Does a Prius Consume More Energy than a Hummer?

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Overview

1. The Prius Production Process
2. Creating the Myth
3. Perpetuating the Myth
4. Flaws in the Study
5. Doing the Math
6. Conclusions

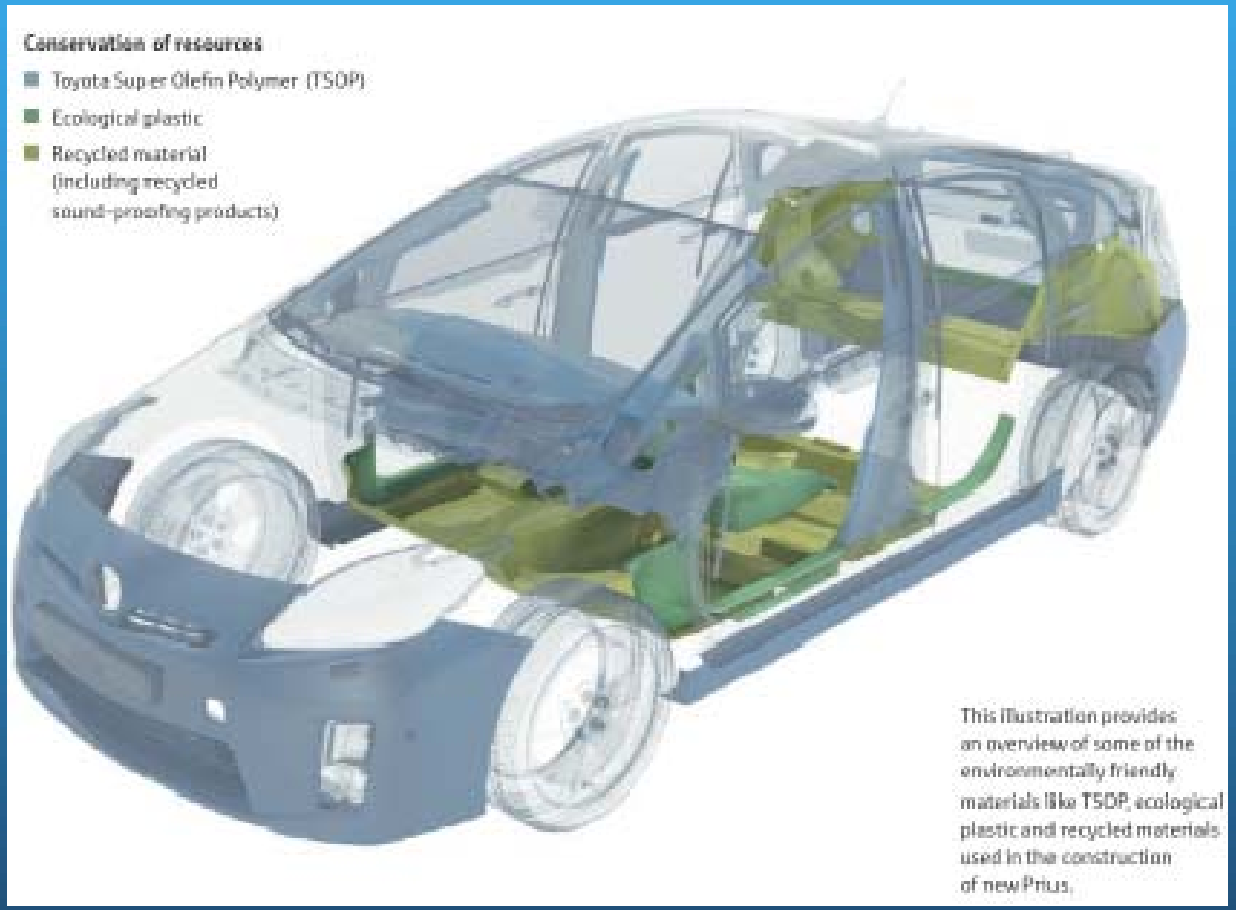
The Prius Production Process

TOYOTA

Tsutsumi Plant

HYBRID SYNERGY DRIVE

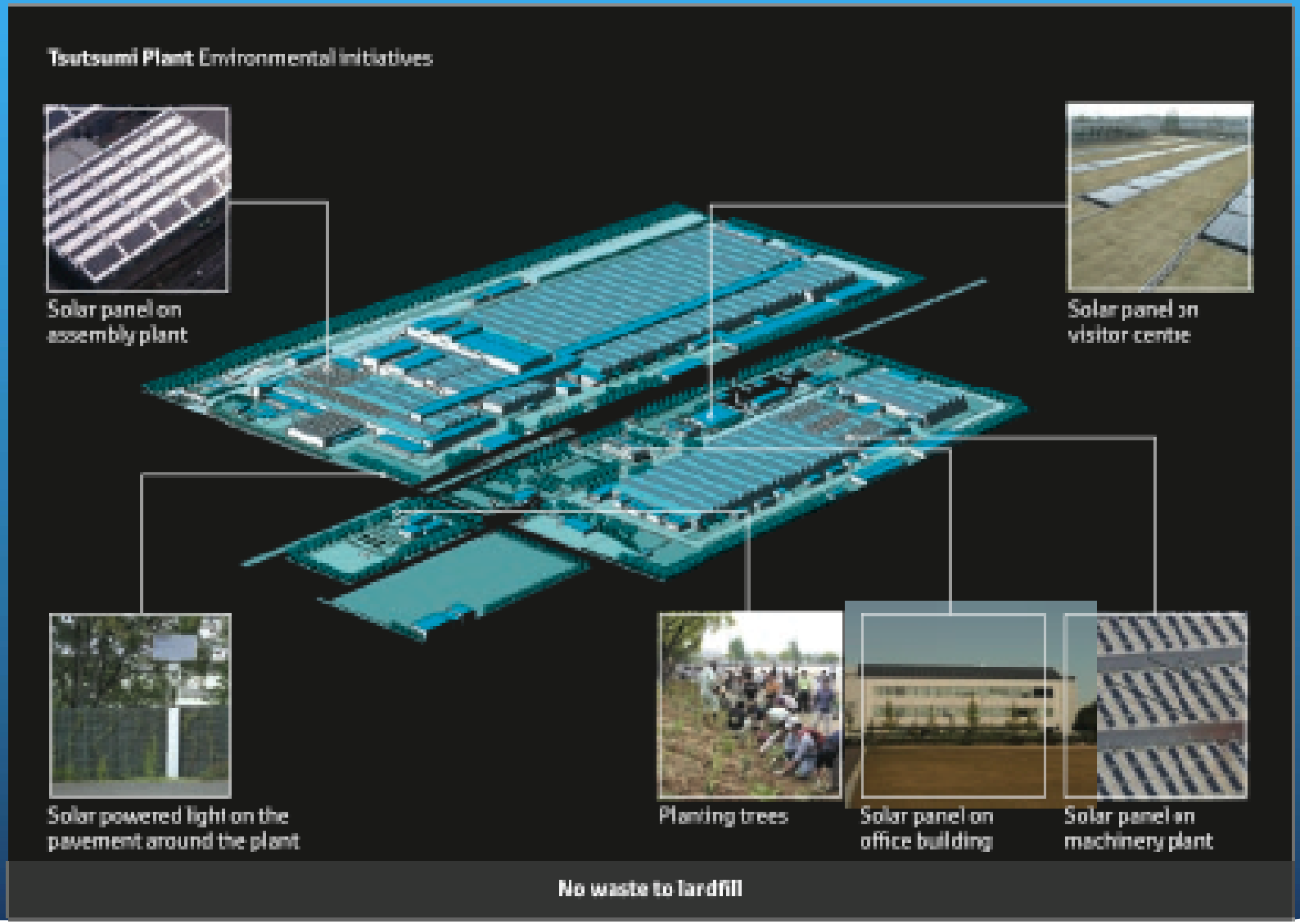
Reducing Energy Consumption by Implementing Reusable Materials



