Connecticut Innovations

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# Connecticut Fuel Cell Programs - From Demonstration to Deployment

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# Connecticut Clean Energy Fund (CCEF)

- Legislation 1998 / Launch 2000
- Administered by Connecticut Innovations (CI)
- Surcharge on electric bills→ ~$20 million per year
- 50¢ per household per month

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# CCEF Highlights

**As of 06/30/07:**

| | |
|---|---|
| Projects Funded/Committed | $ 75.4 Million |
| Program Allocations | $ 65.2 Million |

# Vision, Mission, and Approach

- **Vision** – Connecticut will be a leader in having a sustainable balance of energy production, economic growth, and environmental impact.
- **Mission** – The Connecticut Clean Energy Fund develops, invests in, and promotes clean sustainable energy sources for the benefit of Connecticut ratepayers.
- **CCEF Approach** - To develop and implement programs that are innovative and responsive to the market place.

# Strategic Framework

CCEF Goals

1. Create a **supply** of clean energy (installed capacity)
2. Foster the growth, development and commercialization of **clean energy technologies**
3. Stimulate **demand** of clean energy by increasing public awareness

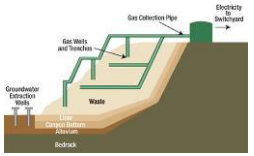
# Clean Energy Technologies

Fuel Cells

Solar

Biomass

Hydro




Landfill Gas

Wave

Wind

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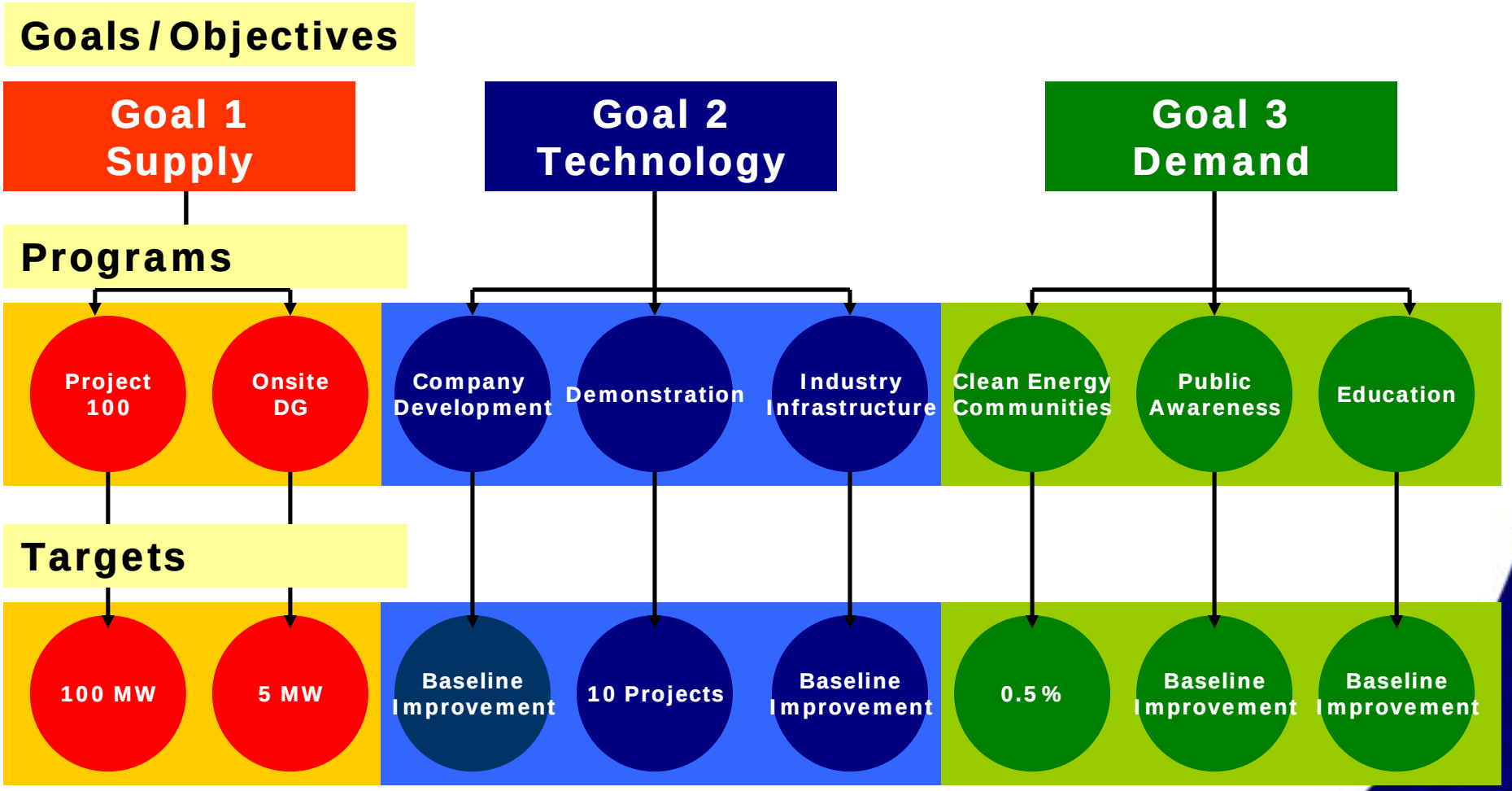
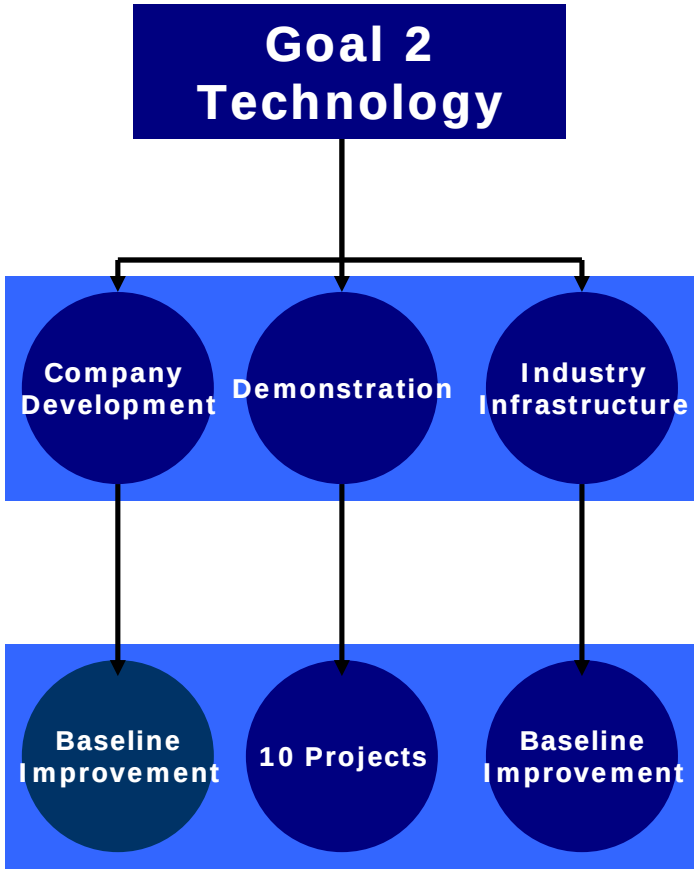
# 3-Year Strategic Plan



# Demonstration Programs




**Program Goal 2** –Support the early-stage development of the clean energy industry in Connecticut by significantly improving the infrastructure and **demonstrating the viability of innovative clean energy technologies**.

# Operational Demonstration

- **Rationale** – CCEF is charged under Connecticut law to foster the growth, development and commercialization of clean renewable energy technologies and related enterprises.

