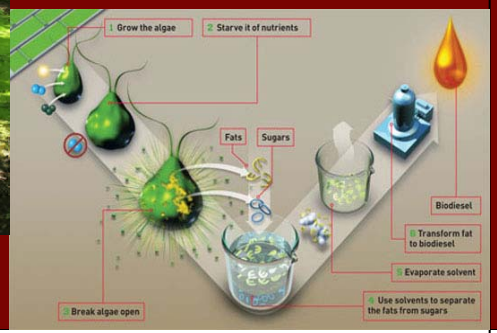
Regulating Greenhouse Gases: Challenges & Opportunities for Advanced Biofuels in the U.S.



Rick Gilmore
President/ CEO
GIC Group
ABLC Conference
April 27, 2010

The GIC Group

U.S. Energy/Climate Policy

Obama adopts touch all the bases approach

- EPA has limited mandatory reporting for ethanol facilities with emissions greater than 25,000 metric tons to just emissions associated with energy combustion.
- EPA also revised life-cycle analysis -- most biofuels including corn-based ethanol produced with the use of natural gas meet the RFS2/EISA GHG reduction threshold.
- Navy has 10-year plan to have alternative fuels supply 50% of its fuel needs (ships, aircrafts, and vehicles.)
- Yet, Obama's drilling plan aimed at growing natural gas supplies to move away from coal and reduce dependence on foreign oil
- Obama plans to double the number of hybrid vehicles in federal fleet and have 1 million electrical vehicles on the road by 2015.

U.S. Climate Initiatives: Mix of Sticks & Carrots

Legislative "Sticks"

New Vehicle GHG Standards & Mileage Standards

- New cars/trucks built in 2012 – 2016

EPA National Renewable Fuel Standard 2

- 36 billion gallons in 2022, with 21 billion coming from advanced biofuels.
- E15: EPA is planning on issuing a waiver for newer vehicles (2001 and later). Will evaluate impact on older vehicles.
- 29 states and the D.C. have established RPS.

