



Partnering with the Petrochemical Industry

•David Theriault, Dow Chemical



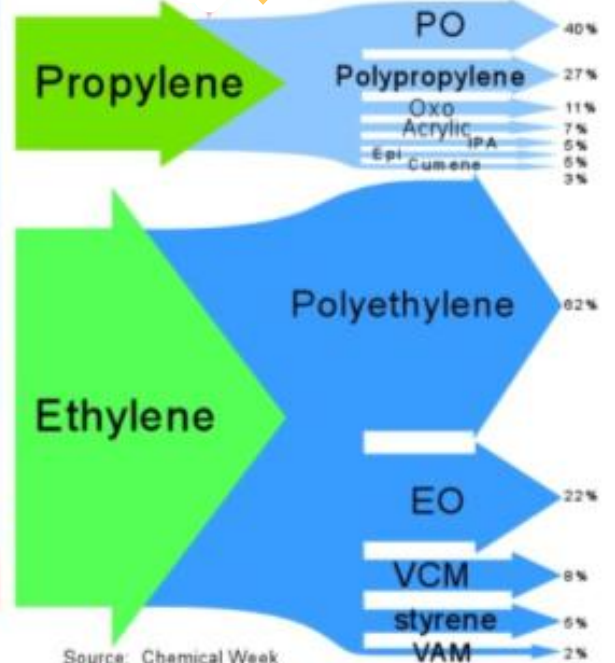
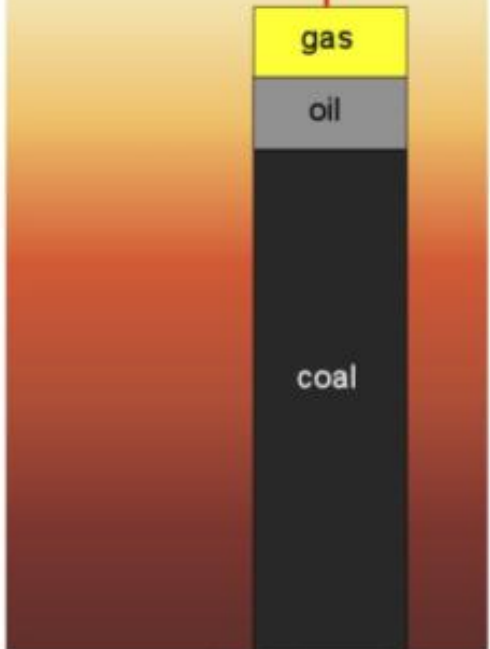
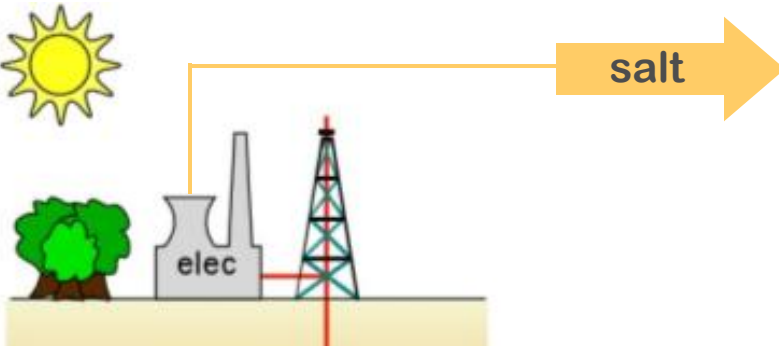


Dow Chemical - Who we are

- A science and technology company with annual sales of \$54 billion (2007)
- Founded in 1897 by Herbert H. Dow in Midland, Michigan
- Supplier of more than 3,100 products to customers in 160 countries
- Operator of 150 manufacturing sites in 35 countries and employer of 46,000 people worldwide



Dow: Large Integrated Chemical Company



source: 2002 BP Statistical Review

source: SRI 29G

Source: Chemical Week



The New Dow

DOW



Advanced Materials

Electronic & Specialty Materials

- Electronic Materials
 - Semiconductor Technologies
 - Interconnect Technologies
 - Display Technologies
 - Specialty Materials
 - Dow Water & Process Solutions
 - Dow Wolff Cellulosics
 - Dow Home & Personal Care
 - Dow Microbial Control
- JV: Dow Corning

Coatings & Infrastructure

- Dow Coating Materials
 - Architectural Coatings
 - Industrial Coatings
- Dow Building & Construction
 - Dow Building Solutions
 - Dow Construction Chemicals
- Adhesives & Functional Polymers
 - Industrial Process Materials
 - Packaging & Converting
 - Tapes, Labels & Textiles



