



# Shock Therapy

Tinkering with the World's Most  
Complicated Machine



# Aspen

## ○ Aspen

- Multidisciplinary staff provides environmental compliance, impact assessment and mitigation services for Energy and Infrastructure Projects
- Project management for large Transmission Projects
- Offering support on large, integrated energy planning assessments



# Carl Linvill

- Current Projects
  - Energy Commission Support for Natural Gas and Electricity Assessments in CA and the West
  - Non-wires program evaluation
- Background
  - NV PUC Commissioner, NV Energy Advisor to Governor
  - Economics PhD, Academic (Production Frontier Analysis/Game Theory)



# Question: Can Preferred Resources Meet Growth?

- Yes, but ...
  - At what cost?
  - Over what time frame?
  - With what intermediate consequences?



# Stumbling toward an answer

- CPUC
- WGA CDEAC
- CEC
  - Toward being “Electrically Correct”
  - Toward being locationally accurate
- Coming attractions: CPUC - effects of Carbon Regulation regimes on optimal resource mix

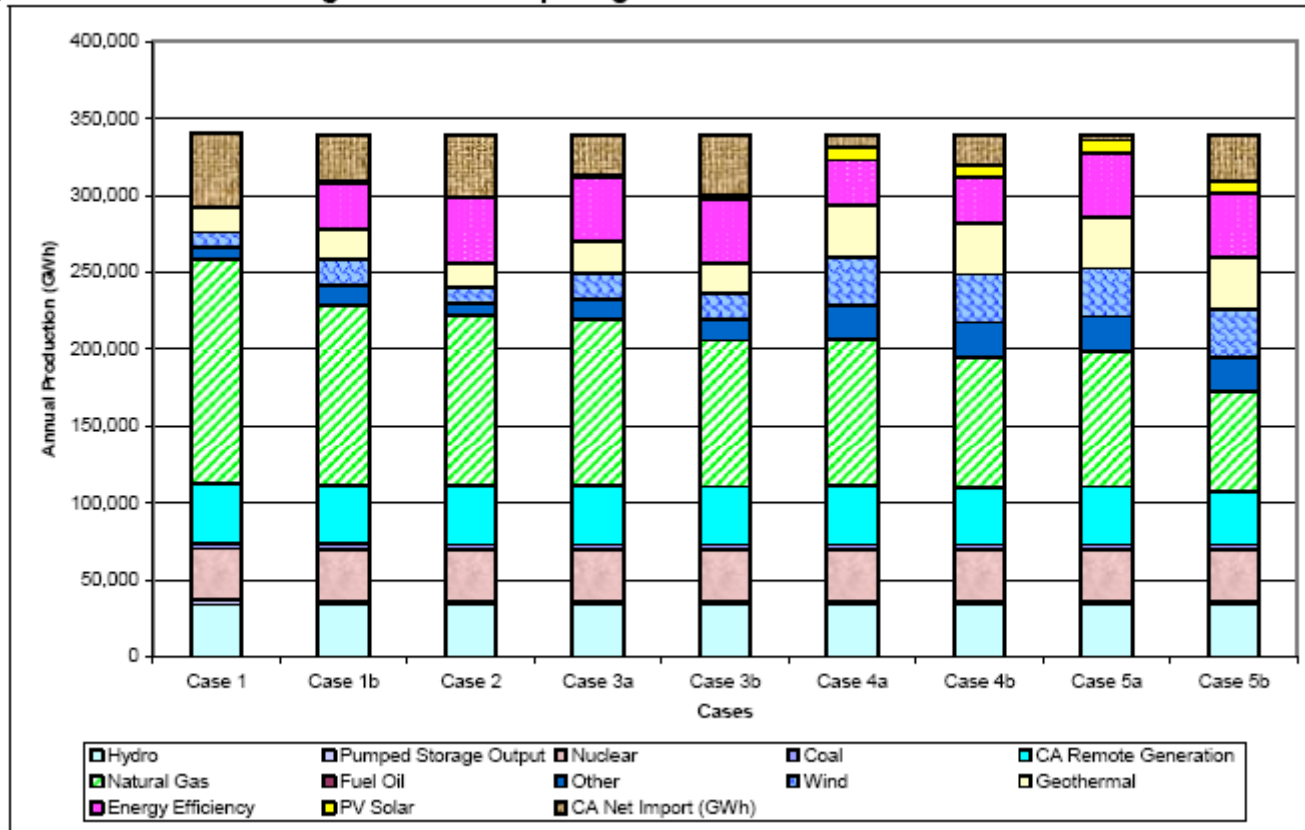


# The CEC Draft

- CEC Report 200-2007-10-SD
  - Build out of 20 and 33% Scenarios in CA and throughout the west
    - Composition of Resources
    - Relative Cost
    - Carbon
    - Infrastructure Requirements

