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# CONTINGENCY PLAN FOR TRANSMISSION CONTROL CENTERS USING MULTISITE ARCHITECTURE

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# CONTINGENCY PLAN FOR TRANSMISSION CONTROL CENTERS USING MULTISITE ARCHITECTURE



*Ing. Esp. Rodrigo Jaramillo Vélez*

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- ISA and Intercolombia's General Information
- Colombian Power System
- Power Network Operation in Colombia
- Multisite Architecture
- Contingency Plans definition for ITCO and TCA
- Operative Procedures for Contingency Attendance
- Conclusions



# ISA AND INTERCOLOMBIA

INTERCOLOMBIA

**Presence in 8 countries**   **5 Business units**   **30 companies**   **3,419 employees**

**CENTRAL AMERICA**  
 ■ ISA, shareholder of EPR (11.11%)  
 ■ Interconexión Eléctrica Colombia Panamá -ICP- ISA's share 50%  
 ■ ISA, shareholder of EDCA (11.11%)

**COLOMBIA**  
 ■ ISA  
 ■ Autopistas de la Montaña  
 ■ TRANSELCA  
 ■ AM  
 ■ CERVEJEX 49.95% investment through IM and 50.05% through INTEREXA Col  
 ■ SISTEMAS INTELIGENTES EN RED  
 ■ INTEREXA

**EQUADOR**  
 ■ TRANSEXIA  
 50% investment through INTEREXA

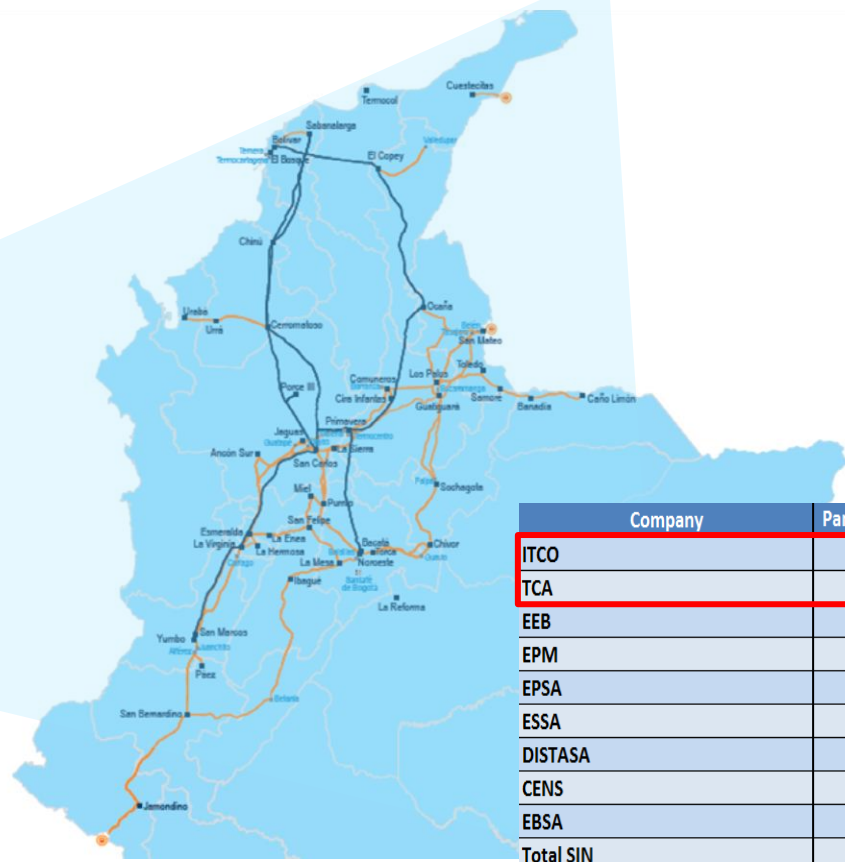
**PERU**  
 ■ REP  
 ■ TransMontano  
 ■ ISA Perú  
 ■ INTEREXA  
 ■ Proyectos de Infraestructura del Perú - PDI-

**BOLIVIA**  
 ■ ISA Bolivia

**CHILE**  
 ■ INTEREXA  
 ■ ISA Inversiones Chile  
 ■ INTERVAL Chile  
 ■ Ruta del Maipo  
 ■ Ruta del Maipo  
 ■ Ruta del Bosque  
 ■ Ruta de la Araucanía  
 ■ Ruta de los Ríos



ISA in Latin America  
 business units and companies



Company	Participation
ITCO	70.994%
TCA	9.809%
EEB	8.015%
EPM	6.492%
EPSA	2.658%
ESSA	1.319%
DISTASA	0.361%
CENS	0.185%
EBSA	0.168%
Total SIN	100%

