

ASSET SERVICING

Asset Servicing Digital Update Q1 2023

APRIL 2023

Execution in Action for 2023 – Data and Digital Execution Focus

Enhancing the overall client experience with the evolution of our digital ecosystem

Institutional Passport Portfolio Valuation Modernization Deliver a new set of core experiences across a suite of pages in our Portfolio Valuation & Exposure offerings with enhanced visual depiction of data

Released **Client Digital Metrics Dashboards** to improve awareness of client usage and experiences across our digital servicing channels

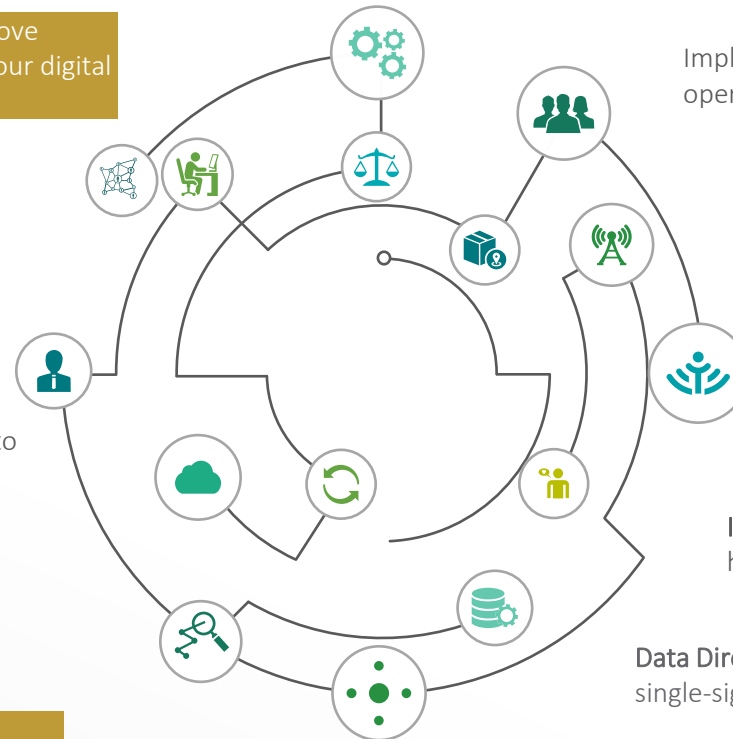
Implemented **IRAS Market Risk and ESG data** in **RADAR** application

Expanded **Strategic Data Sets** available for consumption via **Data Warehouse Files**

Launched **Data Warehouse Solutions** which allow clients to leverage **Strategic Data Sets** and obtain bespoke data views into their Warehouse or applications via **API**

Partnering with **Snowflake** on Data Warehouse Solutions initiatives

Launched **Settlement Monitor** providing timely, insightful data to enhance monitoring of settlements



Implemented **Behavioural Analytics** and **Fund Peek Through** operational support teams.

Implemented **Security Governance Module** providing transparency into KPIs, SLAs and **Market Value Differences** between books of record.

Implementation of enhanced **Passport Security Authentication and Architecture** leveraging industry leading security infrastructure

Investment Performance APIs offered by IRAS have been migrated to the API Store.

Data Direct added to the suite of applications we offer single-sign security authentication capability.

API Store recognized as “**Best Data Management Initiative**” by Waters Technology American Financial Technology Awards.

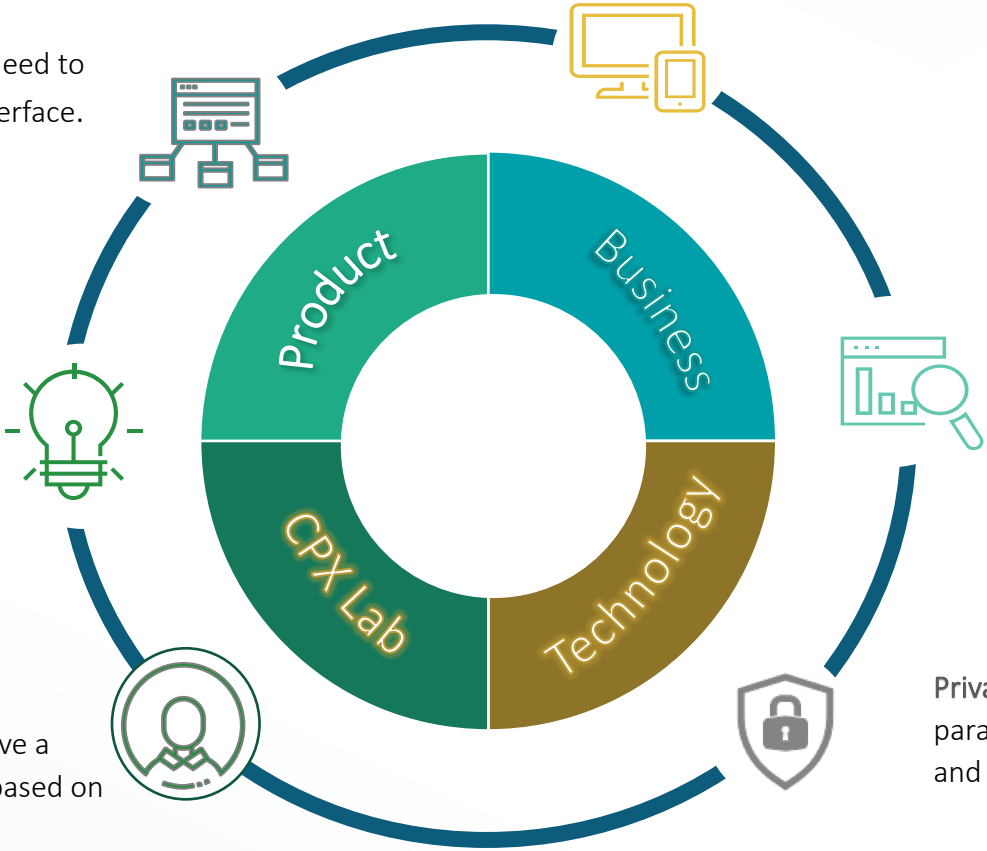
Our Digital Tenets

Access Anywhere - Providing multi channel data solutions across web applications, mobile and APIs to deliver a flexible and consistent client experience.

Enhanced Efficiency - Shortening the time from need to fulfillment. Designing a simple and intuitive user interface.

Knowledge from Numbers - Using technology to tailor the data tsunami, making it relevant, and providing depth on demand only when needed

Client Centric Solutions - Ensuring solutions have a view from the outside in, providing solutions based on client business needs and objectives



Analytical Awareness - A new generation of customizable digital tools that personalize experiences, optimizes data and allows the freedom to focus on what really matters.

Privacy & Security- Data privacy concerns are paramount. We continue to strengthen our privacy and security.

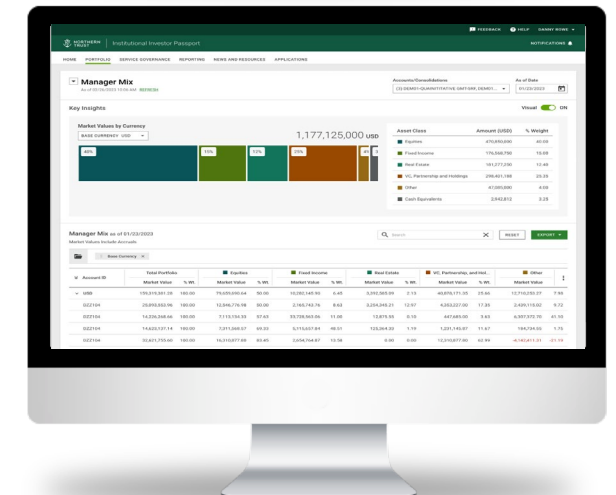
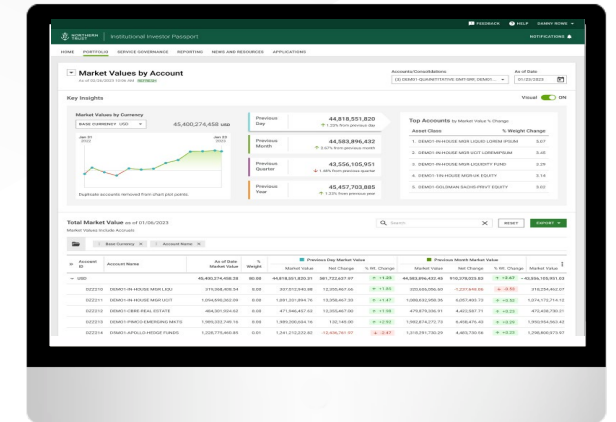
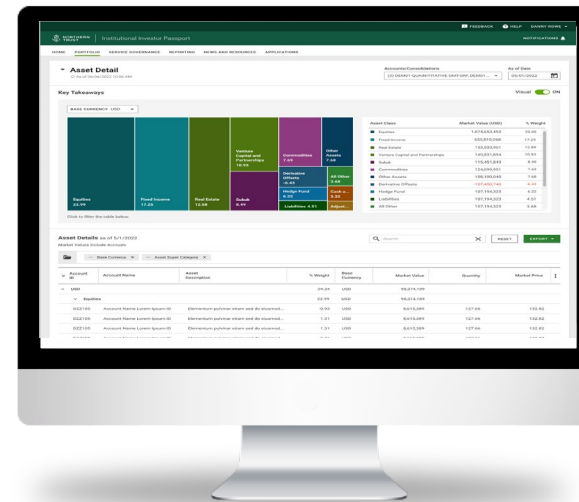
Institutional Investor Passport

New Portfolio Valuation Pages

Delivering digital solutions to support core client decisions

Key Features

- New digital interface designed to promote portfolio insights through improved visualization of data
- Leverages NT Human Centered Design approach to provide a modernized, interactive client experience
- Flexibility to customize data layout and group content according to user preference
- Filters and sorting simplify interaction with account data
- Supports both single account and consolidated views
- New responsive design provides flexibility to view in desktop, tablet and mobile experiences
- Accessibility compliant user interface

