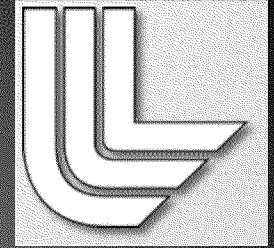


# CES-21 Overview



J u l i o F r i e d m a n

C h i e f E n e r g y T e c h n o l o g i s t

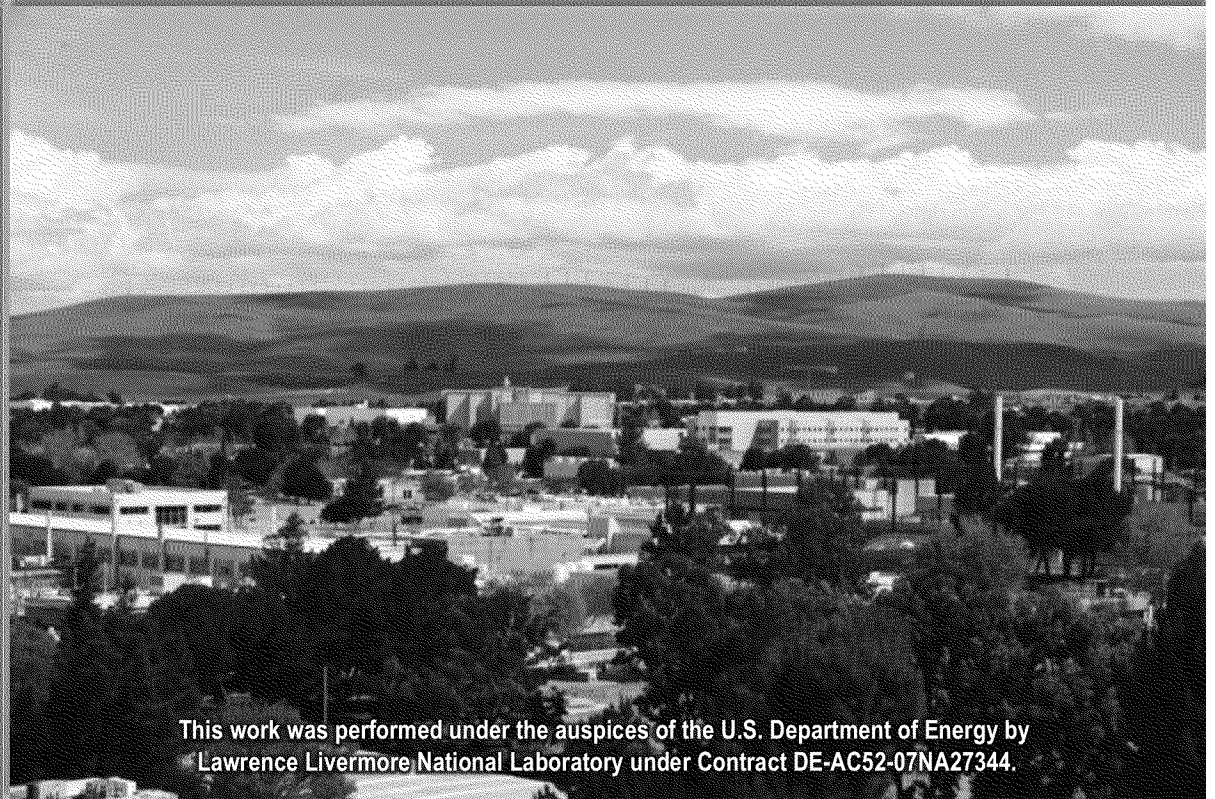
L w e n c e L i v e r m o r e N t i o n a l L a b o r a t o r y L w e n c e L i v e r m o r e N t i o n a l L a b o r a t o r y

Commissioner Mark J. Ferron  
CA Public Utilities Commission

Michael Picker  
Senior Advisor to the Governor  
Renewable Energy Facilities  
State of California

