



U.S. DEPARTMENT OF  
**ENERGY**

Office of the  
**UNDER SECRETARY  
FOR SCIENCE AND ENERGY**

# Energy Earthshots Overview

Briefing to the Secretary of Energy Advisory Board

**Dr. Kathleen Hogan**

**Acting Under Secretary for Science and Energy**

October 28, 2021

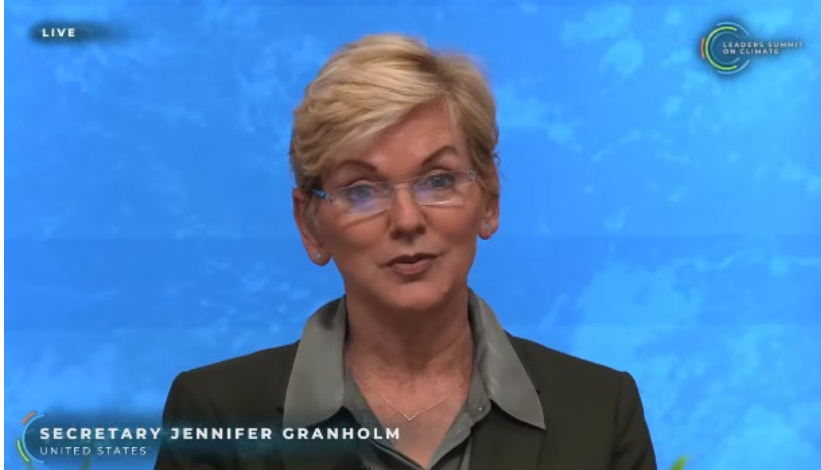


# President's Leaders Summit on Climate



...I've asked the Secretary of Energy...to speed the development of critical technologies to tackle the climate crisis. **No single technology is the answer** on its own because every sector requires innovation to meet this moment.

President Joseph R. Biden  
April 23, 2021



"Over the coming weeks...DOE will be announcing **new goals** for bold, achievable leaps in next-generation technologies—

**This is our generation's Moonshot."**

Secretary Jennifer M. Granholm  
April 23, 2021



# Energy Earthshots: Necessary and Urgent

Energy Earthshots target the *remaining major RD&D breakthroughs* we know *we must achieve in the next decade* to solve the climate crisis and *reach our 2050 net-zero carbon goals*.

## Energy Earthshots:

- Make a major impact towards advancing GHG emissions reduction
- Demonstrate U.S. global leadership
- Address a difficult-to-solve remaining technology barrier
- Achieve a highly ambitious performance target within a decade
- Communicate a compelling, bold, inspirational challenge
- Significantly engage stakeholder groups



# Current Energy Earthshots Portfolio



1 Dollar



1 Kilogram



1 Decade

Exclusive: DOE launches push to meet hydrogen "Earthshot" goal

- [Axios, June 7, 2021](#)

## Hydrogen Shot Summit: Aug 31-Sept 1, 2021

- Convened thousands of stakeholders from across the US & around the world
- 4900+ total registrants; 3,200+ participants; 48 states + DC; 33 countries + USA



Reduce storage costs by **90%** from a 2020 Li-ion baseline...



...in storage systems that deliver **10+** hours of duration



...in **1** decade

***Energy Department Targets Vastly Cheaper Batteries to Clean Up the Grid***

- [New York Times, July 14, 2021](#)