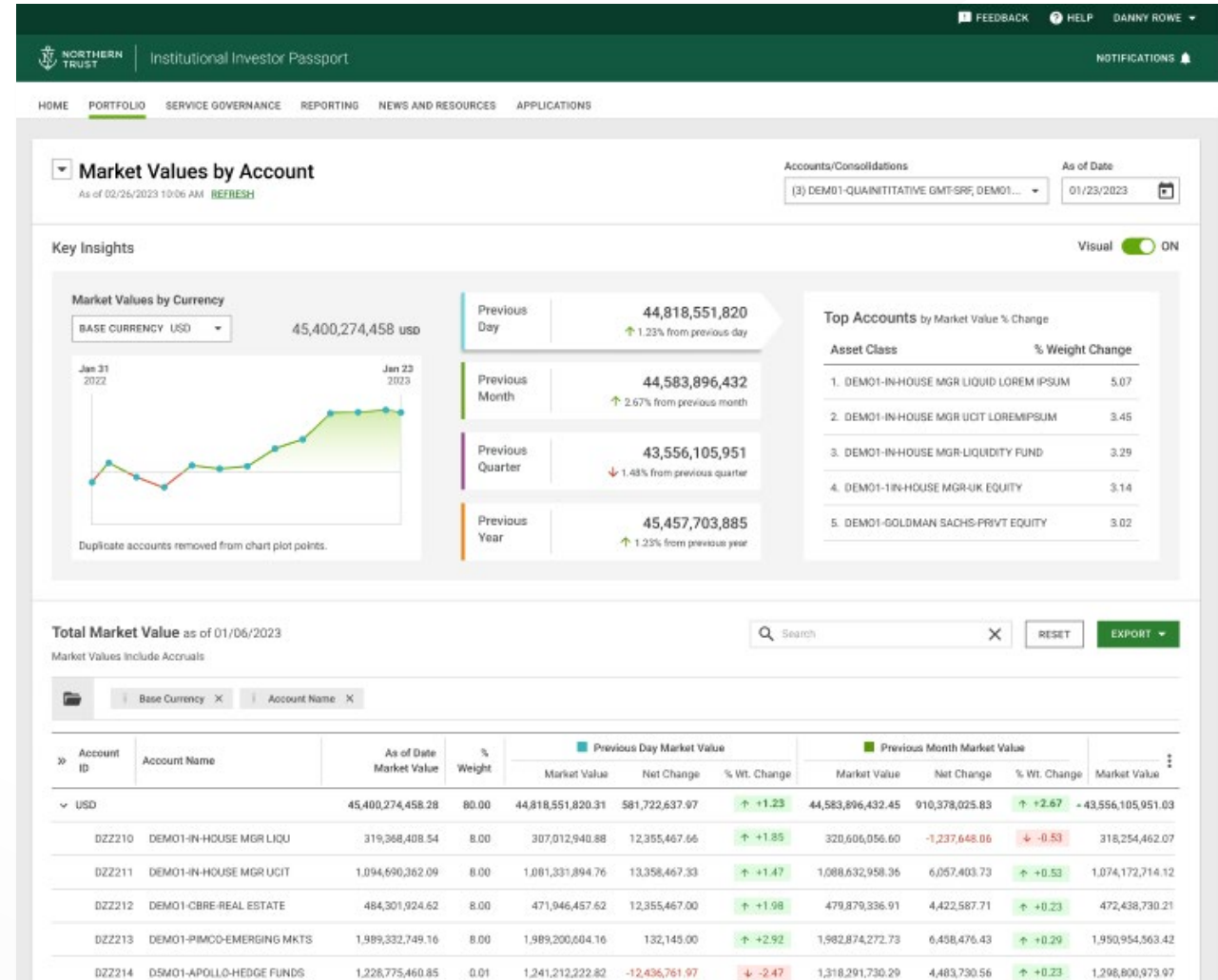


Portfolio Valuation – Market Values by Account

Delivering digital solutions to support core client decisions

Key Features

- Depicts breakdown of accounting-based valuations
- Charting represents breakdown of market value comparisons to previous time periods by selected base currency
- Table data includes
 - As of Date Market Value
 - Weight
 - Net Change
 - Percent Change
- View across various base currencies when multiple accounts are selected

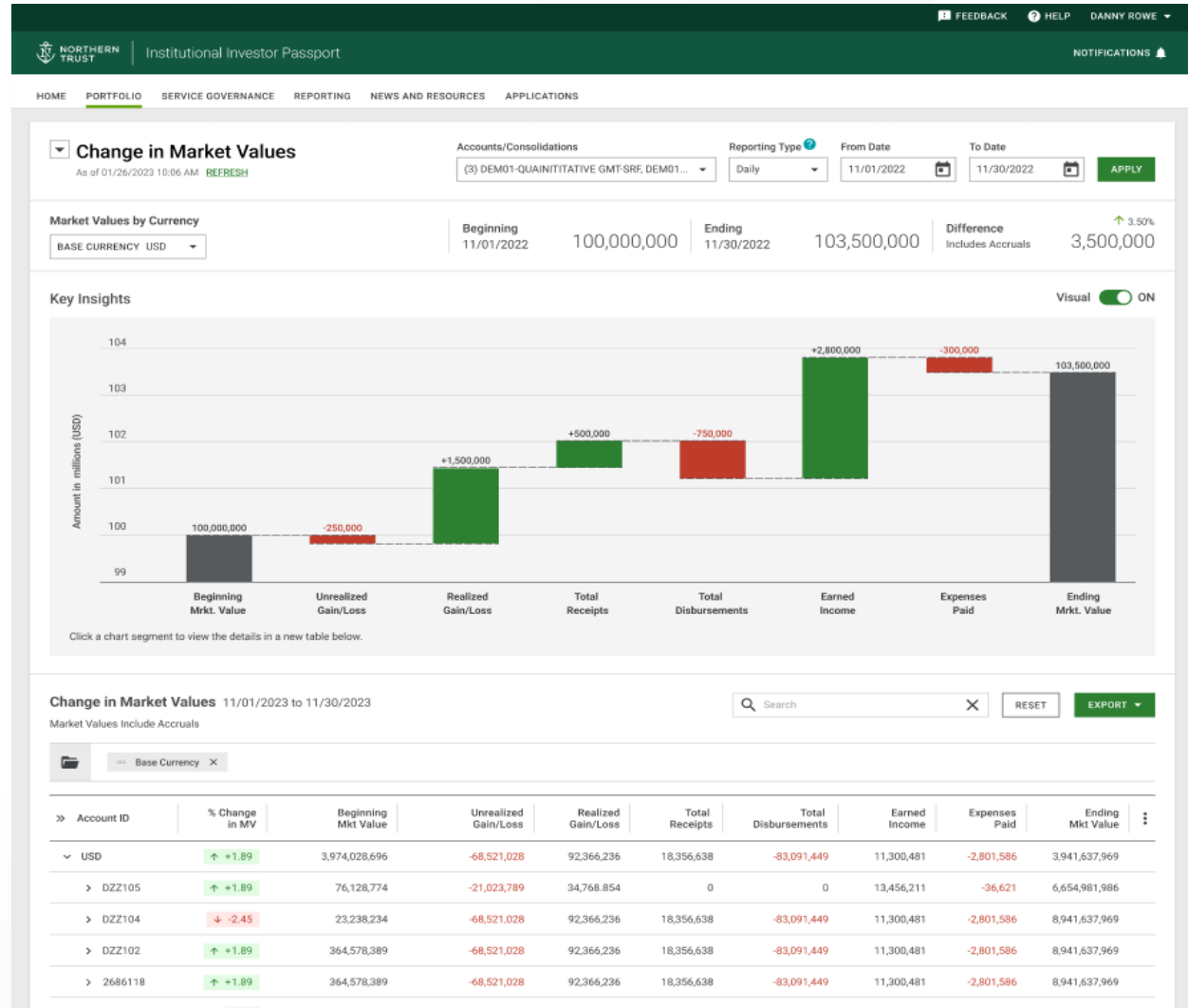


Portfolio Valuation – Change in Market Values

Delivering digital solutions to support core client decisions

Key Features

- Depicts breakdown of accounting-based investment valuations
 - Component data includes
 - ✓ Beginning/Ending Market Values
 - ✓ Unrealized Gains/Losses
 - ✓ Realized Gains/Losses
 - ✓ Total Receipts
 - ✓ Total Disbursements
 - ✓ Earned Income
 - ✓ Expenses Paid
 - ✓ User defined period of concentration provides flexibility to analyze across custom dates
- User defined period of concentration provides flexibility to analyze across custom dates
- View across various base currencies when multiple accounts are selected
- Future phase would introduce new APIs that provide enhanced drill down