≥95% recoverable

≥85% recyclable

Reducing Energy Consumption in the Prius Production Process



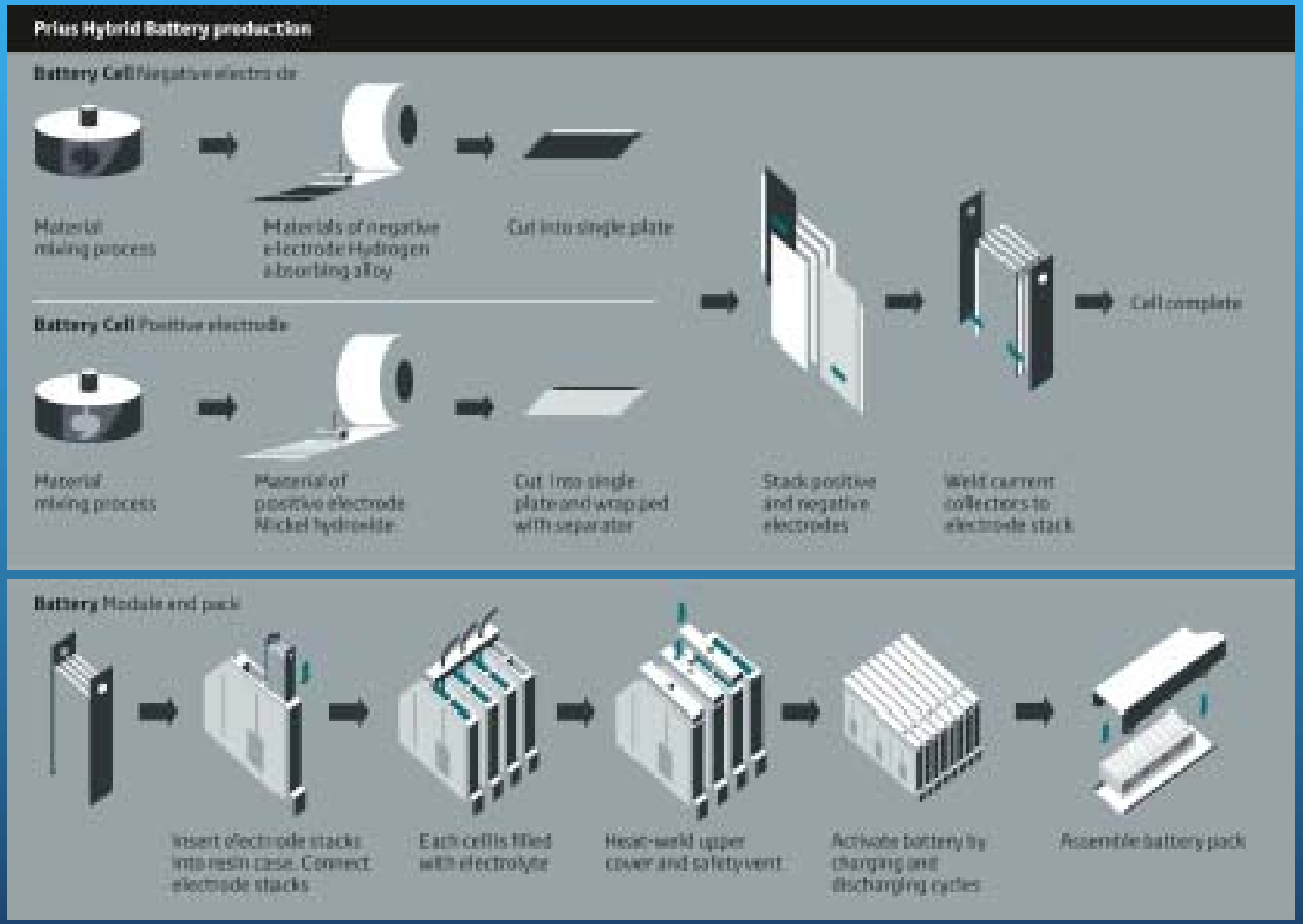
Producing the Battery

Manufacturing a Prius is more energy intensive than manufacturing a traditional nonhybrid car

