



Sustainability As A Catalyst For Innovation

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Outline

- Simply Sustain
- Sustainable Development and Sustainability?
- Energy & Climate Crisis
- Powerful Stakeholder Response
- Retailers' drives to Reduce Carbon in Supply Chains
- Threats and Opportunities For Plastics
- Case Studies
- Plastics Waste - Limits to Growth
- Societal Engagement For Sustainability of Plastics
- Innovation Models

Simply Sustain Consulting

- Advising and Consulting for Sustainability
- Affiliated with MIT, Society for Organizational Learning, Sustainability Consortium.
- Greening of PP, April '07 Roundtable.
 - 65 people, 30 companies in the supply chain, from cradle to cradle.
- Multi-client Report on “Greening PP”
 - Life Cycle Impacts of PP vs bio polymers, end-of-life options.
- Recycling PP, Jan'08 roundtable
 - Included Waste Supply Chain- Municipalities, MRFs and plastics re-processors
 - Created a working group of ACC, US EPA for recycling PP with companies from cradle to cradle supply chain

Sustainable Development (SD)

- The Brundtland Commission, "meeting the needs of the present without compromising the ability of future generations to meet their own needs."
- *Our Common Future* (1987) contains two key concepts:
 - The concept of **needs**, in particular the essential needs of the world's poor, to which overriding priority should be given;
 - The idea of **limits** imposed by current technology and societal values (consumption) on the ability of the environment to meet present and future needs.

SD turned into Sustainability

- Sustainability is driven by concerns for the viability of today's bottom line - no longer a long term issue.
- Sustainability is just good business sense.
 - Protecting business, and by extension the environment and the society in which it is done.
 - Is about spotting trends, sensitivities and changes in expectations.
- Is not a do gooding side-show.
 - It has gone mainstream and strategic
 - Many companies are doing it well & well by it. e.g. DuPont, GE, 3M, Dow, Nike, Royal Dutch Shell, BASF
- Is a global movement
- Is not just about compliance.

Fossil Fuel Supply/Demand Crisis

- Oil supply increasingly from politically insecure regions, Iran, Venezuela, and Nigeria
- End of easy oil and gas, supply is from difficult to access geographies. E.g. Siberia, North Pole
- Dwindling fossil reserves, Shell CEO “ Not a Rosy Picture”
- Escalating demand from China and India
- Oil and global security - Money going to terrorist regimes, e.g. Congo.
- Escalating oil prices not expected to come down in foreseeable future

Climate Crisis = Green House Gases

IMPACT	SOURCE
<ul style="list-style-type: none">• Global warming• Melting ice caps• Rising sea levels• Desertification• Severe weather patterns• Frequent hurricanes• Decaying forests• Dying coral reefs• Insect borne diseases	<ul style="list-style-type: none">• Fossil fuelled electricity generation, transmission• Transportation• Light bulbs• Oil refining & processing• Agriculture (Nitrogen Oxides)• Food & Household• Anaerobic disposals e.g. landfills

Powerful Stakeholder Response

- Stakeholders in sustainability are from the mainstream, not the tree-huggers of the past.
 - Supra shareholder, CERES - coalition of institutional investors
 - Big banks - Bank Of America, Goldman Sachs.
 - Rating agencies - Dow Jones Sustainability Index
 - CEOs, 95% concerned about change in climate
 - Investors, \$1 out of \$9 has sustainability criteria
 - Coalition of companies - USCAP - for voluntary carbon limits.
 - City mayors, 670 of them for own “Kyoto protocol”
 - ***Mega Retailers and Consumer Product Groups***
 - ***Regulators’ heavy handed policies- e.g. ERP, WEEE, Bag Bans***

Retailers' War On Carbon : Tesco

- Committed £500 million to its environmental program - light weighting, energy efficiency, carbon footprint.
- Label the “carbon footprint” of every product it sells
 - 200,000 SKUs.
- Have the first carbon-labeled products on the shelves by '08
- Committed to reducing packaging by 25% by 2010.
- Label all packaging according to whether it can be re-used, recycled or composted - and if it cannot, label that too.



Retailers' Actions: Marks and Spencer

- Committed £250 million to Plan A. There is no Plan B.
- 2012 aims - become carbon neutral, send no waste to landfill.
- Reduce use of packaging and make sure it is easy to recycle, by:
 - Cutting their use of non-glass packaging by 25%
 - Trialing 'closed loop' recycling
 - Using materials that are easy to recycle or compost. E.g. focus on using four plastics: cornstarch derived plastic Polylactic Acid (PLA), Polyethylene terephthalate (PET), Polypropylene (PP) and Polyethylene (PE). **(Note De-selecion of PS and PVC)**

