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NC H2 RT Panel Discussion Guide Brief
Duke University, August 15 2008

...Research that informs Advanced Technology Investment success..

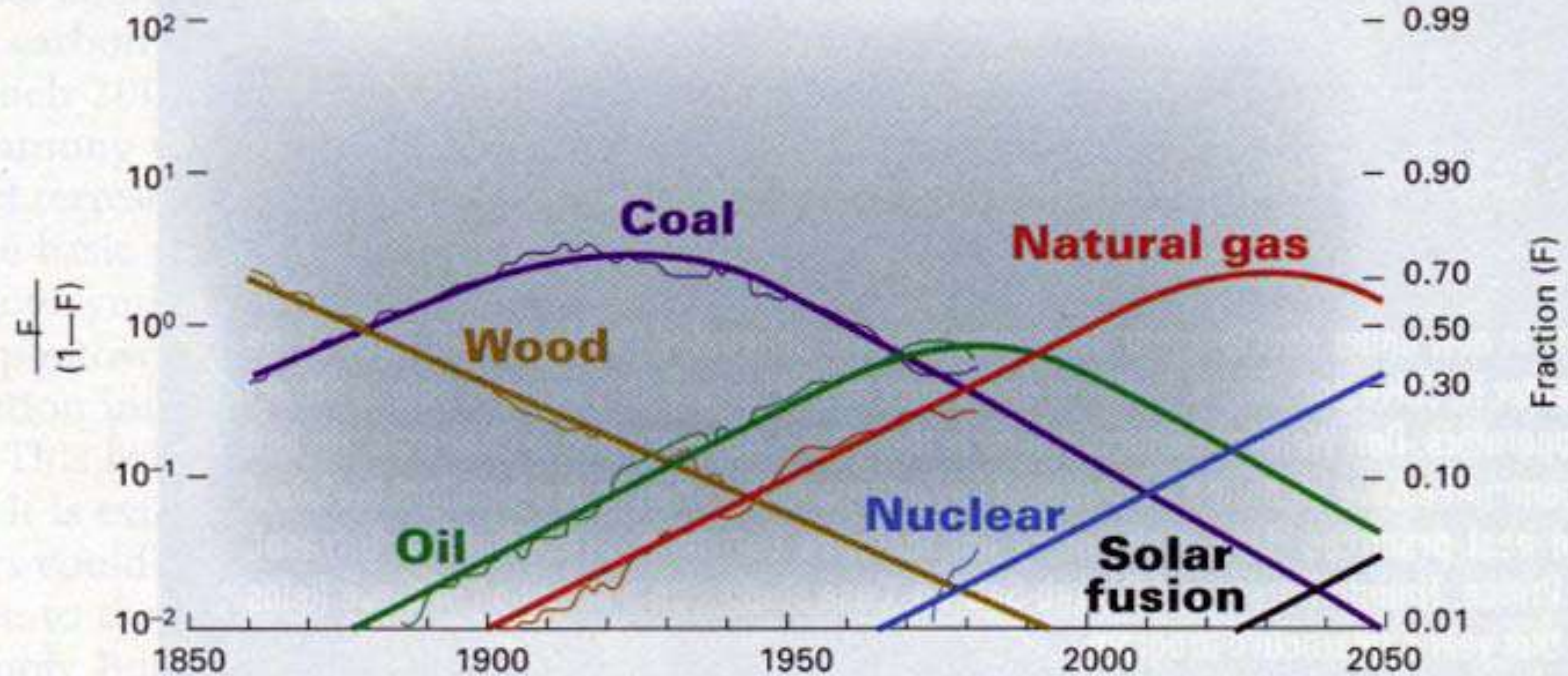
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NC

What We All NOW Face is NO Surprise to Analyst

“In the late 1990’s [2010’s], there will be worldwide oil shortage as the Middle East production peaks out...By the early 2000’s [2020’s], there will probably be... global energy shortages...Hydrogen may be proven by then to be a preferred way to delivery energy. By the year 2025 [2050], I can see a rapidly developing nuclear/solar/hydrogen energy system...making it [hydrogen] the “pipeline gas” of the future.”

