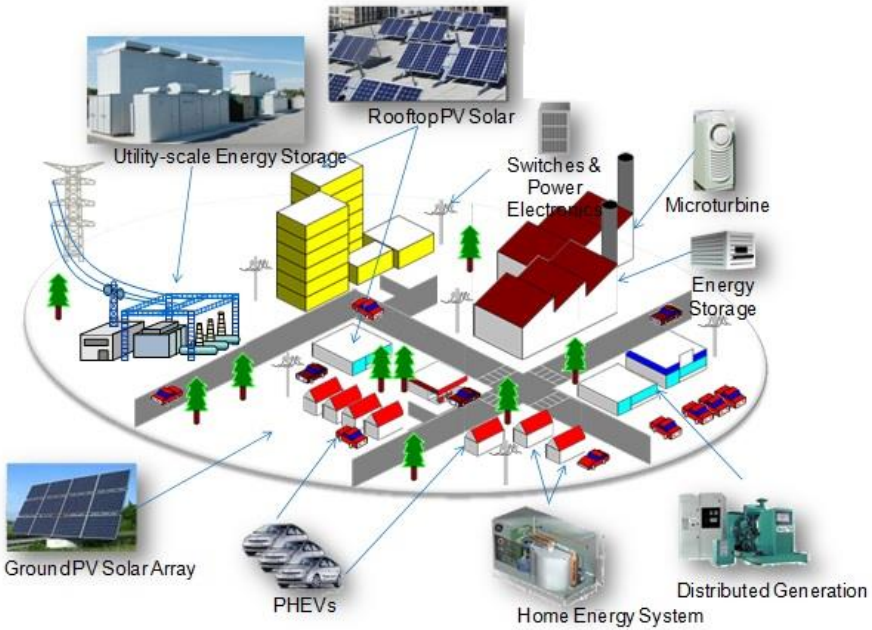


VOLTTRON Technical Meeting

Virginia Tech Advanced Research Institute

July 2015

MASSACHUSETTS CLEAN ENERGY CENTER

MASSACHUSETTS CLEAN ENERGY CENTER

Our mission

- **Accelerate** clean energy technologies, companies and projects
- **Create** high-quality jobs and long-term economic growth
- **Support** municipal clean energy projects
- **Invest** in residential and commercial renewable energy installations
- **Cultivate** a robust marketplace for innovation