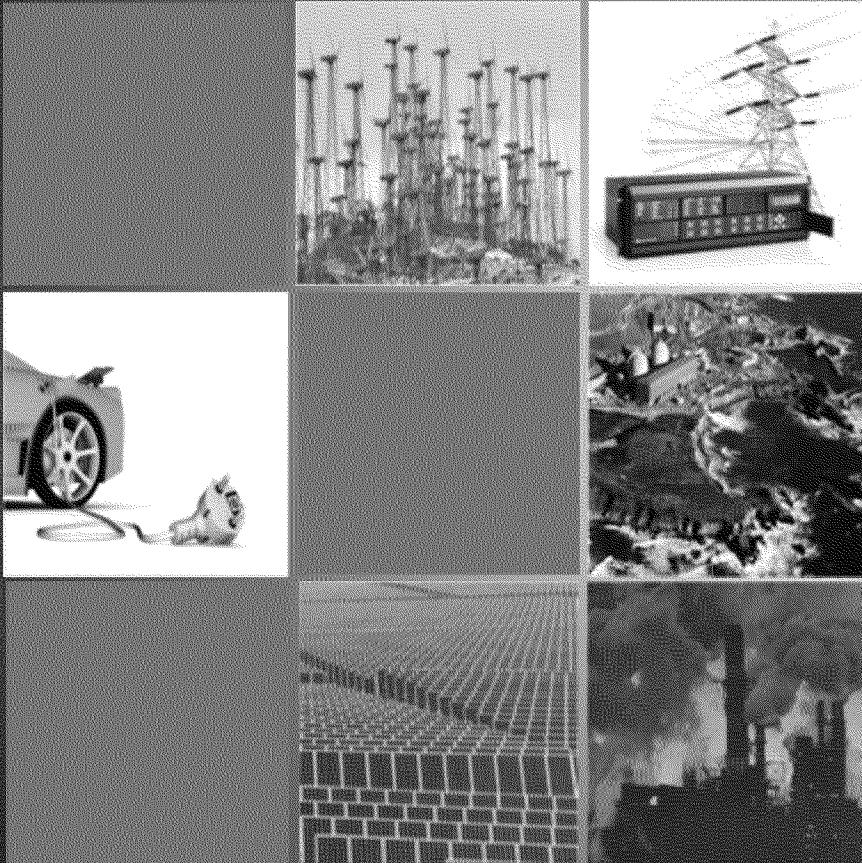
Sept. 18<sup>th</sup>, 2012

LLNL-PRES-583634



This work was performed under the auspices of the U.S. Department of Energy by  
Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344.

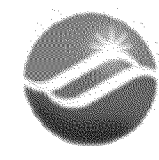
# California's power sector is making revolutionary end-to-end changes to the energy system



## 21<sup>st</sup> Century Challenges

- Renewable integration
- Operational complexity
- Electric transportation
- Data collection and analysis
- Increase in demand
- Aging infrastructure
- Cyber security
- Economic competitiveness

# Partnership for 21st century

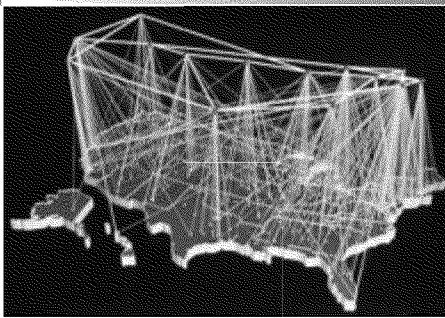


**Investor-Owned Utilities (IOUs)**

**Lawrence Livermore National Laboratory**

Experts in power transmission, infrastructure security, providing efficient and reliable

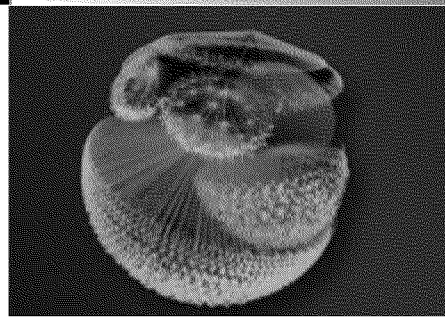
Expertise in solving complex problems with the best solution. Because of our support, we are able to provide



Planning



Operations



Security



Workforce



Lawrence Livermore National Laboratory

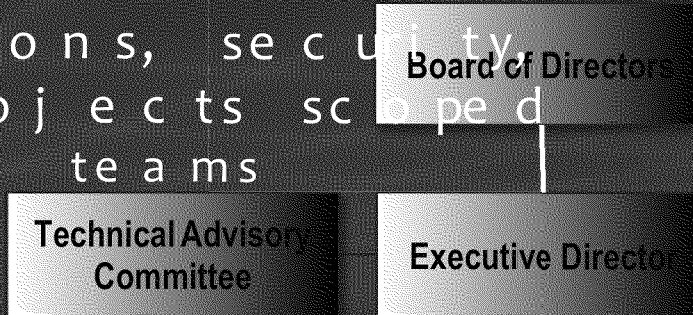
CPUC - Ferron



# Governing board will app

Planning, operations, security, and workforce projects scope d

- ▣ IOU technical teams
- ▣ LLNL
- ▣ CUC, CEC, ISO



Board of Directors prioritizes and approves projects

- ▣ ROI based
- ▣ Regular review
- ▣ milestones & deliverables



Expect mix of projects

- ▣ All four theme areas
- ▣ All resources considered (Labs, universities, industry)
- ▣ Exploit high performance computing