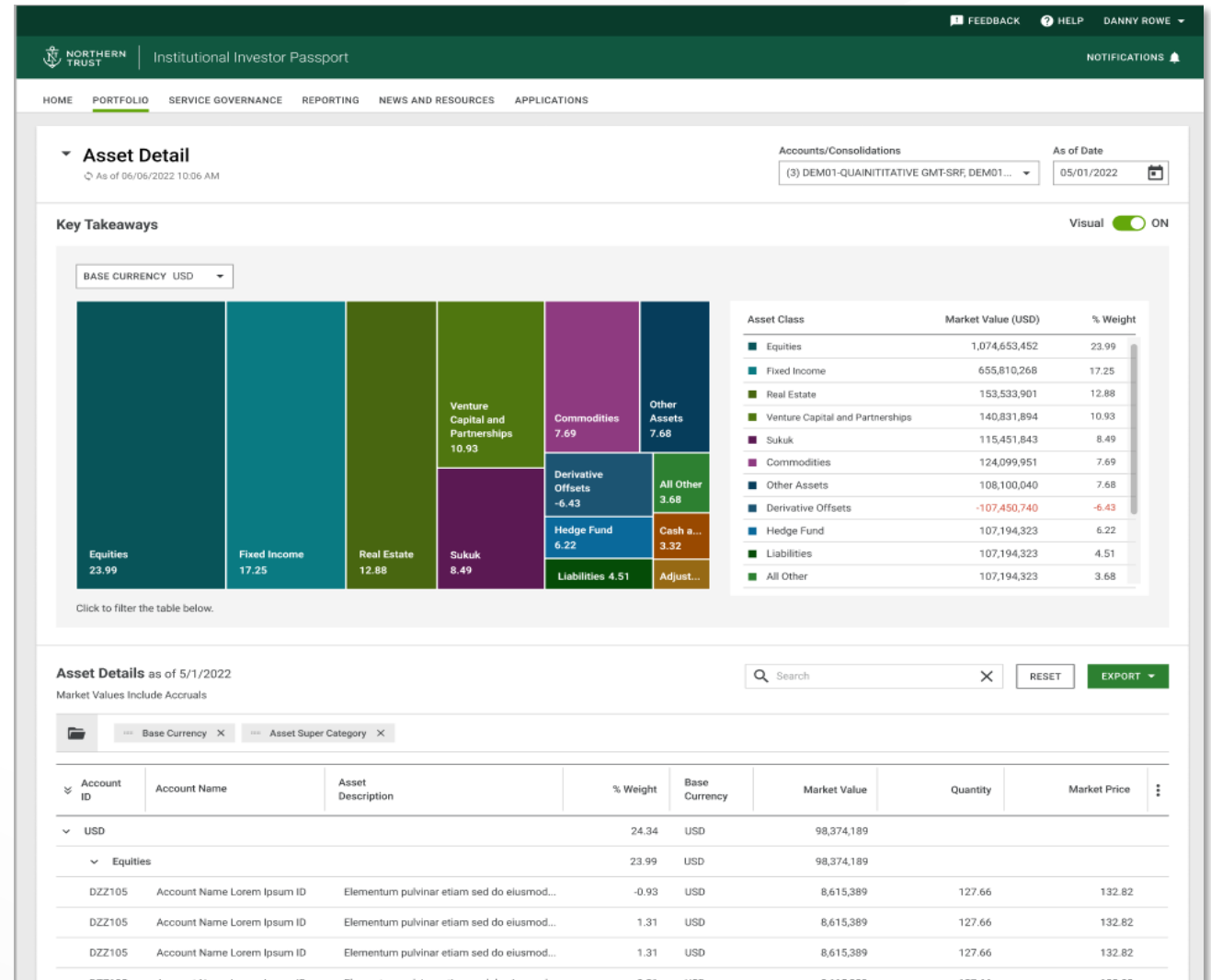


Portfolio Valuation – Asset Detail

Delivering digital solutions to support core client decisions

Key Features

- Tree map view of exposure across asset classes
- Component data includes
 - ✓ Asset Description
 - ✓ Quantity
 - ✓ Ending Market Values
 - ✓ Percent Weight
 - ✓ Unrealized Gains/Losses
 - ✓ Cost
 - ✓ Asset Super Category
 - ✓ Asset Sub-Category
- View across various base currencies when multiple accounts are selected.

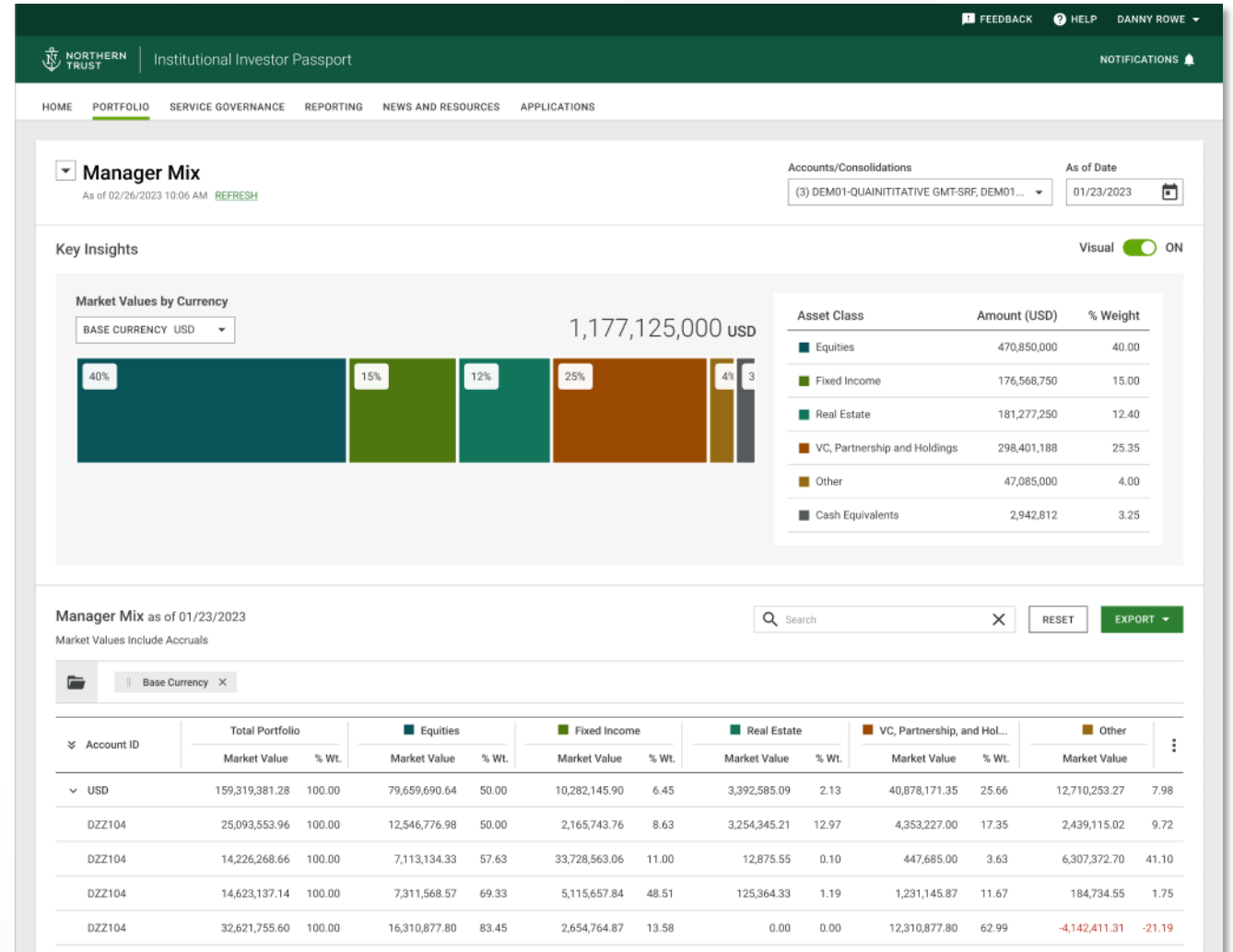


Portfolio Valuation – Manager Mix

Delivering digital solutions to support core client decisions

Key Features

- Horizontal Bar Chart view of exposure across asset classes
- Component data includes:
 - Ending Market Values
 - % Weight
 - ✓ Total Portfolio
 - ✓ Equities
 - ✓ Fixed Income
 - ✓ Real Estate
 - ✓ VC, Partnerships & Hedge Funds
 - ✓ Cash Equivalents
 - ✓ Other
- View across various base currencies when multiple accounts are selected various base currencies when multiple accounts are selected

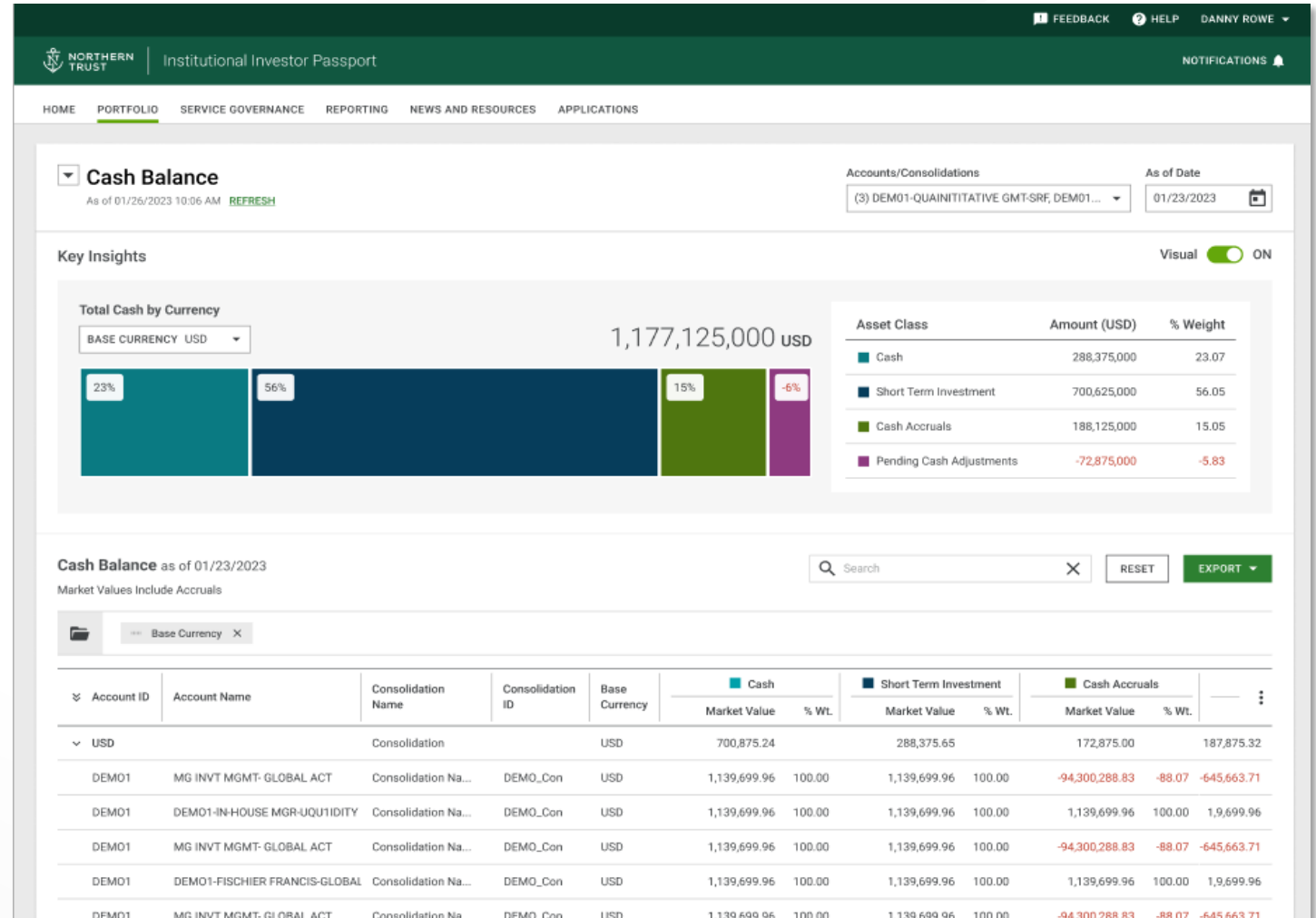


Portfolio Valuation – Cash Balance

Delivering digital solutions to support core client decisions

Key Features

- Horizontal Bar Chart view of exposure across cash categories
- Component data includes
 - Ending Market Values
 - % Weight
 - ✓ Total Cash
 - ✓ Cash
 - ✓ Short Term Investments
 - ✓ Pending Cash Adjustments
 - ✓ Cash Accruals
- View across various base currencies when multiple accounts are selected

