



# Lawrence Berkeley National Laboratory

Kathy Yelick

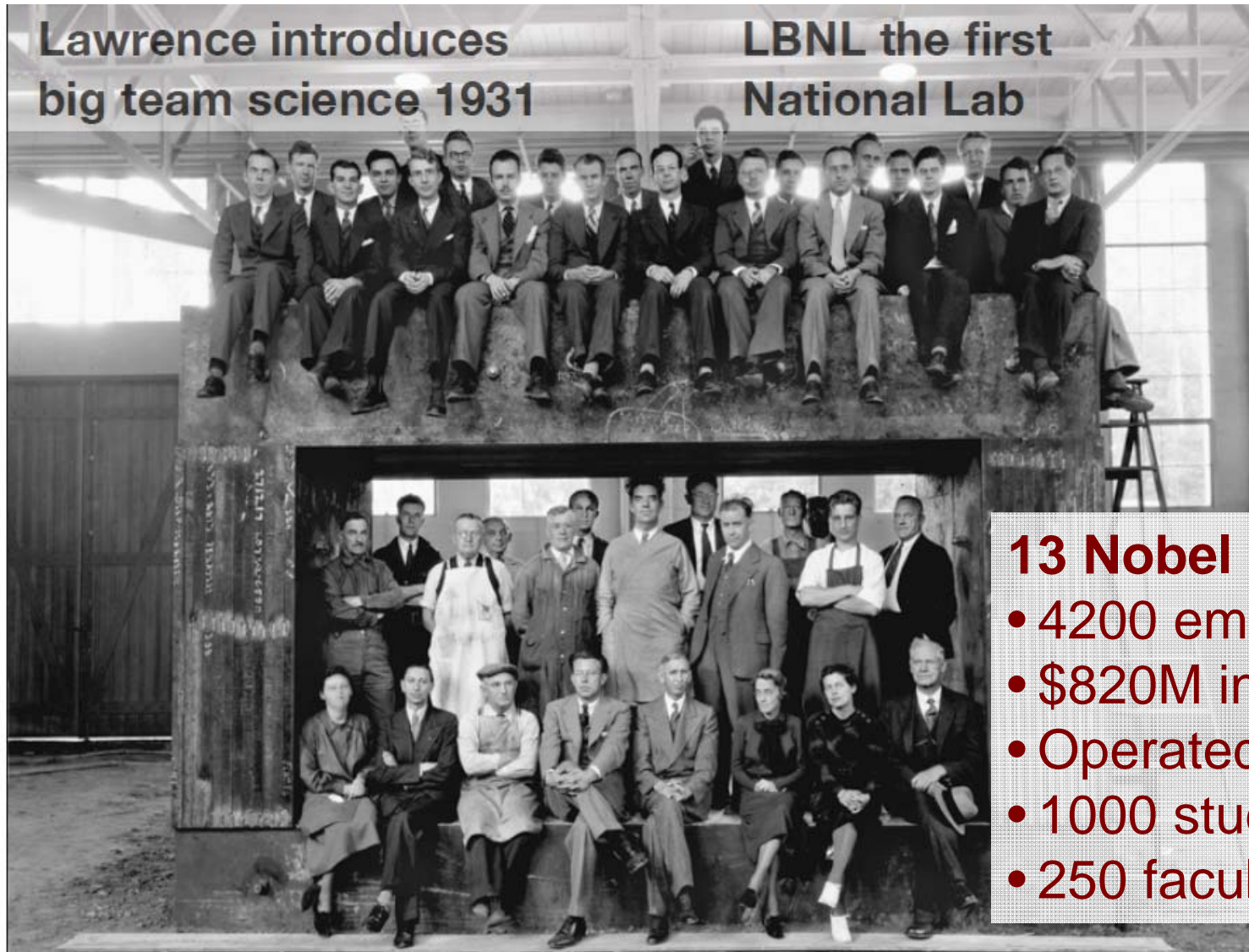
Associate Laboratory Director for Computing Sciences



