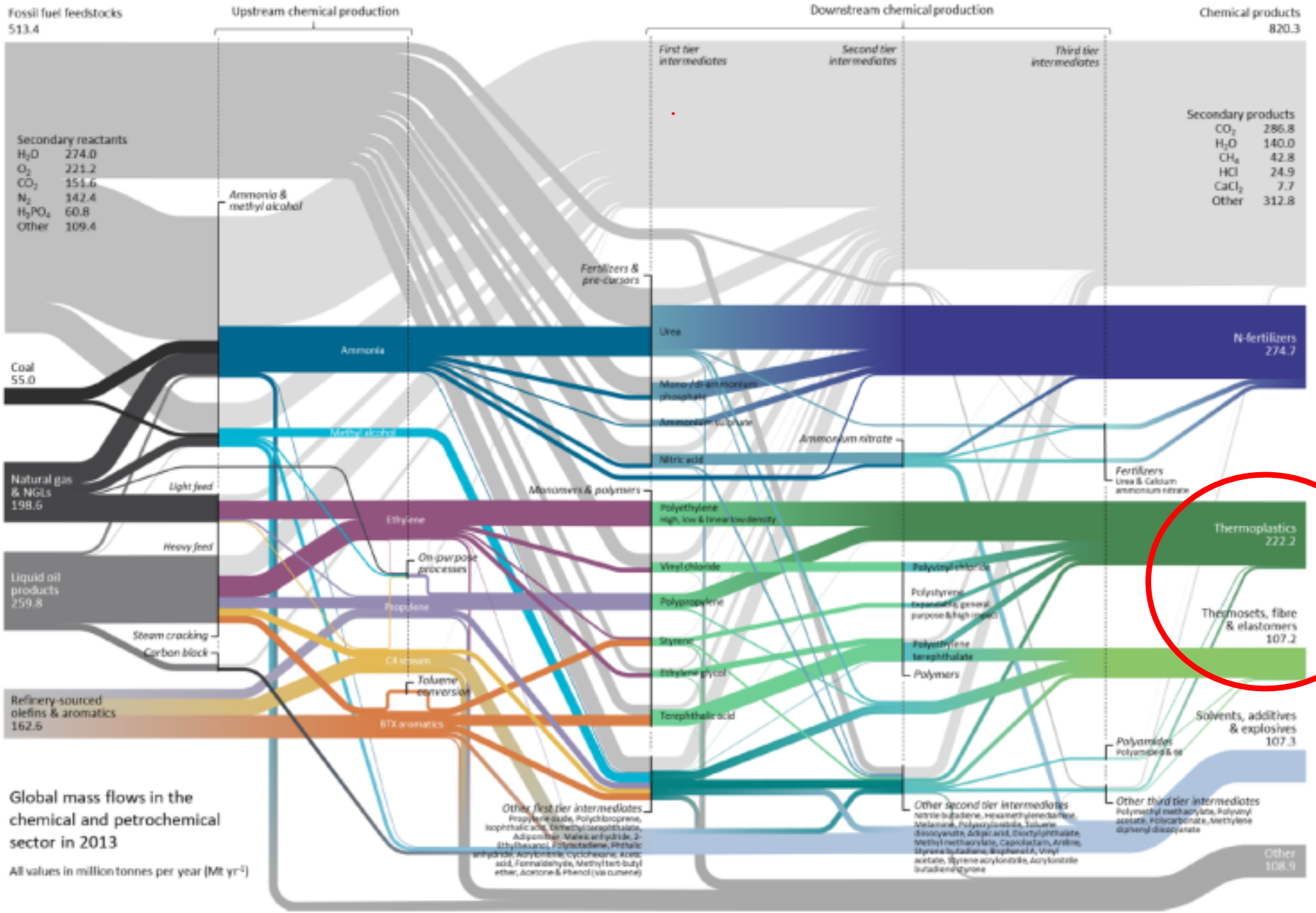
Smart Prosperity Institute

A VISION FOR A CIRCULAR ECONOMY FOR PLASTICS IN CANADA

THE BENEFITS OF PLASTICS WITHOUT THE WASTE AND HOW WE GET IT RIGHT

USMAN A. VALIANTE



Plastics = 40% of global petrochemical production

~1.89 Mt CO_2e are emitted per Mt plastic resin produced = 623 Mt CO_2e

Mapping Global Flows of Chemicals: From Fossil Fuel Feedstocks to Chemical Products

