

April 12, 2012 - California Energy Commission Hearing: **Renewable Energy Valuation Using the SWITCH Electric Power Sector Model**



Jimmy Nelson

Ph.D. Candidate

Link Energy Fellow

Energy and Resources Group

UC Berkeley

PI: Professor Daniel Kammen

Energy and Resources Group

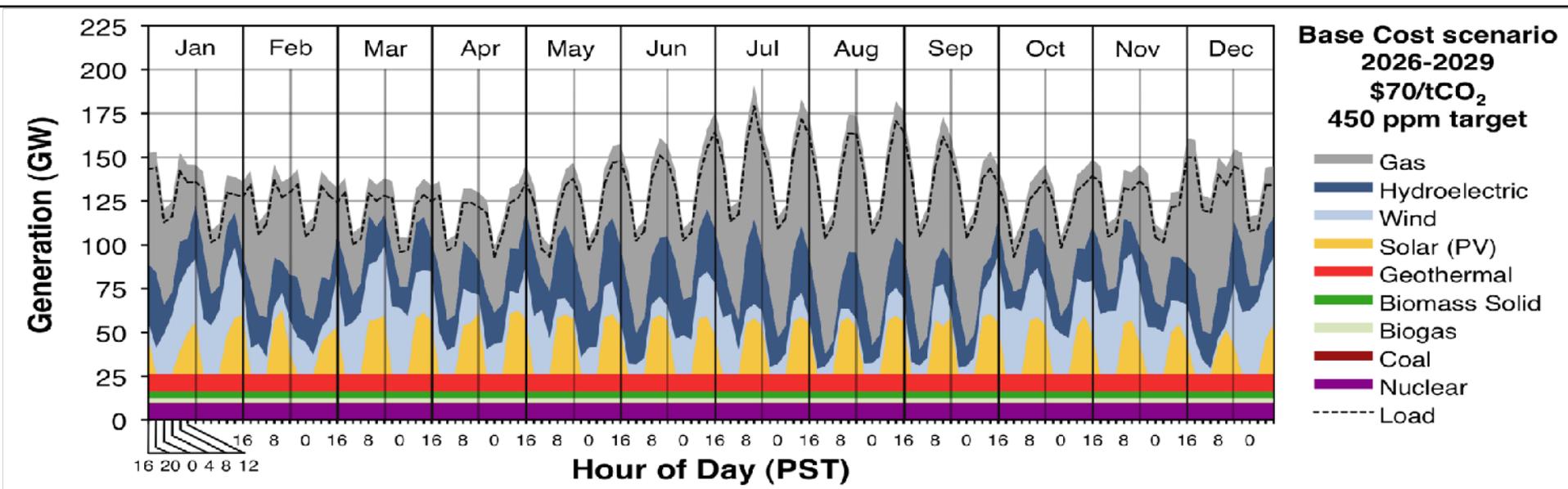
Renewable and Appropriate Energy Laboratory (RAEL)