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# Berkeley Lab Changes Science



- 13 Nobel Prizes**
- 4200 employees
- \$820M in funding
- Operated by UC
- 1000 student
- 250 faculty



# Berkeley Lab's enduring approach: teams and tools for scientific discovery

# ~30% of SC users

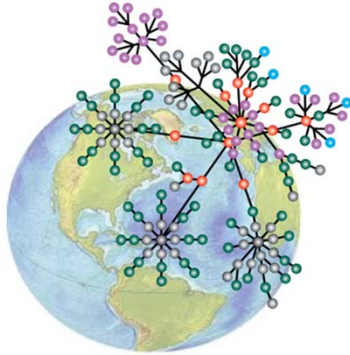


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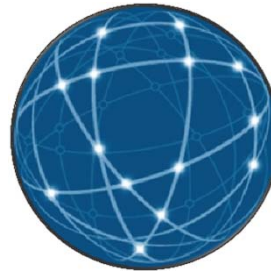
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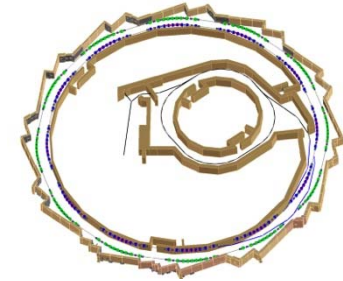
Berkeley Lab's Strategic Initiatives help  
define a common vision, mission and  
culture



**MICROBES TO BIOMES**



**EXTREME SCIENCE  
DATA INITIATIVE**



**DIFFRACTION-LIMITED  
ALS FOR MATERIALS &  
BIOLOGY**



**ENERGY  
INNOVATION**



**DIVERSITY &  
INCLUSION**



**SERVICE  
TECHNOLOGIES  
FOR SCIENCE**

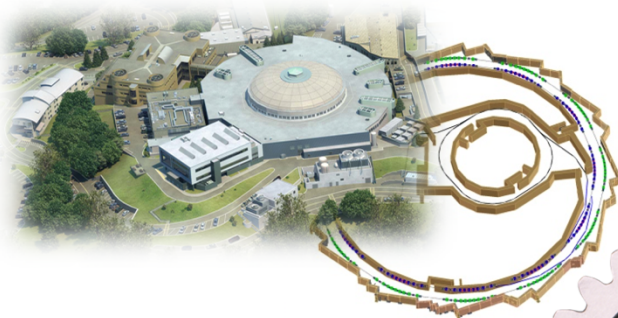


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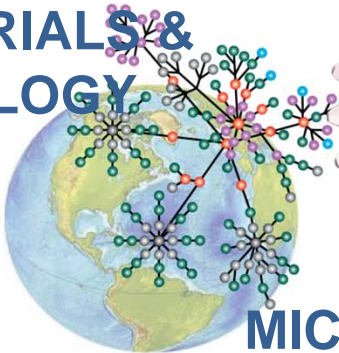
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# Real world impact from the lab-wide science initiatives



