Regional Transportation Authority

# Potential Impacts of State Funding on Transit State of Good Repair

**An Exploratory Analysis of 2016 – 2035**

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# Contents

# Introduction

This White Paper describes the Regional Transportation Authority's (RTA) refocused Strategic Asset Management (SAM) efforts to date with a specific emphasis on the impact that capital funding levels projected in the 2020-2024 Five-Year Capital Program, including funds from *Rebuild Illinois,* could have on the region's asset condition.

This White Paper is intended for Service Board technical staff and professionals working in SAM and Transit Asset Management (TAM). The main purposes of this paper are multifold and are as follows:

- Demonstrate the strategic approach that RTA intends to use to implement asset management activities under SAM,
- Establish the value of strategic (mid-to long-term) analysis in achieving a collective benefit for all agencies,
- Assess the capabilities and limitations of the existing data and tools to conduct similar or more rigorous analyses, and
- Renew interagency collaboration for improving accuracy and currency of asset data, and data sharing practices to support future SAM efforts.

This White Paper focusses on quantifying the need and benefits of continuing the funding levels of the bond program element of *Rebuild Illinois* beyond the current five-year term. The scenario analysis developed for this study is described along with results that are expected to:

- Create data-driven evidence to guide advocacy efforts for seeking funding for transit capital programs, at both the state and federal levels.
- Showcase the value of capital investments on State of Good Repair (SGR) to help improve/maintain bonding capability.
- Help establish realistic regional goals related to capital programming activities and manage/meet expectations regarding impacts of the new capital funding bill.

In addition, the analysis shows how investment priorities are likely to change under varying funding levels in the future, and infer risks associated with asset conditions in the future.

The paper adapts a portfolio approach for presenting projections and interpreting results. More specifically, transit assets are treated as a regional portfolio that are segmented by asset class. Descriptions of initial conditions are presented consistent with earlier reports that are already in public domain. It should be noted that, while portfolio approach provides outputs at a fairly aggregate level, the analysis requires disaggregate data. The challenges of maintaining and updating the asset inventory at the existing level of detail are well recognized, and balancing the data needs for SAM and/or decision support analysis and data reporting requirements will be one of the focus areas of the interagency collaboration efforts which are outlined in the Next Steps section.

This White Paper is an interim report that uses the tools and data developed for the 2016 Capital Asset Condition Assessment to analyze the current Capital Program. While this approach limits the analysis to high-level findings, it is an adequate steppingstone for helping RTA understand the impact of *Rebuild Illinois* on assets and to transition from TAM to SAM.

# RTA's Role in Capital Funding and Strategic Asset Management

The RTA is the unit of local government created to oversee finances, to secure funding, and to conduct transit planning for the Chicago Transit Authority (CTA), Metra, and Pace, which together provide nearly two million rail and bus rides each weekday across northeastern Illinois. The RTA manages these three Service Boards' five-year capital program of more than $8 billion from sources that include a regional sales tax, bonds, and the State of Illinois.

The RTA, as part of its financial oversight function, has historically maintained an interest in ensuring that the Service Boards have sufficient funding to operate and maintain their physical assets. For many years, the RTA has facilitated regional funding campaigns, overseen the issuing of bonds to provide funding for capital investments, and monitored the delivery of major projects of each of the Service Boards in order to achieve this objective. These efforts have been challenged for decades, as the lack of consistent, reliable capital funding has led to aging assets, unreliable service, and an enormous backlog of unmet capital funding needs.

The need for RTA to conduct long-term planning for maintaining the region's transit assets was codified in the 2008 RTA Act.[1] In response to the pressure to evaluate and prioritize capital investments, RTA initiated a capital asset condition assessment program in 2009 that was followed by development of a regional TAM framework. The primary goal of that effort was to estimate the total capital needs for each of the Service Boards and develop a framework to prioritize capital projects based on a condition assessment of the current asset inventory. The initiative also included the development the Capital Optimization Support Tool (COST), a decision support tool and a database of all of the transit assets of the Northeastern Illinois RTA system operated by the three Service Boards. Several Capital Asset Condition Assessment reports were published during this time that established a regional backlog estimate and other State of Good Repair (SGR) statistics[2] helpful to the region's transit capital advocacy efforts.

The RTA's Capital Asset Condition Assessment activities ended in 2017, following the issuance of the Federal Transit Administration (FTA)'s July 26, 2016 TAM Rule[3] (49 CFR part 625). The Service Boards are now required to maintain TAM programs, plans, and datasets for submission to the National Transit Database (NTD). However, the RTA still maintains an interest in regional capital funding activities and has transitioned its TAM activities into a strategic asset management (SAM)

[1] (70 ILCS 3615/) Regional Transportation Authority Act, http://www.ilga.gov/legislation/ilcs/ilcs5.asp?ActID=984&ChapterID=15, last accessed, May 7, 2020.

[2] Key examples include, asset condition distributions by asset category, percent assets exceeding useful life, percent of assets in SGR, and backlog to replacement value ratio. Detailed descriptions and projections can be found in "Capital Asset Condition 2016 - Year 5 Assessment," RTA, December 2016.

[3] https://www.federalregister.gov/documents/2016/07/26/2016-16883/transit-asset-management-national-transit-database, last accessed, May 7, 2020.

framework to monitor the SGR of all of the regional transit assets of the system as a combined portfolio. The SAM function provides RTA with the tools to track mid- and long-term regional investment needs and to inform capital programming and planning processes for strategic investments.

## Current Capital Need and Recent Funding Success

The last regional Capital Asset Condition Assessment investment analysis completed in 2016[4] determined that the RTA region faces an SGR backlog of $19.4 billion (in 2015 dollars) with 31 percent of all assets exceeding useful lives. In addition to backlog projects, the region requires normal reinvestment, which results in a total 10-year capital need of $37.7 billion and affects all types of assets ranging from guideway elements (e.g. track) to vehicles (e.g. trains and buses) and support equipment and systems.

The RTA and Service Boards developed *Invest in Transit,* the 2018-2023 Regional Transit Strategic Plan, to set a bold vision for the region's transit system and articulate the funding that would be needed to address this $2 billion to $3 billion annual capital need. The transit agencies have been working together to implement the plan since its adoption in 2018 and those efforts bore fruit in June 2019, when the Illinois General Assembly passed, and Governor J.B. Pritzker signed, *Rebuild Illinois*, which provided the first-ever sustainable funding source for transit capital funding. The new funding nearly doubled the region's previous five-year transit capital program by adding $3.735 billion which brought the projected size of the program to $8.307 billion for the 2020-2024 period.

RTA's work did not end with the passage of *Rebuild Illinois.* Advocacy work must continue. The funding infusion is significant, but it will not be sufficient to address all remaining needs. A number of projects remain unfunded in the RTA's 2020-2024 Capital Program. Several stakeholders, ranging from government partners to advocacy groups, want to see the proper use of the new resources and to understand how this funding will help achieve *Invest in Transit* and shape asset condition moving forward. RTA's SAM work will contribute to such insights. Finally, RTA's SAM work is expected to provide useful information that will allow the agencies to adapt their strategies for asset management in an uncertain future. Public transit and funding for it may be impacted by a variety of factors in the future ranging from uncertainties in gas tax revenue levels due to lower gas consumption; to concerns on the future fiscal stability at state and regional levels; to changes in commuter behavior; to unknown impacts of climate change; and most recently to changes in travel brought about by the COVID-19 pandemic. The RTA and Service Boards need to be prepared to navigate such futures.

# Background

The RTA was created in 1974 by approval of a referendum by the residents of Cook, DuPage, Kane, Lake, McHenry, and Will counties to provide financial and planning oversight of the region's transit

[4] Capital Asset Condition 2016 - Year 5 Assessment, RTA, December 2016.

system. The three Service Boards, each led by a Board of Directors, individually handle their respective transit operations and fare responsibilities.

- **CTA** operates the nation's second largest public transportation system and covers the City of Chicago and 35 surrounding communities. Through its bus and rail systems, it provides more than 80 percent of the public transit trips in the six-county Chicago metropolitan area either with direct service or connecting service to Metra and Pace.
- **Metra** is the commuter rail agency serving more than 100 communities in the six-county region with 241 stations on 11 lines running from Chicago's city center.
- **Pace** is the suburban transit provider for the Chicago area. Pace serves riders with fixed bus routes, vanpools, and on-demand programs covering 3,500 square miles spread over six counties and 284 municipalities. Pace is also the ADA paratransit provider for the region, both for city and for suburban service.

The RTA regional system is the second largest[5] in the country measured by transit trips. It covers almost 1,500 track miles and 6,000 route miles and provides more than two million daily rides. Assets owned and operated by the Service Boards include approximately 7,500 passenger vehicles, 400 stations, and 70 maintenance facilities worth more than $60 billion (in 2015 dollars).[6]

The RTA manages the region's operating budget and capital program including developing revenue estimates and forecasts of regional sales tax receipts, issuing bonds to provide funding for capital investments and approving and monitoring the annual budgets of each of the Service Boards.

RTA is also responsible for strategic planning. The RTA Act calls for adoption of a minimum of a five-year strategic plan with goals and objectives with respect to, but not limited to, improving ridership and level of service, advancing coordination and integration of transit services, coordination of fare policies and improving fare collection and allocation of transfer revenues, bringing transit assets into a state of good repair, serving transit-dependent populations and assuring equitable access to employment, financial viability of operating and capital programs, and improving regional mobility.

In January 2018, the RTA Board adopted *Invest in Transit*. The plan emphasizes the importance of transit in Northeastern Illinois and champions infrastructure investment for all of the Service Boards. *Invest in Transit's* three goals are centered around preserving and expanding the value of the region's transit system. The plan makes the case that capital improvements are long overdue, citing the impending deterioration of the transit system.

Through *Invest in Transit*, the transit agencies established a list of priority projects, about $30 billion in value, which the Service Boards will advance over the next ten years as additional funding becomes available. These priority projects are a set of core capital initiatives largely focused on bringing the regional transit system nearer to a state of good repair as well as advancing limited expansions in growing markets.

[5] 2018 Regional Peer Review Report, RTA, March 2020.
[6] Capital Asset Condition 2016 - Year 5 Assessment, RTA, December 2016.

To help evaluate and prioritize capital investments, RTA has initiated a capital asset condition assessment program following a traditional TAM framework as mentioned above. The earlier TAM efforts consisted of three main elements:

- An ongoing regional transit asset inventory/condition assessment program
- An SGR[7] needs assessment process that is based on the inventory
- A regional level project screening and prioritization process guided by the goals and objectives set in the *Invest in Transit*.

In addition, RTA invested in development of the COST which was adapted from Transit Economic Requirements Model (TERM) Lite, the decision support tool sponsored by the FTA. COST has additional capabilities to better incorporate assets shared or managed by multiple agencies, a widened set of policy variables, an extended asset inventory, and customized queries. COST estimates capital reinvestment needs based on the known ages, rehabilitation requirements, expected useful lives with standardized replacement costs of the region's transit assets. The latest version of the COST tool was compiled in 2016 using asset inventory and condition estimates from 2015.

In July 2016, the FTA issued the TAM Rule (49 CFR part 625) and required each transit agency to develop an individual TAM Plan and to comply with the new Federal TAM Plan reporting requirements (49 CFR Part 630). The rule imposed important changes to the practice. As a result, agencies developed their own TAM plans and identified goals that serve agency needs, Metropolitan Planning Organizations (MPOs) identified TAM targets that serve federal requirements, and the National Transit Database (NTD) included TAM data deemed useful for high-level analysis. The level of detail in the NTD asset data is generally too aggregate for conducting analyses envisioned by RTA's SAM goals. There is, therefore, a need for revising the existing asset inventory starting from the most recent submittals and enhancing the level of detail to support more reliable analyses.

The RTA's SAM activities are designed to provide a more holistic view of the programmatic distribution of assets across agencies and asset categories in order to advise the RTA Board on portfolio-level investment decisions. Within this context, the RTA's main efforts under SAM can be classified under four key areas:

- Scenario analysis to support funding advocacy efforts
- Analysis of short-term impacts and developing long-term transit asset condition projections of potential funding schemes for bonding capabilities
- Provide support to performance-based capital programming efforts
- Facilitate inter-agency collaboration and data sharing.

This White Paper constitutes an initial step of a coordinated set of actions across RTA and Service Board staff to collaborate for developing and maintaining comprehensive, current, consistent data to support respective SAM and TAM activities, and to facilitate data sharing, knowledge exchange and further communication.

[7] A capital asset is assumed to be in SGR if it is in condition sufficient for the asset to operate at a full level of performance.

# Capital Needs to Date (2016)

In collaboration with the Service Boards, RTA released the 2016 update of the Capital Asset Condition[8] report series, first published in 2010, which provided an assessment of physical conditions and 10-year capital reinvestment needs of the transit capital assets operated and maintained by the three Service Boards as of December 31, 2015. The 2016 update was the latest effort that collected and compiled regional asset condition data and updated the COST model. The outcomes of the project, at the time, expanded the RTA and the Service Boards the ability to assess and prioritize transit capital investment needs within the parameters of regional funding and long-term strategic objectives. The following highlight the key findings:

- The Chicago region has some of the oldest transit assets in the United States with an SGR backlog totaling $19.4 billion.
- In 2016, approximately 31 percent of RTA assets exceeded their useful life benchmarks. Without increased investment, that percentage will grow over time. By 2035, the percentage of RTA assets not in SGR was projected to reach 37 percent given current investment levels.
- The region's capital expenditure has shown little growth over the ten years between 2005 and 2014. While the Chicago region grew 7.7 percent in capital expenditure per resident during this period, Los Angeles grew by more than 100 percent, Washington, D.C., and Houston grew by more than 60 percent, and Dallas by 40 percent.
- The report also established investment levels for attaining various SGR targets.
    - An average investment about $1.5 billion a year would maintain the backlog over 20 years, funding below that amount would result in growth of the backlog,
    - An annual investment of about $3.4 billion per year would eliminate the backlog in a ten-year time frame,
    - An annual investment of $2.6 billion would be required to achieve a full SGR in 20 years, eliminating the backlog and implementing all normal asset replacement; a significant increase from the expected average annual funding level of $785 million.

