



U.S. DEPARTMENT OF  
**ENERGY**

Energy Efficiency &  
Renewable Energy

BIOENERGY TECHNOLOGIES OFFICE

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# Beachheads

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# Goal Statement – Overall ABF

- **Goal:** Enable biorefineries to achieve 50% reductions in time to bioprocess scale-up as compared to the current average of around 10 years by establishing a distributed Agile BioFoundry that will productionize synthetic biology.
- **Outcomes:** 10X improvement in Design-Build-Test-Learn cycle efficiency, new host organisms, new IP and manufacturing technologies effectively translated to U.S. industry ensuring market transformation.
- **Relevance:** Public infrastructure investment that increases U.S. industrial competitiveness and enables new opportunities for private sector growth and jobs.



# DBTL Infrastructure Investment Enables Private Industry

*DBTL infrastructure investment*



**Private** investment in product development, scaling, and tailoring to unique pathways and products

Adapted from Lyft

# Beachheads

- Beachheads are metabolites with the potential to be derivatized into many different bioproducts



## Beachheads



## Beachhead Milestones

- FY20Q2\_DBTL\_R3 (Identify at least 2 new strategic beachheads)
- FY20Q4\_IA\_R2 (Ranking of beachhead molecules)
- FY21Q1\_IA\_R1 (Perform TEA/LCA modeling for 2 new beachheads)
- FY21Q2\_IEO\_R1 (Website map of beachhead molecule metabolism)
- FY21Q2\_DBTL\_R2 (Development of beachheads; identify 2-5 new)
- FY21Q3\_DBTL\_R4 (Demonstrate biosensors for beachhead molecules)
- FY22Q4\_DBTL\_AS2 (3 hosts 15 beachheads 5-10 g/L production)

# Feedback Questions for Beachheads

1. How do we define a beachhead in a way that is useful to industry?
  - a. metabolite that can be derivatized into several different bioproducts. e.g. GPP for monoterpenes
  - b. representative end-product for a specific metabolic pathway, e.g. muconate from the shikimate/B-ketoadipate pathway
2. How do we develop a selection process for ABF beachheads?
  - Do we select based on # of possible downstream products, or their total market value, or to cover diverse metabolic pathways, or ease of production at high TRY, or maximum interest to industry, or ones we can develop in the current ABF hosts, etc.?
3. How can we best involve industry- anonymous solicitation of recommendations, or provide a list of potential targets for industry to vote on, or leverage industry FOA partnerships, or all of the above?
4. How can we align host onboarding with beachheads?
5. How and when to we use TEA and LCA metrics for beachheads?
  - a. TEA/LCA for one representative bioproduct from a beachhead, or look at total value of all bioproducts from one beachhead, or other metrics? Is beachhead TEA/LCA useful?
  - b. How do we do TEA/LCA for beachheads that can make chemically diverse molecules that have different separations, e.g. terpenes: OH, COOH, ketone, alkene?
6. With what interesting targets should we focus on for our FY22 milestone of 5-10 g/L titer for a beachhead or an associated downstream target?