- **Program Goal 2** – CCEF will support the early-stage development of the clean energy industry in Connecticut by significantly improving the infrastructure and demonstrating the viability of innovative clean energy technologies.
- Commercial demonstration qualifies technology for installed capacity programs (P100 and Onsite DG)

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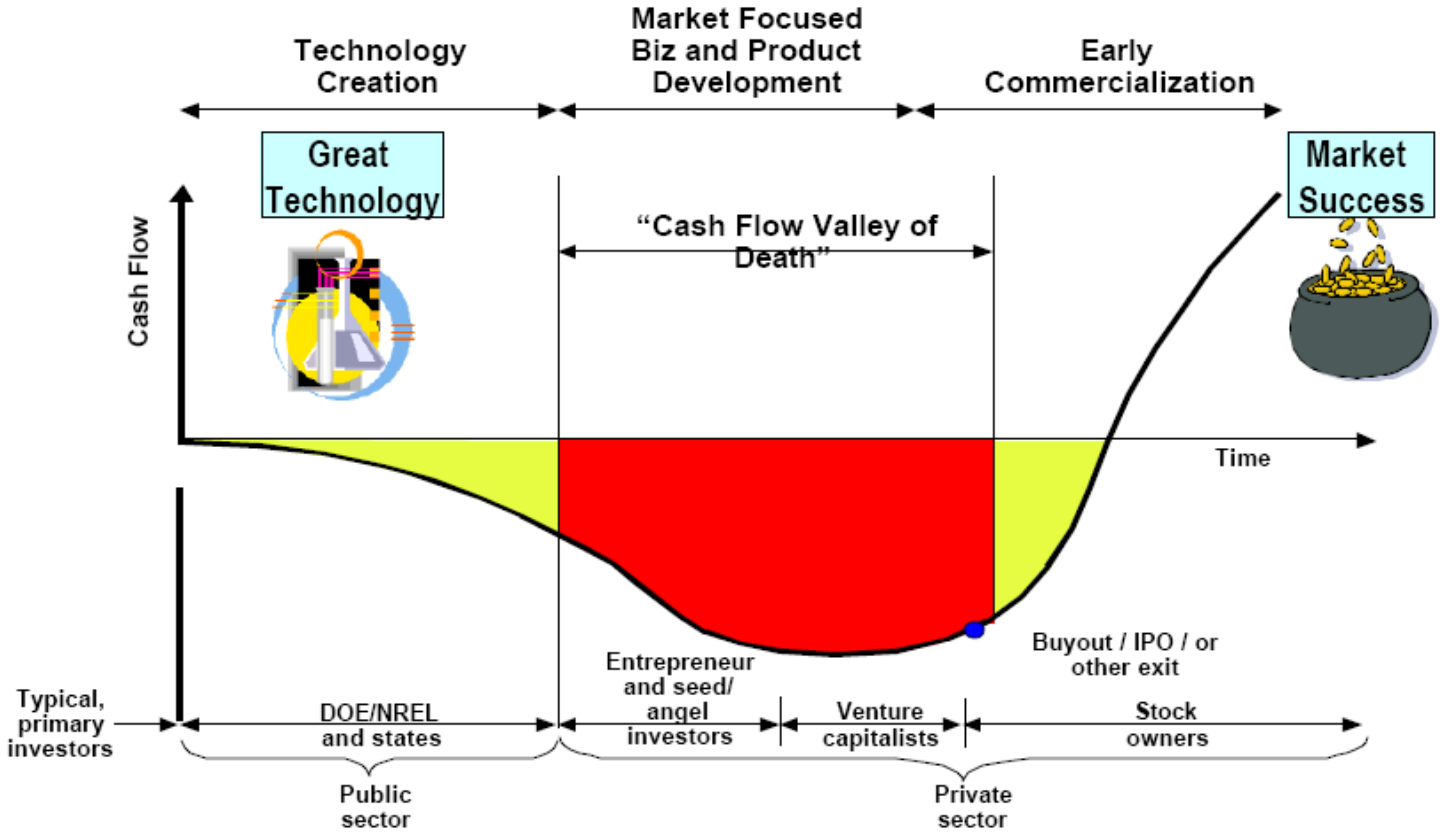
# Innovation Spectrum
# Operational Demo - Bridging the Valley of Death




**References**

Bridging the Valley of Death: Transitioning from Public to Private Sector Financing NREL (Chart by David Berg)

