



# Technology Diffusion - An Investor Perspective

Learning lessons from how government decisions can positively and negatively influence technology investment decisions

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Hazel Capital LLP



## Government Toolbox For Driving Industry Growth

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### **Direct Support**

- Grants
- Loan Guarantees
- Subsidies
- Feed-in Tariffs
- Legally binding industry standards (eg efficiency standards and RPS)

### **Tax**

- Tax Credits
- Differential Taxation (eg VAT on Tobacco and Alcohol v Food)
- Taxes e.g. Carbon Taxes

### **Research & Commercialisation**

- Defence Contracts
- State-funded projects / Government as a customer
- Spin-outs from Defence and other public sector entities
- University Grants

## What are these tools used for?

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### Correction

- To correct a social 'ill'
- To rectify an unwanted 'free market' distortion
- Re-distribution of economic advantage

### Promotion

- To accelerate development of a social 'good'

### Intended/Unintended Consequences

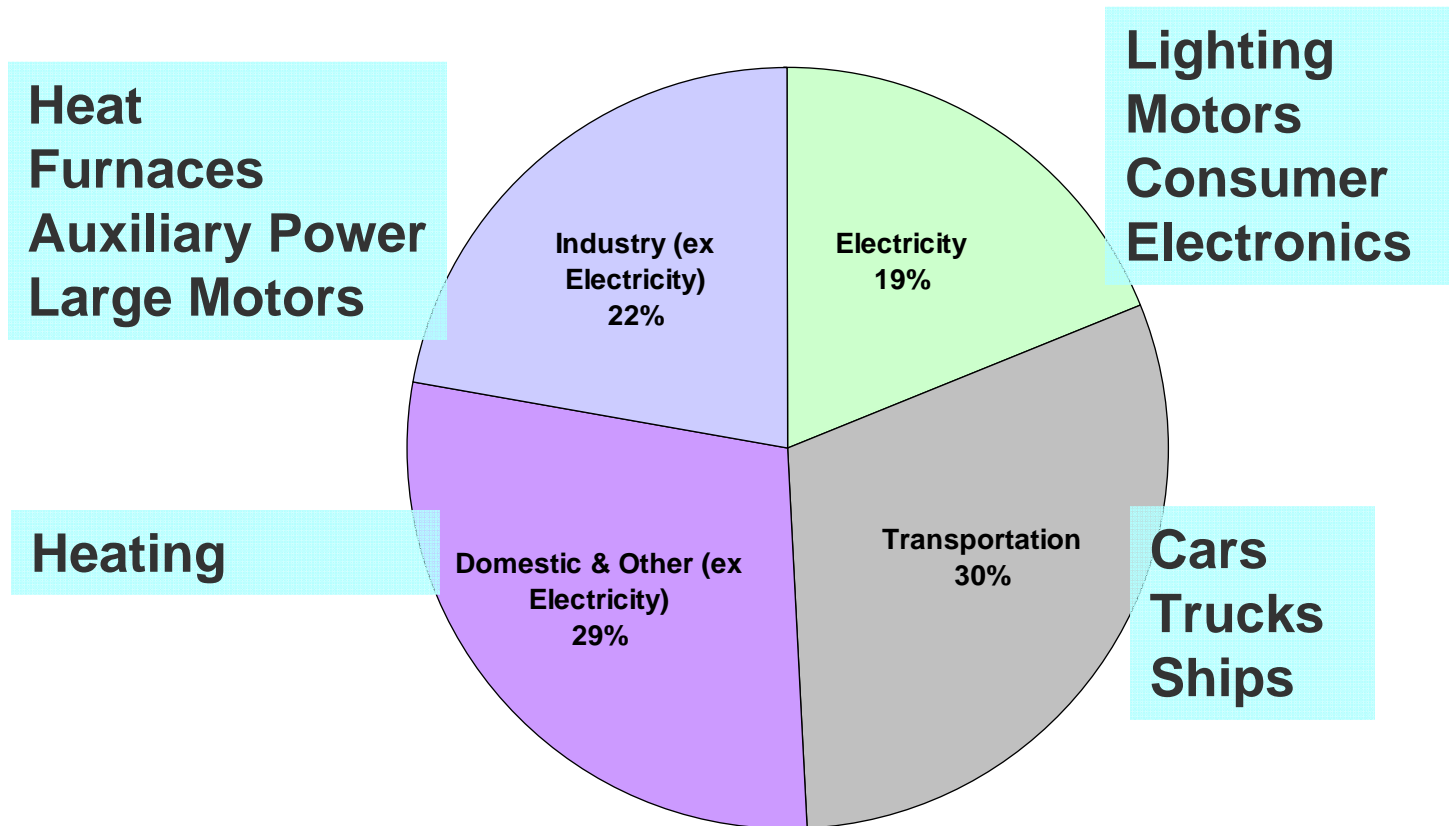
- Market Distortions
- Counterproductive/Too generous