-- Gregory, D. and Escher, W., “Symposium Papers: Hydrogen for Energy Distribution,”
Institute of Gas Technology, July 24-28, 1978.

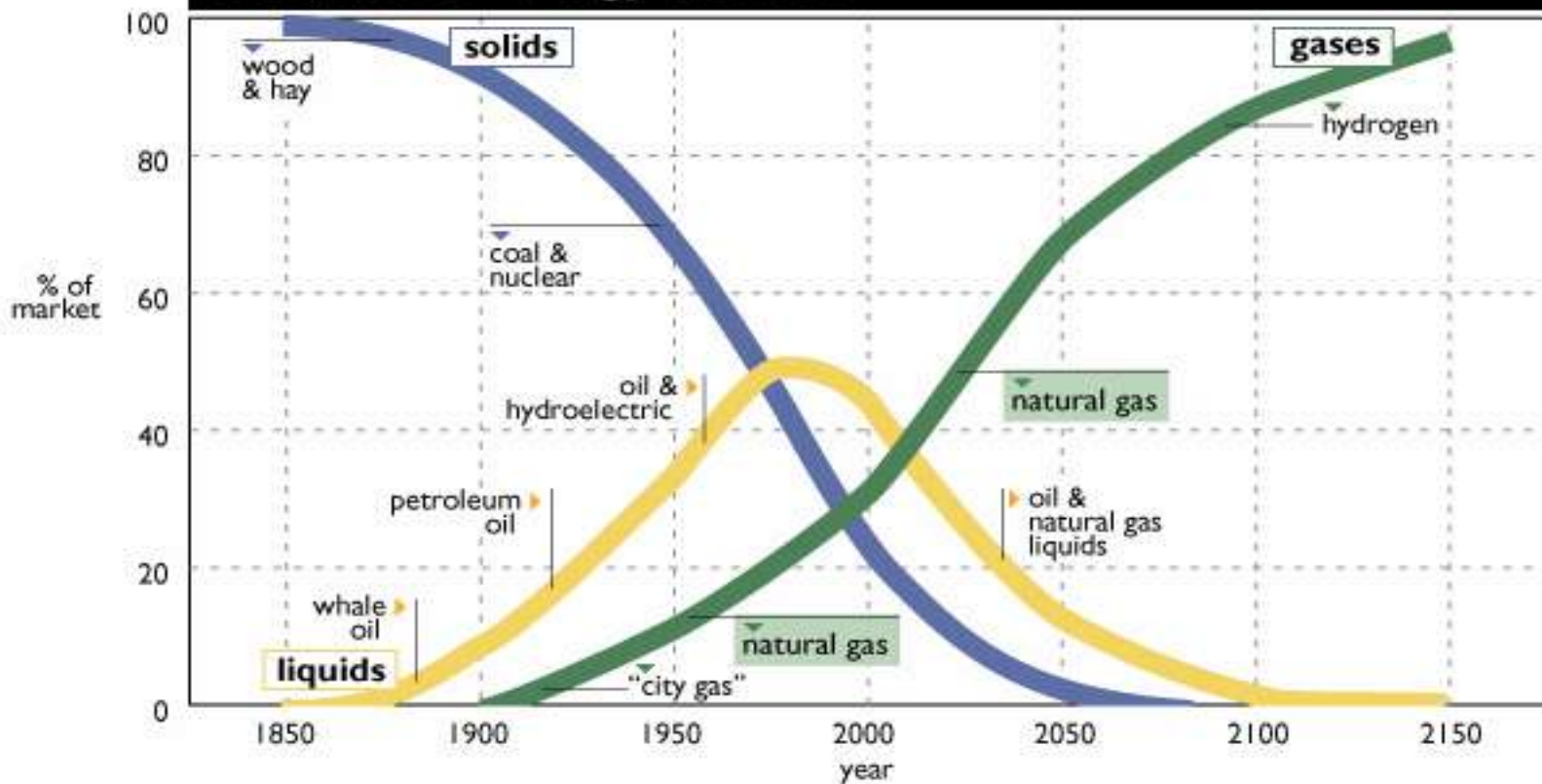
WORLD PRIMARY ENERGY SUBSTITUTION OUTLOOK



Source: Dr. Nebosja Nakicenovic, International Institute for Applied Systems Analysis, Laxenburg, Austria.

