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-M-E-M-O-R-A-N-D-U-M-

DATE: September 23, 2008

TO: All Interested Persons

FROM: Cindy B. Miller, Senior Attorney, Office of the General Counsel

RE: Docket No. 080503-EI - Conference Call on September 24, 2008

Per the attached e-mail, a conference call will the held Wednesday, September 24, at 1:00 p.m. Eastern. The purpose of the call is to present Navigant's overview of the renewables assessment. The conference dial in number is 1-888-808-6959. Conference code: 413-6904. Call Mark Futrell if you have questions at 850-413-6692.

DOCUMENT NUMBER-DATE

08920 SEP 23 8

FPSC-COMMISSION CLERK

Samantha Cibula

From: Mark Futrell
Sent: Tuesday, September 23, 2008 8:34 AM
To: Mark Futrell
Subject: Slides for Wednesday's Stakeholder Meeting
Attachments: FL RE Briefing 9-23-08.pdf

Navigant Consulting is performing a renewables assessment for the state of Florida. The information and data collected from this study will assist the Commission in its efforts to establish a Renewable Portfolio Standard rule as directed by the Legislature.

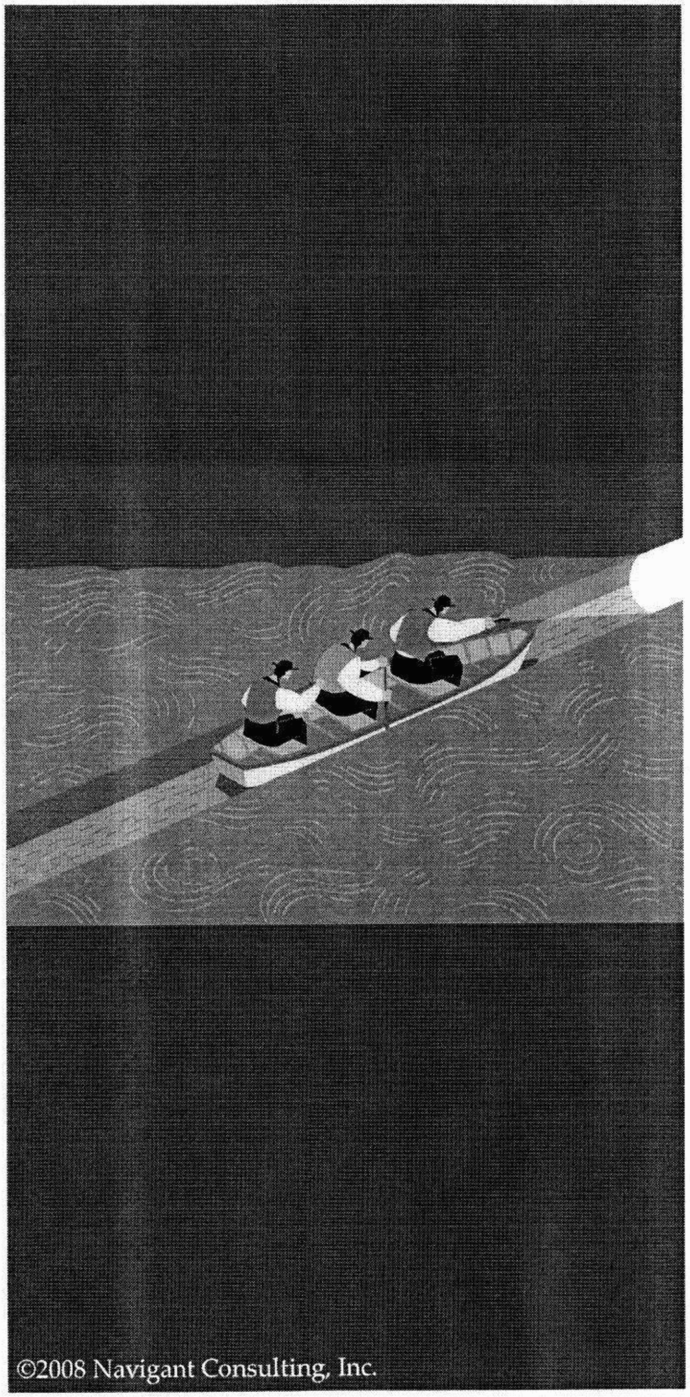
A conference call will be held on Wednesday, September 24, 2008 at 1:00 p.m. Eastern. During this call, members of the Navigant team performing the assessment will present an overview of the study. There will be a limited period of time for stakeholders to ask questions of Navigant. The conference call information is as follows:

Conference Dial-in Number: 1-888-808-6959

Conference Code: 4136904#

Attached is a power point presentation that will be used during the call.

Mark Futrell
Florida Public Service Commission
(850) 413-6692



Florida Renewable Energy Potential Assessment

Project Overview

Prepared for

Florida Public Service Commission, Florida Governor's Energy Office, and Lawrence Berkeley National Laboratory

September 24, 2008

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NCI Reference: 135846

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Content of Report

This report was prepared by Navigant Consulting, Inc.[1] for the use of Lawrence Berkeley National Lab (LBNL), the Florida Public Service Commission (FPSC), and the Florida Governor's Energy Office (EOG) - who supported this effort. The work presented in this report represents our best efforts and judgments based on the information available at the time this report was prepared. Navigant Consulting, Inc. is not responsible for the reader's use of, or reliance upon, the report, nor any decisions based on the report.

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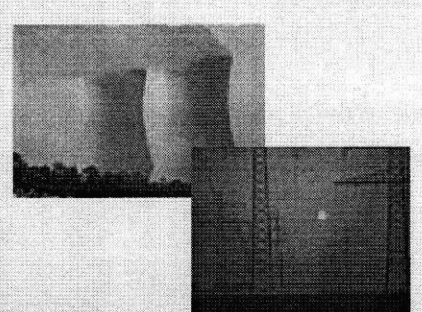
Navigant Consulting, Inc. (NCI) is a specialized consulting firm known globally for its renewable energy technology and strategy expertise.

