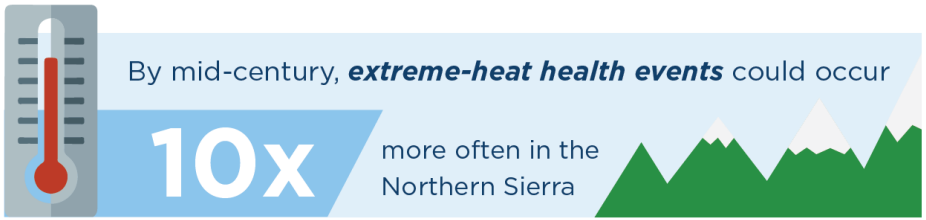
California
Energy Commission

Innovating Our Way to a Low-Carbon Future

CleanTech Innovation Showcase
June 24, 2019

Laurie ten Hope, Deputy Director
Energy Research and Development Division

Driving Innovation: California's Climate Is Changing

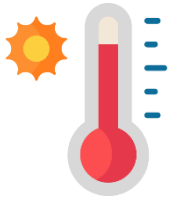


http://www.climateassessment.ca.gov/state/docs/20190116-StatewideSummary.pdf

Climate Risks in the Northwest

Given a change of 1.5°C

67% more days exceeding 90°F

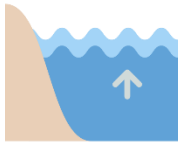


↑ heat-related illness and death
- stressed salmon populations
↑ algal blooms

38% smaller snowpack

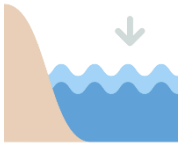
↓ water storage
- irrigation shortages
↓ revenue from recreation

16% higher winter streamflow



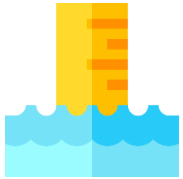
- river flooding
↑ spending on flood protection
- stressed salmon populations

32% lower summer streamflow



↓ hydro power
- water resource disputes
- stressed salmon populations

1.4 feet sea-level rise by 2100



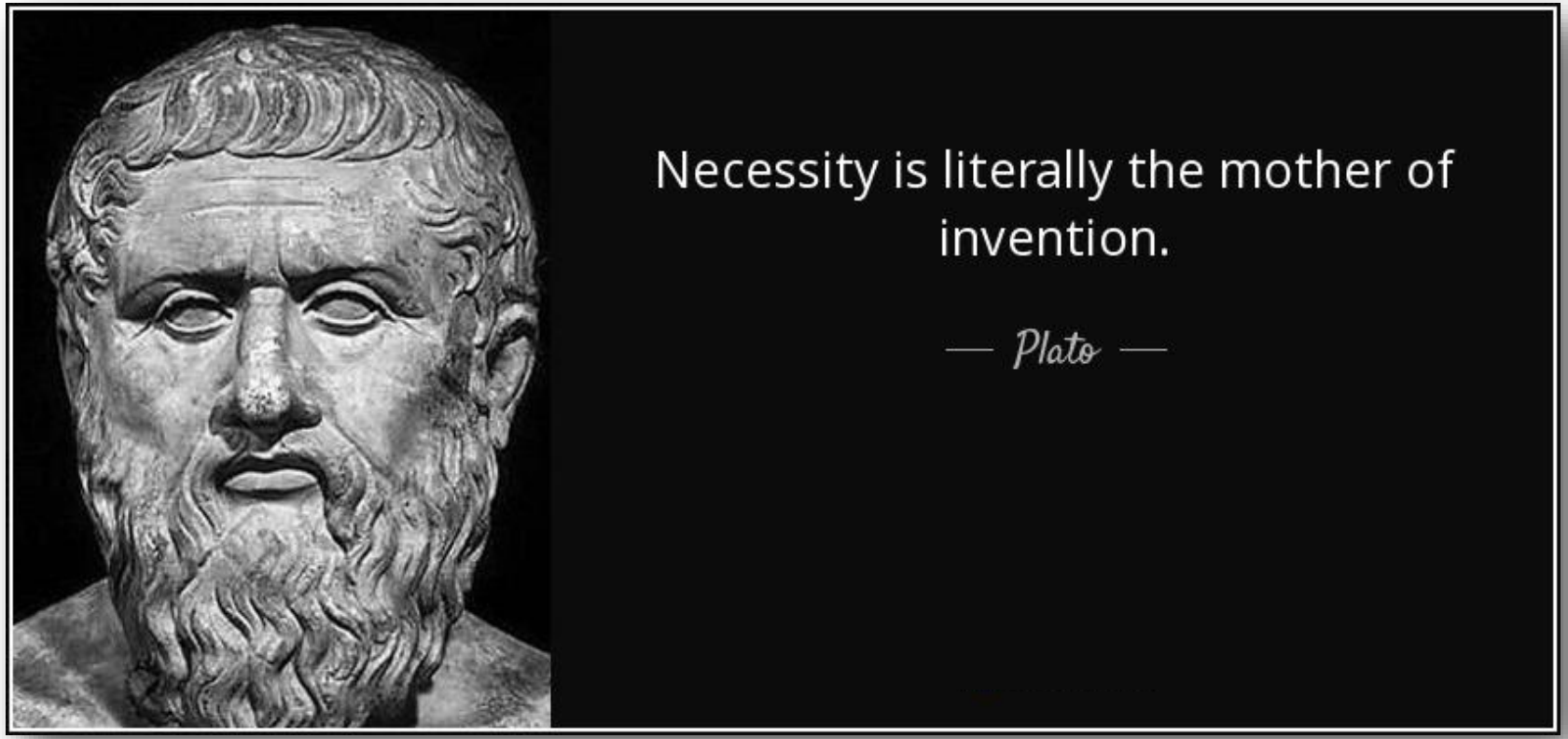
- coastal flooding
- damaged infrastructure
- eroded bluffs