# Composition

Figure ES-2: Comparing California Resource Mix in Year 2020

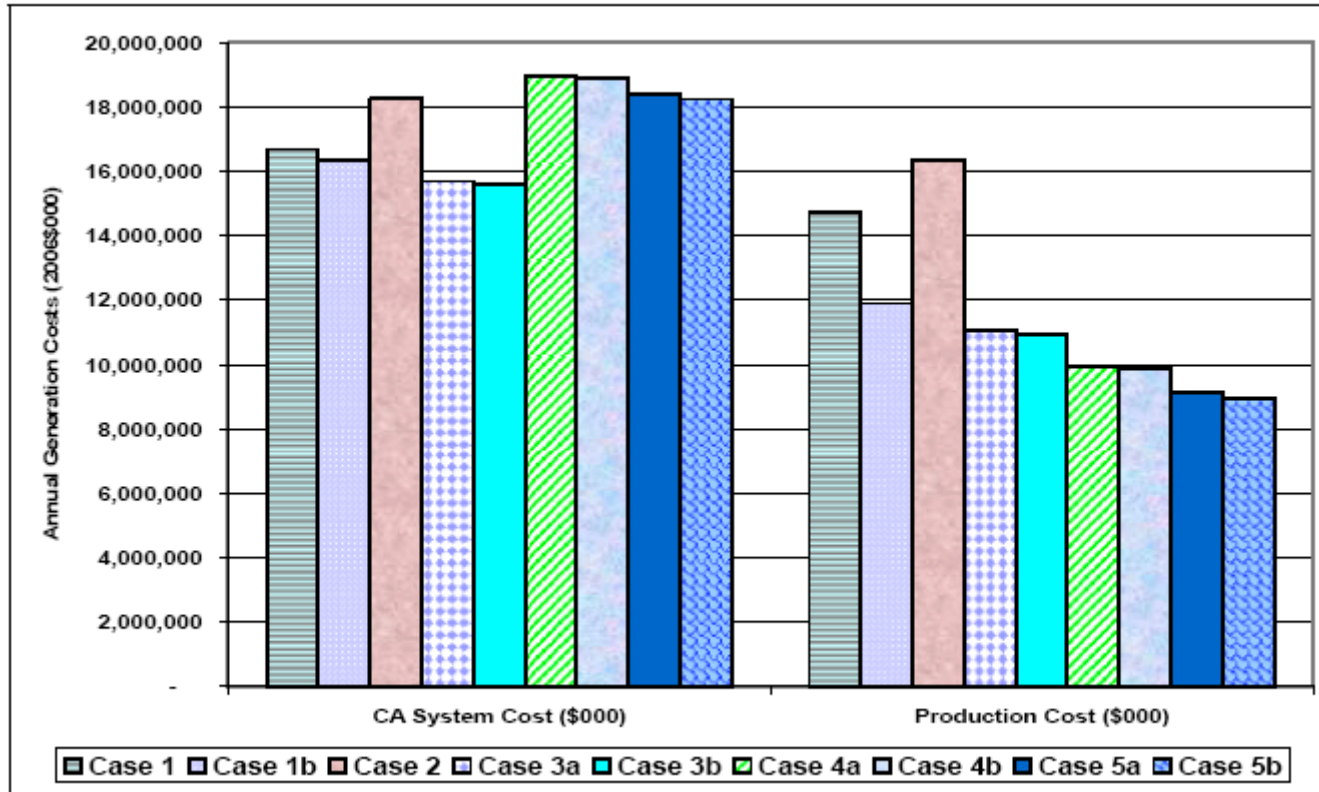


Source: Energy Commission, Energy Project



# Relative Cost

Figure ES-4: California Generation Cost Comparison Across Cases on a Total Cost Basis

