UNITED STATES
SECURITIES AND EXCHANGE COMMISSION

Washington, DC 20549

FORM 10-Q

(Mark One)

☒ **QUARTERLY REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934**
For the quarterly period ended June 30, 2023

OR

☐ **TRANSITION REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934**
For the transition period from _ to _
Commission File Number: 001-38753

Moderna, Inc.

(Exact Name of Registrant as Specified in Its Charter)

Delaware	**81-3467528**
(State or Other Jurisdiction of Incorporation or Organization)	(IRS Employer Identification No.)
200 Technology Square **Cambridge, Massachusetts**	**02139**
(Address of Principal Executive Offices)	(Zip Code)

(617) 714-6500
(Registrant's Telephone Number, Including Area Code)

Securities registered pursuant to Section 12(b) of the Act:

Title of each class	Trading symbol(s)	Name of each exchange on which registered
Common stock, par value $0.0001 per share	MRNA	The Nasdaq Stock Market LLC

Indicate by check mark whether the registrant (1) has filed all reports required to be filed by Section 13 or 15(d) of the Securities Exchange Act of 1934 during the preceding 12 months (or for such shorter period that the registrant was required to file such reports), and (2) has been subject to such filing requirements for the past 90 days. **Yes** ☒ **No** ☐

Indicate by check mark whether the registrant has submitted electronically every Interactive Data File required to be submitted pursuant to Rule 405 of Regulation S-T (§ 232.405 of this chapter) during the preceding 12 months (or for such shorter period that the registrant was required to submit such files). **Yes** ☒ **No** ☐

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, a smaller reporting company, or an emerging growth company. See the definitions of "large accelerated filer", "accelerated filer", "smaller reporting company", and "emerging growth company" in Rule 12b-2 of the Exchange Act.

Large accelerated filer	☒	Accelerated filer ☐	Non-accelerated filer ☐	Smaller reporting company	☐
				Emerging growth company	☐

If an emerging growth company, indicate by check mark if the registrant has elected not to use the extended transition period for complying with any new or revised financial accounting standards provided pursuant to Section 13(a) of the Exchange Act. ☐

Indicate by check mark whether the registrant is a shell company (as defined in Rule 12b-2 of the Act). **Yes** ☐ **No** ☒

As of July 31, 2023, there were 380,592,588 shares of the registrant's common stock, par value $0.0001 per share, outstanding.

SPECIAL NOTE REGARDING FORWARD-LOOKING STATEMENTS

This Quarterly Report on Form 10-Q (Form 10-Q) contains express or implied forward-looking statements. All statements other than those of historical facts contained in this Form 10-Q are based on our management's beliefs and assumptions and on information currently available to our management. Forward-looking statements in this Form 10-Q include, but are not limited to, statements about:

- our activities with respect to our COVID-19 vaccine, and our plans and expectations regarding future generations of our COVID-19 vaccine, including boosters, that we may develop in response to variants of the SARS-CoV-2 virus, ongoing clinical development, manufacturing and supply, pricing, commercialization, regulatory matters (including dosage for vaccines and authorization or approval for boosters), demand for COVID-19 vaccines, and third-party and governmental arrangements and potential arrangements;
- our expectations regarding the endemic and seasonal commercial market for COVID-19 vaccines and our preparations for and ability to effectively compete in such a market, as well as the impact that the evolving market will have on our financial returns;
- expected sales and delivery of our COVID-19 vaccine in 2023, and expected seasonality for sales;
- our applications to regulators around the globe in anticipation of delivering our updated COVID-19 vaccine in time for the fall vaccination season in the Northern Hemisphere;
- our global regulatory submissions for our RSV vaccine candidate, mRNA-1345;
- our ability to successfully contract with third-party suppliers, distributors and manufacturers;
- our ability and the ability of third parties with whom we contract to successfully manufacture, supply and distribute our COVID-19 vaccine and boosters, and any future commercial products at scale as well as drug substances, delivery vehicles, development candidates, and investigational medicines for preclinical and clinical use;
- internal and external costs associated with manufacturing for our products, including our COVID-19 vaccine, and the impact on our cost of sales for full year 2023;
- the scope of protection we are able to establish and maintain for intellectual property rights covering our commercial products, development candidates, investigational medicines and technology, including our ability to enter into license agreements, and our expectations regarding pending legal proceedings related to our intellectual property;
- our expectation that our updated formulation of mRNA-1010 will have improved immunogenicity against influenza B strains;
- our plans with respect to our individualized neoantigen therapy, including our plan to expand the development program to additional tumor types, including non-small cell lung cancer;
- encouraging early signs of dose-dependent pharmacology and potential clinical benefit for mRNA-3927;
- the timing of initiation, progress, completion, results and cost of our clinical trials, preclinical studies and research and development programs, as well as those of our collaborators, including Merck and Vertex Pharmaceuticals;
- participant enrollment in our clinical trials, including enrollment demographics and timing;
- potential advantages of mRNA as compared to traditional medicine;
- our ability to obtain and maintain regulatory approval of our investigational medicines;
- the implementation of our business model and strategic plans for our business, investigational medicines and technology;
- potential product launches, including the timing of launches;
- our ability to successfully commercialize our products, if approved;
- the pricing and reimbursement of our medicines, if approved;

- the build out of our manufacturing and commercial operations;
- estimates of our future expenses, revenues and capital requirements;
- our operation and funding requirements, including our forecast of the period of time through which our financial resources will be adequate to support our operations;
- the potential benefits of strategic collaboration agreements and our ability to enter into strategic collaborations or other agreements with collaborators with development, regulatory and commercialization expertise;
- the potential benefits associated with our acquisition of OriCiro Genomics K.K.;
- our financial performance;
- legal and regulatory developments in the United States and foreign countries;
- our ability to produce our products or investigational medicines with advantages in turnaround times or manufacturing cost; and
- developments relating to our competitors and our industry.

Forward-looking statements often contain words such as "will," "may," "should," "could," "expects," "intends," "plans," "aims," "anticipates," "believes," "estimates," "predicts," "potential," "continue," or the negative of these terms or other comparable terminology, although not all forward-looking statements contain these words. Although we believe that the expectations reflected in these forward-looking statements are reasonable, these statements relate to future events or our operational or financial performance, and involve risks, uncertainties, and other factors that may cause our actual results to differ materially from any future results expressed or implied by these forward-looking statements. Accordingly, you should not place undue reliance on these forward-looking statements. Factors that may cause actual results to differ materially from current expectations include, among other things, those listed under the section entitled "Risk Factors" and elsewhere in this Form 10-Q and under Part I, Item 1A. "Risk Factors" in our Annual Report on Form 10-K for the year ended December 31, 2022. If one or more of these risks or uncertainties occur, or if our underlying assumptions prove to be incorrect, actual results could differ materially from those expressed or implied by the forward-looking statements.

The forward-looking statements in this Form 10-Q represent our views as of the date of this Form 10-Q. We undertake no obligation to update any forward-looking statements, except as required by applicable securities law. You should therefore not rely on these forward-looking statements as representing our views as of any date subsequent to the date of this Form 10-Q. However, any further disclosures made on related subjects in our subsequent reports filed with the Securities and Exchange Commission should be consulted.

TRADEMARKS

This Form 10-Q contains references to our trademarks and to trademarks belonging to other entities. Solely for convenience, trademarks and trade names referred to may appear without the ® or ™ symbols, but such references are not intended to indicate that their respective owners will not assert, to the fullest extent under applicable law, their rights thereto. We do not intend our reference to other companies' trade names or trademarks to imply a relationship with, or endorsement or sponsorship of us by, any other companies.

NOTE REGARDING COMPANY REFERENCES

Unless the context otherwise requires, the terms "Moderna," the "Company," "we," "us" and "our" in this Form 10-Q refer to Moderna, Inc. and its consolidated subsidiaries.

ADDITIONAL INFORMATION

Our website, www.modernatx.com, including the Investor Relations section, www.investors.modernatx.com; and corporate blog www.modernatx.com/moderna-blog; as well as our social media channels: Facebook, www.facebook.com/modernatx; Twitter, www.twitter.com/moderna_tx (@moderna_tx); and LinkedIn, www.linkedin.com/company/modernatx; contain a significant amount of information about us, including financial and other information for investors. We encourage investors to visit these websites and social media channels as information is frequently updated and new information is shared. Information contained on our website, corporate blog and social media channels shall not be deemed incorporated into, or be a part of, this Form 10-Q.

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Item 1. Financial Statements

MODERNA, INC.
CONDENSED CONSOLIDATED BALANCE SHEETS
(Unaudited, in millions, except per share data)

	June 30, 2023	December 31, 2022
Assets		
Current assets:		
Cash and cash equivalents	$ 3,801	$ 3,205
Investments	4,658	6,697
Accounts receivable	232	1,385
Inventory	715	949
Prepaid expenses and other current assets	1,193	1,195
Total current assets	10,599	13,431
Investments, non-current	6,105	8,318
Property, plant and equipment, net	2,280	2,018
Right-of-use assets, operating leases	130	121
Deferred tax assets	1,480	982
Other non-current assets	1,290	988
Total assets	$ 21,884	$ 25,858
Liabilities and Stockholders' Equity		
Current liabilities:		
Accounts payable	$ 310	$ 487
Accrued liabilities	1,490	2,101
Deferred revenue	1,040	2,038
Income taxes payable	47	48
Other current liabilities	236	249
Total current liabilities	3,123	4,923
Deferred revenue, non-current	692	673
Operating lease liabilities, non-current	104	92
Financing lease liabilities, non-current	843	912
Other non-current liabilities	173	135
Total liabilities	4,935	6,735
Commitments and contingencies (Note 13)		
Stockholders' equity:		
Preferred stock, par value $0.0001; 162 shares authorized as of June 30, 2023 and December 31, 2022; no shares issued or outstanding at June 30, 2023 and December 31, 2022	—	—
Common stock, par value $0.0001; 1,600 shares authorized as of June 30, 2023 and December 31, 2022; 381 and 385 shares issued and outstanding as of June 30, 2023 and December 31, 2022, respectively	—	—
Additional paid-in capital	193	1,173
Accumulated other comprehensive loss	(263)	(370)
Retained earnings	17,019	18,320
Total stockholders' equity	16,949	19,123
Total liabilities and stockholders' equity	$ 21,884	$ 25,858

The accompanying notes are an integral part of these unaudited condensed consolidated financial statements.

MODERNA, INC.
CONDENSED CONSOLIDATED STATEMENTS OF OPERATIONS
(Unaudited, in millions, except per share data)

	Three Months Ended June 30,		Six Months Ended June 30,	
	2023	2022	2023	2022
Revenue:				
Product sales	$ 293	$ 4,531	$ 2,121	$ 10,456
Other revenue	51	218	85	359
Total revenue	344	4,749	2,206	10,815
Operating expenses:				
Cost of sales	731	1,381	1,523	2,398
Research and development	1,148	710	2,279	1,264
Selling, general and administrative	332	211	637	479
Total operating expenses	2,211	2,302	4,439	4,141
(Loss) income from operations	(1,867)	2,447	(2,233)	6,674
Interest income	104	40	213	55
Other income (expense), net	14	(13)	(34)	(26)
(Loss) income before income taxes	(1,749)	2,474	(2,054)	6,703
(Benefit from) provision for income taxes	(369)	277	(753)	849
Net (loss) income	$ (1,380)	$ 2,197	$ (1,301)	$ 5,854
(Loss) earnings per share:				
Basic	$ (3.62)	$ 5.55	$ (3.39)	$ 14.66
Diluted	$ (3.62)	$ 5.24	$ (3.39)	$ 13.85
Weighted average common shares used in calculation of (loss) earnings per share:				
Basic	381	396	383	399
Diluted	381	419	383	423

The accompanying notes are an integral part of these unaudited condensed consolidated financial statements.

MODERNA, INC.
CONDENSED CONSOLIDATED STATEMENTS OF COMPREHENSIVE INCOME (LOSS)
(Unaudited, in millions)

	Three Months Ended June 30,		Six Months Ended June 30,	
	2023	2022	2023	2022
Net (loss) income	$ (1,380)	$ 2,197	$ (1,301)	$ 5,854
Other comprehensive income (loss), net of tax:				
Available-for-sale securities:				
Unrealized (losses) gains on available-for-sale debt securities	(10)	(80)	69	(258)
Less: net realized losses on available-for-sale securities reclassified in net (loss) income	14	8	30	15
Net increase (decrease) from available-for-sale debt securities	4	(72)	99	(243)
Cash flow hedges:				
Unrealized gains on derivative instruments	—	46	—	71
Less: net realized (gains) losses on derivative instruments reclassified in net (loss) income	—	(30)	8	(44)
Net increase from derivatives designated as hedging instruments	—	16	8	27
Total other comprehensive income (loss)	4	(56)	107	(216)
Comprehensive (loss) income	$ (1,376)	$ 2,141	$ (1,194)	$ 5,638

The accompanying notes are an integral part of these unaudited condensed consolidated financial statements.

