REFRESHING THE STATUS QUO:

Federal Highway Programs and Funding Distribution

Eno
Center for Transportation

Authors

Paul Lewis, Vice President of Policy and Finance
Jeff Davis, Senior Fellow and Editor, Eno Transportation Weekly
Alice Grossman, Senior Policy Analyst

Acknowledgments

The report authors would like to thank Joshua Schank, Marla Westervelt, Dick Mudge, Pepper Santalucia, and Michael Grant (ICF International) for contributions to the preliminary research on which this report builds. This report would not be possible without Eno's Board of Advisors and the external experts who contributed their time through review process.

About the Eno Center for Transportation

The Eno Center for Transportation is an independent, nonpartisan think tank whose vision is for a transportation system that fosters economic vitality and improves the quality of life for all. The mission of Eno is to shape public debate on critical multimodal transportation issues and build an innovative network of transportation professionals.

Learn more at enotrans.org/about

October 2019
Updated December 2019

Table of Contents

Executive Summary

This year, the federal government gave $45.6 billion in highway "formula" funding to the 50 states and the District of Columbia. The state-by-state distribution of this money was based almost entirely on how the states fared on a variety of real-world metrics back in calendar year 2007, adjusted at the time for the need to keep certain states happy at the percentages of total formula funding they received in the 1980s and 1990s, and how well each state's Congressional delegation did in securing home-state earmarks in the 2005 SAFETEA-LU pork-barrel bonanza. The only factor that is allowed to change with the times is a requirement for each to get back 95 percent of the dollars they paid in federal gasoline, diesel and trucking excise taxes in the most recent prior year, which currently only benefits Texas.

Congress ordered the establishment of the first-ever national performance standards and measures for highways and bridges in 2012. Congress said the purpose of those standards and measures was to "transform the Federal-aid highway program and provide a means to the most efficient investment of Federal transportation funds by refocusing on national transportation goals, increasing the accountability and transparency of the Federal-aid highway program, and improving project decision-making through performance-based planning and programming." But seven years later, those performance measures and standards have nothing at all to do with how the federal government distributes highway funding.

Can we do better?

This paper examines the past, present, and possible future of the distribution of Federal-aid highway funding to states. For the first seven decades of the Federal-aid highway program, while the apportionment formulas were always set by Congress and involved political compromises, the formulas were based on constantly updated real-world factors like state population, lane-miles, miles-traveled on the various highway systems, fuel usage and tax payments, and local air quality. Construction of the Interstate System was distributed based on the periodically updated cost estimate for completion of each state's roads on the Interstate map.

But starting in the 1980s, as construction of the Interstate System wound down, states and their Congressional delegations seemed to lose sight of the shared sacrifice inherent in the Interstate program and instead focused more and more on increasing their state's share of total funding in each successive authorization bill at the expense of other states. Naked political muscle replaced objective metrics, until "minimum guarantees," "hold harmless" provisions, and an ever-increasing number of earmarks dominated the old program in the 2005 SAFETEA-LU law.

Since then, Congress has been unable or unwilling to revisit the state-by-state shares of total highway funding from the last year of SAFETEA-LU and have simply continued those shares in successive authorization laws.

Taking lessons from other federal and local grant programs, both in and out of the transportation field, this paper evaluates eight scenarios for alternative federal highway funding distribution. Each takes the $41.4 billion in highway contract authority apportioned to states via formula for fiscal year 2018 and creates new factors, and in some cases new formulas, to distribute highway money to each state. The analysis makes assumptions about state minimum apportionments (usually ½ of 1 percent, as in current law) and whether or not to cap the percentage change in a state's total apportionment for each program from the old system to the new system.

The eight scenarios evaluate different possibilities and strategies for redesigning federal highway programs and their funding streams. The first two examine how much has changed since the original 1916 Highway Act and the SAFETEA-LU era apportionments. The others test how states would fare under various needs-based and incentive-based apportionments. The final two scenarios examine restructuring of the federal program structure and matching metrics to goals.

The scenarios show how far off the current distribution from any tangible metric. They also show how the upcoming reauthorization presents an opportunity to reshape programs and target limited federal funds. It seems odd that the federal government is forcing states to spend so much time and money reporting the conditions and performance of their highways and bridges only to not use that collected information. Congress stated that those measures were intended to be used to refocus federal transportation investment on national goals. The scenarios offer insights into how Congress can target funds to areas that have the greatest need while also incentivizing better outcomes.

