Implementation of the Centralized Remedial Action Scheme (C-RAS)

i-PCGRID

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Business Environment Background

- Changing generation landscape affecting grid planning and operation capabilities and performance
  - New Renewables
  - OTC (Once Through Cooling) and Retirements
  - BLM's Solar PEIS (Programmatic Environmental Impact Statement)
  - DG Proliferation
- Public Agency environmental goals
  - Kern County's 10,000 MW renewable goal
- Future grid function changing: import to export

Preparing the Grid for Change

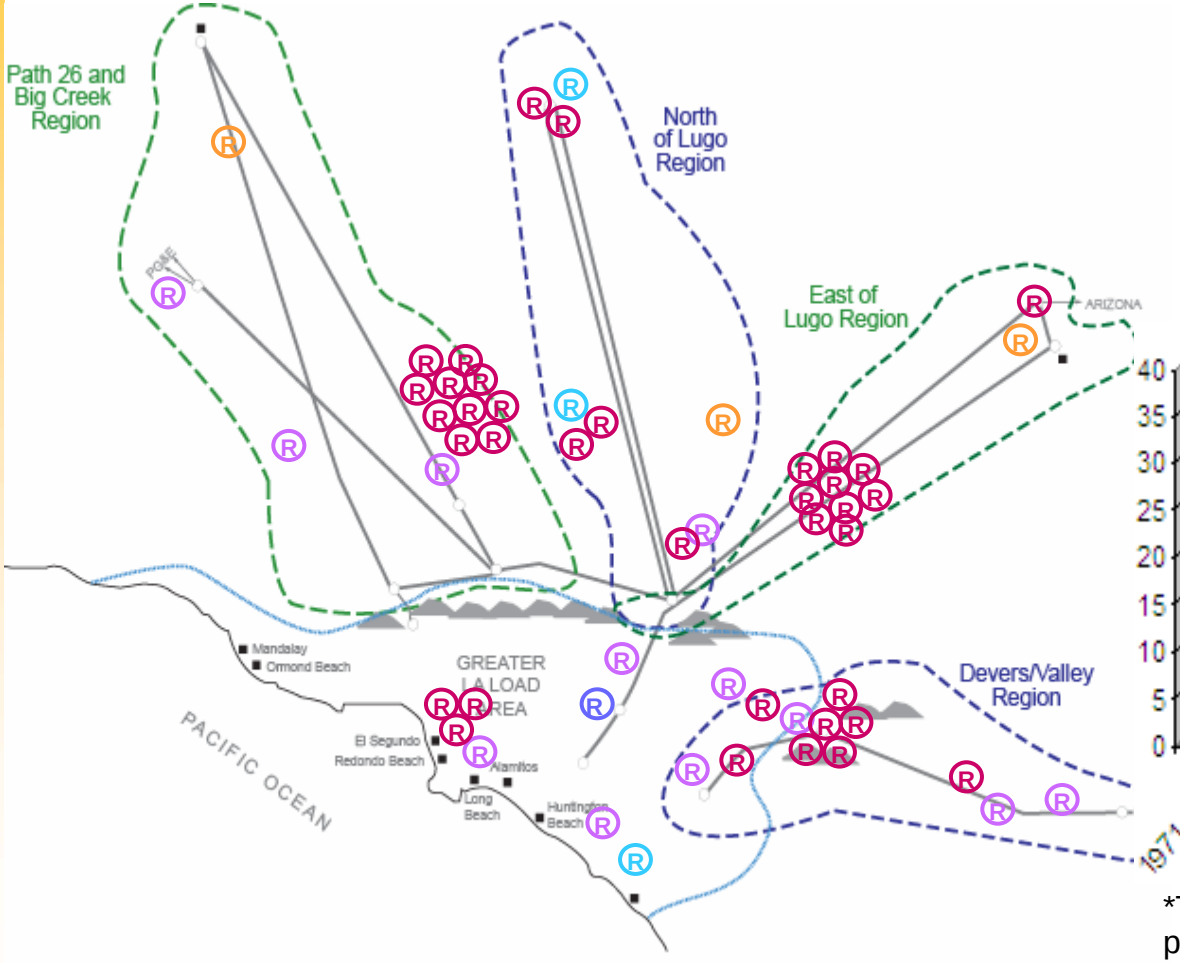
- Grid issues:
  - Interconnection of new resources
  - Delivery upgrades dependent on destination/buyer
    - SCE is “Host” to 80% of state’s renewable potential
    - SCE load cannot absorb all renewables that connect to SCE’s grid
    - Grid cannot operate with just renewable generation