Navigant Consulting (2,300 Employees)

- Publicly traded since 1996 (NYSE: NCI)
- 2007 revenues - $767 million
- 42 offices globally

Energy Practice (160 Employees)

- Technology and Investment Strategy & Management
- Market Opportunity Analysis
- Transaction Advisory
- Mergers & Acquisitions
- Valuation Services and Due Diligence Support



Renewable Energy (45 Employees)

- Public and private sector clients
- Principal staff with over 25 years experience in RE
- Services across the value chain

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Navigant Consulting has been retained to assess renewable energy potential and penetration in Florida.

Project Scope

Navigant Consulting has been retained by Lawrence Berkeley National Laboratory (LBNL), on behalf of the Florida Public Service Commission (FPSC), to:

Task 1: Identify renewable energy resources 1) currently operating in Florida; and 2) that could be developed in Florida through the year 2020.

Task 2: Establish estimates of the quantity, cost, performance, and environmental characteristics of the identified renewable energy resources that (1) are currently operating in Florida; and (2) could potentially be developed through the year 2020.

Task 3: Gather data to compare and contrast renewable energy generation sources to traditional fossil fueled utility generation on a levelized cost of energy basis. Utility generation performance and cost data is available from the FPSC.

Task 4: Conduct a scenario analysis to examine the economic impact of various levels of renewable generation that could potentially be developed through the year 2020.

Navigant Consulting will use the following approach to assess potential renewable energy adoption in Florida.

Project Approach

Step 1: Define what technologies and resources will and will not be covered by this study.

Step 2: Assess technical potential for each covered technology and resource.

Step 3: Compile economic and performance data for each covered technology.

Step 4: Develop scenarios for renewable energy adoption that account for external variables that influence renewable energy adoption, such as natural gas prices, federal incentives, REC prices, etc.

Step 5: Project renewable energy adoption and associated costs in each of the scenarios by comparing renewable energy economics relative to traditional power generation technologies (e.g., natural gas, coal, nuclear, etc) on a levelized cost of electricity basis.

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Navigant Consulting is currently focusing on technical potential assessment.

Completed	• Navigant Consulting has developed a definition of each technology and resource to be studied (to be discussed on the following slides). • Navigant Consulting has also laid out the technical potential approach for each technology and resource.
In Process	• Currently assessing technical potentials. • Navigant Consulting has also started to review the economic and performance data submitted by stakeholders, and started to develop scenario inputs.
Next Steps	• Finalize economic and performance data for each technology. • Finalize scenarios. • Assess renewable energy adoption under each scenario.

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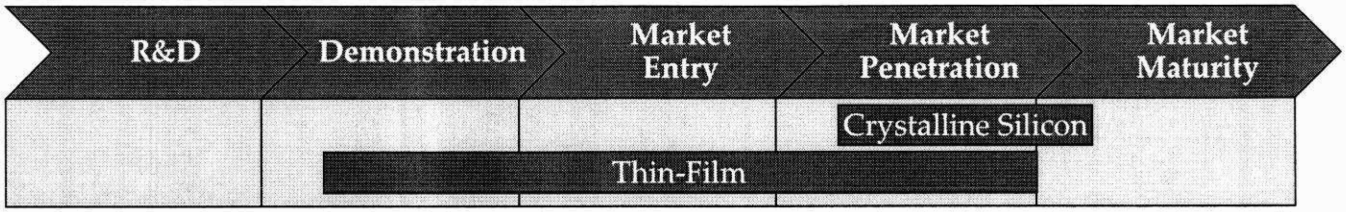
PV technologies are mature and have decades of deployment history.



Technology Definition

- For this study, photovoltaics (PV) are defined as a solid-state technology that directly converts incident solar radiation into electrical energy. The panel may be mounted on a roof or the ground.

Technology Maturity

- Crystalline Silicon based technologies have been in use for many decades, mostly in off-grid applications, but have been widely deployed in grid-connected applications for a decade.
- Thin-film technologies have been in use for several years, but do not have the deployment history of Crystalline Silicon technologies.

Market Maturity

- With the establishment of le European feed-in tariffs and Japanese incentives, the global PV market has been growing at 30-40% per year for several years. Growth has been furthered in the U.S. with federal tax credits.
- With the strong growth, the PV value chain has streamlined, major players have developed, and markets are becoming defined.

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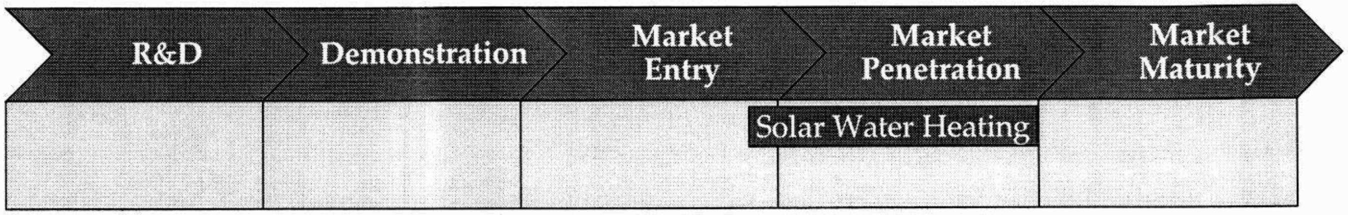
Solar water heating technologies have been in the Florida market for several decades .



Technology Definition

- This study will focus on rooftop solar water heating systems at least 2 MW in size. Locating a ground mounted solar water heating system near a facility is usually not feasible because of shading and land availability.
- This study will not cover pool heating applications.

Technology Maturity

- Glazed flat plate collector technology has successfully been deployed for several decades. Evacuated tube technology is starting to reach maturity as well.
- The remaining system components are all well established technologies (e.g., water heaters, piping, valves, etc.).
- The only relatively immature technology is metering technology to monitor energy output. This technology only has a few years of deployment in the United States.