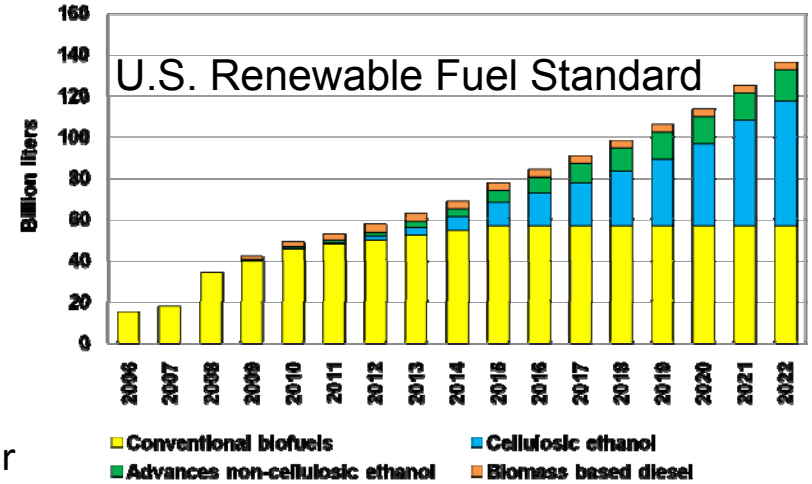
Various Climate/Energy Bill Proposals

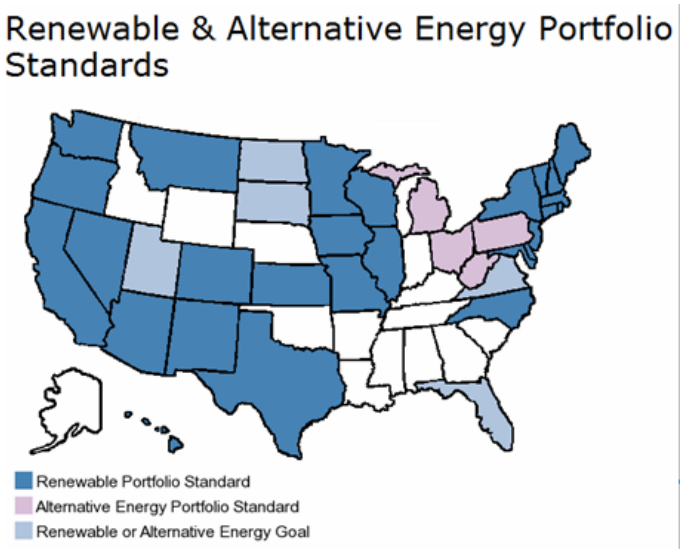
House: ***American Clean Energy & Security Act (ACES)***

- 2 billion compliance offsets; up to 1 billion domestic & up to 1.5 billion international. 5-year moratorium on an indirect land-use charge for biofuels.

Senate: ***Kerry, Graham & Lieberman Climate & Energy Bill***

- Cut emissions 17 per cent over 2005 levels by 2020 is expected to be introduced later this month.





Source: The Pew Center on Global Climate Change

State & Regional Climate "Sticks"

Western Climate Initiative (WCI)

- Regional GHG target of 15 percent below 2005 levels by 2020 by multi-sector mechanism.

Regional Greenhouse Gas Initiative (RGGI)

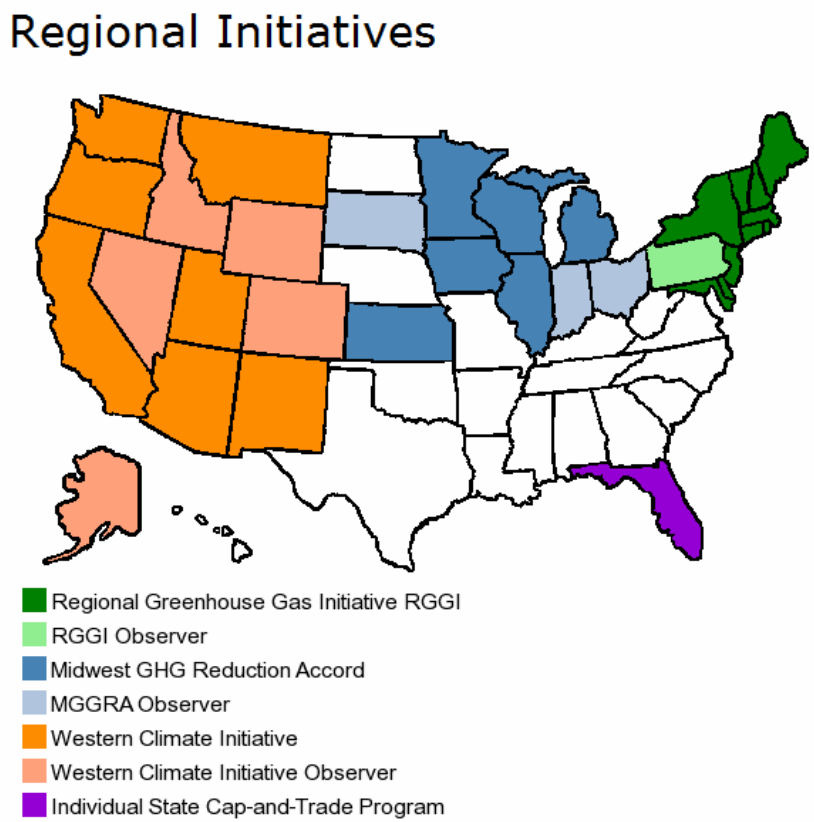
- Regional cap and trade scheme for power producers. Cap set at current 2009 levels. Goal: 10% reduction in power emissions by 2018.