# Defining the problem. How is Energy Consumed?



Energy Market is  
Worth **c.\$8 trillion**

**Final Energy Consumption 2007 - 7527 TWh**

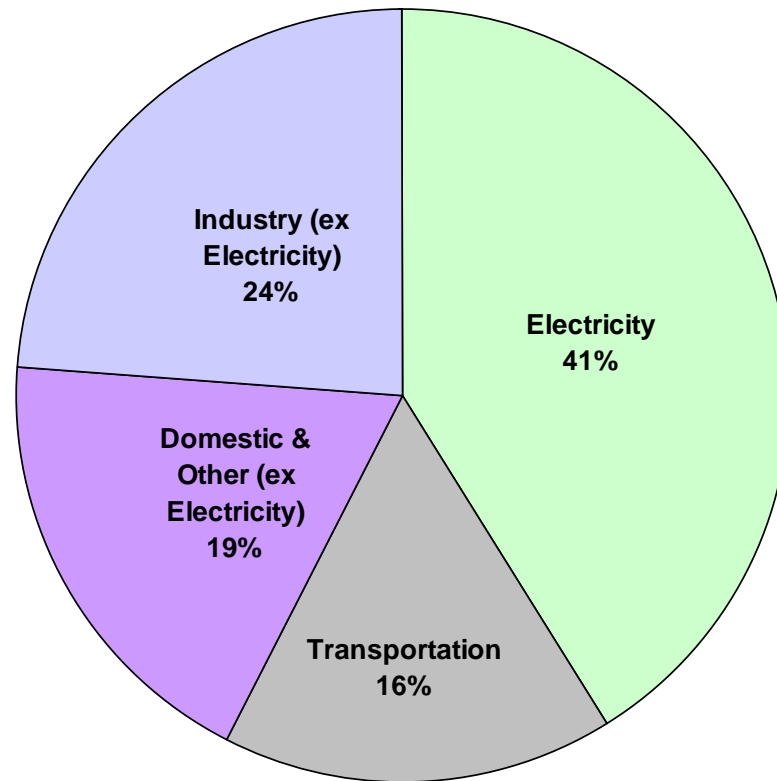


Source: Hazel Capital Research

## A New Landscape Will Emerge

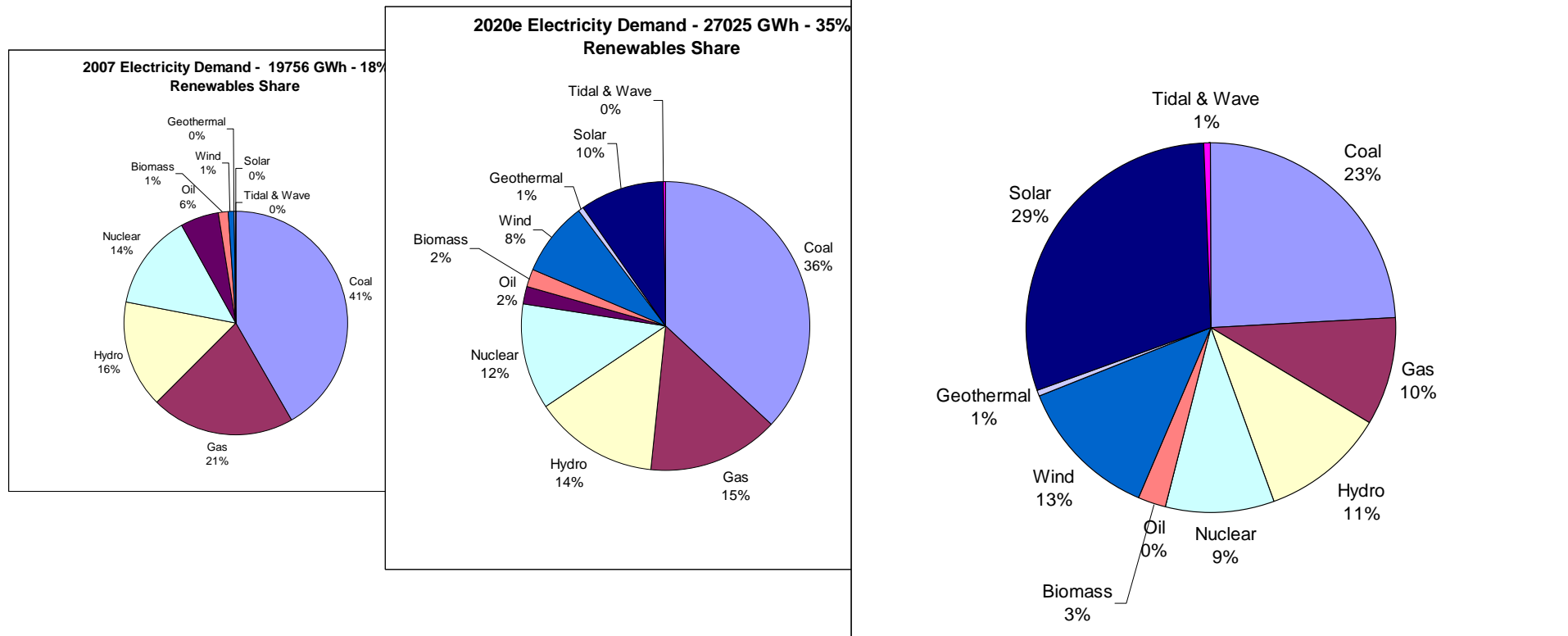


### Final Energy Consumption 2027 - 6985 TWh



Source: Hazel Capital Research

i.e. Electricity Generation needs to double... It can and it WILL!



Source: IEA WEO 2009, Hazel Capital Research

Here's why... The KEY technologies to get us there...



## **THESE TECHNOLOGIES CAN MAKE**

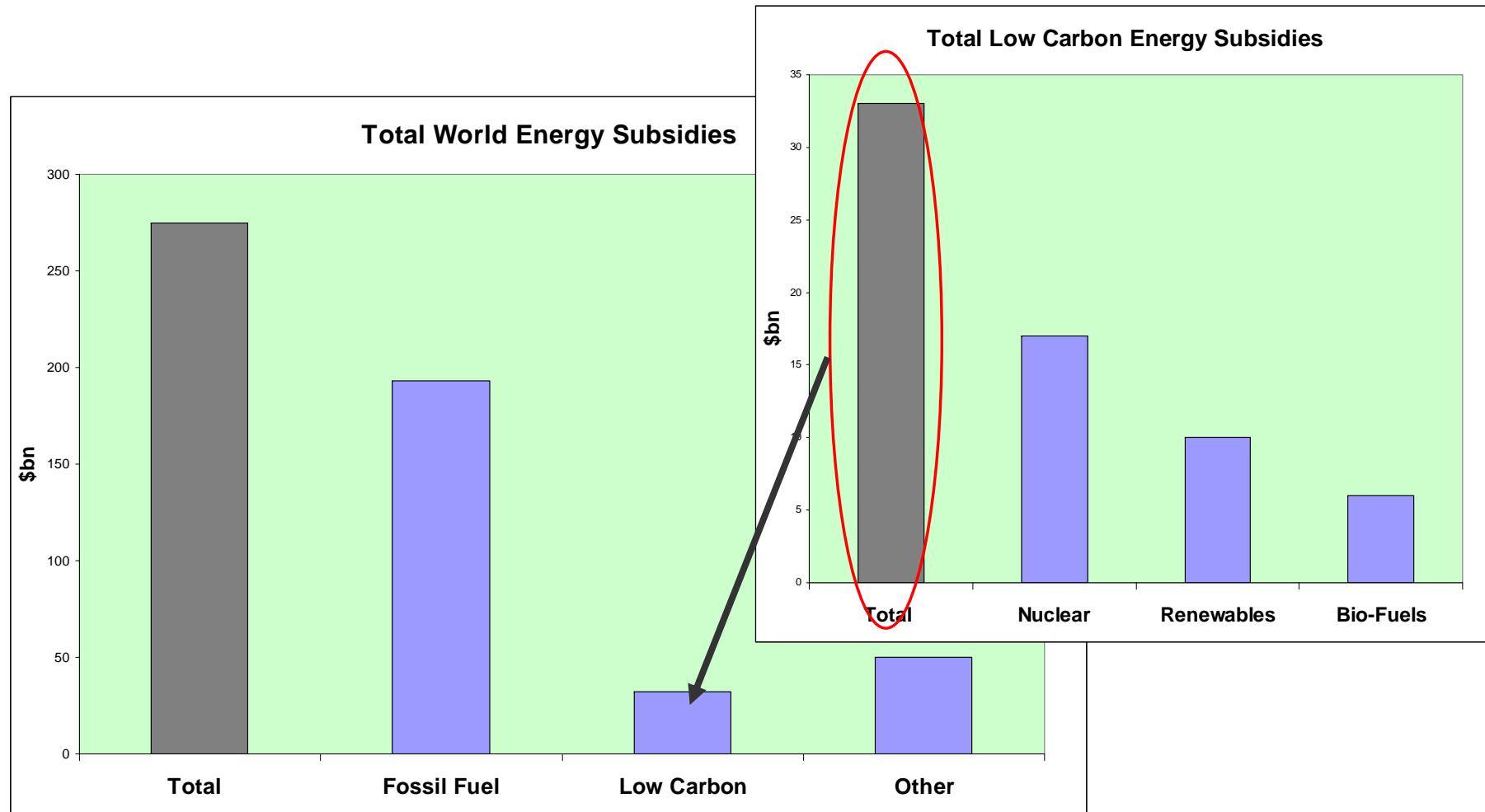
- **ELECTRICITY CLEAN**
- **TRANSPORTATION CLEAN**
- **REDUCE HEAT ENERGY CONSUMPTION BY OVER 70%**
- **REDUCE INDUSTRIAL ENERGY CONSUMPTION BY OVER 50%**
- **REDUCE OVERALL CO2 LEVELS BY 80% OVER 20-25 YEARS**

So what have governments actually supported?