Source: http://media.godashboard.com/gti/1ResearchCap/1_2EnergySyst/GTINGH2.pdf, as shown on pg 9

Evolution of Energy Carriers

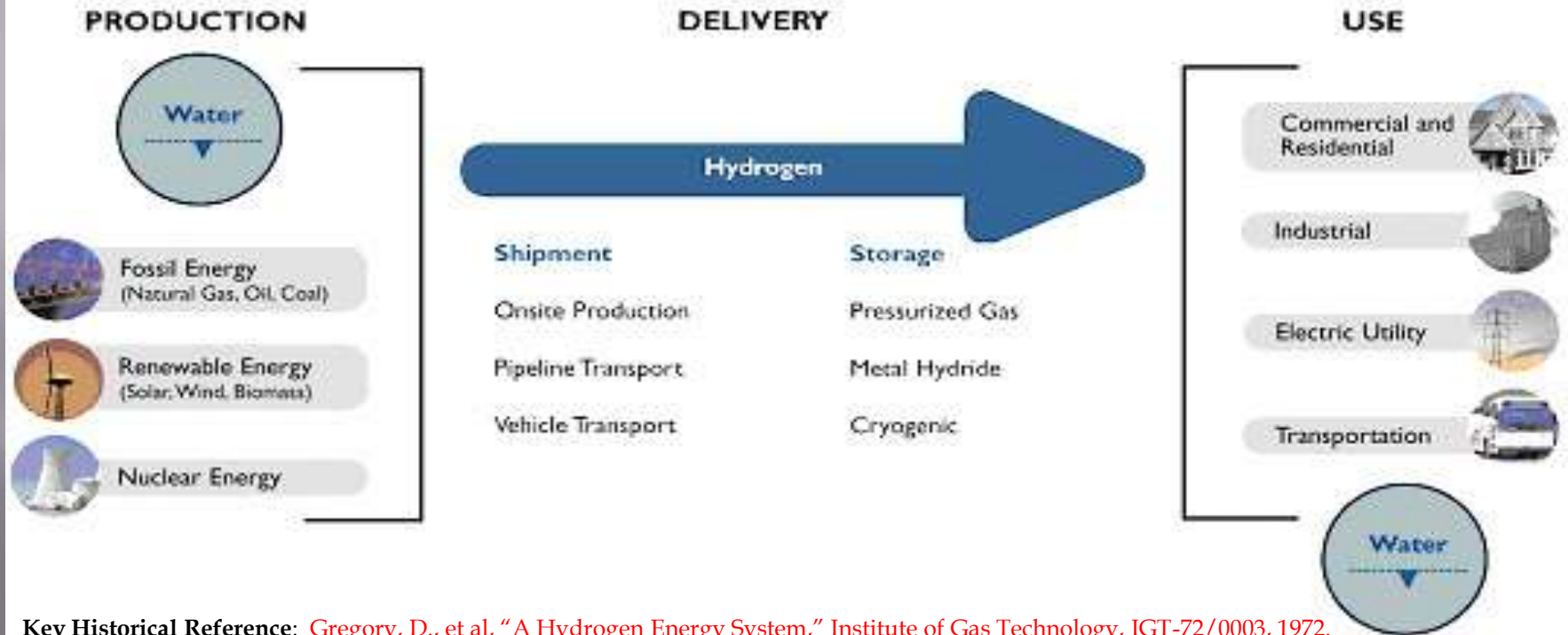


Modified from "The Economist", February 10, 2001 edition.

Hydrogen as Primary Mobile Fuel Source: A 1978 Scenario reaching Realization ?

