

Gilead Mid-Project Update

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**Scope and
Goals**

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**Emerging
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Partnerships and
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Challenges

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01. Scope and Goals



Goals



Landscape

Survey of emerging technologies

50%



Opportunity

Briefs of high potential technologies

20%



Readiness

Evaluate aspects such as maturity & risk

20%



Prioritization

Develop a relevance & impact matrix

10%



02. Emerging Tech

AI and computational biology, synthetic and advanced biomanufacturing, precision and genetic medicine, digital health and patient engagement, and regulatory and supply chain technologies.

Technology Readiness Level (TRL)

1	Basic principle observed
2	Technology concept formulated
3	Experimental proof of concept
4	Technology validated in a lab
5	Technology validated in a relative environment
6	Technology demonstrated in a relative environment
7	System prototype demonstrated in an operational environment
8	System is complete and qualified
9	Actual system proven in an operational environment

AI and Computational Biology

Technology	Notes/Overview	Industry Use Cases	TRL
Process Analytical Technology (PAT) Advances	AI-driven chemometrics (PCA, PLS, neural nets) interpret spectra for real-time process control; foundational to continuous manufacturing.	GSK and Amgen use Raman/NIR for feed control; Fujifilm Diosynth pilots real-time analytics for perfusion control.	8-9
Digital Twins	Hybrid mechanistic + ML models simulate and optimize bioprocesses; enable predictive yield and deviation analysis.	Merck's hybrid twin with Siemens; Pfizer's process scale-up twin; AstraZeneca's continuous bioreactor twin.	6-7
Optimization Algorithms for Treatment	AI driven metaheuristic algorithms to plan and improve treatments to ensure optimal balance	Metaheuristic Algorithm for Optimization in Radiation Therapy and Treatment Planning	3-4

Synthetic and Advanced Biomanufacturing

Technology	Notes/Overview	Industry Use Cases	TRL
Nanotechnology for Drug Delivery	Allows for targeted delivery at specific sites. This system is highly beneficial for both Oncology and Virology.	Lipid based nanoparticles, metal nanoparticles, and resveratrol zinc NP were instrumental in COVID-19 vaccines such as Doxil and Onpattro.	9
Synthetic Notch Receptors	Genetically encoded, modular synthetic receptors that enable mammalian cells to detect environmental signals and respond by activating user-prescribed transcriptional programs.	Kite pharma is already a leader in CAR-T manufacturing and synNotch could enable safer, more durable CAR-T cells for solid tumors.	5-6
AI-Powered Drug Development/ Large Molecule Generation	AI large language models equipped with generative AI tools + pretrained models can be used to generate novel molecules/proteins for specific functions or targets.	NVIDIA's BioNeMo Platform - A collection of tools and frameworks for digital drug discovery solutions.	4-5

Precision and Genetic Medicine

Technology	Notes/Overview	Industry Use Cases	TRL
Advanced Therapeutics & Dx	Gene therapies (editing/replacement) via viral/non-viral delivery, ML-designed antibodies, and liquid biopsy for cancer monitoring.	Novartis uses Zolgensma for spinal muscular atrophy; HederadX and BillionToOne use ctDNA for cancer detection and therapy selection.	4-9
Genomics Innovations (Sequencing, Bioinformatics, AI Platforms)	Broad utility in precision medicine efforts, therapeutic target and biomarker discovery, and improving throughput in diagnostic workflows.	Covaris automates diagnostic workflows (exome/WGS) to improve throughput	6-8
RNA Therapeutics (mRNA & circRNA)	Utilization of mRNA and the more stable, less immunogenic circRNA for therapeutic protein expression and immune response.	Moderna/Merck use mRNA-4157 for personalized melanoma treatment; Abogen uses a circRNA system to sustain protein expression	3-5

Digital Health and Patient Engagement

Technology	Notes/Overview	Industry Use Cases	TRL
Integrated Decentralized Clinical Trial Platforms	Support for traditional in-clinic tasks that can be performed remotely. Includes telehealth, data consolidation, and outcome assessments in one platform.	Science 37 uses DCTs for expansion of clinical trial reach and participation. Medable Inc. has similar platform focused on eCOA.	9
Clinical Trial Recruitment Tools	AI-centered platforms to increase patient-to-trial recruitment for clinical trials. Able to filter candidates, predict eligibility, and score patients.	Viz.AI offers Viz Recruit for eligible candidate identification and enrollment acceleration.	7
Connected Medical Device Platforms	Connected medical device platforms combine sensors, mobile apps, and data analytics to extend healthcare beyond the clinic.	Propeller Health, Connected Propeller Platforms which tracks inhaler use, focused on asthma and COPD patients	7-9



