ASSET MANAGEMENT COUNCIL

Asset Leadership Network

The Asset Management Council and the Asset Leadership Network

are pleased to present

Asset Management System Implementation Experiences

An International Web Program Series of Asset Management Success Stories

Program Featuring

Ing. Jorge Mores
Norm & Standards Manager
AES South America

PRESENTATION CONTENT

AES AS A COMPANY

AMS IMPLEMENTATION TIMELINE

EXTERNAL REQUIREMENTS

HOW TO THINK THE AMS PATH

BENEFITS AND SUCCES CASSES

CONCLUSIONS AND Q&A

4 MARKET-ORIENTED STRATEGIC BUSINESS UNITS

4 CONTINENTS

14 COUNTRIES

MISSION

Improving lives by accelerating a safer and greener energy future.

VALUES

- Put Safety First
- Act with Integrity
- Move with Agility
- Have Fun through Work
- Strive for Excellence

South America Strategic Business Unit

4 COUNTRIES

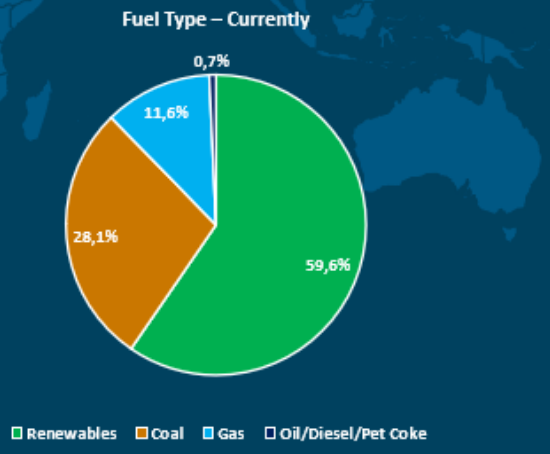
Colombia 1.1 GW

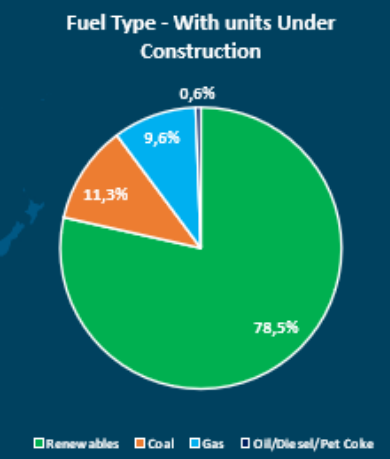
Chile 6.9 GW

Brazil 5.1 GW

Argentina 4.4 GW

2 Utility Companies





AES in Argentina

: Capital City

Norte Complex 755 MW, 1.500 Km of

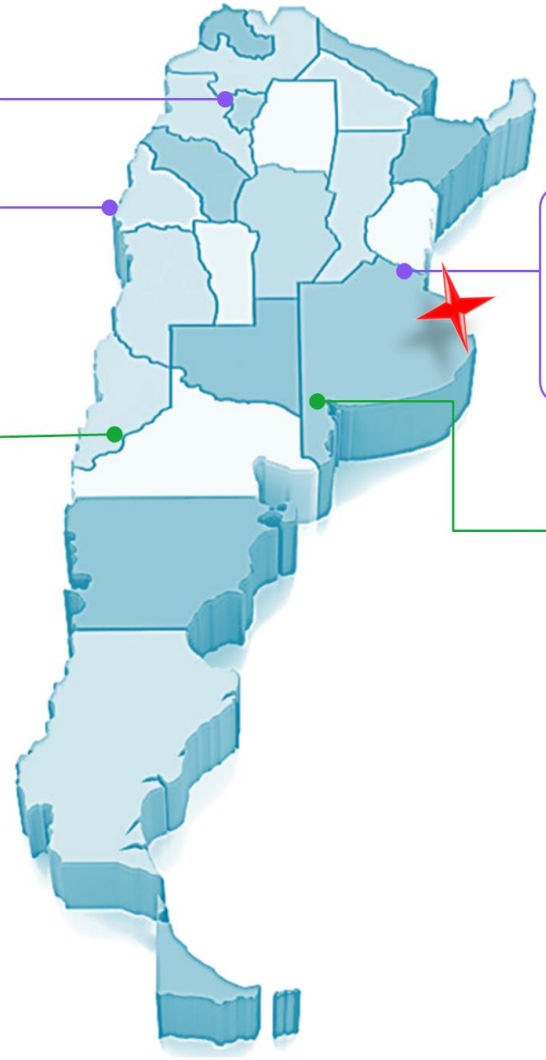
- CT Termoandes: 643 MW
- Cabra Corral: 102 MW
- El Tunal: 11 MW
- Inter Andes Transmition Line