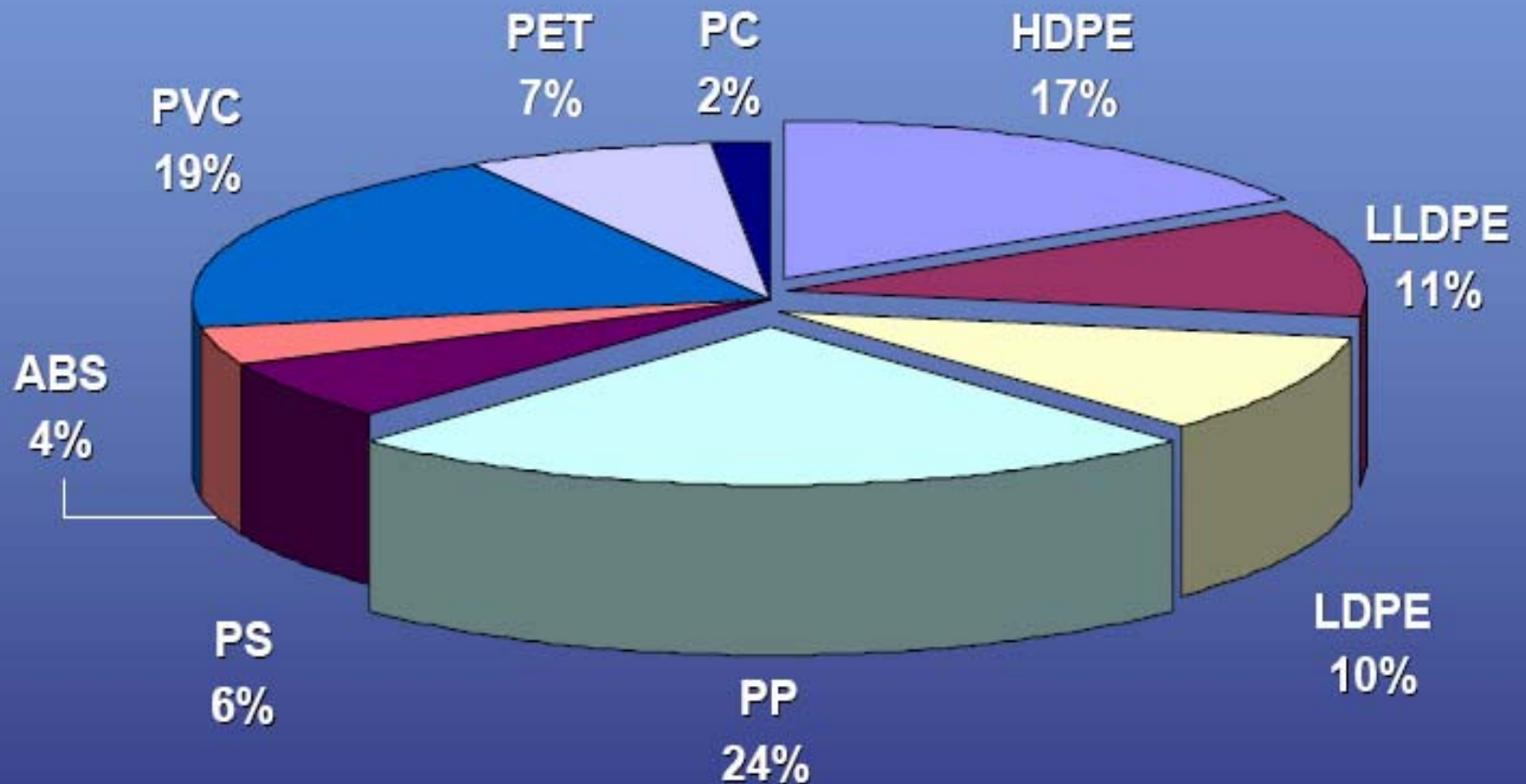
Wal-Mart – The Global Game Changer

- 14 Sustainability Teams
- Packaging scorecard to rate suppliers on their progress toward developing sustainable packaging
- A measurement tool that allows suppliers to evaluate themselves relative to others, based on specific metrics.
 - **15% GHG / CO2 per ton of Production**
 - **15% OSHA Injury Statistic**
 - **15% Product / Package Ratio**
 - **15% Cube Utilization**
 - **10% Distance to Transport**
 - **10% Recycled Content**
 - **10% Recovery Value**
 - **5% Renewable Energy**
 - **5% Innovation**

War on Carbon in Supply Chains Presents Both Threats and Opportunities

- Food Supply Chain Under The Carbon Microscope
 - The food industry consumes 20% of all petroleum consumed in the US
 - Seven to ten calories of fossil energy needed for one calorie of food energy.
 - Only 20% of this is spent on the farm, with the rest used to process, transport & delivery.
 - Food supply chain undergoing shift to local supply
 - Plastics use intimately intertwined with food supply chain

