

# Is California's Energy System Resilient to Climate Change?

What is the State Government Doing?

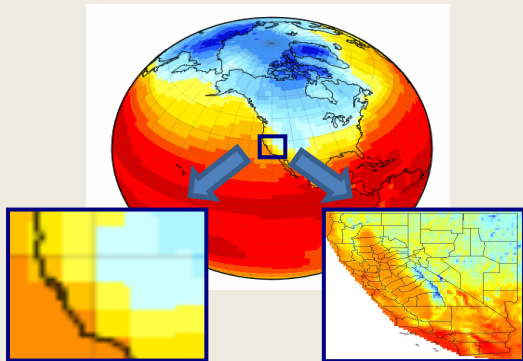
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California Energy Commission

STEPS Fall 2017 Symposium

UC Davis

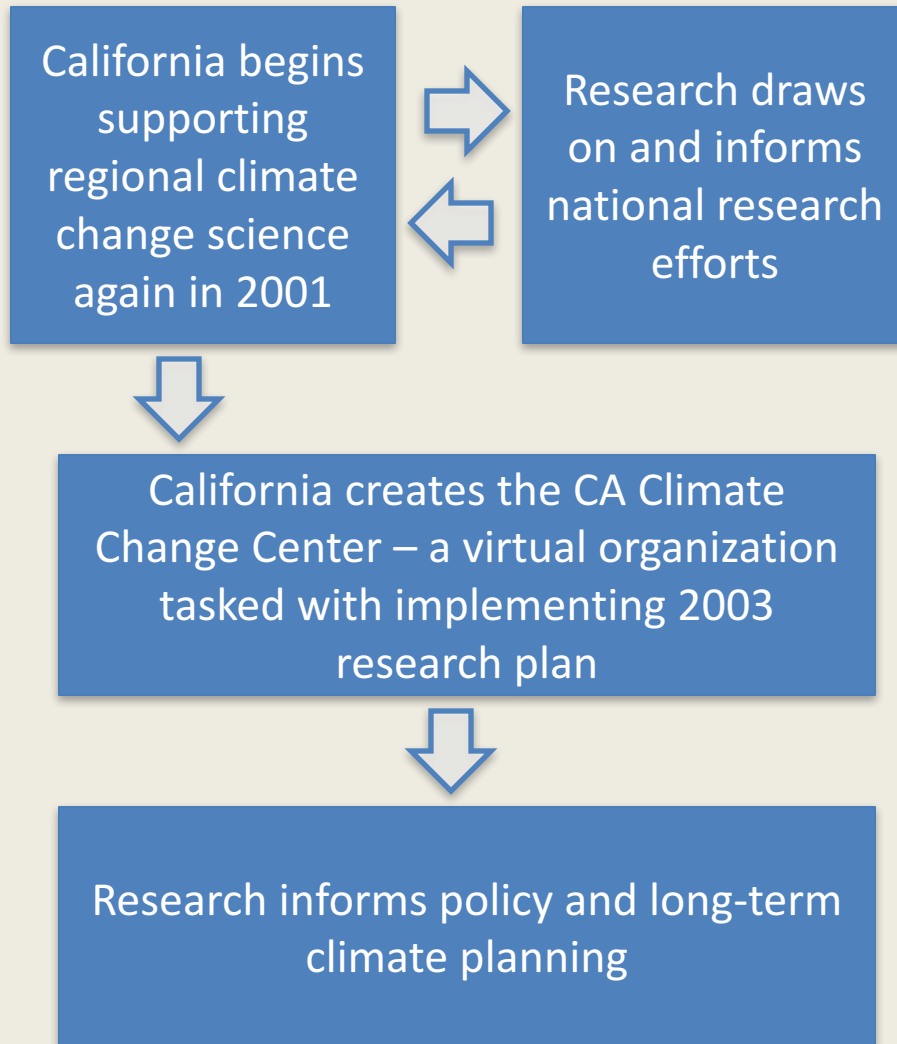
December 7, 2017



# Outline

- Historical Perspective
- California's Fourth Climate Change Assessment
- CPUC/CEC Adaptation Working Group
- What is next?