**EXTREME SCIENCE  
DATA INITIATIVE**

**DIFFRACTION-  
LIMITED  
ALS FOR  
MATERIALS &  
BIOLOGY**



**MICROBES TO  
BIOMES**



**ENERGY INNOVATION**

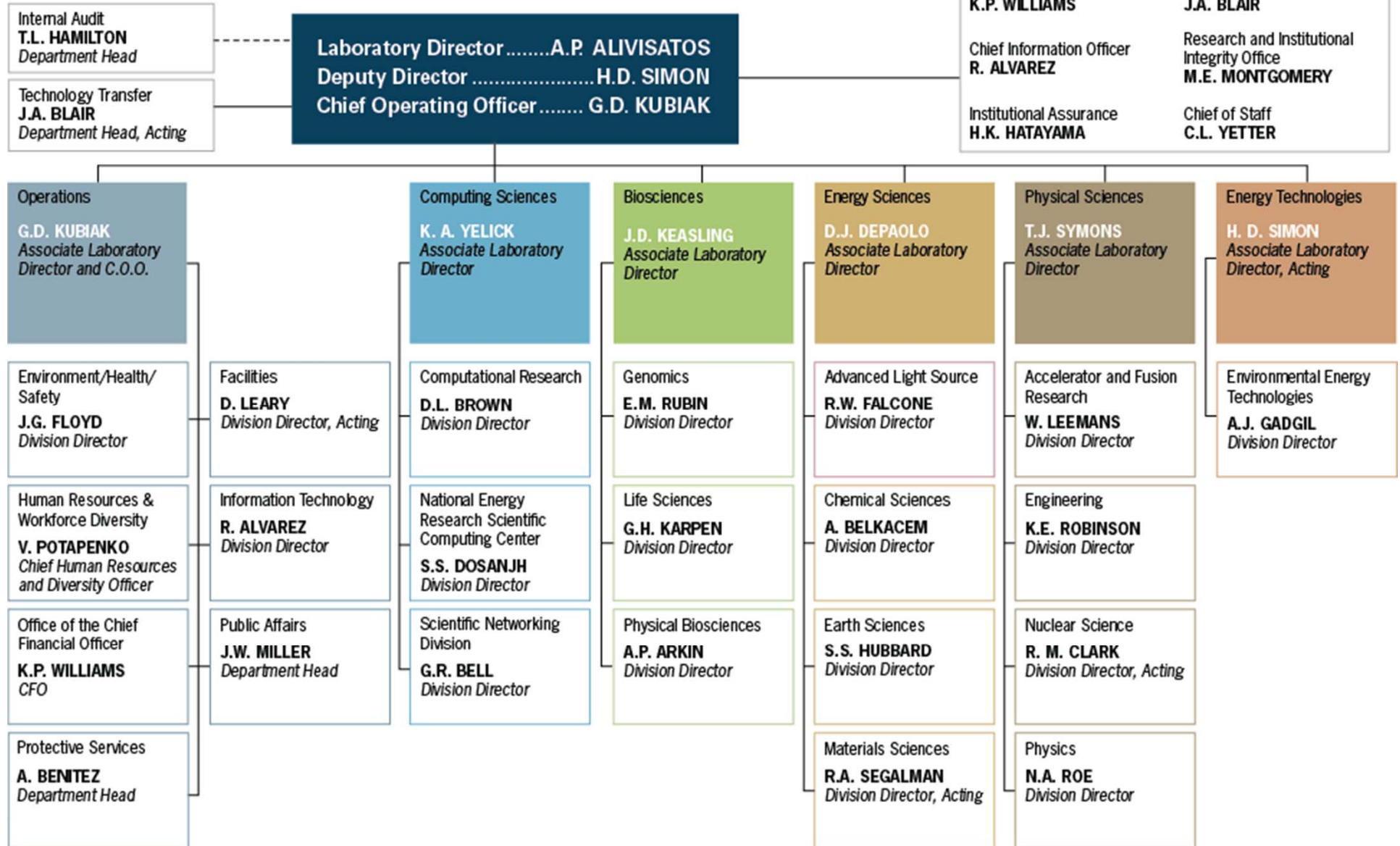


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# LBNL Organization

Lawrence Berkeley National Laboratory  
University of California

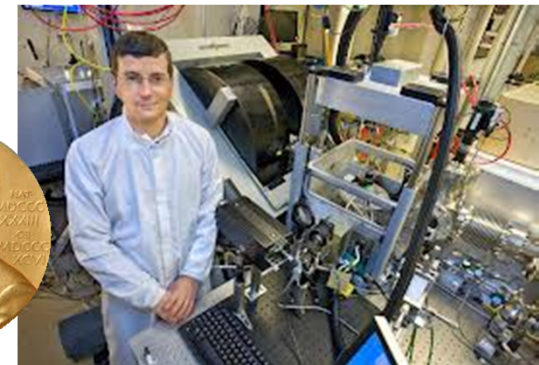


# Laboratory Directed Research and Development (LDRD)

“The purpose of the LDRD program is to encourage innovation, creativity, originality, and quality to keep the Laboratory’s research activities and staff at the forefront of science and technology.”