**10,308 km High Voltage Transmission Lines**

**71 High Voltage Substations**

**We are in 356 municipalities**

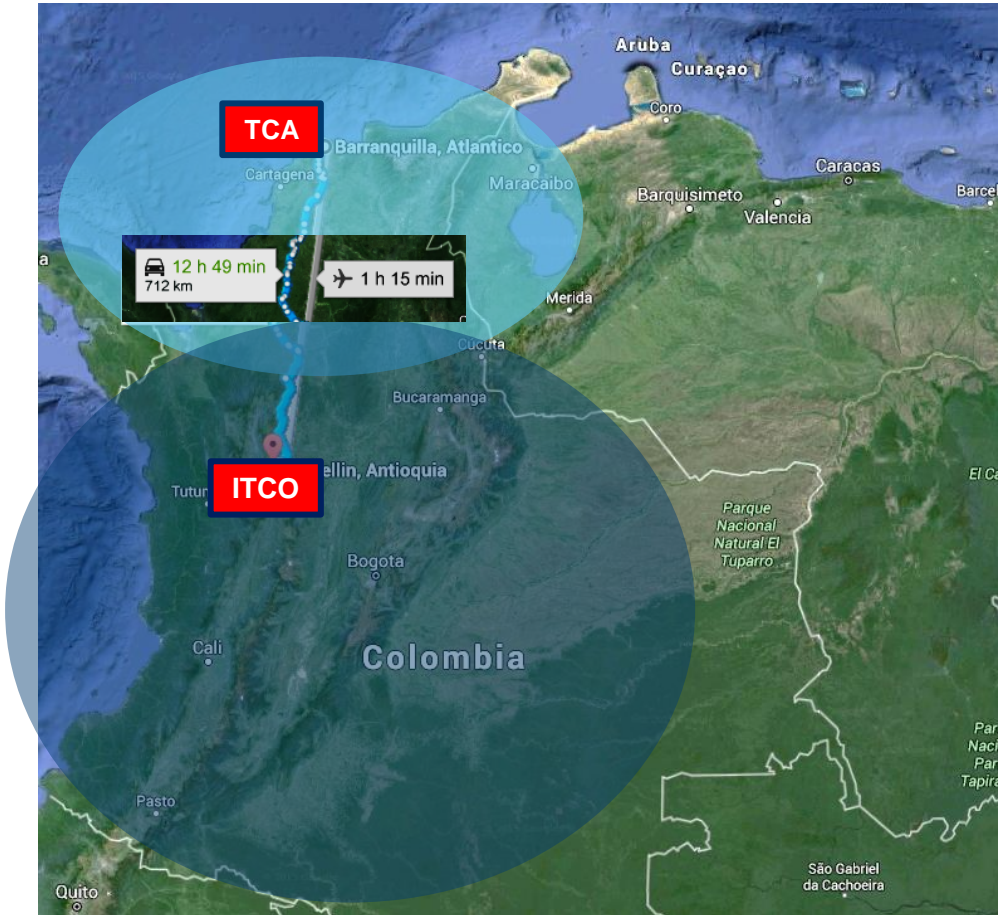
**We have 531 highly skilled employees**



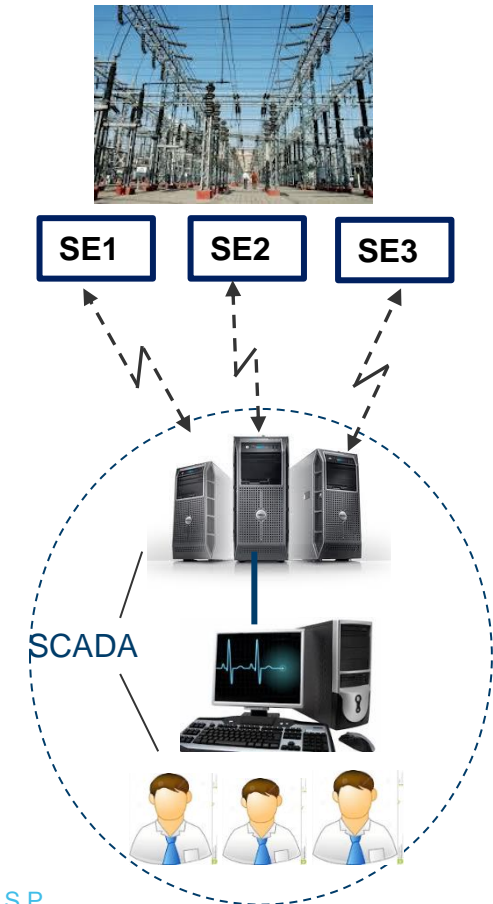
# TRANSMISSION SYSTEM OPERATION - ITCO & TCA

INTERCOLOMBIA

ITCO and TCA supervise and operate all their substation equipment remotely, using the SCADA MONARCH®.