Oeste Complex 1317 MW, 1.100 Km of

- Alicura: 1050 MW
- Ullum: 45 MW
- Sarmiento: 33 MW

Oeste Complex Renewable 100 MW, 1.100 Km of

- Vientos Neuquinos, 29U: 100 MW



Centro Complex 2096 MW, 200 Km of

- San Nicolas: 675 MW
- AES Parana: 845 MW
- Guillermo Brown: 576 MW

Centro Complex Renewable 100 MW, 200 Km of

- Vientos Bonaerenses, 30U: 100 MW

Installed Capacity: 4179 MW

AES in Brazil

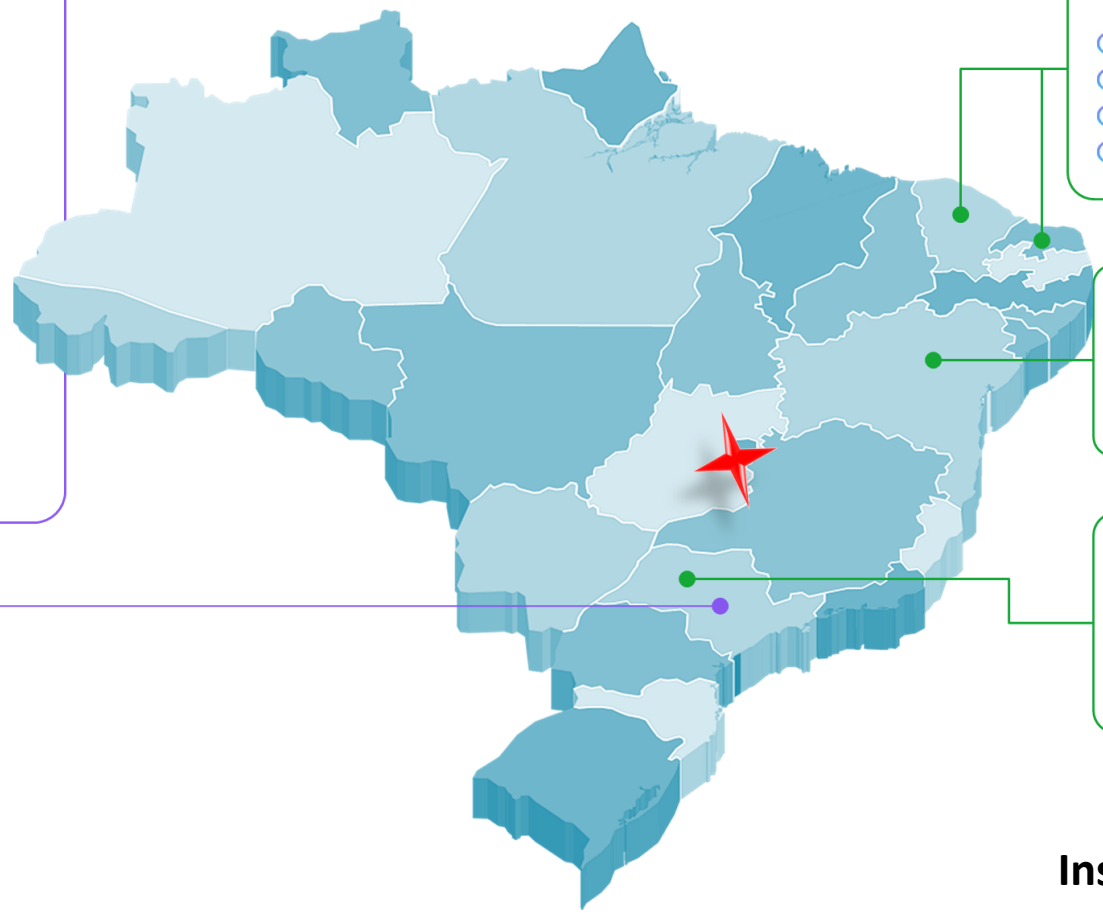
(F) : Future Project

: Capital City

Tiete Hidro Complex 2.659 MW, 500 Km of

Tiete Hidro plants:

- *Água Vermelha: 1396,2 MW*
- *Bariri: 143,1 MW*
- *Barra Bonita: 140,8 MW*
- *Caconde: 80,4 MW*
- *Euclides da Cunha: 108,8 MW*
- *Ibitinga: 131,5 MW*
- *Limoeiro: 32,2 MW*
- *Mogi-Guaçu: 7,2 MW*
- *Promissão: 264 MW*
- *Nova Avanhandava: 347,4 MW*
- *São Joaquim: 3 MW*
- *São José: 4,6 MW*



Renewable Northeast Brasil 1.446 MW, 1.500 Km of

- Cajuina, 55U: 1100 MW (F)
- Ventus: 187,4 MW
- MS/RN-CE: 94,5 MW
- Santos: 64 MW

Renewable Northeast Brasil 708,5 MW, 500 Km of

- Alto Sertao II: 386,1 MW
- Tucano: 322,4 MW (F)

Renewable East Brasil 295 MW, 500 Km of

- Guaimbe: 150 MW
- AGV Solar: 76 MW
- Boa Hora: 69 MW

Installed Capacity: 5108 MW

AES in Chile

(F) : Future Project

: Santiago de Chile (airport)

Norte Complex 1406 MW, 1.400 Km from Santiago (6 flight hours + 3 driving)

- Norgener 2U: 277 MW
- Angamos 2U: 558 MW
- Cochrane 2U: 550 MW

Norte Complex Renewable 773,8 MW, 1.400 Km from Santiago (6 flight hours + 3 driving)

- Andes Solar: 470,8 MW
- Likanantai Solar: 250 MW (F)
- BESS: 53 MW

Centro Complex 1984 MW, 250 Km from Santiago (3 hours driving)