Health & Agricultural Sciences

Health & Agricultural Sciences

- Dow AgroSciences
 - Agricultural Chemicals
 - Seeds, Traits & Oils
- AgroFresh



Performance Products & Systems

Performance Systems

- Automotive Systems
- Dow Elastomers
- Dow Wire & Cable
- Polyurethane Systems & Epoxy Systems
- Dow Oil & Gas
- Dow Fiber Solutions

Performance Products

- Polyurethanes
 - Epoxy
 - Amines
 - Oxygenated Solvents
 - Performance Monomers
 - Performance Fluids, Polyglycols and Surfactants
 - Emulsion Polymers
 - Dow Haltermann
 - SAFECHEM
- JV: OPTIMAL (EO Deriv.)
– JV: SCG-Dow (Latex)



Basics

Basic Plastics

- Polyethylene
 - Polycarbonate and Compounds & Blends
 - Polypropylene
 - Styrenics
 - Basic Plastics Licensing & Catalyst
- JV: Americas Styrenics LLC
– JV: EQUATE (PE)
– JV: Equipolymers
– JV: SCG-Dow (PE, PS)
– JV: Univation Technologies

Basic Chemicals

- Chlor-Alkali/Chlor-Vinyl
 - Ethylene Oxide/
Ethylene Glycol
 - Chlorinated Organics
- JV: EQUATE (EG)
– JV: MEGlobal
– JV: OPTIMAL (EG)

Hydrocarbons & Energy

- Olefins, Aromatics, Power, Aromatic Derivatives
- JV: Compañía Mega
– JV: SCG-Dow (Aromatic Deriv.)

Corporate



Renewables Focus

Basics

- Polyethylene
- Polystyrene
- Polypropylene
- Ethylene Glycol
- Vinyl Chloride
- Caustic Soda
- Vinyl Acetate
- Butanol

Building Blocks

- Ethylene
- Chlorine
- Styrene
- Ethylene Oxide
- Ethylene Dichloride
- Propylene Oxide
- Cell Effluent
- Propylene
- Benzene
- Butadiene

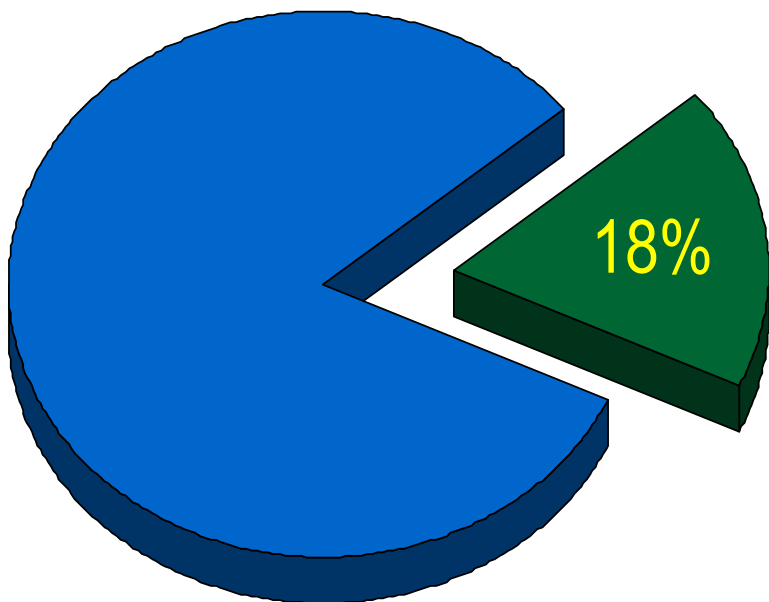
Market Facing

- Agricultural Sciences
- Dow Automotive
- Dow Building Solutions
- Epoxy
- Polyurethanes
- Latex & Acrylic Monomers
- Designed Polymers
- Specialty Plastics & Elastomers
- Specialty Chemicals
- Licensing

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Potential for Renewable Feedstocks



Dow Product Produced

- Epoxy
 - Epoxy Converted Resins
 - Liquid Epoxy Resins
- Polyurethanes
- Propylene Glycol
- Polyols
- Latex & Acrylics
 - Acrylates
- Designed Polymers
 - Cellocise
 - Ethyl Cellulose
 - Methylcellulose
- Specialty Chemicals
 - Glycol Ethers
- Performance Fluids
- Polyglycols
- Surfactants
- Alkanolamines
- Solvents & Intermediates