Market Maturity

- Florida is currently the second leading state for solar water heating installations (behind Hawaii) and has several established manufacturers, distributors and installers.
- Several barriers – including poor perception due to past industry problems, lack of qualified installers, lack of customer awareness, and lack of government support – have been holding the U.S. solar water heating industry back.

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Navigant Consulting will focus on hybrid CSP designs.

R&D	Demonstration	Market Entry	Market Penetration	Market Maturity
	CLFR Dish Stirling Power Tower	Power Tower	Parabolic Trough	

Technology Definition

- Concentrating solar power (CSP) technologies require Direct Normal Insolation (as opposed to PV technologies which can use scattered or diffuse insolation as well). A vast majority of U.S. CSP projects are going in the desert southwest, where Direct Normal Insolation Resources are 50%-60% higher than Florida.
- Most systems in the desert southwest are currently dependent on federal tax credits to be competitive with traditional forms of generation. Given the lower resource in Florida, stand alone systems will not likely be economically competitive in the time frame of this study.
- However, a PPA has been signed in Florida for hybrid CSP system in which the CSP system heats steam for a natural gas combined-cycle plant's steam cycle. Thus, Navigant Consulting assumes this design is feasible in Florida and will focus on the technical potential of these designs.

Technology and Market Maturity

- Parabolic trough technologies have been operating in California since the mid 1980's and new plants have recently been completed in Nevada and Spain. Many more are scheduled to be built in the next decade.
- Compact linear fresnel, dish Stirling, and power tower technologies are still in the demonstration phase, but several plants of each technology are scheduled to be built in the next decade.

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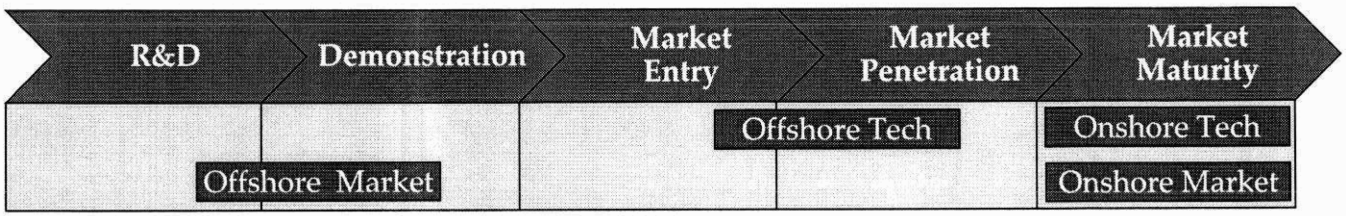
Onshore wind is a booming market, while offshore wind is just starting.



Technology Definition

- Wind energy refers to the use of horizontal axis wind turbines to generate energy from onshore and offshore wind regimes. The turbines range in nameplate capacity from under tens of kWs to upwards of 6 MWs, and installations range from single turbines to large farms with hundreds of turbines.

Technology Maturity

- Onshore wind turbine technology has matured considerably over the last decade as market demand has grown explosively. Average turbine nameplate capacity, tower height, and blade length have grown steadily.
- While offshore wind turbines have been installed in Europe for a number of years, the technology remains less mature than that of onshore wind as manufacturers look to develop larger turbines with innovative foundations and less maintenance requirements. Deep sea (>60 meter in depth) technologies are still in R&D and will not be ready by 2020.

Market Maturity

- The onshore wind market in the United States has entered market maturity. The U.S. wind market is the largest in the world, and in 2007, wind was the largest source of new generation capacity in the country.
- The global offshore wind market is transitioning from market entry to market penetration. In the United States, although there are active projects, no installations have occurred to date primarily due to regulatory and social barriers. Some of these barriers may be eliminated at the end of the year when the Minerals Management Service issues its final rulemaking.

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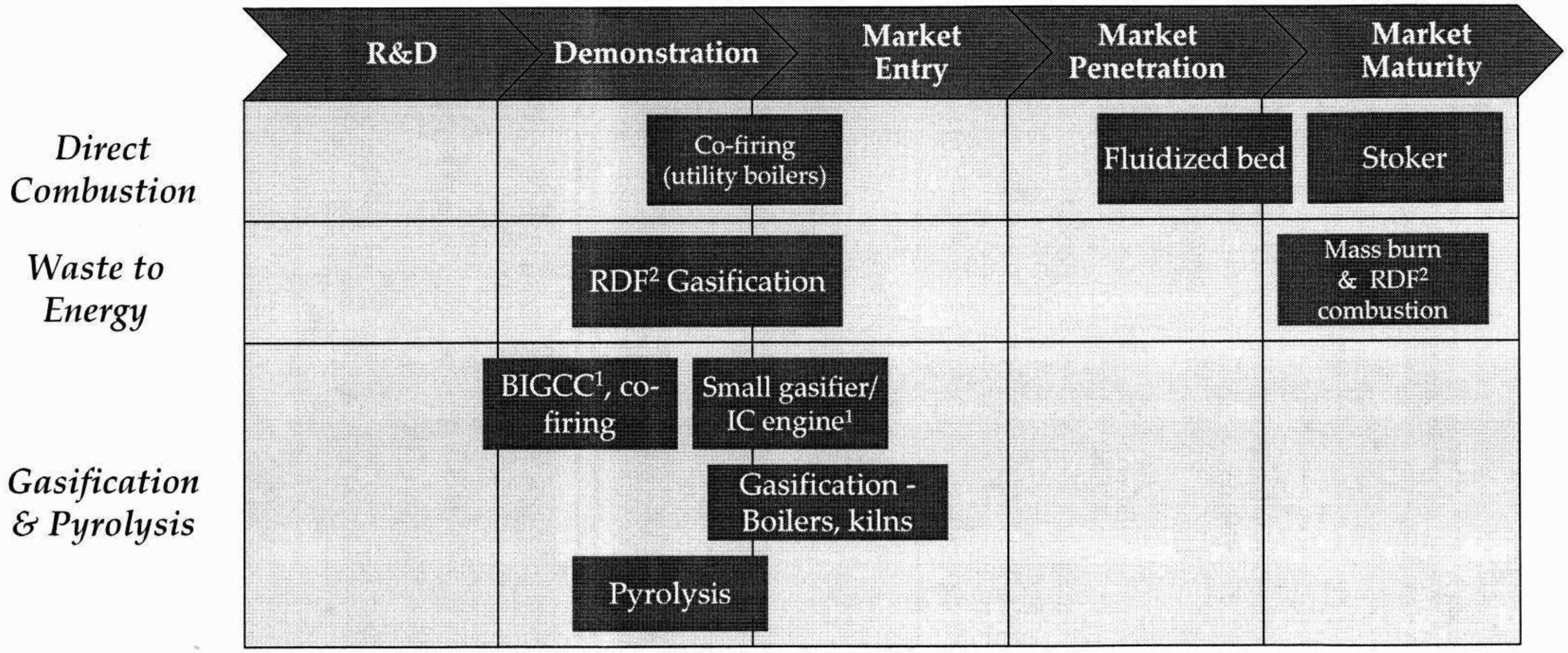
Biomass power generation comprises multiple technology platforms at varying levels of technology and market maturity