Regulatory and Supply Chain Technologies

Technology	Notes/Overview	Industry Use Cases	TRL
RFID Tracking and Smart Asset Management	Enables real-time tracking of materials, parts, and consumables throughout sterilization, storage, and manufacturing to improve traceability and contamination control.	Bayer's RFID sterilization tracking for reusable components; Cytiva RFID-enabled totes for raw materials; Roche logistics automation pilots.	7/8
Digital Product Genealogy / Batch Traceability	Connects PAT, MES, and RFID data to create full digital batch lineage, enabling real-time deviation tracking, genealogy mapping, and root-cause analysis.	Amgen and Lilly digital batch record pilots; Merck continuous manufacturing traceability program	7/8
RegTech and AI-Driven Compliance Analytics	Applies AI/NLP to automate regulatory submissions, review documents, and monitor post-market compliance.	Moderna and Pfizer use AI tools to streamline filings and accelerate submissions; Deloitte RegTech frameworks applied for quality intelligence.	6-7

03.

Competitor Partnerships and Acquisitions



Partnerships and Acquisitions I

AI Computational Biology

- Novartis partnered with BasgenBio for AI-powered clinical trial simulations for breast cancer research (**\$680,000**)
- Sanofi established strategic research collaboration with Exscientia (**\$100 million -> \$5.2 billion**)
- Pfizer entered into research collaboration with Insilico Medicine to explore novel data and artificial intelligence for therapeutic targets

Synthetic and Advanced Biomanufacturing

- Regeneron has partner with FUJIFILM Biotechnologies for a 10-year manufacturing supply agreement (**\$3 billion**).
- Vertex has partnered with Orna Therapeutics to utilize Orna's novel and proprietary LNP delivery solutions (**\$65 million -> \$635 million**).
- Merck has partner with Biocytogen to advance advance antibody-conjugated lipid-based delivery solutions.

Partnerships and Acquisitions II

Precision and Genetic Medicine

- AstraZeneca partnered with Danaher to scale precision medicine.
- Vertex partnered with Moderna for a 3 year partnership in a Cystic Fibrosis mRNA therapy **(\$75 million)**.
- Regeneron invested into Truveta along with Illumina and 17 US Health systems to develop the world's largest genetic database **(\$120 million)**

Digital Health and Patient Engagement

- GSK has partnered with Medable to power decentralized and hybrid clinical trials across its global product portfolio.
- Merck invested into Antidote Technologies a recruitment platform for clinical trials. **(\$11 million)**
- Merck has partnered with Evidation to explore if data from smartphones and wearables can be used in early Alzheimer's detection.

Partnerships and Acquisitions III

Regulatory & Supply Chain

- As part of a partnership with Controlant Moderna has begun utilizing real-time tracking, location data, and real-time thermal modeling to reduce the shipping risks to their products.
- Merck partnered with tracelink to develop a smart inventory tracker for their third party logistics and warehouses.
- Parexel announced AI partnership with Weave Bio for the acceleration of their regulatory submission process.



Future Plans

**Bristol Myers
Squibb**

AstraZeneca

Roche

Regeneron

**Johnson &
Johnson**

Biogen

Eli Lilly

Pfizer

Novartis



04. Challenges and Next Steps

Challenges

Scope Breadth

Problem: Wide range of innovations makes prioritization difficult.

Response: Refined categories and using mentor feedback to maintain focus.

Assessing TRLs

Problem: Technologies span multiple pipeline stages, making TRL scoring inconsistent.

Response: Applying standardized templates and aligning TRL definitions for consistency.

Data Validation

Problem: Limited public data on early-stage technologies.

Response: Cross-checking multiple academic and industry sources to ensure accuracy.

Next Steps



Finalize Technology Categories

Narrow set of focus areas and select key innovations for deeper analysis.



Refine TRL Assessments

Apply consistent evaluation criteria and update scoring across all technologies.



Develop Opportunity Briefs

Expand briefs with recent examples, investment trends, and alignment to Gilead's therapeutic areas.



Build Prioritization Matrix

Rank technologies by novelty, feasibility, and strategic impact.

Questions?

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