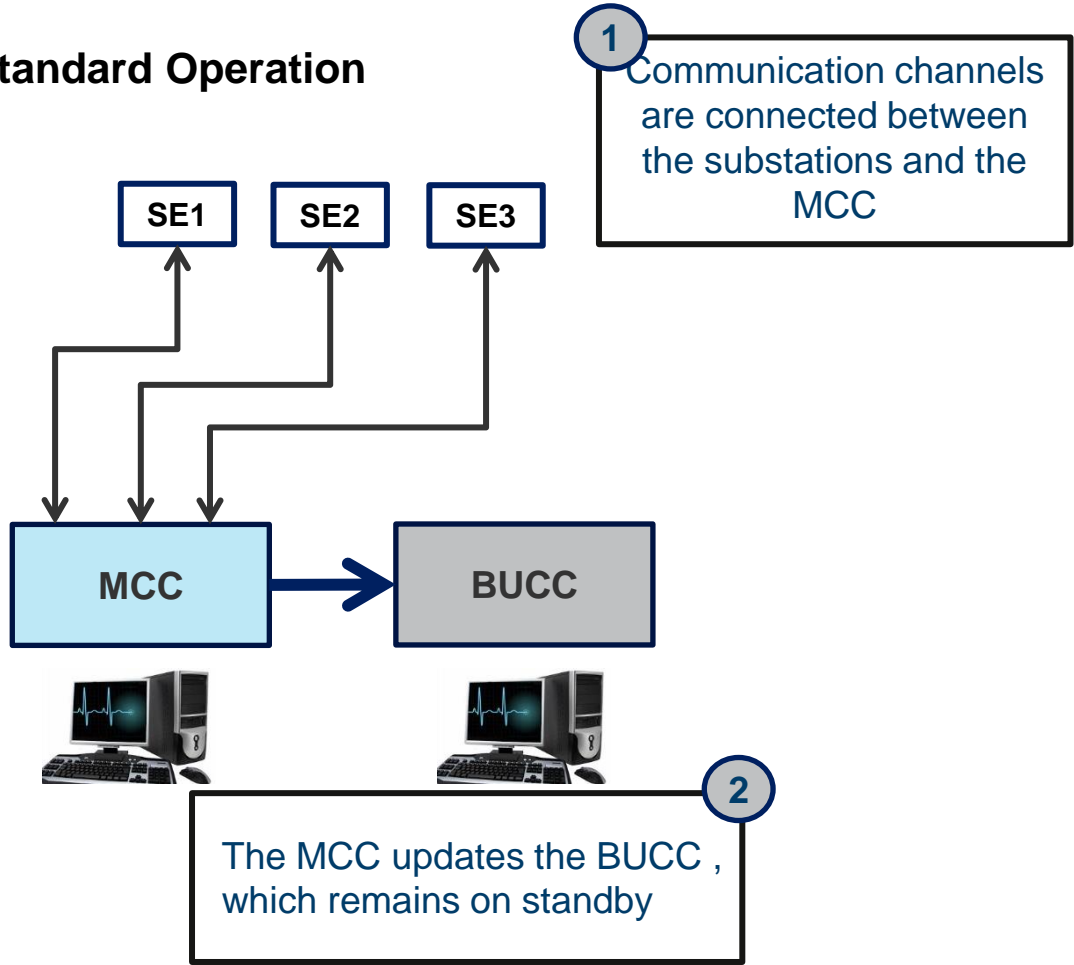


**ITCO:** INTERCOLOMBIA  
**TCA:** TRANSELCA



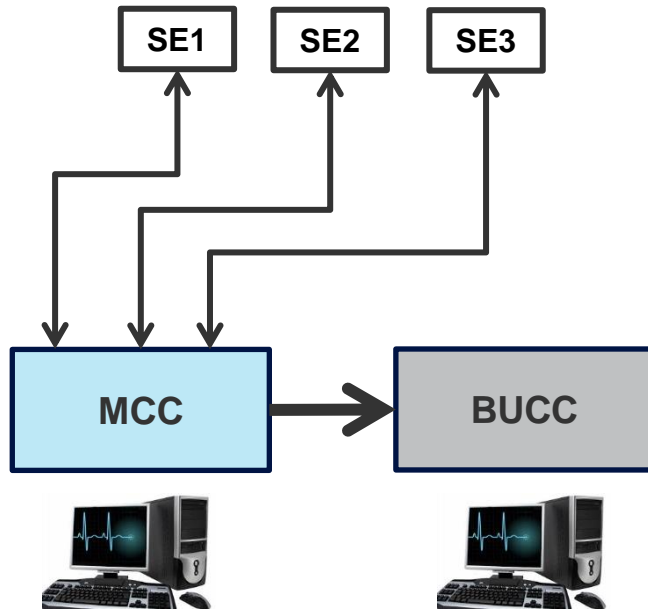


## Standard Operation

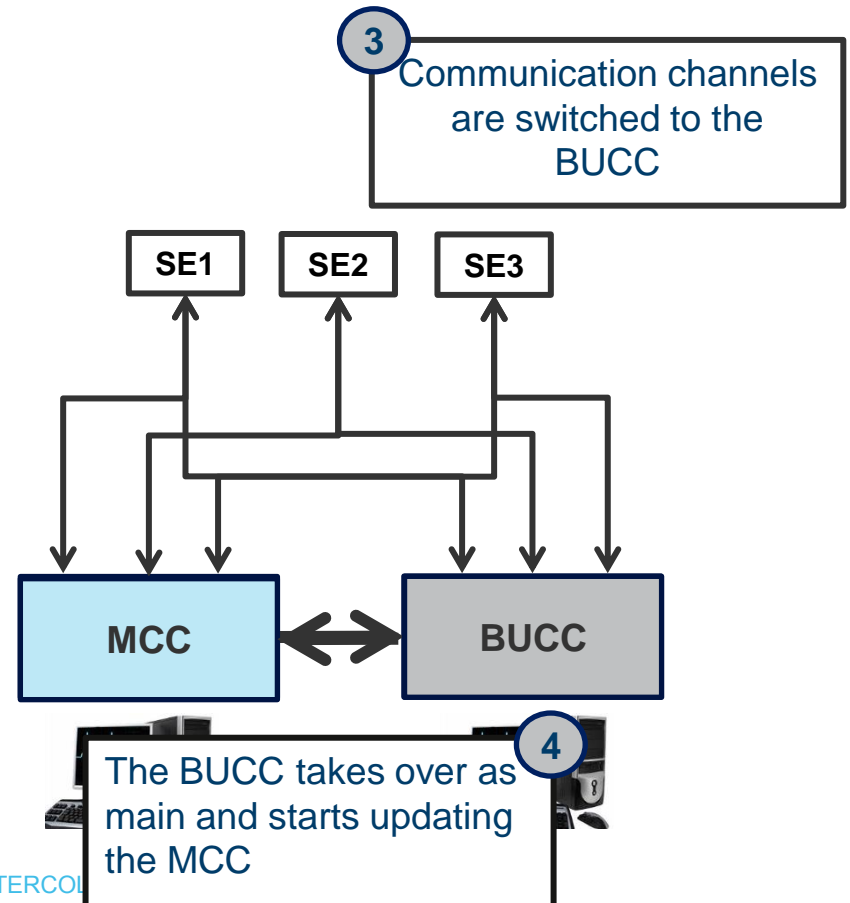


**MCC:** Main Control Center  
**BUCC:** Back Up Control Center

## Standard Operation



## Contingency Operation

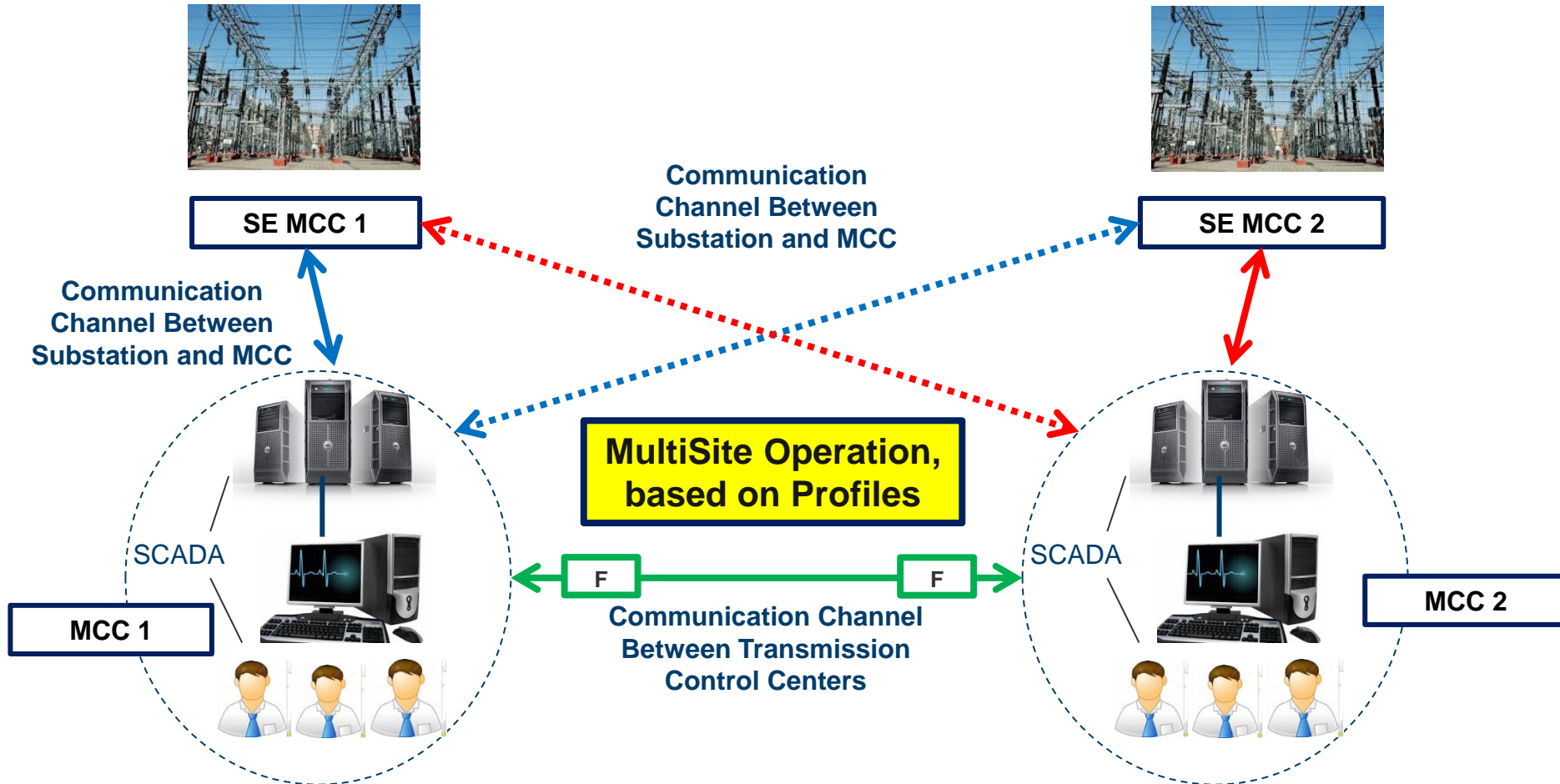