Snover, A.K., C.L. Raymond, H.A. Roop, H. Morgan, 2019. "No Time to Waste. The Intergovernmental Panel on Climate Change's Special Report on Global Warming of 1.5°C and Implications for Washington State." Briefing paper prepared by the Climate Impacts Group, University of Washington, Seattle. *Updated 02/2019*

Climate Mitigation Calls for Aggressive Decarbonization

	Sector	2050 GHG reduction strategy
Efficiency	Buildings	34% reduction in total building energy demand, relative to 2015
	Transportation	24% reduction in per capita light-duty vehicle miles traveled relative to 2015
	Industry	30% reduction in industrial energy demand relative to 2015 90% reduction in refinery and oil & gas extraction energy demand
Electrification	Buildings	100% new sales of water heaters and HVAC are electric heat pumps
	Light-duty vehicles	35 million ZEVs (96% of total) and 100% of new sales are ZEVs
	Trucks	47% of trucks are BEVs or FCEVs (31% of trucks are hybrid & CNG) 88% electrification of buses, 75% of rail, and 80% of ports
Low carbon fuels	Electricity	96% zero-carbon electricity (including large hydro)
	Advanced Biofuels	46% of total (non-electric power generation) fossil fuels replaced with advanced biofuels
Non-combustion GHGs	Reductions in methane and F-gases	62% reduction in methane and F-gas emissions relative to 2015 42% reduction in other non-combustion GHGs relative to 2015

Source: Energy+Enviromental Economics


Necessity is literally the mother of invention.
— Plato —

Fostering Innovation Across the Energy Sector

Mission: strategically invest funds to catalyze change and accelerate achievement of policy goals

Strategy: advance energy technology, facilitate customer learning, and strategic targeted intervention

Funding:

- Electric Program Investment Charge (EPIC),
  $133 million annually
- Natural Gas Research, Development and Demonstration Program,
  $24 million annually
- Food Production Investment Program,
  $124 million biennially
- Low Carbon Fuels R&D Program,
  $18 million, one-time general fund expenditure authority

Innovation Ecosystem | Overview

Core Development Grants

Applied Research Grants
$53 M per year

Technology Demonstration & Deployment Grants
$50 M per year

Core Demonstration Grants

Targeted Intervention

CalSEED
- Concept award - $150,000
- Prototype award - $450,000

Innovation Clusters
- Identify 1st target market
- Identify manufacturing and supply chain requirements

BRIDGE
- Awards follow-on funding for successful federal- or CEC-funded R&D projects.

CalTestBed
- Statewide network of open-access testbeds for startups

RAMP
- Accelerate time to reach MRL 8 at CA manufacturing facilities.

Procurement Assistance
- Overcome technology "lock in" barriers in customer procurement practices

Phase I

Phase II

Building a Statewide Innovation Ecosystem

CalSEED

BLUETECH VALLEY

SOUTHERN CALIFORNIA ENERGY INNOVATION NETWORK
Imperial | Riverside | San Bernardino | San Diego