MODERNA, INC.
CONDENSED CONSOLIDATED STATEMENTS OF STOCKHOLDERS' EQUITY
(Unaudited, in millions)

	Common Stock		Additional Paid-In Capital	Accumulated Other Comprehensive Loss	Retained Earnings	Total Stockholders' Equity
	Shares	Amount				
Balance at March 31, 2023	384	$ —	$ 731	$ (267)	$ 18,399	$ 18,863
Exercise of options to purchase common stock	1	—	4	—	—	4
Purchase of common stock under employee stock purchase plan	—	—	12	—	—	12
Stock-based compensation	—	—	74	—	—	74
Other comprehensive income, net of tax	—	—	—	4	—	4
Repurchase of common stock	(4)	—	(628)	—	—	(628)
Net loss	—	—	—	—	(1,380)	(1,380)
Balance at June 30, 2023	381	$ —	$ 193	$ (263)	$ 17,019	$ 16,949

	Common Stock		Additional Paid-In Capital	Accumulated Other Comprehensive Loss	Retained Earnings	Total Stockholders' Equity
	Shares	Amount				
Balance at March 31, 2022	400	$ —	$ 3,644	$ (184)	$ 13,615	$ 17,075
Exercise of options to purchase common stock	1	—	8	—	—	8
Purchase of common stock under employee stock purchase plan	—	—	9	—	—	9
Stock-based compensation	—	—	50	—	—	50
Other comprehensive loss, net of tax	—	—	—	(56)	—	(56)
Repurchase of common stock	(9)	—	(1,298)	—	—	(1,298)
Net income	—	—	—	—	2,197	2,197
Balance at June 30, 2022	392	$ —	$ 2,413	$ (240)	$ 15,812	$ 17,985

	Common Stock		Additional Paid-In Capital	Accumulated Other Comprehensive Loss	Retained Earnings	Total Stockholders' Equity
	Shares	Amount				
Balance at December 31, 2022	385	$ —	$ 1,173	$ (370)	$ 18,320	$ 19,123
Vesting of restricted common stock	1	—	—	—	—	—
Exercise of options to purchase common stock	3	—	13	—	—	13
Purchase of common stock under employee stock purchase plan	—	—	12	—	—	12
Stock-based compensation	—	—	149	—	—	149
Other comprehensive income, net of tax	—	—	—	107	—	107
Repurchase of common stock	(8)	—	(1,154)	—	—	(1,154)
Net loss	—	—	—	—	(1,301)	(1,301)
Balance at June 30, 2023	381	$ —	$ 193	$ (263)	$ 17,019	$ 16,949

	Common Stock		Additional Paid-In Capital	Accumulated Other Comprehensive Loss	Retained Earnings	Total Stockholders' Equity
	Shares	Amount				
Balance at December 31, 2021	403	$ —	$ 4,211	$ (24)	$ 9,958	$ 14,145
Exercise of options to purchase common stock	2	—	20	—	—	20
Purchase of common stock under employee stock purchase plan	—	—	9	—	—	9
Stock-based compensation	—	—	94	—	—	94
Other comprehensive loss, net of tax	—	—	—	(216)	—	(216)
Repurchase of common stock	(13)	—	(1,921)	—	—	(1,921)
Net income	—	—	—	—	5,854	5,854
Balance at June 30, 2022	392	$ —	$ 2,413	$ (240)	$ 15,812	$ 17,985

The accompanying notes are an integral part of these unaudited condensed consolidated financial statements.

MODERNA, INC.
CONDENSED CONSOLIDATED STATEMENTS OF CASH FLOWS
(Unaudited, in millions)

	Six Months Ended June 30,	
	2023	**2022**
Operating activities		
Net (loss) income	$ (1,301)	$ 5,854
Adjustments to reconcile net (loss) income to net cash (used in) provided by operating activities:		
Stock-based compensation	149	94
Depreciation and amortization	170	155
Amortization/accretion of investments	(29)	29
Gain on equity investments, net	(17)	—
Deferred income taxes	(530)	(376)
Other non-cash items	(12)	15
Changes in assets and liabilities, net of acquisition of business:		
Accounts receivable	1,153	484
Prepaid expenses and other assets	(142)	(324)
Inventory	234	(480)
Right-of-use assets, operating leases	(9)	20
Accounts payable	(187)	(56)
Accrued liabilities	(633)	305
Deferred revenue	(979)	(2,370)
Income taxes payable	(1)	(527)
Operating lease liabilities	12	(19)
Other liabilities	(18)	263
Net cash (used in) provided by operating activities	(2,140)	3,067
Investing activities		
Purchases of marketable securities	(1,281)	(8,734)
Proceeds from maturities of marketable securities	3,264	1,409
Proceeds from sales of marketable securities	2,427	2,506
Purchases of property, plant and equipment	(347)	(219)
Acquisition of business, net of cash acquired	(85)	—
Investment in convertible notes and equity securities	(23)	(35)
Net cash provided by (used in) investing activities	3,955	(5,073)
Financing activities		
Proceeds from issuance of common stock through equity plans	25	29
Repurchase of common stock	(1,154)	(1,921)
Changes in financing lease liabilities	(81)	(77)
Net cash used in financing activities	(1,210)	(1,969)
Net increase (decrease) in cash, cash equivalents and restricted cash	605	(3,975)
Cash, cash equivalents and restricted cash, beginning of year	3,217	6,860
Cash, cash equivalents and restricted cash, end of period	$ 3,822	$ 2,885
Non-cash investing and financing activities		
Purchases of property and equipment included in accounts payable and accrued liabilities	$ 105	$ 49
Right-of-use assets obtained through finance lease modifications and reassessments	$ 50	$ —
Right-of-use assets obtained in exchange for financing lease liabilities	$ —	$ 94

The accompanying notes are an integral part of these unaudited condensed consolidated financial statements.

MODERNA, INC.
NOTES TO CONDENSED CONSOLIDATED FINANCIAL STATEMENTS
(Unaudited)

1. Description of the Business

Moderna, Inc. (collectively, with its consolidated subsidiaries, any of Moderna, we, us, our or the Company) is a biotechnology company pioneering a new class of medicines made of messenger RNA (mRNA). mRNA medicines are designed to direct the body's cells to produce intracellular, membrane or secreted proteins that have a therapeutic or preventive benefit with the potential to address a broad spectrum of diseases. Our platform builds on continuous advances in basic and applied mRNA science, delivery technology and manufacturing, providing us the capability to pursue in parallel a robust pipeline of new development candidates. We are developing therapeutics and vaccines for infectious diseases, immuno-oncology, rare diseases, autoimmune diseases and cardiovascular diseases, independently and with our strategic collaborators.

Our COVID-19 vaccine is our first commercial product and is marketed, where approved, under the name Spikevax®. Our original vaccine, mRNA-1273, targeted the SARS-CoV-2 ancestral strain, and we have leveraged our mRNA platform to rapidly adapt our vaccine to emerging SARS-CoV-2 strains to provide protection as the virus evolves and regulatory guidance is updated.

We have a diverse and extensive development pipeline of 45 development candidates across our 47 development programs, of which 39 are in clinical studies currently.

2. Summary of Basis of Presentation and Recent Accounting Standards

Basis of Presentation and Principles of Consolidation

The accompanying unaudited condensed consolidated financial statements that accompany these notes have been prepared in accordance with U.S. generally accepted accounting principles (GAAP) and applicable rules and regulations of the Securities and Exchange Commission (SEC) for interim financial reporting, consistent in all material respects with those applied in our Annual Report on Form 10-K for the year ended December 31, 2022 (2022 Form 10-K). Any reference in these notes to applicable guidance is meant to refer to the authoritative accounting principles generally accepted in the United States as found in the Accounting Standard Codification (ASC) and Accounting Standards Update (ASU) of the Financial Accounting Standards Board (FASB). This report should be read in conjunction with the audited consolidated financial statements in our 2022 Form 10-K.

The condensed consolidated financial statements include Moderna, Inc. and its subsidiaries. All intercompany transactions and balances have been eliminated in consolidation. The significant accounting policies used in preparation of these condensed consolidated financial statements for the three and six months ended June 30, 2023 are consistent with those described in our 2022 Form 10-K. The results of operations for the three and six months ended June 30, 2023 are not necessarily indicative of the operating results to be expected for the full fiscal year or future operating periods. Other revenue in the condensed consolidated statements of operations comprises grant revenue and collaboration revenue that were previously presented as separate line items in our consolidated statements of operations in our 2022 Form 10-K. The associated prior period amounts in the condensed consolidated financial statements, as well as in the notes thereto, have been reclassified to conform to the current presentation.

Use of Estimates

We have made estimates and judgments affecting the amounts reported in our condensed consolidated financial statements and the accompanying notes. We base our estimates on historical experience and various relevant assumptions that we believe to be reasonable under the circumstances, the results of which form the basis for making judgments about the carrying values of assets and liabilities at the date of the financial statements and the reported amounts of revenues and expenses during the reporting periods that are not readily apparent from other sources. Significant estimates relied upon in preparing these financial statements include, but are not limited to, critical accounting policies or estimates related to revenue recognition, income taxes, valuation allowance of deferred tax assets, inventory valuation, firm purchase commitment liabilities, pre-launch inventory, leases, fair value of financial instruments, derivative financial instruments, useful lives of property and equipment, research and development expenses, stock-based compensation, intangible assets and goodwill. The actual results that we experience may differ materially from our estimates.

Comprehensive Income (Loss)

Comprehensive income (loss) includes net income (loss) and other comprehensive income/loss for the period. Other comprehensive income/loss consists of unrealized gains/losses on our investments and derivatives designated as hedging instruments. Total comprehensive income (loss) for all periods presented has been disclosed in the condensed consolidated statements of comprehensive income (loss).

The components of accumulated other comprehensive loss for the three and six months ended June 30, 2023 were as follows (in millions):

	Unrealized Gains on Available-for-Sale Debt Securities	Net Unrealized Gains on Derivatives Designated As Hedging Instruments	Total
Accumulated other comprehensive loss, balance at December 31, 2022	$ (362)	$ (8)	$ (370)
Other comprehensive income	95	8	103
Accumulated other comprehensive loss, balance at March 31, 2023	(267)	—	(267)
Other comprehensive income	4	—	4
Accumulated other comprehensive loss, balance at June 30, 2023	$ (263)	$ —	$ (263)

Restricted Cash

We include our restricted cash balance in the cash, cash equivalents and restricted cash reconciliation of operating, investing and financing activities in the condensed consolidated statements of cash flows.

The following table provides a reconciliation of cash, cash equivalents and restricted cash in the condensed consolidated balance sheets that sum to the total of the same such amounts shown in the condensed consolidated statements of cash flows (in millions):

	June 30,	
	2023	2022
Cash and cash equivalents	$ 3,801	$ 2,873
Restricted cash, non-current[(1)]	21	12
Total cash, cash equivalents and restricted cash shown in the condensed consolidated statements of cash flows	$ 3,822	$ 2,885

[(1)] Included in other non-current assets in the condensed consolidated balance sheets.

Recently Issued Accounting Standards Not Yet Adopted

From time to time, new accounting pronouncements are issued by the FASB or other standard setting bodies and adopted by us as of the specified effective date. Unless otherwise discussed, we believe that the impact of recently issued standards that are not yet effective will not have a material impact on our condensed consolidated financial statements and disclosures.

3. Product Sales

Product sales are primarily associated with our COVID-19 vaccine supply agreements with the U.S. Government, other international governments and organizations.

Product sales by customer geographic location were as follows (in millions):

	Three Months Ended June 30,		Six Months Ended June 30,	
	2023	2022	2023	2022
United States	$ 2	$ 1,450	$ 3	$ 2,395
Europe	60	1,390	636	3,466
Rest of world	231	1,691	1,482	4,595
Total	$ 293	$ 4,531	$ 2,121	$ 10,456

As of June 30, 2023, our COVID-19 vaccine was our only commercial product authorized for use.

As of June 30, 2023 and December 31, 2022, we had deferred revenue of $1.7 billion and $2.6 billion, respectively, related to customer deposits. We expect $1.0 billion of our deferred revenue related to customer deposits as of June 30, 2023 to be realized in less than one year. Timing of product delivery, manufacturing, and receipt of marketing approval for our latest variant-targeted COVID-19 vaccine will determine the period in which product sales are recognized.

4. Other Revenue

The following table summarizes other revenue for the periods presented (in millions):

	Three Months Ended June 30,		Six Months Ended June 30,	
	2023	2022	2023	2022
Grant revenue	$ 28	$ 183	$ 52	$ 309
Collaboration revenue	23	35	33	50
Total other revenue	$ 51	$ 218	$ 85	$ 359

Grant Revenue

In September 2020, we entered into an agreement with the Defense Advanced Research Projects Agency (DARPA) for an award of up to $56 million to fund development of a mobile manufacturing prototype leveraging our existing manufacturing technology that is capable of rapidly producing vaccines and therapeutics. As of June 30, 2023, we had earned the committed funding of $32 million. An additional $24 million of funding will be available if DARPA exercises additional contract options.

In April 2020, we entered into an agreement with the Biomedical Advanced Research and Development Authority (BARDA), a division of the Office of the Assistant Secretary for Preparedness and Response within the U.S. Department of Health and Human Services (HHS), for an award of up to $483 million to accelerate development of mRNA-1273. The agreement was amended subsequently in 2020, 2021 and 2022 to provide for additional commitments to support various late-stage clinical development efforts of mRNA-1273, including a 30,000 participant Phase 3 study, pediatric clinical trials, adolescent clinical trials and pharmacovigilance studies. The maximum award from BARDA, inclusive of the 2020, 2021 and 2022 amendments, was approximately $1.7 billion. All contract options have been exercised. As of June 30, 2023, the remaining available funding, net of revenue earned was $93 million.