1. BIGCC = Biomass integrated gasification combined cycle.
2. RDF = Refuse derived fuel.

The emphasis of this study is on the resource potential, but technology options will also be evaluated.

The Florida Statutes include a broad definition of biomass for power generation that is not technology specific.

Resource & Technology Definition

- **Florida Statutes 366.91(2)(a)** "Biomass" means a power source that is comprised of, but not limited to, combustible residues or gases from forest-products manufacturing, agricultural and orchard crops, waste products from livestock and poultry operations and food processing, urban wood waste, municipal solid waste, municipal liquid waste treatment operations, and landfill gas.

Technology Maturity

- Biomass combustion is mature and widely deployed technology, mainly for cogeneration but also for stand-alone power generation.
- Biomass gasification is relatively well developed but lacks significant commercial deployment for power generation
- Direct co-firing with coal in utility boilers is technologically mature but not widely deployed
- Waste to energy based on combustion is mature but gasification

Market Maturity

- Markets for onsite use of biomass residues is generally mature but there is the potential for repowering with gasification
- There is less use of biomass for stand-alone power generation
- Co-firing has historically been limited by economic and regulatory factors (e.g., risk of NSR).
- Only about 15% of municipal solid waste in the US is incinerated but market growth has been stagnant due to siting constraints.

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Internal combustion (IC) engines are most commonly used in landfill gas to energy applications.

R&D	Demonstration	Market Entry	Market Penetration	Market Maturity
			Market	Technology

Resource/ Technology Definition

- Landfill gas (LFG) is the naturally occurring biogas produced through anaerobic digestion at landfill sites.
- A landfill gas to energy (LFGTE) project utilizes the biogas produced by decomposing organic waste in landfills to power an electricity generator.

Technology Maturity

- LFG conversion technologies are fully developed, though efficiency and emissions improvements are expected.
- IC engines are most commonly used, but gas turbines, steam turbines, microturbines and fuel cells have all found application with landfill gas/biogas.

Market Maturity

- The market for LFG is mature, but substantial potential exists in Florida as population and GDP growth drive waste generation.
- According to the EPA, as of December 2007, 445 LFG energy projects were operational in the US and about 535 landfill sites had been identified as attractive investment opportunities.

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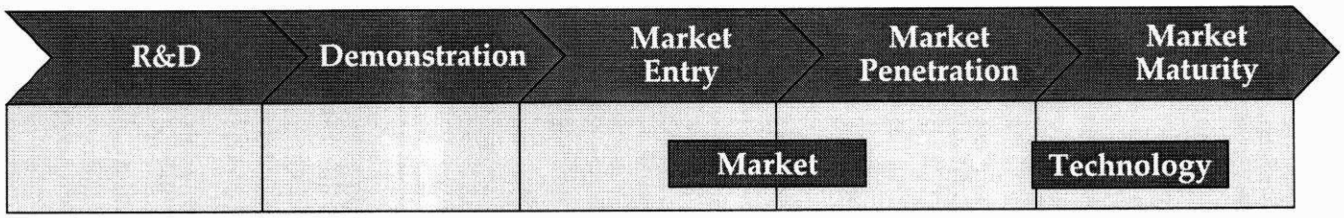
Internal combustion (IC) engines are most commonly used in anaerobic digester gas applications.



Resource/ Technology Definition

- This analysis will focus on farm animal waste, food process waste and wastewater treatment plant waste as the sources of anaerobic digester gas.
- An anaerobic digester utilizes the natural process of anaerobic decomposition to treat waste (e.g. dairy cow manure) and produce biogas that can be used to power electricity generators.

Technology Maturity

- Anaerobic digester technologies are mature, though future costs are expected to decline as designers and manufacturers of the digesters learn and optimize the design.
- IC engines are most commonly used in anaerobic digestion power production.

Market Maturity

- Dairy and beef farms are the most typical farm-based feedstocks and are at a low level of penetration. Wastewater sludge and food processing waste are at a medium level of penetration.