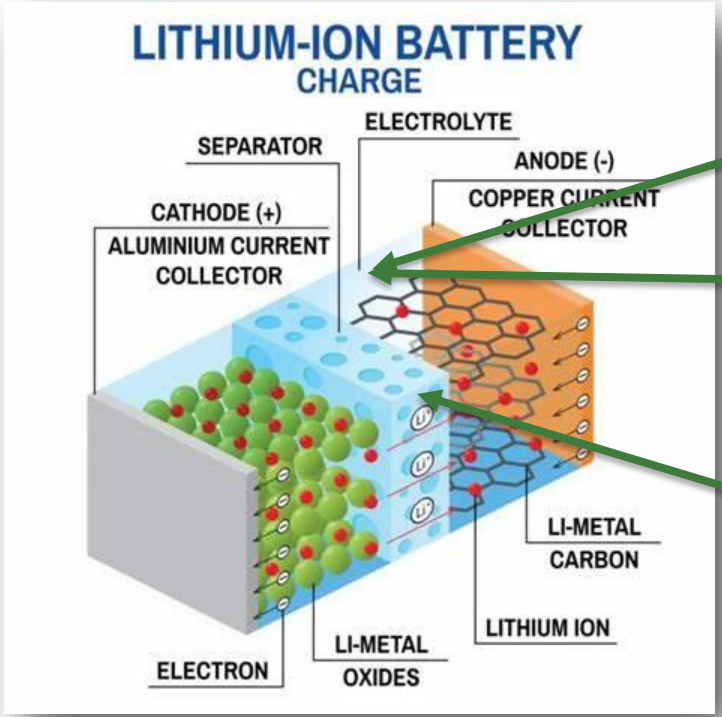
cyclotronroad LACI

- Since the ecosystem's inception:
  - Start-up companies have attracted **$88 million** in private and public funding.
  - Ecosystem partners have secured **$4.4 million** in federal funding to expand entrepreneurial services.

CalTestBed

- Statewide voucher program that will provide technology developers access to testing and certification facilities.
- Accelerates the transition form the prototype stage into field trials.
- Initially launching with participation from all 10 University of California campuses, LBNL, and LLNL.
- Expected launch in **early 2020.**

Ecosystem Example: Advancing Battery Technologies

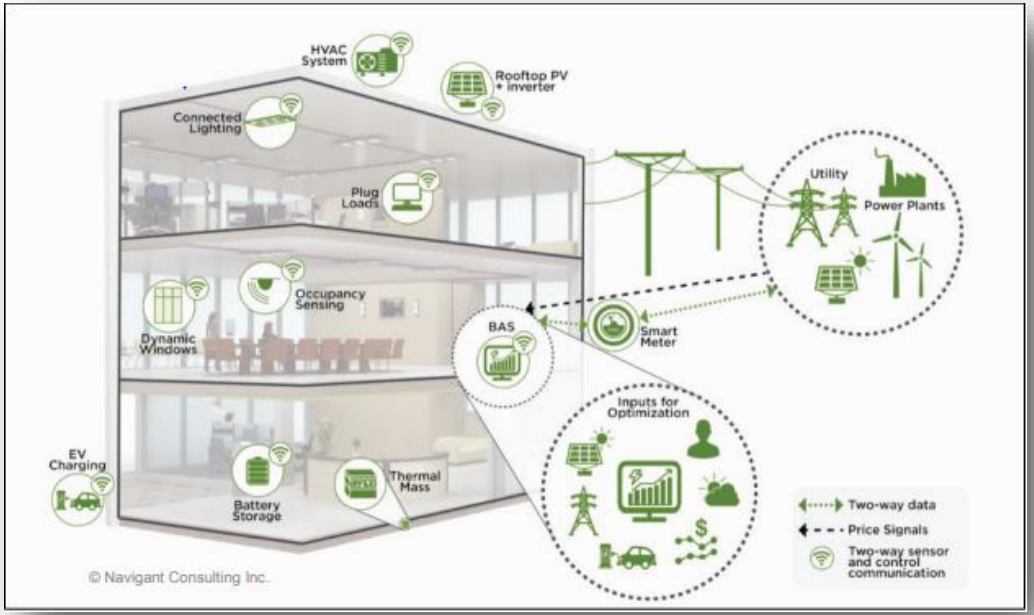


SOUTH 8 TECHNOLOGIES

CUBERG

SEPION TECHNOLOGIES

Ecosystem Example: Innovations in Grid Interactive Buildings



ENERDAPT
ENERGY SAVINGS. SIMPLIFIED.

NUVVE

NEXT
Next Energy Technologies Inc.

Scaling Techs in Challenging Markets: Efficiency Retrofits in MF Housing

Significant improvements in retrofit production speed and cost reductions are **critical** to realizing mass deployment of energy efficiency improvements.

Rocky Mountain Institute, Association for Energy Affordability, Integral Group, UC Davis, David Baker Architects, Stone Energy, Prospect Silicon Valley, SF Dept of the Environment and CA Housing Partnership Corporation

Demonstrating a business model for large scale energy efficiency retrofits in disadvantaged communities.