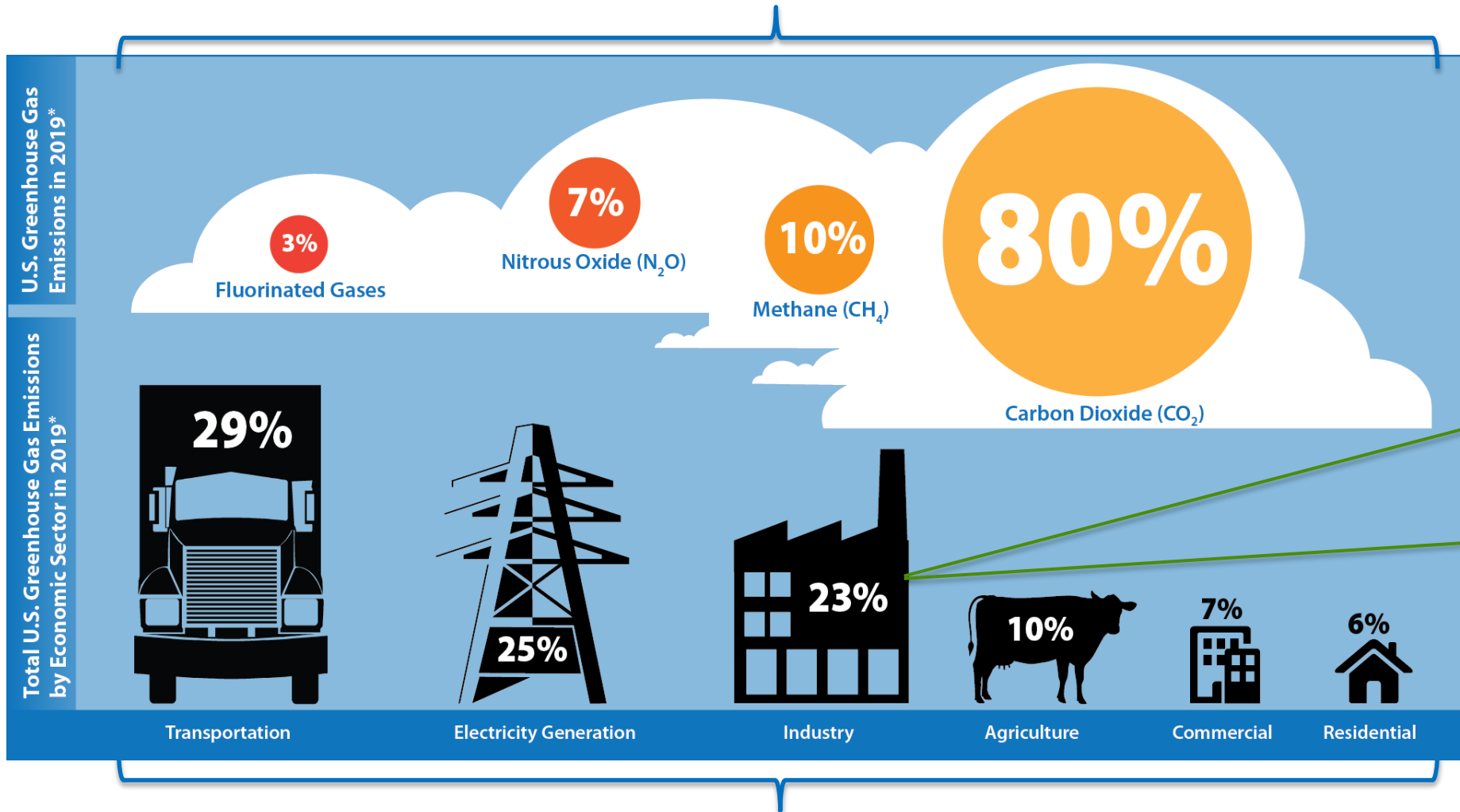
## Long Duration Storage Shot Summit: Sept 22-23, 2021

- Attendees spread across government, industry, trade groups, academia, international
- 2187 Registered; 1100+ Attendees



# Addressing the Hardest Remaining Challenges

Address non-CO<sub>2</sub> GHG emissions and Remove CO<sub>2</sub>



Administration Goals:

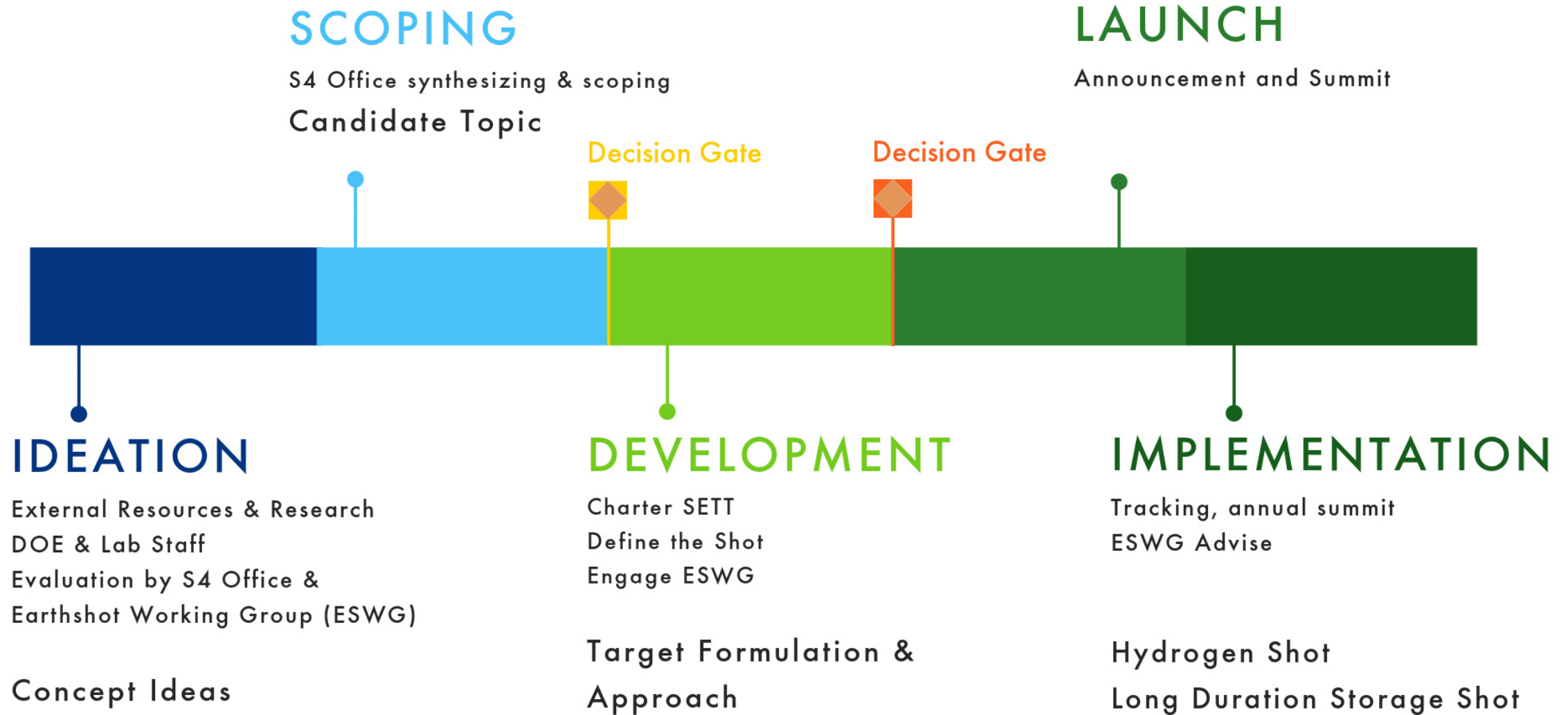
- 50-52% reduction in Carbon emissions by 2030
- 100% Carbon-Free Electricity by 2035
- Net-Zero Economy Wide by 2050
- Justice 40
- Job Creation

## Strategies for Industrial Decarbonization

- Electrification
- Enhance Efficiency
- Low Carbon Fuels
- Carbon Capture

Transform the Generation and Use of Energy

# Energy Earthshots: Development Pipeline



# Energy Earthshots: Support Structure

Earthshots Working Group  
DOE Senior Leaders  
(Advisory Role)

- Energy Efficiency and Renewable Energy
- Fossil Energy and Carbon Management
- Office of Nuclear Energy
- Office of Science
- Office of Electricity
- Office of Technology Transitions
- Office of the Secretary of Energy
- Office of Policy
- ARPA-E
- Office of Economic Impact and Diversity
- SunShot Initiative Representative

Hydrogen  
SETT

S4 SEPM

Co-Leads: EERE; BES; FECM

Energy Storage  
Grand Challenge/SETT

S4 SEPM

Co-Leads: OE & EERE

Carbon Management  
SETT

S4 SEPM

Co-Leads: FECM; BES; EERE;  
ARPA-E

Core Team Members come from: ARPA-E, EERE, FECM, NE, OE, OS  
Support from: PA, CI, IA, and National Laboratories