In January 2016, we entered a global health project framework agreement with the Bill & Melinda Gates Foundation (Gates Foundation) to advance mRNA development projects for various infectious diseases, including human immunodeficiency virus (HIV). As of June 30, 2023, the available funding, net of revenue earned was $4 million, with up to an additional $80 million available if additional follow-on projects are approved.

The following table summarizes grant revenue for the periods presented (in millions):

	Three Months Ended June 30,		Six Months Ended June 30,	
	2023	2022	2023	2022
BARDA	$ 24	$ 179	$ 44	$ 301
Other grant revenue	4	4	8	8
Total grant revenue	$ 28	$ 183	$ 52	$ 309

Collaboration Revenue

We have entered into collaboration agreements with strategic collaborators to accelerate the discovery and advancement of potential mRNA medicines across therapeutic areas. As of June 30, 2023 and December 31, 2022, we had collaboration agreements with Merck & Co., Inc (Merck), Vertex Pharmaceuticals Incorporated and Vertex Pharmaceuticals (Europe) Limited (together, Vertex), AstraZeneca plc (AstraZeneca) and others. Please refer to our 2022 Form 10-K under the heading "Third-Party Strategic Alliances" and Note 5 to our consolidated financial statements for further description of these collaboration agreements.

The following table summarizes our total collaboration revenue from our strategic collaborators for the periods presented (in millions):

	Three Months Ended June 30,		Six Months Ended June 30,	
Collaboration Revenue by Strategic Collaborator:	**2023**	**2022**	**2023**	**2022**
Vertex	$ 22	$ 25	$ 32	$ 29
Merck	—	5	—	15
AstraZeneca	—	4	—	4
Other	1	1	1	2
Total collaboration revenue	$ 23	$ 35	$ 33	$ 50

5. Collaboration Agreements

Generation Bio Co.

In March 2023, we entered into a strategic collaboration and license agreement with Generation Bio Co. (GBIO). The collaboration aims to expand the application of each company's platform by developing novel nucleic acid therapeutics, including those capable of reaching immune cells, to accelerate our respective pipelines of non-viral genetic medicines. Under the agreement, we have the option to license GBIO's proprietary cell-targeted lipid nanoparticle (ctLNP) and closed-ended DNA (ceDNA) technology for two immune cell programs and two liver programs, with an additional option for either a third immune cell or liver program. We made an upfront payment to GBIO of $40 million, a prepayment of research funding of $8 million, plus a $36 million equity investment. We will fund all research and development activities under the research plans. We expensed, as research and development expense, the upfront payment of $40 million and the equity premium of $13 million, representing the difference between the equity investment of $36 million paid to GBIO and the fair value of the equity instrument acquired in the first quarter of 2023. Additionally, we recorded an equity investment of $23 million, representing the fair value at the closing date, as other non-current assets in our condensed consolidated balance sheet as of March 31, 2023. The equity investment in GBIO is subsequently remeasured and recorded at the quoted market price of GIBO common stock at the end of each reporting period.

In addition to the GIBO collaboration agreement, we have other collaborative and licensing arrangements that we do not consider to be individually significant to our business at this time. Pursuant to these agreements, we may be required to make upfront payments and payments upon achievement of various development, regulatory and commercial milestones, which in the aggregate could be significant. Future milestone payments, if any, will be reflected in our consolidated financial statements when the corresponding events have occurred. In addition, we may be required to pay significant royalties on future sales if products related to these arrangements are commercialized.

6. Acquisition

On January 31, 2023, we acquired all outstanding shares of OriCiro Genomics K.K., a Japan-based, privately held biotech company primarily focused on cell-free DNA synthesis and amplification technologies, for $86 million in cash. With this acquisition, we obtained tools for cell-free synthesis and amplification of plasmid DNA, a key building block in mRNA manufacturing. OriCiro's technology strategically complements our manufacturing process and further accelerates our research and development efforts. The acquisition was accounted for as a business combination requiring all assets acquired and liabilities assumed to be recognized at their fair value as of the acquisition date. Following the acquisition, OriCiro was renamed as Moderna Enzymatics.

The following table summarizes the estimated fair values of assets acquired and liabilities assumed as of the acquisition date (in millions):

	January 31, 2023
Finite-lived intangible asset	
Developed technology	$ 48
Deferred tax liabilities	(15)
Other assets and liabilities, net	1
Total identifiable net assets	34
Goodwill	52
Total consideration	$ 86

The developed technology of $48 million represents the estimated fair value of the cell-free DNA synthesis and amplification technologies, as of the acquisition date. The fair value was determined by applying the cost saving method under the income approach, which is a valuation technique that provides an estimate of the fair value of an asset based on market participant expectations of the cash flows an asset would generate over its remaining useful life. To estimate the expected cash flows attributable to the development technology, it requires the use of Level 3 fair value measurements and inputs, including estimated expense savings and a discount rate that is based on the estimated weighted-average cost of capital for companies with profiles similar to ours and represents the estimated rate that market participants would use to value this intangible asset. The developed technology is being amortized on a straight-line basis over an estimated useful life of 12 years.

The excess of the consideration over the fair values assigned to the assets acquired and the liabilities assumed of $52 million was recorded as goodwill, which is not deductible for tax purposes. The goodwill is primarily attributable to the expected synergies from the acquired technologies combining with our existing platform technologies and manufacturing capabilities. Our accounting for this acquisition is preliminary and will be finalized upon completion of our analysis to determine the acquisition date fair values of certain assets acquired, liabilities assumed and tax-related items as we obtain additional information during the measurement period of up to one year from the acquisition date.

7. Financial Instruments

Cash and Cash Equivalents and Investments

The following tables summarize our cash and available-for-sale securities by significant investment category as of June 30, 2023 and December 31, 2022 (in millions):

	June 30, 2023						
	Amortized Cost	Unrealized Gains	Unrealized Losses	Estimated Fair Value	Cash and Cash Equivalents	Current Marketable Securities	Non-Current Marketable Securities
Cash and cash equivalents	$ 3,801	$ —	$ —	$ 3,801	$ 3,801	$ —	$ —
Available-for-sale:							
Certificates of deposit	11	—	—	11	—	11	—
U.S. treasury bills	196	—	—	196	—	196	—
U.S. treasury notes	5,786	—	(157)	5,629	—	3,157	2,472
Corporate debt securities	4,949	—	(170)	4,779	—	1,257	3,522
Government debt securities	156	—	(8)	148	—	37	111
Total	$ 14,899	$ —	$ (335)	$ 14,564	$ 3,801	$ 4,658	$ 6,105

	December 31, 2022						
	Amortized Cost	Unrealized Gains	Unrealized Losses	Estimated Fair Value	Cash and Cash Equivalents	Current Marketable Securities	Non-Current Marketable Securities
Cash and cash equivalents	$ 3,205	$ —	$ —	$ 3,205	$ 3,205	$ —	$ —
Available-for-sale:							
Certificates of deposit	188	—	—	188	—	188	—
U.S. treasury bills	767	—	—	767	—	767	—
U.S. treasury notes	7,781	—	(229)	7,552	—	4,182	3,370
Corporate debt securities	6,595	—	(226)	6,369	—	1,560	4,809
Government debt securities	148	—	(9)	139	—	—	139
Total	$ 18,684	$ —	$ (464)	$ 18,220	$ 3,205	$ 6,697	$ 8,318

The amortized cost and estimated fair value of available-for-sale securities by contractual maturity as of June 30, 2023 and December 31, 2022 were as follows (in millions):

	June 30, 2023	
	Amortized Cost	Estimated Fair Value
Due in one year or less	$ 4,751	$ 4,658
Due after one year through five years	6,347	6,105
Total	$ 11,098	$ 10,763

	December 31, 2022	
	Amortized Cost	Estimated Fair Value
Due in one year or less	$ 6,792	$ 6,697
Due after one year through five years	8,687	8,318
Total	$ 15,479	$ 15,015

In accordance with our investment policy, we place investments in investment grade securities with high credit quality issuers, and generally limit the amount of credit exposure to any one issuer. We evaluate securities for impairment at the end of each reporting period. Impairment is evaluated considering numerous factors, and their relative significance varies depending on the situation.

Factors considered include whether a decline in fair value below the amortized cost basis is due to credit-related factors or non-credit-related factors, the financial condition and near-term prospects of the issuer, and our intent and ability to hold the investment to allow for an anticipated recovery in fair value. Any impairment that is not credit related is recognized in other comprehensive loss, net of applicable taxes. A credit-related impairment is recognized as an allowance on the balance sheet with a corresponding adjustment to earnings. We did not recognize any impairment charges related to available-for-sale securities for the three and six months ended June 30, 2023 and 2022. We did not record any credit-related allowance to available-for-sale securities as of June 30, 2023 and December 31, 2022.

The following table summarizes the amount of gross unrealized losses and the estimated fair value for our available-for-sale securities in an unrealized loss position by the length of time the securities have been in an unrealized loss position as of June 30, 2023 and December 31, 2022 (in millions):

	Less than 12 Months		12 Months or More		Total	
	Gross Unrealized Losses	Estimated Fair Value	Gross Unrealized Losses	Estimated Fair Value	Gross Unrealized Losses	Estimated Fair Value
As of June 30, 2023:						
U.S. treasury bills	$ —	$ 117	$ —	$ —	$ —	$ 117
U.S. treasury notes	(28)	1,358	(129)	4,272	(157)	5,630
Corporate debt securities	(17)	874	(153)	3,779	(170)	4,653
Government debt securities	(1)	46	(7)	102	(8)	148
Total	$ (46)	$ 2,395	$ (289)	$ 8,153	$ (335)	$ 10,548
As of December 31, 2022:						
U.S. treasury bills	$ —	$ 128	$ —	$ —	$ —	$ 128
U.S. treasury notes	(101)	3,956	(128)	3,541	(229)	7,497
Corporate debt securities	(138)	3,505	(88)	1,890	(226)	5,395
Government debt securities	(2)	46	(7)	93	(9)	139
Total	$ (241)	$ 7,635	$ (223)	$ 5,524	$ (464)	$ 13,159

As of June 30, 2023 and December 31, 2022, we held 467 and 582 available-for-sale securities, respectively, out of our total investment portfolio that were in a continuous unrealized loss position. We neither intend to sell these investments, nor do we believe that we are more-likely-than-not to conclude we will have to sell them before recovery of their carrying values. We also believe that we will be able to collect both principal and interest amounts due to us at maturity.

Assets and Liabilities Measured at Fair Value on a Recurring Basis

The following fair value hierarchy is used to classify assets and liabilities based on the observable inputs and unobservable inputs used to value the assets and liabilities:

- Level 1: Unadjusted quoted prices in active markets that are accessible at the measurement date for identical, unrestricted assets or liabilities;
- Level 2: Quoted prices for similar assets and liabilities in active markets, quoted prices in markets that are not active, or inputs which are observable, either directly or indirectly, for substantially the full term of the asset or liability; or
- Level 3: Prices or valuation techniques that require inputs that are both significant to the fair value measurement and unobservable (i.e., supported by little or no market activity).

The following tables summarize our financial assets and liabilities measured at fair value on a recurring basis as of June 30, 2023 and December 31, 2022 (in millions):

	Fair value at June 30, 2023	Fair Value Measurement Using	
		Level 1	Level 2
Assets:			
Money market funds	$ 2,767	$ 2,767	$ —
Certificates of deposit	11	—	11
U.S. treasury bills	641	—	641
U.S. treasury notes	5,629	—	5,629
Corporate debt securities	5,200	—	5,200
Government debt securities	148	—	148
Equity investments[1]	77	77	—
Derivative instruments (Note 8)	6	—	6
Total	$ 14,479	$ 2,844	$ 11,635
Liabilities:			
Derivative instruments (Note 8)	$ 1	$ —	$ 1

	Fair value at December 31, 2022	Fair Value Measurement Using	
		Level 1	Level 2
Assets:			
Money market funds	$ 1,079	$ 1,079	$ —
Certificates of deposit	188	—	188
U.S. treasury bills	767	—	767
U.S. treasury notes	7,552	—	7,552
Corporate debt securities	6,369	—	6,369
Government debt securities	139	—	139
Derivative instruments (Note 8)	6	—	6
Total	$ 16,100	$ 1,079	$ 15,021
Liabilities:			
Derivative instruments (Note 8)	$ 32	$ —	$ 32

[1] Investments in publicly traded equity securities with readily determinable fair values are recorded at quoted market prices for identical securities, with changes in fair value recorded in other income (expense), net, in our condensed consolidated statements of operations.

For the three and six months ended June 30, 2023, we recognized a net gain of $36 million and $17 million, respectively, on equity investments from changes in fair value of the securities. We did not have equity investments in publicly traded securities with readily determinable fair values during 2022.

As of June 30, 2023 and December 31, 2022, we did not have non-financial assets or liabilities measured at fair value on a recurring basis and did not have any Level 3 financial assets or financial liabilities.

In addition, as of June 30, 2023 and December 31, 2022, we had $42 million, at each balance sheet date, in equity investments without readily determinable fair values, which are recorded within other non-current assets in our condensed consolidated balance sheets and excluded from the fair value measurement tables above.

