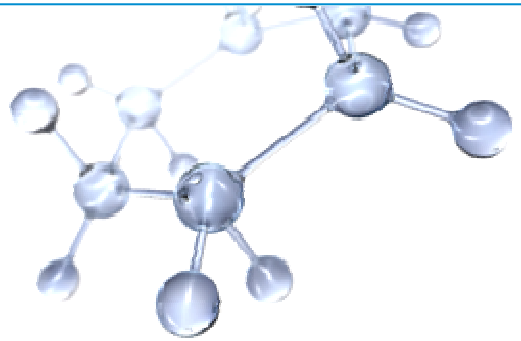
ExxonMobil

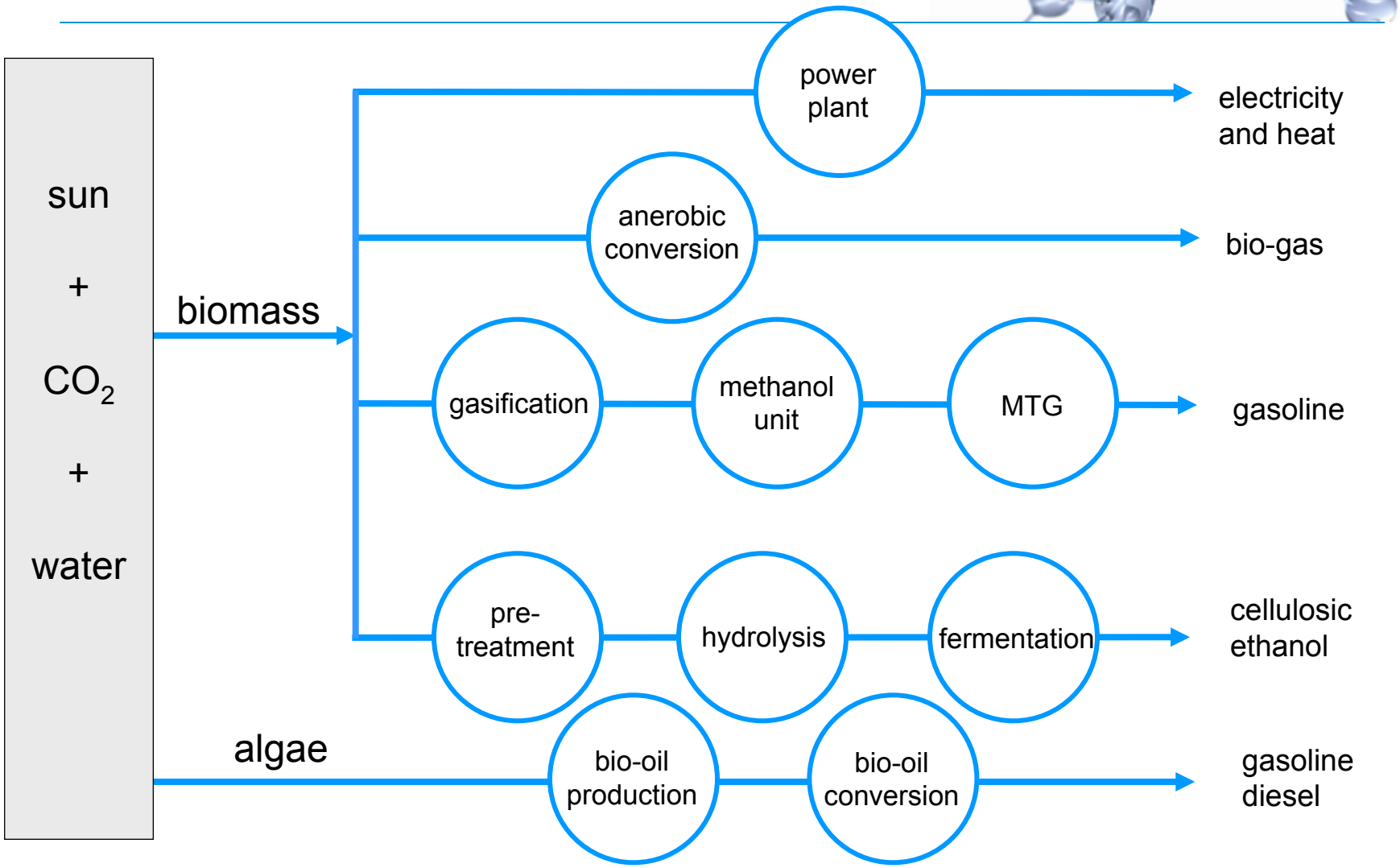
Taking on the world's toughest energy challenges.℠

# algae biofuels



David Stern

# many bio-energy pathways emerging



# algae-based biofuels

- ExxonMobil alliance with Synthetic Genomics Inc
  - focus on development of advanced biofuels from photosynthetic algae
  - compliments ExxonMobil's ongoing efforts to advance breakthrough technologies to meet the world's energy challenges


- benefits of using algae for biofuels production:
  - can be grown using land and water unsuitable for food production
  - potentially yield greater volumes of biofuels per acre than other biofuel sources
  - could be used to manufacture biofuels similar to today's transportation fuels
  - growing algae consume $CO_2$; algae-based biofuels could provide GHG mitigation benefits versus conventional fuels

# algae-based biofuels – key challenges

- ExxonMobil and Synthetic Genomics will develop innovative solutions to the challenges of large scale production and commercialization of algae-based biofuels
  - identifying and developing algal strains that achieve high bio-oil yields at lower cost
  - determining the best production systems for growing algal strains
  - developing integrated systems required for full scale, economic production of biofuels
- if successful, algae-based biofuels could help augment the world's transportation fuel supply and assist in reducing greenhouse gas emissions

# ExxonMobil – SGI alliance

algae growth → algae harvesting → bio-oil recovery → bio-oil transport & storage → bio-oil conversion → biofuel products

- R&D program
  - targets production of bio-oils from photosynthetic algae for conversion to advanced biofuels compatible with today's vehicle and fuels infrastructure
  - if R&D milestones are successfully met, ExxonMobil expects to spend more than $600M

ExxonMobil

- Leadership role in engineering, process development and scale up
- Key role in upgrading bio-oil produced by photosynthetic algae into finished products, and total process integration for development and commercial applications

SYNTHETIC GENOMICS®

- Leadership role in biological research for algae strain development, growth and harvesting
- Key role in bio-oil recovery research and development

# conclusion

- population and economies will expand; energy demand and $CO_2$ emissions will rise
- integrated set of solutions required
  - increase efficiency
  - expand supply
  - mitigate emissions
- technology breakthroughs are critical
  - algae-based biofuels could contribute to set of solutions
- meeting this demand will require a global effort