The analysis reveals two significant challenges with creating new formula factors. The first is with data. Readers will note that the factors in the analysis are often incomplete or out of date. If they are to be used to fairly allocate billions of dollars, data would need to be more robust in its accuracy and timeliness.

But the largest and most obvious problem with reforming the highway funding programs and their allocation is political. Each scenario results in significant changes to the amounts that states receive in annual highway funding. This alone is a nonstarter in Congress unless a dramatic increase in funding accompanies such a change. While the transportation industry continues its call for increased federal investment in transportation, perhaps it should be coupled with calls to reform how that new money will be distributed.

1.0 INTRODUCTION

The Federal-aid highway program is over a century old, and while the word "federal" gets most of the attention, "aid" is equally important. In 1916 Congress decided that the national government would only build roads if they were located on federally owned lands. For everything else, Washington would provide financial aid to state governments, which would carry out the road program.

For over a century, the fundamental policy question has been: what is the federal role in the construction and operation of highways, and how should the federal government divide highway money between the states?

Congress has always chosen to use some sort of formula to allocate most federal highway aid dollars. This process is political and Congress, state departments of transportation (DOTs), and other stakeholders spend substantial time and effort manipulating formula factors in attempts to optimize the distributions to particular states.

However, in recent years these factors have played a diminishing role in determining ultimate funding. The political process has overtaken any substantive debate about goals, objectives, and the very purpose of the program. Highway funds are now distributed based solely on the state-by-state percentages of prior year apportionments and the amount of taxes paid by users in the state into the Highway Trust Fund. Recent legislation largely ignores investment needs and efforts to allocate funds based on competitive proposals are still a minute percentage of the federal program.

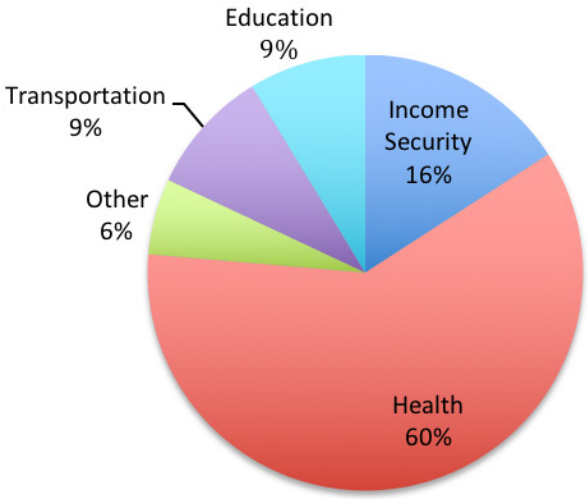
The current law governing surface transportation—the Fixing America's Surface Transportation (FAST) Act—expires in the fall of 2020. Congress and the Administration are now drafting proposals for how to reauthorize the program and have an opportunity to rework these formulas based on the stated goals and purpose of the Federal-aid highway program.

In order to inform that discussion, this report reviews the formulas used to apportion surface transportation funding in the Interstate Era. It reviews existing practices and intended goals as well as a set of case studies that model different methods of distributing funds. The report also examines competitive discretionary programs in order to offer insights into how funding might be better tied to performance and goals. Finally, it develops different scenarios for how federal money could be allocated to states. It is intended to serve as essential background in the development of new formulas and apportionment methods that are supportive of the goals of the Federal-aid highway program and can also be instructive for public transportation, freight, and other modes.

2.0 THE EVOLUTION OF TRANSPORTATION FEDERALISM

In FY 2018, the federal government issued $697 billion in grants-in-aid to states and localities (See Figure 1). In addition to transportation, these included funding for healthcare, education, and community development. Although these grants currently account for only 17 percent of all federal outlays, the federal government's role in distributing funding has always been intensely debated.

Figure 1: Outlays for Federal Grants to State and Local Governments, FY 2018



Source: Office of Management and Budget, Historical Tables, Fiscal Year 2020. Table 12-2.

Under the U.S. federal system, power is shared between the national government and the states or territories. This is not a directly hierarchical division; each level of government is a "fully functioning constitutional polity" and is empowered to define policy and pass legislation.[1] The exact nature of this relationship, however, has been deliberated since the ratification of the Constitution in 1789.