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Potential Future Opportunities for Industrial Biotech

DOW

Attractive Intermediates

- Small Alcohols
 - Ethanol
 - Propanol
 - Butanol
 - Octanol
- Glycols
 - Propylene Glycol
 - Ethylene Glycol
 - Glycerin
- Acids
 - Acrylic Acid
 - Adipic Acid
- Oxides
 - Epichlorohydrin
 - Propylene Oxide
 - Ethylene Oxide

Attractive Final Products

- Polyglycols
- Surfactants
- Glycol ethers
- Solvents
- Polyols
- Polyesters

Potential Routes to these materials

- Fermentation
 - Small molecules
- Biocatalysis
 - Selective oxidation and reduction
 - Hydroxylases, decarboxylase
- Novel seed oil fatty acids
 - Hydroxy terminated
 - Epoxy terminated

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Dow Global Industrial Biotech Projects

- **Brazil** - Sugarcane to Polyethylene integrated facility with a capacity of 350,000 metric tons.
- **China**- 150,000 MTPA world-scale ECH plant first to use a new Dow proprietary glycerine-to-epichlorohydrin technology.
- **US**- Propylene Glycol Renewable (PGR) is made from bio-based glycerin and RENUVA™ technology used to produce bio-based polyols





Accelerating Dow's Innovation Agenda





The Innovation Challenge

Fuzzy Front End

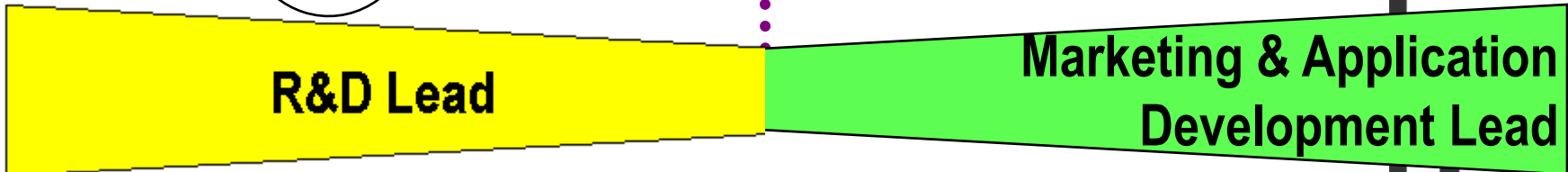
- *Intuitive*
- *Non-linear*
- *Ideas Based*
- *Exploratory*
- *High uncertainty*

Structured Implementation

- Analytical
- "Linear" Process
- Data Based
- Milestone & Business Results Driven