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# Project Due Diligence

- Review process includes:
  - Technology Analysis (Innovation/Uniqueness/Value Added)
  - Market and Competition analysis,
  - Cost Effectiveness
  - Company & Management Experience
  - Host site readiness (regulatory/legal)

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# Financing Vehicle

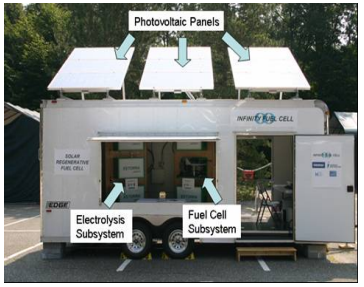
- Non-Recourse Loan
  - Up to $750,000
- Payback based on level of Commercial Success
  - 3 year commercialization window
  - 5 years for fuel cells
- 25% cash cost share

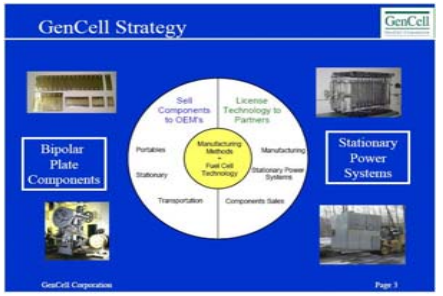
# Operational Demo Projects

- **Operational Demonstration Program** – provides funds for pre-commercial stage clean energy projects that rely on the innovative use or application of renewable energy generation technologies - $4.0 million allocated

***Result:***

- *Electrochemical hydrogen separator enhances productivity of FCE DFC fuel cells*
- *Gencell Molten Carbonate demonstration to access the mid-size (25 to 100kW) high temperature fuel cell*
- *Ztek solid oxide fuel cell demonstrate heating cooling and power generation.*

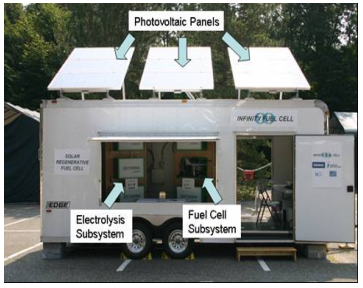



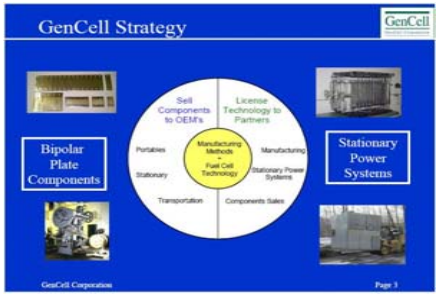
# Operational Demo Projects (con'd)

- **Operational Demonstration Program** – provides funds for pre-commercial stage clean energy projects that rely on the innovative use or application of renewable energy generation technologies - $4.0 million allocated