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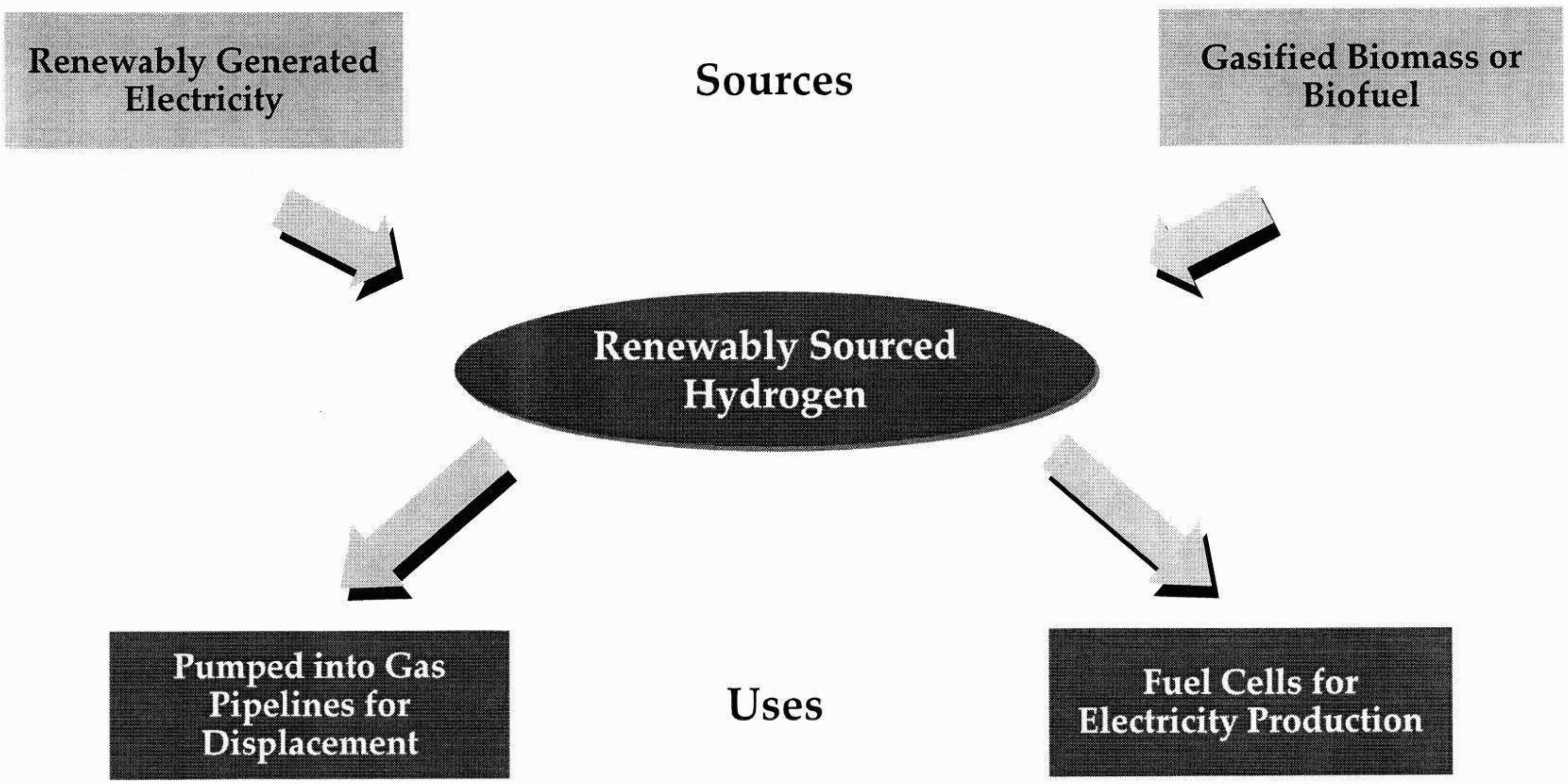
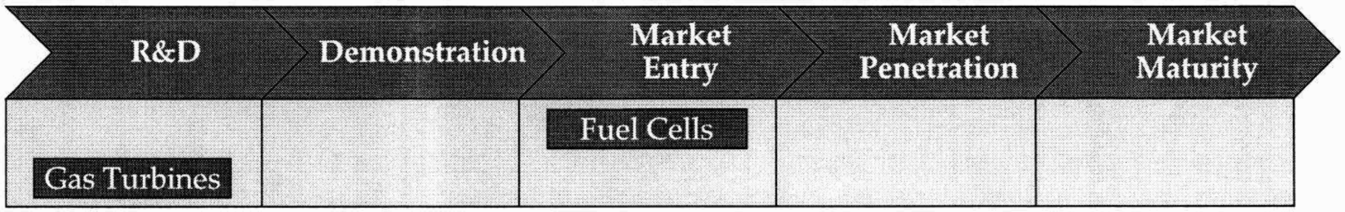
Hydrogen differs from the other RE resources in that it is a derivative resource. Only hydrogen from renewable sources is considered.



Notes: This analysis assumes that the use of hydrogen as a transportation fuel and as a component of industrial processes (e.g., hydrogen is used for desulphurization in refineries) would not qualify under the state RPS so these uses are not depicted in the diagram above.

Hydrogen technologies have limited market penetration to date.



Technology Definition

- Technologies that can produce electrical, mechanical, or thermal energy from hydrogen include fuel cells and natural gas turbines, which can combust a mix including natural gas and a small portion hydrogen.

Technology Maturity

- There are four principal types being of fuel cells being developed for commercial markets are: proton exchange membrane (PEM), phosphoric acid (PAFC), molten carbonate (MCFC), and solid oxide (SOFC). While all of these types have been around for some time, their primary challenge continues to be cost and efficiency loss (if used as a storage technology).
- Standard natural gas turbines are an established technology , but their usage for combustion of a mix of natural gas and hydrogen has been very limited. The advantage is that it does not require much modification as long as the percentage of hydrogen is kept low enough to prevent pipe brittling or necessitate change out of the burner tip. One challenge is ensuring that the hydrogen does not leak from transport pipes.

Market Maturity

- The use of fuel cells for stationary power generation is an established technology, but widespread penetration has not happened due primarily to high system costs.
- The use of hydrogen mix in gas turbines has been discussed but remains largely unimplemented to date.

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Steam turbines and Organic Rankine Cycle (ORC) technologies are most commonly used to convert waste heat into electricity.