\$20+M at Berkeley Lab; two proposal types:

- Institutional strategic initiatives (20-30% of total)
- Area/Division strategic initiatives

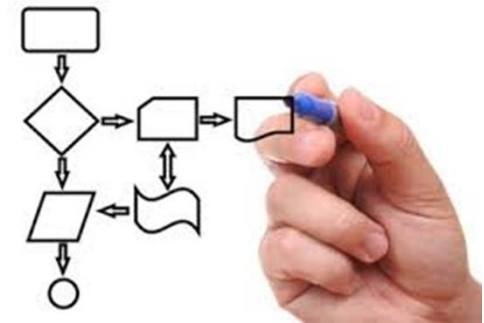


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# Extreme Data for Science at Berkeley Lab



$$\begin{aligned} \frac{dVar(t)}{dt} &= \\ &= - \int_{s_i(t)}^{s_i(t)+S} (g^{-1}F_s)_s - K \\ &= - \int_{s_i(t)}^{s_i(t)} (g^{-1}F_s)_s ds + \int_{s_i(t)}^{s_i(t)+S} (g^{-1}F_s)_s ds \\ &= -F_s |_{s_i(t)} - g^{-1}F_s |_{s_i(t)} + \left[ g^{-1}F_s |_{s_i(t)+S} - g^{-1}F_s |_{s_i(t)} \right] + \left[ g^{-1}F_s |_{s_i(t)+S} - g^{-1}F_s |_{s_i(t)} \right] \\ &= -2 (g^{-1}F_K K_s) |_{s_i(t)} + 2 (g^{-1}F_K K_s) |_{s_i(t)} \end{aligned}$$



Leverage Berkeley Lab talent in math, computer science, interdisciplinary team science, networking, software engineering and our new infrastructure to enable new modes of inquiry and discovery from scientific data sets