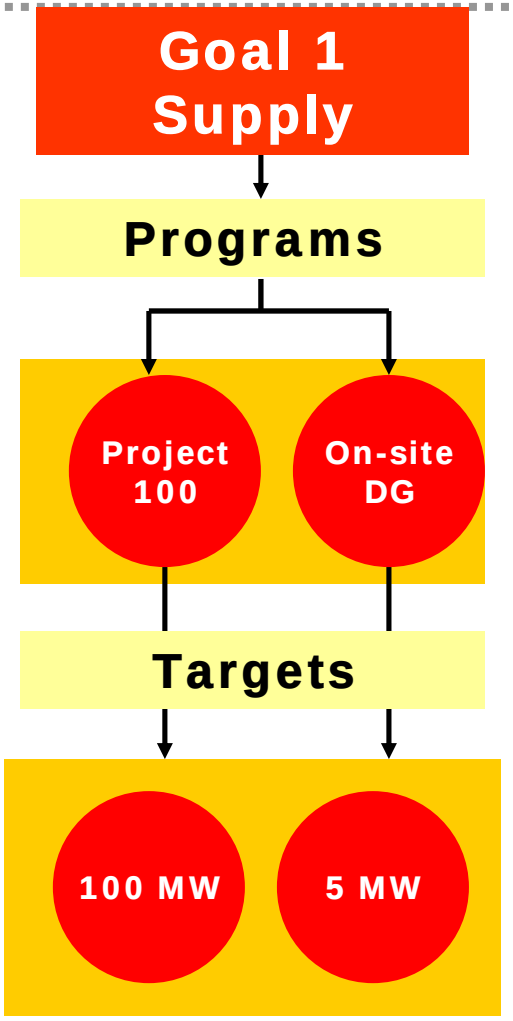
***Result:***

- *Several Proton Energy regenerative fuel cell and hydrogen generation system*
- *Infinity Fuel Cell Smart modular regenerative fuel cell that self generates Hydrogen from wind or PV for remote deployment of small fuel cell system.*

# FC Deployment Programs




## Program Goal 1

Connecticut ratepayers will have access to a diverse supply of installed clean energy resources through the implementation of Project 100 (100 MW) and on-site distributed generation (5 MW).

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# Supply Programs

- Project 100
- Onsite Renewable DG Program
- Commercially available technology

# Project 100

- ***Program Requirement:***

  Select no less than 100 MW of Class I grid-side renewable energy projects through a competitive RFP process

- ***Result:***

  **Round 1:** 34 MW forwarded to utilities – 19 MW withdrew, 15 MW Power Purchase Agreement signed 5/07

  **Round 2:** 31 Proposals/331 MW received – 11 Proposals/159.4 MW forwarded to utilities **including 68 MW Fuel Cells**

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# Project 100 Evaluation Criteria

## Financial Viability

- Financial expectations and assumptions
- Financing experience and creditworthiness
- Financial structure
- Status of attracting capital
- Firmness of cost data

## Technical Feasibility

- Team experience
- Permitting status and public acceptance
- Site control
- Design status and technical viability
- Fuel/resource plan
- Commercial available technology

## CT Ratepayer Costs and Benefits

- Contract price
- CCEF investment amount
- CT economic development potential
- CT T&D impact
- CT energy price suppression
- Diversity

# Onsite Renewable DG Program

**Onsite Renewable DG Program** – designed to stimulate the demand for behind-the-meter installations of clean energy at CI&I buildings in the state – $32.3 M Allocated

*Result:*

39 Solar PV completed/in process – 4 MW; 8 fuel cells, 2.7 MW


# On-site Renewable DG Projects

**Yale University's Environmental Sciences Center (New Haven)**

**Fairfield Water Pollution Control Authority (Fairfield)**



**Pepperidge Farm (Bloomfield)**

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# On-site Renewable Distributed Generation Program

- Enable renewable energy installations at **industrial, institutional and all commercial sites**
- Grants to “buy down” the cost of renewable energy generating devices
- Up to $4 million per grant
- Host site in CL&P or UI service territory

# On-site Renewable Distributed Generation Program - the Process

- Applications accepted on rolling basis
- Staff reviews projects against screening criteria
- CCEF project modeling and grant assessment
- Applicant agrees to award amount
- Projects Committee and Advisory Board

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# On-site Renewable Distributed Generation Program

## Project Funding Amounts

- Max funding → $4,000,000
- Funding Caps

| Technology | Solar | Fuel Cells | Small Wind | Small Biomass | Landfill Gas | Hydro |
|---|---|---|---|---|---|---|
| Funding cap | $5/W | $4.70/W | $3.60/W | $3.30/W | $3.20/W | TBD |
| Evaluation timeframe | 20 yrs | 10 yrs | 15 yrs | 10 yrs | 10 yrs | TBD |

- Specific grant amount determined after CCEF completes project modeling

*Fuel Cells over 1 MW;$3.20/W

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# Summary

## Growing in Scale: What's Needed to Make this Happen…

- All 5 Major Players working in concert:
  - Federal R&D, Biofuel Subsidies, Tax Credits, Loan Guarantees
  - State-Based Clean Energy Funding, Project Management, Education Programs
  - Private Venture Capital, Private Equity and Project Finance
  - Industry & University Innovation - looking to new markets/products
  - Educated/Aware Consumers

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# VISIT US ONLINE

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