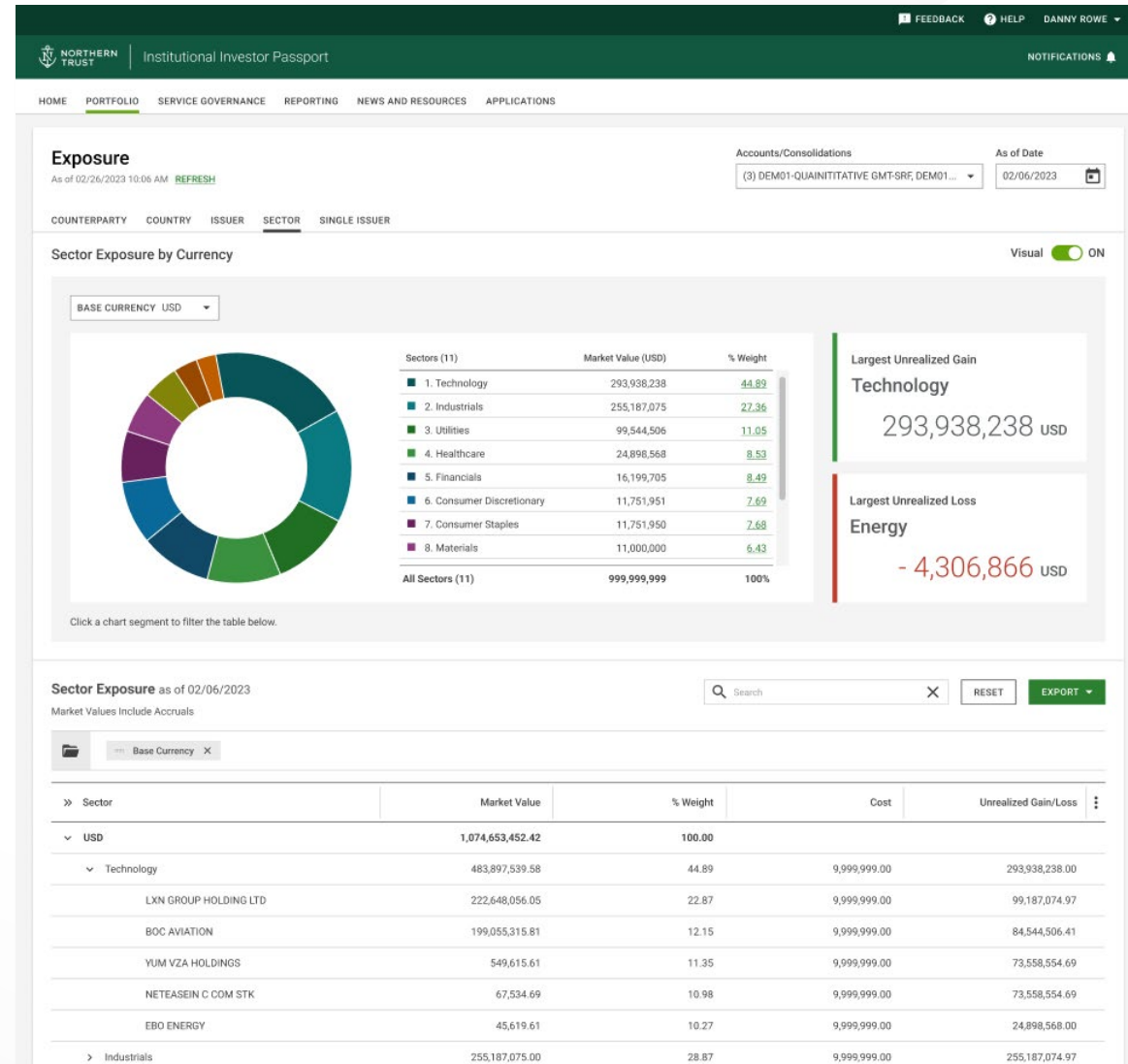


Portfolio Valuation – Sector Exposure

Delivering digital solutions to support core client decisions

Key Features

- Exposure views across Sector, Countries, Issuers and Counterparties
- Can be viewed across a single account or multiple accounts/consolidations
- Visual Cards easily identify asset class with Largest Unrealized Gain / Loss
- Content is exportable to Excel

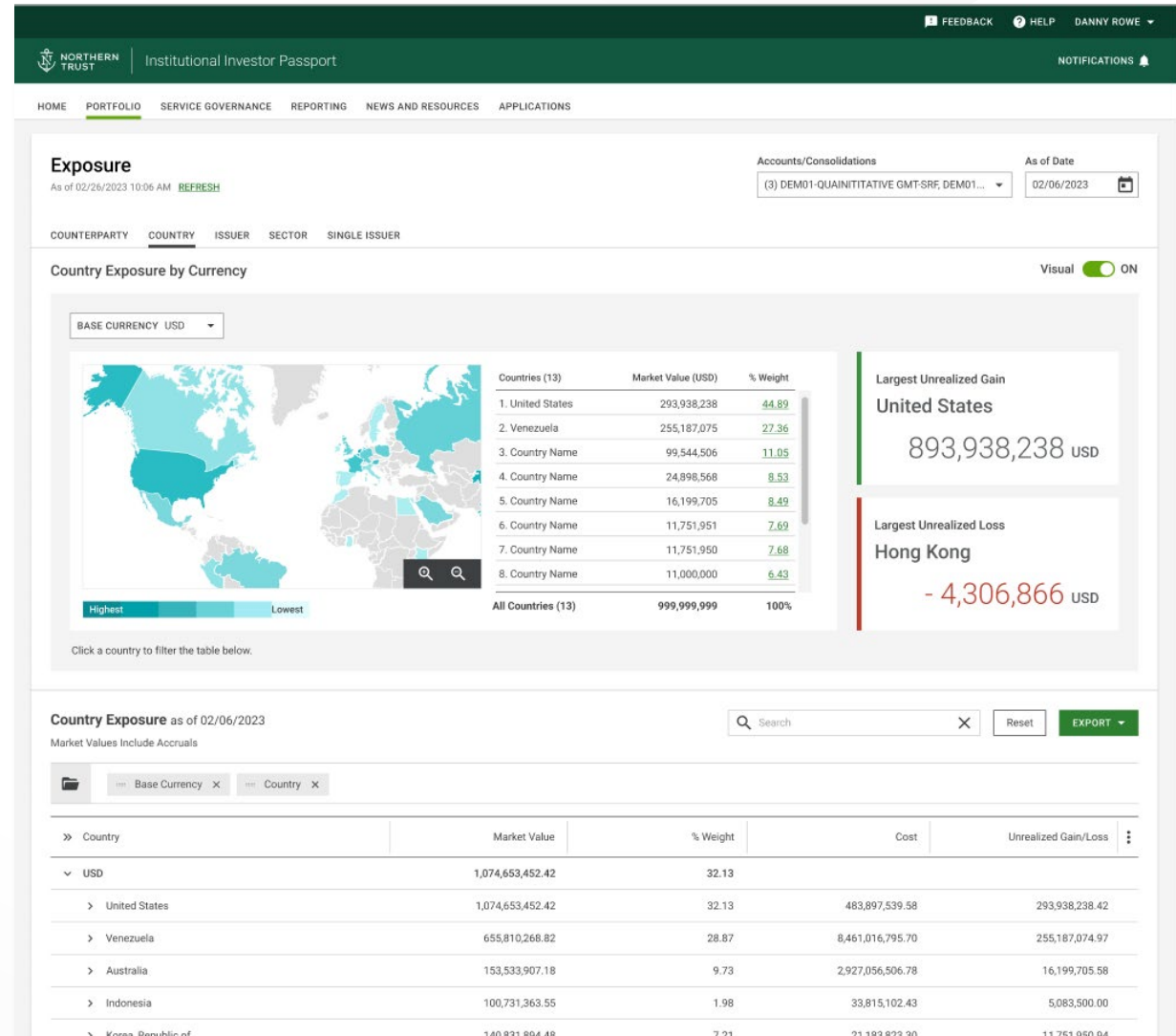


Portfolio Valuation – Country Exposure

Delivering digital solutions to support core client decisions

Key Features

- Exposure views across Sector, Countries, Issuers and Counterparties
- Can be viewed across a single account or multiple accounts/consolidations
- Visual Cards easily identify asset class with Largest Unrealized Gain / Loss
- Content is exportable to Excel