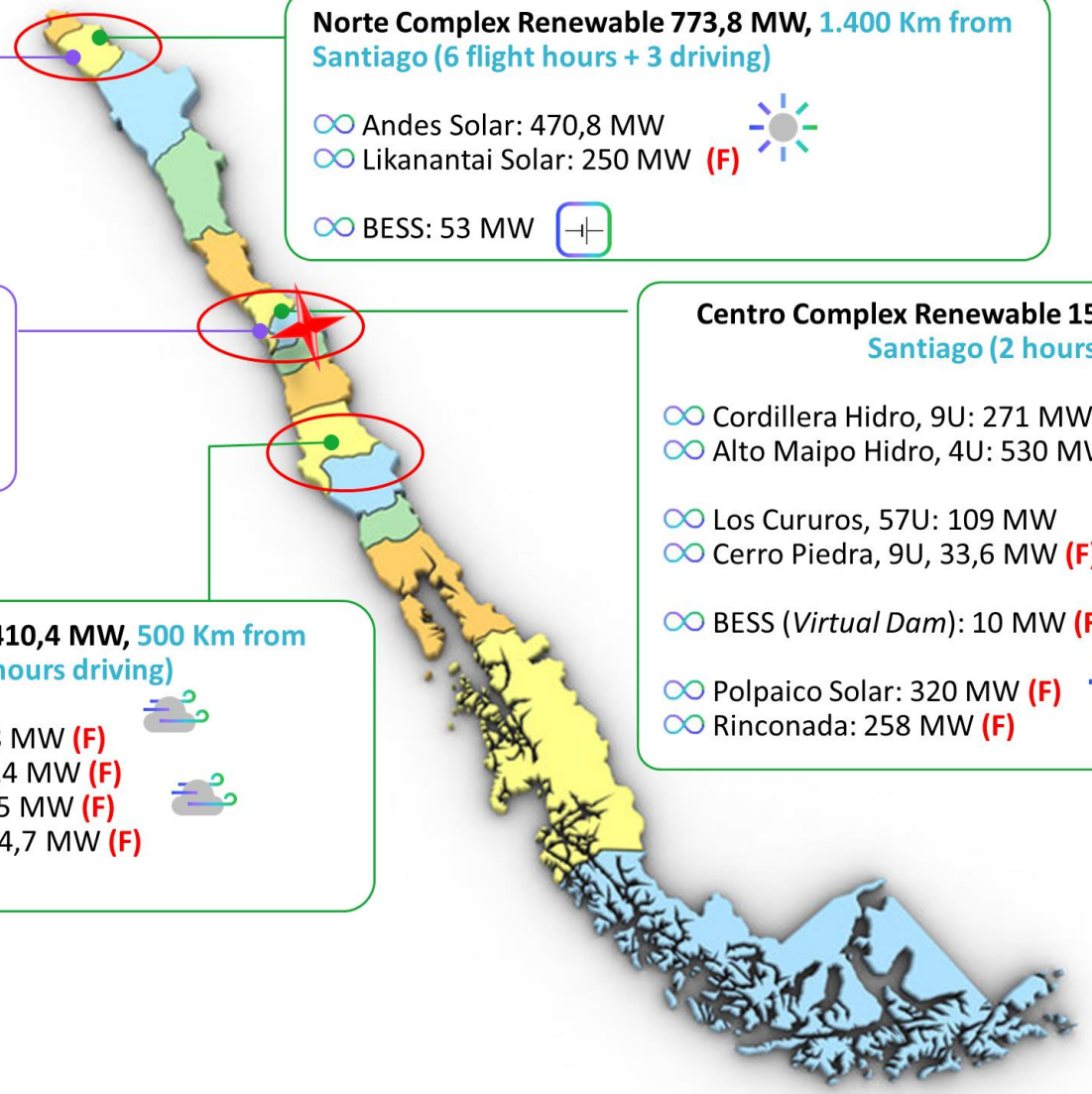
- Ventanas 4U: 884 MW
- Laja 1U: 12,6 MW

Centro Complex Renewable 1540 MW, 100 Km from Santiago (2 hours driving)

- Cordillera Hidro, 9U: 271 MW
- Alto Maipo Hidro, 4U: 530 MW (F)
- Los Cururos, 57U: 109 MW
- Cerro Piedra, 9U, 33,6 MW (F)
- BESS (*Virtual Dam*): 10 MW (F)
- Polpaico Solar: 320 MW (F)
- Rinconada: 258 MW (F)

8° Region Renewable 410,4 MW, 500 Km from Santiago (7 hours driving)

- Los Olmos, 43U: 110,8 MW (F)
- Mesamavida, 13U: 67,4 MW (F)
- San Matias, 25U: 107,5 MW (F)
- Campo Lindo, 44U: 124,7 MW (F)