**MCC:** Main Control Center  
**BUC:** Back Up Control Center

# ISA. SCADA SYSTEM – MULTISITE ARCHITECTURE

INTERCOLOMBIA

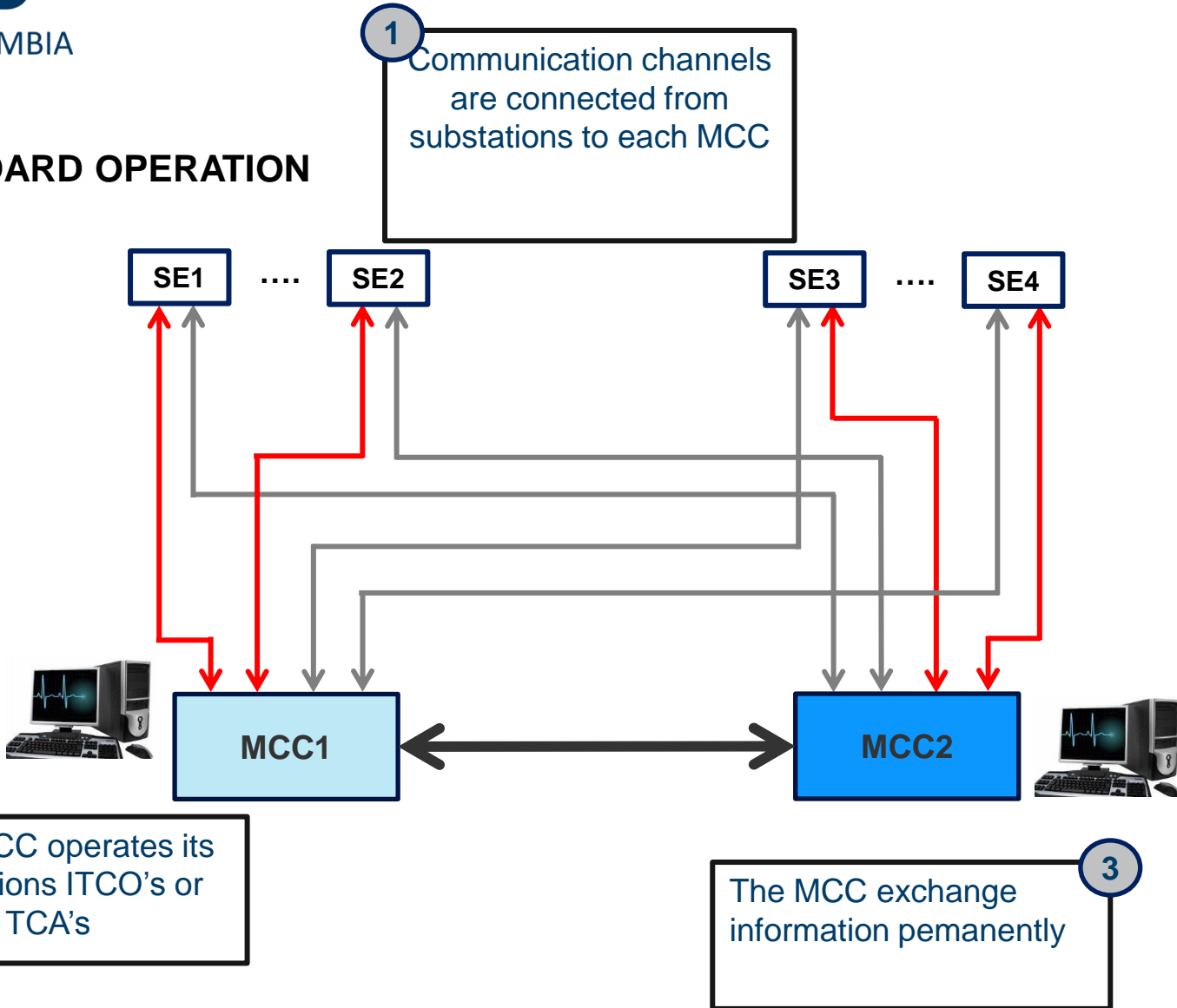
- The multisite architecture allows for the supervision and control of all ISA's substation from both transmission control centers (ITCO and TCA)