Implications For Petro-Plastics _

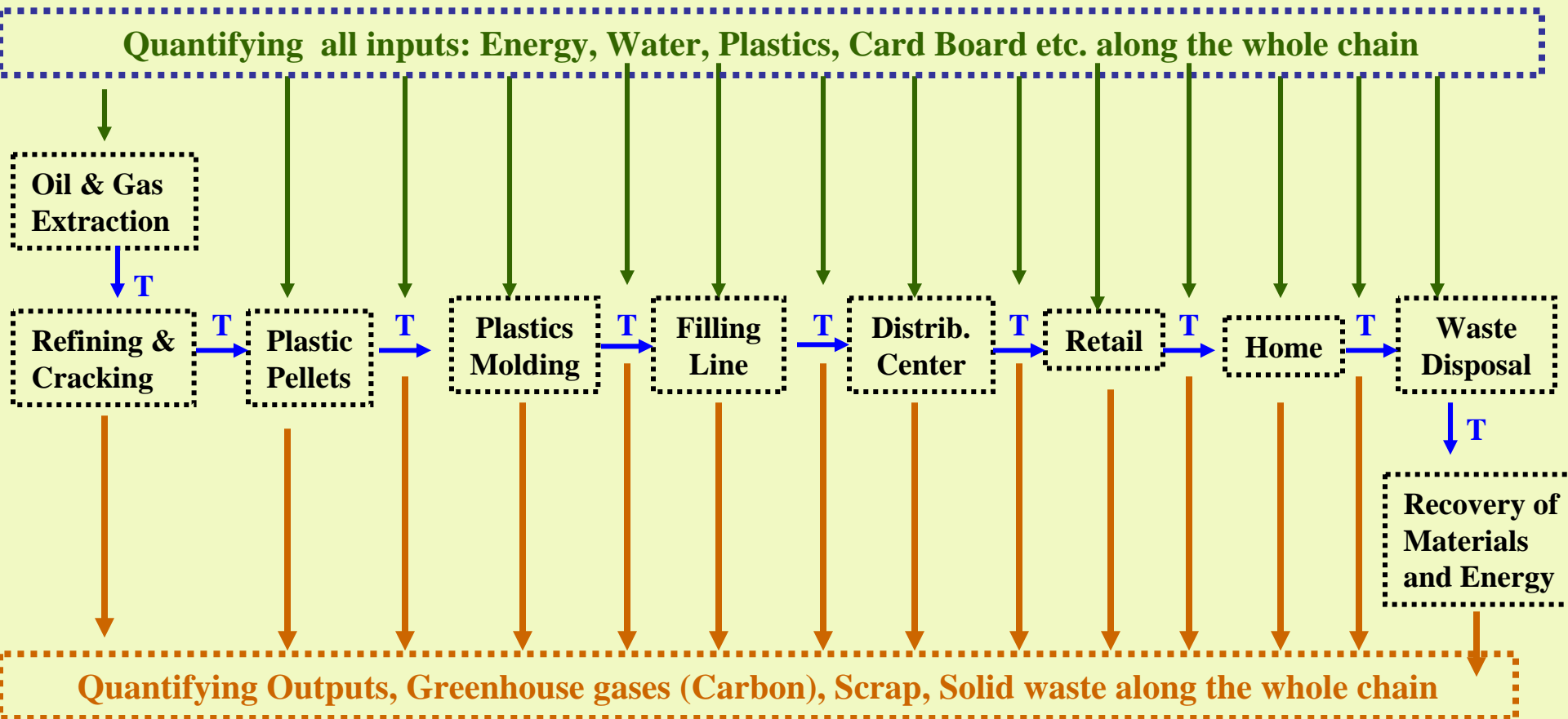


World Polymer Demand = 174.7 Million Metric Tons

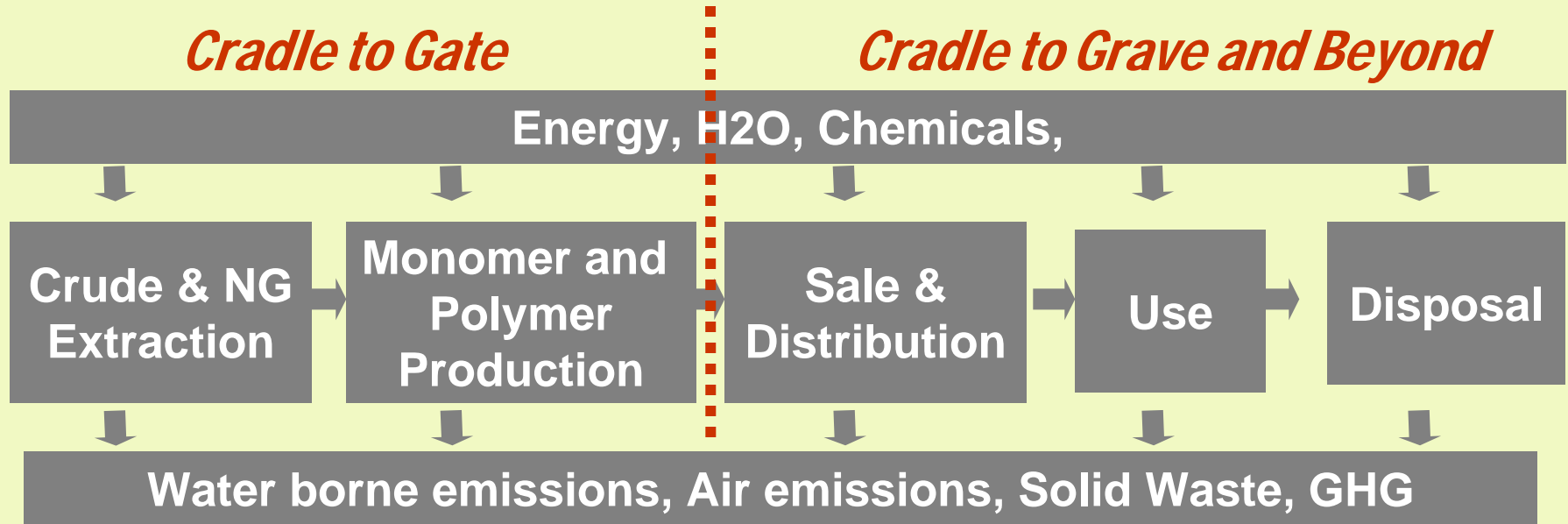
Petro Plastics Growth - Threats

- People
 - Retailers - Wal-Mart, Tesco, Marks & Spencer
 - Regulators - Europe, California
 - Municipalities - Plastic bans
 - NGOs - Challenge credibility of industry funded science
 - 70% increase in state and local attacks (06-07)
- Planet
 - Non-renewable energy – 4-8% of oil and gas go into Plastics
 - Carbon - taxes, credits, calculators, tags
 - Waste & litter
 - Marine debris
- Profits
 - Escalating oil and gas prices, and volatility
 - Margin squeeze.