- Preparing the grid for change:
  - Today: Importing power to serve local load (resource mix heavily fossil fuels)
  - Tomorrow: Exporting power to non-local load (resource mix heavily renewables)
  - Today’s SCE projected load ~25,000MW and generation queue ~30,000MW

Increasing Need for Centralized RAS

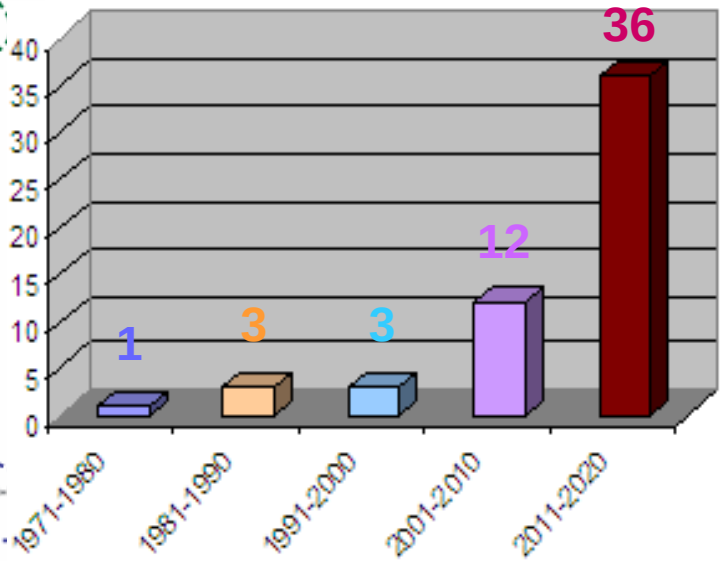
- RASs become critical to the change of grid function
  - Enable generation interconnection
  - Postpone transmission (to a point)
  - Allow operations to vacillate between importing and exporting
- C-RAS allows proliferation of above RAS philosophy

SCE RAS Statistics and Forecast



The increase is NOT linear!

