

Herzliya Conference 2010

Breaking the Global Oil Addiction:

***Role of the Israeli Research
Universities and Centers***

***Alternative liquid fuels and other means
for reducing oil consumption***

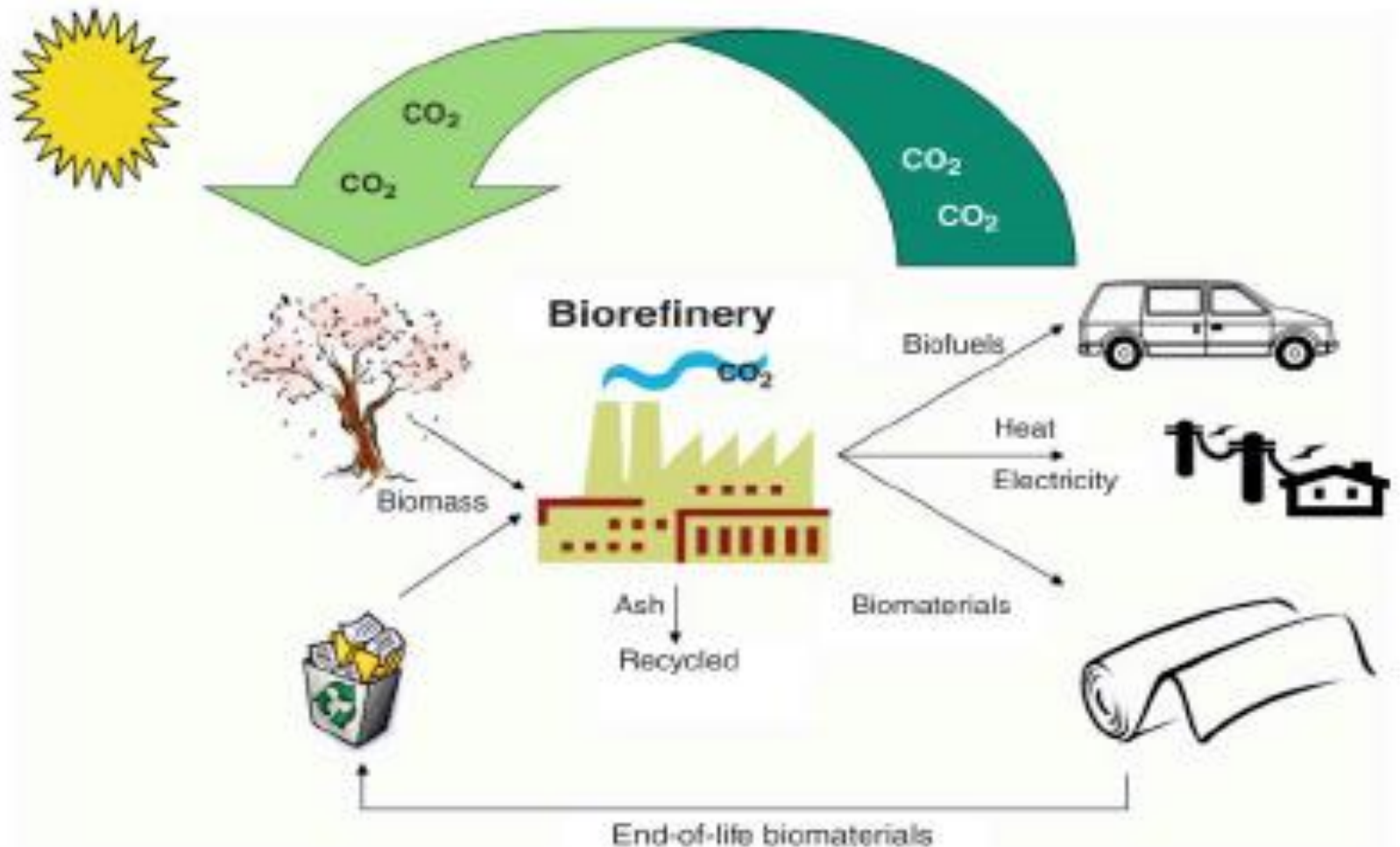
M. Herskowitz

February 2, 2010

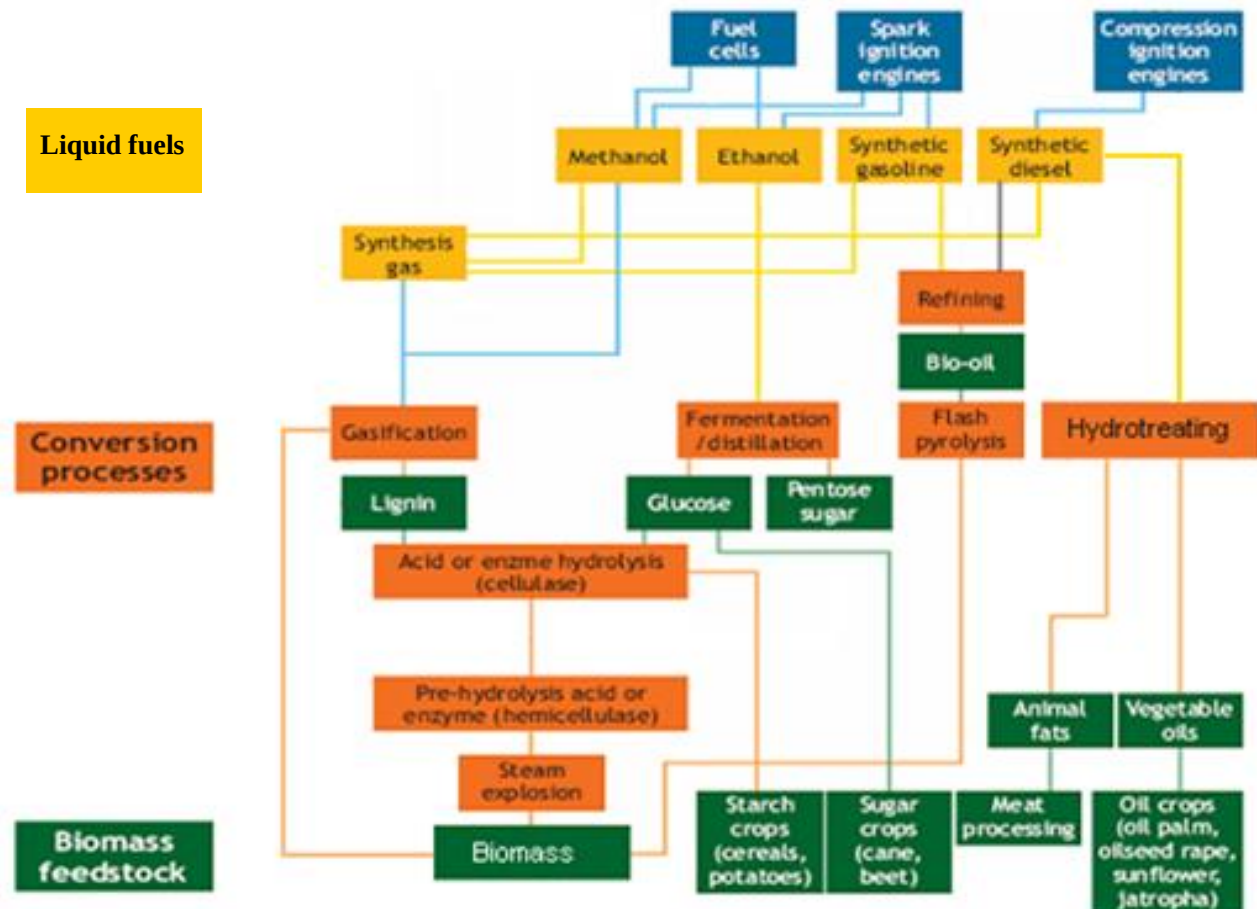
Remedies to oil addiction are diverse and require short- to long-term RD&D