# State-Sponsored Research



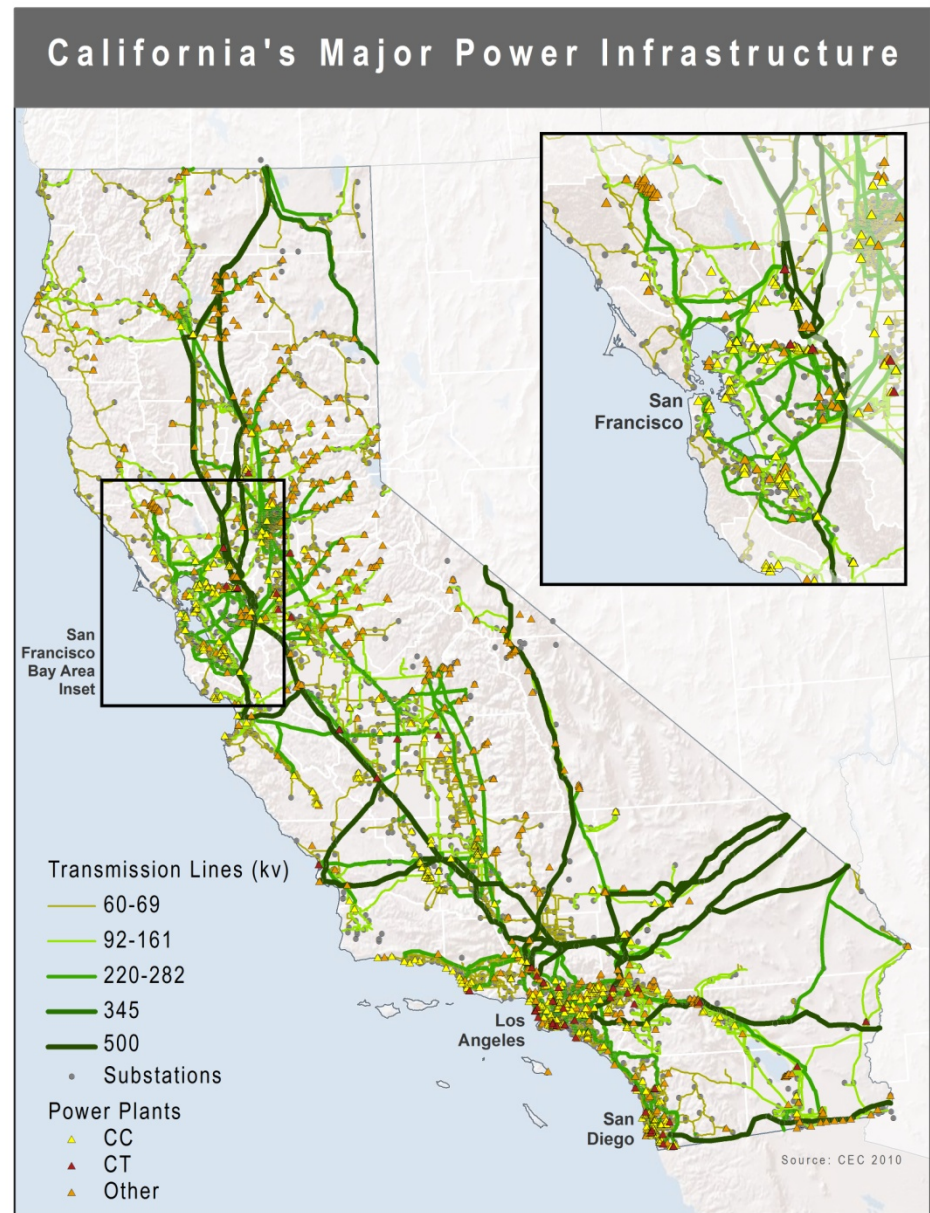
# Electricity

## LONG-TERM IMPACTS

- **Need for More Generation on Hottest Days**
  - Decreased Gas Plant Generation Efficiency
    - Need additional GW (8%)
  - Peak Period Demand (90%tile)
    - 21% higher cooling demand
    - Need additional GW (27%)
  - Substation Loss
    - 2.7% higher losses
    - Need more GW (3.6%)
- **Total Required Generation Capacity:**
  - Need 39% more capacity GW
- **Need for More Transmission Capacity**
  - Transmission lines
    - 7% - 8% loss of peak period capacity (static rating)
    - Need up to 31% additional transmission capacity