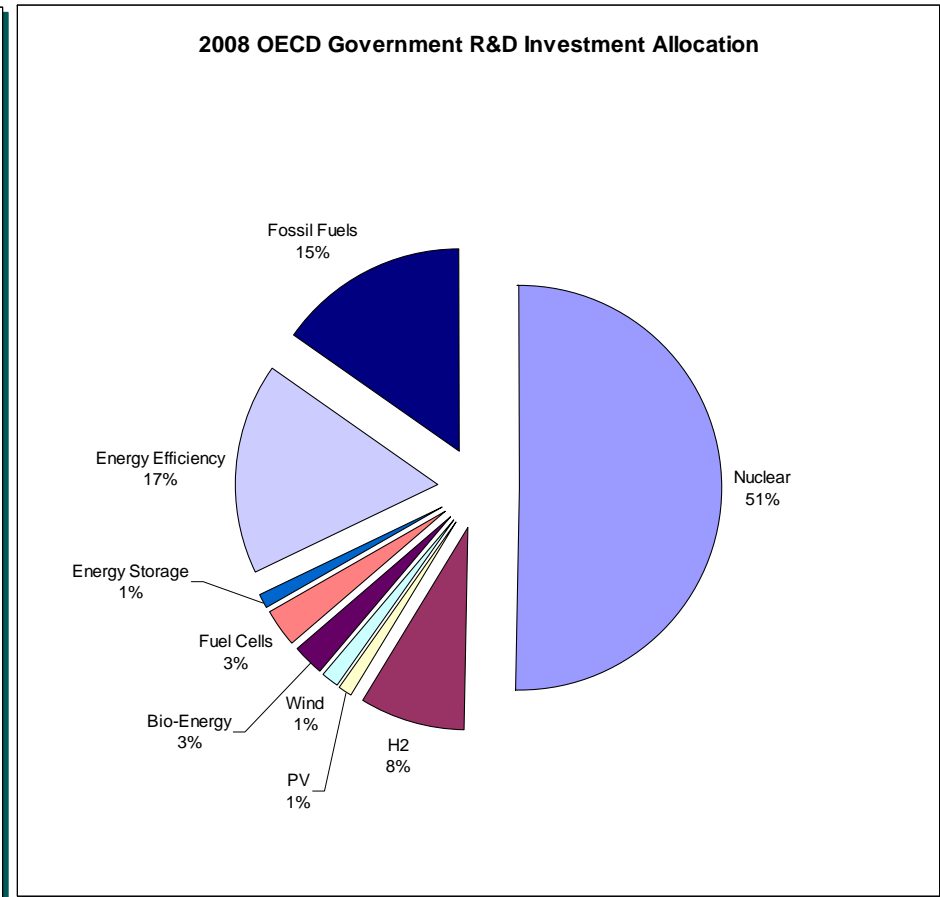
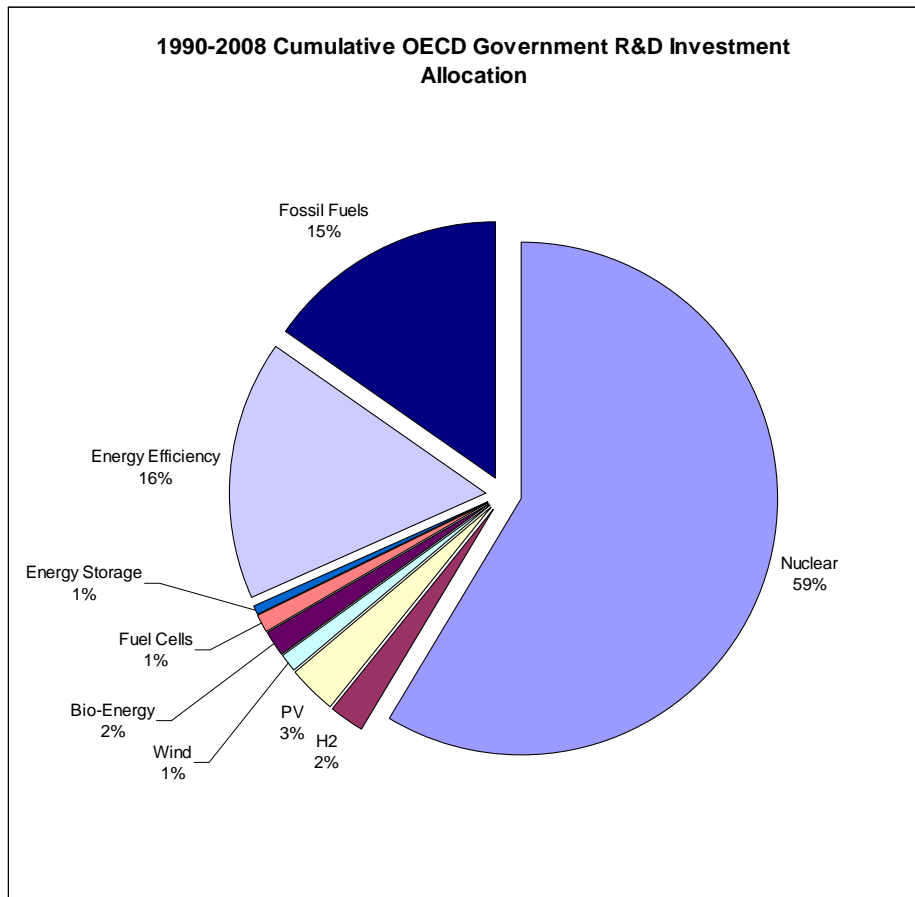


In 2004 renewables received 4% of total energy subsidies!



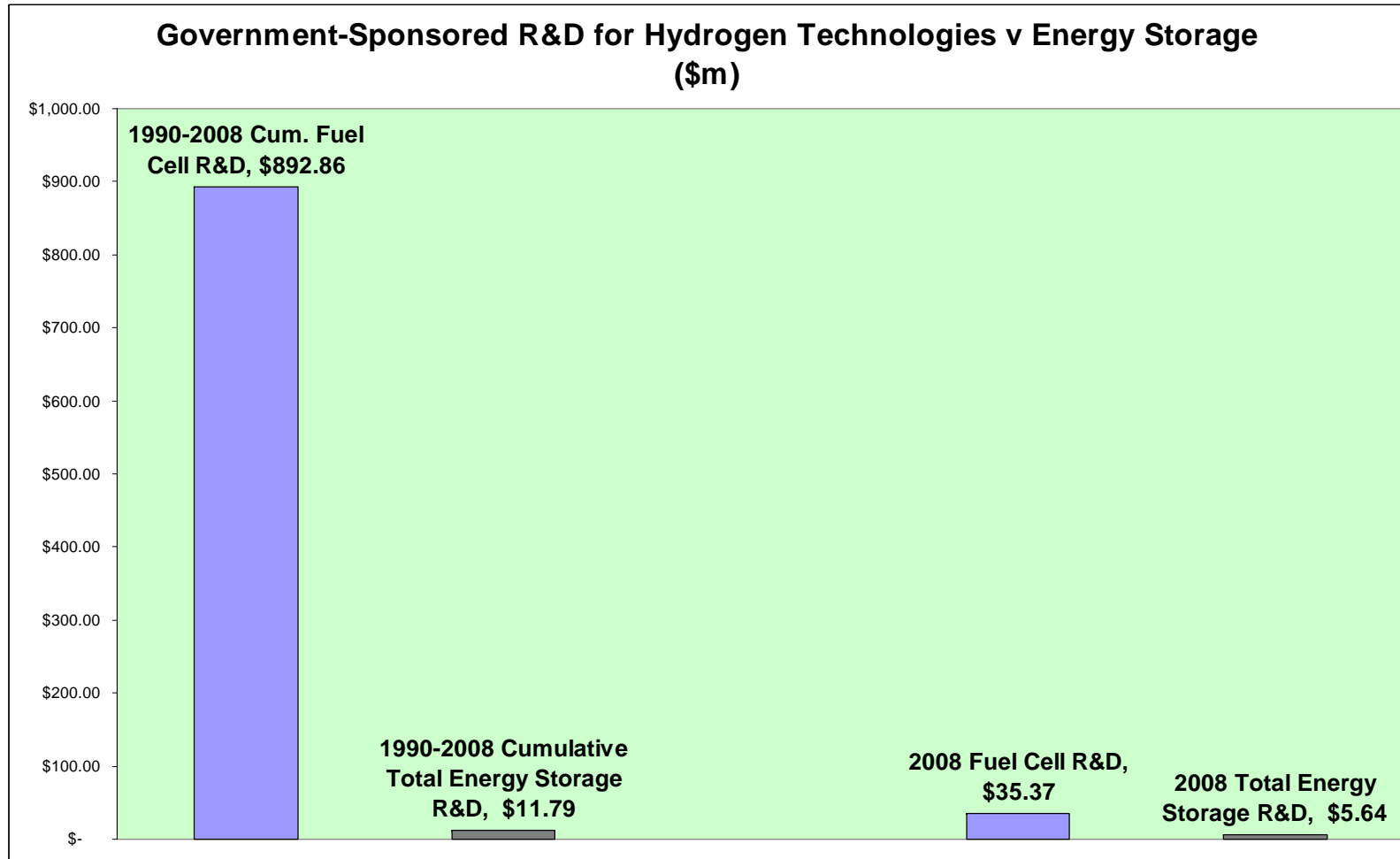
Source: Stern Report, Hazel Capital Research

# R&D has focused on the wrong technologies



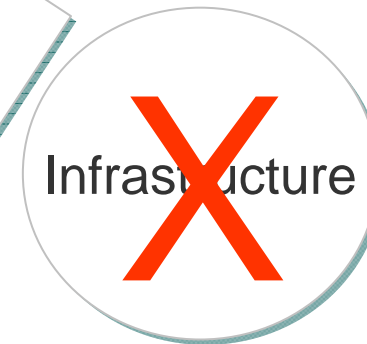
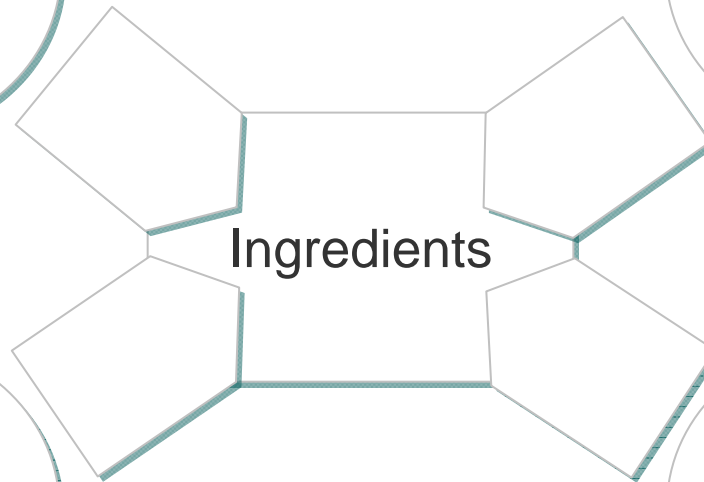
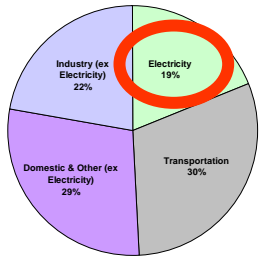
Source: IEA.org, Hazel Capital Research