8. Derivative Financial Instruments

We transact business in various foreign currencies and have international sales and expenses denominated in foreign currencies. Therefore, we are exposed to certain risks arising from both our business operations and economic conditions. Our risk management strategy includes the use of derivative financial instruments to hedge: (1) forecasted product sales that are denominated in foreign currencies and (2) foreign currency exchange rate fluctuations on monetary assets or liabilities denominated in foreign currencies. We do not enter into derivative financial contracts for speculative or trading purposes. We do not believe that we are exposed to more than a nominal amount of credit risk in our foreign currency hedges, as counterparties are large, global and well-capitalized financial institutions. We classify cash flows from our derivative transactions as cash flows from operating activities in our condensed consolidated statements of cash flows.

Cash Flow Hedges

We mitigate the foreign exchange risk arising from the fluctuations in foreign currency denominated product sales in Euro and Japanese Yen through a foreign currency cash flow hedging program, using forward contracts and foreign currency options that do not exceed 15 months in duration. We hedge these cash flow exposures to reduce the risk that our earnings and cash flows will be adversely affected by changes in exchange rates. To receive hedge accounting treatment, all hedging relationships are formally documented at the inception of the hedge, and the hedges must be highly effective in offsetting changes to future cash flows on hedged transactions. The derivative assets or liabilities associated with our hedging activities are recorded at fair value in other current assets or other current liabilities, respectively, in our condensed consolidated balance sheets. The gains or losses resulting from changes in the fair value of these hedges are initially recorded as a component of accumulated other comprehensive income (loss) (AOCI) in stockholders' equity and subsequently reclassified to product sales in the period during which the hedged transaction affects earnings. In the event the underlying forecasted transaction does not occur, or it becomes probable that it will not occur, within the defined hedge period, we reclassify the gains or losses on the related cash flow hedge from AOCI to other income (expense), net in our condensed consolidated statements of operations. We evaluate hedge effectiveness at the inception of the hedge prospectively, and on an ongoing basis both retrospectively and prospectively. If we do not elect hedge accounting, or the contract does not qualify for hedge accounting treatment, the changes in fair value from period to period are recorded as a component of other income (expense), net in our condensed consolidated statements of operations. As of June 30, 2023, we had no deferred gains or losses on our foreign currency forward contracts included in AOCI that are expected to be recognized into product sales within the next 12 months.

Balance Sheet Hedges

We enter into foreign currency forward contracts to hedge fluctuations associated with foreign currency denominated monetary assets and liabilities, primarily cash, accounts receivable, accounts payable and lease liabilities in Euro, Japanese Yen and Swiss Franc, that are not designated for hedge accounting treatment. Therefore, these forward contracts are accounted for as derivatives whereby the fair value of the contracts are reported as other current assets or other current liabilities in our condensed consolidated balance sheets, and gains and losses resulting from changes in the fair value are recorded as a component of other income (expense), net in our condensed consolidated statements of operations. The gains and losses on these foreign currency forward contracts generally offset the gains and losses in the underlying foreign currency denominated assets and liabilities, which are also recorded to other income (expense), net in our condensed consolidated statements of operations.

Total gross notional amount and fair value of our foreign currency derivatives were as follows (in millions):

	June 30, 2023		
		Fair Value	
	Notional Amount	Asset[1]	Liability[2]
Derivatives not designated as hedging instruments:			
Foreign currency forward contracts	$ 691	$ 6	$ 1
Total derivatives	$ 691	$ 6	$ 1

	December 31, 2022		
		Fair Value	
	Notional Amount	Asset[1]	Liability[2]
Derivatives designated as cash flow hedging instruments:			
Foreign currency forward contracts	$ 120	$ —	$ 11
Derivatives not designated as hedging instruments:			
Foreign currency forward contracts	1,368	6	21
Total derivatives	$ 1,488	$ 6	$ 32

[1]As presented in the condensed consolidated balance sheets within prepaid expenses and other current assets.
[2]As presented in the condensed consolidated balance sheets within other current liabilities.

Gains on our foreign currency derivatives, net of tax recognized in our condensed consolidated statements of comprehensive income (loss) for the three and six months ended June 30, 2023 and 2022 were as follows (in millions):

	Three Months Ended June 30,		Six Months Ended June 30,	
	2023	2022	2023	2022
Derivatives in cash flow hedging relationships:				
Foreign currency forward contracts	$ —	$ 46	$ —	$ 71

The effect of our foreign currency derivatives in our condensed consolidated statements of operations for the three and six months ended June 30, 2023 and 2022 was as follows (in millions):

		Three Months Ended June 30,		Six Months Ended June 30,	
	Statement of Income Classification	2023	2022	2023	2022
Derivatives in cash flow hedging relationships:					
Foreign currency forward contracts					
Net gain (loss) reclassified from AOCI into income	Product sales	$ —	$ 30	$ (8)	$ 44
Derivatives not designated as hedging instruments:					
Foreign currency forward contracts					
Net realized and unrealized gain	Other expense, net	$ 33	$ 41	$ 49	$ 69

9. Inventory

Inventory as of June 30, 2023 and December 31, 2022 consisted of the following (in millions):

	June 30, 2023	December 31, 2022
Raw materials	$ 507	$ 575
Work in progress	196	205
Finished goods	12	169
Total inventory	$ 715	$ 949
Inventory, non-current[(1)]	$ 723	$ 910

[(1)]Consisted of raw materials with an anticipated consumption beyond one year. Inventory, non-current is included in other non-current assets in the condensed consolidated balance sheets.

Inventory write-downs as a result of excess, obsolescence, scrap or other reasons, and losses on firm purchase commitments are recorded as a component of cost of sales in our condensed consolidated statements of operations. For the three and six months ended June 30, 2023, inventory write-downs were $464 million and $612 million, respectively. For the three and six months ended June 30, 2022, inventory write-downs were $499 million and $689 million, respectively. For the three and six months ended June 30, 2023, losses on firm purchase commitments were $75 million and $141 million, respectively. For the three and six months ended June 30, 2022, losses on firm purchase commitments were $184 million and $342 million, respectively. Inventory write-downs were mainly related to obsolete inventory due to shelf-life expiration and inventory in excess of expected demand. Losses on firm purchase commitments were primarily related to excess raw material purchase commitments that will expire before the anticipated consumption of those raw materials. These charges in 2023 were primarily driven by a continued shift in product demand to the latest variant-targeted COVID-19 vaccines and a decline in customer demand as the COVID-19 vaccine market continues to shift to an endemic seasonal market in 2023. As of June 30, 2023 and December 31, 2022, the accrued liability for losses on firm future purchase commitments in our condensed consolidated balance sheets was $220 million and $268 million, respectively.

As of June 30, 2023 and December 31, 2022, we had inventory on hand of $1.4 billion and $1.9 billion, respectively. Our raw materials and work-in-progress inventory had variable shelf lives and were expected to be consumed over the next three years. The shelf life of our COVID-19 vaccine product is nine months.

Pre-launch Inventory

In June 2023, we completed submission of a regulatory application to the U.S. Food and Drug Administration (FDA) for our updated COVID-19 vaccine candidate targeting the Omicron XBB.1.5 sublineage of SARS-CoV-2 (mRNA-1273.815). The submission is based on guidance from the FDA, which advised that COVID-19 vaccines should be updated to a monovalent XBB.1.5 composition. This guidance from the FDA is in alignment with other regulators and global public health agencies recommending a monovalent XBB.1.5 composition. We started manufacturing and capitalizing pre-launch inventory costs related to mRNA-1273.815 in the second quarter of 2023, prior to regulatory approval. As of June 30, 2023, we had capitalized pre-launch inventory of $183 million in our condensed consolidated balance sheets.

10. Property, Plant and Equipment, Net

Property, plant and equipment, net, as of June 30, 2023 and December 31, 2022 consisted of the following (in millions):

	June 30, 2023	December 31, 2022
Land	$ 32	$ 11
Manufacturing and laboratory equipment	307	284
Leasehold improvements	488	460
Furniture, fixtures and other	22	21
Computer equipment and software	46	38
Construction in progress	580	281
Right-of-use asset, financing (Note 12)	1,631	1,581
Total	3,106	2,676
Less: Accumulated depreciation	(826)	(658)
Property, plant and equipment, net	$ 2,280	$ 2,018

Depreciation and amortization expense for three and six months ended June 30, 2023 was $90 million and $168 million, respectively. Depreciation and amortization expense for the three and six months ended June 30, 2022 was $76 million and $155 million, respectively.

11. Other Balance Sheet Components

Prepaid Expenses and Other Current Assets

Prepaid expenses and other current assets, as of June 30, 2023 and December 31, 2022 consisted of the following (in millions):

	June 30, 2023	December 31, 2022
Prepaid services	$ 332	$ 216
Income tax receivable	288	10
Prepaid income taxes	214	187
Down payments to manufacturing vendors	77	229
Interest receivable	62	61
Down payments for materials and supplies	61	219
Tenant improvement allowance receivable	42	42
Collaboration receivable	41	11
Value added tax receivable	23	140
Convertible note receivable	—	36
Other current assets	53	44
Prepaid expenses and other current assets	$ 1,193	$ 1,195

Other Non-Current Assets

Other non-current assets, as of June 30, 2023 and December 31, 2022 consisted of the following (in millions):

	June 30, 2023	December 31, 2022
Inventory, non-current[(1)]	$ 723	$ 910
Downpayments and prepayments, non-current	303	—
Equity investments	119	42
Goodwill (Note 6)	52	—
Finite-lived intangible asset (Note 6)	46	—
Restricted cash	21	12
Other	26	24
Other non-current assets	$ 1,290	$ 988

[(1)]Consisted of raw materials with an anticipated consumption beyond one year.

Accrued Liabilities

Accrued liabilities, as of June 30, 2023 and December 31, 2022 consisted of the following (in millions):

	June 30, 2023	December 31, 2022
Manufacturing	$ 385	$ 400
Clinical trials	290	319
Loss on future firm purchase commitments[(1)]	220	268
Development operations	142	88
Other external goods and services	136	264
Compensation-related	126	190
Property, plant and equipment	70	5
Raw materials	62	316
Royalties	12	203
Other	47	48
Accrued liabilities	$ 1,490	$ 2,101

[(1)]Related to losses that are expected to arise from firm, non-cancellable, commitments for future raw material purchases (Note 9).

Other Current Liabilities

Other current liabilities, as of June 30, 2023 and December 31, 2022 consisted of the following (in millions):

	June 30, 2023	December 31, 2022
Lease liabilities - financing (Note 12)	$ 187	$ 161
Lease liabilities - operating (Note 12)	34	35
Other	15	53
Other current liabilities	$ 236	$ 249

Deferred Revenue

The following table summarizes the activities in deferred revenue for the six months ended June 30, 2023 (in millions):

	December 31, 2022	Additions	Deductions	June 30, 2023
Product sales	$ 2,626	$ 127	$ (1,085)	$ 1,668
Grant revenue	4	—	(2)	2
Collaboration revenue	81	13	(32)	62
Total deferred revenue	$ 2,711	$ 140	$ (1,119)	$ 1,732

12. Leases

We have entered into various long-term non-cancelable lease arrangements for our facilities and equipment expiring at various times through 2042. Certain of these arrangements have free rent periods or escalating rent payment provisions. We recognize lease cost under such arrangements on a straight-line basis over the life of the lease. We have two main campuses in Massachusetts, our Cambridge campus and our Moderna Technology Center (MTC), an industrial technology center located in Norwood. We also lease other office and lab spaces globally for our business operations.

Cambridge Campus

We occupy a multi-building campus in Technology Square in Cambridge, Massachusetts with a mix of offices and research laboratory space totaling approximately 292,000 square feet. Our Cambridge campus leases have expiry ranges from 2024 to 2029. All our Cambridge leases are classified as operating leases.

We are also investing in a new Moderna Science Center (MSC) in Cambridge, Massachusetts to create a purpose-built space to support our next chapter of discovery (see Note 13). As of June 30, 2023, we did not gain control of the underlying leased asset at the MSC, and therefore, we did not recognize the related right-of-use asset and lease liability on our condensed consolidated balance sheets. In connection with our MSC investment, in September 2021, we entered into amendments to our lease agreements to allow for an option for early termination of the leases, either in part or full. Notification of the intent to exercise the option must be provided by December 2023. We have not elected to exercise this option.

Moderna Technology Center

Our MTC is comprised of three buildings, MTC South, MTC North and MTC East, totaling approximately 686,000 square feet. Our MTC leases expire in 2042 and we have the option to extend the term for three extension periods of five years each. All of our MTC leases are classified as finance leases.

Embedded Leases

We have entered into multiple contract manufacturing service agreements with third parties which contain embedded leases within the scope of ASC 842. These leases expire from 2023 through 2026. As of June 30, 2023 and December 31, 2022, we had lease liabilities of $456 million and $440 million, respectively, related to the embedded leases. As of June 30, 2023 and December 31, 2022, we had right-of-use assets of $633 million and $639 million, respectively, related to the embedded leases. All our embedded leases are classified as finance leases.

Operating and financing lease right-of-use assets and lease liabilities as of June 30, 2023 and December 31, 2022 were as follows (in millions):

	June 30, 2023	December 31, 2022
Assets:		
Right-of-use assets, operating, net[1] [2]	$ 130	$ 121
Right-of-use assets, financing, net[3] [4]	1,076	1,150
Total	$ 1,206	$ 1,271
Liabilities:		
Current:		
Operating lease liabilities[5]	$ 34	$ 35
Financing lease liabilities[5]	187	161
Total current lease liabilities	221	196
Non-current:		
Operating lease liabilities, non-current	104	92
Financing lease liabilities, non-current	843	912
Total non-current lease liabilities	947	1,004
Total	$ 1,168	$ 1,200

[1] These assets are real estate related assets, which include land, office, and laboratory spaces.
[2] Net of accumulated amortization.
[3] These assets are real estate assets related to the MTC leases as well as assets related to contract manufacturing service agreements.
[4] Included in property and equipment in the condensed consolidated balance sheets, net of accumulated depreciation.
[5] Included in other current liabilities in the condensed consolidated balance sheets.