How Is a Carbon Footprint Calculated



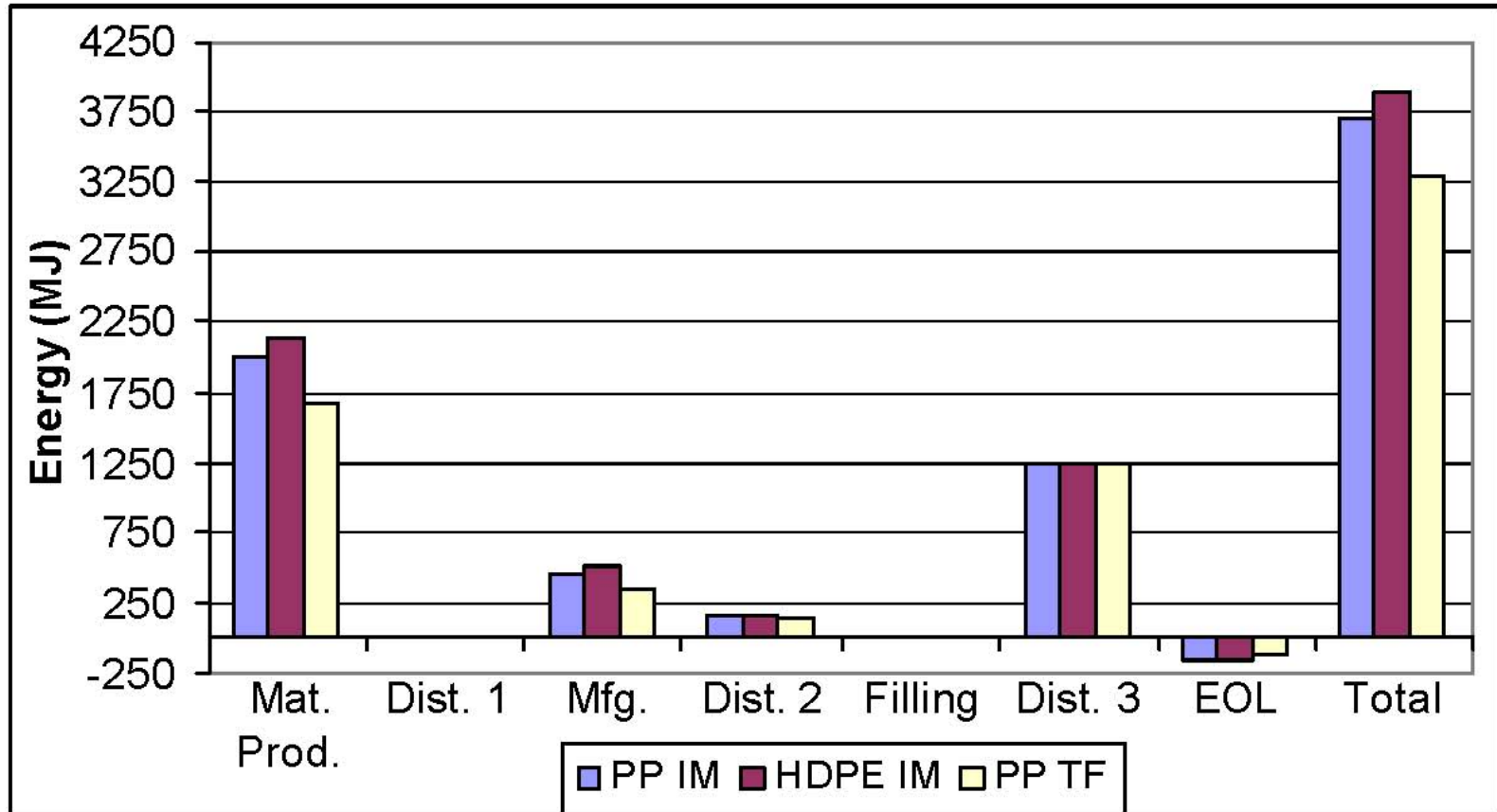
Life Cycle Impacts & Assessment (LCI, LCA)



- ***Very complex and evolving methodology***
- ***Easy to misuse for material comparison***
- ***Powerful tool for benchmarking and continuous improvement***