The study reiterated the risks of underinvesting in transit capital and highlighted the potential of a predictable state capital program that would provide a sustainable level of funding in facilitating revenue streams through federal loan programs, bond issuances, public-private partnerships, or other financing mechanisms.

# *Rebuild Illinois* and Provisions for Transit

The first State of Illinois capital bill in more than a decade and the largest in Illinois history, *Rebuild Illinois* is projected to provide the RTA system with $2.6 billion over five years in State bond funding and an estimated $227 million annually in gas tax revenue, referred to as "PAYGO" dollars. The

[8] Capital Asset Condition 2016 - Year 5 Assessment, RTA, December 2016.

PAYGO funding stream introduced by *Rebuild Illinois* is a highway funding source that was not available to transit before and the program commits to provide inflation-adjusted funding.

With the new funding, the RTA's 2020-2024 Capital Program has $8.3 billion for capital projects — an added $3.7 billion, nearly doubling the previous five-year program level. The program is expected to help the Service Boards allocate funds to serve the following principles:[9]

- Begin decreasing the regional backlog of deferred capital replacement and maintenance projects.
- Focus spending on projects that can be completed in a timely manner.
- Provide near-term programming and planning certainty.
- Use transparent data that informs the project selection process.

A portion of the $2.6 billion bond revenue allocated for the next five years ($369.5 million) has been earmarked for specific transit capital projects. The remaining bond revenue of approximately $2.23 billion has been appropriated through IDOT to the RTA for the Service Boards capital programs.

The RTA region will receive 18 percent of the new revenue generated through the state's motor fuel and diesel tax increase resulting in approximately $227 million in new revenue annually.

The goal of programming the funding will be to adhere to the stated principles to deliver projects in a timely manner, to demonstrate the needs are warranted, and that the funding is allocated and spent effectively in a transparent process to ensure accountability. Each year during the annual budget process, the RTA provides refreshed estimates of capital funding likely to be available and addresses the above distributions based on established principles as well as the funding realities (such as the impacts of COVID-19 anticipated to impact the 2021 budget year).

# Approach

The analytical framework of this White Paper is designed as a three-part scenario analysis. The primary scenario is the committed *Rebuild Illinois* funding level estimated in the 2020-2024 Five-Year Capital Program. Two additional alternative funding scenarios are developed to pivot off the committed *Rebuild Illinois* funding level. The first alternative scenario assumes a five-year extension of State bond availability beyond the five years programmed by *Rebuild Illinois* for a sustained ten years of funding. The second alternative scenario assumes the provision of perpetual State bonds (or other State-provided funding sources) at the same level as *Rebuild Illinois*. The study evaluated the impacts of these three funding scenarios on investment needs and asset condition over a 20-year analysis period. The final version of COST (V8.4.03) was used for producing the necessary metrics for comparing the scenarios regionwide. For each of the scenarios, all transit assets were analyzed together at the system level allowing every asset to be evaluated for funding regardless of ownership across Service Boards.

[9] "Ordinance establishing estimates of funding amounts available to the Service Boards for the 2020-2022 Operating Budgets, the required Recovery Ratios for 2020, and the preliminary 2020-2024 Capital Program funding amounts," RTA, September 9, 2019

## Data and Tools

Funding level is the sole variable used in scenario development. The approved 2020-2024 Five-Year Capital Plan funding and sources as reflected in the 2020 budget marks were used as a basis in developing future-year funding projections. In principle, the federal, local, and RTA funds supporting SGR investments were assumed to continue in the future at the same levels as assumed in the 2020-2024 Capital Program. Key components of federal and local sources that are included in the funding projections are as follows:

- Federal Funds
    - 5307/§5340 Urbanized Area,
    - 5337 State of Good Repair,
    - 5339 Bus and Bus Facilities,
    - Congestion Mitigation and Air Quality Improvement (CMAQ),
    - New Starts
    - Homeland Security, and
    - Associated bond issuance costs and payments.
- Local Funds
    - RTA Bonds
    - RTA ICE Funds,
    - Ground Tax Bond proceeds,
    - Other Service Board bonds, and
    - Associated bond issuance costs and payments.

*Rebuild Illinois* contains an inflation adjustment to the PAYGO funds; as the analysis in this study uses constant 2015 dollars, the current estimated value of $227M per year for PAYGO is included as constant throughout the analysis period. State Bonds allocated to SGR investments under *Rebuild Illinois* were also included at the current levels into the future with inflation adjustments.

In order to facilitate interpretation, the 20-year analysis period is divided into four- to six-year periods (2016-2019; 2020-2024; 2025-2029; 2030-2035). All estimated disbursements within each of these four periods were averaged and are used as uniform annual disbursements.

COST is a decision support tool based in MS Access and designed to help prioritize asset rehabilitation and replacement investments. At the core of its operation, the COST tool includes an asset inventory database that reflects asset classification, condition, age, life expectancy (useful life benchmark), annual decay assumptions by asset type, standardized values for replacement cost, and relevant spatial (location) and temporal (date) information.

The latest version of the tool (V8.4.03) includes a comprehensive regional transit asset inventory dataset compiled in 2015. Since the analysis in this paper sought to examine long-term impacts, near-term allocations were not mapped (i.e., the asset inventory used does not include any expansion projects or assets purchased or rehabbed since 2015). However, more accurate mapping of expenditures, new asset data, and updates to existing assets will be incorporated in the in the

next round of SAM efforts. As a result, analysis period started from 2016, and all investments and their distributions across asset categories prior to 2020 are the estimates provided by COST. Therefore, those should not be compared to actual investments that occurred since 2015.

All funding estimates and projections, initially in 2019 dollars, were converted to 2015 dollars by assuming a Producer Price Index (PPI)-based inflation rate of 2.5 percent. Conversion to 2015 dollars was needed to align with COST's asset data vintage.

The region's asset inventory is worth $61.7 billion (in 2015 dollars) and consists of 49,687 records. Assets are first grouped as replaceable and permanent assets and further classified into five broad functional categories. Permanent assets consist of elements of underground concrete tunnels in the CTA rail system, while every other asset is considered as a replaceable asset. **Table 1** provides a distribution of replacement value of assets by category and Service Board, as identified in the COST database.

**Table 1. Replacement Values of Transit Assets by Type and Service Board**

| | CTA | Metra | PACE | ALL |
|---|---|---|---|---|
| Guideway Elements | $13,801,007,359 | $5,915,074,265 | | $19,716,081,623 |
| Stations | $10,211,128,784 | $4,245,171,166 | $133,799,871 | $14,590,099,821 |
| Vehicles | $5,367,865,304 | $6,072,360,381 | $919,141,311 | $12,359,366,996 |
| Facilities | $4,801,964,458 | $1,078,937,078 | $931,003,073 | $6,811,904,610 |
| Systems | $4,549,570,100 | $1,552,932,256 | $185,865,640 | $6,288,367,996 |
| **All Replaceable Assets** | **$38,731,536,005** | **$18,864,475,145** | **$2,169,809,895** | **$59,765,821,045** |
| Guideway Elements (Permanent) | $1,978,234,165 | - | - | $1,978,234,165 |
| **All Assets** | **$40,709,770,170** | **$18,864,475,145** | **$2,169,809,895** | **$61,744,055,210** |

CTA owns about 65.9 percent of the regional assets in value, Metra's share is 30.6 percent, and remaining 3.5 percent is comprised of Pace assets. Guideway Elements (e.g., tracks, bridge elements) systemwide are about 35 percent of all assets, Stations (e.g., passenger facilities, park and ride lots) are worth 23.6 percent, and Vehicles (both revenue and non-revenue vehicles) make up 20 percent. Facilities (maintenance yards, garages) and Systems (such as control and communication equipment) account for 11 and 10.2 percent of the total value of the region's transit assets, respectively.

Since 2015, the Service Boards have made capital improvements to the region's assets that are not captured in the existing COST data. Between 2015 and 2018, about $2.91 billion[10] was spent on capital projects: Buses, railcars and locomotives have been upgraded; 95th Street and Wilson stations on Red Line, among others, were updated; segments of structure and bridges have been built; Pace introduced Pulse stations on Milwaukee Avenue. Efforts to update the regional asset inventory are underway by the Service Boards. Updating the COST model is a focus of RTA's 2020 SAM efforts in collaboration with Service Board staff. This White Paper details key action items under the RTA's SAM initiative. Nevertheless, the information and algorithms in the model are sufficient for high-level, regional scenario analysis presented in this White Paper.

While methods of estimating asset condition vary by asset type, typically using performance decay curves assessed by age and the expected useful life of the asset, condition of each asset is represented by an overall condition score in a five-point scale where "1" indicates a "Poor/Worn" condition and "5" points to an "Excellent" asset condition. For additional descriptive power, COST uses an additional classification of asset condition as a function of the condition score below.[11]

- Excellent – 4.5 or greater
- Good – between 3.5 and 4.49
- Adequate – between 2.75 and 3.49
- Marginal – between 2.0 and 2.74
- Worn – less than 2.0

**Table 2** shows a summary of average condition scores and percent of assets with "Worn" or "Marginal" rating by asset type and Service Board. These averages, and throughout this White Paper, are weighted by replacement value.

**Table 2. Asset Condition Estimates by Asset Type and Service Board in 2015**

| | CTA | | Metra | | Pace | | ALL | |
|---|---|---|---|---|---|---|---|---|
| | Average Condition Score | Percent Marginal or Worn | Average Condition Score | Percent Marginal or Worn | Average Condition Score | Percent Marginal or Worn | Average Condition Score | Percent Marginal or Worn |
| Guideway Elements | 3.10 | 38.1% | 2.81 | 49.0% | | | 3.02 | 41.1% |
| Stations | 3.32 | 33.7% | 3.72 | 6.0% | 2.25 | 78.1% | 3.43 | 26.1% |
| Vehicles | 3.38 | 39.9% | 2.69 | 50.8% | 3.16 | 46.3% | 3.02 | 45.8% |
| Facilities | 2.98 | 38.2% | 2.95 | 35.5% | 3.19 | 21.0% | 3.00 | 35.4% |
| Systems | 2.69 | 54.4% | 2.97 | 40.4% | 2.60 | 60.8% | 2.76 | 51.1% |
| ALL | 3.13 | 39.1% | 3.00 | 38.4% | 3.07 | 38.7% | 3.09 | 38.9% |

[10] 2018 Regional Peer Review Report, RTA, March 2020.

[11] These categories reflect the existing classification structure in the COST tool and may not align with the current FTA TAM condition rating scheme used for assessing condition of assets under Facilities class.

Overall, about 39 percent of the region's transit assets need replacement or rehabilitation. More than half of the total value of Systems assets need significant investment. Vehicles is the second critical asset category that is in dire need of replacement with nearly 46 percent of the vehicles in value was in marginal condition or worse.

Integrating asset condition data with custom asset deterioration assumptions by asset category and using a set of prioritization weights, the COST tool estimates condition of each asset and calculates a prioritization score to sort assets accordingly. Assets in need of investment are either replaced or rehabilitated, based on predetermined life cycle reinvestment rules as available budget for the year is not exceeded. Backlog estimates are created for assets with unmet investment needs and an annual capital maintenance expenditure is assumed to keep these assets operational for each year an asset stays in backlog. These calculations are repeated for each year within the analysis period to generate various practical output summaries, performance, and condition metrics to help interpret results.

This White Paper focusses on two key metrics that are proven to be easy to understand and effectively reflect the impacts of various investment scenarios:

- **Backlog**, the level of reinvestment required to replace all assets that currently exceed their useful life, fund rehabilitation costs of those that exceeded their mid-life, or annual maintenance needs (minor investments to maintain the asset within SGR, e.g., annual paving contracts), and
- **Percent Assets Exceeding Useful Life**[12] (PAEUL), the portion of the replaceable assets that remain in service past their expected useful life benchmark (ULB).[13]

## Scenario Definitions

In order to project short-term and longer-term impacts of State capital investments on the SGR of the region's transit assets as described previously, the three investment scenarios with varying State Bond fund availability are defined as follows:

- **Scenario 1**: The base scenario, assumes that State bond funds will be available only until 2024.
- **Scenario 2:** Assumes continuation of State bond availability at the same rate as defined in the 2020-2024 Capital Plan for another five years until 2029.
- **Scenario 3:** Considers a perpetual availability of State bond funds at the same rate as above until 2035, which reflects the 20-year planning horizon that is default in COST tool.

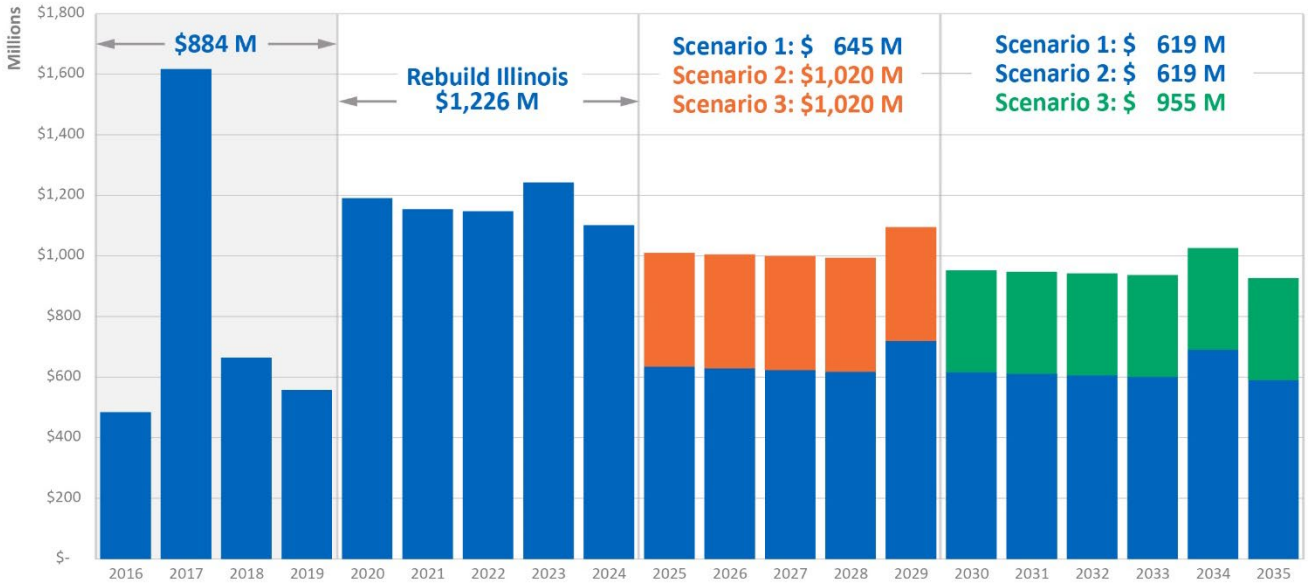
While alternative and/or additional scenarios can be defined by varying the magnitude of the State or Federal funding levels and timing, these selected scenarios reflect the existing program levels and

[12] PAEUL statistic used in this paper is weighted by asset replacement value to allow easier comparisons across asset types, while the latest TAM data reporting guidelines require unweighted estimates by asset type. Therefore, PAEUL statistics from this paper and those available from the NTD should not be compared.
[13] Besides default values suggested by the FTA, ULBs can be customized by transit agencies in order to reflect local operating conditions. For example, ULB for Fixed Route CTA buses is 15 years, while Pace estimates an ULB of 12 for the same bus category.

continuation of State funding into the future at a similar level for ease of interpretation and communication.