Future minimum lease payments under our non-cancelable lease agreements as of June 30, 2023, were as follows (in millions):

Fiscal Year	Operating Leases	Financing Leases[1]
2023 (remainder of the year)	$ 20	$ 126
2024	47	198
2025	20	130
2026	18	109
2027	19	23
Thereafter	48	1,097
Total minimum lease payments	172	1,683
Less amounts representing interest or imputed interest	(34)	(653)
Present value of lease liabilities	$ 138	$ 1,030

[1] Includes certain optional lease term extensions, predominantly related to the MTC leases, which represent a total of $668 million of undiscounted future lease payments.

13. Commitments and Contingencies

Legal Proceedings

We are involved in various claims and legal proceedings of a nature considered ordinary course in our business. The outcome of any such proceedings, regardless of the merits, is inherently uncertain; therefore, assessing the likelihood of loss and any estimated damages is difficult and subject to considerable judgment. We are not currently a party to any legal proceedings for which a material loss is probable, or for which a loss is reasonably estimable at this time.

Indemnification Obligations

As permitted under Delaware law, we indemnify our officers, directors, and employees for certain events, occurrences while the officer, or director is, or was, serving at our request in such capacity. The term of the indemnification is for the officer's or director's lifetime.

We have standard indemnification arrangements in our leases for laboratory and office space that require us to indemnify the landlord against any liability for injury, loss, accident, or damage from any claims, actions, proceedings, or costs resulting from certain acts, breaches, violations, or non-performance under our leases.

We enter into indemnification provisions under our agreements with counterparties in the ordinary course of business, typically with business partners, contractors, clinical sites and customers. Under these provisions, we generally indemnify and hold harmless the indemnified party for losses suffered or incurred by the indemnified party as a result of our activities. These indemnification provisions generally survive termination of the underlying agreement. The maximum potential amount of future payments we could be required to make under these indemnification provisions is unlimited.

Through the three and six months ended June 30, 2023 and the year ended December 31, 2022, we had not experienced any material losses related to these indemnification obligations, and no material claims were outstanding. We do not expect significant claims related to these indemnification obligations and, consequently, concluded that the fair value of these obligations is negligible, and no related reserves were established.

Purchase Commitments and Purchase Orders

We enter into agreements in the normal course of business with vendors and contract manufacturing organizations for raw materials and manufacturing services and with vendors for preclinical research studies, clinical trials and other goods or services. As of June 30, 2023, we had $3.4 billion of non-cancelable purchase commitments related to raw materials and manufacturing agreements, which are expected to be paid through 2029. As of June 30, 2023, $220 million of the purchase commitments related to raw materials was recorded as an accrued liability for loss on future firm purchase commitments. As of June 30, 2023, we had $347 million of non-cancelable purchase commitments related to clinical services and other goods and services which are expected to be paid through 2039. These amounts represent our minimum contractual obligations, including termination fees.

In addition to purchase commitments, we have agreements with third parties for various goods and services, including services related to clinical operations and support and contract manufacturing, for which we are not contractually able to terminate for convenience and avoid any and all future obligations to the vendors. Certain agreements provide for termination rights subject to termination fees or wind down costs. Under such agreements, we are contractually obligated to make certain payments to vendors, mainly, to reimburse them for their unrecoverable outlays incurred prior to cancellation. As of June 30, 2023, we had cancelable open purchase orders of $2.9 billion in total under such agreements for our significant clinical operations and support and contract manufacturing. These amounts represent only our estimate of those items for which we had a contractual commitment to pay as of June 30, 2023, assuming we would not cancel these agreements. The actual amounts we pay in the future to the vendors under such agreements may differ from the purchase order amounts.

Licenses to Patented Technology

In 2017, we entered into sublicense agreements with Cellscript, LLC and its affiliate, mRNA RiboTherapeutics, Inc., to sublicense certain patent rights. Pursuant to each agreement, we are required to pay certain license fees, annual maintenance fees, minimum royalties on future net sales and milestone payments contingent on achievement of certain development, regulatory and commercial milestones for specified products, on a product-by-product basis. Commercial milestone payments and royalties based on annual net sales of licensed products for therapeutic and prophylactic products are accounted for as additional expense of the related product sales in the period in which the corresponding sales occur.

In December 2022, we entered into a non-exclusive patent license agreement with the National Institute of Allergy and Infectious Diseases, an Institute or Center of the National Institutes of Health to license certain patent rights concerning stabilizing prefusion coronavirus spike proteins and the resulting stabilized proteins for use in COVID-19 vaccine products. Pursuant to the agreement, we have agreed to pay low single-digit royalties on future net sales, a minimum annual royalty payment, and certain contingent development, regulatory and commercial milestone payments on a licensed product-by-licensed product basis.

For the three and six months ended June 30, 2023, we recognized $12 million and $98 million, respectively, of royalty expenses associated with our product sales. For the three and six months ended June 30, 2022, we recognized $157 million and $364 million, respectively, of royalty expenses associated with our product sales. These royalty expenses were recorded to cost of sales in our condensed consolidated statements of operations.

Additionally, we have other in-license agreements with third parties which require us to make future development, regulatory and commercial milestone payments and sales-based royalties for specified products associated with the agreements. The achievement of these milestones have not yet occurred as of June 30, 2023.

Moderna Science Center

In September 2021, we announced an investment in the development of the MSC in Cambridge, Massachusetts. The MSC is expected to integrate scientific and non-scientific spaces, including our principal executive offices, and is built to support our growth as we continue to advance our pipeline of mRNA medicines. In relation to the investment, we entered into a lease agreement for approximately 462,000 square feet and are currently undergoing an approximately two-year building project. Following completion of the building project, the lease term is 15 years, subject to our right to extend the lease for up to two additional seven-year terms. Pursuant to this lease agreement, we are committed to approximately $1.0 billion non-cancellable rent payments for the initial lease term. We expect to begin a phased move-in process in the fourth quarter of 2023.

14. Stock-Based Compensation and Share Repurchase Programs

Stock-Based Compensation

The following table presents the components and classification of stock-based compensation expense for the three and six months ended June 30, 2023 and 2022 as follows (in millions):

	Three Months Ended June 30,		Six Months Ended June 30,	
	2023	2022	2023	2022
Options	$ 34	$ 27	$ 70	$ 52
Restricted Common Stock (RSUs) and Performance Stock Units (PSUs)	37	22	74	39
Employee Stock Purchase Plan (ESPP)	3	1	5	3
Total	$ 74	$ 50	$ 149	$ 94
Cost of sales	$ 16	$ 13	$ 21	$ 21
Research and development	33	19	75	39
Selling, general and administrative	25	18	53	34
Total	$ 74	$ 50	$ 149	$ 94

As of June 30, 2023, there was $743 million of total unrecognized compensation cost related to unvested stock-based compensation with respect to options, RSUs and PSUs granted. That cost is expected to be recognized over a weighted-average period of 3.0 years as of June 30, 2023.

Share Repurchase Programs

As of June 30, 2023, $1.7 billion of our Board of Directors' authorization for repurchases of our common stock remains outstanding (the 2022 Repurchase Programs), with no expiration date. The timing and actual number of shares repurchased under the 2022 Repurchase Programs will depend on a variety of factors, including price, general business and market conditions, and other investment opportunities, and shares may be repurchased through open market purchases through the use of trading plans intended to qualify under Rule 10b5-1 under the Securities Exchange Act of 1934, as amended.

The following table summarizes activity related to our share repurchase programs for the six months ended June 30, 2023 (in millions, except per share data):

	Six Months Ended June 30, 2023
Number of shares repurchased	8
Average price per share[(1)]	$ 143.39
Aggregate purchase price	$ 1,154
Remaining authorization at end of period	$ 1,667

[(1)]Average price paid per share includes related expenses and excise tax.

15. Income Taxes

The following table summarizes our income tax expense for the periods presented (in millions, except for percentages):

	Three Months Ended June 30,		Six Months Ended June 30,	
	2023	2022	2023	2022
(Loss) income before income taxes	$ (1,749)	$ 2,474	$ (2,054)	$ 6,703
(Benefit from) provision for income taxes	$ (369)	$ 277	$ (753)	$ 849
Effective tax rate	21.1 %	11.2 %	36.7 %	12.7 %

The effective tax rate for the three months ended June 30, 2023 was consistent to the U.S. statutory tax rate. The effective tax rate for the six months ended June 30, 2023 was higher than the U.S. statutory rate, primarily due to international provisions of the Tax Cuts and Jobs Act and research and development credits. The effective tax rates for the three and six months ended June 30, 2023 also include a discrete benefit from stock-based compensation, a state deferred tax rate change and a valuation allowance release on a portion of its state tax attributes. The decreases in income tax expense for the three and six months ended June 30, 2023 were primarily due to decreases in pre-tax income.

We file U.S. federal income tax returns and income tax returns in various state, local and foreign jurisdictions. We are not currently subject to any tax assessment from an income tax examination in the United States or any other major taxing jurisdiction.

On a periodic basis, we reassess any valuation allowances that we maintain on our deferred tax assets, and weigh positive and negative evidence to assess the recoverability of the deferred tax assets. As of the year ended December 31, 2022, we maintained a state valuation allowance of $155 million. For the three and six months ended June 30, 2023, we reassessed the state valuation allowance noting the increase in positive evidence, including investments in research and development and future profitability with increased market expansions in the United States. After assessing both the positive evidence and negative evidence, we determined it was more likely than not that we will realize a portion of the state tax attributes and released $50 million in 2023. We will continue to maintain a valuation allowance on certain state tax attributes that we expect to expire prior to utilization.

The President signed into law the Inflation Reduction Act (the IRA) on August 16, 2022. The Act includes a new 15% corporate minimum tax and a 1% excise tax on the value of corporate stock repurchase, net of new share issuances, after December 31, 2022. We currently are not expecting these provisions to have a material adverse impact to our financial statements. We expect additional guidance and regulations to be issued in future periods and will continue to assess its potential impact on our business and results of operations as further information becomes available.

16. (Loss) Earnings per Share

The computation of basic (loss) earnings per share (EPS) is based on the weighted-average number of our common shares outstanding. The computation of diluted EPS is based on the weighted-average number of our common shares outstanding and potential dilutive common shares during the period as determined by using the treasury stock method.

Basic and diluted EPS for the three and six months ended June 30, 2023 and 2022 were calculated as follows (in millions, except per share data):

	Three Months Ended June 30,		Six Months Ended June 30,	
	2023	2022	2023	2022
Numerator:				
Net (loss) income	$ (1,380)	$ 2,197	$ (1,301)	$ 5,854
Denominator:				
Basic weighted-average common shares outstanding	381	396	383	399
Effect of dilutive securities	—	23	—	24
Diluted weighted-average common shares outstanding	381	419	383	423
Basic EPS	$ (3.62)	$ 5.55	$ (3.39)	$ 14.66
Diluted EPS	$ (3.62)	$ 5.24	$ (3.39)	$ 13.85
Anti-dilutive potential common shares excluded from the EPS computation above	28	4	28	3

Item 2. MANAGEMENT'S DISCUSSION AND ANALYSIS OF FINANCIAL CONDITION AND RESULTS OF OPERATIONS

You should read the following discussion and analysis of our financial condition and results of operations together with our unaudited financial information and related notes included in this Form 10-Q and our consolidated financial statements and related notes and other financial information in our Annual Report on Form 10-K for the year ended December 31, 2022, which was filed with the Securities and Exchange Commission (the SEC) on February 24, 2023 (the 2022 Form 10-K).

Overview

We are a biotechnology company pioneering a new class of medicines made of messenger RNA (mRNA). mRNA medicines are designed to direct the body's cells to produce intracellular, membrane or secreted proteins that have a therapeutic or preventive benefit with the potential to address a broad spectrum of diseases. Our platform builds on continuous advances in basic and applied mRNA science, delivery technology and manufacturing, providing us the capability to pursue in parallel a robust pipeline of new development candidates. We are developing therapeutics and vaccines for infectious diseases, immuno-oncology, rare diseases, autoimmune diseases and cardiovascular diseases, independently and with our strategic collaborators.

Since our founding in 2010, we have transformed from a research-stage company advancing programs in the field of mRNA to a commercial enterprise with a diverse clinical portfolio of vaccines and therapeutics across seven modalities, a broad intellectual property portfolio and integrated manufacturing capabilities that allow for rapid clinical and commercial production at scale. We have a diverse and extensive development pipeline of 45 development candidates across our 47 development programs, of which 39 are in clinical studies currently.

Our COVID-19 vaccine is our first commercial product and is marketed, where approved, under the name Spikevax®. Our original vaccine, mRNA-1273, targeted the SARS-CoV-2 ancestral strain, and we have leveraged our mRNA platform to rapidly adapt our vaccine to emerging SARS-CoV-2 strains to provide protection as the virus evolves and regulatory guidance is updated.