California

- Low Carbon Fuel Standard (LCFS) reduce carbon content in transport fuel mix. Goal: 10% reduction by 2020. *CARB standard on land-use charge penalizes corn-based ethanol.*
- AB32, proposed statewide cap & trade program. Goal: reduce GHGs to 1990 levels by 2020.

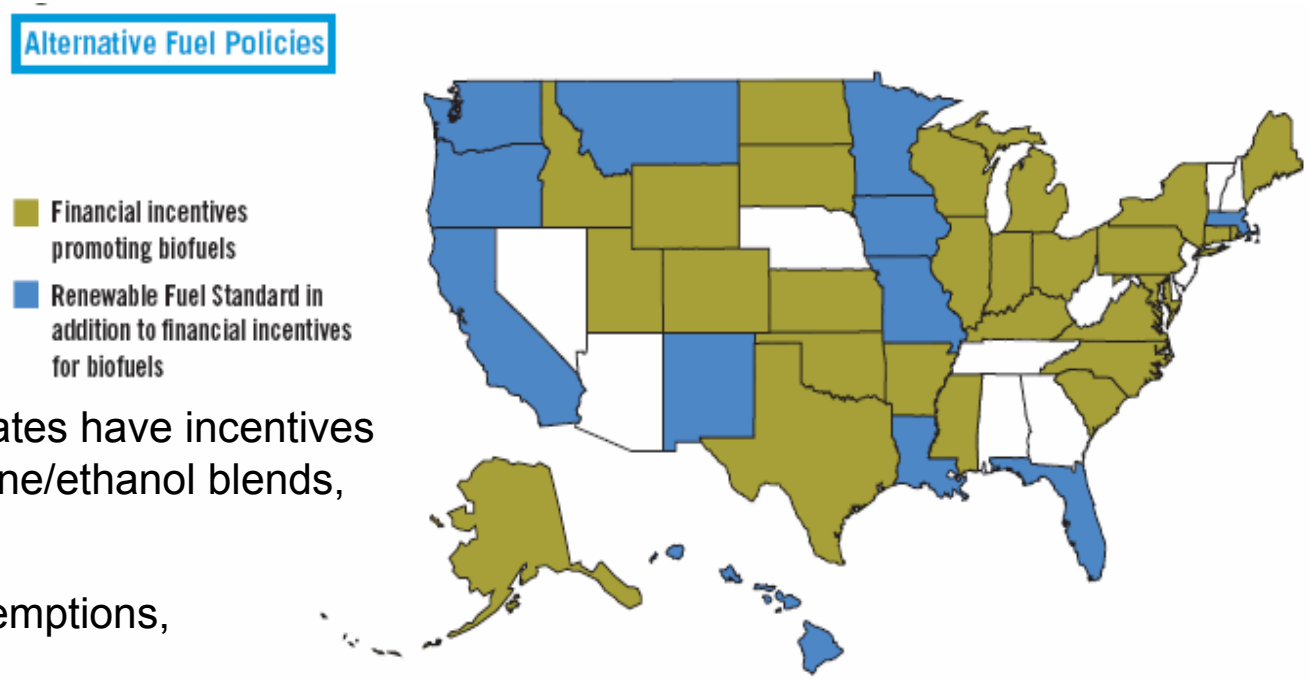
State Emission Targets & Climate Action Plans

- 21 states have adopted statewide emission targets
- 36 states have comprehensive climate action plans



Source: The Pew Center on Global Climate Change

U.S. Climate "Carrots" for Biofuels



Source: The Pew Center on Global Climate Change

Alternative Fuels

- More than half of U.S. states have incentives for alternative fuels, gasoline/ethanol blends, and low-emission vehicles
- Examples: excise tax exemptions, tax credits, and grants.