THE HYDROGEN ENERGY SYSTEM

SOURCE: http://www.gastechnology.org/webroot/app/xn/xd.aspx?it=enweb&xd=4ReportsPubs/4_8FOCUS/HydrogenResearchFocus.xml



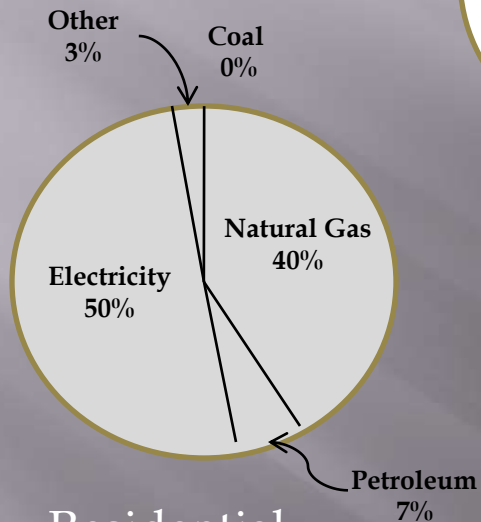
Key Historical Reference: Gregory, D., et al, "A Hydrogen Energy System," Institute of Gas Technology, IGT-72/0003, 1972.

NC H2 Economy Strategic Considerations

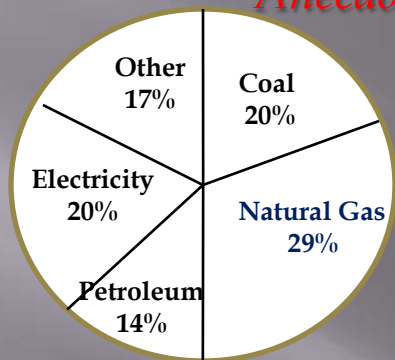
- ***Key H2 Energy Transport System Components are Already in the Works***
 - IC To Hybrids to Electric Power or Gas Grid to (Mobile or Stationary Fuel Cell)
- ***Strategic Market Pressures Offer NC and Economic Development Opportunity –***
i.e., there is an upside Advanced Commercial technology EXPORT play
- ***Current World Hydrogen Fuel System buildout Deal Flows*** Suggests a vibrant Global H2 Future is being FUNDED now.
- ***Some Key Work Competitor(s)*** (i.e., Commercial , Academic, and Public Policy) Anecdotes

Historical US Economy- Energy Policy End Use Sectors' *Current State -- Virginia 2007*

