

# Views on A Low Carbon Society- a USA and Stony Brook University Perspective on Research and Education

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## SBU Institutional Snapshot

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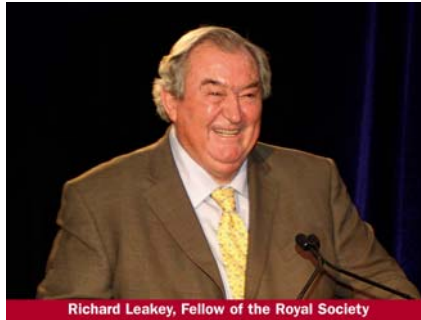
- Founded in 1957, now a member of the Association of American Universities, the top 62 research universities in North America
- Faculty of 2,000; 97% of full-time faculty hold doctoral degrees or the highest degrees in their fields
- Part of the State University System of New York
- Manage Brookhaven National Laboratory with Battelle Memorial Institute for the US Department of Energy



# Outstanding Faculty

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- Three Nobel Prize winners
- Fields medalist
- Many winners of United States Presidential medals
- MacArthur Foundation “genius” awards
- Members of the Academies and the Royal Society



Richard Leakey, Fellow of the Royal Society



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Brookhaven National Laboratory

# Energy and Sustainability

- M. I. Hoffert et al., *Nature*, **1998**, 395, 881, "Energy Implications of Future Atmospheric Stabilization of CO<sub>2</sub> Content"

adapted from IPCC 92 Report: Leggett, J. et al. in Climate Change, The Supplementary Report to the Scientific IPCC Assessment, 69-95, Cambridge Univ. Press, 1992

- Kaya Identity: Carbon emissions are the result of  

$$\text{Population Growth} \times \text{per capita GDP} \times \text{Primary energy intensity (energy needed per GDP)} \times \text{Carbon intensity}$$
- IPCC model (business as usual) is IS92a and requires substantial carbon-free energy sources
- Predictions of CO<sub>2</sub> levels by the Wigley, Richels and Edmonds (WRE) model



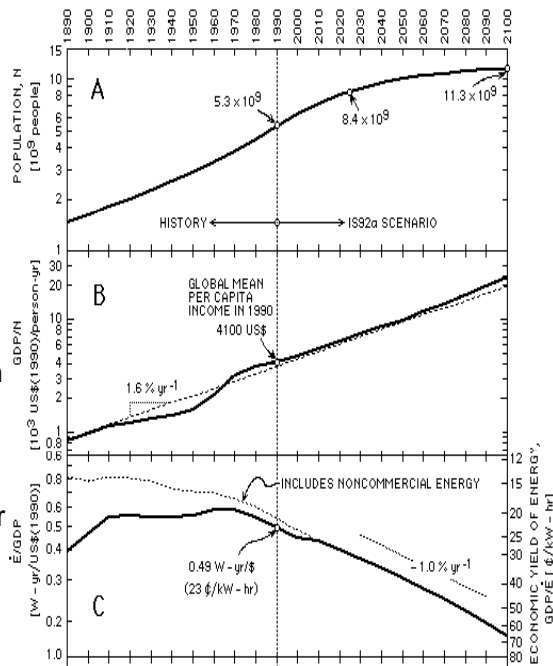
Source: Nate Lewis, Caltech

Population Growth to 10 - 11 Billion People in 2050

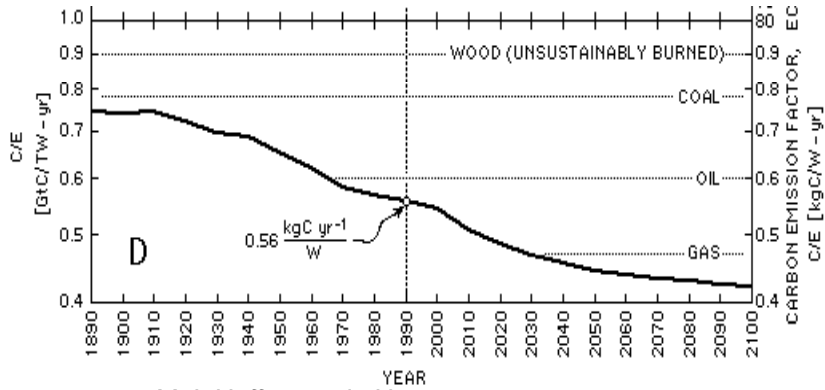
Per Capita GDP Growth at 1.6% yr<sup>-1</sup>