# High-performance computing resources are dedicated to this project

Leading edge capability

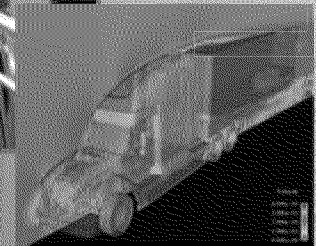
- ☐ Modeling and simulation
- ☐ Data analytics
- ☐ Computer science and math

Prioritized Availability

Secure Computing

High Performance Computing

Innovation Center



# CES-21 will deliver solutions to our nation's energy challenges

Modeling & Simulation

Renewable Energy

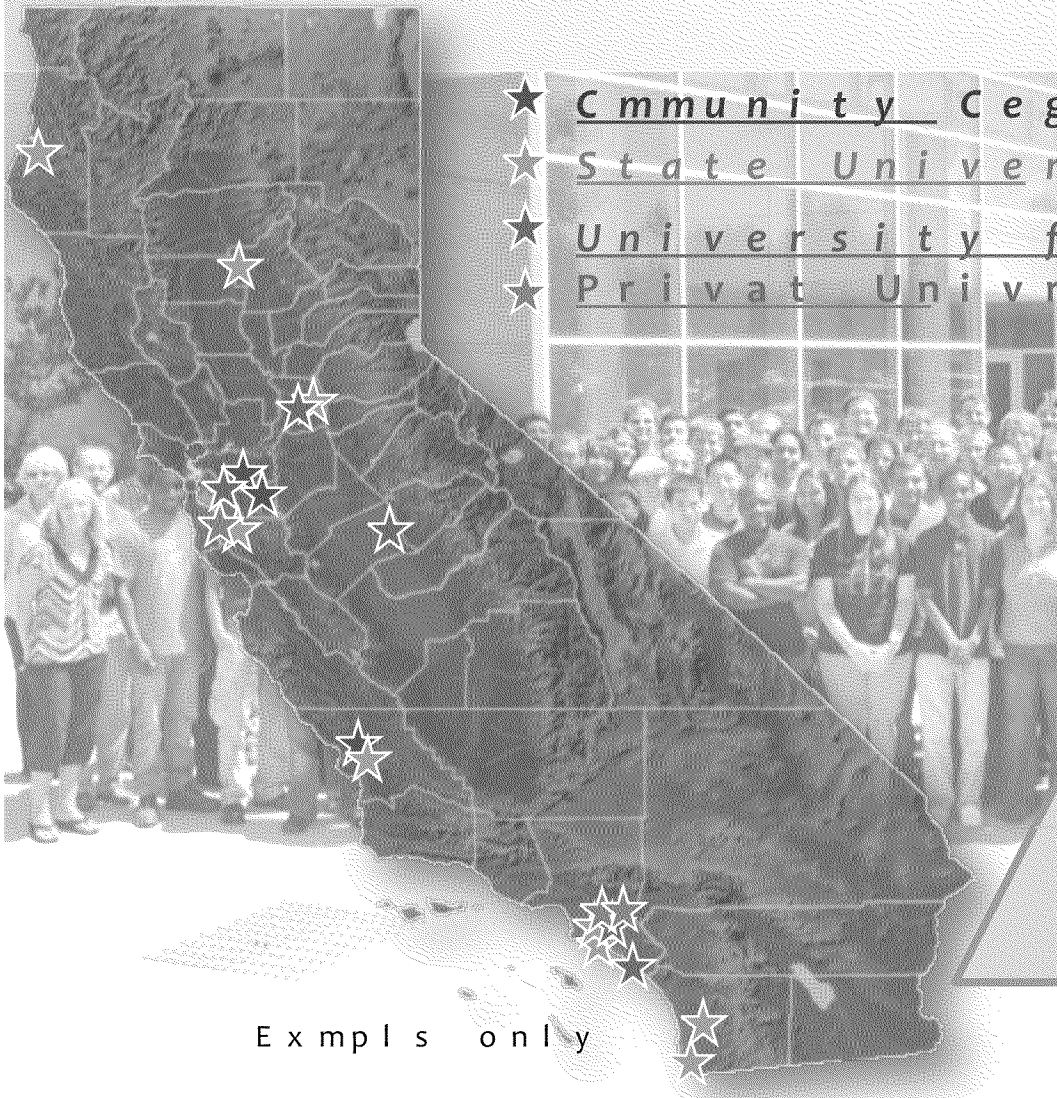
Cyber Security

## New Capabilities from CES-21

- Salient investment in integrated demand response
- Improved safety and emergency response
- Real-time operational and coupled gas and electric systems
- New "transparent" information for system makers