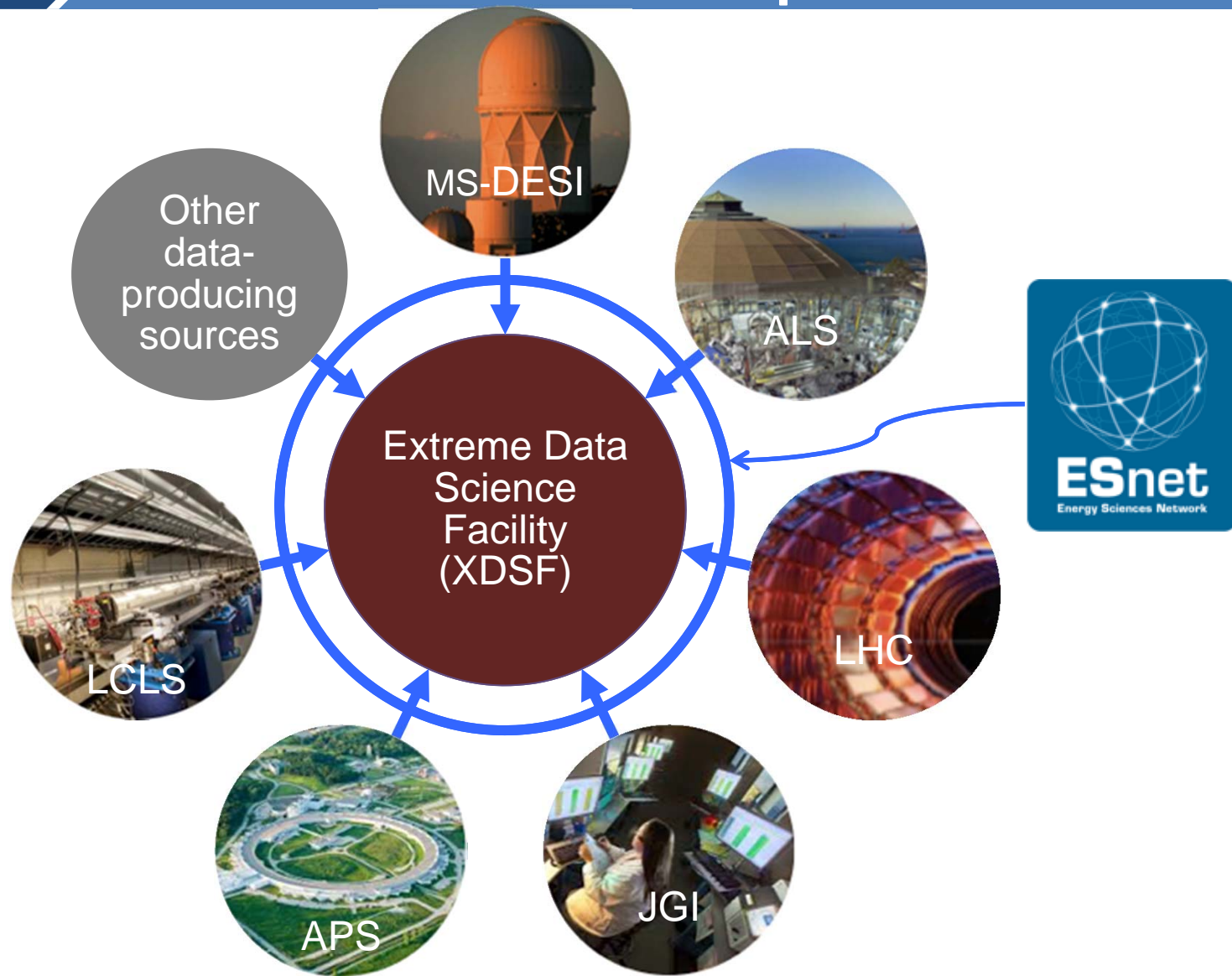
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# Extreme Data Scientific Facility (XDSF) Concept



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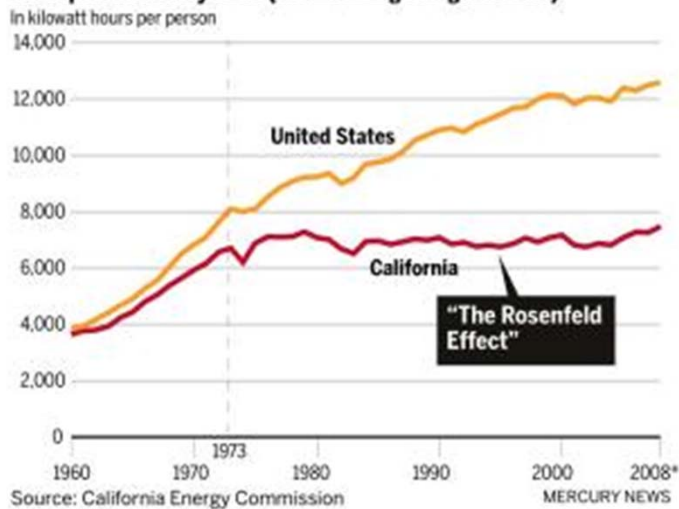
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# Energy innovation: Berkeley Lab's history of success

## "The Rosenfeld Effect"

Though electricity use has risen sharply in the United States, California's per capita electricity use has remained relatively flat since 1973 because of the state's strict efficiency regulations. This leveling is dubbed "The Rosenfeld Effect," after physicist Arthur Rosenfeld who has championed the energy conservation movement since the '70s.

### Per capita electricity sales (not including self-generation)



## Technologies and

- Efficiency Standards (CA vs. US) and policy assistance
- Buildings, lighting technology
- Foundational work in lithium ion batteries

## Startups

- 30 Berkeley Lab spinoffs contribute \$695M to Bay Area and \$2.8B nationally each year