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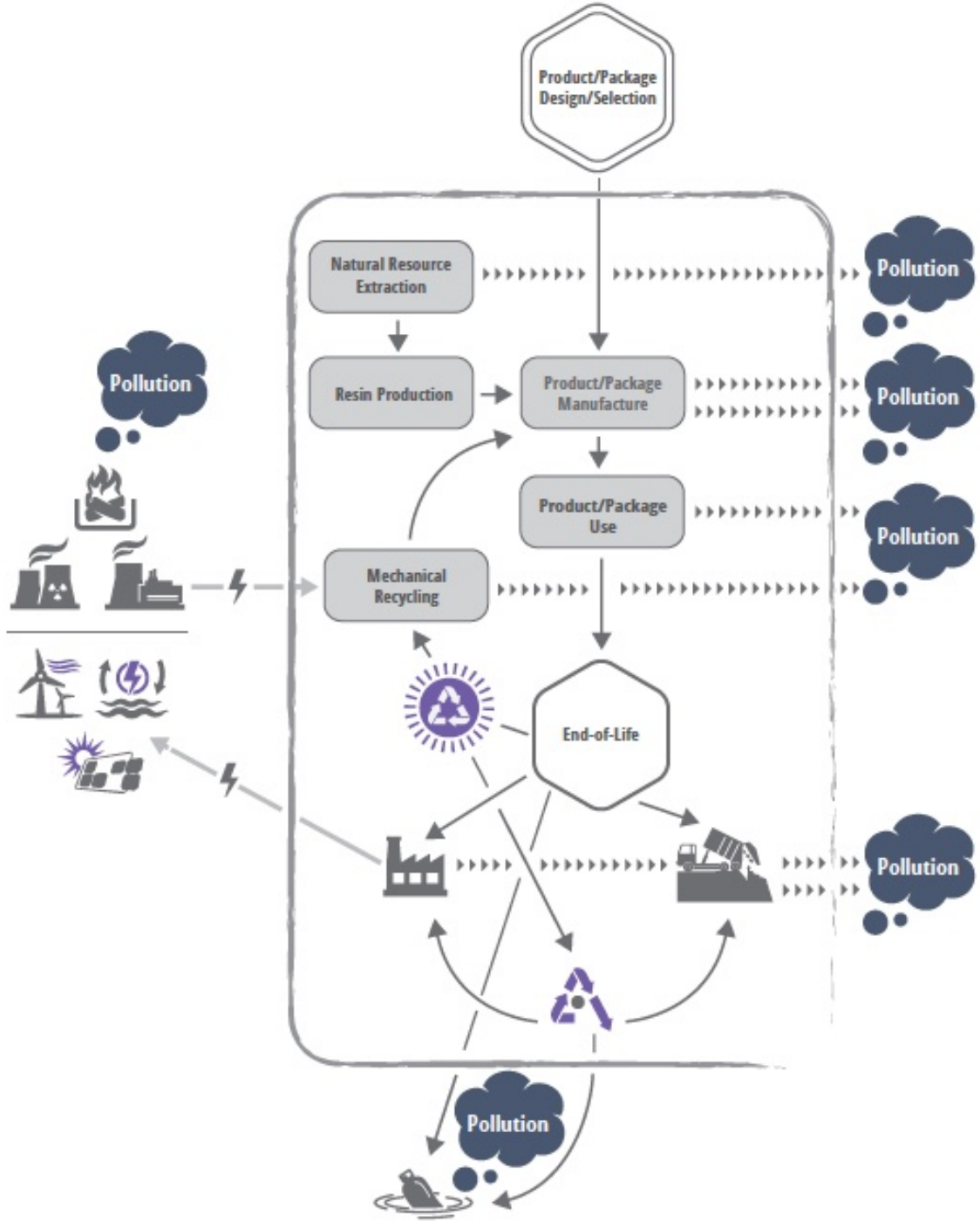
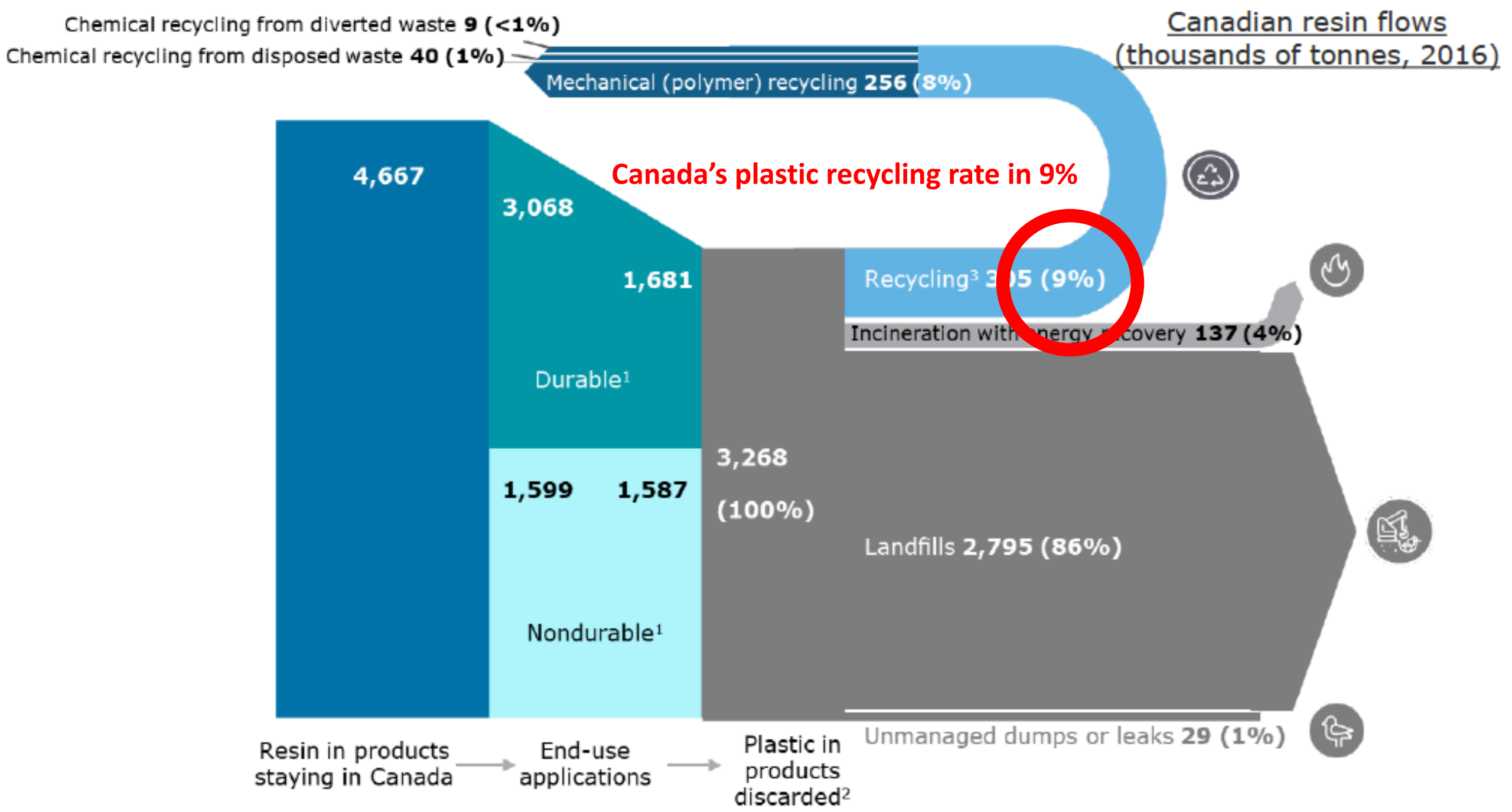
Figure 1. A Sankey diagram depicting the passage of feedstock through the chemical sector: from fossil fuel feedstocks to chemical products. NGLs: Natural gas liquids, N-fertilizers: Nitrogenous fertilizers.