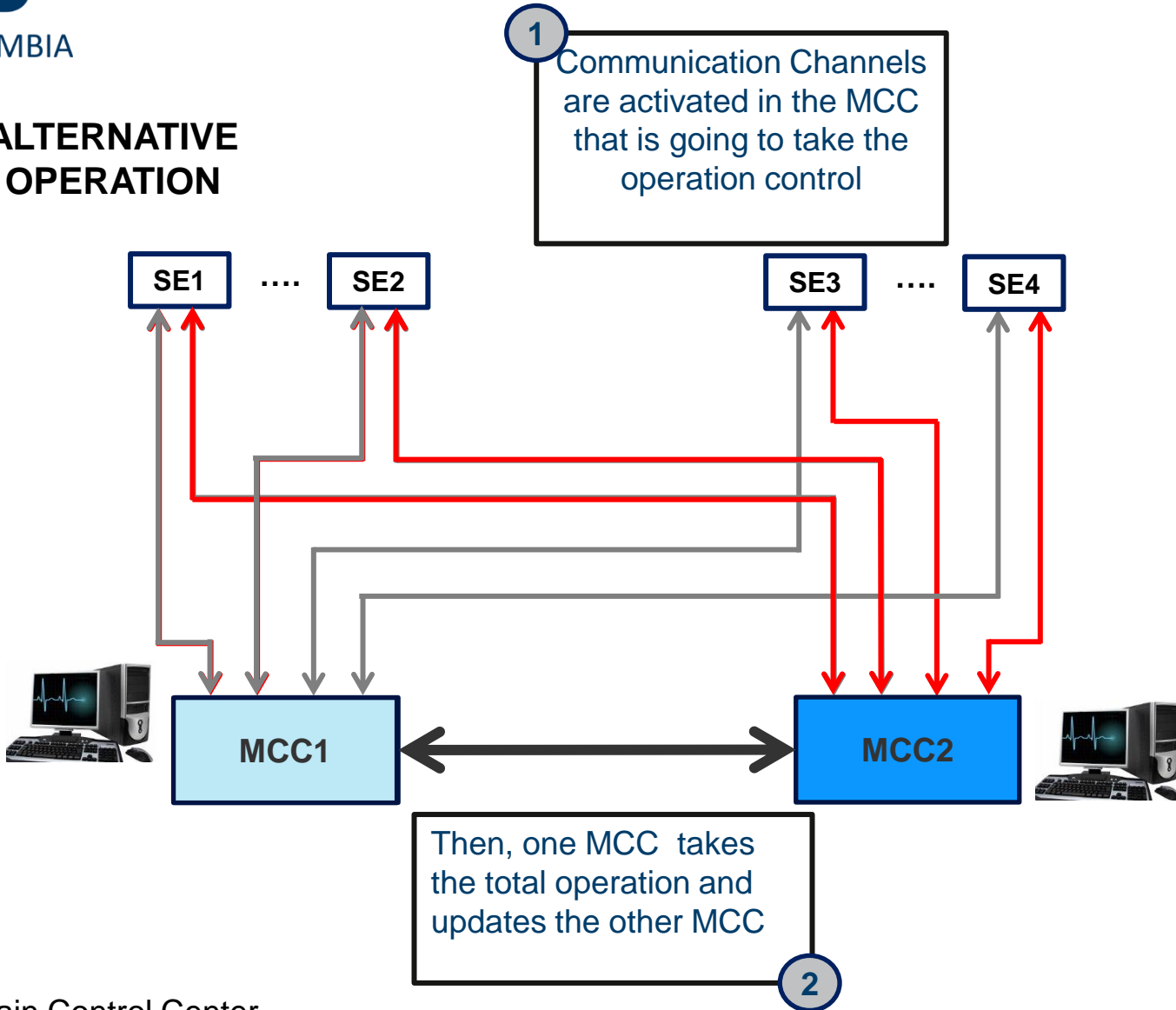
**F** : Firewall    **MCC**: Main Control Center    **SE**: Substations



## STANDARD OPERATION



## ALTERNATIVE OPERATION



**MCC:** Main Control Center



# REAL MULTISITE ARCHITECTURE ITCO & TCA



INTERCOLOMBIA

SUBSTATION

COMMUNICATIONS

DATACENTER

COMMUNICATIONS

RTU / SAS  
ITCO

RTU / SAS  
TCA

ITCO

TCA

ITCO

TCA

CND \*

MONARCH  
ITCO

MONARCH  
TCA

30MB

128 KB

SPLITTER

MULTISITE LINK

ICCP LINK

\* CND: INDEPENDENT SYSTEM OPERATOR IN COLOMBIA

- The objective of this plan is to establish the operational procedures when emergency situations arise and these situations expose the ITCO and TCA transmission control center operational reliability.