R&D	Demonstration	Market Entry	Market Penetration	Market Maturity
			Market	Technology

Resource/ Technology Definition

- Waste heat is a by-product of exothermic industrial processes. Waste heat can be captured to be recycled for thermal processes, turned into electricity or a combination of the two (cogeneration).
- This study will focus on the MW electricity-potential from sulfuric acid conversion processes as part of the fertilizer manufacturing industry in Florida. The most common waste product at H_2SO_4 plants is waste heat.

Technology Maturity

- Waste heat conversion technologies are fully developed, though the concept of "turn-key" cogeneration and Organic Rankine Cycle technologies are evolving.
- A variety of technologies and applications exist to convert waste heat, but steam turbines and ORC technologies are some of the most widely used.

Market Maturity

- The market for waste heat to electricity is still growing. Rising energy cost, among other factors, have improved the economics of heat recovery systems has and led to a more widespread adoption of the concept.
- In Florida, the estimated penetration of waste heat recovery in the sulfuric acid production process for phosphate-based fertilizers is 73%.

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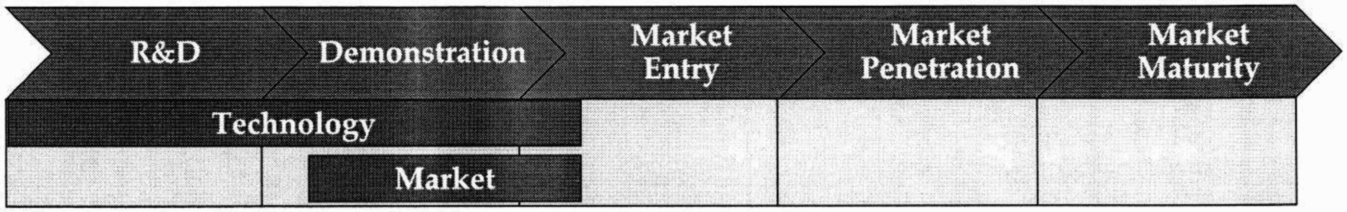
Certain wave technologies have reached the market entry stage.



Technology Definition

- **Florida Statutes 366.91(2)(d):** "Ocean energy" is listed without additional detail in this statute. For the purposes of this project, the definition of wave energy technologies will include both onshore and offshore wave power systems. The wave energy technologies are described in more detail in the Appendix.

Technology Maturity

- Though most wave technologies remain in the R&D stage, a handful of companies (5 to 10) have completed the development stage and are at or near the commercial demonstration phase. A few companies are prepared to develop commercial projects.

Market Maturity

- The first commercial sale was announced in 2005 and some additional commercial orders have been secured in Scotland, Portugal, and Australia. Commercial projects in CA, HI, and OR are seeking preliminary FERC permits. One commercial project in WA has been issued a license to move forward. No commercial or pilot wave projects exist or are seeking permitting in FL.
- Due to technology risk, FERC has ruled that all ocean power projects first be developed as pilots and operate for five years.

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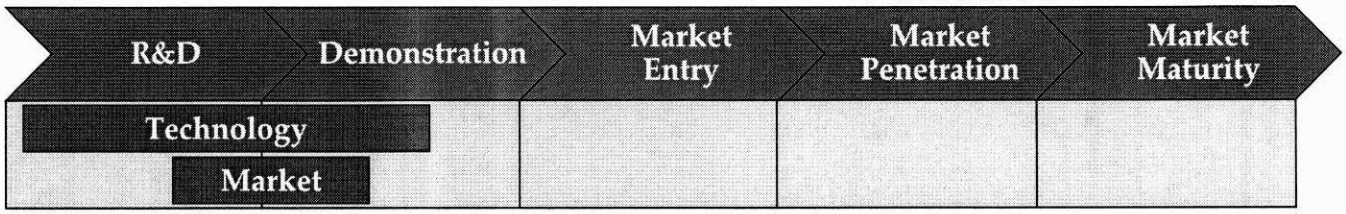
In-stream tidal may be able to gain a foothold in the market by 2010 given a supportive regulatory environment.



Technology Definition	• **Florida Statutes 366.91(2)(d):** "Ocean energy" is listed without additional detail in this statute. For the purposes of this project, tidal technologies will be defined as technologies which use the flow of water due to ocean currents or tidal changes to generate electricity. The wave energy technologies are described in more detail in the Appendix.
Technology Maturity	• Traditional tidal technology has reached commercial market entry in some areas of the world, but has not been implemented in the United States. • In-stream tidal power is still in the design/piloting stages. Recent and current demonstration projects are testing the operational capabilities of turbine designs, as well as environmental impacts. Companies are refining their designs and preparing for large-scale deployment. One major area of uncertainty is O&M, and performance and lifetime have yet to be proven.
Market Maturity	• Due to technology risk, FERC requires that ocean power projects be developed first as pilots and operate for five years. FERC has issued ~30 preliminary permits (mostly in-stream) since 2005. There are 2 pending preliminary permits for FL ocean current pilots. • Traditional tidal technology requires a difference of ~16 feet between high and low tide, limiting the worldwide and U.S. potential for development to ~40 sites.

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Ocean thermal energy's limited applicability has impacted its growth.

R&D	Demonstration	Market Entry	Market Penetration	Market Maturity
Technology Market				

Technology Definition

- **Florida Statutes 366.91(2)(d):** "Ocean energy" is listed without additional detail in this statute. For the purposes of this project, the definition of ocean thermal energy conversion (OTEC) technologies will include open loop, closed loop, and hybrid systems. The wave energy technologies are described in more detail in the Appendix.

Technology Maturity

- Small-scale OTEC pilot systems and individual system components have been tested successfully off the coast of Hawaii. No OTEC facilities are currently generating electricity.

Market Maturity

- The limited applicability of OTEC technology in the United States has constrained public R&D investments and commercial interest.
- Due to technology risk, FERC now requires that all ocean power projects be developed first as pilots and operate for five years.