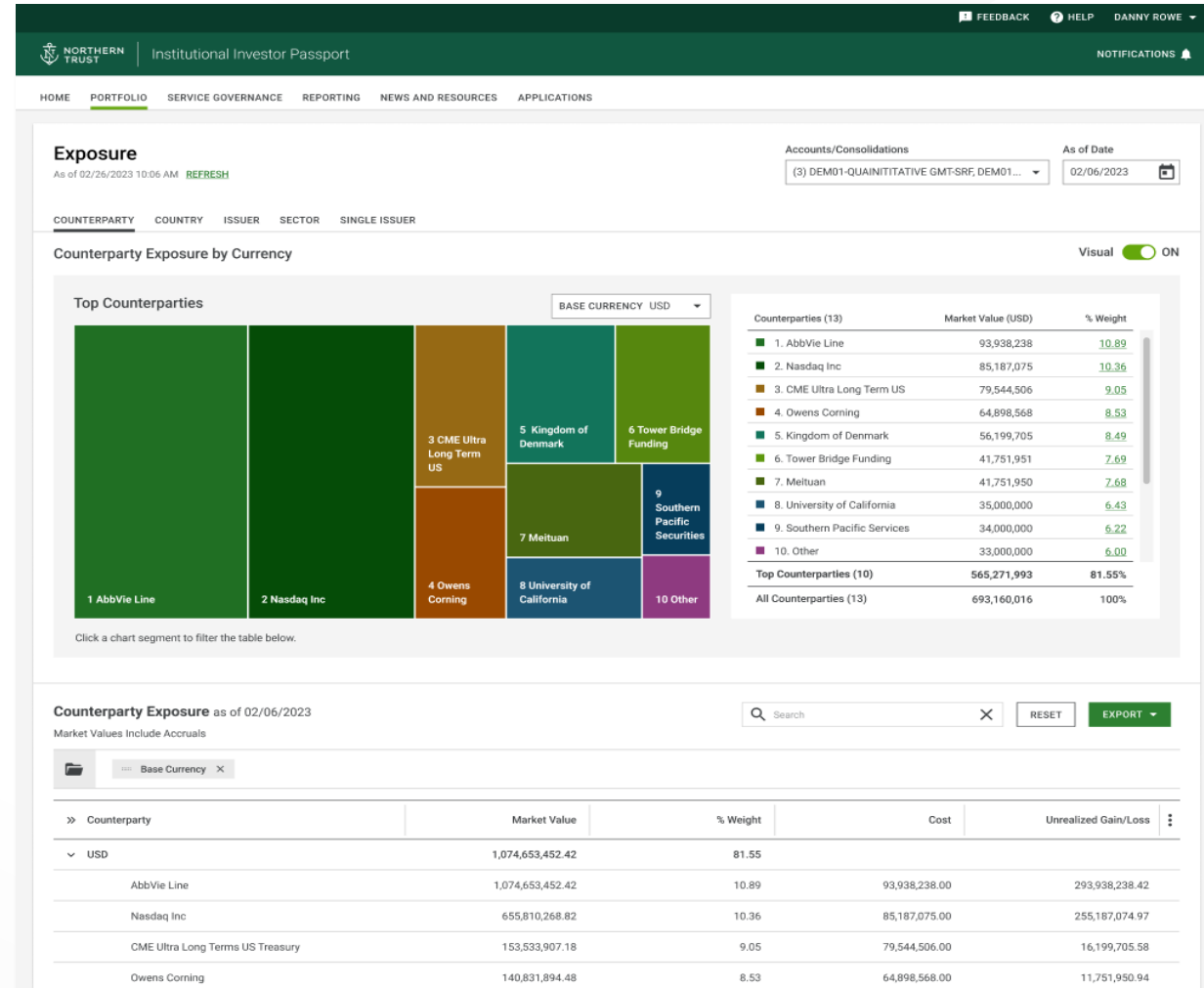


Portfolio Valuation – Issuer and Counterparty Exposure

Delivering digital solutions to support core client decisions

Key Features

- Release May '23
- Exposure views across Sector, Countries, Issuers and Counterparties
- Can be viewed across a single account or multiple accounts/consolidations
- Visual Cards easily identify asset class with Largest Unrealized Gain / Loss
- Content is exportable to Excel

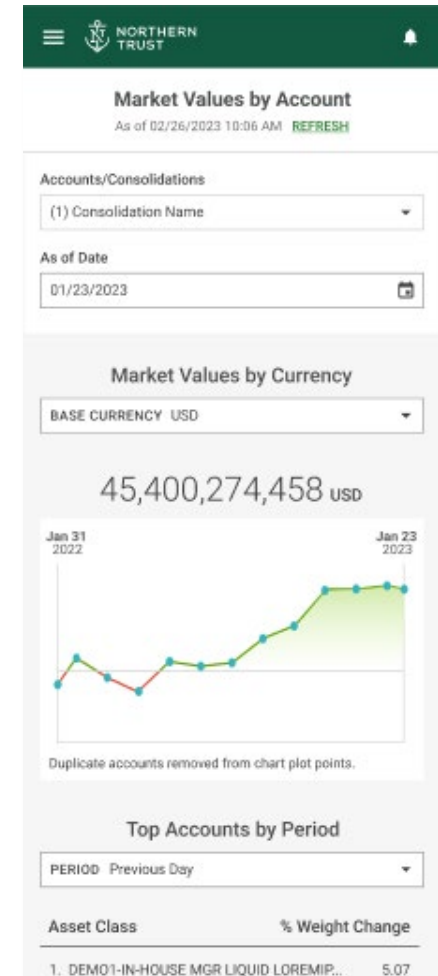
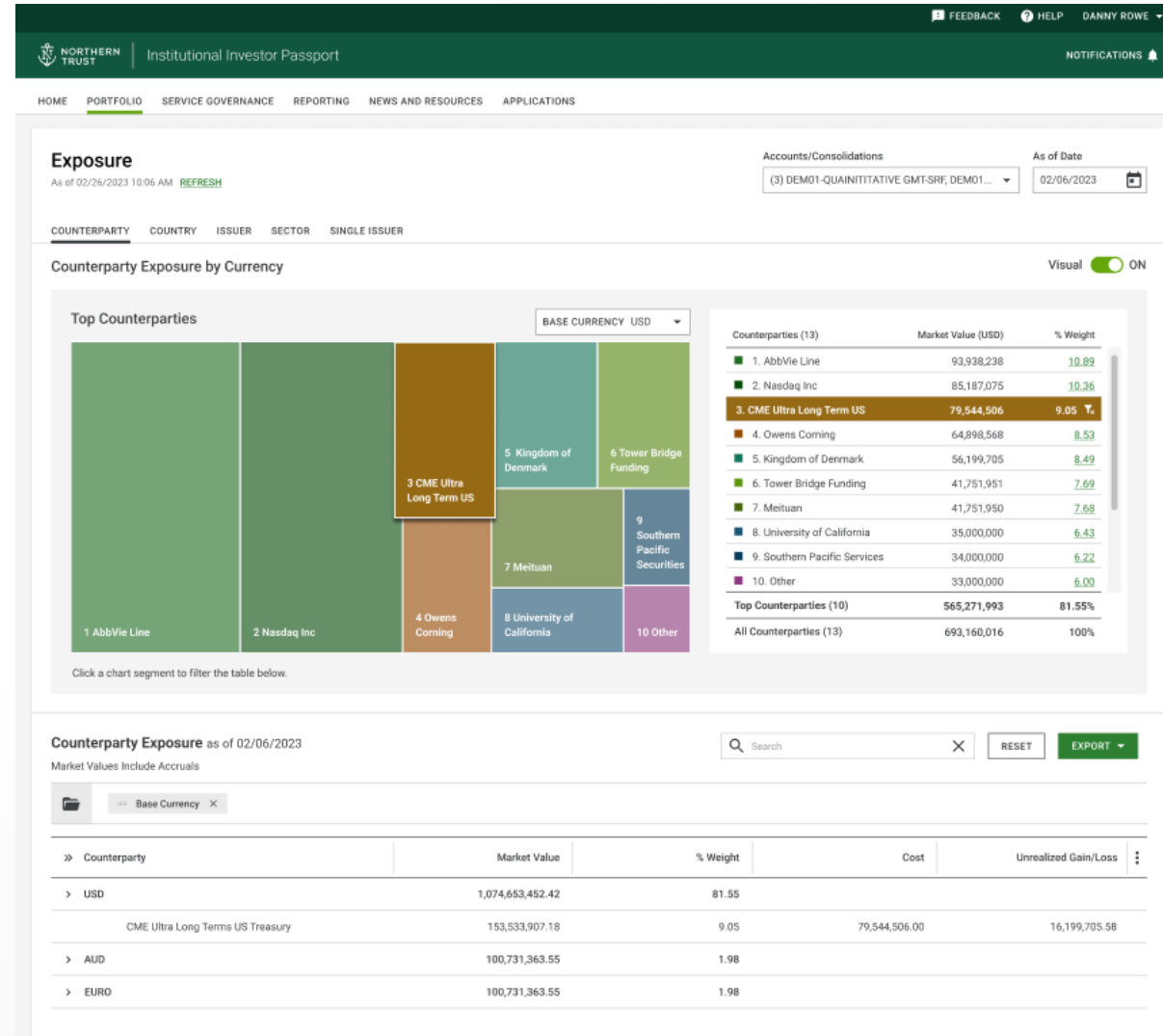


Portfolio Valuation – New features coming in 2023

Delivering digital solutions to support core client decisions

Targeted Features

- Introduce click on visual charting to filter table data
- Change in Market Value page will include drill down feature allowing users to interrogate chart to view transactional data
- Mobile / responsive view will improve usability on phones and tablets
- Additional cosmetic / usability improvements