- ***Biomass is a potential sustainable source while coal and natural gas are abundant in short term***
 - ***Biomass to fuels should be examined based on availability, life cycle analysis, food vs. energy crops, transportation***
 - ***Technologies based on coal and natural gas can be deployed***
- ***CO₂ and water are the ultimate feedstock for fuels***
 - ***Carbon dioxide capture and decomposition to carbon monoxide***
 - ***Photo-catalytic water splitting to hydrogen***
 - ***Artificial photosynthesis***
- ***Electric, hybrid and fuel cell cars, light materials, public transportation***

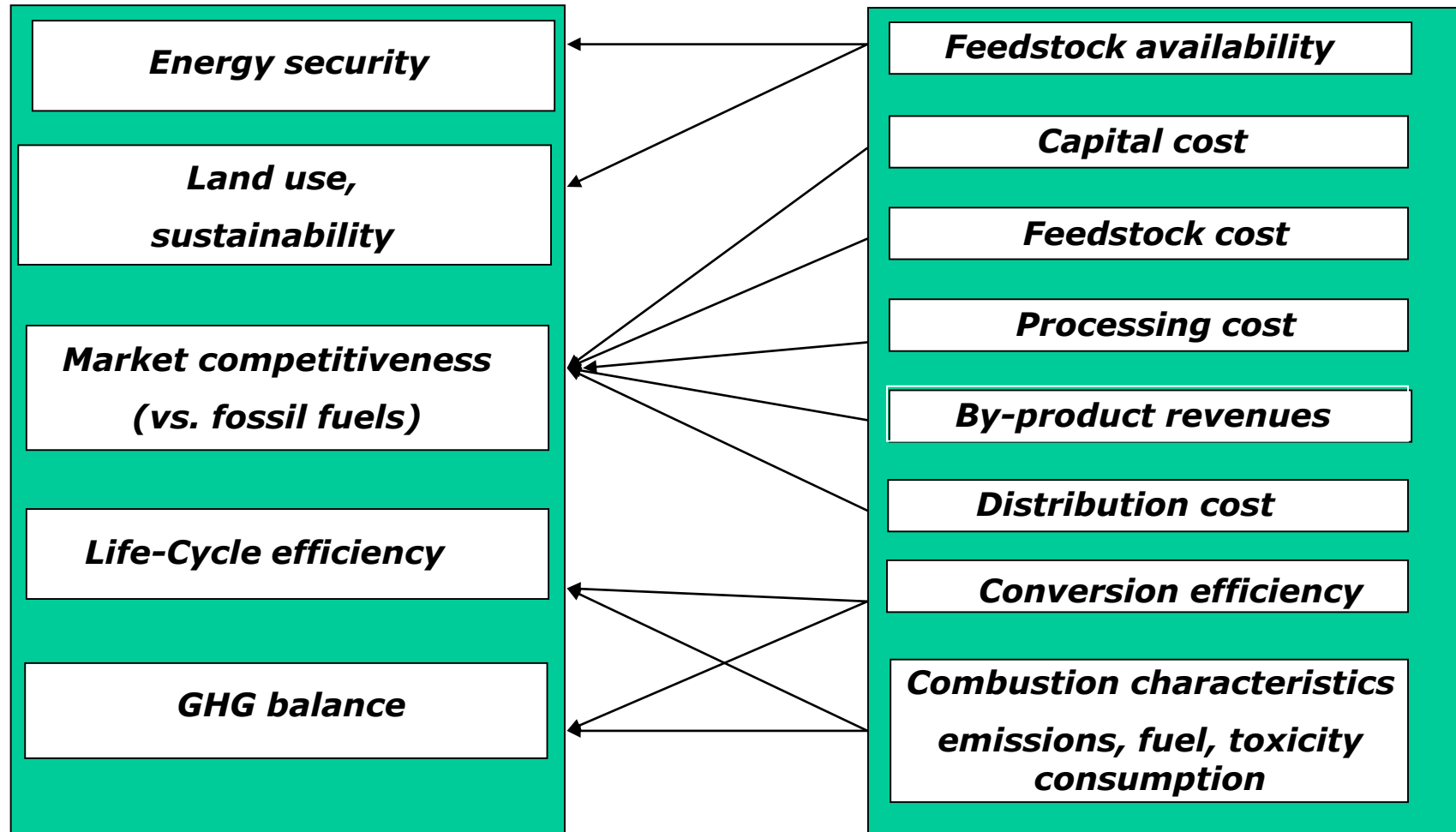
Biomass will replace oil as the feedstock for the future refinery