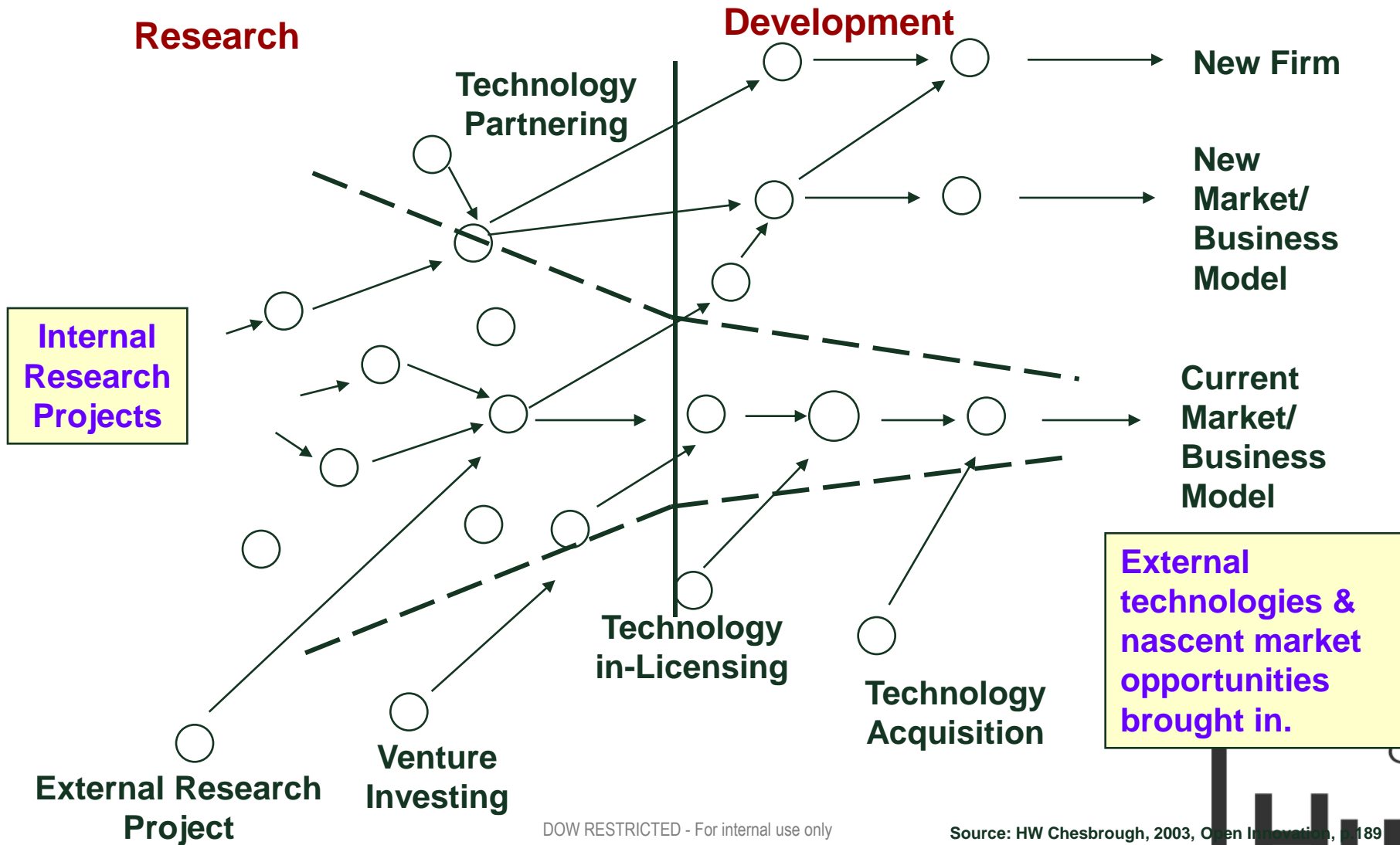
Science

Markets and Consumers





Filling Knowledge Gaps



External technologies & nascent market opportunities brought in.

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Source: HW Chesbrough, 2003, *Open Innovation*, p.189





Finding Better Solutions - Externally

Why Change from Internal to External Focus?

- Dow's R&D's engine is based on innovation and targets large challenges
- Key technology inventions require many elements and a combination of inventions
- Shortened time horizons and leveraging costs
- Creativity from all sources needs be tapped into

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Key Elements for Success

- **Success factors for corporation:**
 - Visible entry points to champion concept
 - Connect with national/state organizations focused on commercializing start-ups
 - Communicate main technology challenges and interests
 - Share early on typical project scenarios/milestones with start-up
- **Success factors for start-ups** (and universities with emerging technologies):
 - Clear value proposition and compelling disruptive technology
 - Sufficient and business-friendly IP coverage
 - Milestone-driven scale-up plan
 - Assessment of competitive technologies and market potential
 - Advisory boards of independent experts in the field

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Selecting the Right Agreement Vehicle

- Considerations:
 - Direction & Deliverables
 - Intellectual Property Control and FTO
 - Dow Proprietary Information
 - Leverage / co-funding
 - Time frame
 - Cost

Depending on business model interests, strategic fit and project success, outcome could range anywhere from JDA, licensing, acquisition or decision not to pursue.

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Dow Innovation Functions - Entry Portals

- **Ventures & Business Development**
 - Responsibility: To create and manage a portfolio of technology options that position Dow to incubate new businesses, explore growth opportunities and enhance entrepreneurial innovation
 - Screening Criterion: **Technical strategic fit** with Dow
- **Venture Capital**
 - Responsibility: To provide private capital to fast growing companies that match Dow's growth objectives
 - Screening Criterion: **Financial parameters**
- **Dow R&D - External Technology**
 - Responsibility: To identify and leverage external science and technology resources to achieve Dow's business and corporate objectives
 - Screening Criterion: **Specific research collaboration**

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Summary

- **Sustainability is key for Dow's triple bottom-line commitment**
- **Industrial biotechnology will be a key component of its sustainable transformation**
- **Dow/DowAgrosciences are actively seeking biotechnologies from around the world and have structures set up to enhance external collaboration.**
- **Australia has proved itself in producing world-class science in the various fields of biotechnology.**
- **We are interested to talk to you !**