**Figure 1** shows an overview of the budget levels assumed for the regional analysis. The investment levels for the 2016-2019 period reflect realized and expected expenditures and show a higher degree of variation due to availability of New Starts funds for CTA's Red-Purple line modification project and Transit Tax Increment Financing (TIF) funds.[14] The average funding level of $884 million is used for approximating an order of magnitude funding level.

**Figure 1. Budget Constraints for Regional Scenario Analysis**




For the 2020-2024 period, *Rebuild Illinois*, on average, provides an additional $342 million per year until 2024.[15] In the absence of State Bond funds, it was estimated that the remaining federal, local and PAYGO funds would provide an annual funding of $645 million for the 2025-2029 period and $619 million for the 2030-2035 period. The difference between these estimates is primarily driven by inflation adjustments.

**Scenario 1** allows $16.6 billion of investment until 2035, which is 16.5 percent higher than the funding level assumed in SGR analysis prior to enactment of *Rebuild Illinois.*

**Scenario 2** assumptions yield an average funding level of $1.02 billion for the 2025-2029 period. For 2030 and onward, availability of funding was same as in Scenario 1. This five-year extension of State bond funds resulted in $18.5 billion of total investment which is 29.7 percent improvement over pre-*Rebuild Illinois* assumptions.

**Scenario 3** maintains an annual budget approximately at the $1 billion level. The perpetual availability of State Bonds yielded a total investment of $20.5 billion, which improved the pre-*Rebuild Illinois* expectations by 44 percent. In addition, an **Eliminate Backlog** analysis is performed which is far less restrictive on budget and seeks to eliminate backlog at the end of the analysis

[14] Appendix A includes an abridged version of the funding projections used in this White Paper.

[15] All expected and estimated funding levels reflect pre-COVID-19 pandemic conditions. It is highly likely that these values will change after more accurate estimates of the impact of the pandemic on transit finances become available.

period. While practically unattainable, this establishes an upper bound that can help assess the potential of each of the scenarios above in meeting the overall investment needs. Using a built-in function in COST, this analysis spreads out the total expenditures needed to eliminate the backlog within the 20-year planning horizon.

Finally, to examine investment priorities as whole, all scenarios and eliminate backlog analysis were conducted at regional level, in which all transit assets are allowed to compete for investment that draw from the total SGR budget available for all Service Boards.

The average regional funding levels and program period are entered in COST as budget inputs and all assumptions that relate to cost calculations, estimation of condition decay, policy parameters for asset prioritization, asset categorization, and queries that generate output summaries were kept the same as the COST analysis that supported 2016 Condition Assessment Report.[16]

# Condition Projections

COST creates annual condition projections of each asset, and based on predetermined rules and assumptions, it resets age and condition data for replaced or overhauled assets. Assets that needed investment but not funded are moved to backlog and updates of their condition and age information are used for the next year's evaluation. Besides backlog and amount of assets beyond useful life (i.e., PAEUL), COST provides detailed outputs on estimated condition, investment action, and expenditures for each asset overtime. A summary of projected expenditures by asset category and program period is provided in this section to highlight the differences in investment strategies across the scenarios.

## Regional Results

Regionwide analysis allows all of the region's assets to be evaluated on equal footing for funding, not restricted by individual agency needs or budgets. As a result, the outcome portrays a holistic view of regional capital investment needs and potential priorities in the long-term.

The following section features the regional SGR analysis results. The trends in backlog and PAEUL statistics are plotted and analyzed to assess the impacts of capital funding on SGR over time. In order to show the net impact of state funding on SGR, previous estimates of backlog and PAEUL trends prior to the announcement of *Rebuild Illinois* are included in this analysis and figures under the **Do Nothing** scenario.[17] Finally, funding levels estimated by the **Eliminate Backlog** analysis are discussed and compared to the scenario findings.

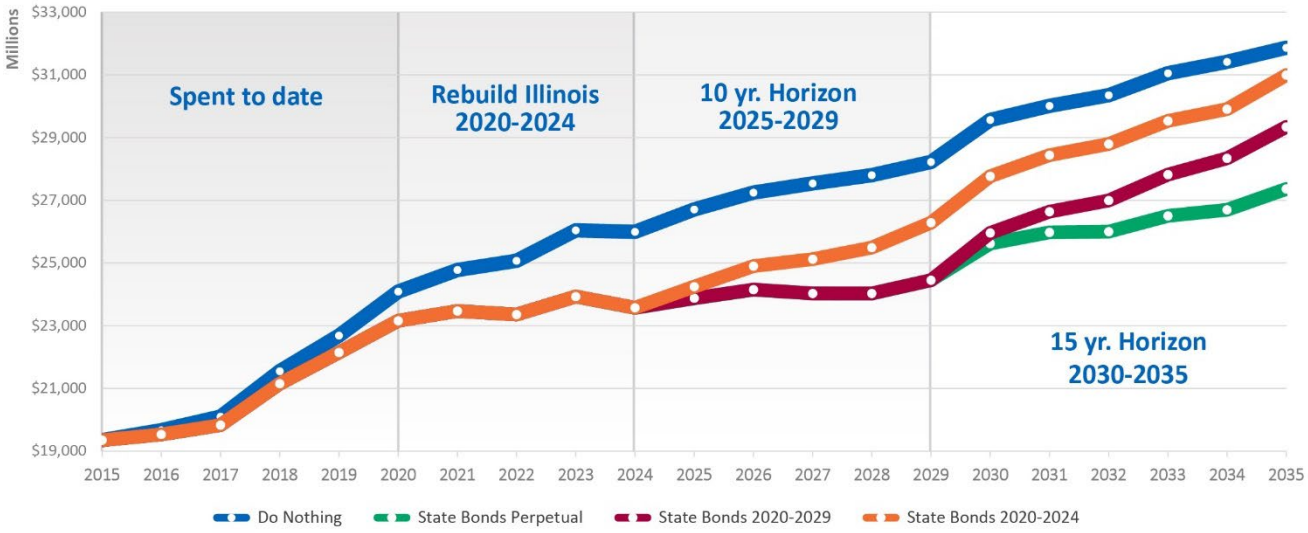
### Analysis of Regional Backlog

**Figure 2** shows the 20-year trends in the regional backlog under **Do Nothing** scenario and three scenarios on variations on State Bond funds. The regional backlog is initially estimated at $19.3

[16] COST Capital Optimization Support Tool, Technical Documentation, CH2MHill, 2017.
COST Capital Optimization Support Tool, User's How to Guide, CH2MHill, 2017
[17] The Do Nothing Scenario, as shown in Figure 2, indicates a slightly higher of degree of SGR need by 2020 due to differences in assumptions for local and federal funding prior to 2020.

billion at the onset of the analysis period, about 32.4 percent of the value of all assets, and in the absence of State funding it was expected to grow to $31.9 billion, exceeding 53 percent of all assets; 65 percent growth in 20 years.

**Figure 2. Regional Analysis of Backlog Trends by Scenario**




The trend curves for *Rebuild Illinois* scenarios indicate significant improvements during 2020-2024 period. However, following discontinuation of State Bonds, the backlog for **Scenario 1** starts to grow at a higher rate than other scenarios. Further examination of outputs pointed that growth in backlog for **Scenario 1** is mainly driven by the growth in rehabilitation and replacement needs of assets replaced in the first half of the analysis period.[18]

Funding levels in **Scenario 2** or **Scenario 3** seem to subdue the growth in backlog during the 2025-2029 period. However, both scenario budgets are overwhelmed by additional investment needs starting from 2029. In short, even with extensions of State Bond funding, none of the scenarios was able to improve the total backlog in 20 years. A final backlog level of $27.4 billion (44 percent of all asset worth) was projected under **Scenario 3** funding assumptions by 2035.

## Analysis of Backlog by Asset Category

The COST tool implements a multi-criteria approach in prioritizing asset investments to allow users some flexibility on how assets are prioritized. By default, asset condition has the highest contribution to the prioritization score for almost all assets. Other factors include safety, reliability, cost, and ridership. **Table 3** summarizes the value of assets in backlog for the 2015 conditions and introduces a new statistic, backlog factor, to describe how investment decisions, projected by COST under each scenario, impact backlogged asset distribution. While, backlog factor is not a standard asset management metric, it is reported to improve descriptive power for portraying changes in the backlog across the scenarios.

[18] A part of CTA's bus fleet remains in backlog through 2035 for the Do Nothing Scenario. Those buses are replaced under Scenario 1 in 2023. In 2029, they started contributing to backlog due to mid-life overhaul needs and were back to backlog in full by 2035 for replacement.

The backlog factor indicates a propensity of an asset category being in the backlog, and it is calculated as the ratio of the share of that asset category in the backlog to the share of its replacement value with respect to the total worth of region's assets. A backlog factor greater than 1.00 indicates that a particular asset category is overrepresented in the backlog. The backlog factors shown in **Table 3** reveal that Systems in the region are disproportionately backlogged the most and are followed by Vehicles and Guideway Elements, while assets in Facilities and Stations were underrepresented in the backlog.

**Table 3. Assessment of Backlog by Asset Type in 2015**

| Asset Categories | Replacement Value (in Millions) | Shares | Initial Backlog | Backlogged Asset Shares | Backlog Factor |
|---|---|---|---|---|---|
| Guideway Elements | $21,694 | 35.1% | $7,136 | 36.9% | 1.05 |
| Stations | $14,590 | 23.6% | $3,056 | 15.8% | 0.67 |
| Vehicles | $12,359 | 20.0% | $4,528 | 23.4% | 1.17 |
| Facilities | $6,812 | 11.0% | $1,836 | 9.5% | 0.86 |
| Systems | $6,288 | 10.2% | $2,794 | 14.4% | 1.42 |
| ALL | $61,744 | | $19,350 | | |

COST outputs were further queried to produce backlog projections by asset category. Plots of backlog estimates by asset type and more detailed discussions are provided in **Appendix B.** The examination of backlog by asset type across the *Rebuild Illinois* scenarios indicated that regardless of funding scenario, assets in Systems and Vehicles showed a more immediate priority for investment, while funding of other categories was generally pushed back in time or deferred to scenarios with better funding.

The spending levels and changes in estimated backlog across asset categories and scenarios are summarized in a tabular form to help quantify and interpret impacts of each scenario on the backlog. **Table 4** includes estimates of total expenditures through the analysis period by asset category. Expenses on Vehicles made up the largest share of total capital spending for all scenarios, followed by Guideway Elements and Systems. The overall valuation of assets in Systems and Vehicles (**Table 1**) compared to other categories and the spending levels in **Table 4** indicates the urgency of investing in these asset classes. The same observation can be made by examining the relative increases in *Rebuild Illinois* scenario investments compared to **Do Nothing** scenario across asset categories. Where there is relatively low and uniform differences between the **Do Nothing** and *Rebuild Illinois* scenarios, these are assets of high priority, while discrete and significant increases in relative spending by **Scenario 2** (e.g., Facilities) or **Scenario 3** (e.g., Guideway Elements and Stations) point to investments reserved for improved funding levels.

**Table 4. Expenditures by Asset Categories**

| | | Guideway Elements | Stations | Vehicles | Facilities | Systems | Total |
|---|---|---|---|---|---|---|---|
| Expenditures (in Millions) | Do Nothing | $2,661 | $512 | $7,518 | $907 | $2,652 | $14,250 |
| | Scenario 1 | $3,034 | $901 | $8,774 | $999 | $2,899 | $16,607 |
| | Scenario 2 | $3,918 | $996 | $8,981 | $1,496 | $3,092 | $18,482 |
| | Scenario 3 | $4,881 | $1,578 | $9,326 | $1,517 | $3,194 | $20,495 |
| Changes from Do Nothing Expenditures | Scenario 1 | 14.0% | 76.1% | 16.7% | 10.1% | 9.3% | 16.5% |
| | Scenario 2 | 47.2% | 94.7% | 19.5% | 64.9% | 16.6% | 29.7% |
| | Scenario 3 | 83.4% | 208.4% | 24.0% | 67.2% | 20.4% | 43.8% |

Changes in backlog under each scenario by asset category are featured in **Table 5**. The total backlog continues to grow under all investment scenarios considered in this White Paper, while the growth rates across asset categories vary substantially.