# Fuel Cells v EVs

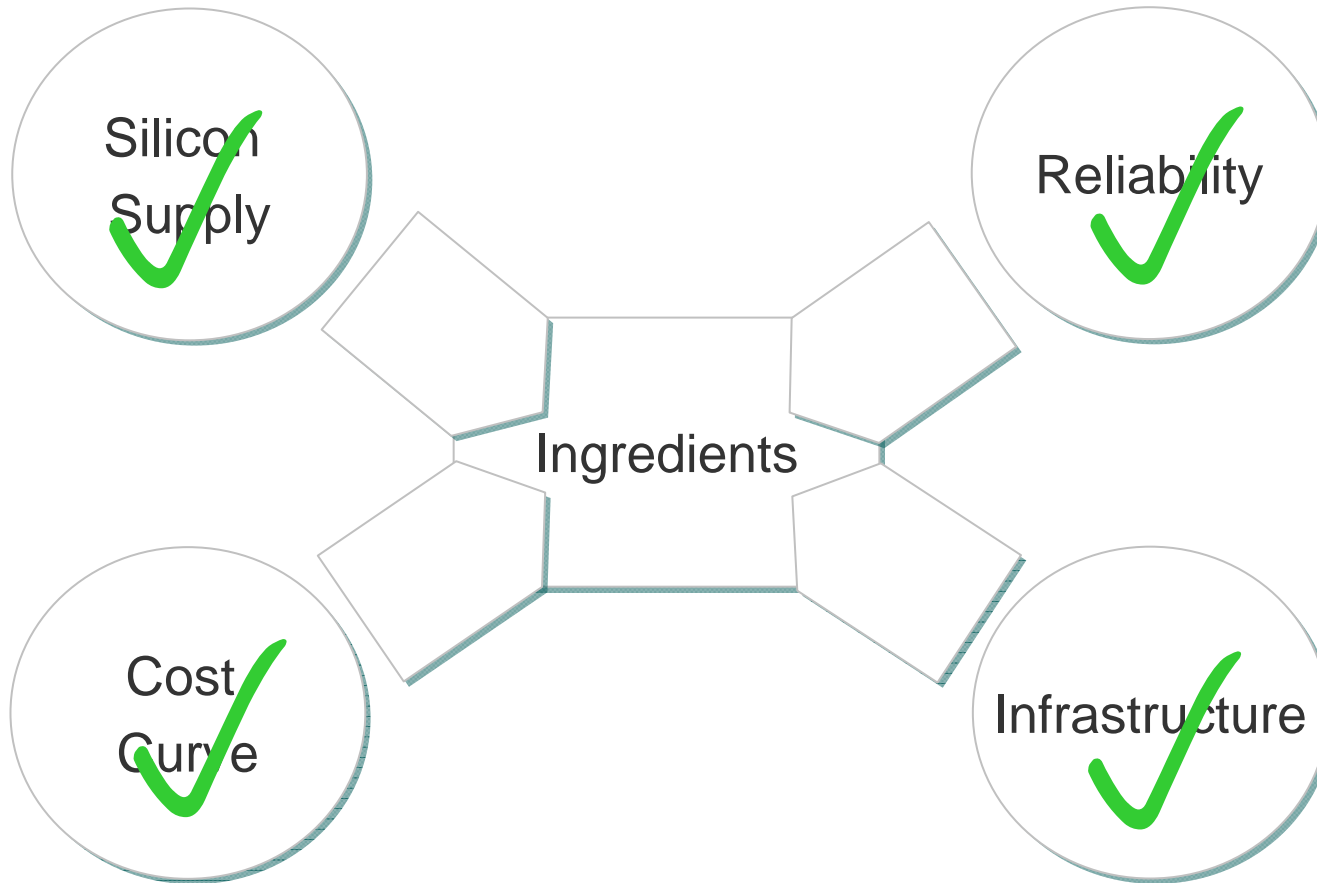
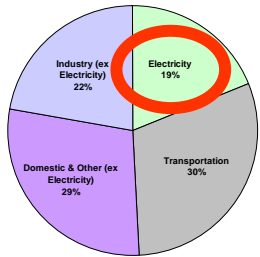


Source: IEA.org, Hazel Capital Research

# Technology Assessment – Fuel Cells



# Technology Assessment– Solar PV (esp Rooftop)



## Why have things gone wrong? I speculate...

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### DISTORTIONS / DANGERS

- Economic/Political considerations
  - Job Creation v Destruction
  - Inflationary or Deflationary
  - Cost
  - Long Term Benefits
  - Protectionism
- Other Market Distortions
  - Big Business
  - Vested Interests

## Considerations in creating a decent subsidy regime

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Identify the social need

- Stable Climate = Low Carbon Economy

Accurate assessment of a technology

- Renewable Resource, Fuel & Material source-mapping
- Volume characteristics
- Time to market
- Scale & Cost
- Reliability/Maintenance
- Complexity
- Nimby-ism
- Environmental Impact
- Other externalities

## Setting the ground rules



We prefer mechanisms that

- 1) Help to **let the market choose** the best technologies (eg FITs)
- 2) Allow **investment decisions to be made by return-driven entities** (eg SWF)
- 3) **Legally-ratified standards** set government intentions (eg Banning Light bulbs, RPS)

i.e. We like

- Feed-in-tariffs
- Product Subsidies
- Standards & Targets (e.g. CAFÉ standards & RES in the US)
- Differential taxation: one segment finances another (e.g. Cars v EV, FMCG v LLCG)
- State-backed venture funds: Make up for the lack of capital or skittishness of investors

i.e. We don't like

- Direct industry or company grants
- Any other form of 'favouritism'