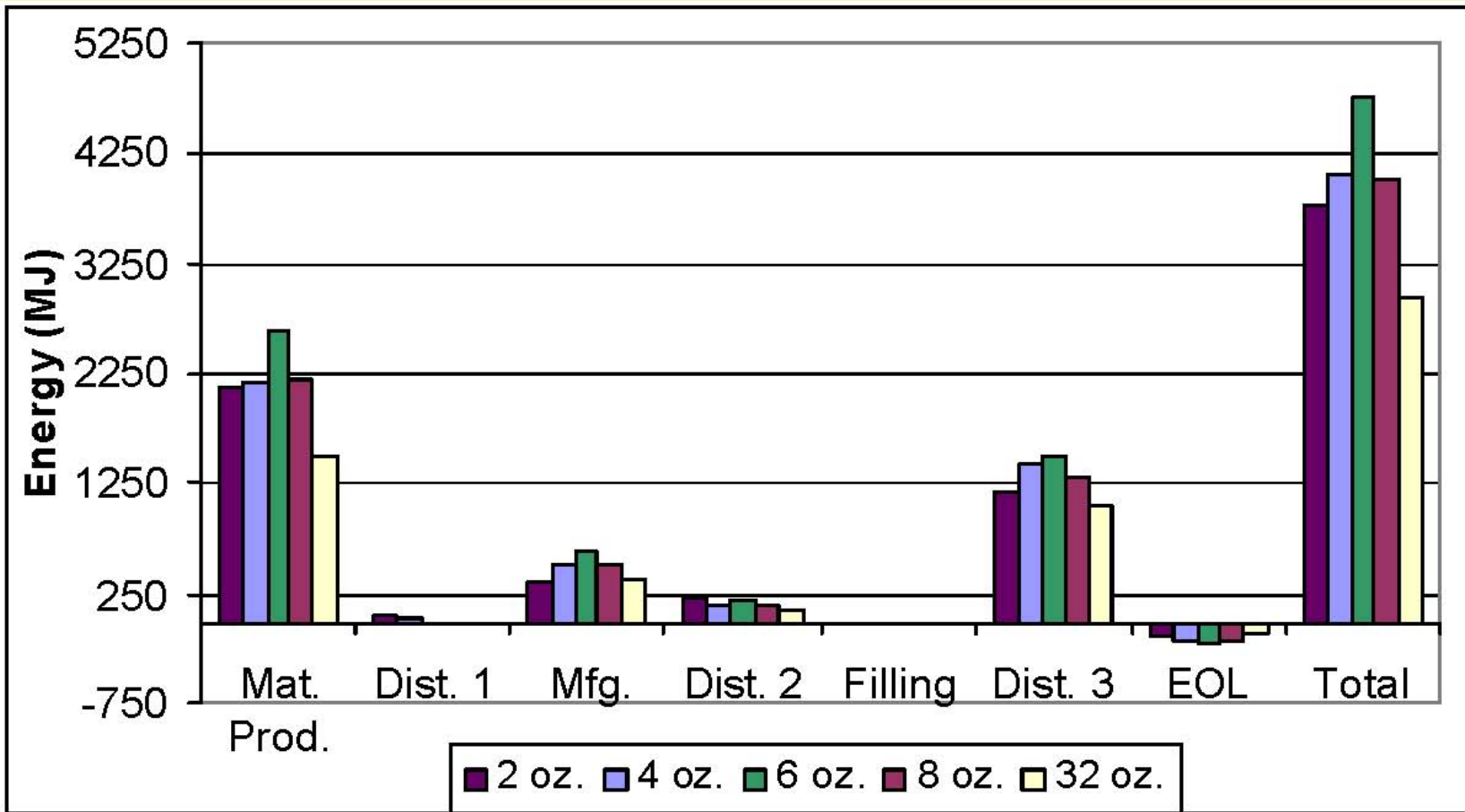
Yogurt Delivery Supply Chain System

Life Cycle Energy using HDPE or PP (IM Vs TF)

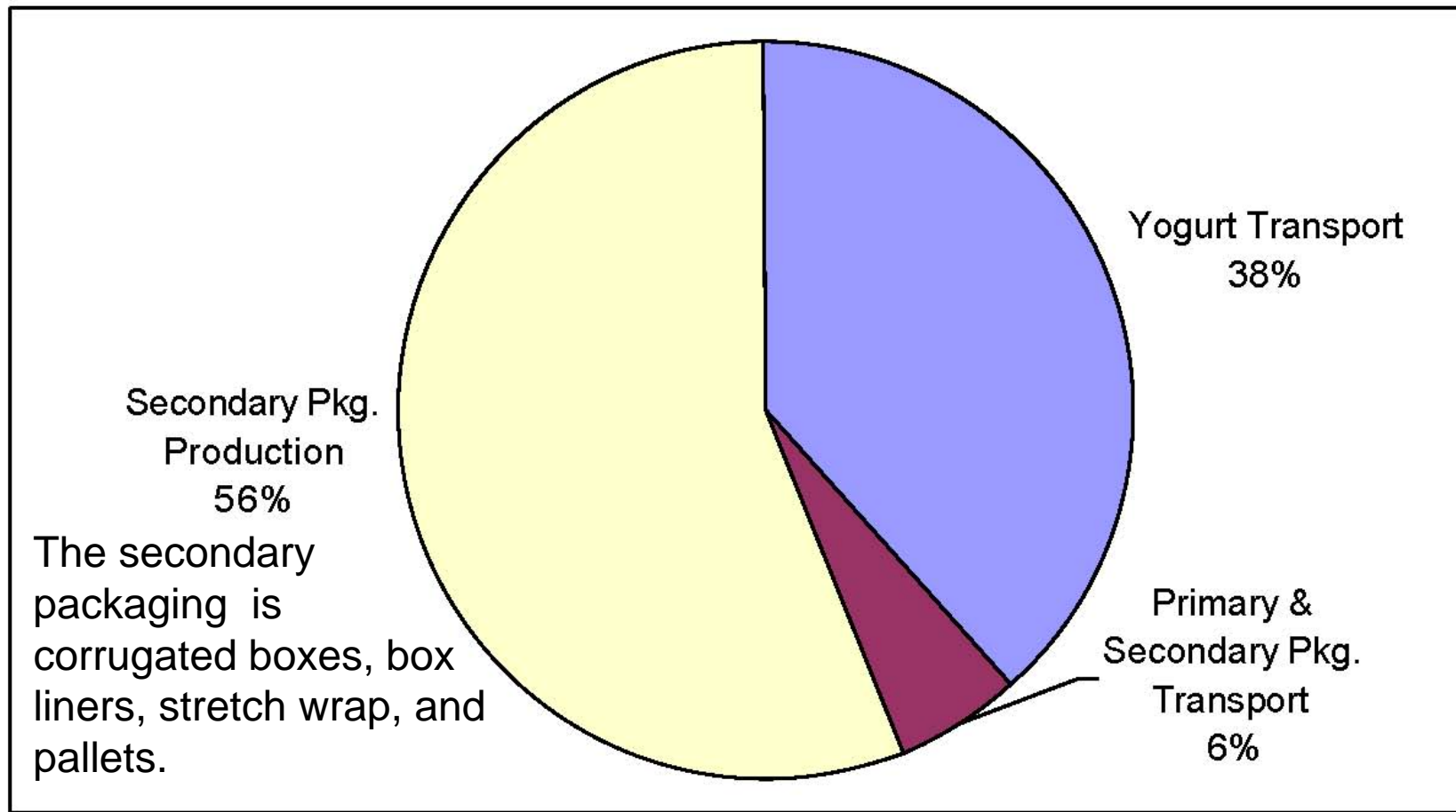


Yogurt Delivery Supply Chain System

Life Cycle Energy Size of Packaging



Energy Consumed In Delivering Yogurt to Distributors and Retailers



Optimizing primary packaging (Plastics) does not give the biggest rewards. Opportunities for innovation open by looking at all packaging.