Wind Turbine Testing Facility

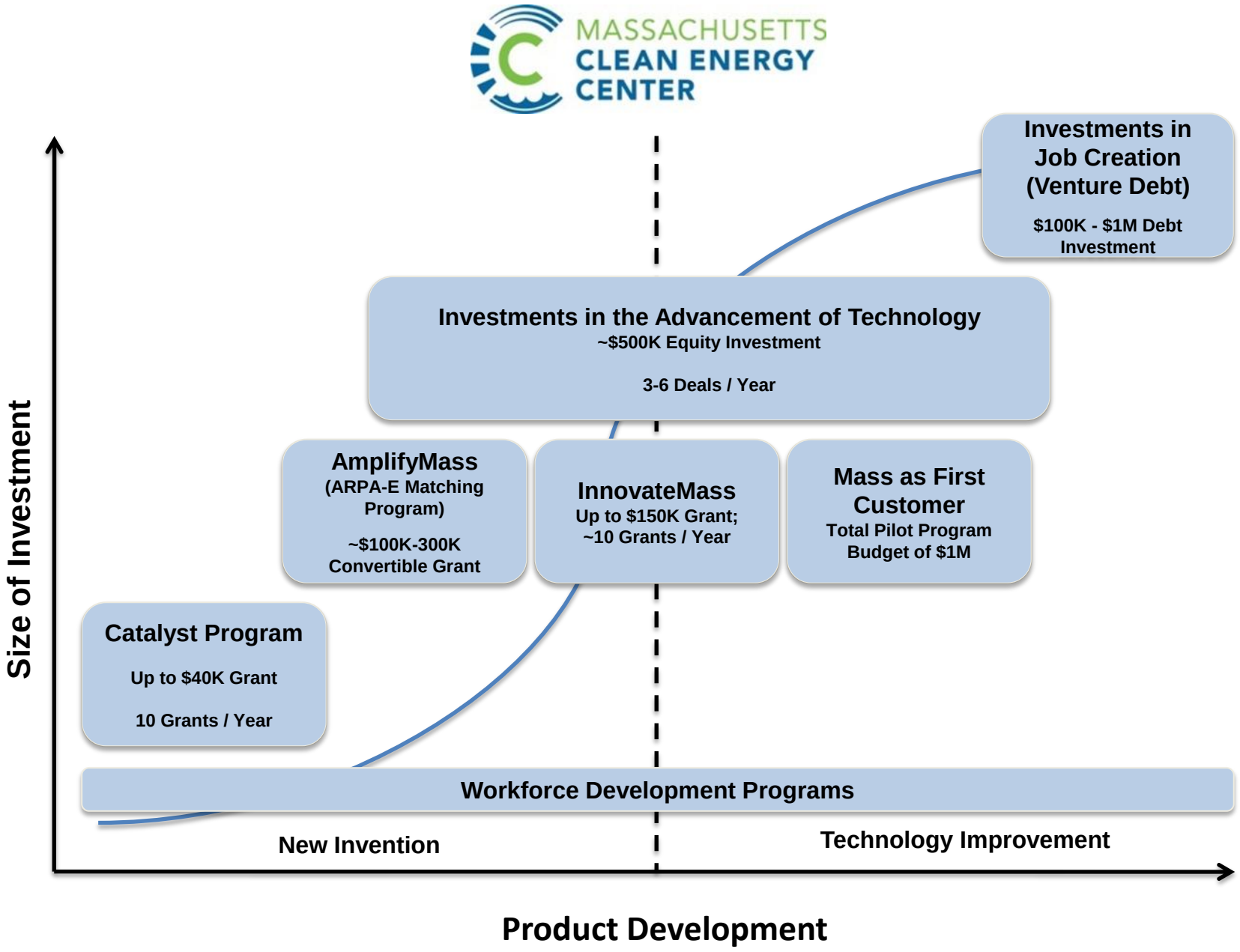
MASSACHUSETTS CLEAN ENERGY CENTER

Boston, Massachusetts

Mass Energy Landscape/Challenges

- MA #1 in energy efficiency but …
- Summer and peak demands rising
- Demand charges a competitiveness challenge
- MA Dept. of Public Utilities Grid Modernization process
- Limited AMI deployment
- Increasing DER penetration not a problem … yet
- Natural gas pipeline constraints

The second objective for the DPU is to optimize demand, "which includes reducing system and customer costs" [by] driving greater overall end-use efficiency through smart grid and energy efficiency initiatives.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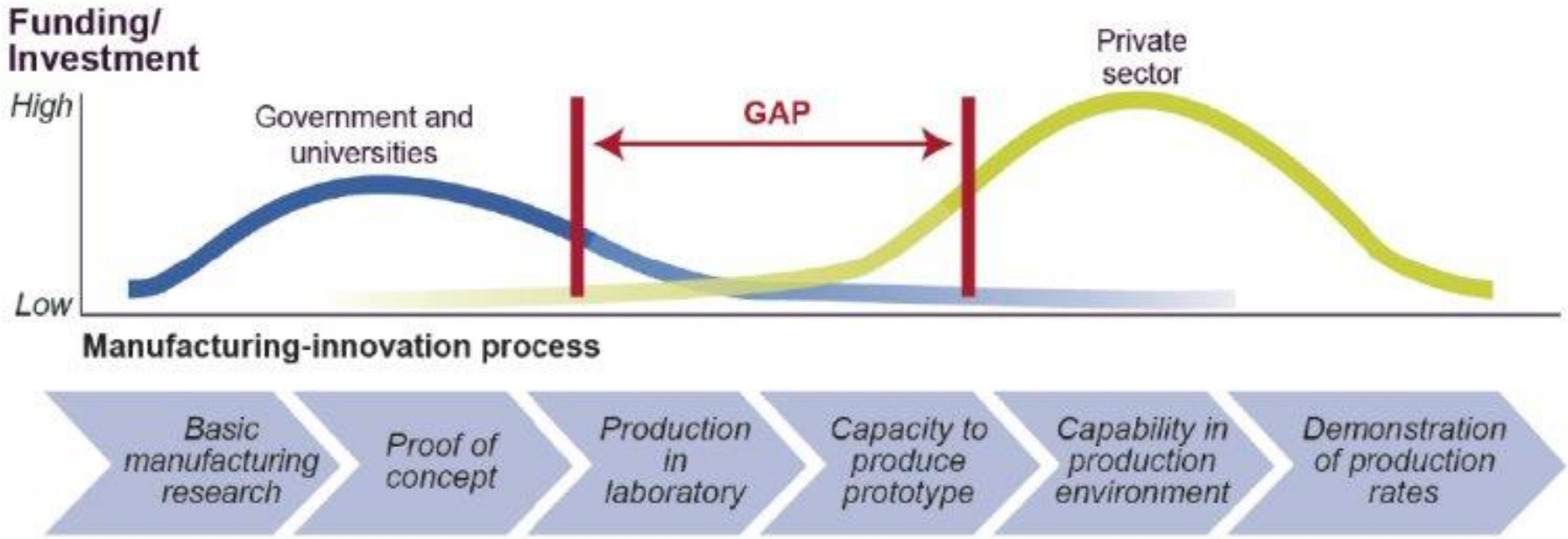
Investments in Job Creation (Venture Debt)
$100K - $1M Debt Investment
Investments in the Advancement of Technology
~$500K Equity Investment
3-6 Deals / Year
AmplifyMass
(ARPA-E Matching Program)
~$100K-300K Convertible Grant
InnovateMass
Up to $150K Grant;
~10 Grants / Year
Mass as First Customer
Total Pilot Program Budget of $1M
Catalyst Program
Up to $40K Grant
10 Grants / Year
Workforce Development Programs
New Invention
Technology Improvement
Size of Investment
Product Development