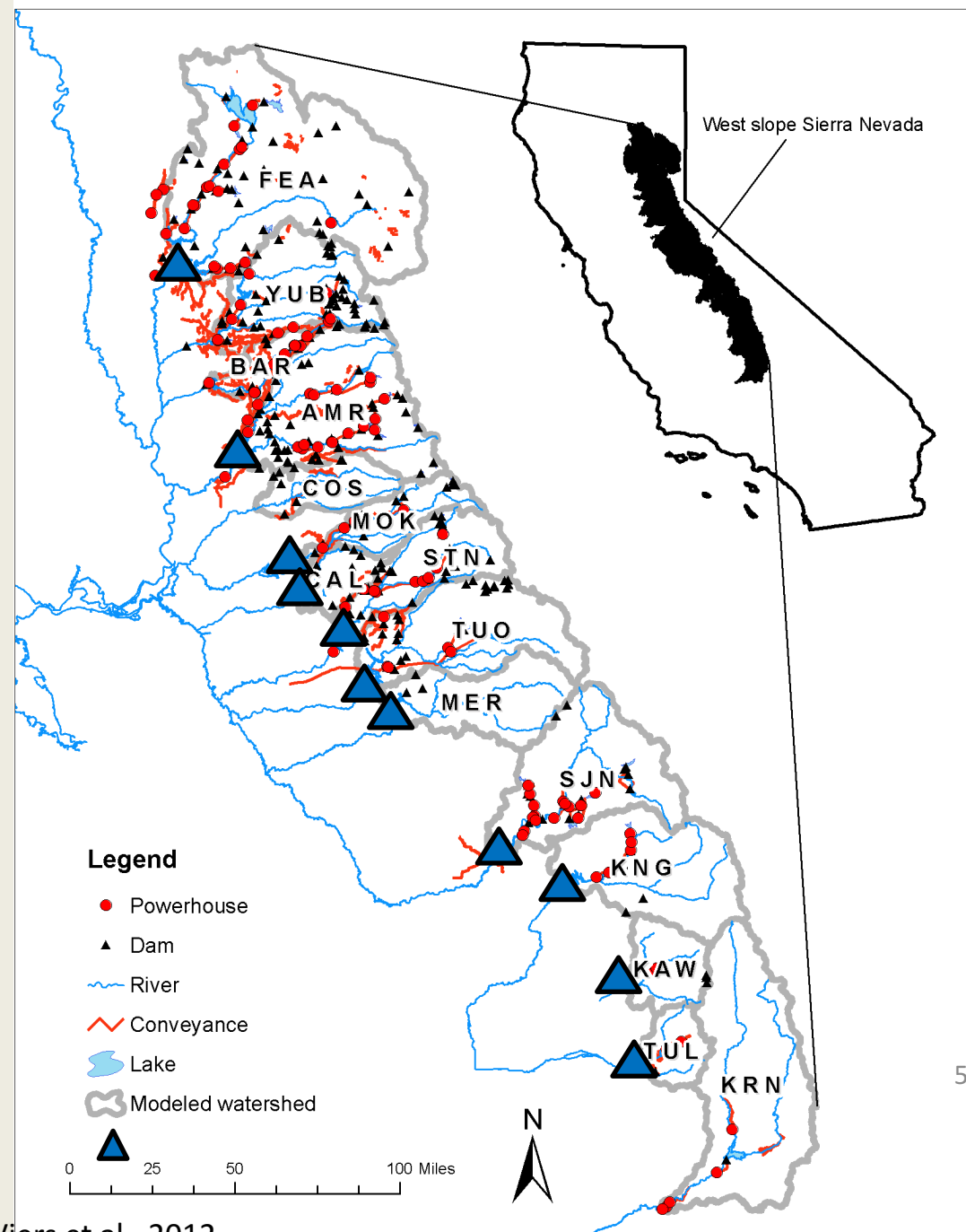
## NEAR-TERM IMPACTS

- **Same as long-term but at a lesser degree. For example:**
  - Additional capacity of 1.6 GW in the next 10 years (IEPR)