PP Trays For Packaging Chicken

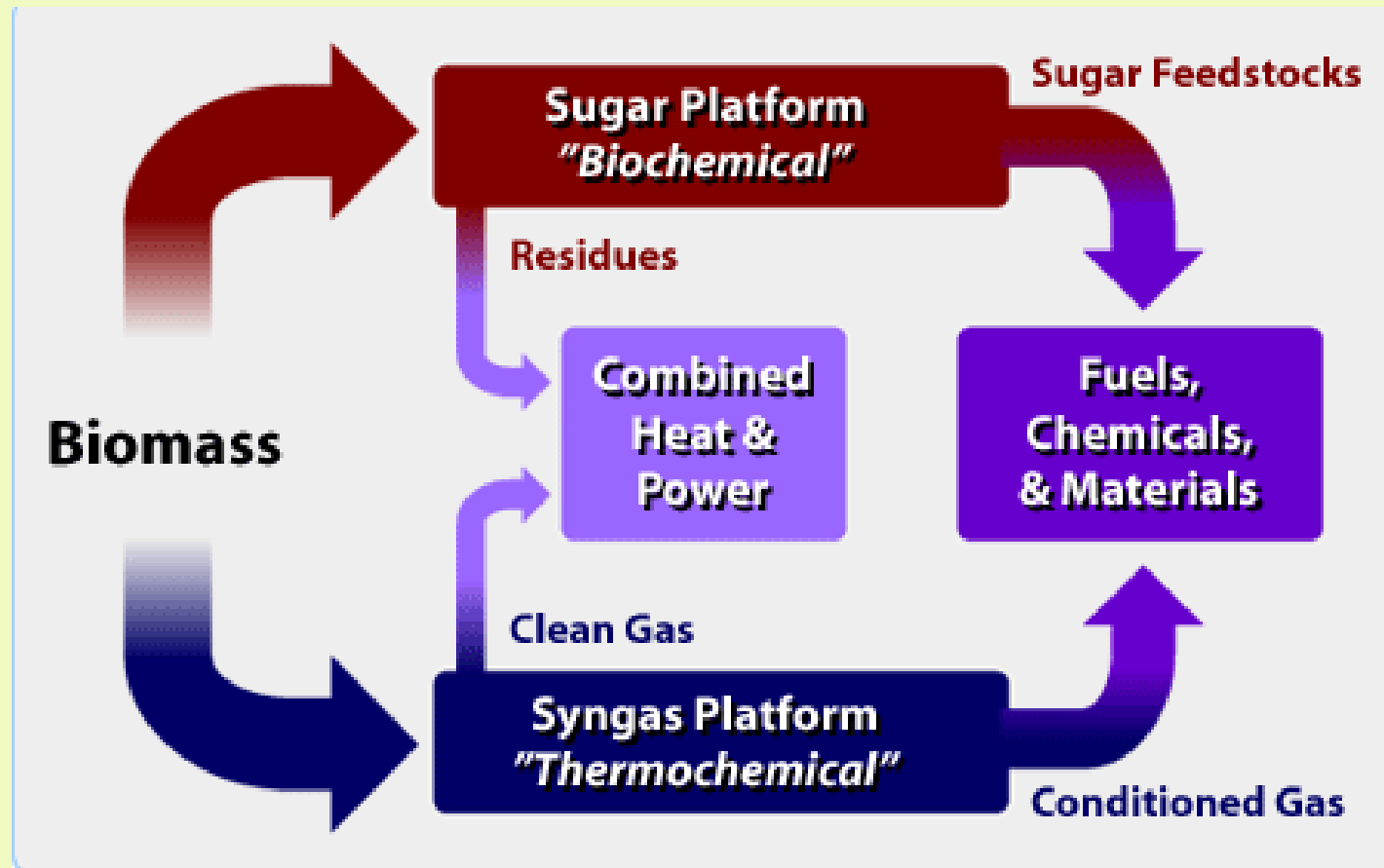
Sharp Interpack	Faccenda Group	ASDA
<p>Tray depth from 35 to 30 mm reduced:</p> <ul style="list-style-type: none">• PP use by 273 tons in 2007.• Transportation• Conversion energy	<p>1 extra tray per unit outer casing reduced:</p> <ul style="list-style-type: none">• 2000 outer cases and 57 pallets/wk.• Pallet & peak storage.• Trips & transport• Secondary packaging.• Cost/kg of delivered chicken by 20%.	<p>Increased shelf capacity in store & reduced</p> <ul style="list-style-type: none">• Transport to RDC• Pallets to load, labor• In store transport• Frequency of reloading• Storage costs in RDC• Storage costs in back-up refrigeration• Water & soap

Small change in design can give big monetary benefits, beyond your boundary in the whole supply chain

Growing Choice of Bio Plastics

Sugarcane	Fermentation	Bio PE, Dow, Braskem
Agri-waste	Thermo-Chemical	Bio Polyolefins, Lurgi, UOP
Sugar wastes,	Microbial	(PHA & PHB) Metabolix
Corn & other starches	Chemical modification	Thermo plastic starches, Novamont
Corn & other starches	Enzymes, Chemical	PLA, Nature Works, PTT, DuPont
Oil Seeds	Trans-esterification	Bio Polyols, Dow

Bio Refinery Concept (NREL)



Potentially carbon neutral vs Petro-refineries.