Business Highlights

In June 2023, we completed submission of a regulatory application to the U.S. Food and Drug Administration (FDA) for our updated COVID-19 vaccine candidate targeting the Omicron XBB.1.5 sublineage of SARS-CoV-2 (mRNA-1273.815). We have also submitted regulatory applications for mRNA-1273.815 to other regulators globally, including to the European Medicines Agency (EMA), Swissmedic and the Ministry of Health, Labour and Welfare in Japan. These submissions are based on guidance from the FDA, the European Centre for Disease Prevention and Control (ECDC) and the EMA, among other regulators and global public health agencies, which advised that COVID-19 vaccines should be updated to a monovalent XBB.1.5 composition. Additionally, we have generated preliminary clinical data of mRNA-1273.815 showing an immune response against XBB descendent sublineages such as XBB.1.5, XBB.1.16, and XBB.2.3.2.

We have initiated a rolling submission of a Biologics License Application to the FDA for our investigational respiratory syncytial virus (RSV) vaccine (mRNA-1345) for adults aged 60 years or older. We have also submitted marketing authorization applications for mRNA-1345 for adults aged 60 years or older with the EMA, Swissmedic, the Therapeutic Goods Administration in Australia and the Medicines and Healthcare products Regulatory Agency in the United Kingdom. The regulatory applications are based on positive data from a prespecified interim analysis of our pivotal ConquerRSV study, a randomized, double-blind, placebo-controlled study of approximately 37,000 adults 60 years or older in 22 countries. In the study, mRNA-1345 met primary efficacy endpoints, demonstrating vaccine efficacy of 83.7% against RSV lower respiratory tract disease in older adults.

For the second quarter of 2023, we recognized product sales of $293 million from sales of our COVID-19 vaccine, compared to $4.5 billion for the second quarter of 2022. Diluted loss per share was $(3.62) for the second quarter of 2023, compared to diluted earnings per share of $5.24 for the second quarter of 2022.

Recent Program Developments

Individualized neoantigen therapy (mRNA-4157)

- We are developing mRNA-4157, an investigational mRNA individualized neoantigen therapy (INT), in collaboration with Merck & Co., Inc (Merck). In July 2023, we and Merck announced the initiation of the pivotal Phase 3 randomized V940-001 clinical trial evaluating mRNA-4157 in combination with KEYTRUDA® (pembrolizumab), Merck's anti-PD-1 therapy, as an adjuvant treatment in patients with resected high-risk melanoma (Stage IIB-IV). Global recruitment in the trial has begun, and the first patients are enrolling in Australia. The trial is expected to enroll approximately 1,089 patients at more than 165

sites in over 25 countries around the world. The primary endpoint of the study is recurrence-free survival (RFS) and secondary endpoints include distant metastasis-free survival (DMFS), overall survival and safety.

- Based on data from the Phase 2b KEYNOTE-942/mRNA-4157-P201 study, the FDA and EMA granted Breakthrough Therapy Designation and the Priority Medicines (PRIME) scheme, respectively, for mRNA-4157 in combination with KEYTRUDA for the adjuvant treatment of patients with high-risk stage III/IV melanoma following complete resection. We and Merck presented the study's primary endpoint, RFS, in April 2023 at the American Association for Cancer Research (AACR) Annual Meeting, which showed that mRNA-4157 in combination with KEYTRUDA demonstrated a statistically significant and clinically meaningful improvement in RFS, and reduced the risk of recurrence or death by 44% (HR=0.56 [95% CI, 0.309-1.017]; one-sided p value=0.0266) compared with KEYTRUDA alone in the overall intention-to-treat population. Further data from a key secondary endpoint of the study, DMFS, were presented in June 2023 at the American Society of Clinical Oncology (ASCO) Annual Meeting. We and Merck plan to expand the development program to additional tumor types, including non-small cell lung cancer. In the overall intention-to-treat population, adjuvant treatment with mRNA-4157 in combination with KEYTRUDA demonstrated a statistically significant and clinically meaningful improvement in DMFS compared with KEYTRUDA alone and reduced the risk of developing distant metastasis or death by 65% (HR=0.347 [95% CI, 0.145-0.828]; one-sided p value=0.0063). The secondary endpoint of DMFS, defined as the time from the first dose of KEYTRUDA until the date of first distant recurrence or death from any cause, was pre-specified for statistical testing following the positive primary endpoint of RFS.

Seasonal influenza (flu) vaccines (mRNA-1010)

- The Phase 3 immunogenicity trial (P303) of our seasonal influenza vaccine candidate, mRNA-1010, is fully enrolled. P303 is testing an updated formulation of mRNA-1010 that is expected to lead to improved immune responses against influenza B strains.

CMV vaccine (mRNA-1647)

- The pivotal Phase 3 trial (CMVictory) of our CMV vaccine candidate, mRNA-1647, is more than 80% enrolled, with an expectation to enroll up to 7,300 women from approximately 150 clinical sites. CMVictory is evaluating the vaccine's ability to protect against primary CMV infection in women ages 16 to 40 years. The trial is a randomized, observer-blind, placebo-controlled study designed to evaluate the efficacy, safety, and immunogenicity of mRNA-1647 to evaluate the prevention of primary infection. The primary efficacy analysis will be triggered based on the accrual of seroconversion cases.

Propionic acidemia (mRNA-3927)

- The Phase 1/2 clinical trial, the Paramount Study, of mRNA-3927, an investigational mRNA therapy for propionic acidemia (PA), is ongoing and currently enrolling patients in the dose confirmation arm. The trial includes a dose optimization stage (cohorts 1-5) followed by a dose confirmation stage with progression dependent on the safety of the preceding cohort. Enrollment is complete for cohorts 1 through 5. mRNA-3927 has been generally well-tolerated at the doses administered, with encouraging early signs of dose-dependent pharmacology and potential clinical benefit. The majority of eligible participants have elected to continue with treatment by participating in the Open-Label Extension Study.

- In May 2023, we reported on interim data from the Paramount Study at the 2023 American Society of Gene + Cell Therapy (ASGCT) Annual Meeting.

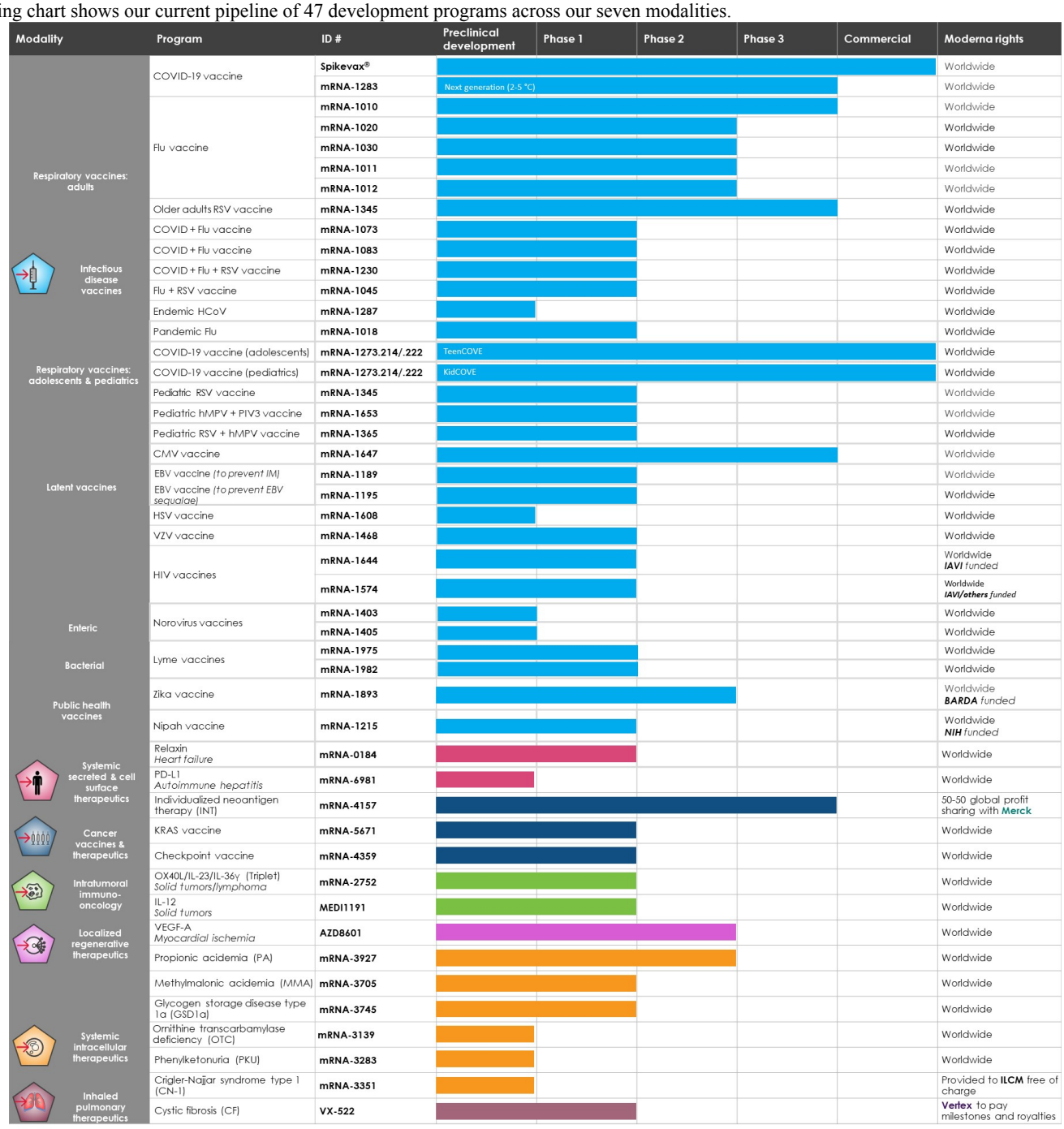
Emerging Programs

- In April 2023, we announced new development candidates against Lyme disease, representing our first bacterial vaccine candidates, and norovirus, constituting our first vaccine candidates against an enteric virus. To address Lyme's biological complexity, we are advancing a seven-valent approach with two Lyme disease vaccine candidates that will be developed in parallel. mRNA-1982 is designed to elicit antibodies specific for Borrelia burgdorferi, which causes almost all Lyme disease in the U.S. mRNA-1975 is designed to elicit antibodies specific for the four major Borrelia species causing disease in the U.S. and Europe. We have initiated a Phase 1 clinical trial for mRNA-1982 and mRNA-1975.

- A broadly effective norovirus vaccine will require a multivalent vaccine design, given the wide genetic and antigenic diversity of noroviruses. We are developing pentavalent (mRNA-1405) and trivalent (mRNA-1403) candidates for norovirus.

Our Pipeline

The following chart shows our current pipeline of 47 development programs across our seven modalities.



Abbreviations: BARDA, Biomedical Advanced Research and Development Authority; CMV, Cytomegalovirus; EBV, Epstein-Barr virus; HIV, human immunodeficiency virus; hMPV, human metapneumovirus; HSV, herpes simplex virus; ILCM, Institute for Life Changing Medicines; IL-12, interleukin 12; IL-23, interleukin 23; IL-36γ, interleukin-36 gamma; NIAID, National Institute of Allergy and Infectious Diseases; NIH, National Institutes of Health; OX40L, wildtype OX40 ligand; PIV3, human parainfluenza virus 3; RSV, respiratory syncytial virus; VEGF-A, vascular endothelial growth factor A; VZV, varicella-zoster virus.

Results of operations

The following tables summarize our condensed consolidated statements of operations for the periods presented (in millions):

	Three Months Ended June 30,		Change 2023 vs. 2022	
	2023	2022	$	%
Revenue:				
Product sales	$ 293	$ 4,531	$ (4,238)	(94)%
Other revenue	51	218	(167)	(77)%
Total revenue	344	4,749	(4,405)	(93)%
Operating expenses:				
Cost of sales	731	1,381	(650)	(47)%
Research and development	1,148	710	438	62%
Selling, general and administrative	332	211	121	57%
Total operating expenses	2,211	2,302	(91)	(4)%
(Loss) income from operations	(1,867)	2,447	(4,314)	(176)%
Interest income	104	40	64	160%
Other income (expense), net	14	(13)	27	208%
(Loss) income before income taxes	(1,749)	2,474	(4,223)	(171)%
(Benefit from) provision for income taxes	(369)	277	(646)	(233)%
Net (loss) income	$ (1,380)	$ 2,197	$ (3,577)	(163)%

	Six Months Ended June 30,		Change 2023 vs. 2022	
	2023	2022	$	%
Revenue:				
Product sales	$ 2,121	$ 10,456	$ (8,335)	(80)%
Other revenue	85	359	(274)	(76)%
Total revenue	2,206	10,815	(8,609)	(80)%
Operating expenses:				
Cost of sales	1,523	2,398	(875)	(36)%
Research and development	2,279	1,264	1,015	80%
Selling, general and administrative	637	479	158	33%
Total operating expenses	4,439	4,141	298	7%
(Loss) income from operations	(2,233)	6,674	(8,907)	(133)%
Interest income	213	55	158	287%
Other expense, net	(34)	(26)	(8)	31%
(Loss) income before income taxes	(2,054)	6,703	(8,757)	(131)%
(Benefit from) provision for income taxes	(753)	849	(1,602)	(189)%
Net (loss) income	$ (1,301)	$ 5,854	$ (7,155)	(122)%

Revenue

Product sales by customer geographic location were as follows (in millions):

	Three Months Ended June 30,		Six Months Ended June 30,	
	2023	2022	2023	2022
United States	$ 2	$ 1,450	$ 3	$ 2,395
Europe	60	1,390	636	3,466
Rest of world[(1)]	231	1,691	1,482	4,595
Total	$ 293	$ 4,531	$ 2,121	$ 10,456

As of June 30, 2023, our COVID-19 vaccine was our only commercial product authorized for use.