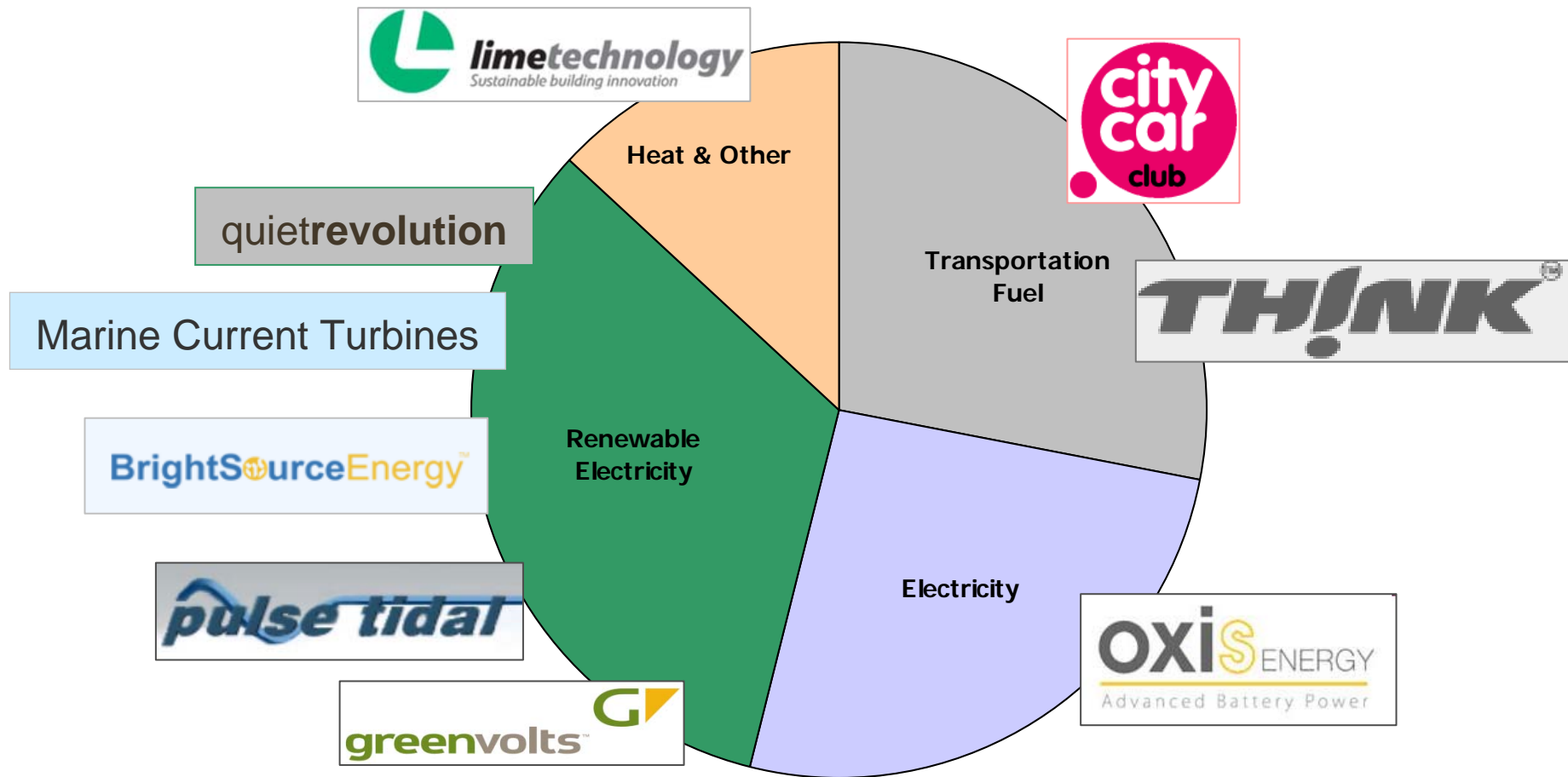
## OUR SOLUTION

Principle: Make the new abundant then banish the old

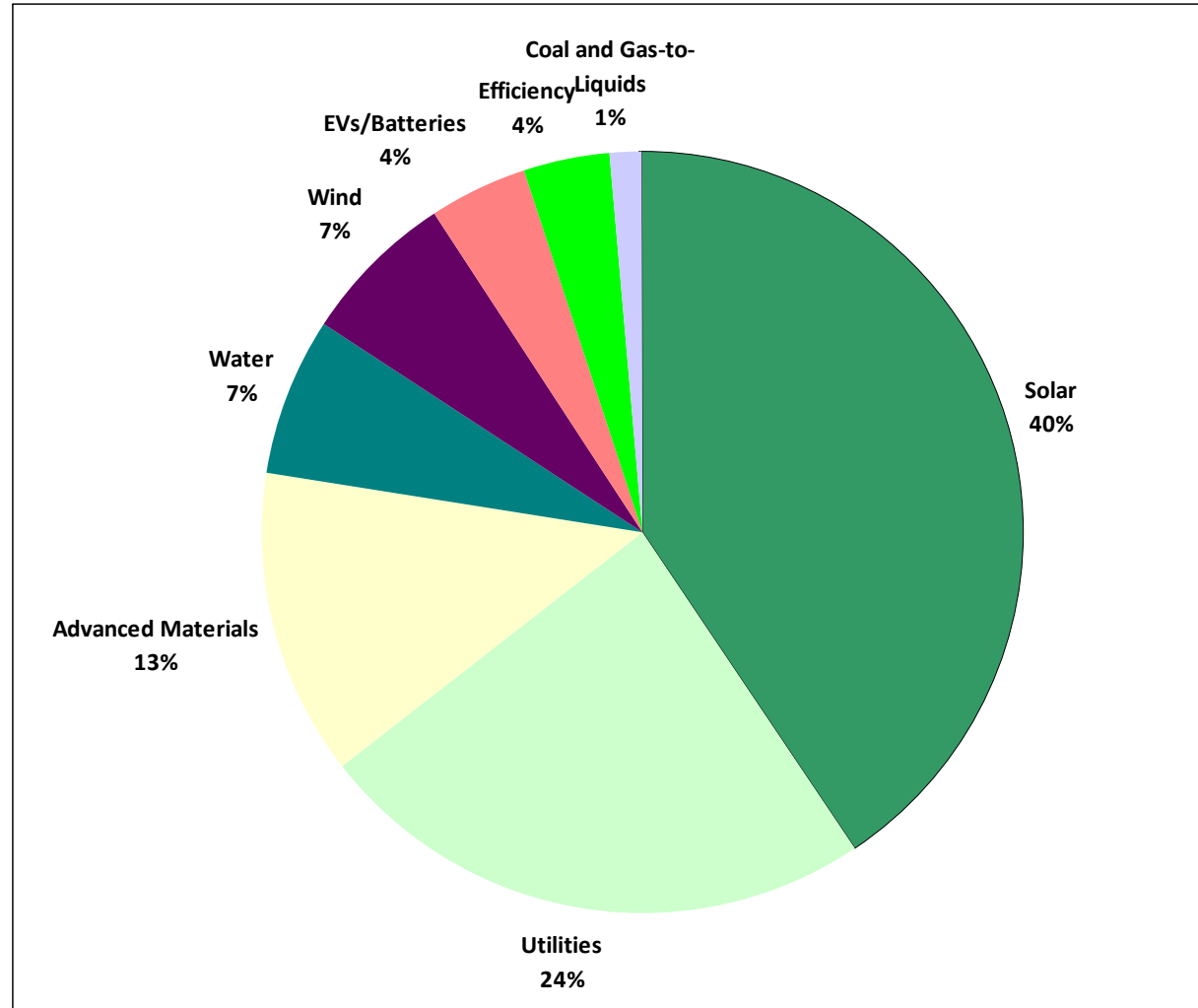


- Fossil Fuels, Nuclear, Geothermal and Biofuels – No Subsidies
- Fast Moving Consumer Goods - Differential VAT, then ban short warranties
- Electric Vehicles – Favourable VAT & Subsidies, set ramping efficiency standards
- All renewables: Support as shown below and rising RPS/RES
  - Wind (On & Offshore), Solar (Ground Mount), Tidal – Receding Feed-In Tariffs, Loan Guarantees
  - Wind (Small) – Receding Subsidies
  - Solar (Rooftop) – Receding Subsidies
- Batteries – Subsidies for batteries with  $>140\text{Wh/Kg}$
- Demand Management/Storage Management – Set Common Standard (a la GSM), no subsidy
- Low Energy Lighting – Set Light Efficiency Standards plus Receding subsidies for LED
- Carbon Fibre Mass Manufacturing Equipment – Let State-back venture fund who to back
- Contactless DC Motors – Differential VAT plus receding subsidies
- Plant-based Building Materials – Industry Standards (eg Code Level housing in UK) and differential VAT for carbon negative materials

# The Hazel Capital VC Portfolio



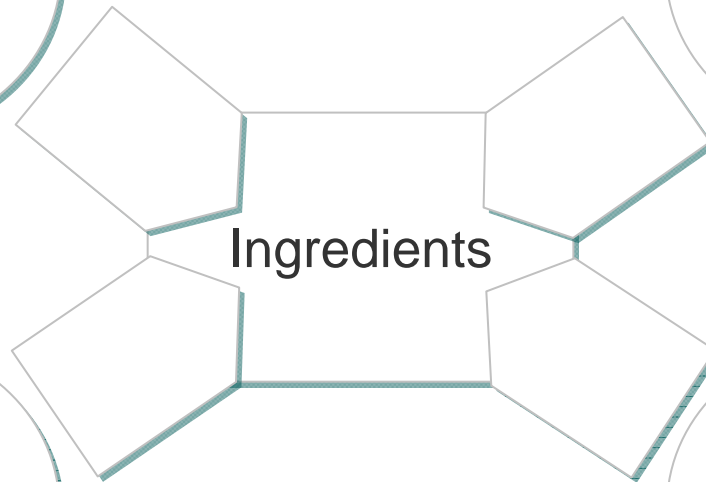
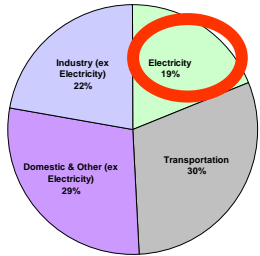
# The Hazel Capital Mutual Fund Portfolio