Bio Plastics Emergence

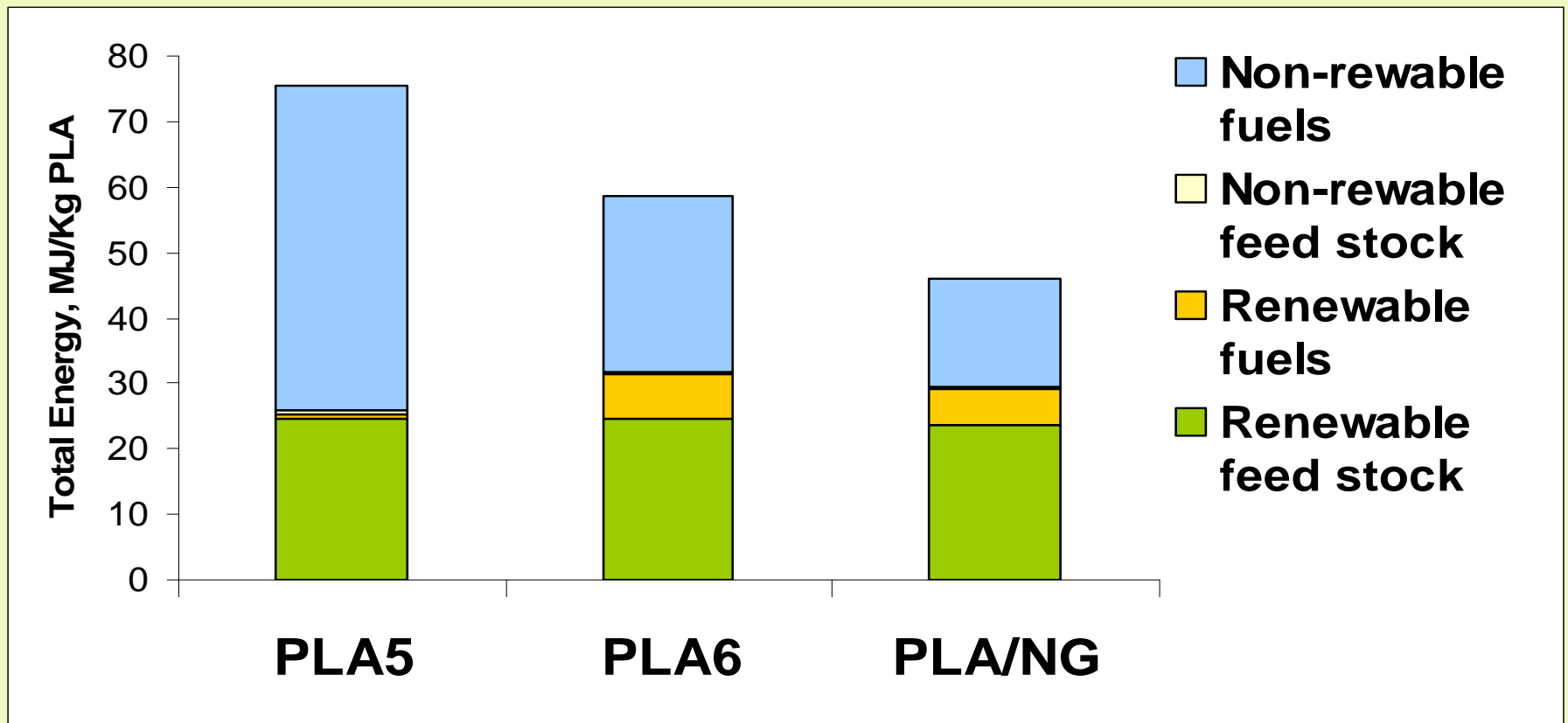
DRIVERS

- Bio-tech advances
- Venture capital
- Bio fuels
- Strategic Shift
 - DuPont,
- Consumer Appeal
- Federal Purchasing Bio-preferred

IMPLICATIONS

- Competition w food
- Land, bio-diversity
- Water
- Monetization of food, wood and agri waste
- Regional plants
- Single polymer plants
- Low capital entry

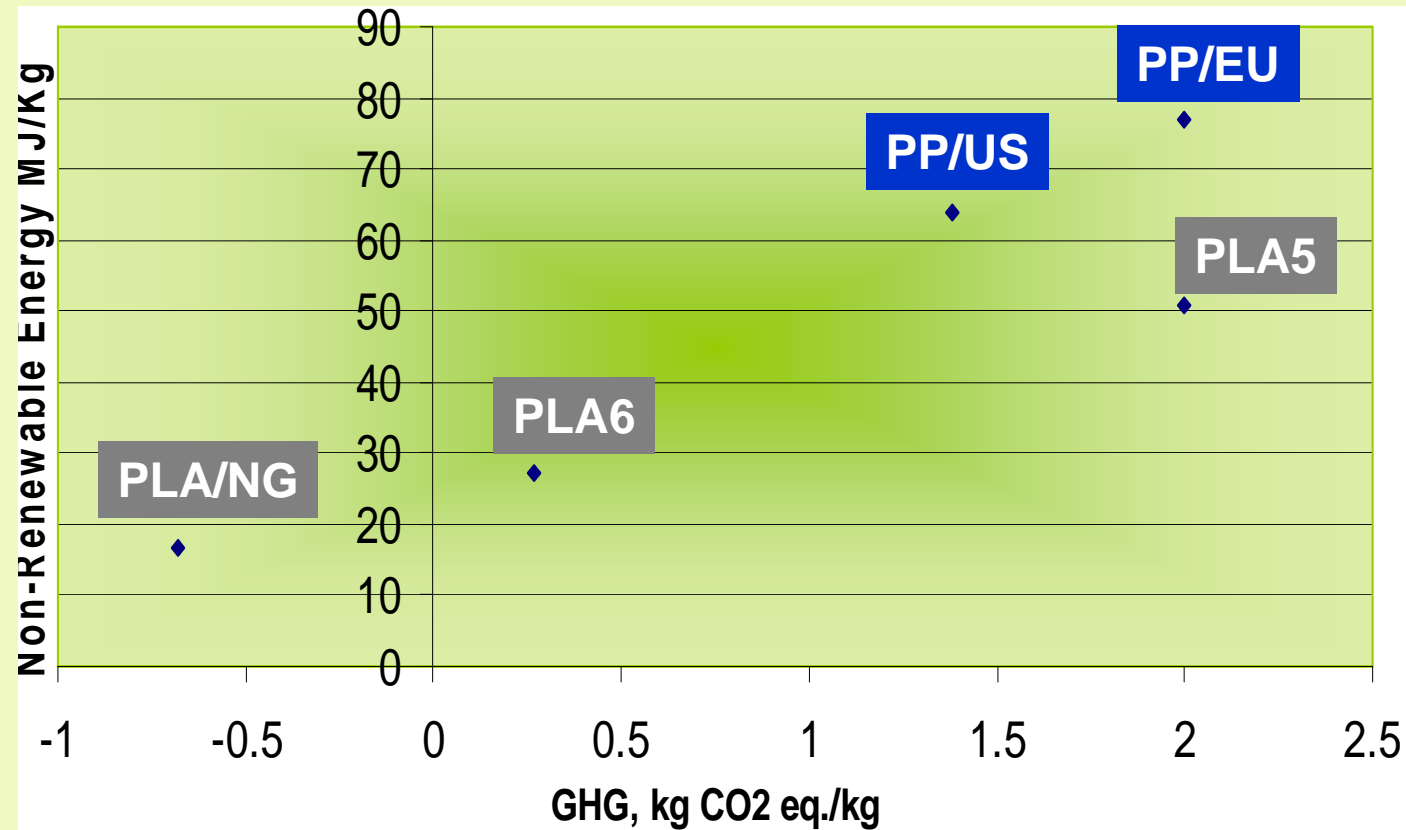
Evolution of Energy Use In PLA



In PLA6 grid electricity is replaced with wind renewable energy credits.