**Table 5. Backlog by Asset Categories**

| | | Guideway Elements | Stations | Vehicles | Systems | Facilities | Total |
|---|---|---|---|---|---|---|---|
| Initial Backlog (in Millions) | | $7,136 | $3,056 | $4,528 | $1,836 | $2,794 | $19,350 |
| End Year Backlog (in Millions) | Do Nothing | $10,252 | $6,697 | $7,923 | $3,989 | $3,004 | $31,865 |
| | Scenario 1 | $9,924 | $6,316 | $8,035 | $3,926 | $2,790 | $30,992 |
| | Scenario 2 | $9,044 | $6,229 | $7,955 | $3,492 | $2,619 | $29,340 |
| | Scenario 3 | $8,102 | $5,660 | $7,612 | $3,472 | $2,514 | $27,360 |
| Growth in Backlog | Do Nothing | 43.7% | 119.2% | 75.0% | 117.2% | 7.5% | 64.7% |
| | Scenario 1 | 39.1% | 106.7% | 77.4% | 113.8% | -0.1% | 60.2% |
| | Scenario 2 | 26.7% | 103.8% | 75.7% | 90.2% | -6.3% | 51.6% |
| | Scenario 3 | 13.5% | 85.2% | 68.1% | 89.1% | -10.0% | 41.4% |
| End Year Backlog Ratios | Do Nothing | 0.92 | 0.89 | 1.24 | 1.13 | 0.93 | |
| | Scenario 1 | 0.91 | 0.86 | 1.30 | 1.15 | 0.88 | |
| | Scenario 2 | 0.88 | 0.90 | 1.35 | 1.08 | 0.88 | |
| | Scenario 3 | 0.84 | 0.88 | 1.39 | 1.15 | 0.90 | |

For example, by 2035 under **Scenario 3** investment one can find Facilities and Stations, on one extreme, with projected backlogs increasing by 89 percent ($1.6B) and 85.2 percent ($2.6B), respectively, and, on the other, Systems with *reduction* in backlog of 10 percent ($279M). Moreover, given the highest level of investment across all asset categories, Vehicles had the highest net growth

in backlog by $3.1B. Finally, Guideway Elements had the lowest backlog growth rate (13.5 percent), but the highest backlog value ($8.0B).

Backlog ratios portray relative distributions of backlogged assets with respect their value. Backlog ratios featured in **Table 5** indicated that *Rebuild Illinois* scenarios had similar effects on all asset categories by the end of the analysis horizon. While those investments for Systems and Guideway Elements helped lowering initial backlog ratios **(Table 3)** for these categories, Vehicles and Facilities are overrepresented in the backlog by 2035, and those are likely to receive a higher priority in the upcoming funding cycles.

## Analysis of 20-Year Needs

This section includes estimates of the level of capital investment required to address all of the RTA region's deferred transit reinvestment needs (the investment backlog) as well as all anticipated rehabilitation and replacement needs during the 20-year analysis period between 2016 and 2035.

Given the magnitude of the reinvestment needs and the limitations of existing funding capacity and other factors, it should not be expected that all of these needs can be addressed within a foreseeable future. Rather, these estimates are intended to provide an understanding of the total extent of the region's reinvestment needs, to underline the relative power of each *Rebuild Illinois* funding scenarios in addressing the SGR needs and to foster discussion of how to best manage the remaining investment backlog, and to maintain and to improve funding for transit. Similar analyses were undertaken by earlier efforts.[19]

The needs estimates were calculated by a built-in functionality in COST that seeks to eliminate backlog by the end of the analysis horizon.

The **Eliminate Backlog** analysis showed that an estimated $54B 20-year investment program, where annual investments ranged between $2.0B and $4.1B, was needed to achieve full SGR. In order to provide a perspective, **Scenario 3**, the most robust Rebuild Illinois scenario considered for this White Paper was selected for portraying the potential of continued state funding in meeting the overall SGR need.

**Table 6** summarizes the **Eliminate Backlog** results asset categories and compares those with asset valuation and investment levels for **Scenario 3** and shows that **Scenario 3** was able to provide only 38 percent of the funds needed.

**Table 6** includes another new statistic, SGR Need Ratio, calculated as the ratio of expenditure needed to complete SGR for asset category over its replacement value. On average, about 87 percent of region's total asset replacement value has to be spent to achieve a complete SGR by 2035.

[19] Capital Asset Condition 2016 - Year 5 Assessment, RTA, December 2016.

**Table 6. Investment Need to Eliminate Backlog by Asset Category**

| Asset Categories | Replacement Value (in Millions) | 20-Year Need for SGR (in Millions) | SGR Need Ratio | Scenario 3 Expenditure (in Millions) | Percent SGR Needs Met |
|---|---|---|---|---|---|
| Guideway Elements | $21,694 | $13,854 | 0.64 | $4,881 | 35.2% |
| Stations | $14,590 | $7,380 | 0.51 | $1,578 | 21.4% |
| Vehicles | $12,359 | $21,723 | 1.76 | $9,326 | 42.9% |
| Facilities | $6,812 | $4,980 | 0.73 | $1,517 | 30.5% |
| Systems | $6,288 | $6,078 | 0.97 | $3,194 | 52.6% |
| **ALL** | **$61,743** | **$54,015** | **0.87** | **$20,495** | **37.9%** |

The SGR Need ratio by asset category provides an order of magnitude of relative distribution of investments that may have similar SGR effects across the asset categories.

The examination of **Eliminate Backlog** results by asset category showed that the total investment needed for complete SGR and the ability of the *Rebuild Illinois* scenarios to meet these needs varied considerably.

- Vehicles, probably due to their relatively short useful life, required more than $21.7B which is 176 percent of the replacement value of all vehicles in the system over the 20-year analysis period. Scenario 3 provided 42.9 percent of this need.
- Scenario 3 was able to meet 35 percent of the $13.9 billion investment need for Guideway Elements.
- The majority of the investment need for Systems assets was funded by Scenario 3.
- Stations was the asset category with the highest degree of unmet needs by **Scenario 3** and had the lowest SGR Need ratio.

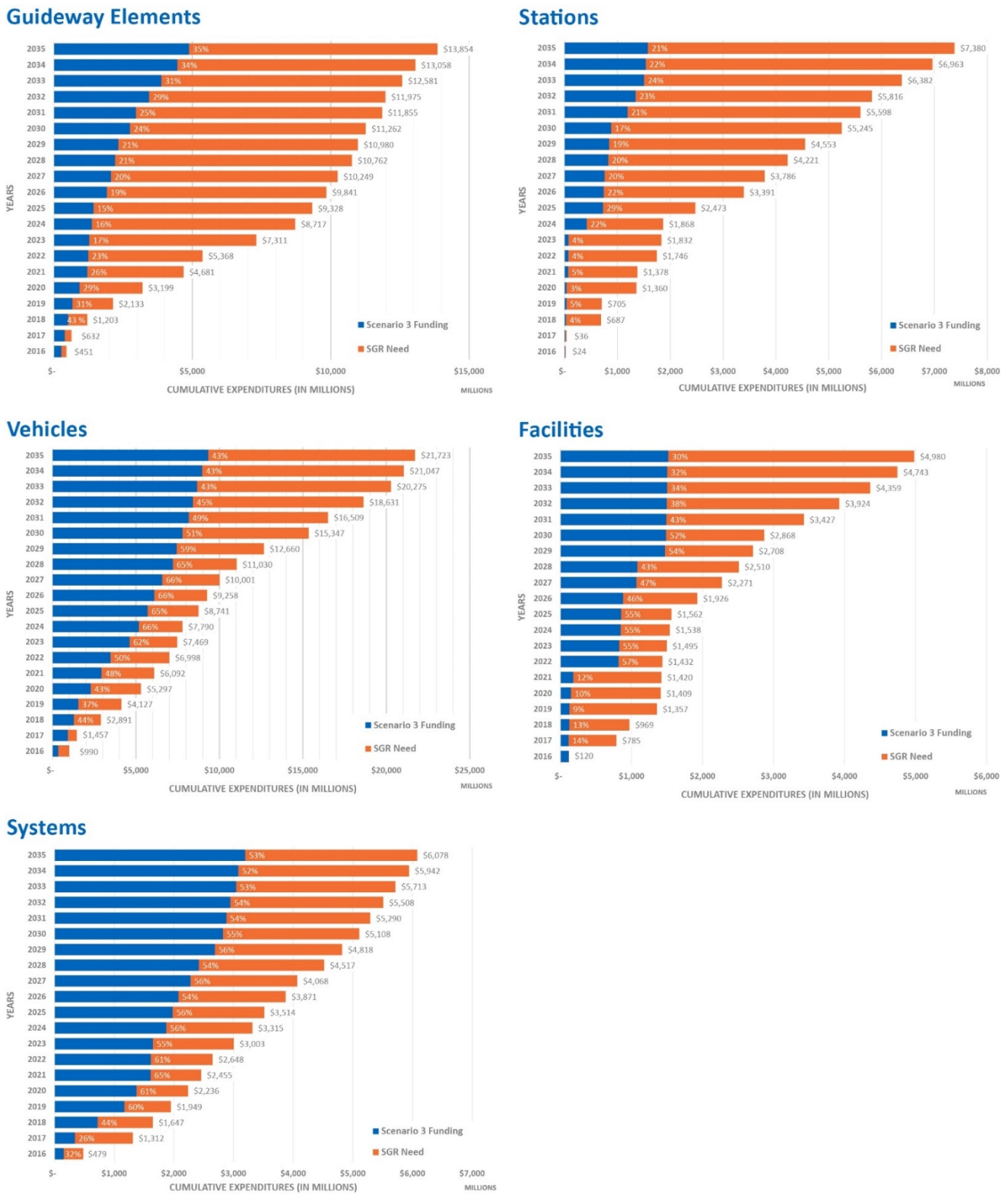
**Figure 3** features a series of charts that compares the progressions of the cumulative distributions of funding that was provided by **Scenario 3** and the needs for complete SGR for each asset category. The bars in orange indicate the SGR needs (total funds necessary to achieve full SGR for that year) and the overlapping blue bars show the amount of funds allocated by **Scenario 3.** The labels with percentages show the portion of the overall SGR need met by **Scenario 3.**

Examination of **Figure 3** indicates the following:

- There is a substantial growth in SGR needs particularly by the second half of the analysis period for all asset categories. For Guideway Elements and Stations this growth starts earlier.
- Growth in SGR needs in Guideway Elements was not matched well by **Scenario 3.** The increased rate of investment was not enough to catch up with the SGR need, and may have been affected by modest and slowly growing rate of investment in the first half of the analysis period.

- Investments on Vehicles during the first half of the analysis period corresponded up to two-thirds of the need by 2024. However, **Scenario 3** funding seems to have been overwhelmed by the growing needs, particularly by the mid-life rehabilitation needs and followed by replacement needs of assets with shorter ULB.
- Investments in the first five years on Systems assets met 65 percent of the SGR need by 2021, while the SGR need grew, Scenario 3 was still able to fund 53 percent of the total need by 2035.
- Both Stations and Facilities had investment patterns which resemble step-function like patterns.
    - Deferred investment surges for Stations were only able to meet a small share of the SGR need throughout the analysis period.
    - Facilities seemed to have benefited by these surges by a higher degree compared to Stations.

**Figure 3. Comparisons of Cumulative SGR Needs and Scenario 3 Provisions**

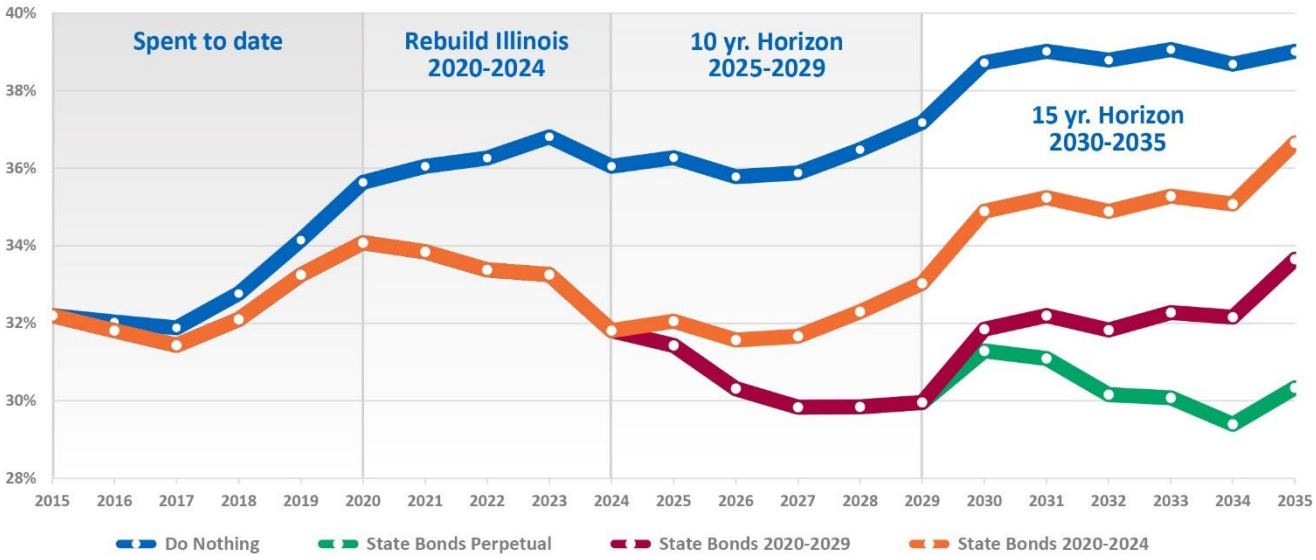


## Analysis of Percent Regional Assets Exceeding Useful Life (PAEUL)

The PAEUL statistic accounts for replaceable assets that are still in operational condition but are due for replacement. In other words, the measure focusses on assets in the backlog due for replacement and provides a view describing aging of assets. Only replaceable assets are included in the calculation of PAEUL and asset replacement values are used as weight. As a result, it reflects the portion of the value of assets that exceeded their useful life waiting for replacement. PAUEL measure does not account for assets that need major rehabilitation such as mid-life overhauls.

**Figure 4** shows projections of PAEUL over the analysis period. Similar to backlog analysis, **Figure 4** incudes the **Do Nothing** Scenario for comparison.[20] The PAEUL is projected to grow from 32.2 percent to 39 percent in the absence of State capital funds as reflected in the **Do Nothing** Scenario.