U.S. Department of Energy

- FY 2009, more than $2.2 billion in for energy efficiency and renewable energy technologies.
- Biomass Program has awarded nearly $718 million for advanced biofuels
- March 2010, $18 million to Lawrence Berkeley National Lab for Advanced Biofuel Lab

Biofuels Score Major Victory

- EPA limits mandatory reporting requirement
  - Ethanol producers only have to report emissions associated w/ energy combustion.
  - Pushed back proposed permit requirement for emitting facilities to 2013 and raised emissions threshold to between 50,000 and 100,000 tons.

- Indirect Land-Use charge also modified by EPA
  - Incorporated impact of higher yields and positive impact of DDGs on feed market in offsetting growth in feed demand.
  - Corn ethanol produced at new natural gas powered facilities meet 20% EISA requirement to qualify as renewable fuel.

- Big win for next generation biofuels
  - EPA determined biodiesel from waste oil and soy oil meet the 50% GHG reduction for biodiesel designation under EISA.
  - Ethanol from sugarcane meets 50% reduction for advanced biofuel status
  - Cellulosic (current feedstock and technologies(meet 60% GHG threshold for cellulosic designation.

RFS2 Requirements (billions of gallons)

Year	Cellulosic biofuel requirement	Biomass-based diesel requirement	Advanced biofuel requirement	Total renewable fuel requirement
2010	0.1	0.65	0.95	**12.95**
2011	0.25	0.8	1.35	**13.95**
2012	0.5	1	2	**15.2**
2013	1	a	2.75	**16.55**
2014	1.75	a	3.75	**18.15**
2015	3	a	5.5	**20.5**
2016	4.25	a	7.25	**22.25**
2017	5.5	a	9	**24**
2018	7	a	11	**26**
2019	8.5	a	13	**28**
2020	10.5	a	15	**30**
2021	13.5	a	18	**33**
2022	16	a	21	**36**

[a] To be determined by EPA through a future rulemaking, but no less than 1.0 billion gallons.

Previous EPA Lifecycle Analysis

Table 1. Draft Lifecycle GHG Emission Reduction Results. For Different Time Horizon And Discount Rate Approaches.

Fuel Pathway	100 year, 2% Discount Rate	30 year, 0% Discount Rate
Corn Ethanol (Natural Gas Dry Mill)	-16%	+5%
Corn Ethanol (Best Case Natural Gas Dry Mill)[2](footnote)	-39%	-18%
Corn Ethanol (Coal Dry Mill)	+13%	+34%
Corn Ethanol (Biomass Dry Mill)	-39%	-18%
Corn Ethanol (Biomass Dry Mill with Combined Heat and Power)	-47%	-26%
Soy-Based Biodiesel	-22%	+4%
Waste Grease Biodiesel	-80%	-80%
Sugarcane Ethanol	-44%	-26%
Switchgrass Ethanol	-128%	-124%
Corn Stover Ethanol	-115%	-116%

New Generation Biofuels: A Real Game Changer?

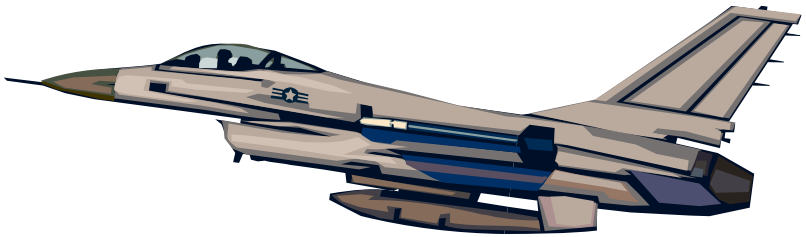
Algae: The Dream

- Algae naturally absorbs CO2 as it grows.
- Efficient production technologies can further lower Algae's carbon footprint compared to conventional fuels other biofuels.
- Alternative uses for algae, which help lower GHG emissions in other industries, can expand the value-chain.