The existing linear economy for plastics





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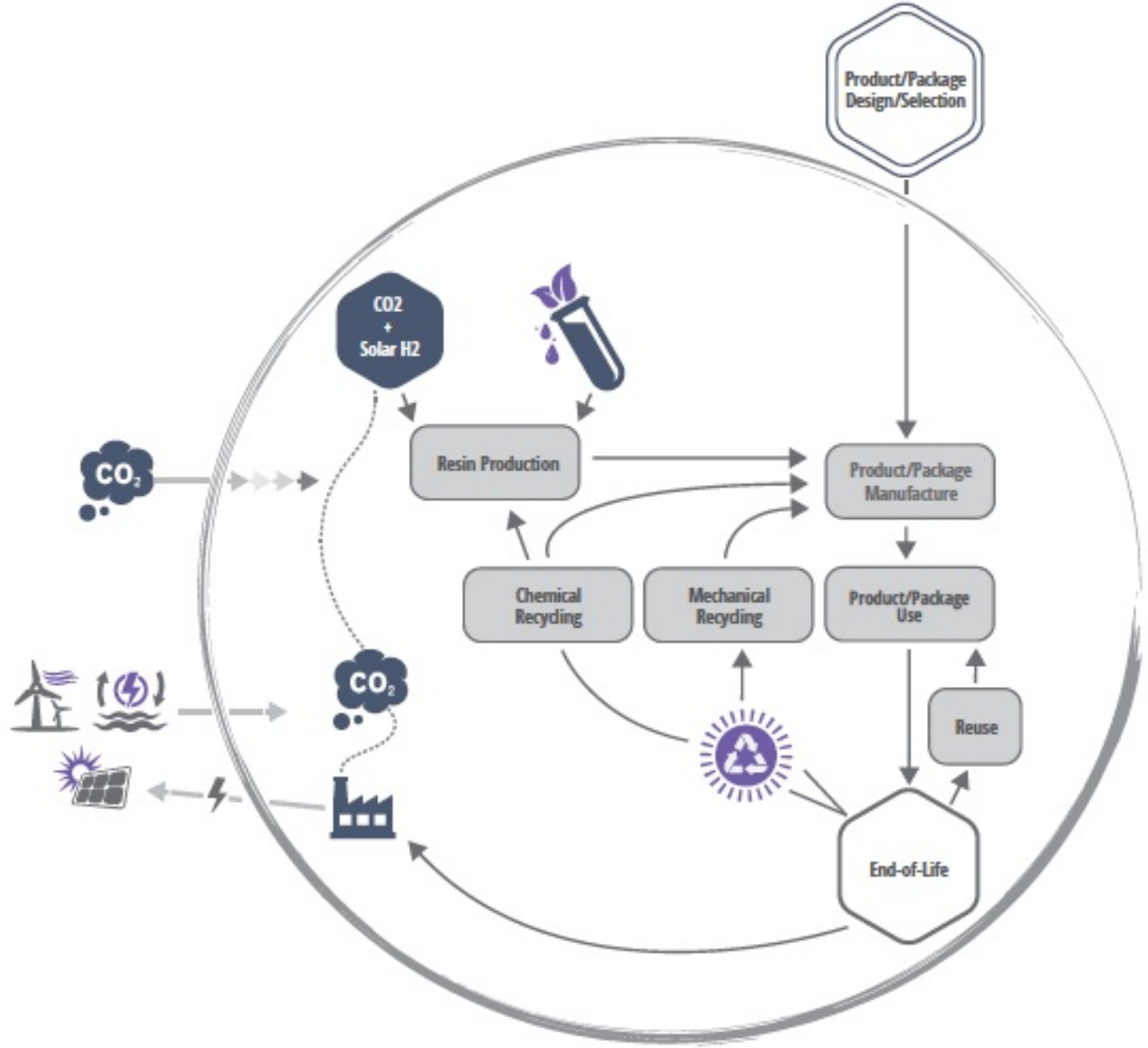
Circular economy – what is it?