# Hydropower

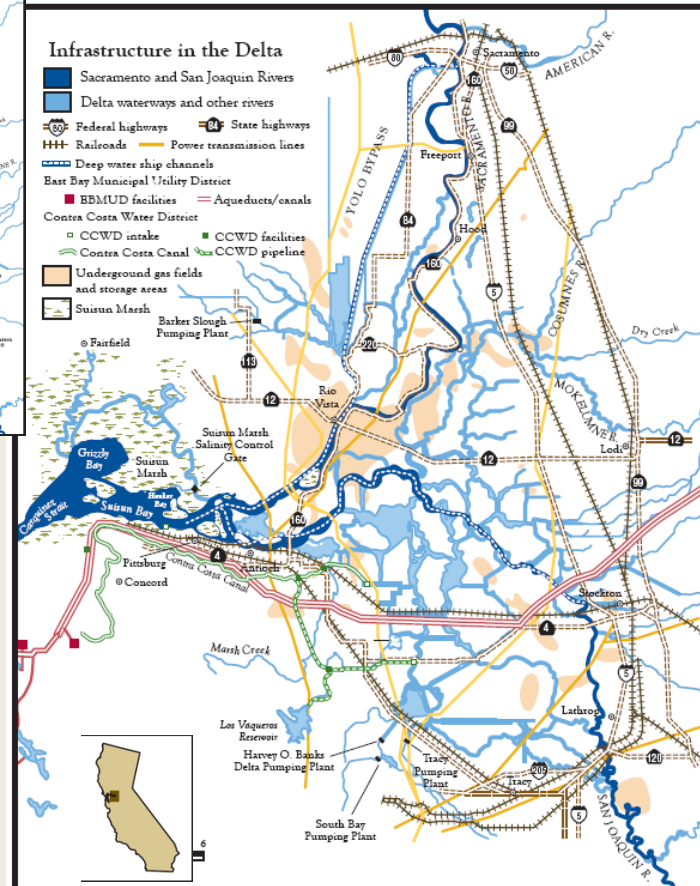
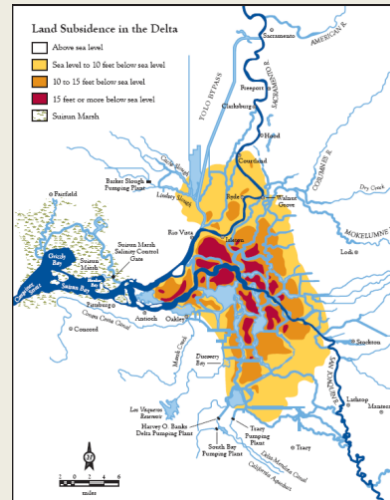
- **Multiple studies** (low and high elevation units)
- **Figure illustrates modeling work by UC Davis** (high elevation ~75% MWh)
  - 56 reservoirs
  - 85 run-of-river hydropower plants
  - 16 variable head hydropower plants
  - 125 diversion channels
  - 106 instream flow requirement points
  - Weekly time step
- **General results:**
  - Overall reductions in generation
  - Less generation available in the summer. Shift to generation in the winter





# Natural Gas System

- The Sacramento-San Joaquin Delta is protected by levees. Delta islands are below sea level
- Energy Facilities:
  - Underground natural gas reservoirs
  - Transmission lines
  - Natural gas pipelines
- Prof. Radke (UC Berkeley) worked very closely with PG&E.