- Reduce retrofit package costs by 50%
- Increase access to capital for EE measures
- Generate owner and manufacturer demand
- Develop replicable integrated EE packages

Potential measures:

- Panelized envelopes (insulation + fenestration)
- Multifunction mechanical pods (HVAC, DHW, etc.)
- 110 V heat pump
- Thermal mass w/phase change materials
- Induction ranges
- Energy recovery systems

The Next EPIC Challenge: Reimaging Affordable Mixed-Use Development

Climate change and the affordable housing crisis are two of the most significant challenges facing California, requiring systemic change to the way buildings are planned, designed, financed, and ultimately built.

The EPIC Challenge is a $19M(+) competition to challenge multi-disciplinary teams to design and build a mixed-use development concept that is:

- Equitable, affordable and safe.
- Free of GHG emissions and criteria pollutants
- Attractive from a market standpoint to developers, building owners, and occupants.

Emerging Opportunities with Microgrids Economic, Resilient, and Sustainable Benefits

Charge Bliss & Kaiser

Borrego Springs

Blue Lake Rancheria

Bosch DC Microgrid

Las Positas Community College

City of Fremont Fire Station

Laguna Waste Water Treatment Plant

Addressing Technology Lock-in with Procurement Tools

UCDAVIS Energy and Efficiency Institute

Energy Product Evaluation Hub
Evaluating market-ready clean energy technologies for commercial and institutional customers and making evaluations readily accessible online through buyer's guides.

MyFleetBuy

Software with a mobile component that tracks vehicle type, driving behavior, and routes to give fleet managers insight needed to confidently switch to EVs.

PROSPECT Silicon Valley

Opportunities for Procurement to Accelerate Clean Energy
Help technology providers navigate institutional procurement channels and procurement managers organize group procurements.

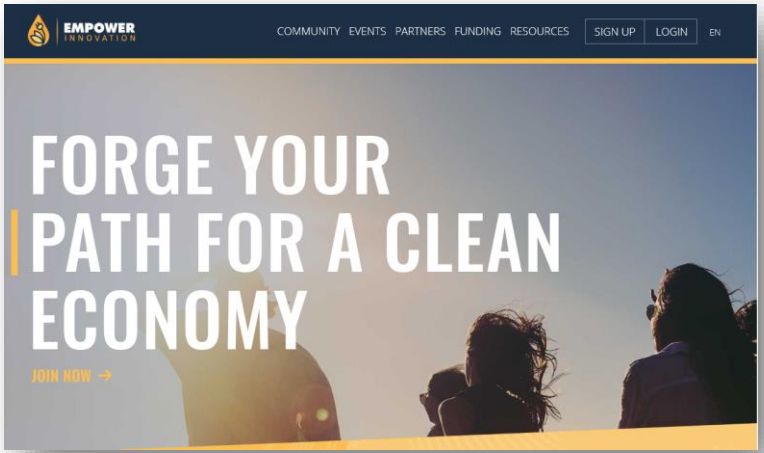
TRADEPRO CONNECT

Online platform for commercial and residential customers to connect with DER products, and qualified contractors while simplifying the bidding process.

Benefiting All Californians

A minimum of 25% of EPIC demonstration projects will be invested in disadvantaged communities and an additional 10% in low-income communities.

- Project selection criteria will assess localized health impacts & project benefits
- Solicitations will require inclusion of community-based organizations as paid projects partners
- Expanding community engagement by deepening relationships with CBO's through traditional and digital methods
- Empower Innovation Tool: Provides curated resources to connect underserved communities with clean energy resources and accelerate the build out of our energy future. Visit: www.empowerinnovation.net



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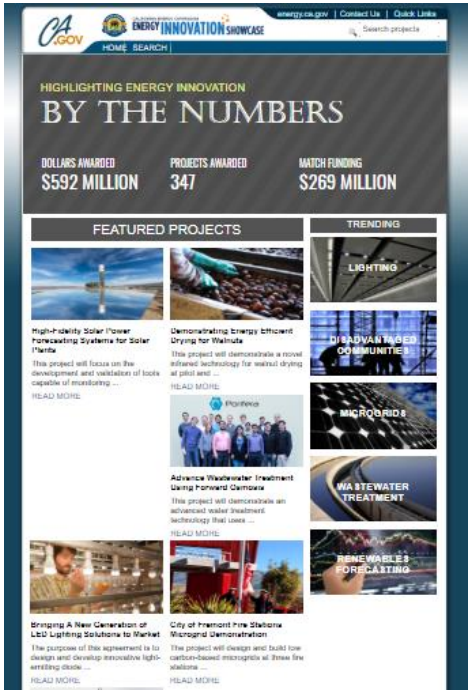

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