The U.S. Constitution gave Congress the authority "to establish Post Offices and post Roads," in Article 1, Section 8.[2] But a federal grant-in-aid program was not formally established until 1916 with the enactment of the Federal-aid Road Act. Prior to the 20th century, the federal government left the business of directly funding roads, railroads, and canals primarily to the states and to the private sector.[3] By the 1900s, interest in increasing financial assistance from the federal government for modern highways among Members of Congress and the public began to grow, and the program expanded.

Historically, Congress used *apportionment formulas* to determine how to distribute available funding for surface transportation to the states. A 1969 Federal Highway Administration (FHWA) study found that Congress considered at least 12 different formula "factors" when drafting the original Federal-aid law in 1916: (1) total population; (2) farm population; (3) total land area; (4) area of cultivated land; (5) total road mileage; (6) rural post road mileage; (7) mileage of improved roads; (8) mileage of unimproved roads; (9) assessed valuation of taxable property; (10) highway needs; (11) highway funds already expended, and (12) equal distribution of funds among states.[4]

The formula selected by Congress in the 1916 law followed a recommendation by the organization of state highway bureaus and used three equally-weighted apportionment factors: state population (to benefit the populous Eastern states), state area (to benefit the newly developing Western states), and the length of the U.S. Post Office's star routes and rural delivery routes in the state (to represent the direct federal interest and provide a constitutional justification for the program).[5]

The Federal Highway Act of 1921 added a provision guaranteeing small states no less than one-half percent of the total apportionment. With this "minimum apportionment" addition, this formula stayed intact until 1944, when Congress began to experiment with additional programs (with their own formula factors) to provide a link between apportionments and evolving investment needs.

The Highway Revenue Act of 1956 led to the birth of our current system by introducing the Highway Trust Fund (HTF) as the funding mechanism for the federal surface transportation grant-in-aid program. The introduction of the HTF involved a 50 percent increase in the gas tax, with most of the new funding supporting an expanded Interstate Highway program. This new program also had a much higher federal matching share of spending: 90 percent instead of the historical 50 percent. The 1956 Act also included the preexisting federal highway programs, which retained the traditional 50 percent match.

In general, the concept of the grant-in-aid system called on the federal government to give funding to the states to "pursue mutually agreed-upon" goals.[6] In the case of surface transportation, the primary agreed-upon goal was to build the Interstate Highway System as rapidly as possible. In a compromise between the House of Representatives and the Senate, funding for Interstate construction would be given out via a population-weighted formula for the first three years of the HTF. Then in 1959, formulas that considered the cost to complete the Interstate System would be introduced as the new apportionment method. Each state, in partnership with the federal Department of Commerce, calculated the cost-to-complete the proposed Interstate within their boundaries. The formula considered these costs and the amount of money that each state would contribute when determining the apportionment.

From the creation of the HTF in 1956 to the declared completion of the Interstate System in 1991, the primary focus of state and local government officials during drafting of surface transportation legislation was "maximizing the provision of federal assistance and minimizing federal involvement in how [the states could use] federal funds."[7] In turn, that effort helped to determine the way the cost-to-complete formula was calculated.[8]

The initial cost-to-complete formula for the Interstate was used through the Federal-aid highway reauthorizations of the 1960s. In 1963 the formula was slightly adjusted, and from time to time new estimates of the cost to complete the system were introduced. The most influential change was made in 1970, which included a guaranteed minimum Interstate System apportionment of 0.5 percent. This gave states the additional assurance that they would receive a minimum amount of funding.

Table 1: Post-Interstate Era Federal Surface Transportation Laws

Law	Year	Total ($B)
Intermodal Surface Transportation Efficiency Act (ISTEA)	1991	$155
Transportation Equity Act for the 21st Century (TEA-21)	1998	$219
Safe, Accountable, Flexible Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU)	2005	$286
Moving Ahead for Progress in the 21st Century (MAP-21)	2012	$105
Fixing America's Surface Transportation (FAST)	2015	$305