Installed Capacity: 5771 MW

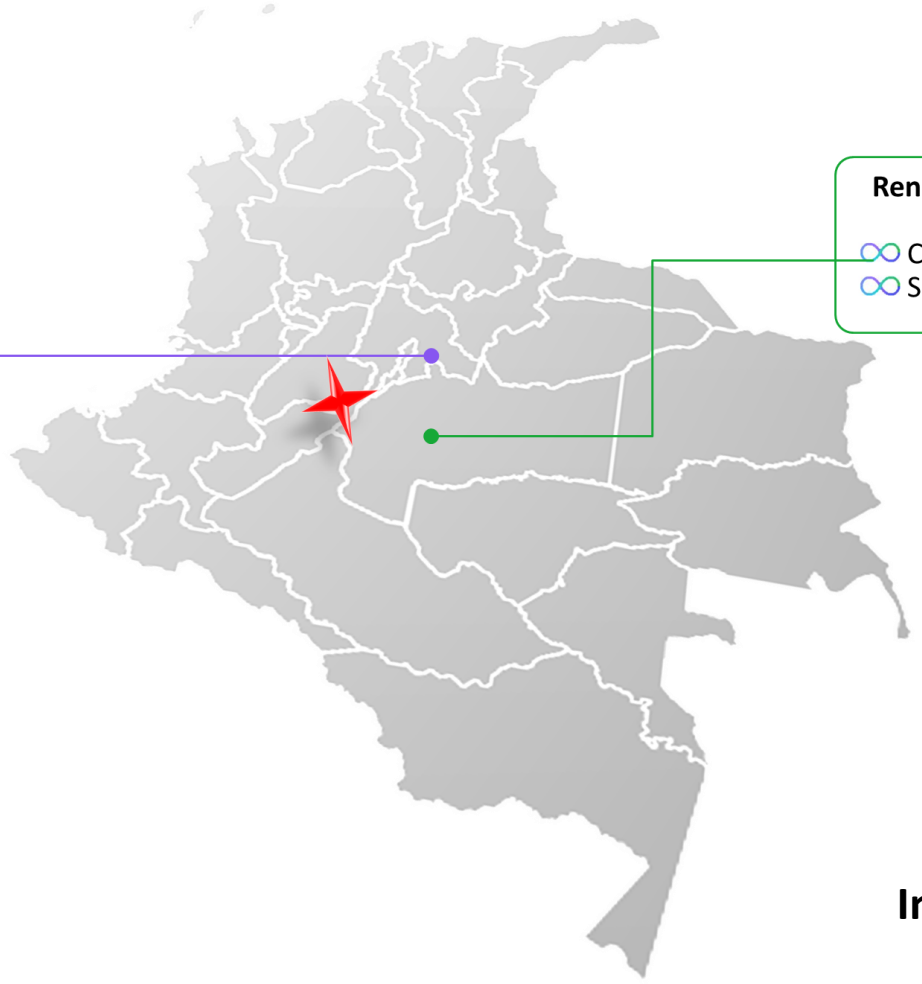
AES in Colombia

(F) : Future Project

: Capital City

Chivor Hidro Complex 1019 MW, 120 Km of

- Chivor, 8U: 1.000 MW
- Tunjita, 2U: 19,8 MW



Renewable Solar (Castilla la Nueva) 80 MW, 120 Km of

- Castilla: 21 MW
- San Fernando: 59 MW (F)

Installed Capacity: 1100 MW

Asset Management Implementation
ISO 55001

AES SA AMS IMPLEMENTATION TIMELINE

2009 — AES Corp AM Framework (Internal Certification)

2011 — Maturity criteria template

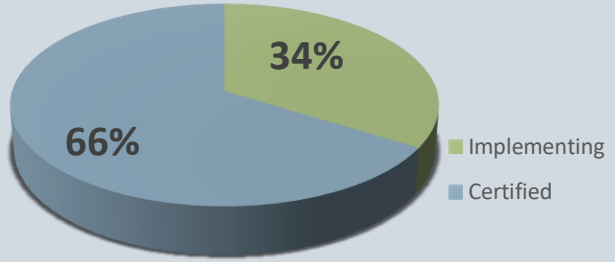
2012 — AES Tietê 1st Latin-American Company with PAS55 certification

2013 — AES Corp 15 AM Standards

2015 — AES Tietê ISO 55001:2014 Certification

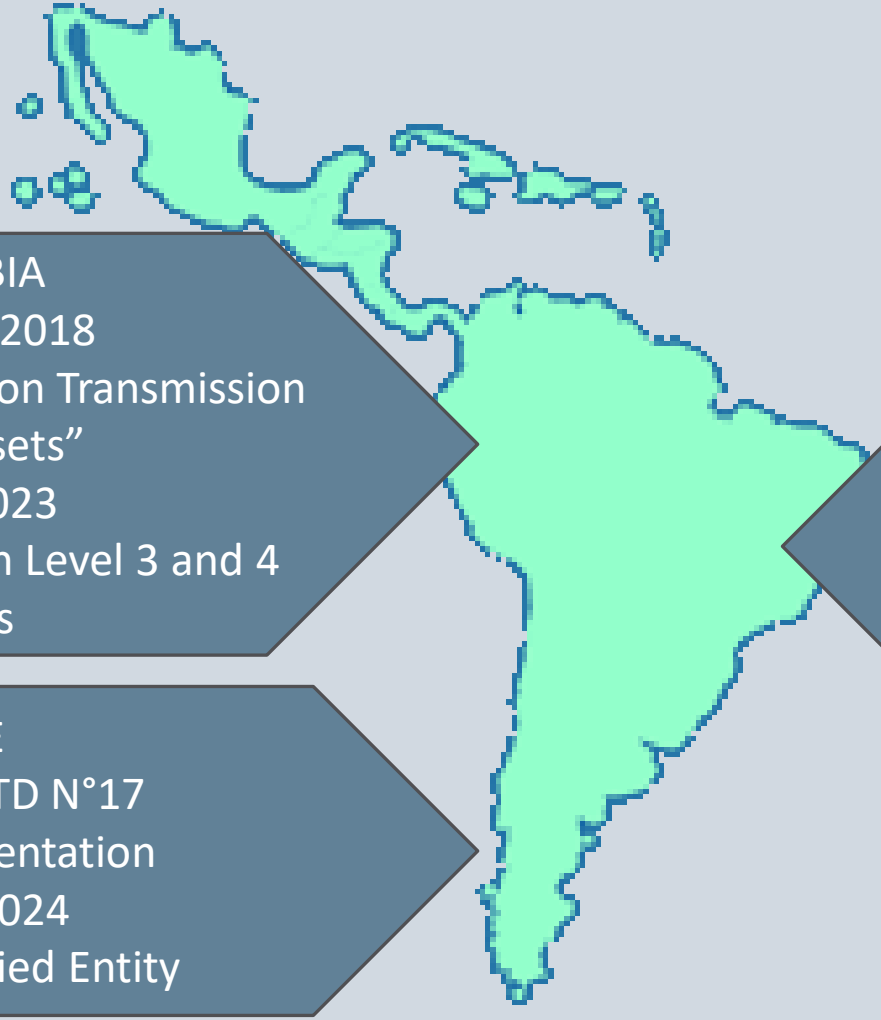
2019 — Integration AES SBU South American

