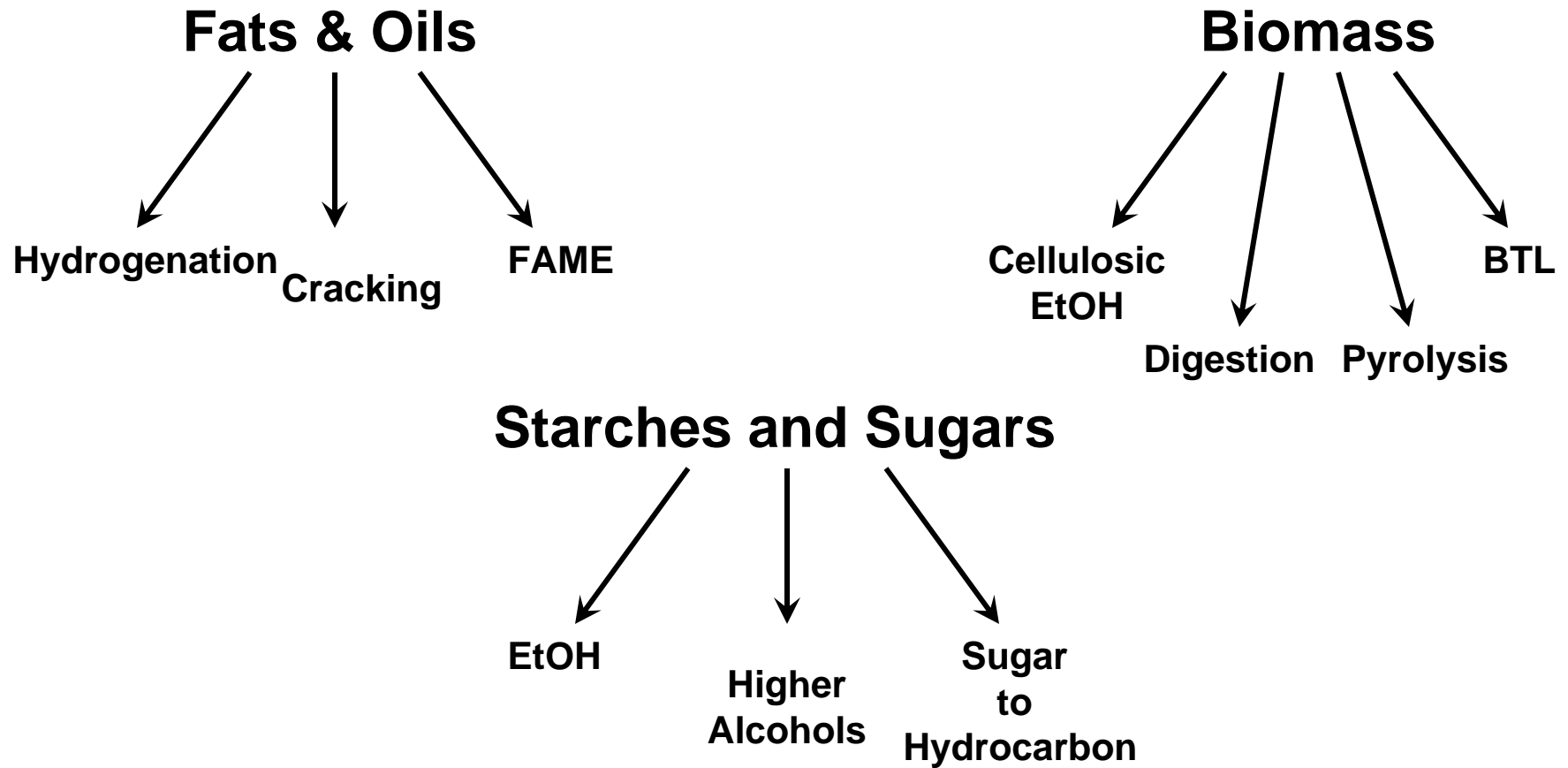


A Discussion of Biofuels Pathways

Lou Burke

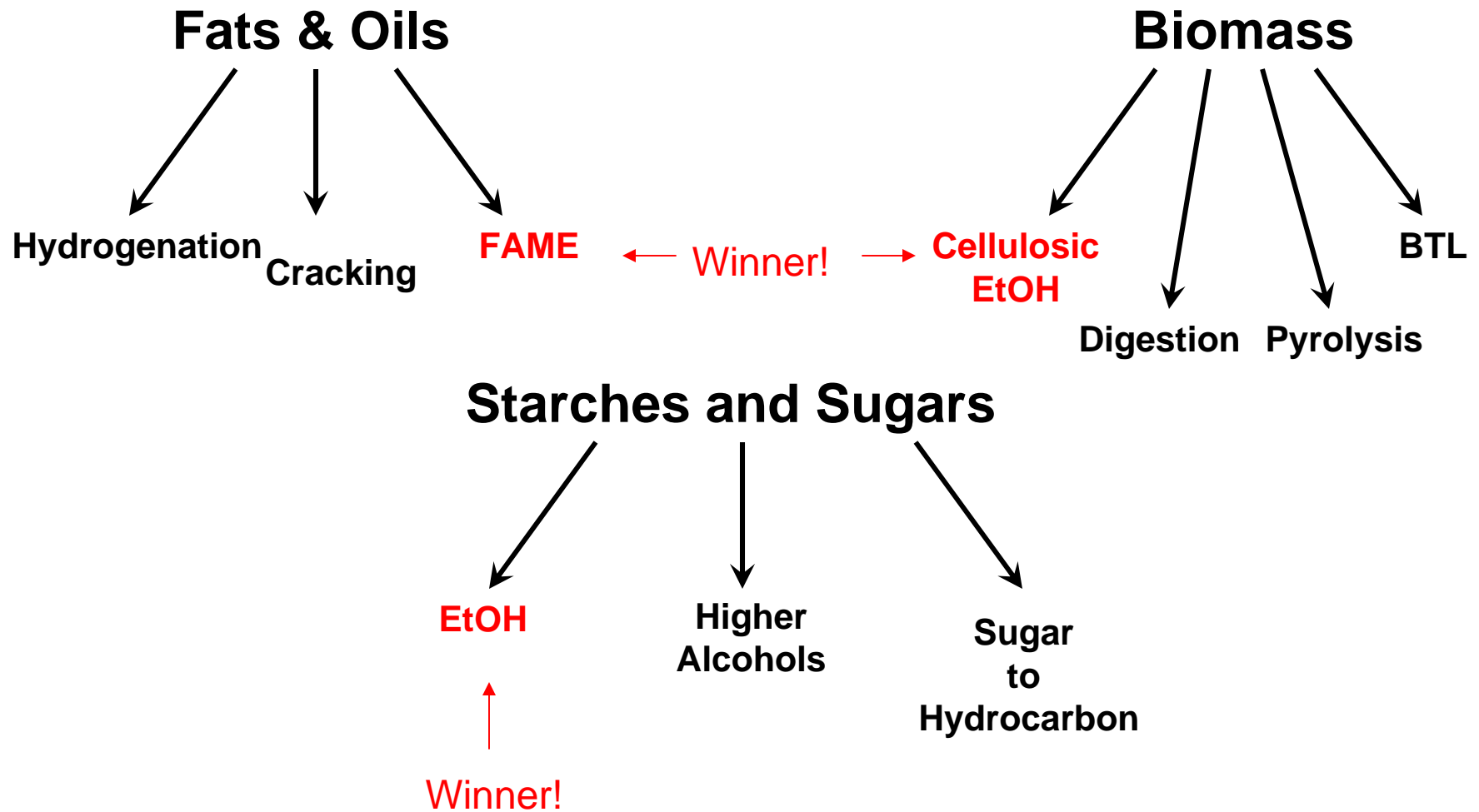
Biofuel Pathways



RFS Language vs Implementation

- RFS General Definition is product neutral
- Regulations and regulators need to avoid choosing winners and losers
 - Ethanol, Biodiesel and Cellulosic Ethanol are “in” and establishing greater special interest inertia
 - The existing subsidies can encumber the economics of competing technologies
- What you talk about sets the stage
 - Hydrogen hype vs hydrogen hangover
 - The reality and goals have not changed

These are assumed to be the winners....



...Are they perfect?

Product Comparison

- EtOH vs. Gasoline

- Octane 

- Fuel Economy 

- Infrastructure 

- Emissions Impact

- VOC 

- NOx 

- CO 

- Refinery Impacts (BOB Volatility) 

- Quality 

 Positive

 Variable

 Negative

Transition to massive scale ethanol resembles a transition to hydrogen


- Need to invent new technology to hit gge target
 - Like Hydrogen this has had long term research and we are not yet there
- Need to turn the fleet (And increase auto efficiency)
 - At least this technology exists
- Need to develop new infrastructure
 - Both distribution **and** cellulose gathering
- Need to revamp agriculture crops and practices
- Need to coordinate vehicle, retailing and distribution transition
- Subsidy??
- Strands much of current petroleum infrastructure
- Exposes fuel supply to climate risk

Product Comparison

- Diesel vs. Biofuel

- Cetane 

- Lubricity 

- Cold Flow (CFPP) 

- Emissions

- NOx 

- PM 

- HC 

 Positive

 Variable

 Negative

Distribution expense  (Biodiesel Only)