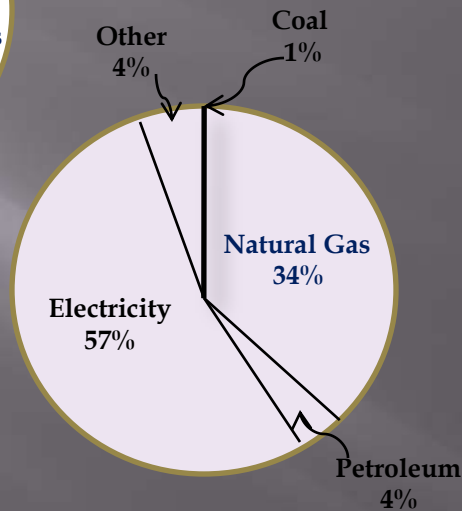
Anecdotal data



Residential Sector

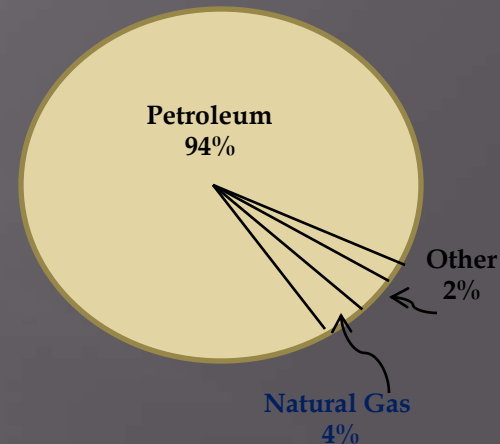


Industrial Sector



Commercial Sector

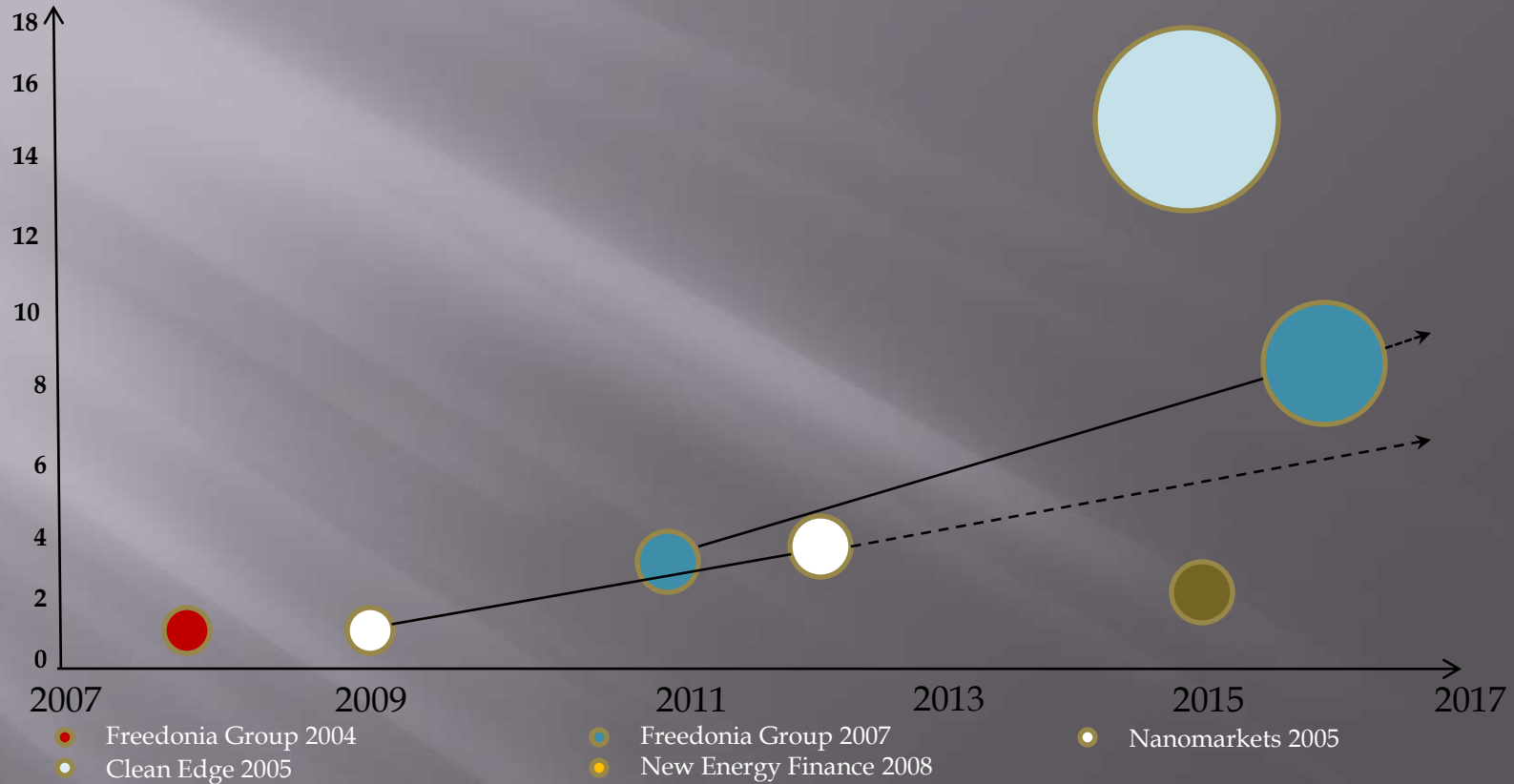
Transportation Sector



Source: Commonwealth of Virginia: Department of Mine, Minerals and Energy "The Virginia Energy Plan 2007"

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Fuel Cell Market Forecast(s) Mashup: (\$bn, year)



Source: New Energy Finance , “Fuel Cells: A Second Look?” (see: Figure 1. Other Market Estimates) , May 2008