Securities Services

Securities Services

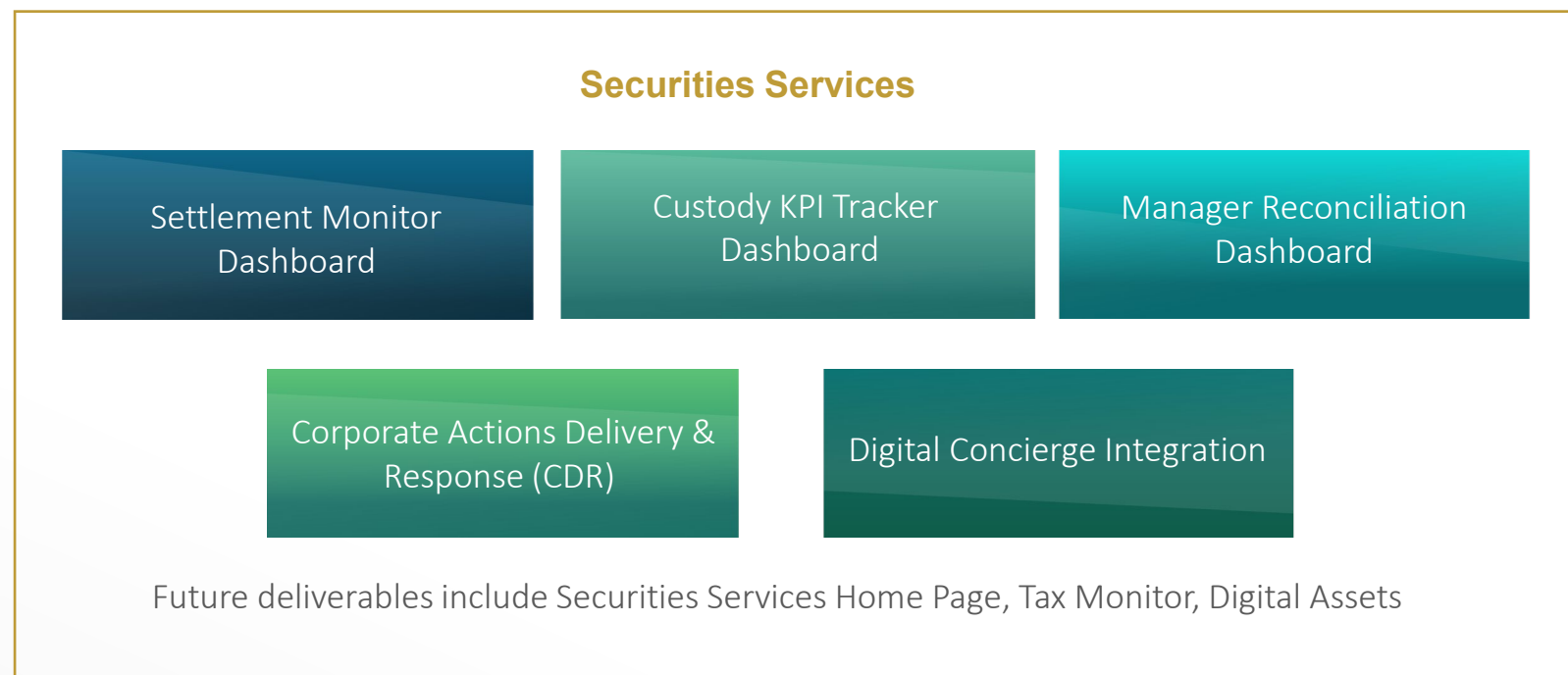
Enhancing our online digital experience to provide clients additional tools to monitor their custody portfolios

Strategic Vision

Enhance the Digital Client Securities Services experience to provide consistency and transparency into client data and analytics while increasing productivity for clients and Northern Trust partners alike.

Key Features

- Reduced fragmentation across a user's experience
- Enhanced visualizations designed for interactive experience
- Reduced manual reporting complexities
- Improved analytics & data automation
- Improved self-service



Settlement Monitor

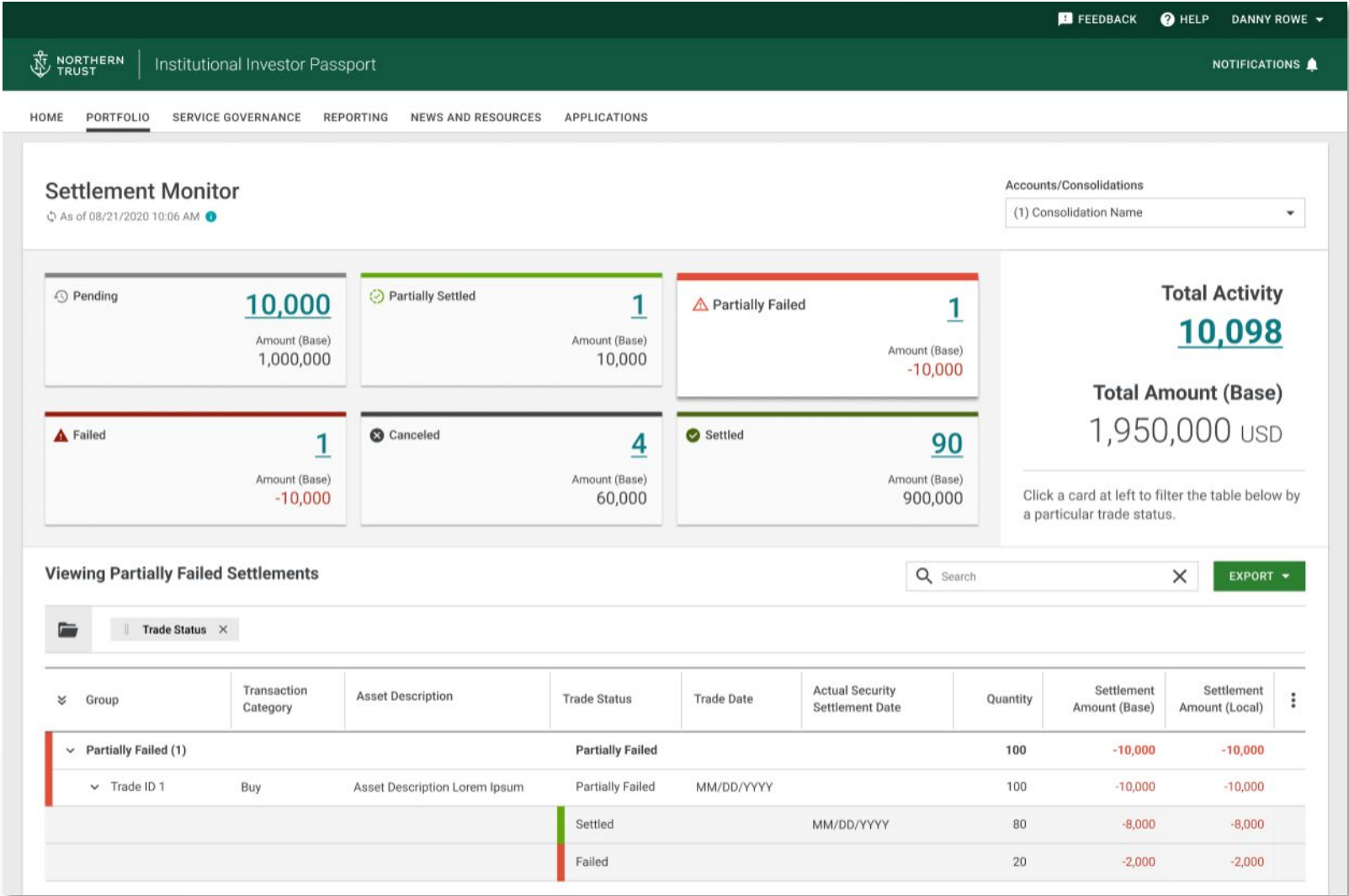
Delivering timely, insightful data to enhance client monitoring of settlements activity

Key Features

- Wealth Passport Integration April '23
- New Settlements ORC reports April '23
- Enhanced Narratives & Country of Settlement are expected 2Q '23
- Partial Status' delivered 4Q '22
- Improved navigation and workflow for more intuitive access to information
- Improved data coverage, quality & timeliness
- Multi-channel and responsive design allows via desktop, tablet, or mobile device



[Product Video available](#)



Securities Services Capabilities Catalogue

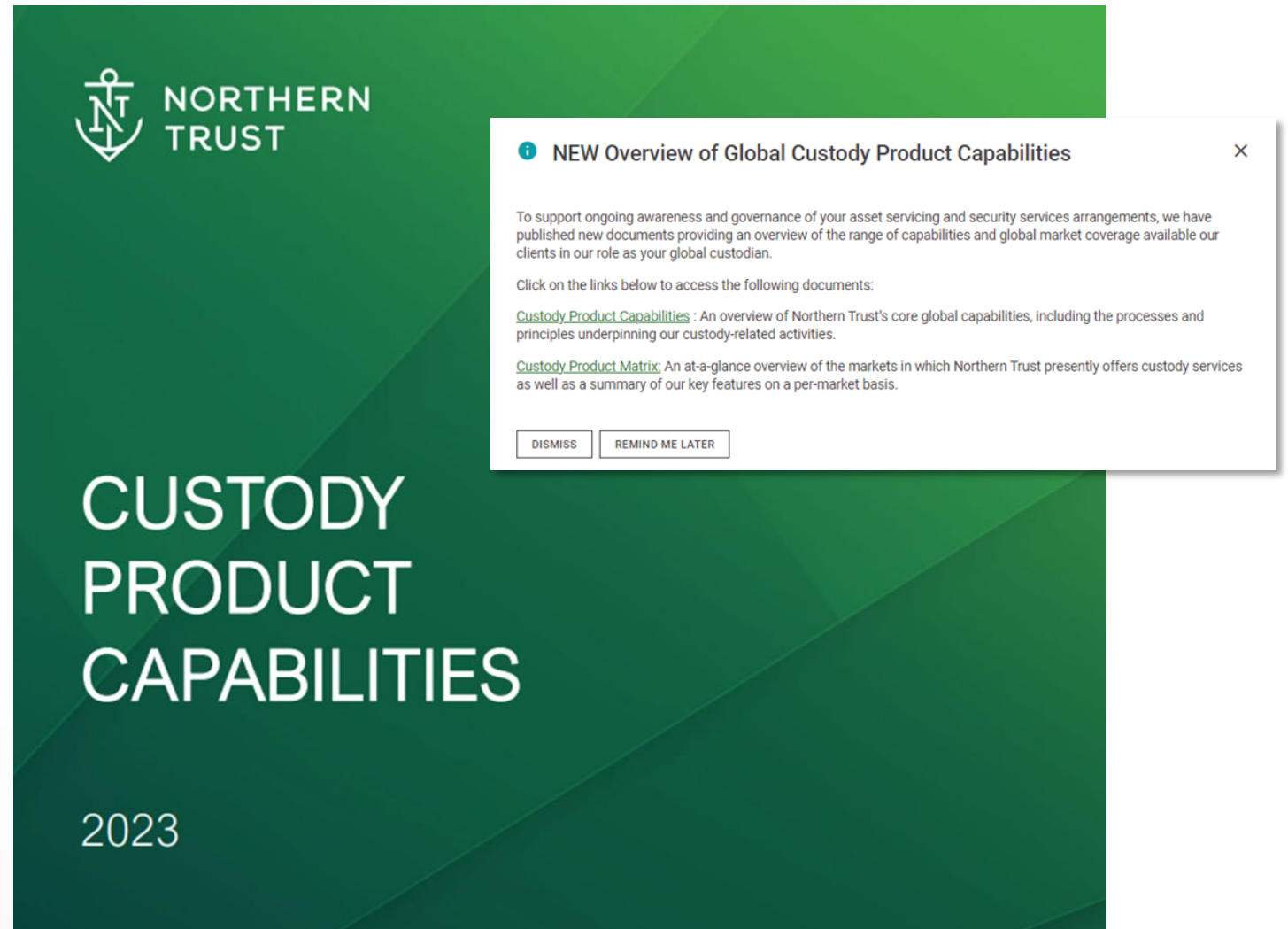
Provides a detailed review of Northern Trust's core capabilities as custodian with input of subject matter expertise from around the organization.