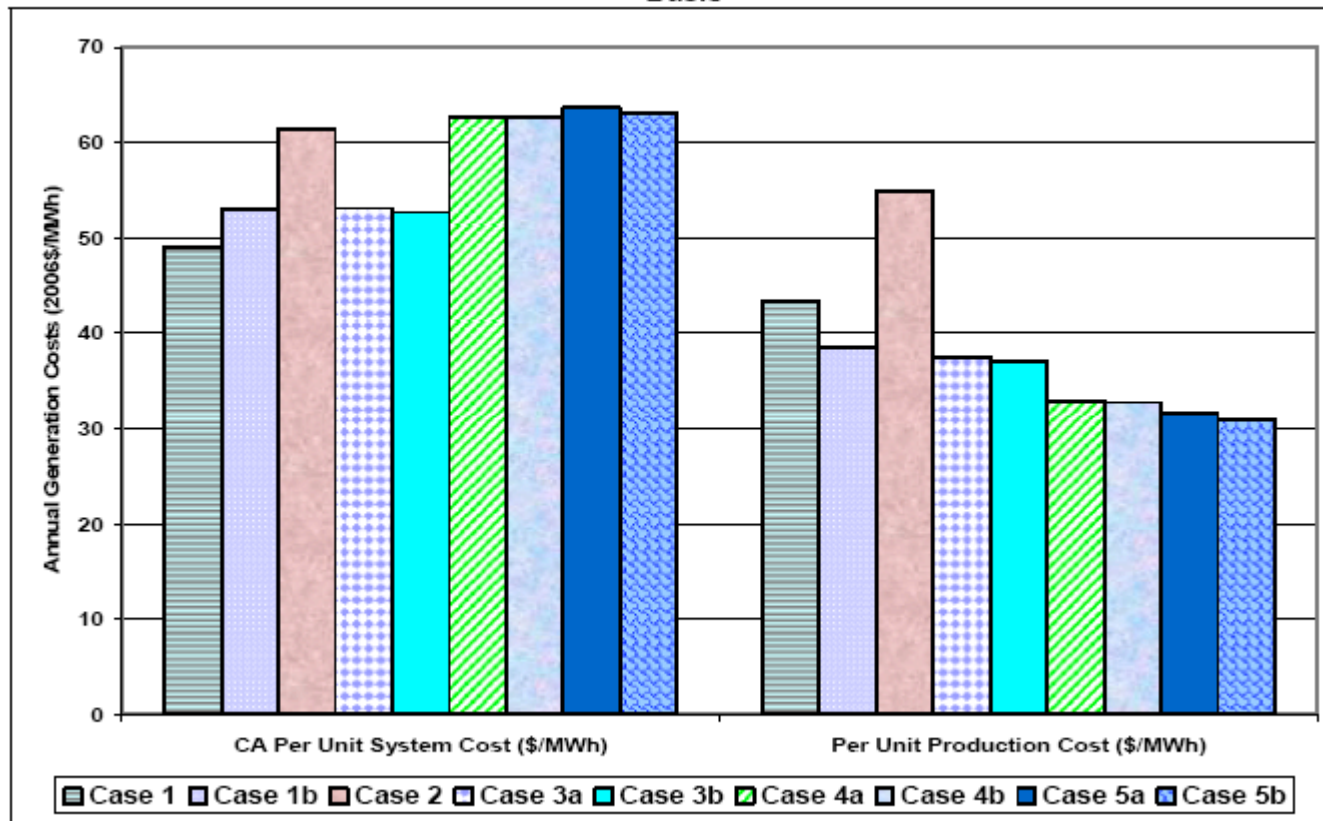


Source: Energy Commission Scenario Project



# Relative Unit Cost

Figure ES-5: California Generation Cost Comparison Across Cases on a Per Unit Cost Basis