RAS ADDITIONS*



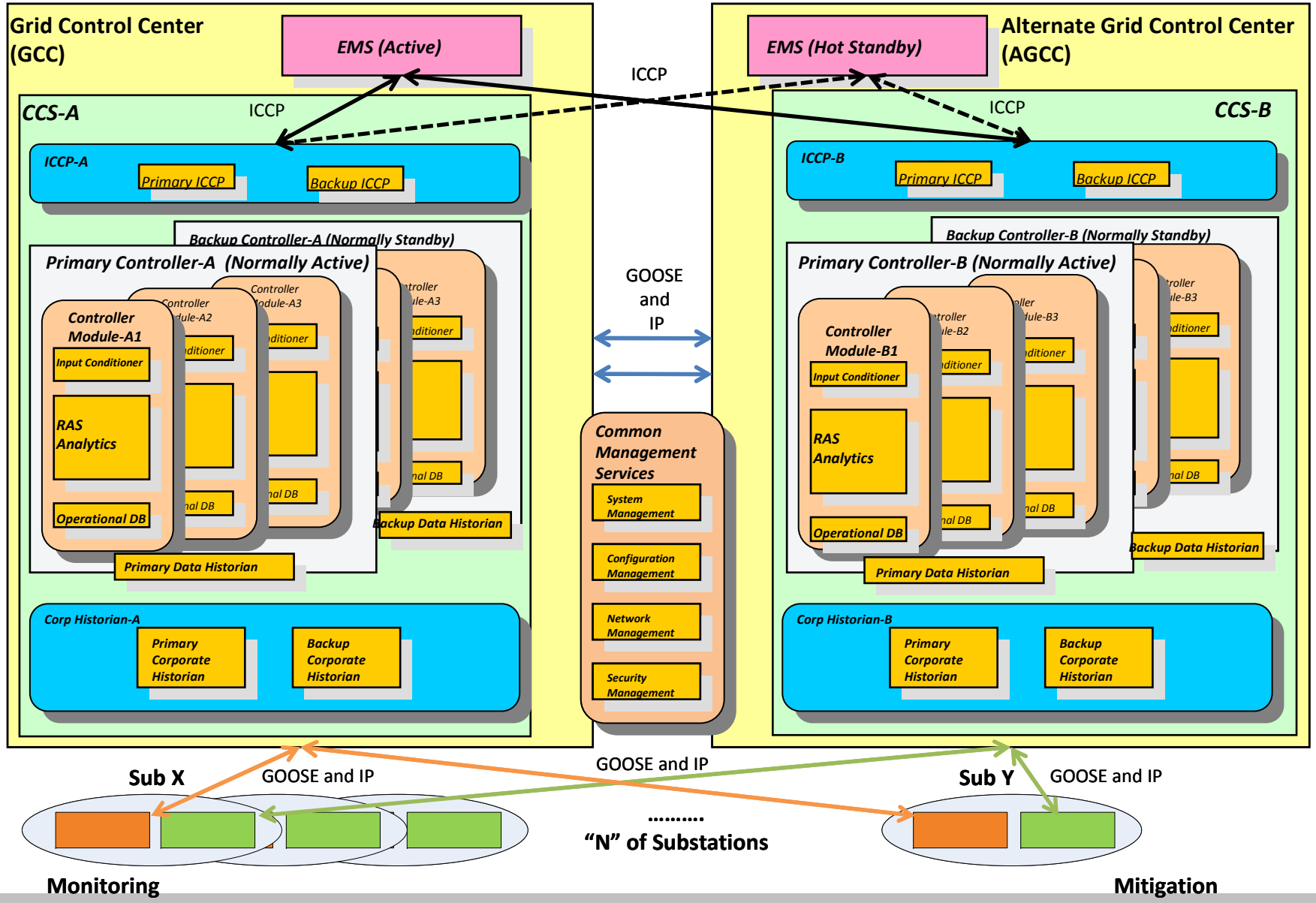
*The forecast assumes that all the generation projects in the queue choose to move forward.