2024 — AES SBU SA Completion ISO 55001:2014 Certification



Asset Leadership Network

EXTERNAL AMS IMPLEMENTATION REQUIREMENTS



COLOMBIA
"CREG 015 2018
AMS Implementation on Transmission System Assets"
2018 – 2023
Additional Income on Level 3 and 4 systems

CHILE
DS 109 – RPTD N°17
AMS Implementation
2020 – 2024
External Certified Entity

BRASIL
"REN 409/2010"
Assured Remuneration reduction Mechanism

Asset Leadership Network

HOW TO THINK THE MAS?

Asset Leadership Network

HOW TO THINK THE AMS?

Top Down

- Strategy Definition as a Business or external requirements
- Objective and priorities
- Assessments - Plan and Performance monitoring
- Stakeholders and supplier risk management
- Transversal areas integration

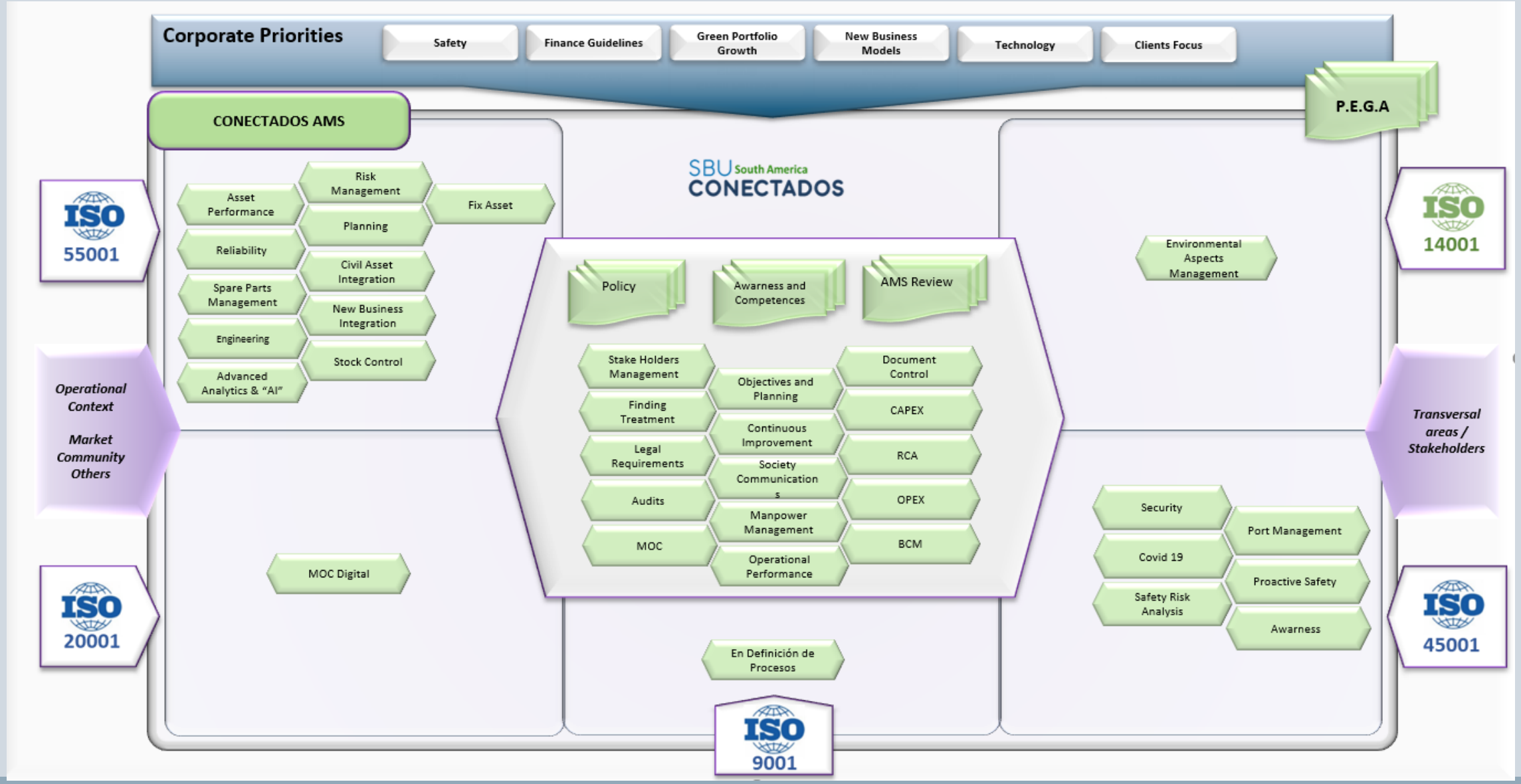
Continuous Improvement vs Project scope

- Maturity levels consideration -
- Leveraging portfolio experiences
- Risk vs Cost perspective
- Asset criticality and risk mapping

Key elements

- Financial and Technical worlds connection (life cost cycle)
- Processes standardization vs Digital tools
- Organization structure improvement
- Centralized Reliability and Performance Monitoring
- CapEx a& OpEx portfolio improvement