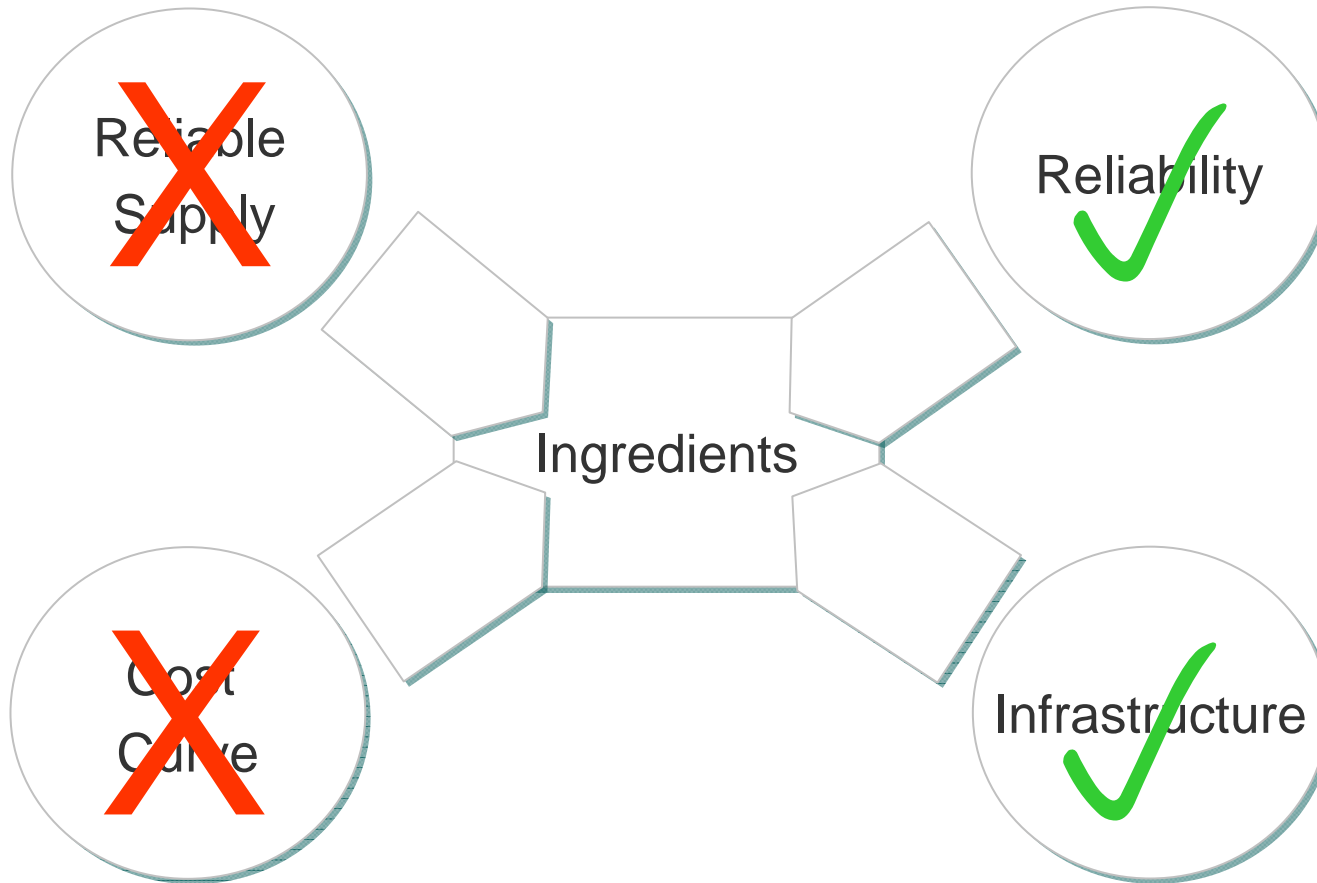
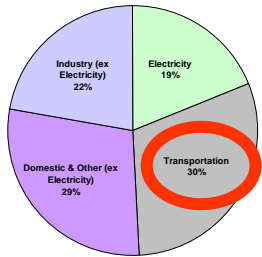


Thank you!

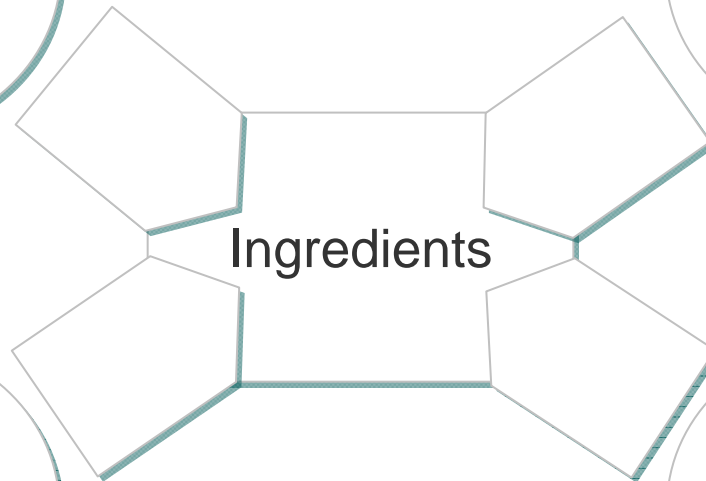
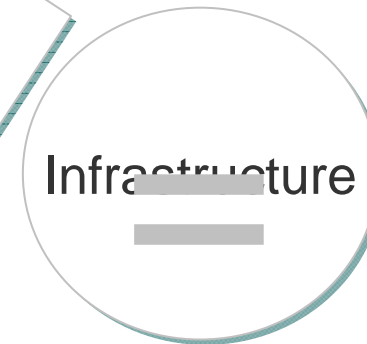
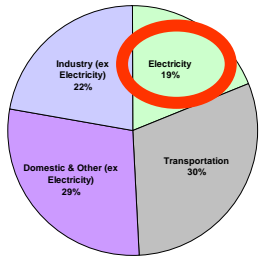
# Technology Assessment – Nuclear



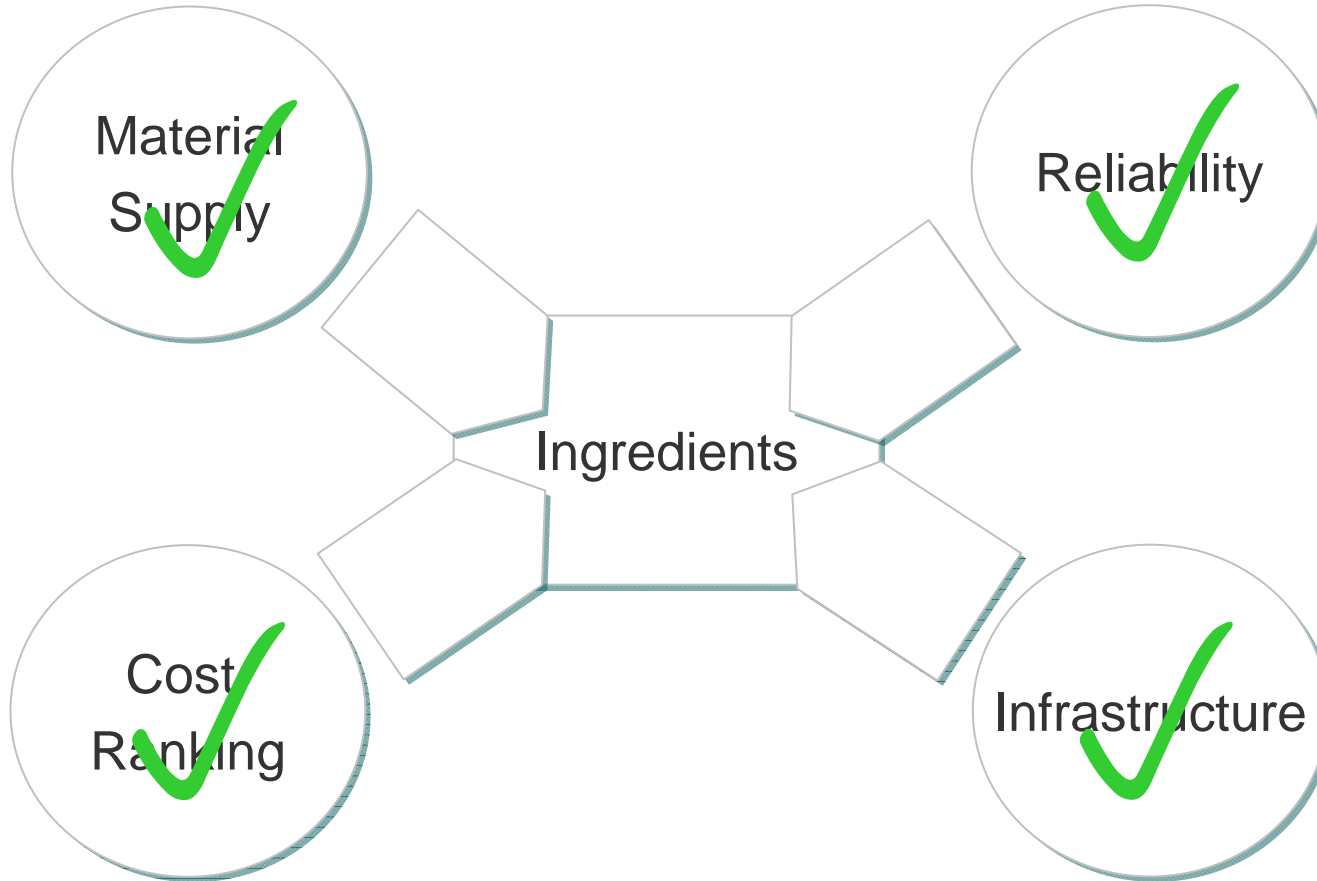
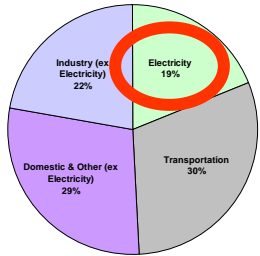
# Technology Assessment – Bio-Fuels



