Mitigates life safety with reductions in high height locations:
  - Man-lift procedures (power plants, refineries, manufacturing, pharma or processing, etc.)
  - Distillation columns (power plants/refineries, chemical plants, etc)
  - Potential to reduce safety recordable, incidents, etc.
- Improves security camera images
- Improves employee security to parking lots and employee fatigue
- Provides carbon reduction solution to client corporate goals
  - 5x less landfill – EPA carbon credits
  - 4x Energy Savings – Organic carbon reductions
- Reduces operating expense for energy (100W LED vs 400 W HID)
- Helps clients with small capital projects
  - GRI completed every 5 yrs as Small Cap
- Delivers being a valued partner, not a vendor
- FTE's scheduled for lamp/bulb replacements can be utilized for critical facility scheduled maintenance vs lighting replacements
- Reduces budget risks on annual lamping costs (spares)

https://energyfactor.exxonmobil.com/news/faq-leds-worth/

https://corporate.exxonmobil.com/energy-and-environment/tools-and-processes/energy-efficiency

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Closing Thoughts

- Each Big Data Platform is unique… but the SAME
  - Training required / updates occur / behavior change
  - Level of bridging / implementation / integration
- Need to gather key data
  - Establish baselines (e.g. Best Practices)
  - Granular as possible
- Develop strategies to optimize and integrate IoT/Big Data
  - Standardize the strategy game plan
  - Start with the little things with big savings
- Monitor and report results across the enterprise
  - Use operational savings as your competitive edge
  - Reporting/tracking savings is key for growth
- Behavior Change drives success when easy items are:
  - Implemented with team buy in
  - Integrated through getting feedback from the actual user
  - Mitigated when everyone knows the objective

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Closing Thoughts

Integrating Big Data is a sustainable practice implemented in operations that mitigates the risks

Thank you!

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