Improved information for decision policy and investments on a multi-scale

CES - will finance and integrate  
for thousands of utility workers



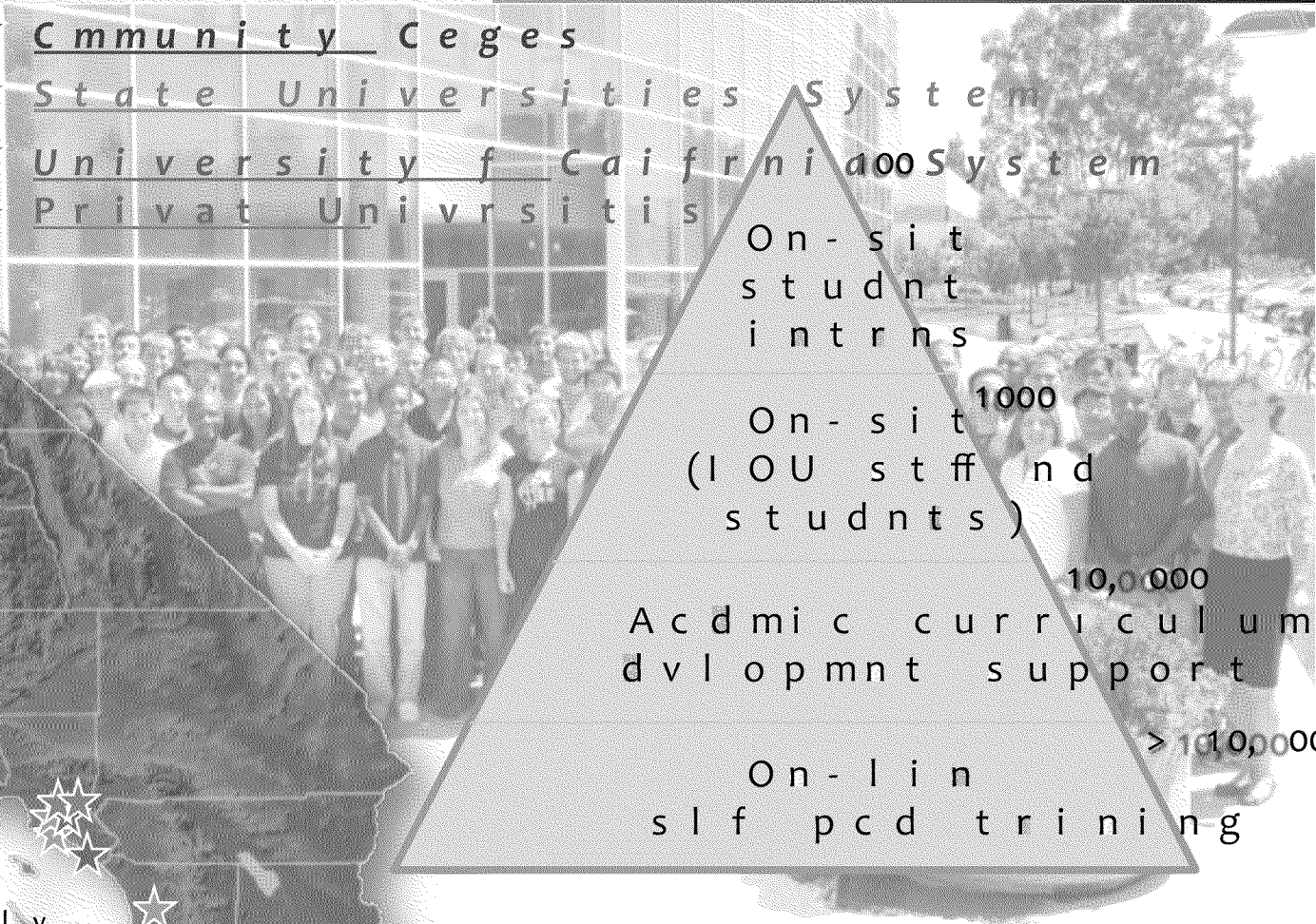
- ★ Cmmunity Ceges
- ★ State Universities System
- ★ University of California System
- ★ Privat Univrsitis

On-sit  
studnt  
intrns

On-sit <sup>1000</sup>  
(IOU stff nd  
studnts)

Acdmic curriculum  
dvlopmnt support <sup>10,0000</sup>

On-lin  
slf pcd trining <sup>> 100,0000</sup>



\* \* \* \* \*

\* \* \* \* \*

\* \* \* \* \*  
\* \* \* \* \*  
\* \* \* \* \*  
\* \* \* \* \*

\* \* \* \* \*  
\* \* \* \* \*  
\* \* \* \* \*  
\* \* \* \* \*  
\* \* \* \* \*  
\* \* \* \* \*  
\* \* \* \* \*

\* \* \* \* \*

\* \* \* \* \*  
\* \* \* \* \*  
\* \* \* \* \*

\* \* \* \* \*  
\* \* \* \* \*  
\* \* \* \* \*