Kathleen Hogan  
Acting U/S for  
Science &  
Energy



Ali Douraghy  
Chief of Staff



Kelly Visconti  
Crosscut Team  
Lead

# Energy Earthshots: Implementation

- **Stakeholder Engagement**
  - Launch and Annual Summits
  - Requests for Information
  - Technical workshops and interchanges
- **Planning and Execution**
  - Integrated roadmapping
  - Identify RDD&D gaps
  - Budget process input
  - Coordinate funding opportunities
  - Interagency coordination and alignment
- **Track and Report Progress**
  - Establish baseline metrics methodology
  - Measure, track and report progress

*Active Engagement:  
From Ideation to  
Implementation*



**BACKUP**

# Bipartisan Infrastructure Provisions

## Hydrogen

- Clean Hydrogen Electrolysis Program – sec. 40314
- Regional Clean Hydrogen Hubs – sec. 40314
- Clean Hydrogen Research and Development Program – sec. 40314
- National Clean Hydrogen Strategy and Roadmap – sec. 40314
- Clean Hydrogen Manufacturing Recycling Research, Development, and Demonstration Program – sec. 40314
- Clean Hydrogen Production Qualifications – sec. 40315

## Energy Storage

- Preventing Outages and Enhancing the Resilience of the Electric Grid / Hazard Hardening – sec. 40101
- Electric Grid Reliability and Resilience RD&D – sec. 40103
- Deployment of Technologies to Enhance Grid Flexibility – sec. 40107
- Energy Storage Demonstration Pilot Grant Program – sec. 41001(a) / 40112
- Long Duration Demonstration Initiative and Joint Program – sec. 41001(b)
- Study of Codes & Standards for use of Energy Storage Systems across Sectors – sec. 40111
- Pumped Storage Hydropower Wind and Solar Integration and System Reliability Initiative – sec. 40334
- Electric Drive Vehicle Battery Recycling and Second-Life Applications Program – sec. 40208

## Carbon Management

- Carbon Utilization Program – sec. 40302
- Carbon Capture Technology Program – sec. 40303
- Carbon Dioxide Transportation Infrastructure Finance and Innovation Program Account (CIFIA) – sec. 40304
- Carbon Storage Validation and Testing – sec. 40305
- Carbon Removal / Regional Direct Air Capture Hubs – sec. 40308(j)
- Carbon Capture Demonstration and Pilot Programs / Carbon Capture Large-scale Pilot Projects – sec. 41004(a)
- Carbon Capture Demonstration and Pilot Programs / Carbon Capture Demonstration Projects Program – sec. 41004(b)
- Direct Air Capture Technology Prize Competition / Precommercial – sec. 41005(a)
- Direct Air Capture Technology Prize Competition / Commercial – sec. 41005(b)

# Energy Earthshots: Framework

## MISSION

### Ambitious

*Bold and aspirational at the scale of 2030 and 2050 necessity*

### Technology focused

*Establishes cost, performance or other target in a specific DOE tech space*

### Purposeful

*Singularly focused on reducing emissions at scale and foundational to U.S. clean energy agenda*

### Leading the way

*Places DOE and U.S. as central thought leader of global clean energy trajectory*

## STRATEGIC ALIGNMENT

### Resources aligned

*Coordinated DOE budget requests*

### Informed with strategic planning

*Science to applied energy near- and long-term RDD&D vision, analysis and periodic reassessments*

### Stakeholders engaged

*Engages stakeholders from universities, national labs, industry throughout each stage*

## IMPLEMENTATION

### Clearly-communicated

*Clear, compelling, highly-visible core message tied to DOE innovation story*

### Measurable progress

*Innovation progress evaluated against benchmark targets*

### Jobs, economic, and energy justice

*Impact assessments on opportunity for job creation, equity, and domestic economy*

### Decisive

*Allows DOE to become more risk tolerant, streamlined, and prioritized around achieving targets*