## CONTINGENCY CLASSIFICATION (1)

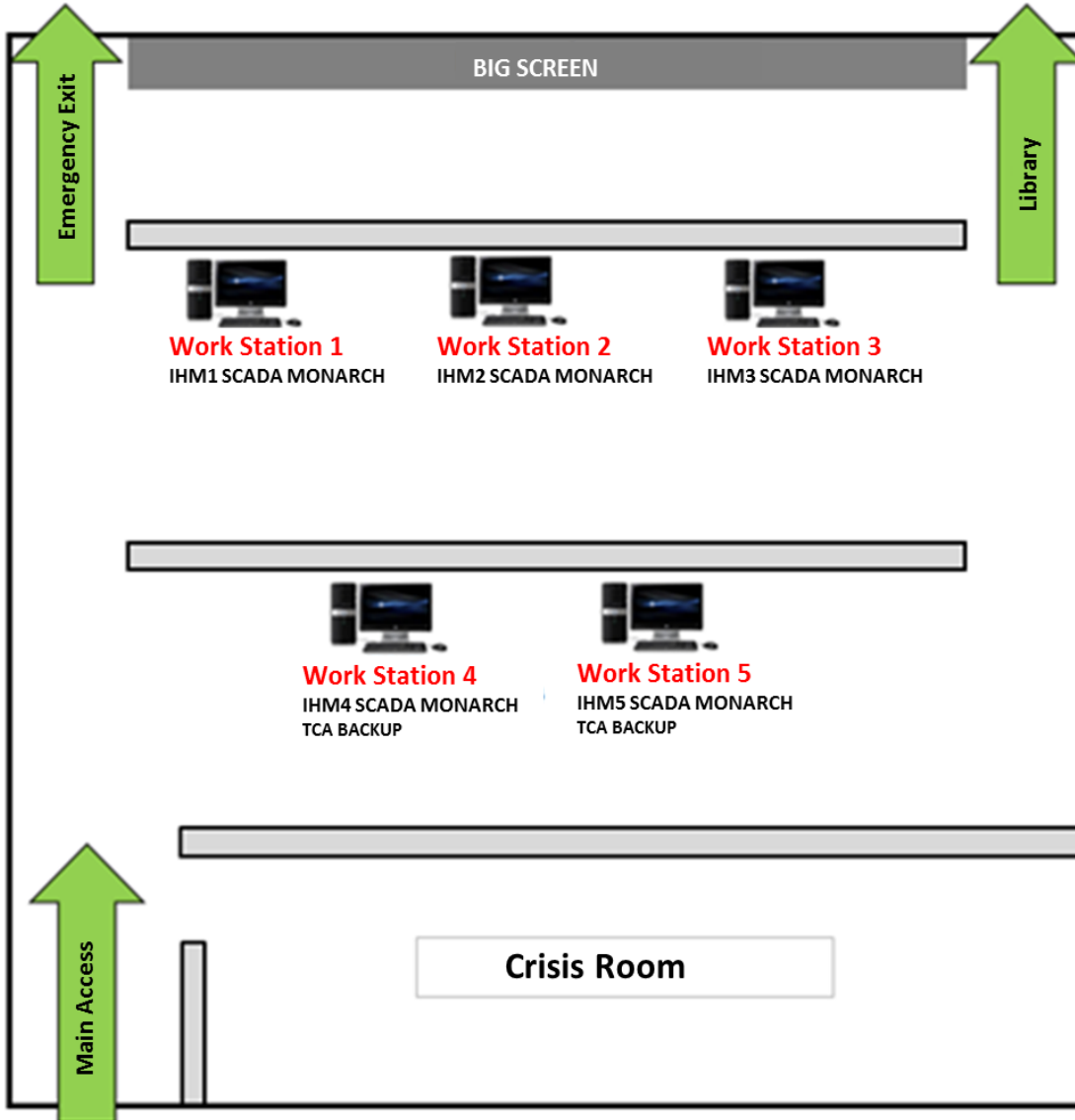
Contingencies that can affect the correct development of the CSM of ITCO:

- Total or partial loss of the supervision and control of substation equipment, associated with communication faults related to the RTU and SAS.
- Total or partial loss of the SCADA MONARCH system, associated with CSM software, hardware and auxiliary services.
- Total or partial loss of the voice communication system associated with telephones and operative extensions.



## CONTINGENCY CLASSIFICATION (2)

- Total or partial loss of the CSM, due to:
  - ✓ Threat or terrorist attack.
  - ✓ Fire or outbreak of fire.
  - ✓ Natural phenomena such as earthquakes, hurricanes, gales, heavy rain, flood, volcanic eruption or ash emissions, among others.
  