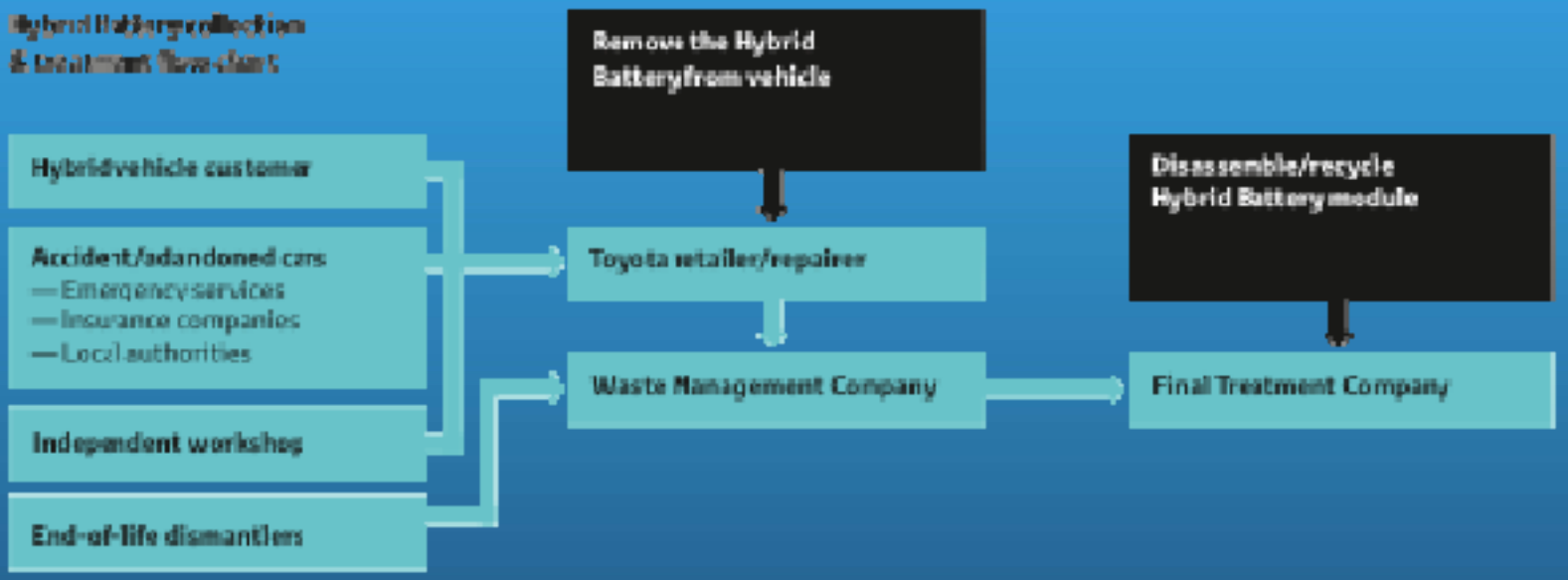
Argonne National Laboratory study:

- producing a pound's worth of a hybrid car requires 23% more energy than a pound of nonhybrid car

Producing the Battery



Battery Recycling Program



Reducing Energy Consumption in the Prius Production Process

Toyota created 2 flower species specifically designed to reduce emissions:

- Sage derivative's leaves: absorb harmful gases
- Gardenia's leaves: create water vapor
  - Reduces surface temperature at the site
    - Less energy needed to cool the site

Creating the Myth

- CNW Marketing Research, Inc.:

  "Dust to Dust: The Energy Cost of New Vehicles From Concept to Disposal"

"Hybrids Consume More Energy in Lifetime Than Chevrolet's Tahoe SUV, Hummer H1,H2, & H3"

- Conclusions of the Dust to Dust study:
  - A Prius will consume $3.25 worth of energy per mile over its lifetime.
  - A Hummer H2, by contrast, will use $3.03 per mile and the Hummer H3 just $1.95.

Creating the Myth

Life-Cycle Energy Assessments were determined by calculating the total energy used to:

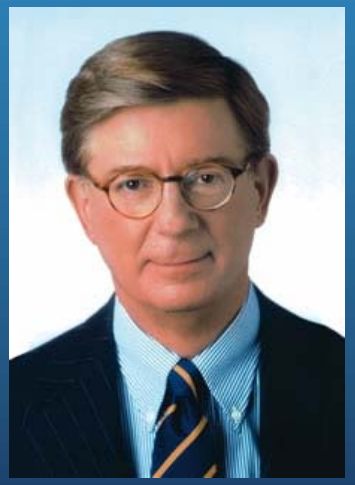
- Build
- Maintain
- Operate
- Recycle

Perpetuating the Myth

- CNW's study was picked up by George Will, syndicated columnist to over 450 Newspapers:

  "Speaking of Hummers, perhaps it is environmentally responsible to buy one and squash a Prius with it. The Toyota Prius hybrid is, of course, fuel-efficient. There are, however, environmental costs to mining and smelting (in Canada) 1,000 tons a year of zinc for the battery-powered second motor, and the shipping of the zinc 10,000 miles - trailing a cloud of carbon - to Wales for refining and then to China for turning it into the component that goes to a battery factory in Japan"

  - *Use a Hummer to Crush a Prius,* 2007



Perpetuating the Myth

- The *Economist* referenced CNW's study:

  "The dirty little secret about hybrids is that their batteries and extensive use of aluminum parts make them costly to build in energy terms as well as financial terms. One life-cycle assessment claims that, from factory floor to scrap heap, a Prius consumes more energy even than a Hummer III."

  - *The Economist*, In Praise of Diesel - 2/9/07

Flaws in the Dust-to-Dust Study

- Relied on assumptions that distorted the results
  - To determine the money spent on energy per mile, the study made assumptions about the lifetime of the vehicle:
    - Prius: 109,000 miles over a 12 year lifespan
    - Hummer: 379,000 miles over a 35 year lifespan
- Toyota claims a Prius battery will last at least 180,000 miles
  - CNW's Study assumption exaggerated the cost/mile energy estimate because of the under representative mileage estimate

Flaws in the Dust-to-Dust Study

- The Study assumes that most energy consumption occurs during the production phase of a vehicles lifetime
  - However, independent studies conclude that most energy is consumed during vehicle operations
    - Argonne National Laboratory study:
      - 75% of all hybrid and internal combustion vehicle use comes from the operation of the vehicle

Flaws in the Dust-to-Dust Study

- CNW's study inflates the Priuses energy consumption over its lifecycle by prorating the research-and-development costs across the existing Priuses on the road
  - Since new technologies require significant upfront investment, the methodology used by CNW dramatically increases the total energy consumption of the Prius compared to vehicles using existing technologies
- By overexaggerating the energy consumption required in the production phase, the study skews the results against hybrids

Flaws in the Dust-to-Dust Study

- The Study's premise was based on the economic devastation resulting from nickel mining in the 1970s, even though Sudbury, Ontario has been dramatically rehabilitated since
- The batteries sold for one million Toyota hybrids requires only 1% of the world's annual nickel-mining production.
  - Estimates show that 80% of nickel is reused
    - So the true percentage of nickel mined for Priuses' is only .2% annually
- The Hummer's frame has twice the amount of nickel that the Prius frame contains

Flaws in the Dust-to-Dust Study

- Not Peer Reviewed
- CNW refused to release its methodology
- CNW's Dust-to-Dust conclusions are directly refuted by several leading sources:
  - MIT
  - Argonne National Laboratory
  - Carnegie Mellon's Lifecycle Assessment Group
  - Union of Concerned Scientists' Clean Vehicles Program

"The reality is hybrids can significantly cut global-warming pollution, reduce energy use, and save drivers thousands at the pump."