Key Features

The Securities Services Product Capabilities Catalogue provides a detailed review of Northern Trust's core capabilities as custodian with input of subject matter expertise from around the organization and a key focus on the client experience and what to expect from Northern Trust.

This catalogue focuses on these capabilities:

- Market Access and Account Structure
- Trade Communication and Settlement
- Transactions Linked to Foreign Exchange
- Tax Services
- Corporate Actions
- Income-related Services
- Proxy Voting
- Class Actions
- Manager Reconciliations



Service Governance Dashboards

Service Governance Overview

Enhanced monitoring and reporting solutions designed to deliver greater transparency

Key Drivers

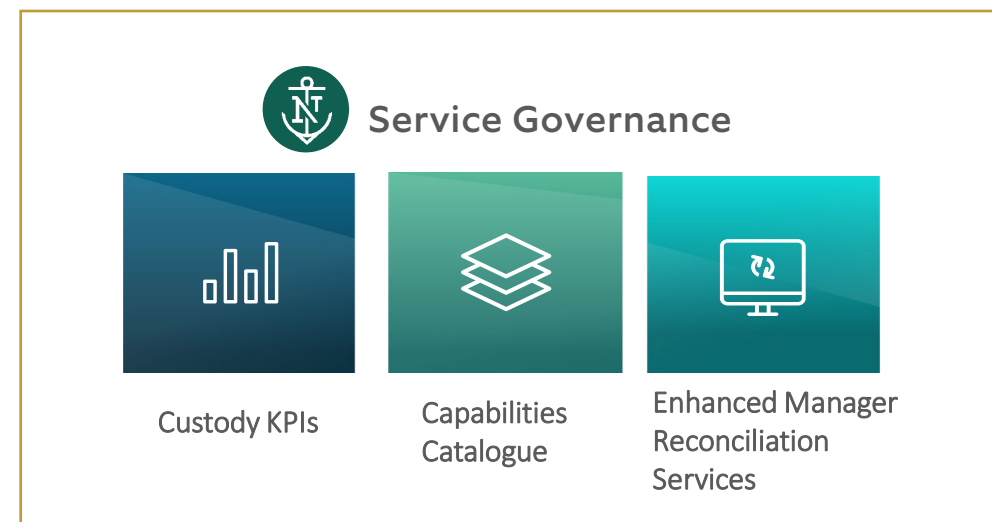
- In an outsourcing business Northern Trust recognizes that transparent KPIs are required to ensure understanding of service quality and value
- Service Governance dashboards enable that transparent record which is part of communication in our service relationship

Capabilities

- **Custody Key Performance Indicators**
Interactive custody data points across settlement instructions, settlements, corporate actions, income, and tax reclaims
- **Enhanced Manager Reconciliation Services**
Interactive dashboard of Investment Manager vs. Northern Trust's discrepancies
- **Capabilities Catalogue**
Detailed profile of all custody capabilities provided. Found in IIP under News & Resources

Key Features

- **Enriched data for more transparency**
Contextual information to understand the 'Why'
- **Smarter self-service for increased productivity**
Intuitive design to surface the data you need to review
- **Ease of customization to meet your specific needs**
Flexible, intuitive interface



Custody Key Performance Indicators

Provides transparency into your custody key performance indicators through a modern online experience

Key Features

- Ability to measure KPIs across 5 key domains
 - ✓ Settlement Instructions
 - ✓ Settlements
 - ✓ Corporate Actions (2Q '23)
 - ✓ Income
 - ✓ Tax Reclaims (2Q '23)
- Provides a stop light approach to easily surface areas of focus – evaluate, watch, and on target
- Review summary, detail, and time series data points based on your specific needs
- Interactive experience to easily drill down to investigate areas of interest
- Details are exportable to Excel



[Product Video available](#)

NORTHERN TRUST

Institutional Investor Passport

FEEDBACK

NEED HELP

DANNY ROWE

HOME

PORTFOLIO

SERVICE GOVERNANCE

REPORTING

NEWS AND RESOURCES

APPLICATIONS

Home

Service Governance

KPI Summary

KPI Summary

As of 08/21/2020 10:06 AM

Accounts / Consolidations

(1) Consolidation Name

Key Performance Indicators

SETTLEMENT INSTRUCTIONS

SETTLEMENTS

CORPORATE ACTIONS

INCOME

TAX RECLAIMS

KPI REPORTS

Filter KPIs by:

On Target

On time above 95%

Watch

On time at 90-95%

Evaluate

On time below 90%

EXPORT

Account(s)	May 2021	Apr 2021	Mar 2021	Feb 2021	Jan 2021	Dec 2020	Nov 2020	Oct 2020	Sep 2020	Aug 2020	Jul 2020	Jun 2020
Consolidation Name (7)												
DZZ105 - Account name 1												
Voluntary Events	2	2	2	2	2	-	2	2	2	2	2	-
Late Responses	1.00%	1.00%	7.20%	3.50%	0.80%	-	-	1.00%	-	-	-	-
On-Time Responses	99.00%	99.00%	92.80%	96.50%	99.20%	-	100.00%	99.00%	100.00%	100.00%	100.00%	-
Mandatory Events	4	4	4	4	4	-	2	2	2	2	2	-
DZZ106 - Account name 2												
DZZ107 - Account name 3												
DZZ108 - Account name 4												
DZZ109 - Account name 5												
DZZ110 - Account name 6												
DZZ111 - Account name 7												

Provides transparency into your custody key performance indicators through a modern online experience

Provides easy access to meaningful insights:

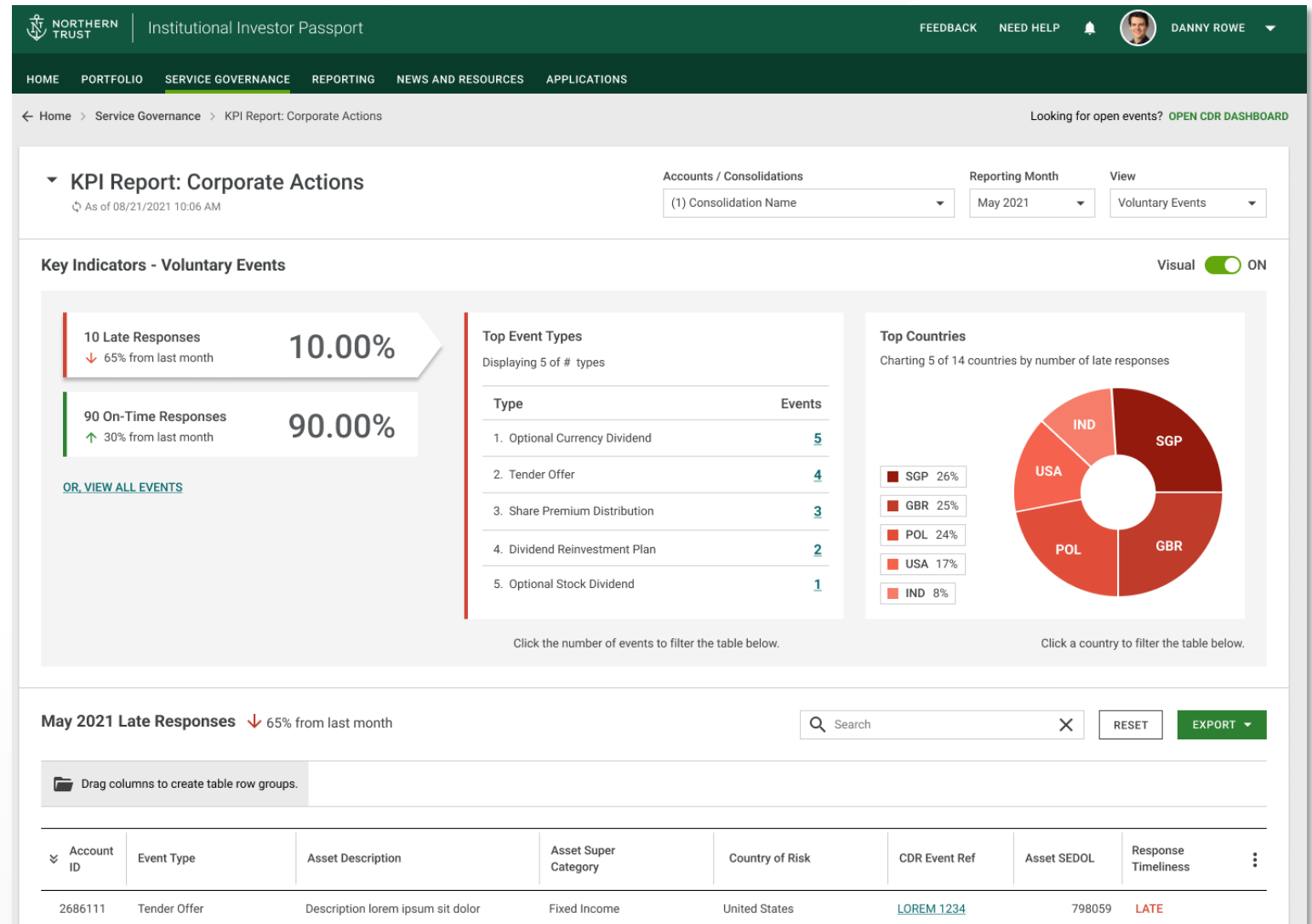
- On-Time Settlements
- Failed Settlements (Reasons & Age)
- Canceled
- Interconnected with Settlements Monitor
- What happened vs. What is happening

- Clean (Straight through Processing)
- Manual
- Repaired (Reasons)

- On-Time/Late Elections for Voluntary Events
- Reporting for Mandatory Events

- On-Time/Late Income Events

- On-Time/Late Tax Reclaim Events



Key Performance Indicators – Time Series Views

Provides transparency into your custody key performance indicators through a modern online experience