**Figure 4. Percent Regional Assets Exceeding Useful Life**




Under **Scenario 1,** which reflects *Rebuild Illinois* funding provisions, the PAEUL was estimated to grow about 2.3 percentage points from 31.8 percent to 34.1 until 2020 and then start to retreat to 2016 levels by 2024. Starting from 2025 PAEUL started to grow and reached to 36.7 percent level in the next 10 years.

**Scenario 2** funding allows further reduction in PAEUL until 2029, and in 2030 PAEUL grows by two percent points and remains at 32 percent level for four years and the trend ends at 33.7 percent.

**Scenario 3,** with perpetual State Bonds, seems to control PAEUL after 2029, and is able to improve the overall PAUEL by two percent (30.3 percent) at the end of the analysis period. In short, **Scenario 1** and **Scenario 2** both failed to improve PAEUL statistic, but a funding level near to permanent availability of State Bonds seemed to have the potential to stabilize the aging of assets at the 30 percent level until 2035.

[20] Due to differences in assumptions in funding levels, Do Nothing scenario's PAEUL projection for 2016 does not exactly match with those form the *Rebuild Illinois* Scenarios.

## Analysis of PAEUL by Asset Category

A built-in query in COST allowed creating PAEUL projections by asset category. Plots of PAEUL estimates by asset type and more detailed discussions are provided in **Appendix B.** In summary, PAEUL measure varied noticeably across scenarios and asset categories. Investments projected in the earlier years of the analysis period provided substantial improvements in PAEUL for Vehicles and Systems and resulted in lowering PAEUL by 2035. Rebuild Illinois scenarios had limited success in improving ageing of the assets in other categories; **Scenario 2** and **Scenario 3** improved the overall age of the assets in Facilities category, while assets in Stations and Guideways did not show an overall improvement. The summary of PAEUL projections featured in **Table 7** provides more details on the magnitude change in PAEUL between the 2015 and 2035 for each asset category.

**Table 7. Changes in PAEUL by Asset Category and Scenario**

| | Initial | Do Nothing | | Scenario 1 | | Scenario 2 | | Scenario 3 | |
|---|---|---|---|---|---|---|---|---|---|
| | 2015 | 2035 | Change | 2035 | Change | 2035 | Change | 2035 | Change |
| Guideway Elements | 36.2% | 47.7% | 11.6% | 45.9% | 9.9% | 41.4% | 5.2% | 36.6% | 0.5% |
| Stations | 20.9% | 33.6% | 12.7% | 30.8% | 9.9% | 30.2% | 9.3% | 26.3% | 5.3% |
| Vehicles | 36.6% | 33.2% | -3.4% | 30.6% | -6.1% | 29.0% | -7.6% | 26.2% | -10.4% |
| Systems | 44.4% | 46.5% | 2.1% | 43.0% | -1.4% | 40.3% | -4.1% | 38.6% | -5.8% |
| Facilities | 25.4% | 29.0% | 3.6% | 27.5% | 2.1% | 20.9% | -4.5% | 20.6% | -4.8% |

## Implications of Funding Levels on Asset Condition

Analysis of regional backlog and PAEUL as discussed above show that increases in funding levels to continue State Bonds for the 2025-2035 period had positive impacts in managing backlog and PAEUL in the long term. While none of the scenarios was able to reduce the backlog, permanent availability of State Bond funds provided modest level of improvements in PAEUL. Since all three scenarios had the same budget constraints until the end of 2020-2024 five-year capital plan, longer term fund allocation patterns can be understood by examining allocation of funding across asset categories by a set of pairwise comparisons of scenarios. By focusing on portions of the analysis periods where scenarios differ in funding, variations in projected funding allocations across the asset categories can be examined. **Table 8** shows three pairwise comparisons of scenarios. Each comparison presents percent funding allocation (expenditures) by a scenario with lower level funding (e.g., **Scenario 1)** with respect to a scenario with better funding (e.g., **Scenario 2)** by capital program periods.

**Table 8. Comparison of Expenditures Across Asset Classes over Time**

| | Scenario 1/Scenario 2 | | | Scenario 1/Scenario 3 | | Scenario 2/Scenario 3 | |
|---|---|---|---|---|---|---|---|
| | 2025 - 2029 | 2030 - 2035 | ALL | 2030 - 2035 | ALL | 2030 - 2035 | ALL |
| **Facilities** | 4.2% | 492.8% | 66.8% | 271.3% | 63.4% | 55.0% | 98.6% |
| **Guideway Elements** | 75.7% | 59.1% | 77.4% | 36.8% | 62.5% | 62.3% | 80.3% |
| **Stations** | 79.9% | 93.7% | 90.5% | 19.5% | 57.1% | 20.8% | 63.1% |
| **Systems** | 47.0% | 158.9% | 93.8% | 126.6% | 89.3% | 79.7% | 96.8% |
| **Vehicles** | 76.9% | 120.7% | 97.7% | 98.7% | 97.6% | 81.7% | 96.3% |
| **ALL** | 63.2% | 100.0% | 89.9% | 64.9% | 81.0% | 64.9% | 90.2% |

A value of 100 percent indicates that both scenarios invested at the same level for a particular asset group. Values less than 100 percent indicate that lower budget scenario investments are smaller than those by the higher budget scenario (values below 50 percent are highlighted in red) For example, in **Scenario 1/Scenario 2** comparisons, **Scenario 1** investments on Facilities was about 4 percent of the funds allocated by **Scenario 2** for the 2025-2029 period.

In total, **Scenario 1** provided almost 90 percent and 81 percent of **Scenario 2** and **Scenario 3** funding, respectively. All three scenarios almost spent the same amount of resources on Vehicles and had comparable expenditures on assets in the Systems category. **Scenario 1** spending for Vehicles and Systems caught up with **Scenario 2** and **Scenario 3** levels during the 2030-2035 period, indicating a minor relative weakness in **Scenario 1** for these asset classes.

Investments in Guideway Elements gradually increased as funding levels improved across scenarios. **Scenario 1** matched 62.5 percent of **Scenario 3** spending, the majority of which had to be deferred until 2030-2035 period (increases in funding are denoted decreasing levels of **Scenario 1** matches against **Scenario 2 and 3** over time).

**Scenario 1** provided nearly 63 percent of the funds spent by **Scenario 3** for Facilities. **Scenario 2** provisions were very similar to **Scenario 3** and both scenarios had almost identical allocations that were both skewed towards 2025-2029 period with a significant drop in 2030-2035. **Scenario 1** had a lower funding for the post Rebuild Illinois period and its allocation was skewed towards 2030-2035 period, as indicated by higher values in comparisons shown in **Table 8.**

**Scenario 1** and **Scenario 2** provided comparable levels of funding for Stations through the study period. **Scenario 3** provided significant additional funding during the 2030-2035 period that almost increased the total **Scenario 1** funding level by 75 percent and those were reflected by the 19.5 percent match between **Scenario 1** and **Scenario 3,** and by the relative size estimate of 57.1 percent that compares **Scenario 1** and **Scenario 3** provisions in **Table 8**.

# Next Steps

This White Paper documents the results of RTA's recent SAM analysis work with an exploratory study to examine potential impacts of State funding for capital investment on the SGR of the transit assets in the region. The COST tool is used to estimate asset conditions, and measure the impact of investment levels on replacement, midlife rehabilitation, or annual capital maintenance activities under different funding strategies over a 20-year analysis horizon. Regional analysis have shown great potential to examine effects of different funding strategies in detail as well as to expand analytics to quantify and accommodate risks,[21] to estimate benefits of SGR, and to support advocacy efforts and a wide range of capital planning and programming needs.

Further discussions between RTA and all Service Boards are warranted on this topic to identify and prioritize the analysis goals and future modeling needs to ensure the most efficient use of time and resources.

Nevertheless, through the initial support by the Service Board experts, the study provided an excellent opportunity to improve the collaboration between RTA's SAM efforts and Service Board TAM activities to advance the collective understanding of impacts of funding assumptions on SGR, data quality issues and implications, capabilities and limitations of existing tools towards the resource and schedule needs for data updates.

## Data Quality and Needs for Improvements

The study showed that COST tool and its outcomes were extremely sensitive to the currency and quality of the asset data. The existing RTA asset inventory is not yet updated to reflect new assets added to the system since 2015 and is still reflecting asset condition in 2015. This data vintage limited the analysis span, which had to start from 2016, and required extra effort to interpret the results in light of past and future timeframes. In addition, Service Boards may have incorporated updates to cost calculation assumptions such as cost years, contingency factors for certain assets and updates to policy factors that are used in asset priority score computations.

In-depth examination of outputs revealed presence of inconsistencies in level of detail for some asset categories across Service Boards. More recent condition data reporting to the NTD seems to have remedied this issue to a certain degree, future inventory updates should assure consistent and reasonable grouping of assets into asset inventory items that would allow easier and more logical classifications for interpretation and communication purposes.

A thorough update of the asset inventory, and overhaul of cost and condition information for the existing assets would enable more reliable results. In addition, an updated asset inventory would

[21] Recent experience by the CTA experts indicated that other than funding uncertainties, variations in assumptions about useful life and replacement costs for Revenue Vehicles, replaceability and useful life and decay for Guideway Structures and Facilities and various unit cost inputs showed substantial impacts on model results.

allow establishing a more realistic asset-project mapping and implementing a more robust project level analysis.

An initiative undertaking the exploration of the minimum additional data needs and most efficient ways of compiling the necessary data is underway. This effort will build from earlier work and will make the best use of annual NTD data comprised of information from the A-10, A-15, A-20, A30, and A-35 forms and their components. Informed by the analytical priorities mentioned above the process intends to leverage the existing data update processes, minimize additional data collection burden, and to achieve a standardized, current and accurate, to the extent possible, asset inventory that would serve the collective modeling needs of RTA and all Service Boards.

## COST Limitations and Needs for Improvements

COST tool is still in use by CTA. Metra relies on a custom developed tool that is also capable of generating NTD reports. Pace uses a well-established legacy procedure that facilitates capital investment prioritization. There is a general consensus that COST seems useful for scenario analysis and complementing the capabilities of the existing tools. As a result, the COST tool will remain as the main decision support tool for RTA in the near term. A detailed review of the tool and needs assessment will be conducted later in 2020 in collaboration with users in each Service Board. The following provides an initial list of potential short-term updates:

- The tool includes many redundant or unused queries that complicate usage, those will be removed, and the remaining will be better organized to assure consistency with the documentation.
- The study showed that scenario analysis required additional steps in data preparation and output preparation, options for automating these steps will be explored.

As part of a more involved effort, the core algorithm can be redesigned or revised to add new functionality like extending the analysis horizon beyond 30 years, and new options such as custom filtering of assets and hard coding a selection of investments, will be explored. Code modifications to alter the existing prioritization logic, and to revise and to extend output calculations can be considered.

# Appendix A: Funding Projection Summary

| | Federal and Local Funding Sources | 2015-2019 | 2019-2023 | 2025-2029 | 2030-2035 |
|---|---|---|---|---|---|
| CTA | §5307/§5340 Urbanized Area Formula | 120,487,471 | 112,924,660 | 107,522,580 | 101,882,779 |
| | §5337 State of Good Repair Formula | 144,823,359 | 150,805,647 | 143,591,420 | 136,059,726 |
| | §5339 Bus and Bus Facilities | 11,725,103 | 12,278,109 | 11,690,765 | 11,077,558 |
| | CMAQ | 7,406,323 | 5,990,916 | 5,115,758 | 4,467,350 |
| | §5339c Low/No-Emission Bus Program | 1,114,412 | - | - | - |
| | §5310 Funds | 70,639 | - | - | - |
| | TIGER | 4,759,072 | - | - | - |
| | TIFIA | 111,400,000 | - | - | - |
| | Department of Homeland Security | 6,624,082 | 5,050,670 | 4,464,056 | 3,898,250 |
| | New Starts/Core Capacity | 85,448,958 | 78,648,978 | 24,748,132 | 21,611,380 |
| | Other Federal Grants (Clean Diesel EPA/Safety Research) | 1,022,209 | - | - | - |
| | RTA Bonds | 24,277,216 | - | 10,615,908 | 7,819,096 |
| | RTA ICE Funds | 4,225,005 | - | - | - |
| | Positive Budget Variance | 8,821,297 | - | - | - |
| | Other Service Board Funds | 16,470,520 | 168,445 | 88,279 | 78,973 |
| | Transit TIF Funds | 118,405,711 | - | - | - |
| | CTA Bond Proceeds to be paid for by Ground Transportation Tax | 2,971,518 | 34,054,188 | - | - |
| | Reprogrammed CTA Bond Proceeds to be paid for by Ground Transportation Tax | 8,432,980 | - | 27,903,119 | 25,450,737 |
| | CTA Bond Proceeds RPM | 11,143,193 | 54,648,257 | - | - |
| | Reprogrammed CTA Bond Proceeds (RPM) | 13,241,899 | - | - | - |
| | Reprogrammed Federal Formula Funds | 1,009,398 | - | - | - |
| | Reprogrammed ICE Funds | 903,556 | - | - | - |
| | Reprogrammed RTA Bond Funds | 2,107,634 | - | - | - |
| | CTA Ground Transportation Tax Repayment (Short Term) | (1,549,719) | (16,850,389) | - | - |
| | CTA Debt Repayment Principal (§5307/§5340 ) | (16,671,077) | (23,292,874) | (24,468,901) | (21,889,495) |
| | CTA Debt Repayment Principal (§5309) | (35,499,265) | (48,923,883) | (32,686,656) | (29,240,970) |
| | CTA Debt Repayment Interest (§5307/§5340) | (8,916,072) | (8,556,269) | (10,665,862) | (9,541,512) |
| | CTA Debt Repayment Interest (§5309) | (72,980,834) | (56,826,922) | (53,220,863) | (47,610,549) |
| Metra | §5307/§5340 Urbanized Area Formula | 77,529,061 | 73,394,736 | 69,883,685 | 66,218,129 |
| | §5337 State of Good Repair Formula | 84,869,542 | 88,403,310 | 84,174,280 | 79,759,149 |
| | Consolidated Rail Infrastructure and Safety Improvments (CRSI) | 4,268,457 | - | - | - |
| | §5310 Funds | 48,000 | - | - | - |
| | TIGER | 2,731,707 | - | - | - |
| | CMAQ | 3,278,525 | 52,773 | 1,974,075 | 1,723,867 |
| | RTA ICE Funds | 6,062,002 | 2,743,147 | 4,122,809 | 3,906,558 |
| | RTA Bonds | 21,849,494 | 21,339,411 | 9,554,317 | 7,037,187 |
| | Other Service Board Funds | 24,614,294 | 4,946,418 | 16,815,050 | 15,042,480 |
| | Reprogrammed Federal Formula Funds | 84,782 | - | - | - |
| | Additional Federal Formula Funds | 11,849 | - | - | - |
| | Reprogrammed/Deobligated State Funds | 10,741,811 | - | - | - |
| | Reprogrammed RTA Bond Funds | 2,819,924 | - | - | - |
| | Deobligated/Reprogrammed Service Board Funds | 3,517,285 | - | - | - |
| Pace | §5307/§5340 Urbanized Area Formula | 36,593,884 | 36,376,594 | 34,636,414 | 32,819,656 |
| | §5339 Bus and Bus Facilities | 1,617,714 | 1,693,534 | 1,612,519 | 1,527,939 |
| | CMAQ | 4,980,747 | - | 768,540 | 671,130 |
| | RTA ICE Funds | 2,427,722 | - | 1,061,591 | 781,910 |
| | RTA Bonds | 1,150,148 | - | - | - |
| | Positive Budget Variance | 6,391,869 | 237,809 | 210,188 | 188,031 |
| | Reprogrammed Federal Formula Funds | 3,780 | - | - | - |
| | Reprogrammed/Deobligated State Funds | 14,867,341 | - | - | - |
| | Deobligated/Reprogrammed Service Board Funds | 2,136,562 | - | - | - |