AMSs Integrations



P&AM SILOS

PMAC

Performance

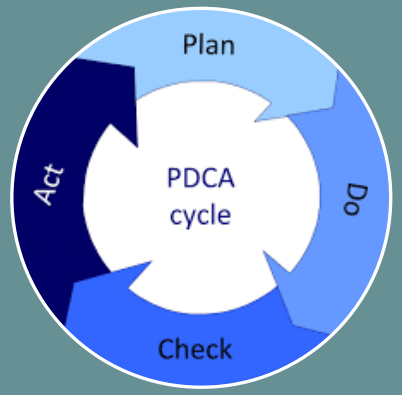
Reliability

AI/ML

WORK MANAGEMENT

Short time Planning

Outage Planning



CONTINUOUS IMPROVEMENTS

APEX

Innovation

ENGINEERING

AES Experts

BD Support

NORM&STDs

Operational Performance

ISO55001

BENEFITS CLASIFICATION

SOFT

- Finance Planning Efficiency
- O&M processes Integration
- Regional experience leveraging
- Risk Management
- Information Base Decisions
- Safety Improvements

HARD

- Asset Operational Optimization (EFOR – EAF)
- Maintenance Strategy Optimization
- Cost Reductions

BENEFITS AND SUCCES CASSES – 2021 SBU Performance

Performance Process

Asset Health Deviation → Perliminar Analysis → Recomentations / AESExpert

EtaPRO® PERFORMANCE & CONDITION MONITORING

3,75 MM USD

Reliability Process

Bad Actors Prioritization → RCA & Risk Analysis → Strategies Improvement

ASSET PERFORMANCE MANAGEMENT

2,28 MM USD

Advanced Analytics & Artificial Intelligence Process

Opportunities & issues (Decisions) → Business Cases → Decisions Improvements

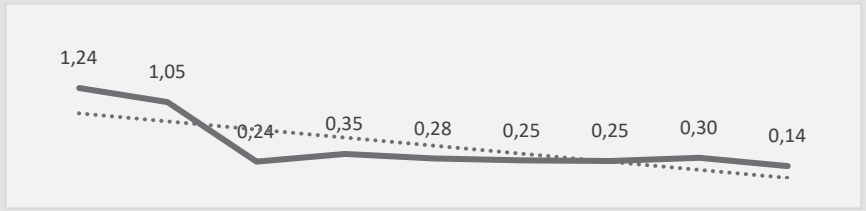
sas

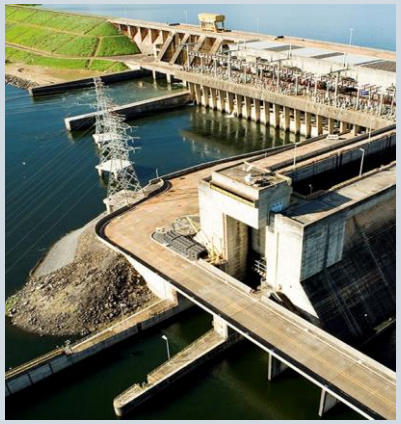
0,7 MM USD

Asset Leadership Network

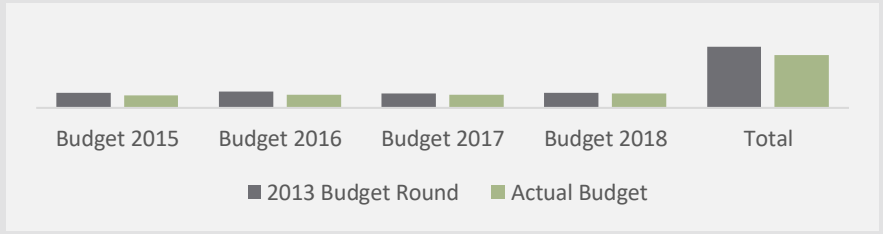
BENEFITS AND SUCCES CASSES - Brazil

EFOF Reduction on Hydro Plants
89% Since 2009 to 2019

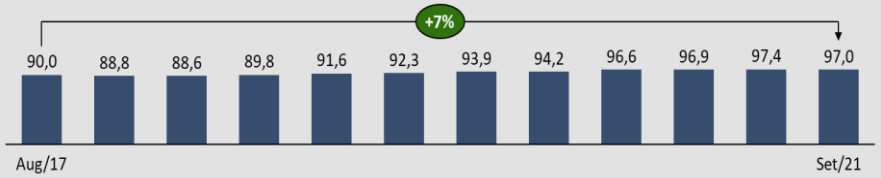




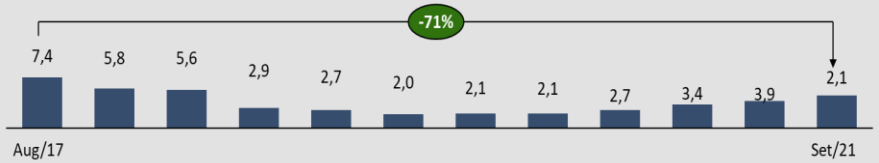
13% OpEx reduction on Hydro Plants
since 2015 to 2018



Incremental Availability Factor
7% Since 2017 to 2021



Forced Outage Factor Redaction
71% Since 2017 to 2021



Asset Leadership Network

CONCLUSIONS

- Top-Down guidelines
- AMS apply to all business levels and areas
- Assessment considering the maturity levels are critical to define the system implementation plan
- Action plan and performance monitoring metrics (Short and long plans)
- Certification is a great milestone but not the last one. Just the start line
- Tools and processes should be integrated

THANK YOU VERY MUCH!