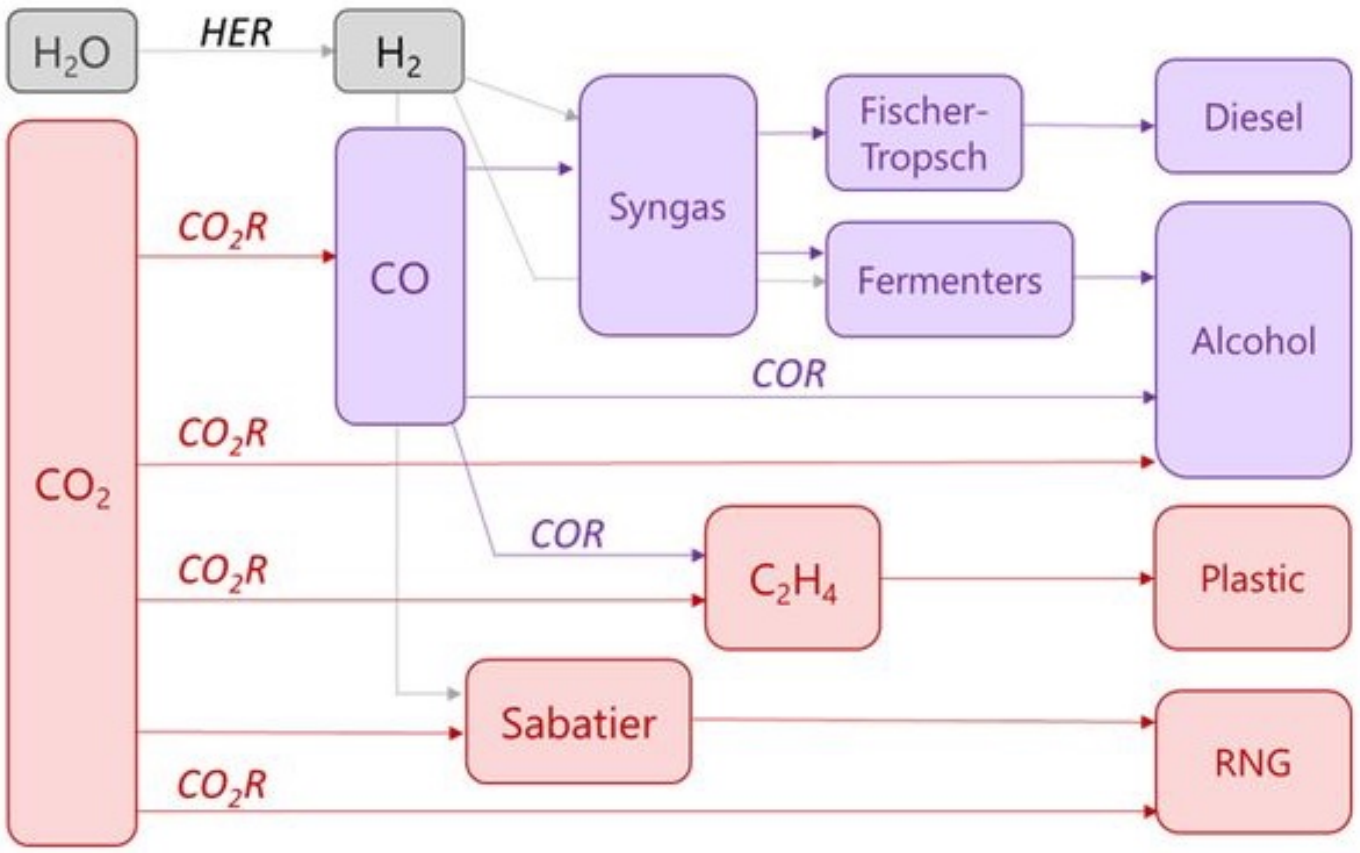
- **Technical nutrients**
  - Products and packaging are reused, or the constituent materials are recovered for their reintroduction into manufacturing, in a manner that displaces raw materials
- **Biological nutrients**
  - Materials in products and packaging are consumed by biological systems, with no adverse impact to those systems

A plastics circular economy is powered by renewable energy and is zero waste



Renewable plastic chemistries

- **Recycling CO2**: the electrocatalytic production of plastic using captured carbon dioxide, water and renewable energy
- **Biomass** (waste) as a feedstock to make the chemical building blocks for polymers