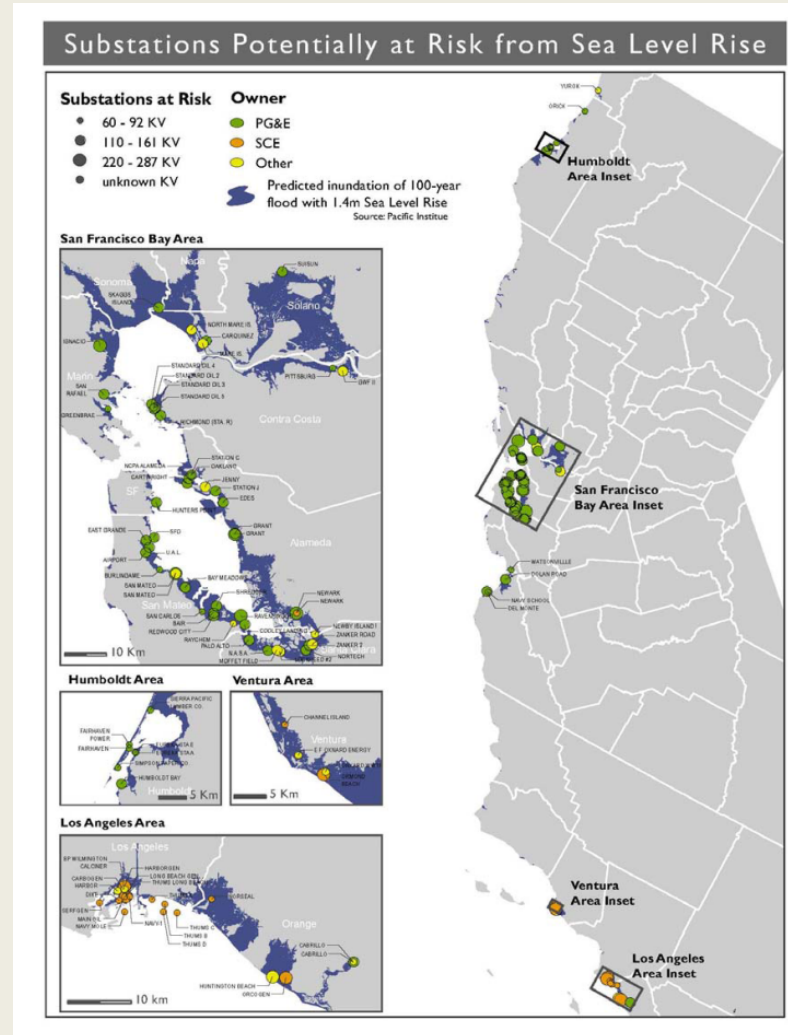


Source: PPIC 2007

# Coastal Impacts

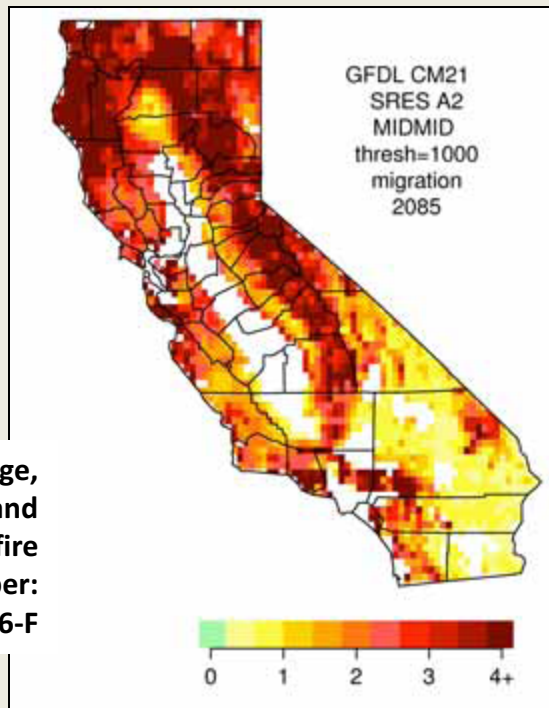
Source: Heberger et al., 2012

- Potential risks to coastal power plants and substations.