- Problem related accessing the CSM edification or transmission control center dispatchers, either partial or total inability, due to:
  - ✓ Protests, strikes and blockades of access roads.
  - ✓ Damage to access routes.
  - ✓ Health problems, family or personal.
  - ✓ Domestic calamity.
  - ✓ Work accidents either on site or off-site to the CSM

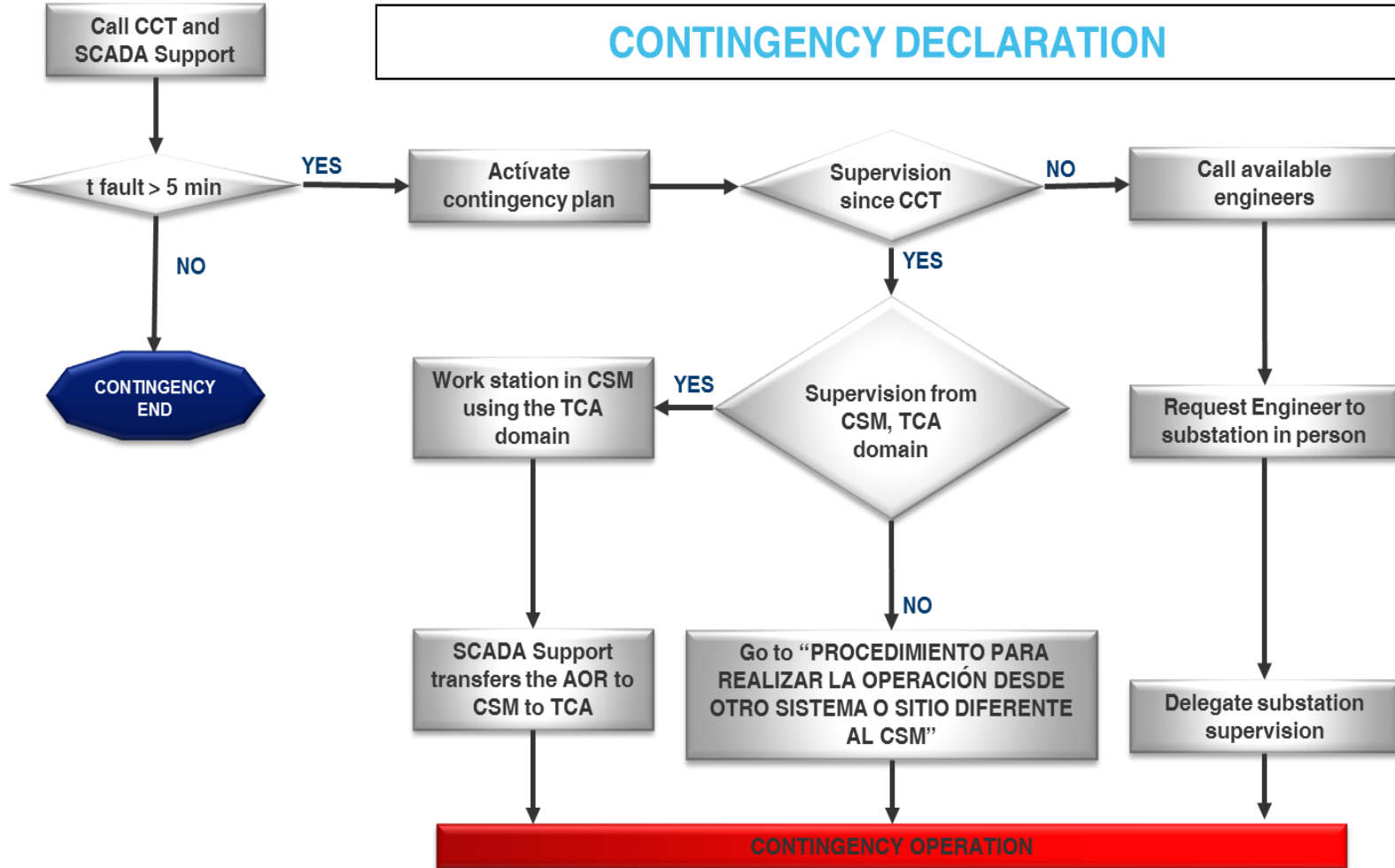


## ITCO's CSM \*

\* CSM: Center of Supervision and Operations



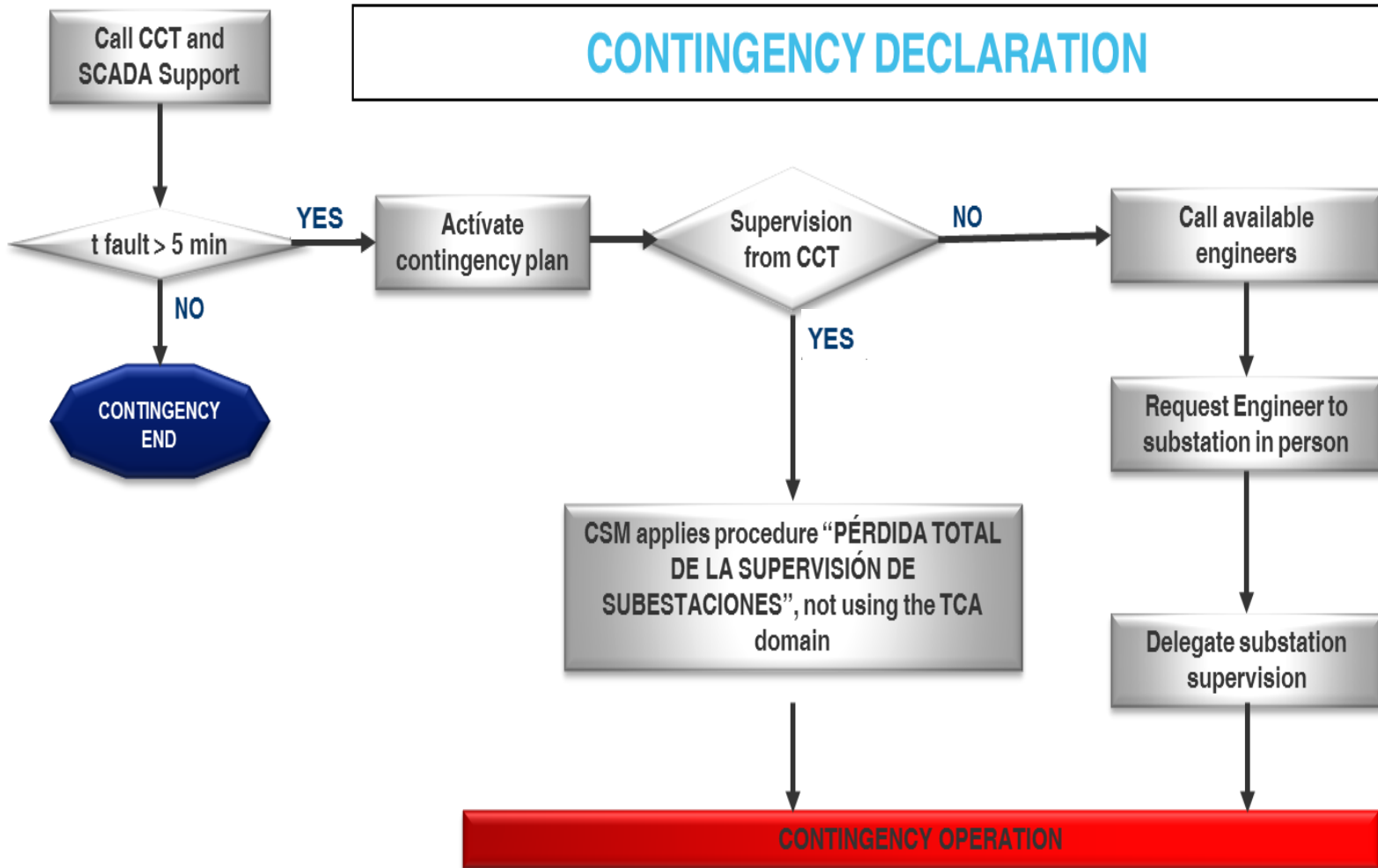
## EXAMPLE 1: TOTAL SUBSTATION SUPERVISION LOSS