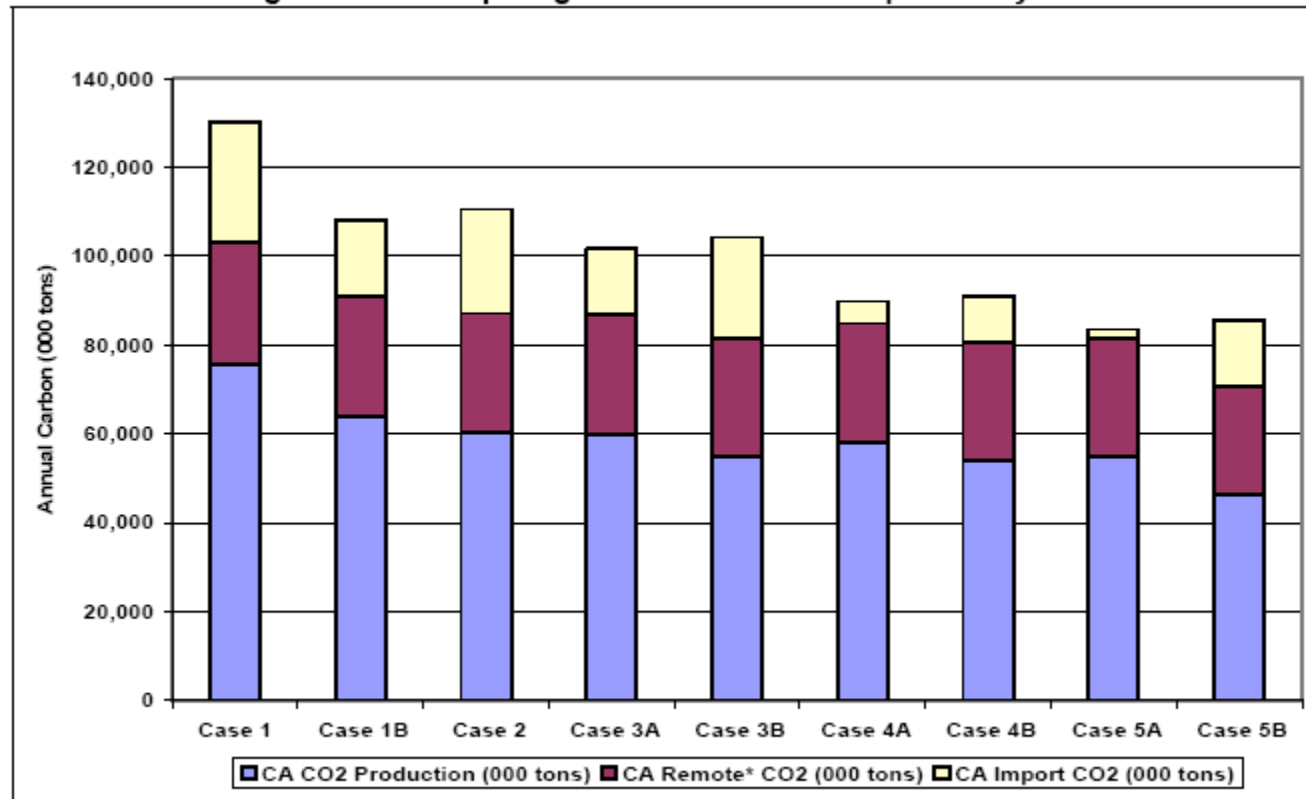


Source: Energy Commission Scenario Project



# Carbon

Figure ES-3: Comparing California Carbon Responsibility in Year 2020



Source: Energy Commission Scenario Project



# Infrastructure Requirements

(beyond Tehachapi, Sunrise, Green Path, and PV-D)

**Table 2-3: Case 1B Transmission Capacity Additions**

From Area	To Area	Year	Transfer Capacity Increase (MW)
Alberta S	Montana	2008	300
Arizona	So. Nevada	2009	1,430
BC	Northwest	2009	500
IID	SCE	2009	1,000
Wyoming	Idaho	2010	700
Imperial	SDG&E	2010	1,150
Montana	Northwest	2011	500
Wyoming	Utah	2011	500
Wyoming	Idaho	2012	800
Montana	Northwest	2013	500
Wyoming	Utah	2013	500
Alberta S	Montana	2014	500
Alberta S	BC	2016	500

**Table 2-6: Case 4A Transmission Capacity Additions Imperial Valley to North Gila Substation**

	To Area	Year	Increase in Transfer Capacity (MW)
IID	SCE	2015	500
SCE	LADWP	2015	500
IID	IV-NG*	2015	700

Source: Navigant Consulting

\*Imperial Valley-North Gila Substation



# Back to the Question

- CEC Draft:
  - Takes a stab at addressing costs
  - Takes a stab at addressing feasibility
- How do uncertainties impinge?