In 1991 the Intermodal Surface Transportation Efficiency Act (ISTEA) authorized the final $7.2 billion installment to complete construction of the Interstate System, signaling the end of the existing apportionment formulas. The law introduced new formulas that considered the cost-to-complete the Interstate, Interstate System lane miles, vehicle miles traveled (VMT) on the Interstate System, cost of deficient bridges, and populations with air quality levels below the national air quality standards. This introduction initiated the dawn of the post-Interstate era and the challenge of determining how to administer a program without any clearly defined goals. ISTEA also added several so-called "equity" programs that provided states with assured baseline apportionments. In fact, funding for these "minimum guarantee" programs exceeded funding for Interstate construction for the first time.[9]

By 1998 there were no more segments of the Interstate to fund through the cost-to-complete formula program. The formulas and programs contained within the Transportation Equity Act for the 21st Century (TEA-21) had an increased number of considerations, but the law also consolidated all of the various formula equity programs into one overall Minimum Guarantee program, in effect, superseding all the other formulas. If a state's total apportionment under the other formula programs was below a percentage for that state

fixed in law and adjusted to guarantee each state a 90.5 percent rate of return on its HTF Highway Account tax payments, the Minimum Guarantee program boosted that state's allocation to get it to the minimum share.

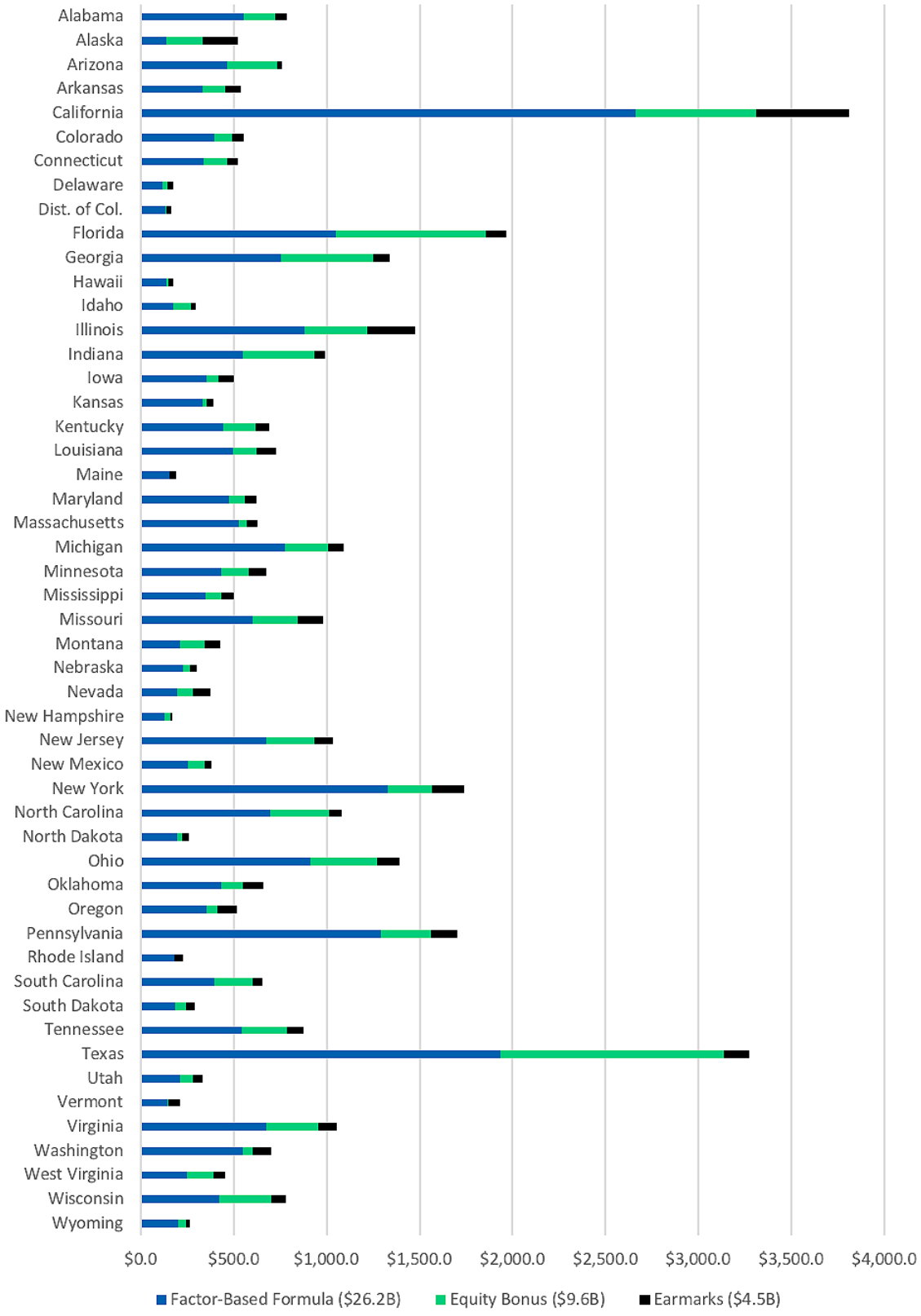
The last multi-year surface transportation authorization to include multiple, up-to-date apportionment formulas was 2005's, the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU). The formulas weighed specific aspects of the transportation system within a state—such as Interstate lane miles—with a number of other factors. These factors were then used in specific formulas that apportioned available funds among states. Within SAFETEA-LU, there were about a dozen apportionment formulas (See Appendix Tables).