Challenges



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InnovateMass Program At a Glance

Program Objectives

- Showcase early-stage technologies in preparation for commercialization and sales into the marketplace
- Allow teams to reach specific milestone(s) that will attract follow-on financing
- Fill funding gap to demonstrate emerging technologies

Program Structure

- One funding round per year
- Two-stage process including 5 page concept paper and pitches
- 8-10 $150K grants awarded annually
- Awardees receive third party technical assistance

Criteria for Evaluation

- Strong market potential
- Energy/environ-mental impact
- Economic development/job creation
- Leverage of 3rd party funding – 50% match required
- Project plan and demonstration site
- MA connection

Program History

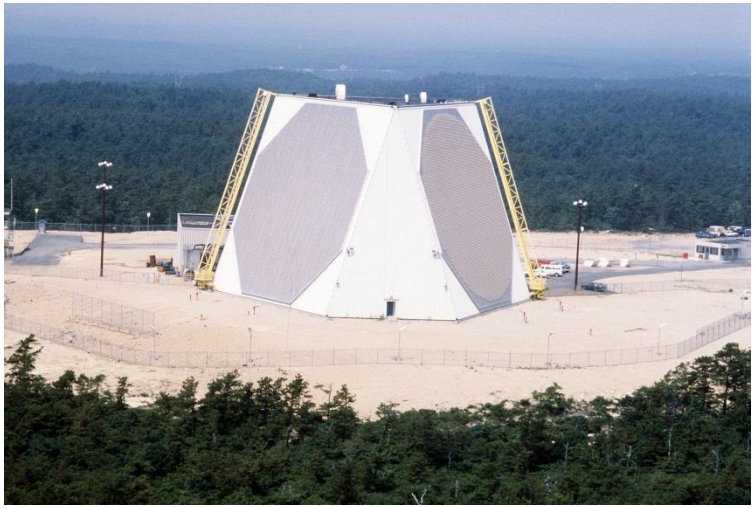
- Began in 2013; 3 rounds completed
- 70+ applications
- $2.18M awarded to 19 teams
- Leveraged $3M in cost share/private funding
- Water technology challenges embedded in pilot and third rounds

Project Snapshot: Ambri

AMBRI

Phase I: Functional Feasibility Study – 16MWh battery could reduce energy costs by over $9.4M over the life of the battery mostly through reduced demand charges and capacity payments. Battery could also facilitate greater integration of renewables on the base and energy resilience.

Phase II: Deployment of 6kW/25kW battery at the base to simulate planned deployment of 1-2 MW/4-8 MWh battery