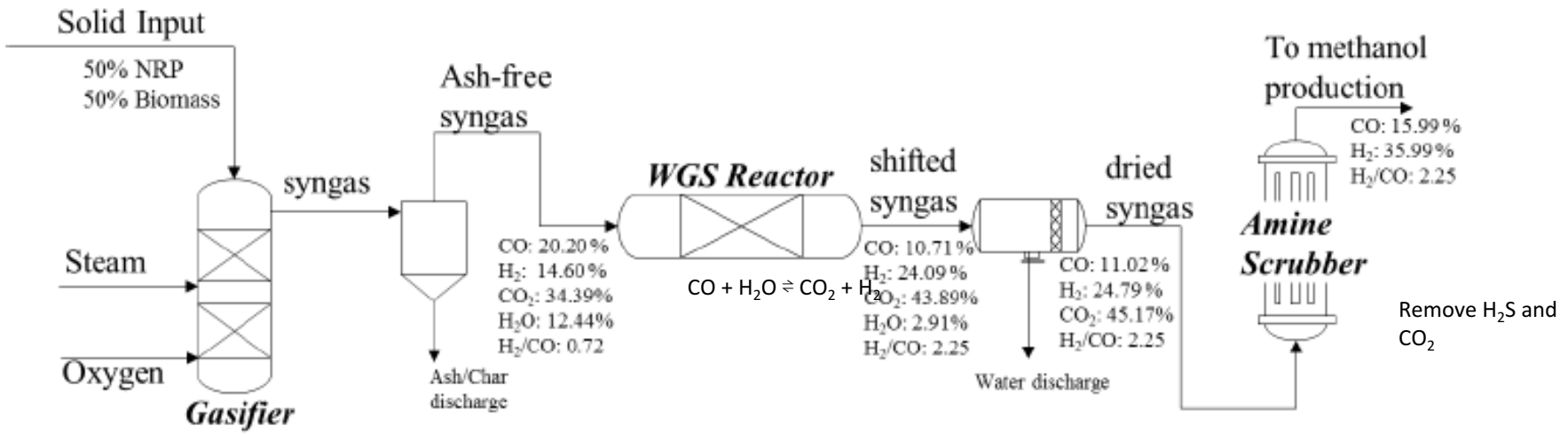


What would it take for renewably powered electrosynthesis to displace petrochemical processes?
Phil De Luna et. Al. *Science* 26 Apr 2019: Vol. 364, Issue 6438

Recirculating plastics and their building blocks

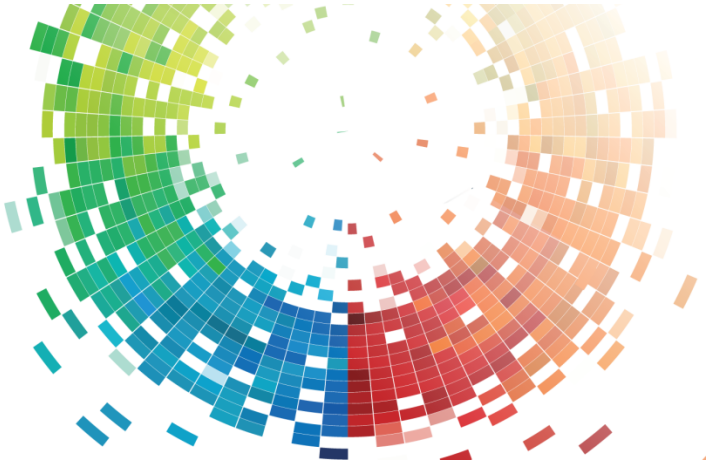
- **Reuse**
- **Mechanical recycling**
- **Chemical recycling:** pyrolysis, gasification, chemical depolymerization, catalytic cracking and reforming and hydrogenation

Plastic to methanol, methanol to olefins



THE EFFECTS OF NON-RECYCLED PLASTIC (NRP) ON GASIFICATION: A QUANTITATIVE ASSESSMENT
Demetra A. Tsiamis and Marco J. Castaldi Earth Engineering Center | City College City University of New York. April 30, 2018