Electricity generation is extremely inefficient!! To make and deliver 1MJ needs 3.5 MJ of fossil energy.

PP & PLA, Cradle to Gate Energy Vs CO₂

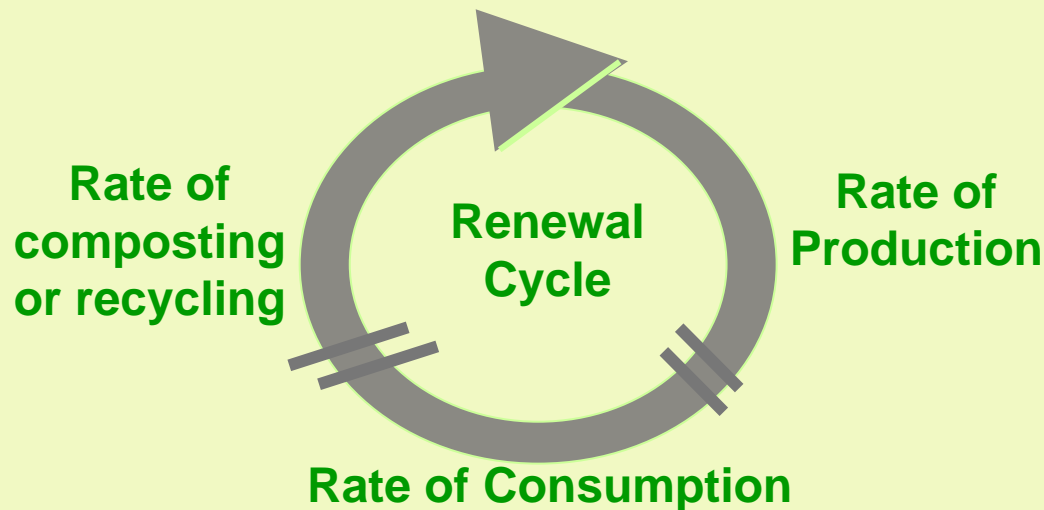


Beware Of:

- Age of data
- Industry participation
- Methodology
- Regionality
- Density

Our View

- Bio not necessarily good unless systems to compost exist. If land filled release methane – 23x more potent than CO₂
- Petro plastics not necessarily bad if systems to recycle exist.
- If production, consumption and disposal are faster than renewal, we have a sustainability problem. Today, 40-85% of some plastics go to landfills in less than 6 months.



Legislation Aimed at Reducing Waste

- ❖ **Many Countries and EU have Packaging Directives**
- ❖ **Extended Producer Responsibility (EPR)**
 - Makes the producer financially and/or physically responsible for end of life.
- ❖ **End of Life Vehicles (ELV)**
 - Improve design and production of new vehicles to facilitate their dismantling, reuse, recycling, and recovery; and integrate more recycled materials in vehicles:
- ❖ **Waste from Electrical and Electronic Equipment (WEEE)**
 - Producers will be responsible for taking back and recycling electrical and electronic equipment. This will provide incentives to design electrical and electronic equipment in an environmentally more efficient way, taking waste management aspects fully into account.

Progressive Bag Affiliates

- **PBA is now a work group of ACC**
- **Promotes the responsible use and recycling of plastic bags.**
- **Recycling toolkit is being used by retailers around the nation to deploy effective recycling solutions in stores.**
- **For more information, please visit www.plasticbagrecycling.org.**

Home

Consumers

Businesses

Recycling Coordinators

Recyclers

Retailers

The online resource for plastic bag and film recycling



Consumers ▶

In this section you will find general information about plastic bag recycling including what material is readily recyclable as well as a list of retailers that offer plastic bag recycling.

[» Learn More](#)

Businesses ▶

In this section you will find a comprehensive guide to plastic film and bag recovery. You can find specific information such as plastic film types, recyclers, and how to calculate the economics of recovery.

[» Get Started](#)

Recycling Coordinators ▶

Since plastic bags and film are a relatively new recycling commodity, many businesses and recyclers are not yet aware of the option and opportunities to recover it. More information in the marketplace may facilitate recovery programs.

[» Tips for Increasing Film Recovery](#)

Recyclers ▶

Let businesses and other commercial generators of plastic scrap film know about your services by listing in our directory. For information about how to set up a recovery program go to the business section.

[» List Information](#)

Retailers ▶

Consumers are increasingly asking where they can recycle their plastic bags. Grocers and Retailers can help through education, providing recycling bins in convenient locations, and listing in our directory.

[» Learn More & List Your Store](#)

Sponsors & Partners ▶

Learn about other organizations that support plastic bag and film recycling.

[» Learn More](#)



Plastic Bag Recycling Awareness

Poster &
Bin w/signage



Progressive Bag Affiliates

Recycling Solutions: The “Bring It Back” Model

- A single unifying symbol that is used to convey a simple message to consumers.
- Ensures consistency and reinforcement of the message across multiple geographies, multiple stores, etc.
- Educates consumers and drives behavioral change



Summary

- No one part of the system can pull the entire weight to get us out of trouble!!
 - Plastic, article design, delivery, use, disposal are connected and have many trade-offs, balances.
- Bio Plastics too have known and unknown impacts.
- Adding innovations on top of the current wasteful industrial supply chain system will not pay back.
- Life-cycle and systems wide innovation needed.
- Many opportunities to innovate for sustainability.