UC Berkeley

<http://rael.berkeley.edu/switch>

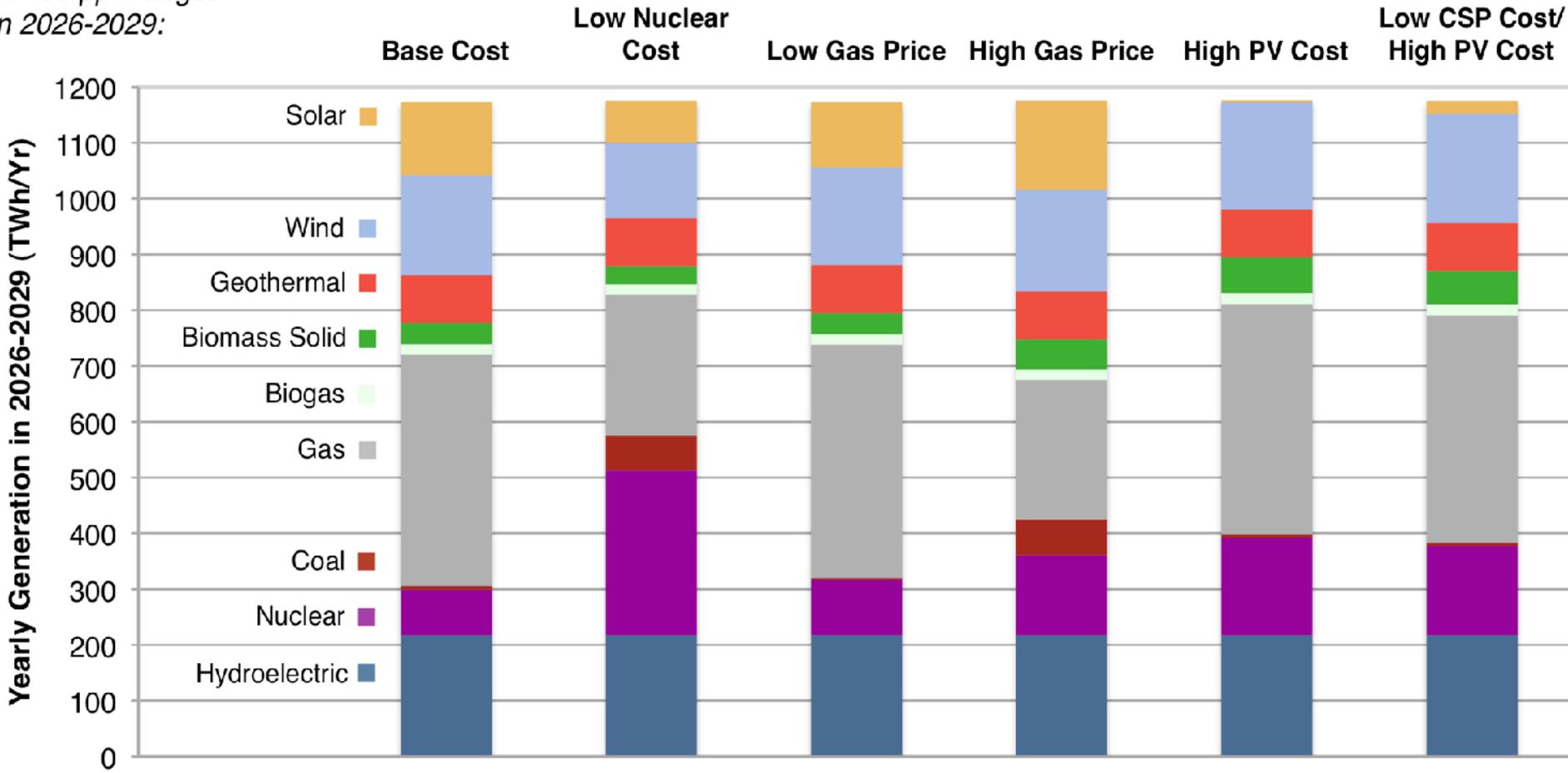
Using the SWITCH high-resolution electricity sector planning model to value renewable energy

- Generation, transmission and storage of electricity can only be properly valued when investment and dispatch are optimized concurrently
 - Value of intermittent sources (wind + solar) dependent on dispatch of the rest of the power system and vice-versa
 - Policy and reliability constraints should be included in optimization



SWITCH Model: switch-model.org

At 450 ppm target
in 2026-2029:



Carbon price adder (\$2007/tCO ₂)	70	59	87	66	84	86
Power cost (\$2007/MWh)	113	110	110	114	114	114
Cumulative new transmission built by 2030 (10 ³ GW-km)	9.8	6.0	9.0	11.7	12.0	12.3

SWITCH Modeling Objectives to Support California Energy Planning

- SWITCH is a CEC-supported modeling program
 - Guido Franco & Joe O'Hagan – CEC Program Officers
- High-spatial and temporal resolution modeling of CA and WECC energy supply, T&D and end-use opportunities to meet cost, reliability and environmental objectives
- Next objectives include:
 - High-solar energy scenarios (pending detailed natural gas supply curves, added complexity of storage options)
 - Environmental impacts of energy siting and operation
 - Scenarios under carbon quantity and cost constraints
 - Inter-model comparisons and validation studies