BUILDING DASHBOARD

embue

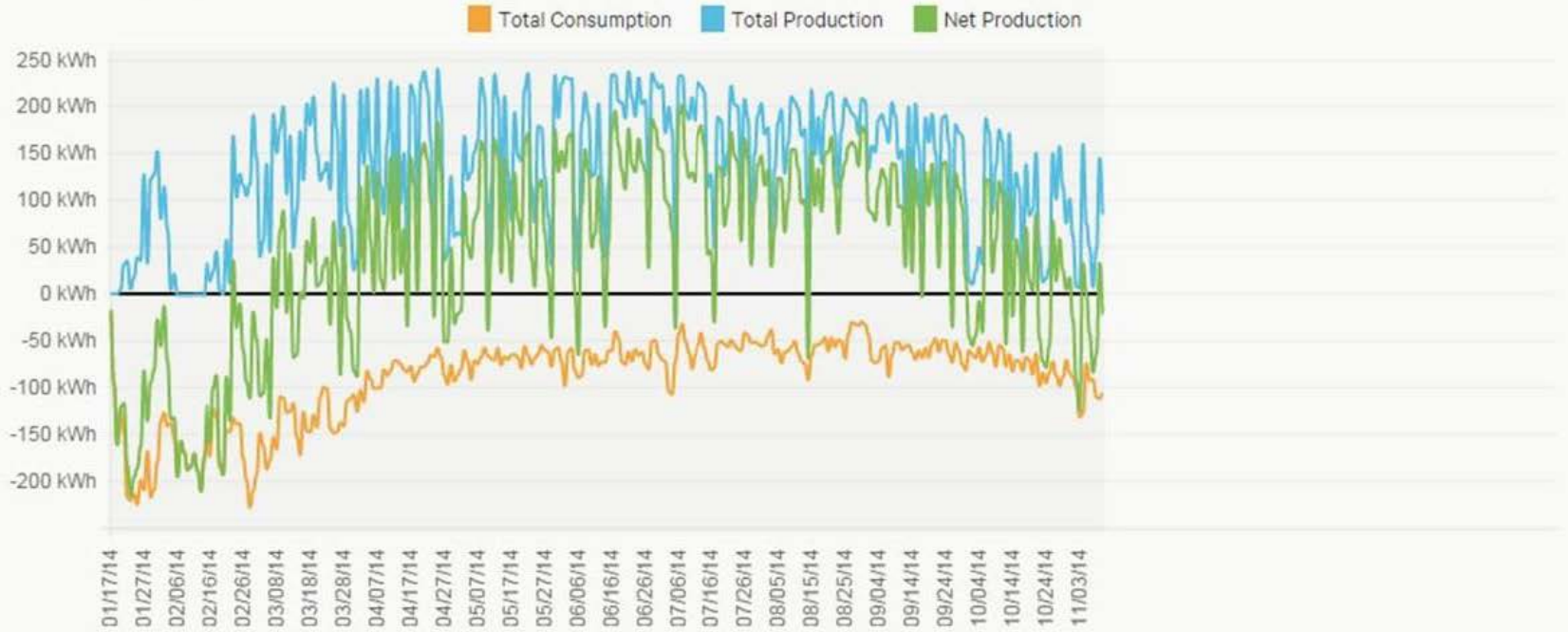
Highland Street

A four-unit multifamily building totalling 7900 square feet.

Predicted yearly energy performance: electricity production 44,400 kWh, consumption 36,900 kWh, net 12,600 kWh.

Net Electricity Production

Lifetime	12311 kWh
Year to date	12311 kWh
Last 30 days	-213 kWh



MassCEC Smart Building Support

- Investments in companies developing smart building technologies
- Fraunhofer Center for Sustainable Energy: DOE SHINES cost share
- MIT Sustainable Design Lab: Boston City Wide Energy Study

Transactive Energy Challenge Goals

- Complement existing transactive energy pilot efforts
- Address energy challenges unique to our region
- Create opportunities for Massachusetts based companies
- Leverage existing or planned clean energy incentive funding administered by state energy offices
- Target funding: $500,000 plus match requirement

Transactive Energy Challenge: Possible Focal Points

- Thermal storage - integrate thermal storage into residential scale pilot to better understand pre-warming and impact on winter am peak gas demand. Could also be deployed on circuits with excess PV/wind production
- Existing Buildings/Plug and Play – focus on affordable, scalable tech deployment targeting dispatchable loads in existing small C&I buildings/multi-family buildings
- V2G – leverage utility interest/investment in EV infrastructure and focus on business district/neighborhood scale EV charging load management and aggregated demand reduction
- Behind the meter – focus strictly on load management within the building either as an intermittent renewables, storage integration exercise or to reduce wear and tear on utility distribution system gear

Transactive Energy Challenge Design Considerations

- Two phase challenge: design + construction?
- Customer/building occupant engagement a challenge focus or selection criteria?
- Project scale: what can we achieve with a very small pilot? Can we effectively model scaled impacts?
- Measuring performance: what does success look like and how will it be measured? Peak demand reduction? Customer savings?
- Utility engagement: ensure that any transactive energy demo fits into existing utility grid modernization vision and related communications infrastructure

Thank you!

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