# Uncertainties

- Demand
- Technology Cost and Performance
  - RE
  - EE
  - Fossil
- Regulatory: Markets
- Regulatory: Permitting
- EFFECTS?????



## More stumbling ...

- Lets think temporally for a minute:
  - What is the right combination of resources over time?
  - When is the right time to deploy certain resources?
  - Does sequencing of resource deployment and infrastructure matter?



# Shock therapy?

- What if we focus too much on the long term goal and ignore the temporal aspects?
- We've seen this before:
  - Transition economies
  - The last energy crisis



# So the answer to the question?

- Can we meet growth with preferred resources?
- **WRONG QUESTION.**



# A Better Question

- How do we build out a robust electricity sector that accommodates preferred resources and addresses GHG concerns?
- Or, how should we tinker with the world's most complicated machine?



# Pay Attention to Temporal Interdependence

- The 20 Year Plan should identify the resource mix and infrastructure targets 10, 15 and 20 years out.
- The 3- 5 Year Plan should identify the resources and infrastructure that need to be deployed within 5 years to attain the longer term targets.
- The 1-2 Year Plan should address fuel, energy and capacity procurement and any associated hedging practices.



# The 20 Year Integrated Plan

- The Plan Should Address Resource Mix Issues
  - Fuel Mix
  - Renewable Targets
  - Centralized vs. Distributed Generation
  - Demand Reduction and Demand Response Programs



# The 20 Year Integrated Plan

- The Plan Should Address Infrastructure Needs Created by:
  - Distribution System Growth
  - Control Area Information Needs
  - Customer Information Management Needs
  - Generation Interconnection Requests
  - Regional Market Access Needs



# The 20 Year Integrated Plan

- The Plan Should Evaluate Alternatives Based on:
  - Retail Price Outcomes
  - Retail Price Risk Outcomes
  - System Reliability Outcomes
  - Environmental Outcomes
  - System Flexibility Outcomes



# The 3-5 Year Action Plan

- The Plan Should
  - Balance retail price level and retail price risk
  - Meet reliability targets
  - Fit within the capital constraints of the utility
  - Make progress toward achieving the longer term resource mix and infrastructure needs goals



# The 1-2 Year Energy Supply Plan

- The Plan should consider available resources and their respective prices to fill resource needs and reliability targets
- The Plan should consider procurement and hedging strategy alternatives
- The Plan should evaluate alternatives based on measures of price and risk



# Lessons

- **Managing price and risk in the short term is relatively limited so long term planning is critical now**
  - For Customers: Management of Price and Risk is Limited to Conservation, Efficiency, On-site Generation and TOU Tariffs
  - For the Utility: Management of Price and Risk is Limited to Fuel Switching, Procurement and Hedging Practices
  - The Bottom Line is that the Ability to Manage Price and Risk is Critically Dependent upon the Resource Mix and Infrastructure Legacy of the Utility



# Lessons

- **Nobody can tell you what the optimal mix of resources will be 10 years from now, especially if one has no idea what infrastructure will exist**
  - Information and Control Technologies will Enhance the Desirability of Decentralized and Intermittent Resources
  - Amount of Customer Generation and Demand Response is Uncertain
  - T & D Infrastructure that Gets Built in the Mean Time affects Cost of Resources
  - Cost of Fuels is Uncertain and Volatile
  - Cost of Generation Equipment is Changing
  - Rate and Environmental Regulatory Rules will affect the Relative Cost and Availability of Resources



# Lessons

- **Finding the correct balance between commitment and flexibility is important now**
  - Committing to Building the Infrastructure of the Future is Important Now.
  - Committing to an Infrastructure that Supports One Fuel or One Technology is Risky.
  - Committing to an Information Infrastructure that can Accommodate Demand Response, Distributed Generation, and Intermittent Resources will Enhance the Ability to Manage Price and Price Risk.



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