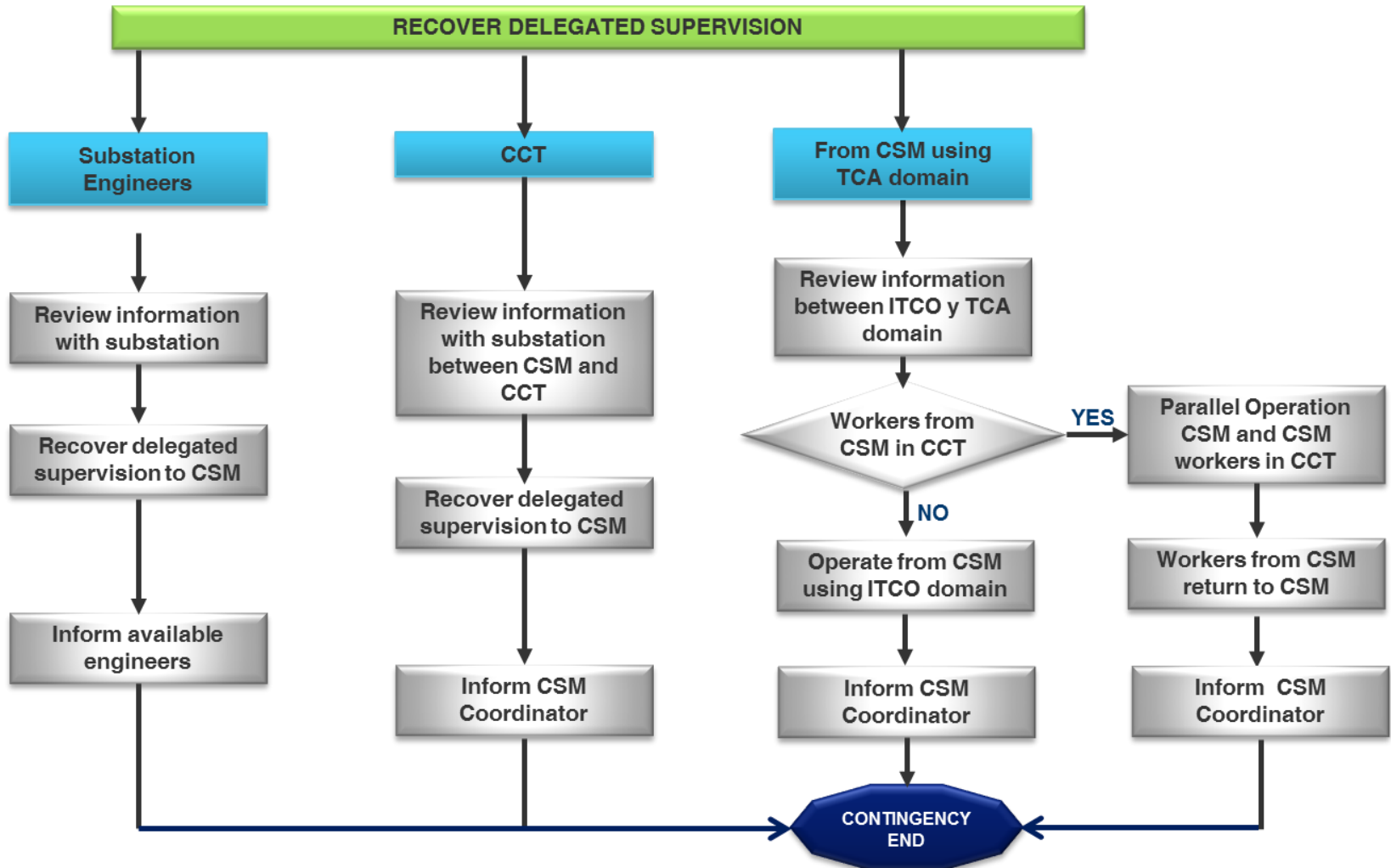




## EXAMPLE 2: TOTAL SCADA MONARCH SYSTEM LOSS



## EXAMPLE 3: RETURNING TO NORMAL CONDITIONS





- Many different configurations, guaranteeing the safe and reliable supervision and control of ITCO's and TCA's equipment, under both normal and contingency conditions.
- Improve the response capacity when a contingency occurs and this situation threatens essential resources of the CSM of ITCO
- This contingency plan is based on the cyber security strategy defined by ISA.
- Correct application of this contingency plan requires some periodical simulations

Thank you!