Algae: The Hurdles

- Restricted funds
- Limited emissions data
- Cost effectiveness of plant operations

Algae Not the Only New Darling



- Camelina has the potential to be a drop-in aviation fuel.
- Potential to reduce GHG emissions from jet aircraft by 80%
- U.S. Airforce will fly F-18 “Green” Hornet on a 50% camelina biofuel mix on Earth Day.

New Generation Biofuels: Real or a Dream?

Feedstock	Yields
Palm	**650** gallons per acre per year *
Sugar cane	**450** gallons per acre per year *
Corn	**250** gallons per acre per year *
Soy	**50** gallons per acre per year *
Jatropha	**175** gallons per acre per year **
Micro Algae	**1850** [based on actual biomass yields] ***
Micro Algae	**5000-15000** [theoretical laboratory yield] ***

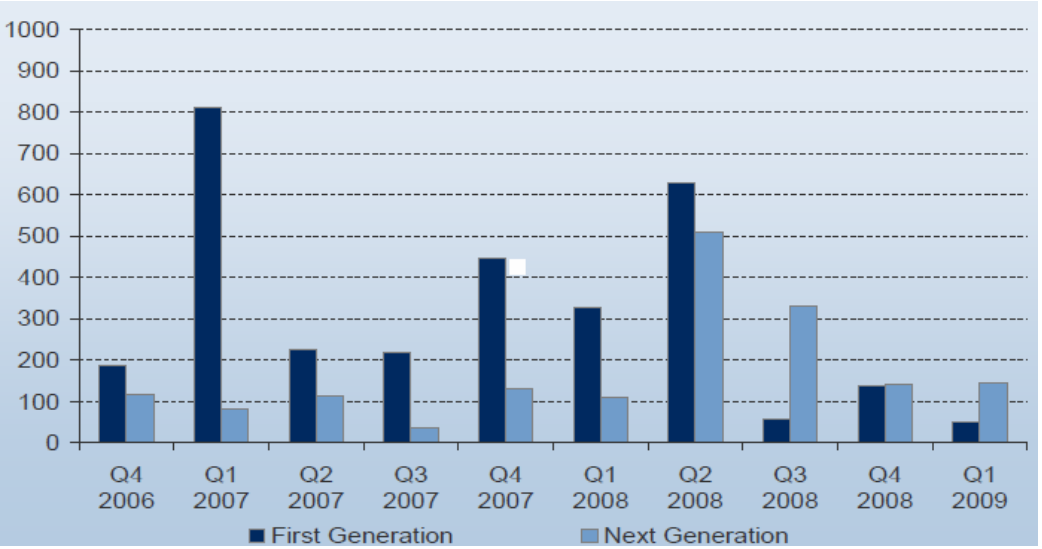
*Source: * ExxonMobil; ** Bryan Wilson, a co-founder of Solix and a professor at Colorado State University; *** Dr. Thomas F. Riesing*

Case Study: Algae Potential

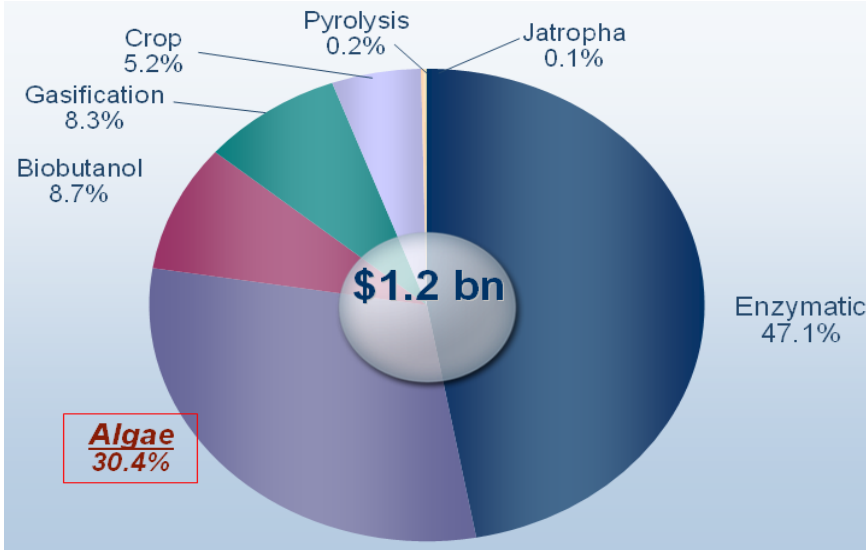
- Carbon sequestration: 0.016 ~ 0.024 tons of CO_2 /gallon of biodiesel.
- DOE estimates 15,000 sq. miles of algae (larger than Maryland) could replace all of the petroleum being used in the U.S.
- It take 4 times the area of the U.S. planted to corn to meet current fuel with just corn-based ethanol