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This study will not cover hydroelectric dams or pumped storage.

Florida Hydro Potential

- **Hydroelectric dams -**
  - –Florida currently has 55.7 MW of hydroelectric capacity.
  - –According to Idaho National Laboratory's state-level hydropower assessment, Florida has the following potential:
    - ➢49.3 MW of potential capacity in developed sites without power generation[1].
    - ➢9.9 MW of potential capacity in greenfield sites.
  - –Given the relatively small potential and the likely high hurdles a developer would face in permitting due to environmental concerns, NCI will not be analyzing hydroelectric dams as part of this study.
- **Pumped storage –**
  - –Pumped storage is a storage technology. Any RECs associated with pumped storage would be generated when the electricity is originally created.
  - –Thus, NCI will not be analyzing pumped storage as part of this study.

Notes
1. The site has some type of developed impoundment or diversion structure, but no developed hydropower generating capability.

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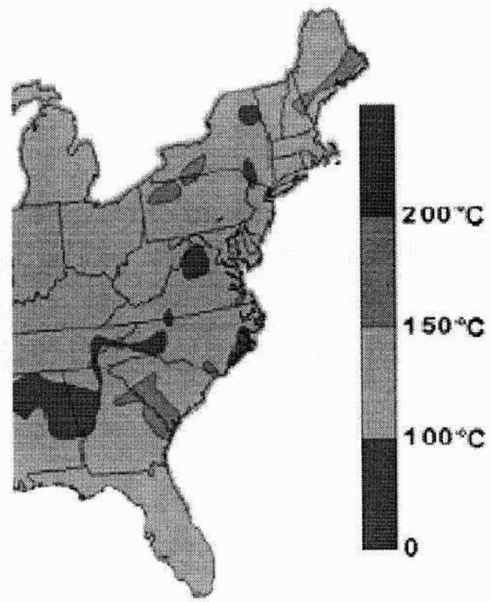
This study will not cover geothermal electric power.

Florida Geothermal Potential

- A geothermal resource of 150 °C (~300 °F) is needed for geothermal electric plants to be feasible.
- Florida does not have resources at this level. Thus, this study will not analyze geothermal resource potential.
- This study will not analyze geothermal heat pumps, as those a demand reduction technology, rather than a supply technology.

Eastern U.S. Geothermal Resource

Resource Potential at a Depth of 6 km.



Source: U.S Department of Energy's Geothermal Technologies Program.

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Appendix

Onshore and offshore wave power systems use the breaking and bobbing motion of waves, respectively, to generates electricity.

Wave Energy Technologies	
Onshore Systems	**Offshore Systems**
Oscillating Water Column: Consists of a partially submerged concrete or steel structure with an opening to the sea below the waterline. It encloses a column of air above a column of water. As waves enter the air column, they cause the water column to rise, compressing and pressurizing the air column. As a result of the fluctuating air pressure, air is repeatedly drawn through the turbine. **Tapchan/overtopping:** Consists of a tapered channel which feeds into a reservoir constructed on cliffs above sea level. The narrowing of the channel causes the waves to increase in height as they move toward the cliff face. The waves spill over the channel walls into a reservoir and the water is then fed through a turbine. **Pendulor Device:** A rectangular box is open to the sea at one end. A flap is hinged over the opening and the action of the waves causes the flap to swing back and forth, powering a hydraulic pump and a generator.	Offshore systems are typically situated in water more than 130 feet deep. **Pump:** Submerged or floating, offshore pump systems use the bobbing motion of waves to power a pump that generates electricity **Hose:** Hoses are connected to floats that ride the waves. The rise and fall of the float stretches and relaxes the hose, which pressurizes the water, thereby rotating a turbine. **Turbine Vessel/overtopping:** Seagoing vessels can also capture the energy of offshore waves. These floating platforms create electricity by funneling waves through internal turbines and then back into the sea.

Note: A couple of these technologies are depicted on the following slide.

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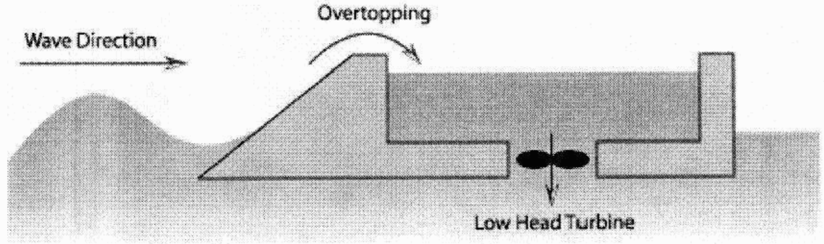
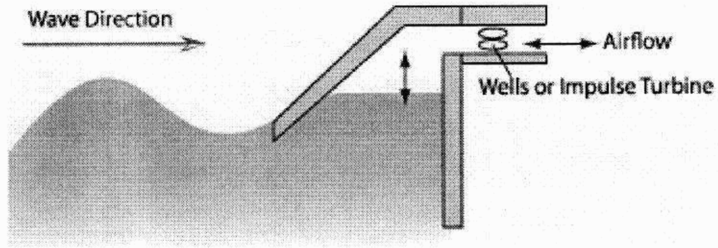
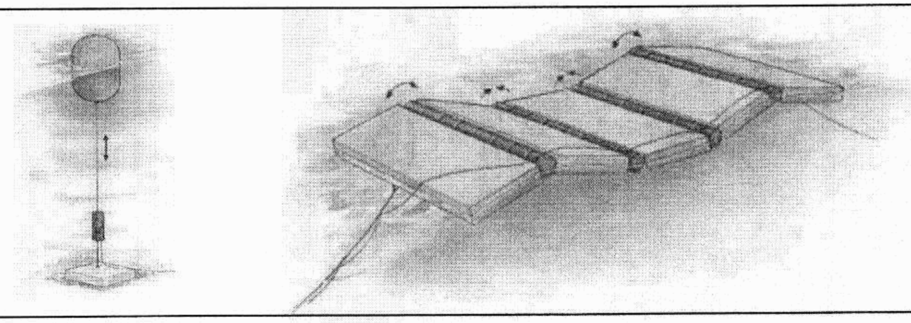
Wave energy conversion devices convert wave motion to electricity.