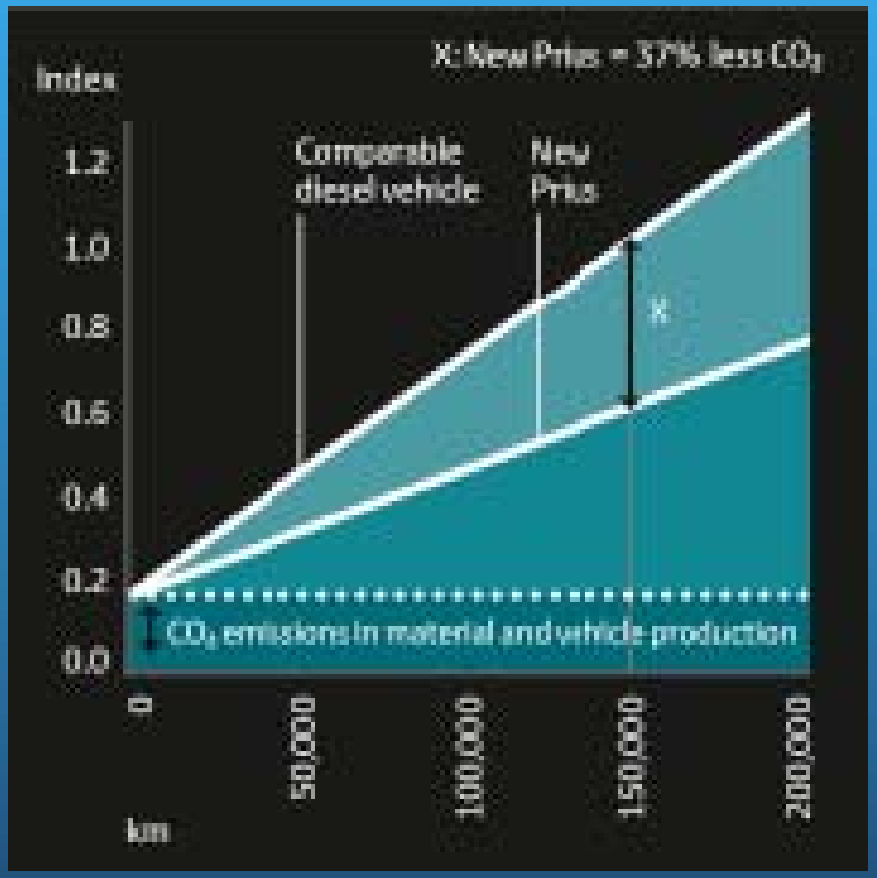
Flaws in the Dust-to-Dust Study

- Months after publishing the study and releasing it to the press, CNW reviewed the study and determined that the Tahoe used 30% more energy over its lifetime than the initial study concluded.

Doing the Math

- Energy required to manufacture the vehicle:
  - Hummer H2: 200.717 mmBTU
  - Toyota Prius: 113.322 mmBTU
- Gasoline contains 113,500 BTU per gallon
- By dividing the expected lifespan (160,000) by the vehicles average MPG, we can determine the amount of gasoline used over the lifetime of a vehicle:
  - Hummer H2: 13,913 gallons
  - Toyota Prius: 2,883 gallons
- Multiply the gallons used by the average energy content in fuel to get total energy used:
  - **Hummer H2: 1579.13 mmBTU**
  - **Toyota Prius: 327.207 mmBTU**

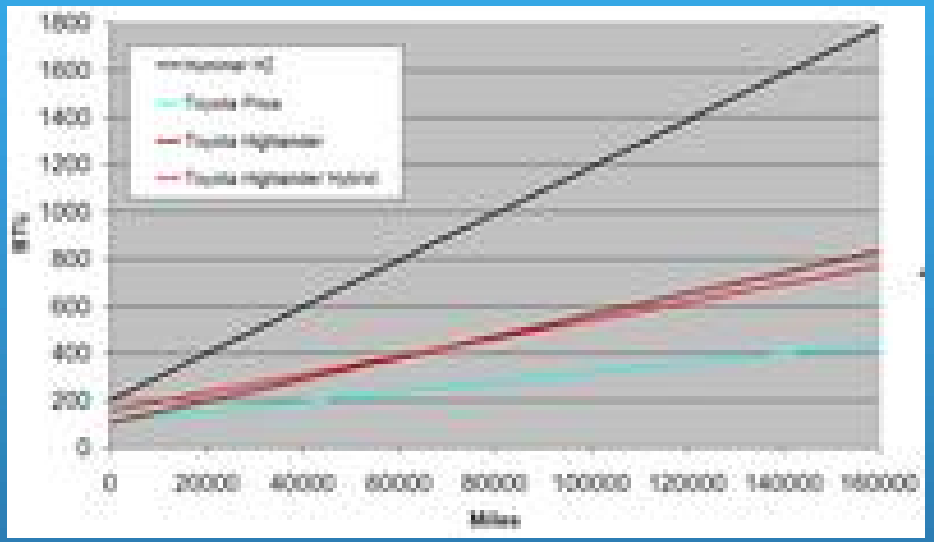
Reduced Emissions over the Vehicle's Life-Cycle



- Significant net reduction in CO2 Emissions compared to diesel vehicles based on the Production, Operation, and Recycling processes implemented by Toyota

- The figures are even more drastic when comparing a Prius to a comparable gasoline powered vehicle

Doing the Math



The H2 uses more energy in the first 24,000 miles than the Prius will use in it's lifetime

Total Energy Consumed by Burning Fuel:

- Hummer H2: 89%
- Toyota Prius: 74%

So the Prius uses more energy to manufacture, but the H2 uses far more to operate