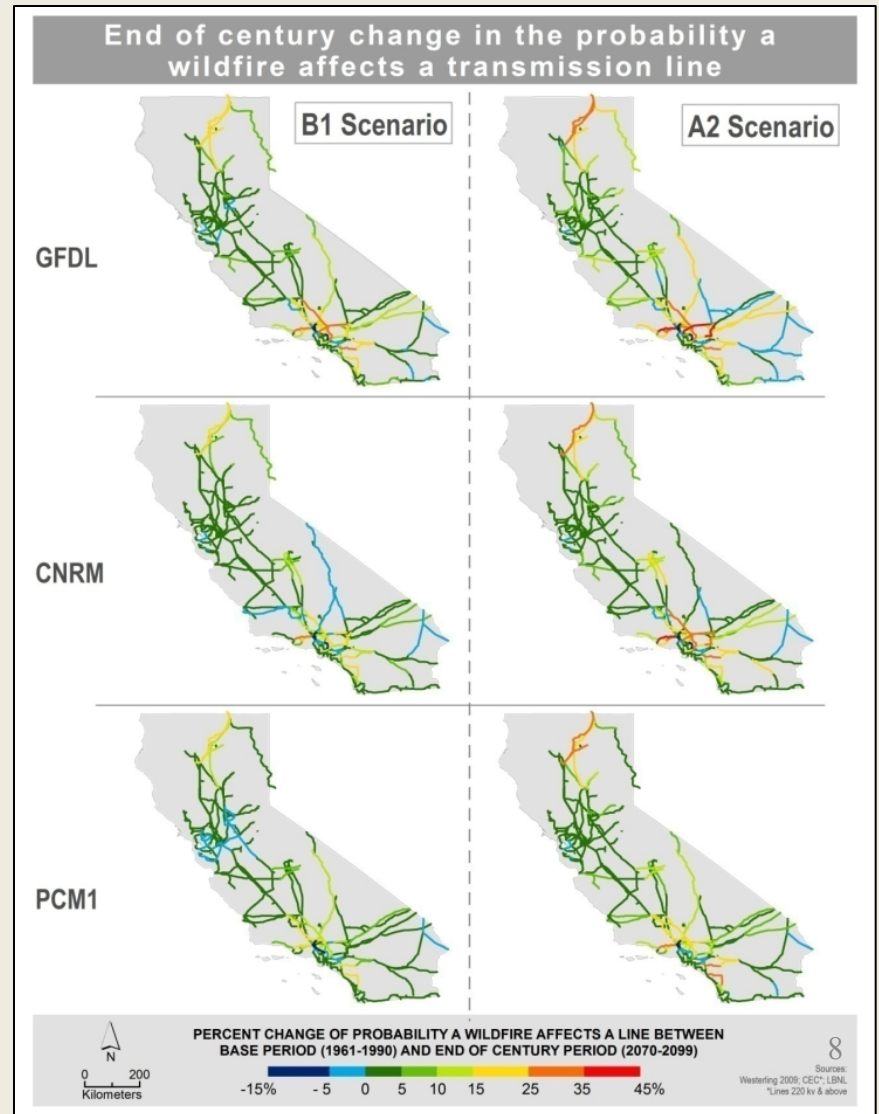


# Wildfires would affect transmission lines

Climate Change,  
Growth, and  
California Wildfire  
Publication Number:  
CEC-500-2009-046-F



Estimating Risk to California Energy Infrastructure  
from Projected Climate Change  
Publication Number: CEC-500-2012-057





# California's Fourth Climate Change Assessment

- Funded by CNRA and CEC
- Directed by CNRA, OPR, and CEC
- About 30 commissioned studies (~15 on energy issues)
- Statewide, regional, and topical reports
- To be released in the Fall of 2018

# CPUC/CEC Adaptation Working Group

- Co-Chaired by CEC Chairman Weisenmiller and CPUC Commissioner Randolph. Includes representatives from the Natural Resources Agency, Governor's Office of Planning and Research, and the Office of Emergency Services.
- Meets every quarter to coordinate climate adaptation related activities.

# What is next?

- More discussions on how to make CEC research activities more actionable. It is no longer enough just to show that there is a need to adapt.
- It would be almost impossible to support actionable science without a direct connection to stakeholders (IOUs) and ratepayers. However, the IOUs must become comfortable with sharing data and information with the researchers.
- Research results would inform rate cases to finance climate adaptation.

# Thank you!

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