# Technology Assessment – Wind

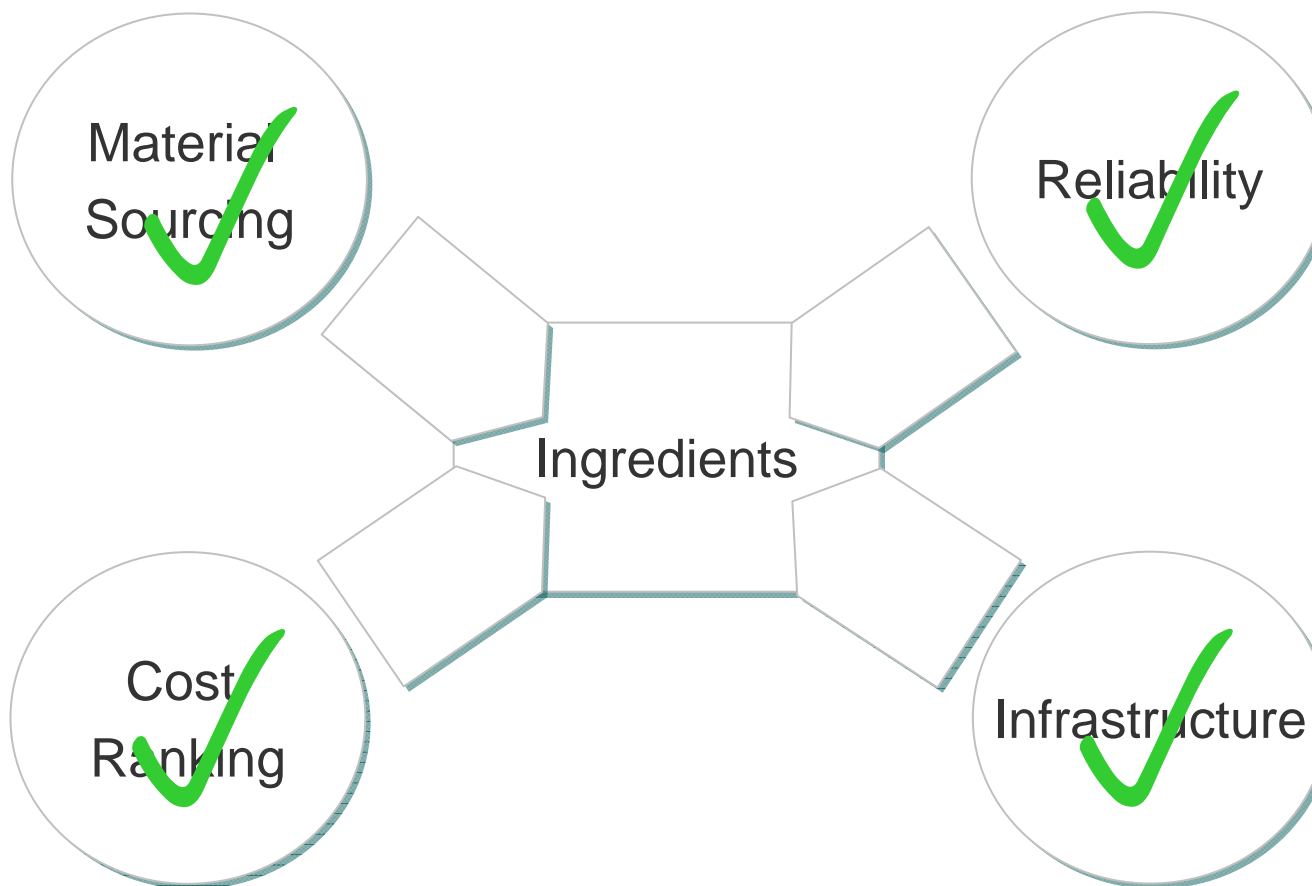
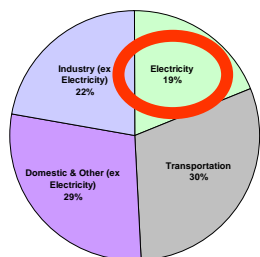


# Technology Assessment– Small Wind

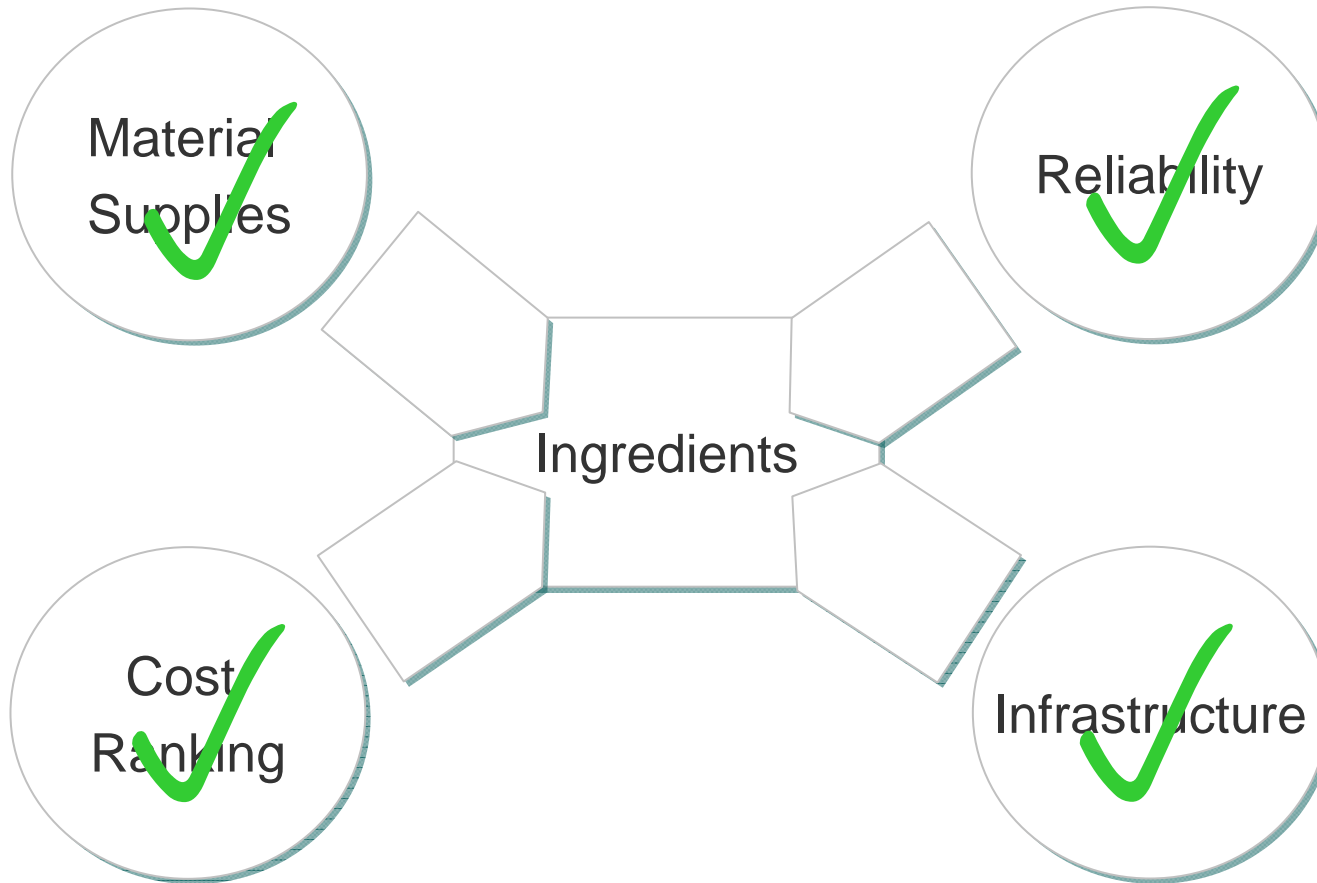
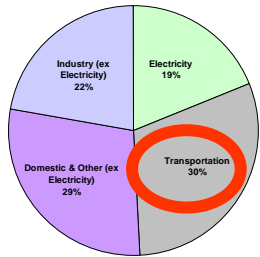