Q&A Time!

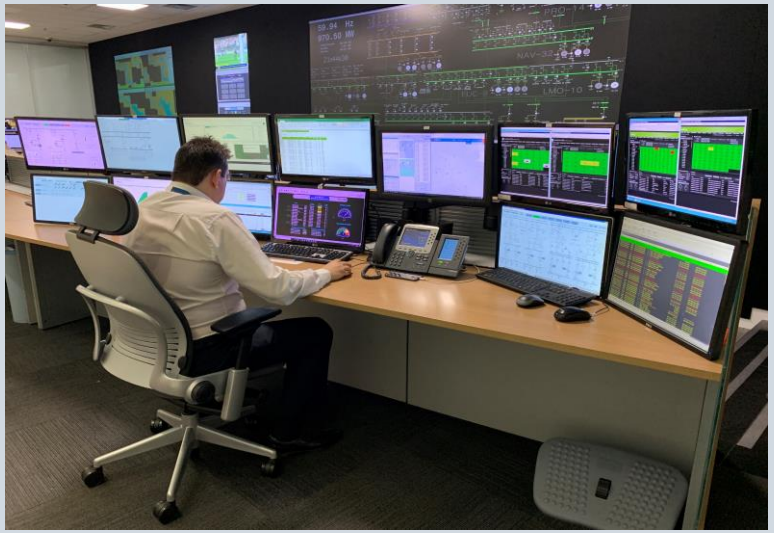
Ing. Jorge Mores
Norm & Standards Manager
AES South America

