



CHANGING WHAT'S POSSIBLE

# Modeling-Enhanced Innovations Trailblazing Nuclear Energy Reinvigoration

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MEITNER Kickoff meeting  
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# MEITNER

- 1<sup>st</sup> fission program from ARPA-E
- \$30M available for 9 selected teams
- \$10M for Resource Team to provide key technical support





# MEITNER: Primary Design Target Areas

- ▶ **Goal:** Develop and demonstrate technologies that improve advanced reactor performance

ID	Metric	Units	State-of-the-Art	With New Technology*
1	Overnight construction cost	$\$/W_e$	2-7	< 2
2	On-site construction time	Months	> 60	< 24
3	Total staffing level (on-site & off-site)	FTE/GW <sub>e</sub>	450-750	< 50
4	Emergency planning zone (EPZ) <sup>+</sup>	Miles	10 and 50	0
5	Time before human response required for an accident	Days	3	> 30
6	Onsite backup power	kW <sub>e</sub>	> 0 kW	0
7a	Ramp rate without steam bypass	power capacity/min	5%	> 5%
7b	Process heat temperature	°C	N/A	> 500

# Why Did You Bring Us All Here?

- Help our teams succeed: access to information and resources
- Foster conversation
- Show the community what we're up to
- Get feedback on our ideas



# Who's Here?

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- The Performers
  - Resource Team Representatives
  - Stakeholder group:
    - Industry
    - Funders
    - Policy
    - Gov't: DoD, NASA, DOE-NE, DOE-LPO, GAIN
    - Legal
  - ARPA-E Program Directors, Fellows, T2M, and Technical Experts
- # who's who?

# What Is the Schedule About?

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- Useful information: DoD panel, TEA, Cost Drivers, LPO, OPEN+ cohort, upcoming opportunities
- Introduction to the Performers
- Information for the teams: export control, IP, T2M, our project management style
- Brainstorming for our next program
- Networking, making connections, and finding people who can help solve problems

# What is This Wednesday Signup Chaos?

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## First 30 minutes

- Stakeholder group: meet with Joel and me
- Performers: meet with RT for common questions

## Next 60 minutes

- Sign up for short meetings with specific stakeholders (setup to rotate through)
- Sign up for short meetings for specific RT Qs

## Final 90 minutes

- Sign up for one-on-ones with me or stakeholders





# Our Teams Tackle Key Areas

## Micro/small reactor



Los Alamos National Laboratory



HolosGen™

## Construction



## Components



## Safety

YELLOWSTONE ENERGY

NC STATE  
UNIVERSITY

ZACHRY

## Load Following

I  
ILLINOIS

# Tech To Market Approach



## SCOPE

Provide strategic market insights necessary to create innovative, commercially relevant programs

## MANAGE

Manage project teams' T2M efforts through T2M plans and jointly developed milestones

## ADVISE

Support project teams with skills & knowledge to align technology with market needs

## PARTNERSHIPS

Engage third-party investors and partners to support technology development towards the market

# ARPA-E Impact Indicators

Since 2009  
ARPA-E has  
provided

**\$1.8 billion**

in R&D funding to  
more than **660 projects**



**136 Projects** have  
attracted more than

**\$2.6 billion**

in private-sector follow-on funding



**71 projects**

have formed  
**new  
companies**



**109 projects**

have **partnered**  
**with other**  
**government**  
**agencies**  
to further  
development



**1,724**

peer-reviewed  
**journal articles**  
from ARPA-E  
projects



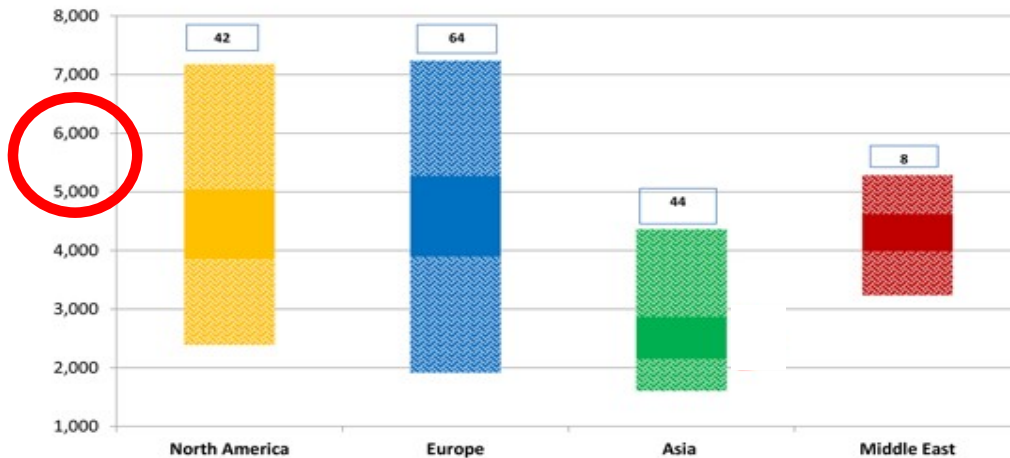
**245 patents**

issued by U.S.  
Patent and  
Trademark Office



# Motivation

Overnight capital cost range by region (US \$/kW)



Note: Data collected from various publications and studies to keep track of nuclear power plants investment costs, since 2008 (updated August 2014), *all data in 2013 USD*

- ▶ New build construction costs and times are large and unpredictable
- ▶ O&M is the bulk of operating cost

Avg. plant operating expenses (2015 \$/MWh)

Plant Type	Operation	Maintenance	Fuel	Total
Nuclear	11.17	7.06	7.48	25.71
Fossil Steam	5.16	5.41	26.70	37.26
Gas Turbine	2.34	2.68	28.22	33.24

# MEITNER Program Concept

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- ▶ ARPA-E is looking for *transformational technologies* that will enable advanced nuclear reactors to be commercially desirable products
- ▶ The new technologies will be evaluated in the context of a full advanced reactor plant design
- ▶ Techno-Economic Analysis, Modeling & Simulation, and Subject Matter Experts will provide feedback into the designs for integrated evaluation and strategic improvement
- ▶ Key experiments may also be done to strategically improve and/or demonstrate the technology
- ▶ **Result:** well-characterized reactors and technologies that can create a domestic supply chain