Energy consumption per Unit of GDP declines at 1.0% yr<sup>-1</sup>

Source: Nate Lewis, Caltech



## Carbon Intensity of Energy Mix



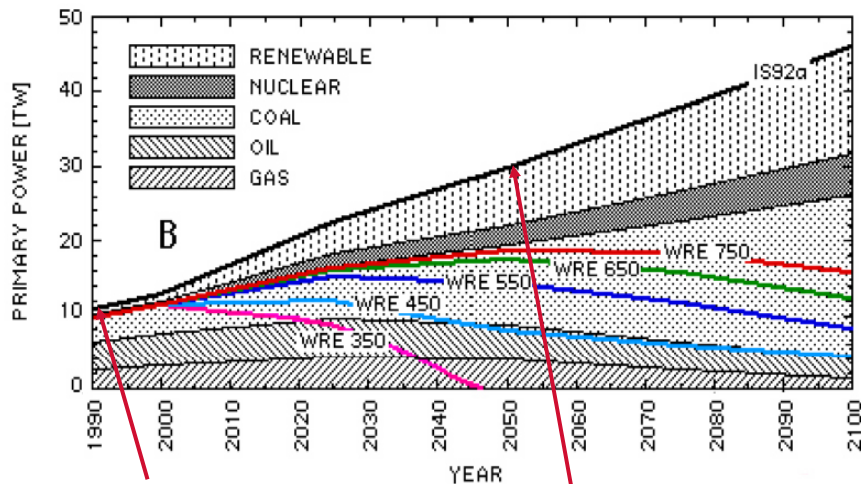
M. I. Hoffert et al., *Nature*, **1998**, 395, 881.  
 Requires 'massive' decarbonization of fuels  
 by 2050 – 10 TW of energy from carbon free  
 sources



Source: Nate Lewis, Caltech

## Total Primary Power vs. Year

WRE lines show the maximum C-based energy allowable to maintain CO<sub>2</sub> (ppm)

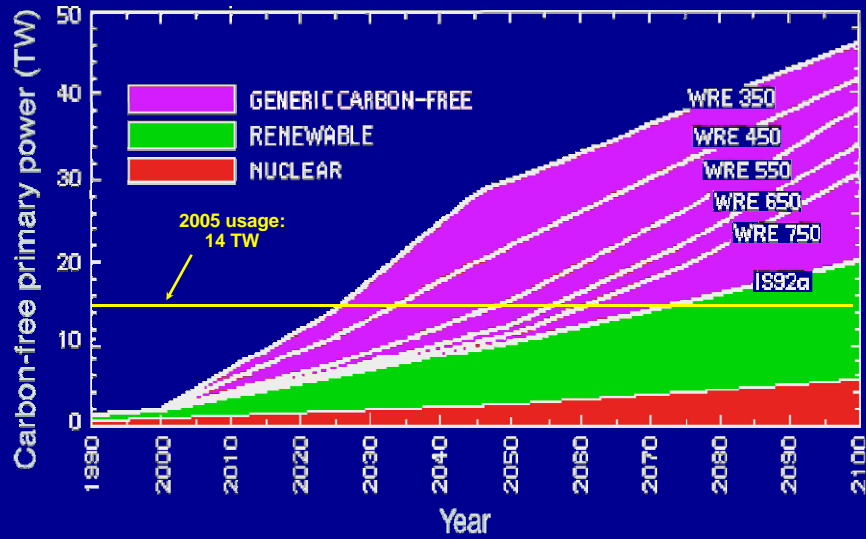


**1990: 12 TW 2050: 28 TW**

Source: Nate Lewis, Caltech/ Hoffert et al.



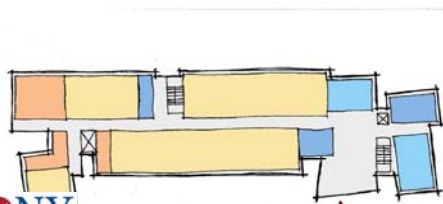
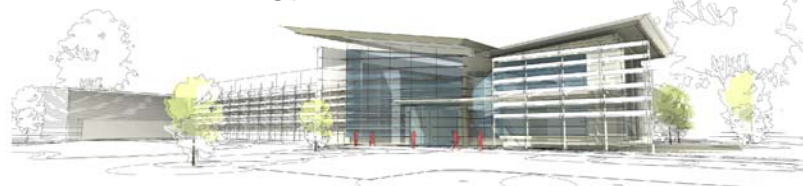
## Projected Carbon-Free Primary Power



Source: Lewis, Hoffert

## These Results Point the Way to Research and Education Pathways

- Advanced Energy Research Center



LEED Platinum Building  
60,000 sq ft



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## These Results Point the Way to Research and Education Pathways

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At Stony Brook/ BNL, substantial research efforts:

- Storage
  - Batteries
- Delivery
  - Smart Grid
    - Management
    - Materials
- Biofuels (NSF Center – D. Mahajan)
- Education



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## These Results Point the Way to Research and Education Pathways

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- We must move towards low carbon intensity and cleaner energy future
- Need education, human resource capacity
  - green employment opportunities!
- Silicon Valley – ‘CleanTech’ is the next technology
- University needs to innovate for this educational need –NOW!



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## Stony Brook Southampton

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- The environment and sustainability are critical issues. Southampton will provide an extraordinary opportunity.
- Southampton is a new kind of school – a small, campus associated with a major research university.
- The curriculum is organized around environmental sustainability, public policy, and natural resource management. Classes depend on an interdisciplinary core and examine policy/economics/society.



## Stony Brook Southampton

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- Our location — on top of the world's richest aquifer and in proximity to the Atlantic Ocean — is the perfect place to put theory to practice
- Current programs: BA in Environmental Studies, BSs in Marine Sciences and Marine Vertebrate Technology
- New Programs: BAs in Ecosystems and Human Impact, Environmental Design Policy and Planning, and Sustainability Studies







**First Class, Stony Brook Southampton, 2007**