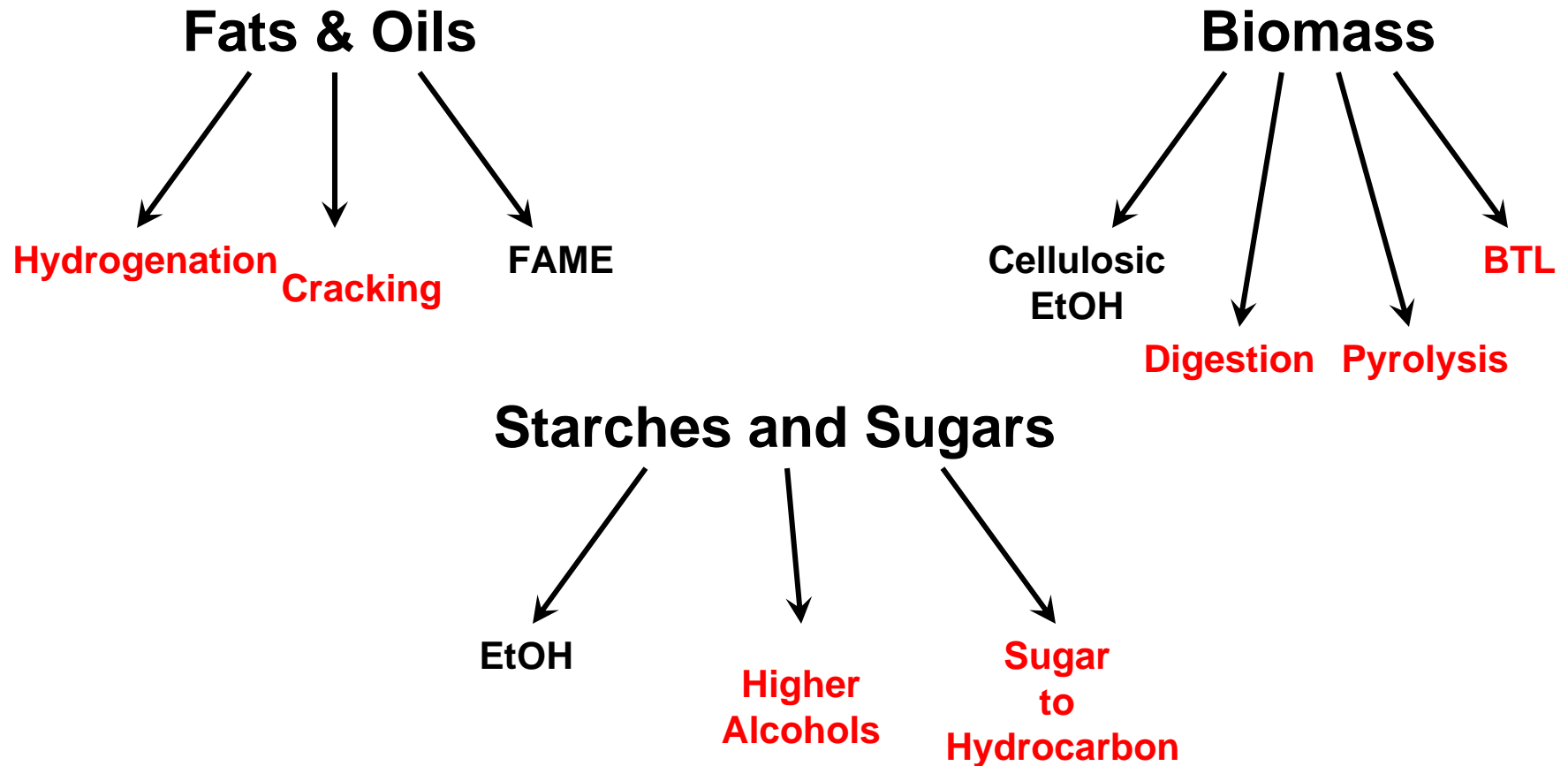
Quality  (Biodiesel Only)

A complimentary vision

Second generation biofuels

- Require massive low cost resource
 - Ag./forest waste, wood, grass, cane, MSW
- Want omnivorous, efficient conversion technology
 - Makes the most of the resource
 - Should integrate with manufacturing infrastructure
 - Linked to distribution infrastructure
- Need conversion to market compatible fuel
 - Gasoline, Diesel
- Other Issues: Sustainability, Economics

Infrastructure Pathways



Coal to Liquids ?

Why a balanced vision should win

- All pathways to large scale biofuels are full of uncertainty
- All will have unintended consequences
- All are full of entrenched interests
- All are less efficient than petroleum today
- Carbon's impact is uncertain

Facilitate Market Neutrality

- Avoid distortive incentives
 - Incent the biomass content not the product
 - Support development alternate technologies
- Broaden the language
 - Biofuels instead of Ethanol and Biodiesel
- Be technology neutral
 - Communicate the strengths and limitations of each pathway