Impact on Biofuel Investment

First Generation versus Next Generation Biofuels VC/PE investment, Q4/2006 - Q1/2009 (US$ million)



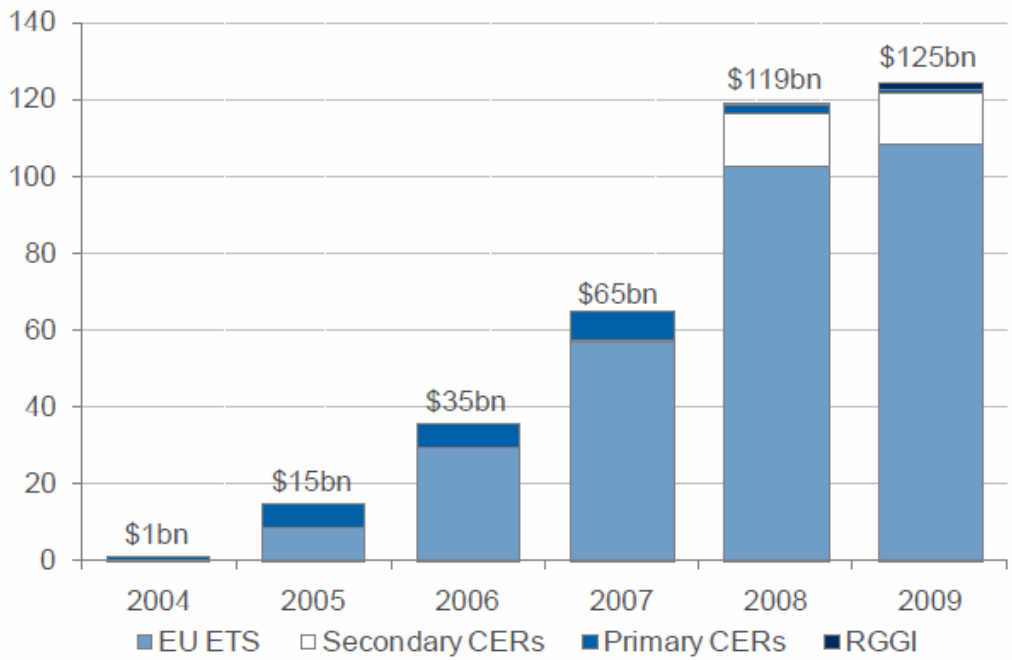
VC investment in 2nd generation biofuel technologies, Q1 2007 – Q1 2009



Source: New Energy Finance

Global Carbon Market: Implications for Biofuel Industry Strategies

Global carbon market size 2004–09 ($bn)



Source: Trading figures taken from ECX, Bluenext, EEX, Reuters, CCX, LEBA

The global carbon market increased 5% in 2009 in terms of value, compared with 83% in 2008.

U.S. voluntary carbon market continued to expand despite recession growing to $75 million.

GIC's Ag Carbon Index (GIC-ACI)

- Captures true worldwide footprint of agribusiness related emissions, including biofuel industry.
- Biofuel producers can quantify and value the carbon reduction potential of new production technologies and biofuel feedstocks.
- Producers can use index to hedge value of reduction technologies through futures contracts.