Current World Hydrogen Fuel System Buildout: *Indicative Deal Flows*

Source: "Fuel Cells: A Second Look?" New Energy Finance, May 2008

Fig 2. VC/PE Investment in Fuel Cells, 2002-2007; \$m

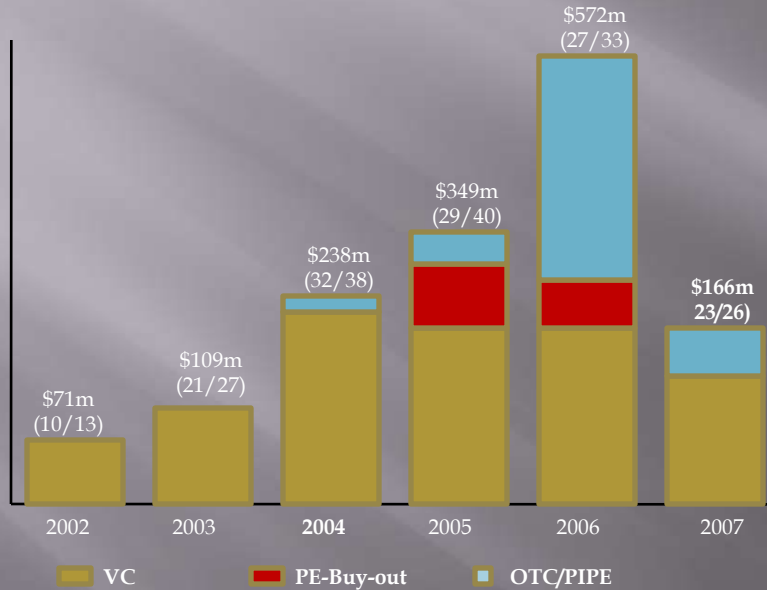
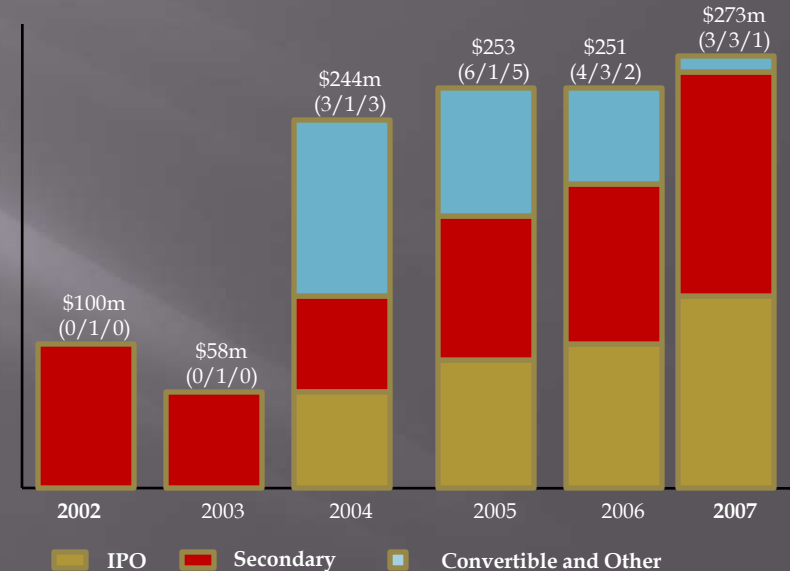


Fig 3. Pub Market Investment in Fuel Cells, 2002-2007; \$m



Note: **Figures** shown are the total deal values of both disclosed and non-disclosed. Deal counts are represented as (number disclosed deals/total number of deals)

Note: labels represent total investment volume (number of IPO's/ Number of secondary offerings/number of convertible and other deals)

Some Bottom Lines: Key Existing Segments and Known Investment Plays* --

- Recreation Vehicles: US and Europe, estimated revenue will be \$612-1.1bn in 2015
- Wireless telecoms back-up: US, estimated revenue will be \$62-110m in 2015
- Mid-sized distributed generation (**250w-5MW**): US and Europe, estimated revenue will be \$ 876m in 2015

Key Players in leading applications

Application	Key Players
Wireless Telecoms Backup power	Plug Power (PLUG), IdaTech(IDA), Relion, Hydrogenics (HYGS), P21
Recreational vehicles	Smart Fuel Cell (SFC), Voller Energy (VLR) IdaTech
Mid-sized distributed generation	FuelCell Energy (FCEL), UTC Power, Nedstack, CFC Solutions

* All these Data sourced from : New Energy Finance:

Your First Steps

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There is a significant NC Technology Commercialization Play. Let's Seize it!