| | State Capital Funds | 2015-2019 | 2020-2024 | 2025-2029 | 2025 - 2035 |
|---|---|---|---|---|---|
| CTA | *State Bond Funds - EM* | | $26,919,931 | $0 | $0 |
| | *State Bond Funds - NEM* | | $208,778,047 | $0 | $0 |
| | *State PAYGO Funds* | | $128,531,748 | $128,531,748 | $128,531,748 |
| Metra | *State Bond Funds - EM* | | $0 | $0 | $0 |
| | *State Bond Funds - NEM* | | $204,958,936 | $0 | $0 |
| | *State PAYGO Funds* | | $66,836,509 | $66,836,509 | $66,836,509 |
| Pace | *State Bond Funds - EM* | | $39,571,347 | $0 | $0 |
| | *State Bond Funds - NEM* | | $10,608,641 | $0 | $0 |
| | *State PAYGO Funds* | | $10,282,540 | $10,282,540 | $10,282,540 |

| | | | | | |
|---|---|---|---|---|---|
| TOTALS (Scenario 1) | CTA | $571,274,585 | $664,349,257 | $343,229,483 | $332,595,072 |
| | Metra | $242,426,734 | $462,675,240 | $253,360,726 | $240,523,879 |
| | Pace | $70,169,766 | $98,770,465 | $48,571,792 | $46,271,205 |
| | Total | $883,871,085 | $1,225,794,961 | $645,162,000 | $619,390,156 |

**2020-2024 CAPITAL PROGRAM REVENUES** **Schedule II-A**

| | | 2020 | | 2021 | 2022 | 2023 | 2024 | TOTAL |
|---|---|---|---|---|---|---|---|---|
| | | Prior Year Reprogrammed Funding | New Funding | | | | | |
| **CTA** | | | | | | | | |
| | **FTA** | | | | | | | |
| CFF01 | §5307/§5340 Urbanized Area Formula | $ 0 | $ 130,281,282 | $ 132,235,501 | $ 134,219,034 | $ 136,232,319 | $ 138,275,804 | **$ 671,243,940** |
| CFF02 | §5337 State of Good Repair Formula | 0 | 173,984,610 | 176,594,379 | 179,243,295 | 181,931,944 | 184,660,924 | **$ 896,415,152** |
| CFF03 | §5339 Bus and Bus Facilities | 0 | 14,165,284 | 14,377,763 | 14,593,430 | 14,812,231 | 15,034,516 | **$ 72,983,224** |
| | **Subtotal FTA** | **$ 0** | **$ 318,431,176** | **$ 323,207,643** | **$ 328,055,759** | **$ 332,976,494** | **$ 337,971,244** | **$ 1,640,642,316** |
| | **Federal-Flexible/Discretionary** | | | | | | | |
| CFD01 | CMAQ | 0 | 33,890,857 | 0 | 0 | 0 | 0 | **33,890,857** |
| CFD03 | Sec. 5303 UWP Planning | 0 | 420,000 | 420,000 | 420,000 | 420,000 | 420,000 | **2,100,000** |
| CFD08 | Department of Homeland Security | 0 | 6,000,000 | 6,000,000 | 6,000,000 | 6,000,000 | 6,000,000 | **30,000,000** |
| CFD09 | New Starts/Core Capacity | 0 | 100,000,000 | 100,000,000 | 100,000,000 | 100,000,000 | 65,476,130 | **465,476,130** |
| | **Subtotal Fed Flexible** | **0** | **140,310,857** | **106,420,000** | **106,420,000** | **106,420,000** | **71,896,130** | **531,466,987** |
| | **Subtotal All Federal** | **$ 0** | **$ 458,742,033** | **$ 429,627,643** | **$ 434,475,759** | **$ 439,396,494** | **$ 409,867,374** | **$ 2,172,109,303** |
| | **State** | | | | | | | |
| CST01 | State Bond Funds | 0 | 247,781,200 | 247,781,200 | 247,781,200 | 247,781,200 | 247,781,200 | **1,238,906,000** |
| CST02 | State Bond PAYGO Funds* | 0 | 141,875,000 | 141,875,000 | 141,875,000 | 141,875,000 | 141,875,000 | **709,375,000** |
| | **Subtotal State** | **$ 0** | **$ 389,656,200** | **$ 389,656,200** | **$ 389,656,200** | **$ 389,656,200** | **$ 389,656,200** | **1,948,281,000** |
| | **RTA** | | | | | | | |
| CR02 | RTA ICE Funds | 0 | 0 | 0 | 0 | 0 | 0 | **0** |
| CR01 | RTA Bonds | 0 | 0 | 0 | 0 | 0 | 0 | **0** |
| | **Subtotal RTA** | **$ 0** | **$ 0** | **$ 0** | **$ 0** | **$ 0** | **$ 0** | **$ 0** |
| | **Service Board/Local** | | | | | | | |
| CB05 | Illinois Long Range Transportation Funds | 0 | 1,221,600 | 220,000 | 0 | 0 | 0 | **1,441,600** |
| CB02 | Other Service Board Funds | 0 | 410,400 | 160,000 | 105,000 | 105,000 | 105,000 | **885,400** |
| CB06 | Service Board Bond Proceeds | 0 | 267,601,874 | 143,373,782 | 77,500,000 | 77,500,000 | 0 | **565,975,656** |
| CB09 | Ground Transportation Tax Bond Proceeds | 0 | 160,939,596 | 10,260,404 | 7,800,000 | 0 | 0 | **179,000,000** |
| CB11 | RPM Bond Proceeds | 0 | 240,256,377 | 46,992,816 | 0 | 0 | 0 | **287,249,193** |
| | **Subtotal SB/Local** | **$ 0** | **$ 670,429,847** | **$ 201,007,002** | **$ 85,405,000** | **$ 77,605,000** | **$ 105,000** | **1,034,551,849** |
| | **Subtotal State/RTA/Local** | **$ 0** | **$ 1,060,086,047** | **$ 590,663,202** | **$ 475,061,200** | **$ 467,261,200** | **$ 389,761,200** | **2,982,832,849** |
| **TOTAL CTA FUNDING** | | **$ 0** | **$ 1,518,828,080** | **$ 1,020,290,845** | **$ 909,536,959** | **$ 906,657,694** | **$ 799,628,574** | **$ 5,154,942,152** |
| | **Debt Repayment** | | | | | | | |
| CDR01 | CTA Ground Transportation Tax Repayment (Short Term) | 0 | (88,571,181) | 0 | 0 | 0 | 0 | $ (88,571,181) |
| | **Subtotal Ground Transportation Tax Repayment** | **$ 0** | **$ (88,571,181)** | **$ 0** | **$ 0** | **$ 0** | **$ 0** | **$ (88,571,181)** |
| CDR02 | CTA Red-Purple Modernization Repayment | 0 | (60,000,000) | 0 | 0 | 0 | 0 | $ (60,000,000) |
| | **Subtotal Red-Purple Modernization Repayment** | **$ 0** | **$ (60,000,000)** | **$ 0** | **$ 0** | **$ 0** | **$ 0** | **$ (60,000,000)** |
| CDR05 | Illinois PAYGO Debt Repayment | 0 | (49,875,000) | (49,875,000) | (49,875,000) | (49,875,000) | (49,875,000) | $ (249,375,000) |
| | **Subtotal Illinois PAYGO Debt Repayment** | **$ 0** | **$ (49,875,000)** | **$ (49,875,000)** | **$ (49,875,000)** | **$ (49,875,000)** | **$ (49,875,000)** | **$ (249,375,000)** |
| CDR03 | CTA Debt Repayment Principal (§5307/§5340 ) | 0 | (41,410,000) | (22,980,000) | (24,125,000) | (7,285,000) | (26,635,000) | (122,435,000) |
| CDR04 | CTA Debt Repayment Principal (§5309) | 0 | (32,230,000) | (47,940,000) | (50,365,000) | (70,995,000) | (55,630,000) | (257,160,000) |
| | **Subtotal Debt Repayment Principal** | **0** | **(73,640,000)** | **(70,920,000)** | **(74,490,000)** | **(78,280,000)** | **(82,265,000)** | **(379,595,000)** |
| CDR06 | CTA Debt Repayment Interest (§5307/§5340) | 0 | (12,656,775) | (10,586,275) | (9,437,275) | (5,366,225) | (6,928,013) | (44,974,563) |
| CDR07 | CTA Debt Repayment Interest (§5309) | 0 | (63,859,010) | (61,863,302) | (59,396,090) | (59,615,257) | (53,967,312) | (298,700,971) |
| | **Subtotal Debt Repayment Interest** | **0** | **(76,515,785)** | **(72,449,577)** | **(68,833,365)** | **(64,981,482)** | **(60,895,325)** | **(343,675,534)** |
| | **Subtotal Debt Repayment** | **$ 0** | **$ (348,601,966)** | **$ (193,244,577)** | **$ (193,198,365)** | **$ (193,136,482)** | **$ (193,035,325)** | **$ (1,121,216,715)** |
| **TOTAL CTA AVAILABLE** | | **$ 0** | **$ 1,170,226,114** | **$ 827,046,268** | **$ 716,338,594** | **$ 713,521,212** | **$ 606,593,249** | **$ 4,033,725,437** |

*PAYGO funding allocation splits will be reassessed in years beyond 2024

**2020-2024 CAPITAL PROGRAM REVENUES** **Schedule II-A**

| | | 2020 | | 2021 | 2022 | 2023 | 2024 | TOTAL |
|---|---|---|---|---|---|---|---|---|
| | | Prior Year Reprogrammed Funding | New Funding | | | | | |
| **METRA** | | | | | | | | |
| | **FTA** | | | | | | | |
| MFF01 | §5307/§5340 Urbanized Area Formula | $ 167,887 | $ 84,675,573 | $ 85,945,707 | $ 87,234,892 | $ 88,543,416 | $ 89,871,567 | $ 436,439,042 |
| MFF02 | §5337 State of Good Repair Formula | 0 | 101,990,978 | 103,520,842 | 105,073,655 | 106,649,760 | 108,249,506 | 525,484,741 |
| | **Subtotal FTA** | **$ 167,887** | **$ 186,666,551** | **$ 189,466,549** | **$ 192,308,547** | **$ 195,193,176** | **$ 198,121,073** | **$ 961,923,783** |
| | **Federal-Flexible/Discretionary** | | | | | | | |
| MFD07 | CMAQ | 0 | 0 | 306,000 | 0 | 0 | 0 | 306,000 |
| | **Subtotal Fed Flexible** | **$ 0** | **$ 0** | **$ 306,000** | **$ 0** | **$ 0** | **$ 0** | **$ 306,000** |
| | **Subtotal Federal** | **$ 167,887** | **$ 186,666,551** | **$ 189,772,549** | **$ 192,308,547** | **$ 195,193,176** | **$ 198,121,073** | **$ 962,229,783** |
| | **State** | | | | | | | |
| MST01 | State Bond Funds | 0 | 205,166,300 | 203,966,300 | 238,101,300 | 242,466,300 | 187,631,300 | 1,077,331,500 |
| MST02 | State Bond PAYGO Funds* | 0 | 73,775,000 | 73,775,000 | 73,775,000 | 73,775,000 | 73,775,000 | 368,875,000 |
| | **Subtotal State** | **$ 0** | **$ 278,941,300** | **$ 277,741,300** | **$ 311,876,300** | **$ 316,241,300** | **$ 261,406,300** | **$ 1,446,206,500** |
| | **RTA** | | | | | | | |
| MR01 | RTA ICE Funds | 0 | 5,198,000 | 5,302,000 | 5,408,000 | 0 | 0 | 15,908,000 |
| MR02 | RTA Bonds | 0 | 0 | 0 | 0 | 130,000,000 | 0 | 130,000,000 |
| | **Subtotal RTA** | **$ 0** | **$ 5,198,000** | **$ 5,302,000** | **$ 5,408,000** | **$ 130,000,000** | **$ 0** | **$ 145,908,000** |
| | **Service Board/Local** | | | | | | | |
| MB01 | Other Service Board Funds | 0 | 6,000,000 | 5,000,000 | 5,000,000 | 5,000,000 | 5,000,000 | 26,000,000 |
| MB02 | Other Local Funds | 0 | 3,600,000 | 0 | 0 | 0 | 0 | 3,600,000 |
| | **Subtotal SB/Local** | **$ 0** | **$ 9,600,000** | **$ 5,000,000** | **$ 5,000,000** | **$ 5,000,000** | **$ 5,000,000** | **$ 29,600,000** |
| | **Subtotal State/RTA/Local** | **$ 0** | **$ 293,739,300** | **$ 288,043,300** | **$ 322,284,300** | **$ 451,241,300** | **$ 266,406,300** | **$ 1,621,714,500** |
| **TOTAL METRA AVAILABLE** | | **$ 167,887** | **$ 480,405,851** | **$ 477,815,849** | **$ 514,592,847** | **$ 646,434,476** | **$ 464,527,373** | **$ 2,583,944,283** |