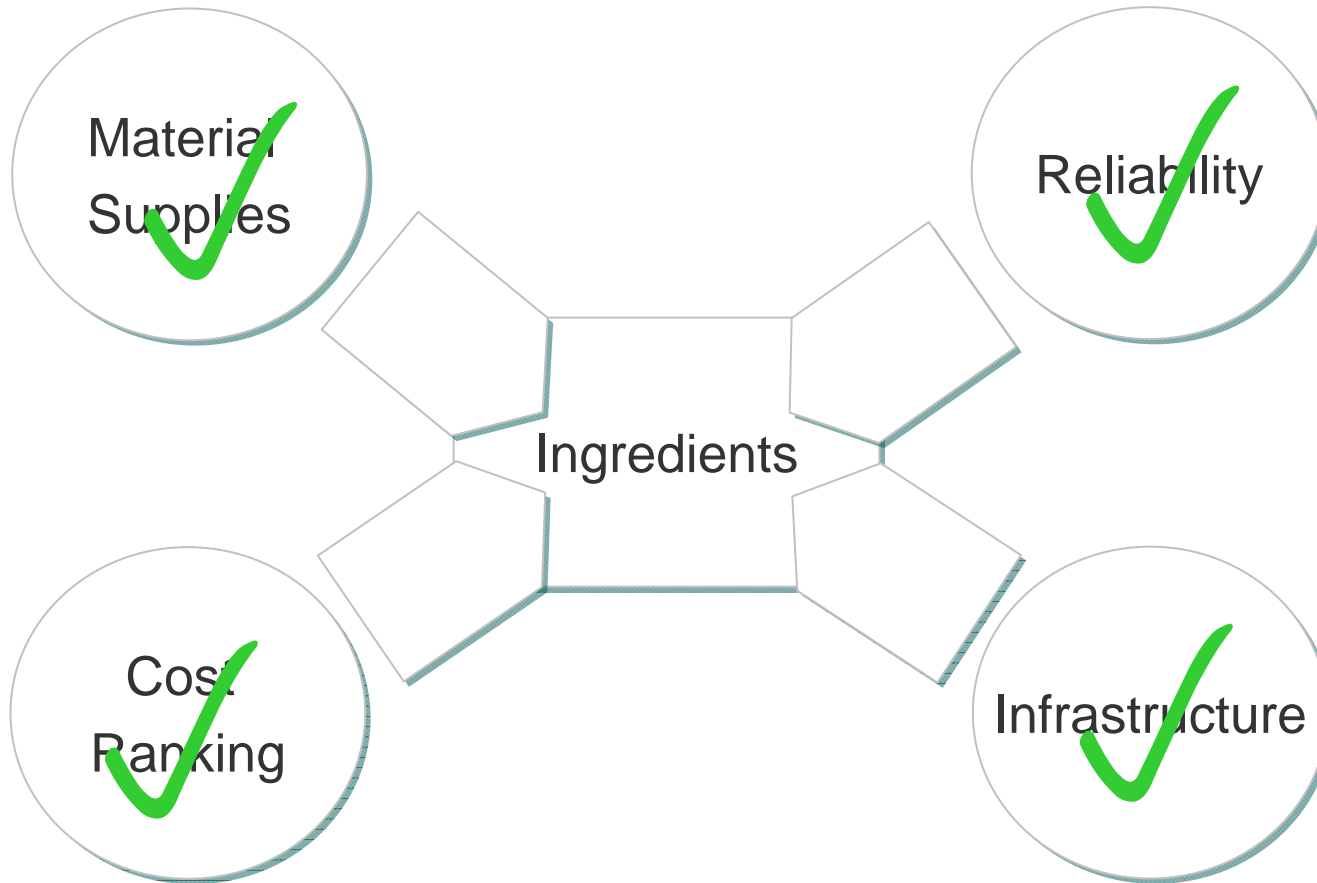
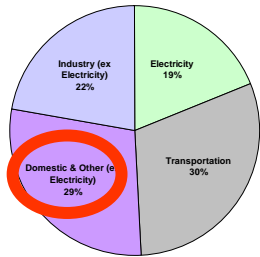
# Technology Assessment– Tidal Power



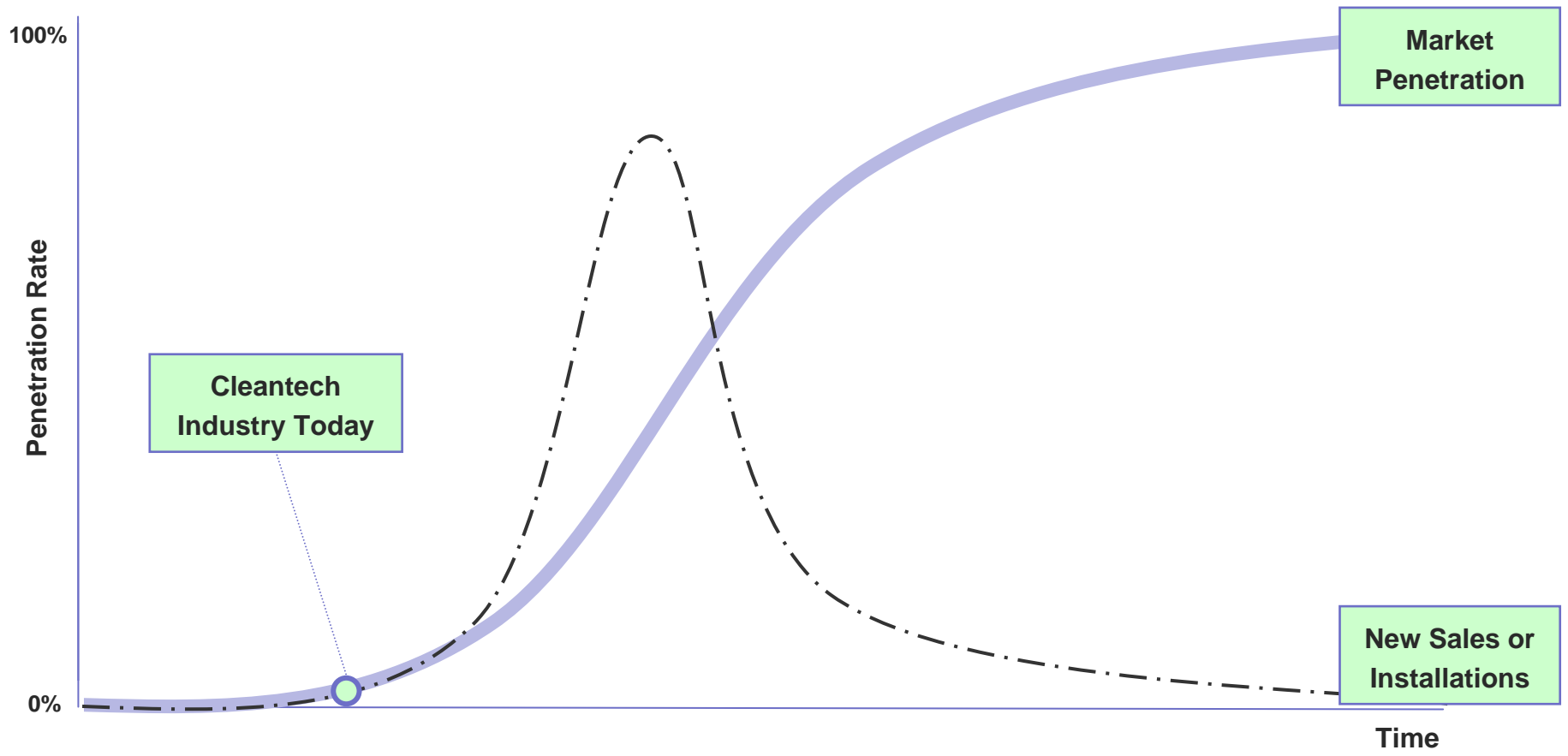
# Technology Assessment– LED Lighting



# Technology Assessment – Plant-Based Building Materials



...to ride the S-Curve. More Demand needs to = LOWER Prices



Source: Hazel Capital