GIC-ACI Index: A New Benchmark for the Biofuel Industry

- Transparent, price discovery mechanism that captures the full value of carbon offset project in agriculture.

  Second and third generation biofuels will likely benefit from carbon offset revenues.

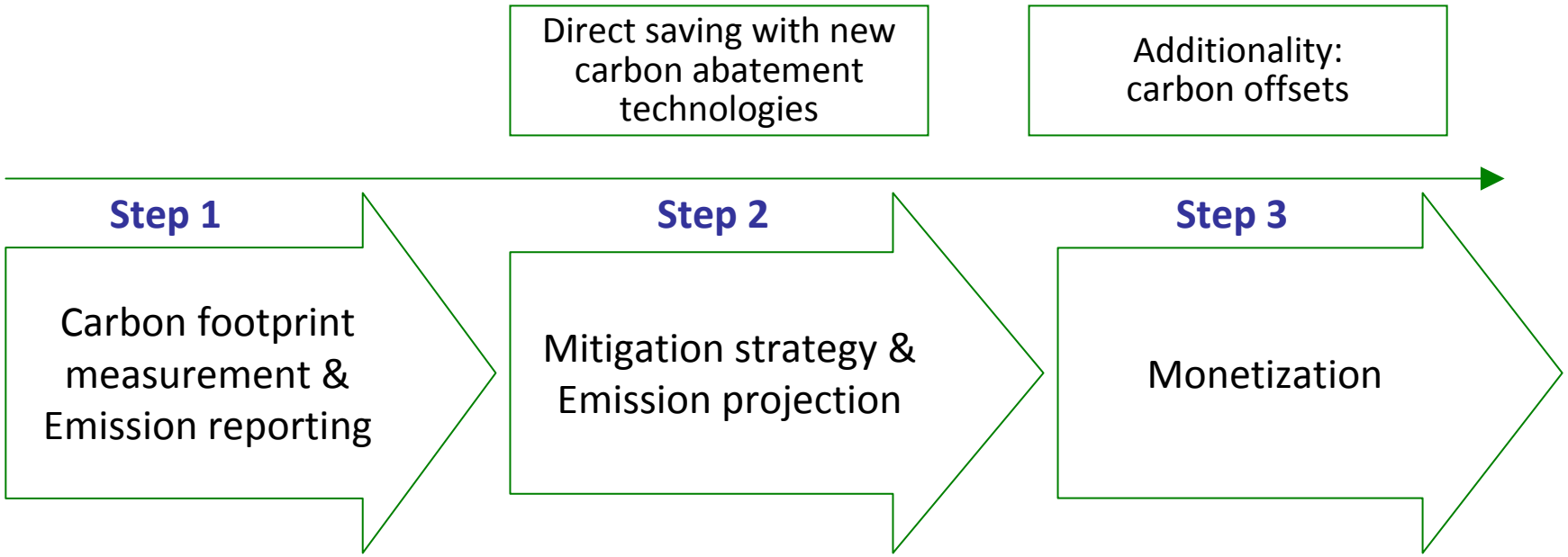
- New production technologies that improve yield of corn or other feedstocks further reduce emissions footprint of biofuel producers.

  Biofuel manufacturers can use the index to value and hedge the carbon price associated with these new technologies or cross hedge commodity prices.

- U.S. production agriculture more efficient in terms of GHG emissions and output.

  Index allows biofuel industry to capture the value of these efficiencies by aggregating offset credits and rewarding U.S. producers with lower GHG emissions.

Ways to Cut Cost & Add Extra Income



- Expected cost to comply with the reporting requirements to the private sector

Total cost *(million)- estimated*		Number of	Ave. cost per facility	
First year	Second year	facilities	First year	Second year
$115	$72	10,000	**$11,500**	**$7,200**

Thank You!

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