*PAYGO funding allocation splits will be reassessed in years beyond 2024

**2020-2024 CAPITAL PROGRAM REVENUES** **Schedule II-A**

| | | 2020 | | 2021 | 2022 | 2023 | 2024 | TOTAL |
|---|---|---|---|---|---|---|---|---|
| | | Prior Year Reprogrammed Funding | New Funding | | | | | |
| **PACE** | | | | | | | | |
| PFF01 | §5307/§5340 Urbanized Area Formula | $ 0 | $ 41,967,709 | $ 42,597,225 | $ 43,236,183 | $ 43,884,726 | $ 44,542,997 | $ 216,228,840 |
| PFF02 | §5339 Bus and Bus Facilities | 0 | 1,953,832 | 1,983,140 | 2,012,887 | 2,043,080 | 2,073,726 | 10,066,665 |
| | **Subtotal FTA** | **$ 0** | **$ 43,921,541** | **$ 44,580,365** | **$ 45,249,070** | **$ 45,927,806** | **$ 46,616,723** | **$ 226,295,505** |
| | **Federal-Flexible/Discretionary** | | | | | | | |
| PFD01 | CMAQ | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | **Subtotal Fed Flexible** | **$ 0** | **$ 0** | **$ 0** | **$ 0** | **$ 0** | **$ 0** | **$ 0** |
| | **Subtotal Federal** | **$ 0** | **$ 43,921,541** | **$ 44,580,365** | **$ 45,249,070** | **$ 45,927,806** | **$ 46,616,723** | **$ 226,295,505** |
| | **State** | | | | | | | |
| PST01 | State Bond Funds | 0 | 52,752,500 | 52,752,500 | 52,752,500 | 52,752,500 | 52,752,500 | 263,762,500 |
| PST02 | State Bond PAYGO Funds* | 0 | 11,350,000 | 11,350,000 | 11,350,000 | 11,350,000 | 11,350,000 | 56,750,000 |
| | **Subtotal State** | **$ 0** | **$ 64,102,500** | **$ 64,102,500** | **$ 64,102,500** | **$ 64,102,500** | **$ 64,102,500** | **$ 320,512,500** |
| | **RTA** | | | | | | | |
| PRT01 | RTA ICE Funds | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| PRT02 | RTA Bonds | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | **Subtotal RTA** | **$ 0** | **$ 0** | **$ 0** | **$ 0** | **$ 0** | **$ 0** | **$ 0** |
| | **Service Board/Local** | | | | | | | |
| PB02 | Positive Budget Variance | 0 | 250,000 | 250,000 | 250,000 | 250,000 | 250,000 | 1,250,000 |
| PB03 | Service Board Bond Proceeds | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | **Subtotal SB/Local** | **$ 0** | **$ 250,000** | **$ 250,000** | **$ 250,000** | **$ 250,000** | **$ 250,000** | **$ 1,250,000** |
| | **Subtotal State/RTA/Local** | **$ 0** | **$ 64,352,500** | **$ 64,352,500** | **$ 64,352,500** | **$ 64,352,500** | **$ 64,352,500** | **$ 321,762,500** |
| **TOTAL PACE AVAILABLE** | | **$ 0** | **$ 108,274,041** | **$ 108,932,865** | **$ 109,601,570** | **$ 110,280,306** | **$ 110,969,223** | **$ 548,058,005** |
| **PACE ADA** | | | | | | | | |
| | **State** | | | | | | | |
| AST01 | State Bond Funds | 0 | 4,000,000 | 4,000,000 | 4,000,000 | 4,000,000 | 4,000,000 | 20,000,000 |
| | **Subtotal State** | **$ 0** | **$ 4,000,000** | **$ 4,000,000** | **$ 4,000,000** | **$ 4,000,000** | **$ 4,000,000** | **$ 20,000,000** |
| **TOTAL PACE ADA AVAILABLE** | | **$ 0** | **$ 4,000,000** | **$ 4,000,000** | **$ 4,000,000** | **$ 4,000,000** | **$ 4,000,000** | **$ 20,000,000** |
| **RTA** | | | | | | | | |
| | **RTA** | | | | | | | |
| RR01 | RTA Funds | $ 0 | $ 250,000 | $ 0 | $ 0 | $ 0 | $ 0 | $ 250,000 |
| | **Subtotal RTA** | **$ 0** | **$ 250,000** | **$ 0** | **$ 0** | **$ 0** | **$ 0** | **$ 250,000** |
| **TOTAL RTA AVAILABLE** | | **$ 0** | **$ 250,000** | **$ 0** | **$ 0** | **$ 0** | **$ 0** | **$ 250,000** |

*PAYGO funding allocation splits will be reassessed in years beyond 2024

**2020-2024 CAPITAL PROGRAM REVENUES** **Schedule II-A**

| | 2020 | | 2021 | 2022 | 2023 | 2024 | TOTAL |
|---|---|---|---|---|---|---|---|
| | Prior Year Reprogrammed Funding | New Funding | | | | | |
| **REGIONAL TOTAL** | | | | | | | |
| **FTA** | | | | | | | |
| §5307/§5340 Urbanized Area Formula | $ 167,887 | $ 256,924,564 | $ 260,778,433 | $ 264,690,109 | $ 268,660,461 | $ 272,690,368 | $ 1,323,911,822 |
| §5337 State of Good Repair Formula | 0 | 275,975,588 | 280,115,221 | 284,316,950 | 288,581,704 | 292,910,430 | 1,421,899,893 |
| §5339 Bus and Bus Facilities | 0 | 16,119,116 | 16,360,903 | 16,606,317 | 16,855,311 | 17,108,242 | 83,049,889 |
| **Subtotal FTA** | **$ 167,887** | **$ 549,019,268** | **$ 557,254,557** | **$ 565,613,376** | **$ 574,097,476** | **$ 582,709,040** | **$ 2,828,861,604** |
| **Federal-Flexible/Discretionary** | | | | | | | |
| CMAQ | 0 | 33,890,857 | 306,000 | 0 | 0 | 0 | 34,196,857 |
| Sec. 5303 UWP Planning | 0 | 420,000 | 420,000 | 420,000 | 420,000 | 420,000 | 2,100,000 |
| Department of Homeland Security | 0 | 6,000,000 | 6,000,000 | 6,000,000 | 6,000,000 | 6,000,000 | 30,000,000 |
| New Starts/Core Capacity | 0 | 100,000,000 | 100,000,000 | 100,000,000 | 100,000,000 | 65,476,130 | 465,476,130 |
| **Subtotal Fed Flexible** | **$ 0** | **$ 140,310,857** | **$ 106,726,000** | **$ 106,420,000** | **$ 106,420,000** | **$ 71,896,130** | **$ 531,772,987** |
| **SUBTOTAL FEDERAL** | **$ 167,887** | **$ 689,330,125** | **$ 663,980,557** | **$ 672,033,376** | **$ 680,517,476** | **$ 654,605,170** | **$ 3,360,634,591** |
| **State** | | | | | | | |
| State Bond Funds | 0 | 509,700,000 | 508,500,000 | 542,635,000 | 547,000,000 | 492,165,000 | 2,600,000,000 |
| State Bond PAYGO Funds* | 0 | 227,000,000 | 227,000,000 | 227,000,000 | 227,000,000 | 227,000,000 | 1,135,000,000 |
| **Subtotal State** | **$ 0** | **$ 736,700,000** | **$ 735,500,000** | **$ 769,635,000** | **$ 774,000,000** | **$ 719,165,000** | **$ 3,735,000,000** |
| **RTA** | | | | | | | |
| RTA ICE Funds | 0 | 5,198,000 | 5,302,000 | 5,408,000 | 0 | 0 | 15,908,000 |
| RTA Funds | 0 | 250,000 | 0 | 0 | 0 | 0 | 250,000 |
| RTA Bonds | 0 | 0 | 0 | 0 | 130,000,000 | 0 | 130,000,000 |
| **Subtotal RTA Funding** | **$ 0** | **$ 5,448,000** | **$ 5,302,000** | **$ 5,408,000** | **$ 130,000,000** | **$ 0** | **$ 146,158,000** |
| **Service Board/Local** | | | | | | | |
| Positive Budget Variance | 0 | 250,000 | 250,000 | 250,000 | 250,000 | 250,000 | 1,250,000 |
| Other Service Board Funds | 0 | 6,410,400 | 5,160,000 | 5,105,000 | 5,105,000 | 5,105,000 | 26,885,400 |
| Other Local Funds | 0 | 3,600,000 | 0 | 0 | 0 | 0 | 3,600,000 |
| Illinois Long Range Transportation Funds | 0 | 1,221,600 | 220,000 | 0 | 0 | 0 | 1,441,600 |
| Service Board Bond Proceeds | 0 | 267,601,874 | 143,373,782 | 77,500,000 | 77,500,000 | 0 | 565,975,656 |
| **Subtotal SB/Local** | **$ 0** | **$ 279,083,874** | **$ 149,003,782** | **$ 82,855,000** | **$ 82,855,000** | **$ 5,355,000** | **$ 599,152,656** |
| **SUBTOTAL State/RTA/Local** | **$ 0** | **$ 1,021,231,874** | **$ 889,805,782** | **$ 857,898,000** | **$ 986,855,000** | **$ 724,520,000** | **$ 4,480,310,656** |
| **TOTAL REGIONAL FUNDING** | **$ 167,887** | **$ 1,710,561,999** | **$ 1,553,786,339** | **$ 1,529,931,376** | **$ 1,667,372,476** | **$ 1,379,125,170** | **$ 7,840,945,247** |
| **Debt Repayment** | | | | | | | |
| CTA Ground Transportation Tax Repayment (Short Term) | 0 | (88,571,181) | 0 | 0 | 0 | 0 | (88,571,181) |
| **Subtotal Ground Transportation Tax Repayment** | **$ 0** | **$ (88,571,181)** | **$ 0** | **$ 0** | **$ 0** | **$ 0** | **(88,571,181)** |
| CTA Red-Purple Modernization Repayment | 0 | (60,000,000) | 0 | 0 | 0 | 0 | (60,000,000) |
| **Subtotal Red-Purple Modernization Repayment** | **$ 0** | **$ (60,000,000)** | **$ 0** | **$ 0** | **$ 0** | **$ 0** | **(60,000,000)** |
| Illinois PAYGO Debt Repayment | 0 | (49,875,000) | (49,875,000) | (49,875,000) | (49,875,000) | (49,875,000) | (249,375,000) |
| **Subtotal Illinois PAYGO Debt Repayment** | **$ 0** | **$ (49,875,000)** | **$ (49,875,000)** | **$ (49,875,000)** | **$ (49,875,000)** | **$ (49,875,000)** | **(249,375,000)** |
| CTA Debt Repayment Principal (§5307/§5340 ) | 0 | (41,410,000) | (22,980,000) | (24,125,000) | (7,285,000) | (26,635,000) | **(122,435,000)** |
| CTA Debt Repayment Principal (§5309) | 0 | (32,230,000) | (47,940,000) | (50,365,000) | (70,995,000) | (55,630,000) | **(257,160,000)** |
| **Subtotal Debt Repayment Principal** | **0** | **(73,640,000)** | **(70,920,000)** | **(74,490,000)** | **(78,280,000)** | **(82,265,000)** | **(379,595,000)** |
| CTA Debt Repayment Interest (§5307/§5340) | 0 | (12,656,775) | (10,586,275) | (9,437,275) | (5,366,225) | (6,928,013) | (44,974,563) |
| CTA Debt Repayment Interest (§5309) | 0 | (63,859,010) | (61,863,302) | (59,396,090) | (59,615,257) | (53,967,312) | (298,700,971) |
| **Subtotal Debt Repayment Interest** | **0** | **(76,515,785)** | **(72,449,577)** | **(68,833,365)** | **(64,981,482)** | **(60,895,325)** | **(343,675,534)** |
| **Subtotal Debt Service** | **$ 0** | **$ (348,601,966)** | **$ (193,244,577)** | **$ (193,198,365)** | **$ (193,136,482)** | **$ (193,035,325)** | **(1,121,216,715)** |
| **TOTAL REGIONAL AVAILABLE** | **$ 167,887** | **$ 1,361,960,033** | **$ 1,360,541,762** | **$ 1,336,733,011** | **$ 1,474,235,994** | **$ 1,186,089,845** | **$ 6,719,728,532** |

