

A woman with dark hair, wearing a vibrant, multi-colored patterned shirt, is shown in profile, leaning over to feed a young child. The child is looking up at her. The background is a simple, light-colored wall, possibly made of mud or plaster, with some white fabric hanging in the background. The lighting is soft and natural, suggesting an outdoor or semi-outdoor environment.

BILL & MELINDA
GATES *foundation*

BUILDING FOR SUSTAINABILITY

2021 DEVELOPING COUNTRY VACCINE
MANUFACTURERS NETWORK ANNUAL
GENERAL MEETING

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NEED TO MOVE FROM “PANIC & NEGLECT” AND “BUILD AND DECAY” TO “**BUILD AND SUSTAIN**”

Ever-Warm

- Manufacturing facilities must be in nearly continuous operation to stay in an always ready state

Revenue

- To avoid an ongoing drain on financial resources, need to be producing products that drive revenue back into the facility to cover costs of keeping the facility running

Can't rely upon mRNA alone

- Although the advancement of mRNA vaccines has been a major, and potentially game-changing, achievement, outside of COVID19, there are no currently approved vaccines

ROBUST PIPELINE FOR MRNA VACCINES AND THERAPEUTICS HOWEVER TIMELINES ARE SUBJECT TO UNCERTAINTY

Overview

Successful application of mRNA in Moderna and Pfizer / BioNTech's COVID-19 vaccines has cleared the regulatory path to additional mRNA products and directly led to the development of a **variety of vaccine and therapeutic candidates** across major multinational companies and biotechs

Non-comprehensive List of the Pipeline of mRNA Vaccines and Therapeutics

Manufacturer	Pipeline
Moderna	COVID-19, Flu, Respiratory Syncytial Virus, Cytomegalovirus, Zika, HMPV/PIV3, Epstein-Barr Virus, HIV, Nipah, Personalized Cancer Vaccine, KRAS, IL-12, VEGF-A Myocardial Ischemia, Relaxin, IL-2, PD-L1, Propionic Acidemia, Methylmalonic Acidemia, Glycogen Storage Disease Type 1A, Phenylketonuria
BioNTech	COVID-19, Flu, Malaria, TB, HIV, CLDN6 CAR-T, IL-2, IL-7, IL-12SC, IL-15suschi, IFNa, PD-L1x4-1BB, CD40x4-1BB, TLR7, CD3xCLDN6
Sanofi/Translate Bio	COVID-19, Flu, Viral Pathogens, Bacterial Pathogens, Cystic Fibrosis, PCD, PAH
CureVac	COVID-19, Flu, Rabies, YF, Syncytial Virus, Malaria, TLR7/8/RIG-1, CRISPR
GSK	COVID-19, Flu, Rabies Prophylaxis
Ethris GmbH	COVID-19 Antibody, Respiratory Viral Infections, PAP, PCD
Arcturus Therapeutics	COVID-19, Flu, OTC Deficiency, Cystic Fibrosis
eTheRNA Immunotherapies NV	Respiratory Virus, Malaria, HIV, Oncogenic, Virus, Multiple Oncology Targets
ReCode Therapeutics 1	Cystic Fibrosis, PCD
Strand Therapeutics	Solid and Liquid Tumors
GreenLight BioSciences	COVID-19, Flu
Stermirna Therapeutics	COVID-19, TB, Flu, Cancer Vaccine, KRAS, KRAS, EBV, HPV

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COVID19 is the driver, but routine vaccines will pay the bills

- Need to look at routine vaccines in addition to those for COVID19 and outbreak/pandemic responses

Think regional/global not local

- Only a handful of the most populous countries have a large enough domestic market to generate sufficient revenue

BUILDING OF VACCINE MANUFACTURING CAPACITY SHOULD BE REGIONAL TO ENSURE PROJECTS HAVE LONG-TERM VIABILITY

Need volume of >50 million dose/year

- An assessment of the net-present value (NPV) for a prototypical bioreactor based vaccine, like rotavirus, shows that one needs a market size of 50M doses per year to have a positive NPV assuming the typical prices reached for such vaccines

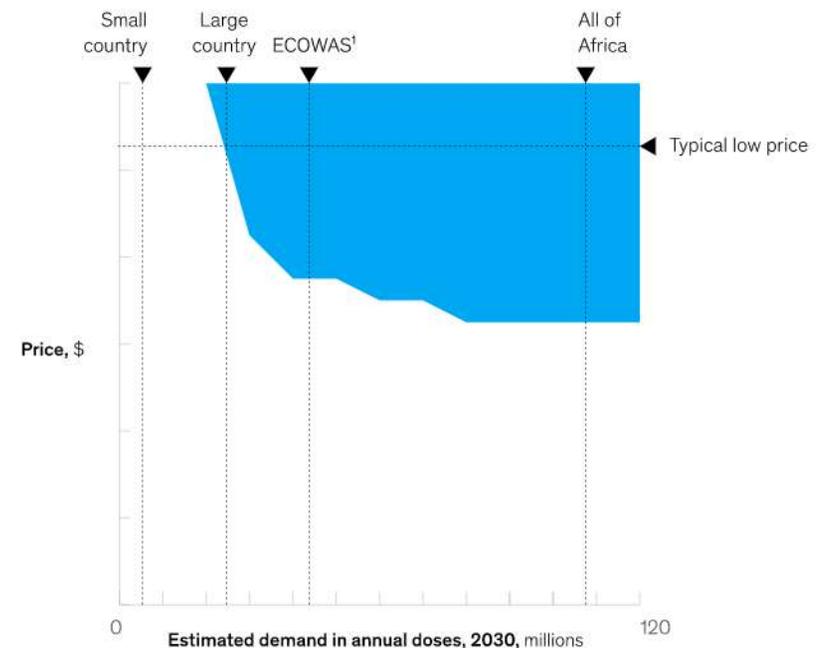
Need a regional or global market to reach these volumes

- Only ~30 countries have populations > 50 million, let alone a birth cohort >50 million

Vaccines made in bioreactors can show positive NPV at sufficient scale.

Net present value (NPV) of a representative bioreactor vaccine made in Africa

Positive NPV



Note: Assumes greenfield plant construction. Excludes costs for R&D, licensing, shipping, and margin. Assumes 10% weighted average cost of capital.
¹Economic Community of West African States.

CONSIDER MULTIPLE PARAMETERS FOR PORTFOLIO PRIORITIZATION

Business model design is contingent on categorizing **high potential products that would allow facilities maintain ever-warm operations** to the highest degree of sustainability. Products can be categorized and prioritized through a number of approaches, including the following:



SUMMARY

Sustainability

- To move from “build and decay” to “build and sustain”, we encourage developers, donors and investors to think about how to make manufacturing facilities financially viable in the time period between pandemics

Market assessment

- We’ve provided one example of how to view the market – however, there are many ways to do such an assessment

Regional/global versus local; portfolio versus single product

- Regardless, most countries will need to take a regional or global lens and have a portfolio of products to ensure financial sustainability