Jorge.mores@aes.com

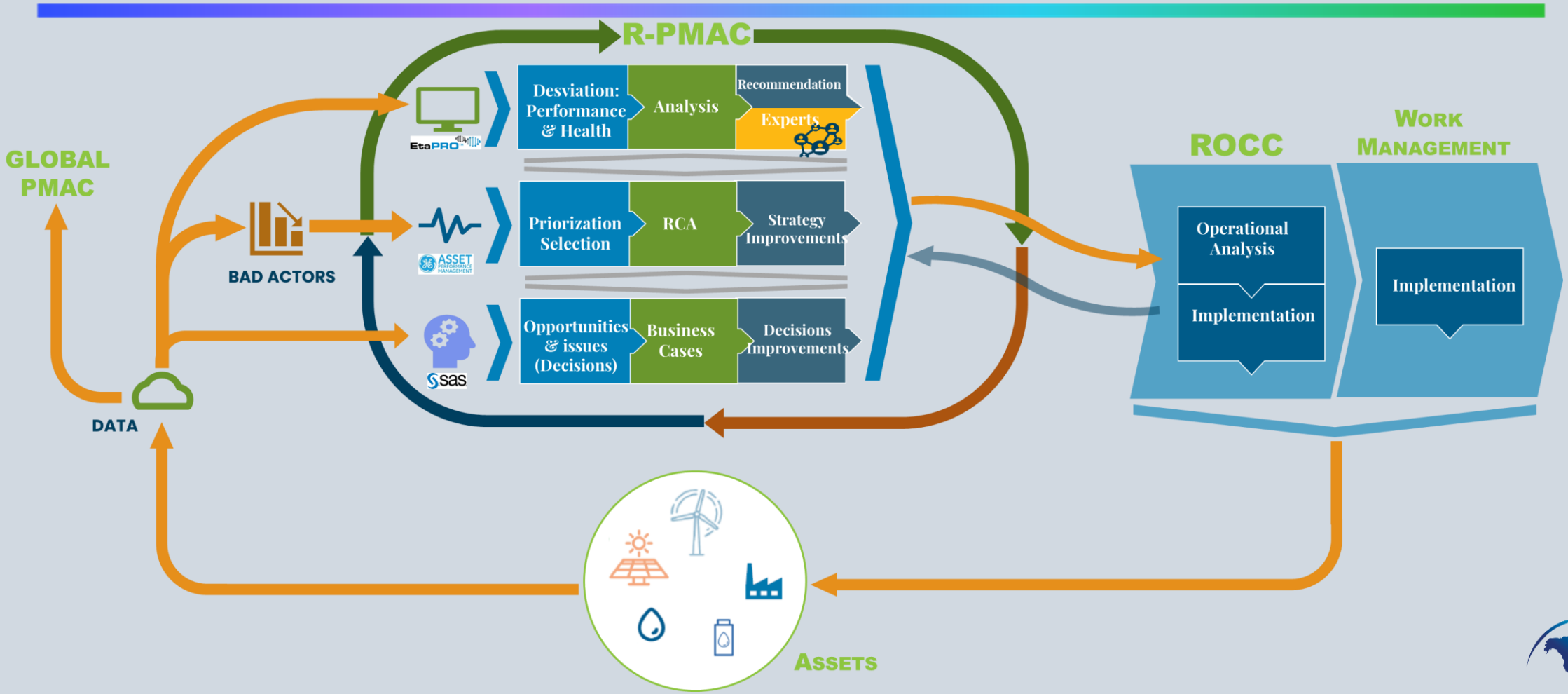
Asset Leadership Network

ANNEXES

CHILE & BRAZIL ROCC



PMAC PROCESSES

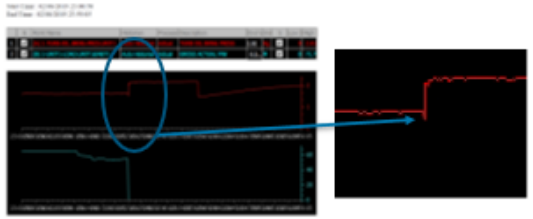


Asset Leadership Network

Reliability

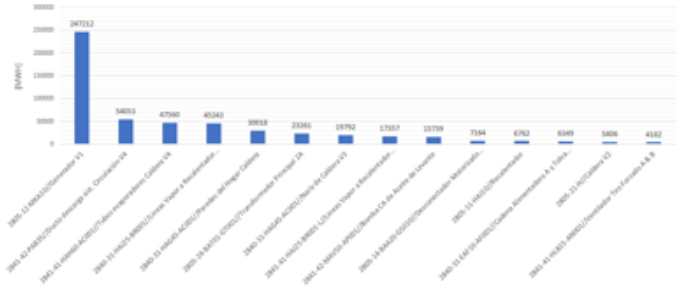
CASE: Generator V1 – Lubrication System

RCA



Failure Mode: flange reléase (inside front standar)
Cause: deficient assembly process

MONITORING – BAD ACTORS



Bad Actor: Impacto EFOF Fire Generator bearings (Oil Seal) 247 GWh / 2019

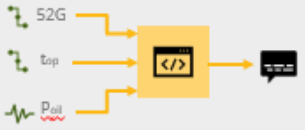
Strategies Improvement

MPC

- Failure Mode Without Monitoring
- Outage (5 years)

MBC

- Policy: Failure mode



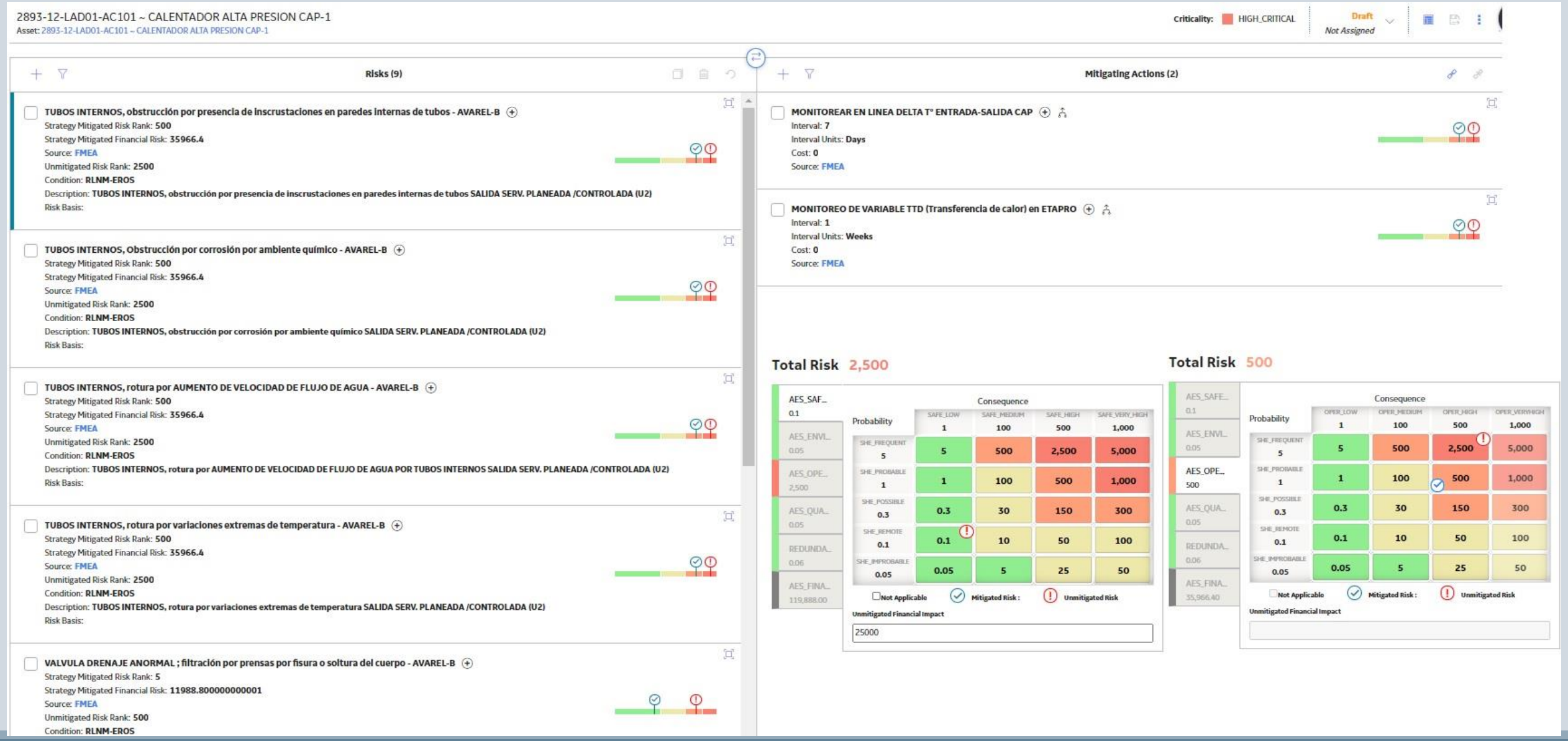
Benefits

6,8 MM USD/año @2%

Assumptios:
(*) Linear probability 2% per year (1/50 years) over 6.8 MMUSD).

High Replicability in Other Units

CRITICALLITY AND RISK ANALYSIS



CRITICALLITY ANALYSIS EXAMPLE RESULT