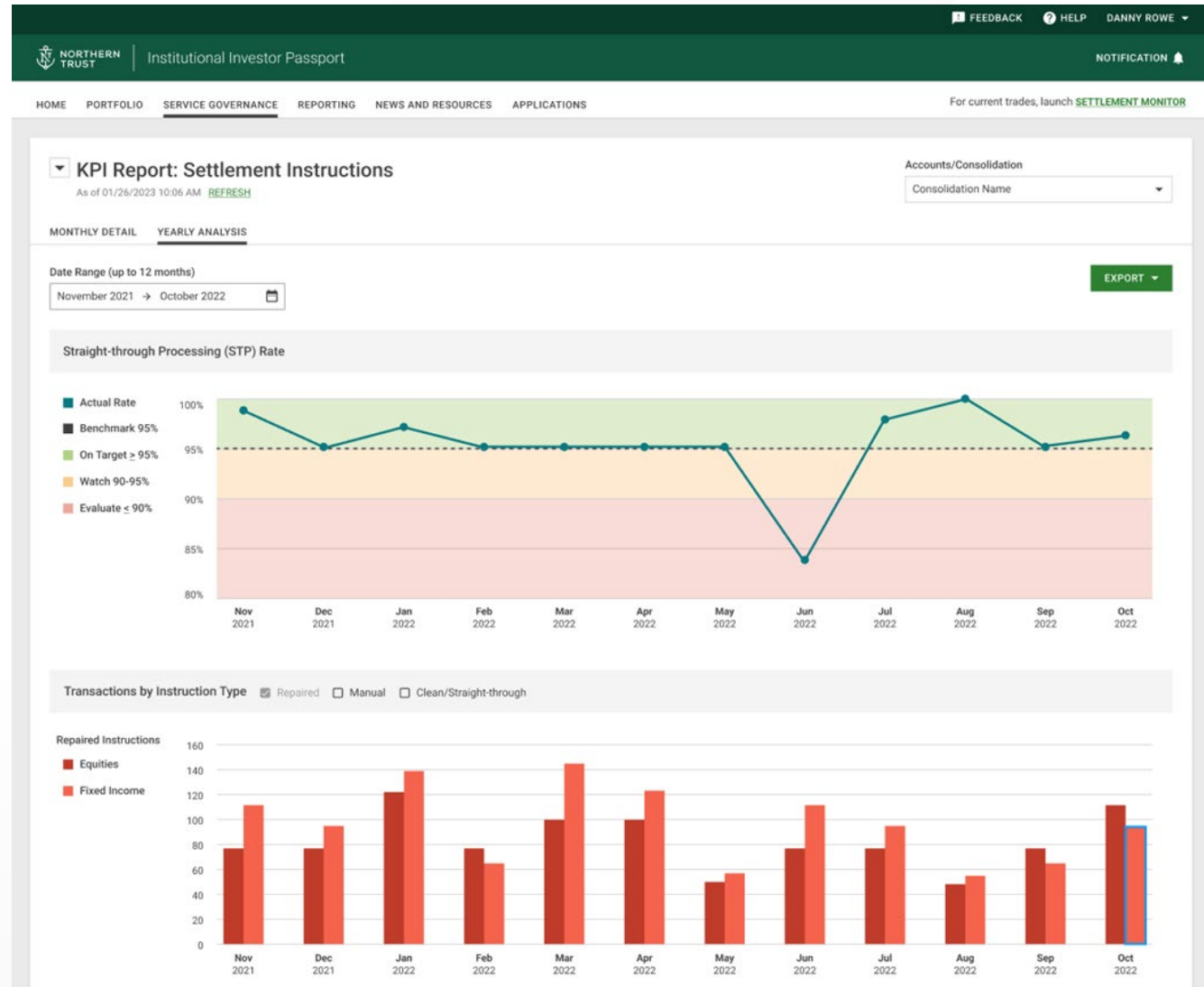
Key Features

Provides easy access to meaningful insights

Expected delivery is 2Q '23

Time Series visualizations for:

- ✓ Settlements
- ✓ Settlements Instructions
- Helps detect trends and anomalous information.
- Supports client Board reporting



Custody Key Performance Indicators | Admin Module

Provides transparency into your custody key performance indicators through a modern online experience

Key Features

Internal facing only user experience

Delivery is expected May '23

Facilitates the On-Time delivery of information

Provides a view across clients and consolidations.

- Consolidation KPI Build Monitoring
- Enables KPI Consolidation Onboarding

NORTHERN TRUST

Institutional Investor Passport

NOTIFICATIONS

OVERSIGHT DASHBOARD

PORTFOLIO

SERVICE GOVERNANCE

REPORTING

NEWS AND RESOURCES

APPLICATIONS

FEEDBACK

HELP

DANNY ROWE

Admin Panel

As of 12/16/2022 10:06 AM [REFRESH](#)

KPI BUILD MONITORING

CONSOLIDATION ONBOARDING

Filter Consolidations by:

✔ Built

✖ Not Built

Search by consolidation

RESUBMIT BUILD

The reports that were not built have been resubmitted and are in progress.

>> Consolidations	Nov 2022	Oct 2022	Sep 2022	Aug 2022	Jul 2022	Jun 2022	May 2022	Apr 2022	Mar 2022	Apr 2022	Mar 2022	Feb 2022
▼ Consolidation Name Lorem	↻	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Settlement Instructions	↻	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Settlements	↻	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Corporate Actions	↻	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Income	↻	✔	✔	✔	✔	✔	●	●	●	●	●	●
Tax Reclaims	↻	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
> Consolidation Name Lorem	↻	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
> Consolidation Name Lorem	↻	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
> Consolidation Name Lorem	↻	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
> Consolidation Name Lorem	↻	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔

northerntrust.com / © 2023 Northern Trust

24

Enhanced Manager Reconciliation Services

Summary View

At-a- glance views of reconciliations across accounts and trailing 6 or 12 months

- Provides a stop light approach to easily surface areas of focus – evaluate, watch, and on target

Account View

- Offers category overview with intuitive drill-down into details
- Ability to view aggregate levels side by side for both Investment Managers and Northern Trust

Holdings Level View

- Detailed individual holding level reconciliation views highlight holdings, pricing, market value and accruals



[Product Video available](#)

Institutional Investor Passport

FEEDBACK NEED HELP

HOME PORTFOLIO **SERVICE GOVERNANCE** REPORTING NEWS AND RESOURCES APPLICATIONS

← Home > Service Governance > Reconciliation Summary

▼ Reconciliation Summary

As of 08/21/2020 10:06 AM

Accounts/Consolidation
(1) Consolidation Name

Filter Summary by:

✔ On Target Within tolerance

⚠ Watch Within tolerance after review

✖ Evaluate Out of tolerance

Show 6 Months **EXPORT**

» Accounts/Consolidations	Mar 2022	Feb 2022	Jan 2022	Dec 2021	Nov 2021	Oct 2021
▼ Consolidation Name (3)						
> DZZ105 - Account name 1	✔	✔	✔	✔	✔	✔
> DZZ106 - Account name 2	✔	✔	⚠	✔	✖	✔
> DZZ107 - Account name 3	✔	✔	⚠	✔	✔	✔

Enhanced Manager Reconciliation Services – Detailed View

Provides transparency into the Enhanced Manager Reconciliation process

Key Features

- Detailed Account Reconciliation views highlight holdings, pricing, market value, and accruals discrepancies
- Offers category overview with intuitive drill-down into details
- Ability to view holdings for both Investment Managers and Northern Trust
- Measure differences against a defined tolerance
- Details are exportable to Excel

NORTHERN TRUST | NEED HELP? | SHARE FEEDBACK | ANDREW ROSENSTEIN

HOME | PORTFOLIO | SERVICE GOVERNANCE | REPORTING | NEWS AND RESOURCES | GLOBAL FUNDS PASSPORT | APPLICATIONS

MANAGE MY VIP ACCESS TOKEN | EXPOSURE | NOTIFICATIONS 11

← Home > Service Governance > Account Reconciliation

Account Reconciliation

Accounts: (1) DZZ215 | Reporting Month: December 2022

December 2022
Reconciliation of Market Values
On Target Within tolerance

Securities Difference: 6.94 Bps
415,124.77
Base Currency (EUR)

Total Difference: 5.98 Bps
357,522.77
Base Currency (EUR)

Comments
OVERVIEW | **MV OF SECURITIES** | MV OF OTHER ASSETS

Reconciliation tolerance is 30.00 Bps

Drag columns to create table row groups. Asset Super Category

Group	Asset Super Category	Asset Sub Category	Asset Description	ISIN	NT Market Value	IM Market Value	Market Value Difference	Share Difference	Price Variance (%)	Market Value Variance (Bps)
Equities (8)					230,103,640.40	229,698,235.91	405,384.49	0.00	2.49	6.78
	Equities	Funds - Common Stock	LINDELL TRAIN GBL LINDSE...	IE00BK424V95	39,265,122.30	39,265,122.30	0.00	0.00	0.00	0.00
	Equities	Funds - Common Stock	ARTISAN PTNRS GBL GLOBAL...	IE00B5T1R961	16,868,979.45	16,462,560.00	406,419.45	0.00	2.47	6.80
	Equities	Funds - Common Stock	GQG GLOBAL UCITS I PARTNR...	IE00BDGV0J60	51,868,313.71	51,868,313.71	0.00	0.00	0.00	0.00
	Equities	Funds - Common Stock	SKYLINE UM FD ICAV EAGLE ...	IE00BJN6GY32	57,236,672.91	57,236,672.91	0.00	0.00	0.00	0.00
	Equities	Unit Trust Equity	IMPAX FDS (RL)PLC ENVIRO...	IE00B04R3521	17,531,637.65	17,531,637.65	0.00	0.00	0.00	0.00
	Equities	Funds - Common Stock	POLUNIN DISCOVERY FUNDS ...	LU0781745368	17,815,851.64	17,815,851.64	0.00	0.00	0.00	0.00
	Equities	Funds - Common Stock	VULCAN GLOBAL VALUE FUN...	IE00BQQ0M257	4,139,840.00	4,140,874.96	-1,034.96	0.00	0.02	-0.02
	Equities	Funds - Common Stock	ORCHARD LANDMARK LTD. C...	QTX001884407	25,377,222.74	25,377,222.74	0.00	0.00	0.00	0.00



NORTHERN
TRUST