Tapchan/ Overtopping	
Oscillating Water Column	
Buoyant Moored Device (Pump or Hose)	

Sources EPRI

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Tidal in-stream devices are designed to use kinetic energy from the flow of water across or through the rotor to power a generator.

Tidal and Ocean Current Technologies		
Traditional Tidal	**Tidal Fence**	**Tidal Turbine**
A barrage or dam is typically used to convert ocean tidal energy into electricity by forcing the water through turbines, activating a generator. Gates and turbines are installed along the dam. When the tides produce an adequate difference in the level of the water on opposite sides of the dam, the gates are opened. The water then flows through the turbines. The turbines turn an electric generator to produce electricity.	Underwater turnstiles span a channel or narrow strait. They can reach across channels between small islands or across straits between the mainland and an island. The turnstiles spin via tidal currents typical of coastal waters. Some of these currents run at 5–8 knots (5.6–9 miles per hour) and generate as much energy as winds of much higher velocity.	Turbines are arrayed underwater in rows. The turbines function best where coastal currents run at between 3.6 and 4.9 knots (4 and 5.5 mph). In currents of that speed, a 15-meter (49.2-feet) diameter tidal turbine can generate as much energy as a 60-meter (197-feet) diameter wind turbine. Ideal locations for tidal turbine farms are close to shore in water depths of 20–30 meters (65.5–98.5 feet).

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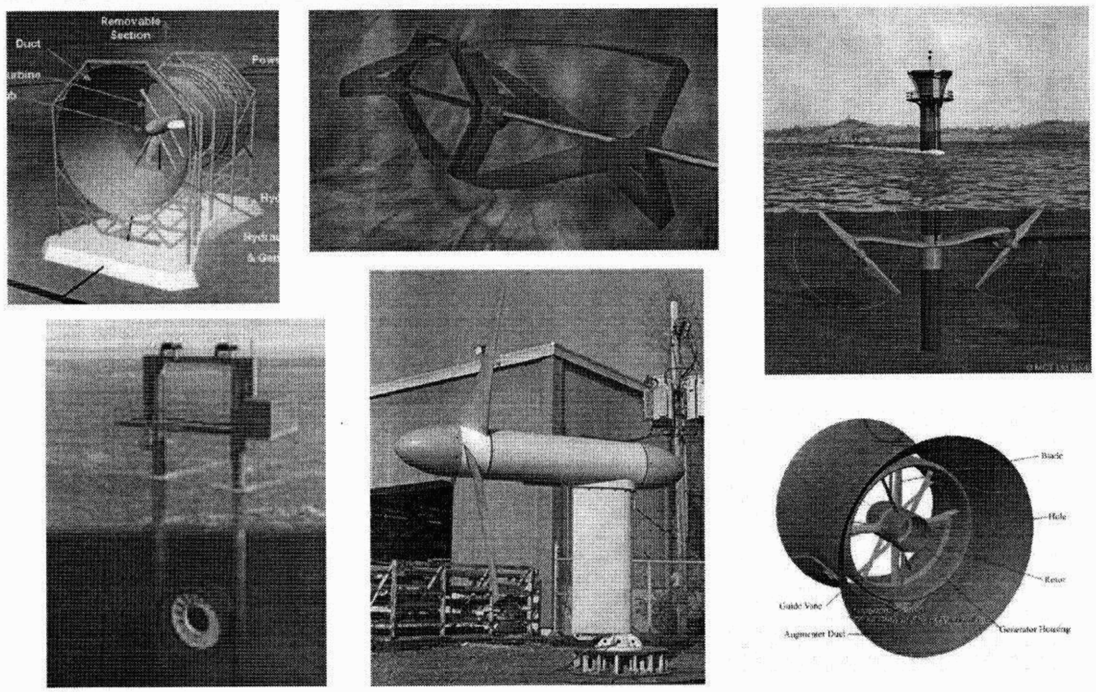
Zero-Head (Kinetic) Hydropower also goes by tidal, in-stream, or kinetic hydro. Several different types of devices are in development.

Different Types of Kinetic Hydro Devices



Sources: "Survey and Characterization, Tidal In Stream Energy Conversion (TISEC) Devices", EPRI, November 9, 2005; Proceedings of the Hydrokinetic and Wave Energy Technologies Technical and Environmental Issues Workshop. Washington, DC. October 26-28, 2005. Prepared by RESOLVE, Inc., Washington, D.C., Susan Savitt Schwartz, ed. March 2006. http://hydropower.inl.gov/; "Future marine Energy", Carbon Trust, January 2006; NCI Interviews with Industry Representatives; Company Websites.

OTEC technology relies on the contrast of cold and warm water temperatures to function.

Ocean Thermal Energy Conversion Technologies		
Open-Cycle	**Closed-Cycle**	**Hybrid**
These systems place warm surface water in a low-pressure container, causing it to boil. The expanding steam drives a low-pressure turbine attached to an electrical generator. The steam, which has left its salt behind in the low-pressure container, is almost pure fresh water. It is condensed back into a liquid by exposure to cold temperatures from deep-ocean water.	These systems use a working fluid with a low-boiling point, such as ammonia, to rotate a turbine to generate electricity. Warm surface seawater is pumped through a heat exchanger where the working fluid is vaporized. The expanding vapor turns the turbo-generator. Cold deep-seawater—pumped through a second heat exchanger—condenses the vapor back into a liquid, which is then recycled through the system.	In a hybrid system, warm seawater enters a vacuum chamber where it is flash-evaporated into steam, similar to the open-cycle evaporation process. The steam vaporizes a low-boiling-point fluid (in a closed-cycle loop) that drives a turbine to produce electricity.