Barriers to a plastics CE

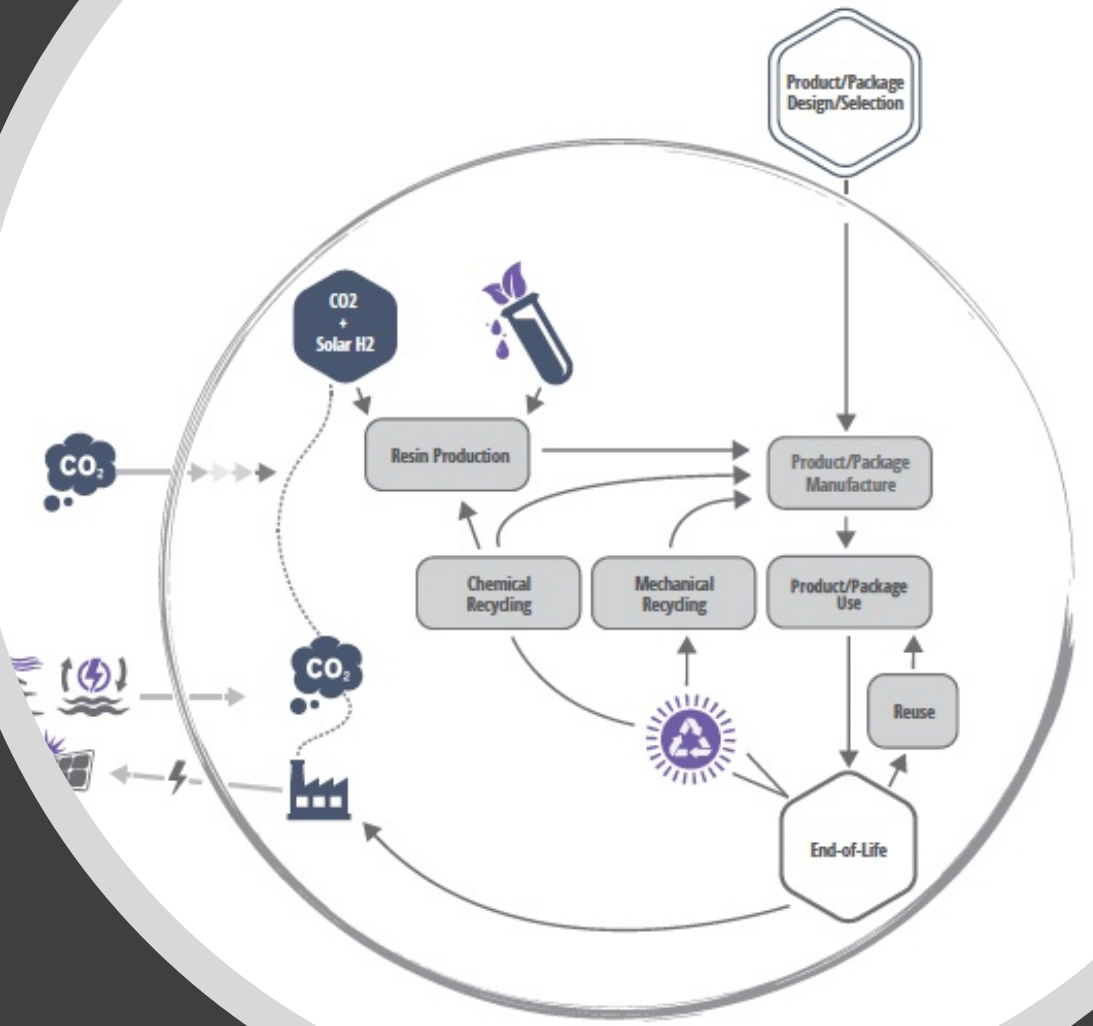


1. Fossil based plastics cheaper than renewable chemistries, reuse and recycling
2. Un-priced and unmitigated externalities effectively subsidize the status quo
3. Exchange of information between various actors in the plastics life-cycle is poor leading to non-circular choices
4. Technological barriers to circularity
5. Existing policies and regulations block or frustrate the development of circular economy practices

Making the right choice to reduce, reuse or recycle or some combination thereof are market decisions

But…

Producers of products containing plastics or using plastics packaging must make those decisions where waste and pollution are fully “priced” in terms of financial and life-cycle environmental cost



3 powerful levers to bend linear towards circular

1. **Full producer responsibility**
   - Producers build collection and management reverse supply-chains
   - Stringency drives innovation - there is no point to regulate EPR for 50% recycling outcomes for plastics
   - Provide producers with economic freedom
     - Collective action through commercial agreement not regulatory fiat
     - Drive innovation in collection, management and reincorporation of materials
   - Government makes policy and ensures administration of the law
     - Eliminate freeriding, ensure compliance with accessibility and recycling performance standards

3 powerful levers to bend linear towards circular

2. **Set low carbon plastic standards (LCPS)**
   - Creates demand for recycled plastics supplied by EPR
   - Drives innovation in plastics recycling
   - Drives renewable plastic chemistries
   - Embed standards in government procurement

3. **Price greenhouse gas emissions (including burning fossil plastics as fuel)**