As of June 30, 2023, we had deferred revenue of $1.7 billion associated with customer deposits received or billable under supply agreements for delivery of our COVID-19 vaccines in 2023. We believe that the COVID-19 vaccine market continues to shift to an endemic seasonal market and our product sales will decline significantly in 2023 compared to 2022. In addition, we anticipate greater seasonality for sales, with greater demand in the fall/winter season in each hemisphere as countries seek to provide booster vaccinations to their populations.

Other than product sales, our revenue has been primarily derived from government-sponsored and private organizations including the Biomedical Advanced Research and Development Authority (BARDA), the Defense Advanced Research Projects Agency (DARPA) and the Bill & Melinda Gates Foundation and from strategic alliances with Merck & Co., Inc (Merck), Vertex Pharmaceuticals Incorporated and Vertex Pharmaceuticals (Europe) Limited (together, Vertex) and AstraZeneca plc (AstraZeneca) to discover, develop, and commercialize potential mRNA medicines.

The following table summarizes other revenue for the periods presented (in millions):

	Three Months Ended June 30,		Six Months Ended June 30,	
	2023	2022	2023	2022
Grant revenue	$ 28	$ 183	$ 52	$ 309
Collaboration revenue	23	35	33	50
Total other revenue	$ 51	$ 218	$ 85	$ 359

Total revenue decreased by $4.4 billion and $8.6 billion, or 93% and 80%, for the three and six months ended June 30, 2023, respectively, compared to the same periods in 2022, mainly due to decreases in product sales of our COVID-19 vaccine.

Product revenue decreased by $4.2 billion and $8.3 billion, or 94% and 80%, for the three and six months ended June 30, 2023, respectively, compared to the same periods in 2022, primarily due to lower sales volume in 2023.

Other revenue decreased by $167 million and $274 million, or 77% and 76%, for the three and six months ended June 30, 2023, respectively, compared to the same periods in 2022, mainly due to decreases in grant revenue under our agreement with BARDA for the development of our mRNA-1273 vaccine.

Operating expenses

Cost of sales

Cost of sales for the three months ended June 30, 2023 was $731 million, including third-party royalties of $12 million, inventory write-downs of $464 million, unutilized manufacturing capacity of $135 million, and losses on firm purchase commitments of $75 million. Cost of sales for the six months ended June 30, 2023 was $1.5 billion, including third-party royalties of $98 million, inventory write-downs of $612 million, unutilized manufacturing capacity of $270 million, and losses on firm purchase commitments of $141 million. These charges, other than royalties, were largely attributable to a shift in product demand to our latest monovalent XBB.1.5 COVID-19 vaccine candidate as well as a decline in customer demand. The shift from a bivalent to monovalent strain selection rendered the remaining mRNA-1273.222 product inventory obsolete.

Cost of sales for the three months ended June 30, 2023 decreased by $650 million, or 47%, compared to the same period in 2022. Cost of sales as a percentage of product sales for the three months ended June 30, 2023 was 249%, compared to 30% for the same period in 2022. Cost of sales for the six months ended June 30, 2023 decreased by $875 million, or 36%, compared to the same period in 2022. Cost of sales as a percentage of product sales for the six months ended June 30, 2023 was 72%, compared to 23% for the same period in 2022. The decreases in cost of sales in 2023 were primarily driven by lower sales volume. The increases in cost of sales as a percentage of product sales in 2023 were mainly due to the aforementioned charges, other than royalties, over lower product sales, driven by a decline in product demand and increased product seasonality.

We expect our cost of sales as a percentage of product sales to increase as we continue to move from a pandemic market to an endemic market, characterized by greater seasonality, for our COVID-19 vaccine in 2023. We expect that this shift will cause our cost of sales for the full year of 2023 to represent a higher percentage of our product sales than the percentage experienced in 2022. Our per unit manufacturing cost in 2023 is expected to be significantly higher than the prior year; we may continue to experience significant unutilized capacity charges and inventory write-downs in 2023 (please refer to Note 9 to our condensed consolidated financial statements for inventory related charges).

Research and development expenses

Research and development expenses increased by $438 million, or 62%, for the three months ended June 30, 2023, compared to the same period in 2022. The increase was primarily attributable to increases in clinical trial expenses of $134 million, manufacturing costs for clinical trial materials of $109 million, personnel-related costs and stock-based compensation of $84 million and consulting and outside services of $72 million. Research and development expenses increased by $1.0 billion, or 80%, for the six months ended June 30, 2023, compared to the same period in 2022. The increase was primarily attributable to increases in clinical trial expenses of $415 million, manufacturing costs for clinical trial materials of $217 million, personnel-related costs and stock-based compensation of $182 million, consulting and outside services of $86 million, and preclinical research expenses, including collaboration upfront fees, of $50 million. These increases for the three and six month periods in 2023 were largely driven by increased clinical development, particularly for our RSV, flu and CMV programs, increased headcount and our collaboration agreements with Life Edit and Generation Bio executed in the first quarter of 2023.

We expect that research and development expenses will increase in 2023, as compared to 2022, as we continue to progress the development of variant-specific and next-generation COVID-19 vaccine candidates and continue to develop our pipeline and advance our product candidates into later-stage development, in particular those in ongoing Phase 3 studies, our RSV, seasonal flu and CMV vaccine programs, as well as our individualized neoantigen therapy (personalized cancer vaccine) program.

Selling, general and administrative expenses

Selling, general and administrative expenses increased by $121 million, or 57%, for the three months ended June 30, 2023, compared to the same period in 2022. The increase was mainly due to increases in consulting and outside services of $65 million and personnel-related costs and stock-based compensation of $44 million. Selling, general and administrative expenses increased by $158 million, or 33%, for the six months ended June 30, 2023, compared to the same period in 2022. The increase was mainly due to increases in outside services of $115 million, personnel-related costs and stock-based compensation of $85 million and commercial and marketing expense of $29 million, partially offset by a decrease in distributor fees of $57 million and an endowment to the Moderna Charitable Foundation of $50 million contributed in 2022. These increases for the three and six month periods in 2023 were primarily driven by increased headcount and spend in digital, medical affairs and commercial functions to support our digital initiatives, marketed products and company expansion.

We expect that selling, general and administrative expenses will increase in 2023, as compared to 2022, as we continue to build out our global commercial, regulatory, sales and marketing infrastructure, and continue to expand the number of programs and our business operations.

Interest income

Interest income increased by $64 million, or 160%, for the three months ended June 30, 2023, compared to the same period in 2022. Interest income increased by $158 million, or 287%, for the six months ended June 30, 2023, compared to the same period in 2022. The increases in interest income from our investments in marketable securities for the three and six month periods in 2023 were mainly driven by an overall higher interest rate environment.

Other income (expense), net

The following tables summarize other expense, net for the periods presented (in millions):

	Three Months Ended June 30,		Change 2023 vs. 2022	
	2023	2022	$	%
Gain (loss) on investments	$ 22	$ (8)	$ 30	375%
Interest expense	(13)	(5)	(8)	160%
Other income, net	5	—	5	100%
Total other income (expense), net	$ 14	$ (13)	$ 27	208%

	Six Months Ended June 30,		Change 2023 vs. 2022	
	2023	2022	$	%
Loss on investments	$ (13)	$ (14)	$ 1	(7)%
Interest expense	(22)	(11)	(11)	100%
Other income (expense), net	1	(1)	2	200%
Total other expense, net	$ (34)	$ (26)	$ (8)	31%

Total other income, net increased by $27 million, or 208%, for the three months ended June 30, 2023, compared to the same period in 2022. The increase in other income, net for the three months ended June 30, 2023 was primarily due to gains on equity investments, partially offset by an increase in interest expense. Total other expense, net increased by $8 million, or 31%, for the six months ended June 30, 2023, compared to the same period in 2022. The increase in other expense, net for the six months ended June 30, 2023 was primarily due to a loss on available-for-sale debt securities and an increase in interest expense, partially offset by a net gain on equity investments. Our interest expense is primarily related to our finance leases. Please refer to Note 12 to our condensed consolidated financial statements.

Income taxes

We had a tax benefit of $369 million and $753 million for the three and six months ended June 30, 2023. Provision for income taxes decreased by $646 million, or 233%, for the three months ended June 30, 2023, compared to the same period in 2022. Provision for income taxes decreased by $1.6 billion, or 189%, for the six months ended June 30, 2023, compared to the same period in 2022. The decrease in both periods of 2023 were primarily due to significant decreases in pre-tax income. As a result, the 2023 effective tax rate will not be comparable to the prior year.

Liquidity and capital resources

The following table summarizes our cash, cash equivalents, investments and working capital as of June 30, 2023 and December 31, 2022 (in millions):

	June 30, 2023	December 31, 2022
Financial assets:		
Cash and cash equivalents	$ 3,801	$ 3,205
Investments	4,658	6,697
Investments, non-current	6,105	8,318
Total	$ 14,564	$ 18,220
Working capital:		
Current assets	$ 10,599	$ 13,431
Current liabilities	3,123	4,923
Total	$ 7,476	$ 8,508

Our cash, cash equivalents and investments are invested in accordance with our investment policy, primarily with a view to liquidity and capital preservation. Investments, consisting primarily of government and corporate debt securities, are stated at fair value. Cash, cash equivalents and investments as of June 30, 2023 decreased by $3.7 billion, or 20%, compared to December 31, 2022. During the six months ended June 30, 2023, we had a net cash outflow from operating activities of $2.1 billion, repurchases of our common stock of $1.2 billion, purchases of property and equipment of $347 million, and a business acquisition, net of cash acquired of $85 million, partially offset by unrealized gains on available-for-sale debt securities of $129 million.

Working capital, which is current assets less current liabilities, as of June 30, 2023 decreased by $1.0 billion, or 12%, compared to December 31, 2022, primarily due to a decrease in cash, cash equivalents and short-term investments of $1.4 billion, primarily to fund our operating activities and repurchases of common stock, and a decrease in accounts receivable of $1.2 billion, primarily driven by collections in excess of invoicing. This was partially offset by a decrease in short-term deferred revenue of $1.0 billion, mainly driven by revenue recognized from deferred revenue in excess of customer deposits received, and a decrease in accrued liabilities of $611 million.

As of June 30, 2023, we did not have any off-balance sheet arrangements.

Cash flow

The following table summarizes the primary sources and uses of cash for each period presented (in millions):

	Six Months Ended June 30,	
	2023	2022
Net cash provided by (used in):		
Operating activities	$ (2,140)	$ 3,067
Investing activities	3,955	(5,073)
Financing activities	(1,210)	(1,969)
Net increase (decrease) in cash, cash equivalents and restricted cash	$ 605	$ (3,975)

Operating activities

We derive cash flows from operations primarily from cash collected from customer deposits and accounts receivable related to our COVID-19 vaccine supply agreements, as well as certain government-sponsored and private organizations and strategic alliances. Our cash flows from operating activities are significantly affected by our use of cash for operating expenses and working capital to support the business.

Beginning in the third quarter of 2020, we entered into supply agreements with the U.S. Government and other international organizations for the supply of our COVID-19 vaccine and received upfront deposits. As of June 30, 2023, we had $1.7 billion in deferred revenue related to customer deposits received or billable.

Net cash used in operating activities for the six months ended June 30, 2023 was $2.1 billion and consisted of net loss of $1.3 billion, a net change in assets and liabilities, net of acquisition of business, of $570 million and non-cash adjustments of $269 million. Non-cash items primarily included deferred income taxes of $530 million, depreciation and amortization of $170 million, and stock-based compensation of $149 million. The net change in assets and liabilities was mainly due to a decrease in deferred revenue of $979 million, a decrease in accrued liabilities of $633 million, a decrease in accounts payable of $187 million and an increase in prepaid expenses and other assets of $142 million, partially offset by a decrease in accounts receivable of $1.2 billion and a decrease in inventory of $234 million.

Net operating cash flows decreased by $5.2 billion, or 170%, during the six months ended June 30, 2023, compared to the same period in 2022, primarily attributable to a decrease in net income of $7.2 billion, partially offset by a change in deferred revenue of $1.4 billion and inventory of $714 million.

Investing activities

Our primary investing activities consist of purchases, sales, and maturities of our investments, capital expenditures for leasehold improvements, manufacturing, laboratory, computer equipment and software, and business development.

Net cash provided by investing activities for the six months ended June 30, 2023 was $4.0 billion, which primarily included proceeds from maturities and sales of marketable securities of $5.7 billion, partially offset by purchases of marketable securities of $1.3 billion, purchases of property and equipment of $347 million, and a business acquisition, net of cash acquired of $85 million.

Net investing cash flows increased by $9.0 billion, or 178%, during the six months ended June 30, 2023, compared to the same period in 2022, primarily due to a decrease in purchases of marketable securities of $7.5 billion and an increase in proceeds from maturities of marketable securities of $1.9 billion.

Financing activities

Net cash used in financing activities for the six months ended June 30, 2023 was $1.2 billion, primarily due to repurchases of common stock of $1.2 billion.