Fundamental Differences of RAS and C-RAS

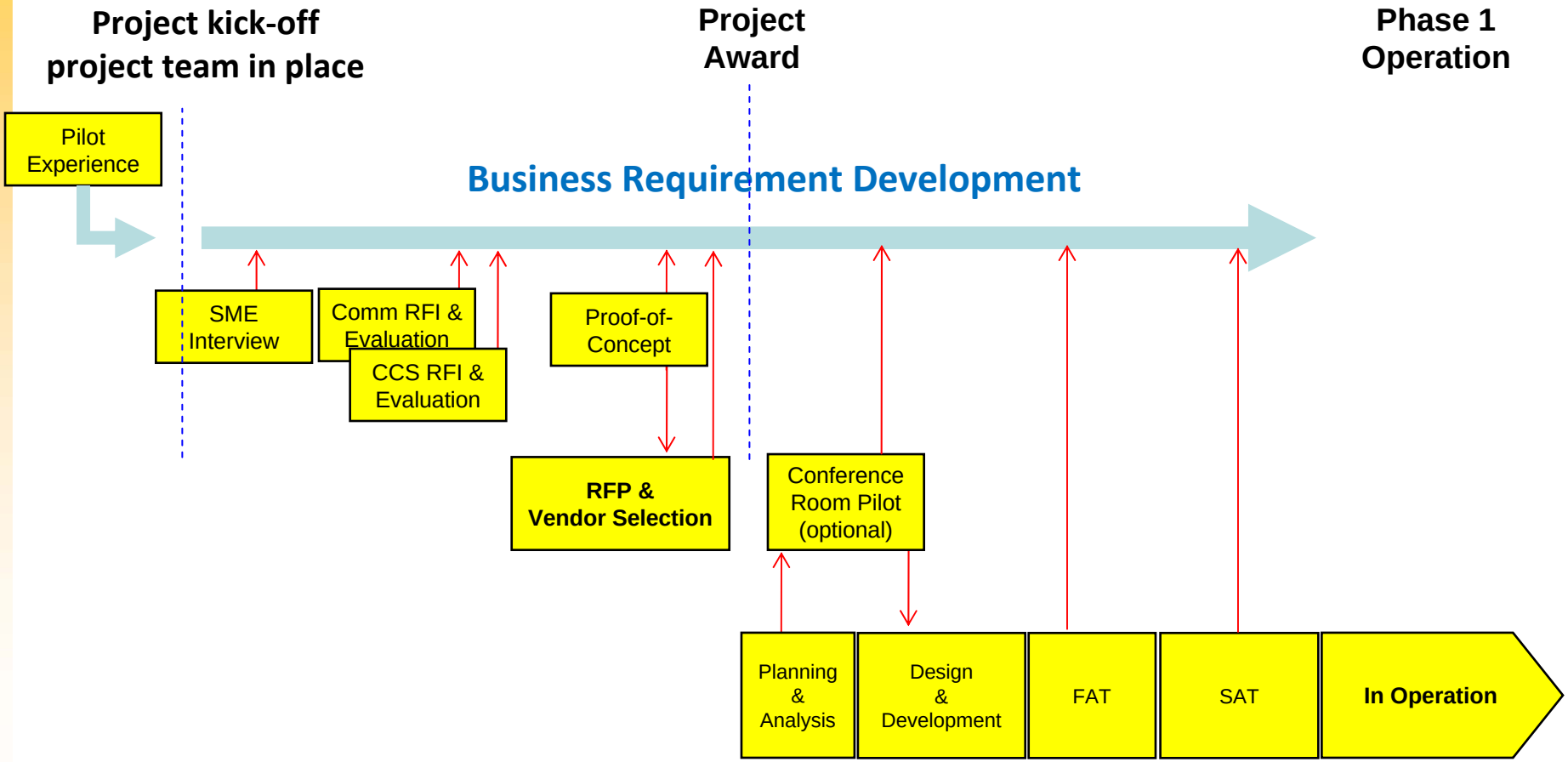
RAS Key Component	RAS	C-RAS
Controller	EMS (GCC/AGCC) – Arming Relay (Sub) – Contingency	CCS* (GCC/AGCC) – Arming + Contingency
Relay	Each RAS has a set of dedicated relays – resulting in multiple relays for one line/bank element.	Each line/bank element has dedicated relay – one time installation and commissioning
Communication	Point-to-point proprietary protocol	Multicast international standardized protocol
Algorithm	"Generation-centric" Non-systematic	"Contingency-centric" Systematic

*CCS stands for Central Controller System

C-RAS Conceptual Architecture



Project Planning & Execution



Project Success Factors

- Clearly Defined Business Requirements
- Participation of All Affected Internal Stakeholders
- Strong Project Management
- Project Sponsorship Continuous Involvement
- Acceptance and Management of Project Evolution

Remarks

- The changing grid resulted from renewable initiatives leads to the increasing need of the Centralized RAS.
- The success of the project is a collaboration between business and technical personnel.

Thank you!

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