Biomass is a renewable source for alternative fuels

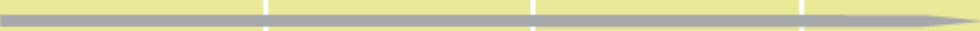
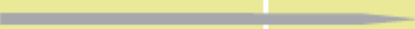
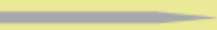
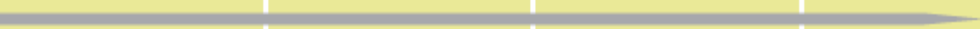
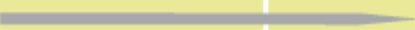
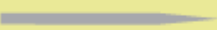
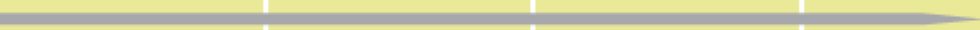
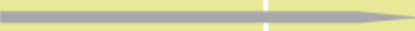
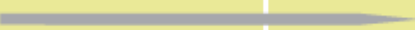


Application of biomass as feedstock requires careful consideration of all factors



Only three processes based on specific feedstock have been implemented



Technologies	Laboratory	Pilot Plant	Demonstration Plant	Market
Sugar/Starch ethanol				
Lignocellulosic ethanol				
P-Series				
Biodiesel & HDRD				
Syn. bio FT diesel				
Methanol				
DME				
Biomethane				
Bio-SNG				
Green pyrolysis diesel				

Israel has a proven record in advanced agricultural research

- *Production of biomass (TAU, HU, BGU, VC, WI, BIU, IDC, T)*
 - *Desert plants for biofuel production*
 - *Genetic engineering to change the plant composition*
 - *Algae biotechnology for the production of liquid fuels*
- *Conversion of biomass to fuels (BGU, WI, HU, IDC)*
 - *Hydro-conversion of oils to high-performance diesel*
 - *Gasification of biomass*
 - *Conversion of syngas to fuels*
 - *Catalytic gasification of biomass in supercritical water*
 - *Cellulosomes as platform for processing biomass-to-biofuels*
 - *Long chain alcohols from algae*

Research on conversion of carbon dioxide and water to fuels is being conducted

- *Carbon dioxide is a viable feedstock (TAU, BGU, BIU, T)*
 - *Capture of carbon dioxide*
 - *Electrochemical generation of CO intermediate from CO₂*
 - *Photoelectrochemical conversion of carbon dioxide*
- *Water splitting to hydrogen (HU, WI, T, BGU)*
 - *The SnO₂/Sn thermochemical cycle for water splitting with aid of solar energy*
 - *Photoelectrochemical cells (PECs) split water into H₂ and O₂*
 - *Novel photo-catalyst are developed for water splitting*

Other means for reducing oil consumption are being pursued

■ *Electric and fuel cell cars (BGU, TAU, T, BIU)*

- *On-board generation of hydrogen*
- *Advanced, high performance anode and cathode materials for lithium ion batteries*
- *Direct methanol fuel cell (DMFC)*

■ *Non-carbon fuels (WI, T)*

- *Alternative ammonia sources*

Mission-oriented programs for development of oil alternatives are needed

- *Short- and long range programs should be considered*
 - *Short-term programs could be tailored like the MAGNET or FP7 programs with significant involvement of industry and significant funding commitment for at least four years*
 - *The short-term programs should be defined based on critical analyses of the current research infrastructure and proposals*
 - *Long-term programs could be initiated by supplement-funding of ISF specifically designed for this purpose*