Net cash used in financing activities decreased by $759 million, or 39%, during the six months ended June 30, 2023, compared to the same period in 2022, mainly due to a decrease in repurchases of common stock.

Operation and funding requirements

Our principal sources of funding as of June 30, 2023 consisted of cash and cash equivalents, investments, and cash we may generate from operations. We generated net income of $8.4 billion and $12.2 billion for the years ended 2022 and 2021, following the authorization of our first commercial product in December 2020. From our inception to the end of 2020, we incurred significant losses from operations due to our significant research and development expenses. We also incurred a net loss of $1.3 billion for the six months ended June 30, 2023. We have retained earnings of $17.0 billion as of June 30, 2023.

We have significant future capital requirements including expected operating expenses to conduct research and development activities, operate our organization, meet capital expenditure needs, and fund our share repurchase programs (refer to Note 14 to our condensed consolidated financial statements). We expect our expenses to increase in connection with our ongoing activities, particularly as we continue research and development of our development candidates and clinical activities for our investigational medicines. We also expect our expenses to increase associated with manufacturing costs, including our arrangements with our international supply and manufacturing partners. Our ongoing work on our RSV, seasonal flu and CMV vaccine candidates, individualized neoantigen therapy, COVID-19 vaccines, including development of any new generations of boosters and vaccines against variants of SARS-CoV-2, late-stage clinical development, and buildout of global commercial, regulatory, sales and marketing infrastructure will require significant cash outflows during 2023, most of which will not be reimbursed or otherwise paid for by our partners or collaborators. In addition, we have substantial facility, lease and purchase obligations (refer to Note 12 and Note 13 to our condensed consolidated financial statements). We have entered into certain collaboration and licensing agreements with third parties that include the funding of certain research and development activities and potential future milestone and royalty payments by us.

We believe that our cash, cash equivalents, and investments as of June 30, 2023, together with cash expected to be generated from operations, will be sufficient to enable us to fund our projected operations, capital expenditures and stock repurchases through at least the next 12 months from the issuance of these financial statements included in this Form 10-Q. We are subject to all the risks related to the development and commercialization of novel medicines, and we may encounter unforeseen expenses, difficulties, complications, delays, and other unknown factors, which may adversely affect our business. For example, we have experienced a decline in customer demand for our COVID-19 vaccine as the market continues to shift to an endemic seasonal market in 2023, and we may continue to experience negative cash flow from operations in future periods as we continue to invest in our business to support future product launches. Our forecast of the period of time through which our financial resources will be adequate to support our operations is a forward-looking statement and involves risks and uncertainties, and actual results could vary as a result of a number of factors. We have based this estimate on assumptions that may prove to be wrong, and we could utilize our available capital resources sooner than we currently expect.

Critical accounting policies and significant judgments and estimates

There have been no material changes in our critical accounting policies and estimates in the preparation of our condensed consolidated financial statements during the three months ended June 30, 2023 compared to those disclosed in our 2022 Form 10-K.

Contractual Obligations

As of June 30, 2023, other than disclosed within Note 12 and Note 13 to our condensed consolidated financial statements, there have been no material changes to our contractual obligations and commitments from those described under “Management’s Discussion and Analysis of Financial Condition and Results of Operations” included in our 2022 Form 10-K.

Item 3. Quantitative and Qualitative Disclosures about Market Risk

Our market risks, and the way we manage them, are summarized in Part II, Item 7A, “Quantitative and Qualitative Disclosures About Market Risk” of our 2022 Form 10-K. There have been no material changes to our market risk or to our management of such risks for the three and six months ended June 30, 2023.

Item 4. Controls and Procedures

Disclosure Controls and Procedures

Our management, with the participation of our Chief Executive Officer and our Chief Financial Officer, evaluated the effectiveness of our disclosure controls and procedures as of June 30, 2023. The term "disclosure controls and procedures," as defined in Rules 13a-15(e) and 15d-15(e) under the Exchange Act means controls and other procedures of a company that are designed to ensure that information required to be disclosed by a company in the reports that it files or submits under the Exchange Act is recorded, processed, summarized and reported, within the time periods specified in the SEC's rules and forms. Disclosure controls and procedures include, without limitation, controls and procedures designed to ensure that information required to be disclosed by a company in the reports that it files or submits under the Exchange Act is accumulated and communicated to the company's management, including its principal executive and principal financial officers, as appropriate to allow timely decisions regarding required disclosure. Management recognizes that any controls and procedures, no matter how well designed and operated, can provide only reasonable assurance of achieving their objectives and management necessarily applies its judgment in evaluating the cost-benefit relationship of possible controls and procedures. Based on the evaluation of our disclosure controls and procedures as of June 30, 2023, our Chief Executive Officer and Chief Financial Officer concluded that, as of such date, our disclosure controls and procedures were effective at the reasonable assurance level.

Changes in Internal Control over Financial Reporting

There were no changes in our internal control over financial reporting (as defined in Rules 13a-15(f) and 15d-15(f) under the Exchange Act) during the three months ended June 30, 2023, which have materially affected, or are reasonably likely to materially affect, our internal control over financial reporting.

Inherent Limitations on Effectiveness of Controls

Our management, including our Chief Executive Officer and Chief Financial Officer, believes that our disclosure controls and procedures and internal control over financial reporting are designed to provide reasonable assurance of achieving their objectives and are effective at the reasonable assurance level. However, our management does not expect that our disclosure controls and procedures or our internal control over financial reporting will prevent all errors and all fraud. A control system, no matter how well-conceived and operated, can provide only reasonable, not absolute, assurance that the objectives of the control system are met. Further, the design of a control system must reflect the fact that there are resource constraints, and the benefits of controls must be considered relative to their costs. Because of the inherent limitations in all control systems, no evaluation of controls can provide absolute assurance that all control issues and instances of fraud, if any, have been detected. These inherent limitations include the realities that judgments in decision making can be faulty, and that breakdowns can occur because of a simple error or mistake. Additionally, controls can be circumvented by the individual acts of some persons, by the collusion of two or more people or by a management override of the controls. The design of any system of controls also is based in part upon certain assumptions about the likelihood of future events, and there can be no assurance that any design will succeed in achieving its stated goals under all potential future conditions; over time, controls may become inadequate because of changes in conditions, or the degree of compliance with policies or procedures may deteriorate. Because of the inherent limitations in a cost-effective control system, misstatements due to error or fraud may occur and not be detected.

PART II

Item 1. Legal Proceedings

We are involved in various claims and legal proceedings of a nature considered ordinary course in our business, including the intellectual property litigation described in our 2022 Form 10-K under the heading "Legal Proceedings." Most of the issues raised by these claims are highly complex and subject to substantial uncertainties. For a description of risks relating to these and other legal proceedings we face, see Part I, Item 1A., "Risk Factors," of our 2022 Form 10-K, including the discussion under the headings entitled "Risks related to our intellectual property" and "Risks related to the manufacturing of our commercial products, development candidates, investigational medicines and our future pipeline." The outcome of any such proceedings, regardless of the merits, is inherently uncertain; therefore, assessing the likelihood of loss and any estimated damages is difficult and subject to considerable judgment.

Item 1A. Risk Factors

Information regarding risk and uncertainties related to our business appears in Part I, Item 1A. "Risk Factors" of our 2022 Form 10-K. There have been no material changes from the risk factors previously disclosed in the 2022 Form 10-K.

Item 2. Unregistered Sales of Equity Securities and Use of Proceeds

Issuer Purchases of Equity Securities

The following table provides information with respect to the shares of common stock repurchased by us during the three months ended June 30, 2023:

Period	Total Number of Shares Purchased	Average Price Paid per Share[1]	Total Number of Shares Purchased as Part of Publicly Announced Program	Approximate Dollar Value of Shares that May Yet Be Purchased Under the Program (in millions)[2]
April 1 - April 30, 2023	2,702,957	$ 146.71	2,702,957	$ 1,896
May 1 - May 31, 2023	1,727,343	$ 132.90	1,727,343	$ 1,667
June 1 - June 30, 2023	—	$ —	—	$ 1,667
Total	4,430,300		4,430,300	

[1]Average price paid per share includes related expenses and excise tax.
[2]On February 22, 2022, our Board of Directors authorized a share repurchase program for our common stock of up to $3.0 billion, with no expiration date. This share repurchase program was increased by the Board of Directors by an additional $3.0 billion on August 1, 2022, also with no expiration date.

Refer to Note 14 to condensed consolidated financial statements for information regarding our share repurchase programs.

Item 6. Exhibits

The Exhibits listed below are filed or incorporated by reference as part of this Form 10-Q.

Exhibit No.	Exhibit Index
31.1*	Certification of Principal Executive Officer pursuant to Rule 13a-14(a) and Rule 15d-14(a) of the Securities Exchange Act of 1934, as adopted pursuant to Section 302 of the Sarbanes-Oxley Act of 2002
31.2*	Certification of Principal Financial Officer pursuant to Rule 13a-14(a) and Rule 15d-14(a) of the Securities Exchange Act of 1934, as adopted pursuant to Section 302 of the Sarbanes-Oxley Act of 2002
32.1+	Certification pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002
101.INS*	XBRL Instance Document - The instance document does not appear in the Interactive Data File because its XBRL tags are embedded within the Inline XBRL document
101.SCH*	XBRL Taxonomy Extension Schema Document
101.CAL*	XBRL Taxonomy Extension Calculation Document
101.DEF*	XBRL Taxonomy Extension Definition Linkbase Document
101.LAB*	XBRL Taxonomy Extension Label Linkbase Document
101.PRE*	XBRL Taxonomy Extension Presentation Link Document
104*	Cover Page Interactive Data File (formatted as Inline XBRL with applicable taxonomy extension information contained in Exhibits 101.)

* Filed herewith

\+ The certification furnished in Exhibit 32.1 hereto is deemed to accompany this Form 10-Q and will not be deemed "filed" for purposes of Section 18 of the Securities Exchange Act of 1934, as amended. Such certification will not be deemed to be incorporated by reference into any filings under the Securities Act of 1933, as amended, or the Securities Exchange Act of 1934, as amended, except to the extent that the Registrant specifically incorporates it by reference.

SIGNATURES

Pursuant to the requirements of the Section 13 or 15(d) of the Securities Exchange Act of 1934, the Registrant has duly caused this report to be signed on its behalf by the undersigned, thereunto duly authorized.

MODERNA, INC.

Date:
August 3, 2023

By: /s/ Stéphane Bancel

Stéphane Bancel
Chief Executive Officer and Director
(*Principal Executive Officer)*

Date:
August 3, 2023

By: /s/ James M. Mock

James M. Mock
Chief Financial Officer
(*Principal Financial Officer)*

Exhibit 31.1

CERTIFICATION PURSUANT TO RULES 13a-14(a) AND 15d-14(a) UNDER THE SECURITIES EXCHANGE ACT OF 1934, AS ADOPTED PURSUANT TO SECTION 302 OF THE SARBANES-OXLEY ACT OF 2002

CERTIFICATIONS

I, Stéphane Bancel, certify that:

1. I have reviewed this Quarterly Report on Form 10-Q of Moderna, Inc.;

2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;

3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;

4. The registrant's other certifying officer and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) for the registrant and have:

   (a) Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;

   (b) Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;

   (c) Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and

   (d) Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and

5. The registrant's other certifying officer and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):

   (a) All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and

   (b) Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Date: August 3, 2023

By: /s/ Stéphane Bancel

Stéphane Bancel
Chief Executive Officer
(Principal Executive Officer)

Exhibit 31.2

CERTIFICATION PURSUANT TO RULES 13a-14(a) AND 15d-14(a) UNDER THE SECURITIES EXCHANGE ACT OF 1934, AS ADOPTED PURSUANT TO SECTION 302 OF THE SARBANES-OXLEY ACT OF 2002

CERTIFICATIONS

I, James M. Mock, certify that:

1. I have reviewed this Quarterly Report on Form 10-Q of Moderna, Inc.;

2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;

3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;

4. The registrant's other certifying officer and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) for the registrant and have:

   (a) Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;

   (b) Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;

   (c) Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and

   (d) Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and

5. The registrant's other certifying officer and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):

   (a) All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and

   (b) Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Date: August 3, 2023

By: /s/ James M. Mock

James M. Mock
Chief Financial Officer
(Principal Financial Officer)

Exhibit 32.1

CERTIFICATION PURSUANT TO
18 U.S.C. SECTION 1350
AS ADOPTED PURSUANT TO SECTION 906
OF THE SARBANES-OXLEY ACT OF 2002

In connection with the Quarterly Report on Form 10-Q of Moderna, Inc. (the "Company") for the period ended June 30, 2023 as filed with the Securities and Exchange Commission on the date hereof (the "Report"), we, Stéphane Bancel, Chief Executive Officer of the Company, and James M. Mock, Chief Financial Officer of the Company, certify, pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002, that to the best of our knowledge:

1. The Report fully complies with the requirements of Section 13(a) or 15(d) of the Securities Exchange Act of 1934, as amended; and
2. The information contained in the Report fairly presents, in all material respects, the financial condition and results of operations of the Company.

Date: August 3, 2023

By: /s/ Stéphane Bancel
Stéphane Bancel
Chief Executive Officer
(Principal Executive Officer)

Date: August 3, 2023

By: /s/ James M. Mock
James M. Mock
Chief Financial Officer
(Principal Financial Officer)