*PAYGO funding allocation splits will be reassessed in years beyond 2024

# Appendix B - Backlog and PAEUL Projections by Asset Category

# Appendix B - Backlog and PAEUL Projections by Asset Category

## Analysis of Backlog by Asset Type

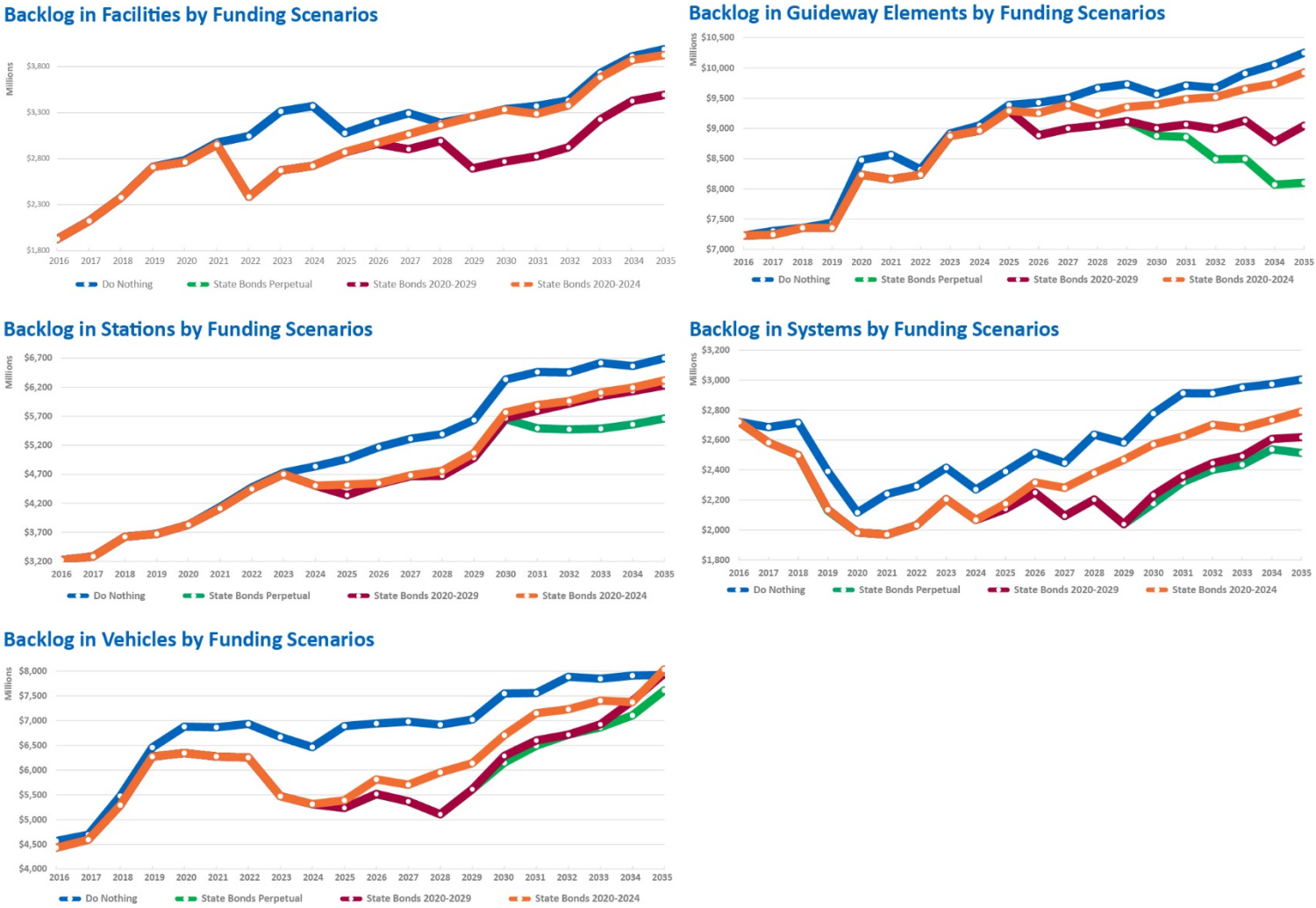
Descriptive analysis of the valuation of assets and the backlog by assets type showed that assets in different categories varied significantly in valuation and in propensity of backlogged. Different investment levels, as represented by the three scenarios in this White Paper, are also expected to have varying degrees of impact on the backlog across asset categories. In order to examine the potential impacts of *Rebuild Illinois* scenarios on backlog by asset type, COST backlog outputs were queried to calculate backlog projections by asset type. This type of analysis is also useful to evaluate the effectiveness, adequacy, and timeliness of actual investment strategies in meeting SGR needs of the region's assets. **Figure B1** features backlog projections by asset category over the analysis period and the key findings for asset category are as follows:

- Increased investments into Systems starts early on and lowest backlog level at $2 billion is achieved by 2021. **Scenario 1** investment level allowed backlog to regrow after 2021, while still ended up lowering the backlog by a small margin ($200 million) when compared to **Do Nothing** Scenario. **Scenario 2** and **Scenario 3** were able to sustain 2021 backlog levels until 2029 and the backlog started to grow at similar rates for both scenarios, while growth seemed to be under control by 2035. **Scenario 2** provided another $170 million of reduction in backlog by 2035 and **Scenario 3** added another $100 million in reduction. Overall Systems is the only category with a net reduction in backlog when compared to 2015. **Scenario 1** maintained the backlog at 2015 level, while **Scenario 2** and **Scenario 3** resulted in 6.3 and 10 percent of backlog reductions, respectively.
- The magnitude of deviations from **Do Nothing** trend for Vehicles in all three scenarios indicated the immediate need. Increased investment started in 2019 stabilizing the trend and then lowering to 2018 levels by 2023. Backlog started to grow in 2025 for **Scenario 1** and exceeded **Do Nothing** scenario by a small margin due to increased needs in maintenance and renewed replacement needs for replaced vehicles earlier. **Scenario 2** was able to control the backlog after 2024 until 2028. Both **Scenario 2** and **Scenario 3** were overwhelmed by the renewed maintenance and replacement needs, as a result 2035 backlog levels ended up at near $8 billion, while **Scenario 3** showed an improvement of approximately $400 million by the end of the analysis period.
- Guideway Elements make up the most valuable assets and accounts for 37 percent of the backlog. **Scenario 1** was not able to allocate noticeably higher funds to Guideway Elements than the **Do Nothing** Scenario. Some modest level allocations during the second half of the analysis period helped attain a final backlog reduction in the range of $300 million to $350 million. **Scenario 2** and **Scenario 3** started to channel noticeably higher amounts of funding starting from 2026 with an initial reduction in backlog just below $9 billion level. **Scenario 2** was able to

stabilize the backlog at this level, while **Scenario 3** continued to allocate funds to Guideway Elements and was able to lower the backlog at the $8 billion level by 2035.

- All three scenarios waited until 2022 to divert additional funding for Facilities. **Scenario 1** funding allows growth in backlog and lets it grow to **Do Nothing** levels by 2028 and tracked the same until 2035. **Scenario 2** and **Scenario 3** invested identically into Facilities. After a four-year break from additional investment, both scenarios allocated additional funds that stopped the growth of the backlog in 2026 and provided some reduction until 2029. By the end of 2035, the backlog reached to $3.5 billion level, still $500 million lower than the **Do Nothing** Scenario projections.
- Incremental investments in Stations started in 2024 and the backlog was kept stable at 2023 levels until 2028. Under **Scenario 1** and **Scenario 2** the backlog started to grow and reached to $6.3 billion and $6.2 billion levels respectively, an improvement about $500 million over the **Do Nothing** Scenario. **Scenario 3** was able to divert additional funding starting in 2030 and maintained the 2030 backlog level of $5.7 billion by 2035.

**Figure B1. Backlog Projections by Asset Type and Scenario**



# Analysis of PAEUL by Asset Type

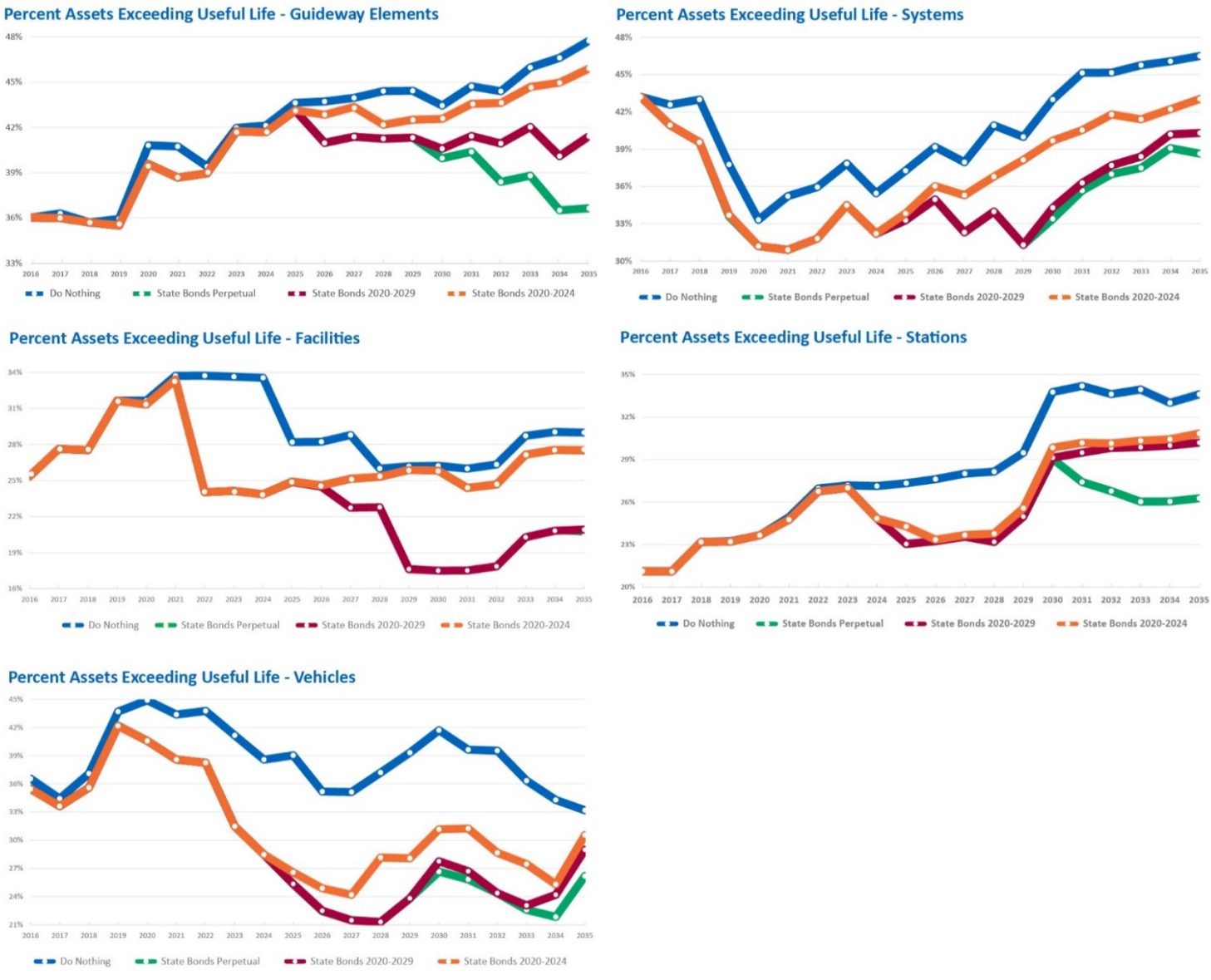
Descriptions PAEUL trends by asset category by scenario as shown in **Figure B2** are summarized below and the key changes in the PAEUL measures are highlighted.

- All scenarios improved assets in Vehicles, improvement in the PAEUL measure ranged from 3.4 percent (**Do Nothing**) to 10.4 percent (**Scenario 3**). A closer examination of PAEUL trends by scenario indicated that post- Rebuild Illinois Scenarios started to make an impact immediately in 2020, and by 2025, PAEUL for Vehicles was reduced by five percent to 28.5 level in 2024. Continuation of State Bond availability resulted in further reductions to a near 21 percent level in 2028. The trend starts to oscillate with a two-year growth starting from 2028 followed by a three-year improvement and this cycle seems to repeat itself. The first extension of State Bond funds (**Scenario 2**), provided sizeable improvements over **Scenario 1,** while still provided visible benefits, the impact of perpetual State Bond funds scenario was somewhat modest during the 2030-2034 period.
- *Rebuild Illinois* Scenarios provided varying degree of improvements to the Systems assets by the end of the analysis period ranging from 1.4 to 5.8 percent. Initial investments until 2021 allowed more than 13 percent point improvement to a 31.8 level. Under **Scenario 1,** PAEUL in Systems started to grow by 2022 and almost fell back to 2016 level by 2035. Starting from 2024, **Scenario 2** and **Scenario 3** held the PAEUL level steady around 33 percent until 2029, and 2030 and onwards neither had substantial investment on Systems as a result PAEUL to grew back to 40.3 and 38.6 percent levels, respectively.
- The additional funding provided by Rebuild Illinois Scenarios did not have noticeable impact on assets categorized under Facilities until 2022. The initial PAEUL of 25.3 percent grew to 34 percent by 2021. The investments starting in 2022 resulted in an immediate 10-percent drop in PAEUL and kept it at 25 percent level until 2026. **Scenario 1** investments following 2026 continued to maintain an average level of 25 percent until 2033 and the trend started to grow to 27.5 percent. **Scenario 2** was able to divert additional resources after 2027 that resulted in significant decline in PAEUL to 17.6 percent until 2029 and maintained the condition of assets at the same level until 2032. The trend showed some growth in 2033 and seemed to stabilize at the 21 percent level for the rest of the analysis period. **Scenario 3** funds practically had no additional impact over **Scenario 2.**
- Assets under Stations did not receive new funding until 2023, as a result the PAEUL grew by 6 percent points to 27 percent from the starting level of 21 percent. **Scenario 1** and **Scenario 2** provided very similar levels of funding for the rest of the analysis period that lowered the PAEUL to 23 and maintained the condition of assets at the same level until 2028. The PAEUL grew to 30 percent levels in 2030 and stabilized in that range till 2035. **Scenario 3** was able to divert additional resources starting in 2030 that helped lower and stabilize the PAEUL to 26 percent level. None of the scenarios was able lower the initial PAUEL level.

Assets classified as Guideway Elements make up the most valuable asset group and had the second highest initial PAEUL level (36.2 percent). Under **Do Nothing** scenario, almost 48 percent of the

assets was projected to exceed their useful life by 2035. The post-Rebuild Illinois Scenarios had varying impacts on the end-year condition of those assets, while none of the funding scenarios was able to improve the initial PAEUL; only perpetual availability of State Bond funding allowed achieving a level close to the initial level of 36 percent. **Scenario 1** funding had marginal improvements throughout the analysis period and was able to lower PAEUL by 2 percent by 2035. More noticeable investments became available in 2026 through **Scenario 2** which initially lowered the PAEUL by 2 percent to 41 percent level and kept it at the same level with minor fluctuations until the end. **Scenario 3** allocated more funding starting from 2029 and provided a steady decline from 41 percent to 36.6 percent for the rest of the analysis period.

**Figure B2. PAEUL Projections by Asset Type and Scenario**



**-- End of report --**