However, these formulas were in many ways a moot point because SAFETEA-LU replaced Minimum Guarantee with the even more complicated Equity Bonus program.[10] In the final year of the law, that program guaranteed each state the greater of a 92 percent minimum rate of return on its share of contributions into the HTF Highway Account or a dollar amount equal to 121 percent of its average annual highway funding under the six years of the 1998 TEA-21 law. In addition, 27 specific states were guaranteed the greater of a 92 percent rate of return or a share of total formula funding equal to their annual average share under TEA-21.

(It should be noted that state tax payments to the HTF Highway Account were, at one point, rated highly as a real-world metric. A 1995 study by the U.S. General Accounting Office (which relied heavily on a 1986 study performed for FHWA by an outside consultant) found that "motor fuel consumption reflected the extent of highway use."[11] The earlier 1996 study performed regression analysis demonstrating that the most recent fiscal year HTF Highway Account tax contributions correlated more closely with highway needs (measured by the old Highway Performance Monitoring System) on Interstate roads and performed as well as any other factor on the Federal-aid primary system.[12] However, increased fuel efficiency since then mid-1980s has almost certainly degraded such tax payments as an accurate metric of road use or needs.)

In fiscal 2009, $26.2 billion was given to states based on various real-world apportionment factors (as calculated in late summer 2008, which meant most factors reflected calendar/fiscal year 2007 data), an additional $9.6 billion was given out through the more political Equity Bonus program described above). And a further $4.5 billion was given out through earmarks based on which state's Congressmen and Senators were senior in committees or in party leadership in summer 2005 when the SAFETEA-LU law was finalized. Each state's relative reliance on factor-based formula programs versus Equity Bonus versus earmarks varied widely (see Figure 2).

Figure 2: Federal-Aid Highway Funding to States in FY 2009 (Million $$)



The 2012 MAP-21 law eliminated the formulas. From then on, each state has been guaranteed an annual share of total apportioned highway funding equal to the state's share of the $40.3 billion in highway apportionments *and earmarks* given out in 2009. MAP-21 locked-in the 2009 funding percentages while adding just one variable – each state is now guaranteed to receive at least 95 percent of its estimated nominal dollars contributed to the HTF Highway Account annually. The 2015 reauthorization law, the Fixing America's Surface Transportation (FAST) Act, maintained this method of apportioning funding. Importantly, the last two authorizations also brought a renewed interest in performance and outcomes and, for the first time in decades, established national goals for surface transportation policy. MAP-21 identified seven major goals (Table 2).

Table 2: National Goals for Surface Transportation Policy

Goal Area	National Goal
Safety	Achieve a significant reduction in traffic fatalities and serious injuries on all public roads
Infrastructure condition	Maintain the highway infrastructure asset system in a state of good repair
Congestion reduction	Achieve a significant reduction in congestion on the National Highway System
System reliability	Improve the efficiency of the surface transportation system
Freight movement and economic vitality	Improve the national freight network, strengthen the ability of rural communities to access national and international trade markets, and support regional economic development
Environmental sustainability	Enhance the performance of the transportation system while protecting and enhancing the natural environment
Reduced project delivery delays	Reduce project costs, promote jobs and the economy, and expedite the movement of people and goods by accelerating project completion through eliminating delays in the project development and delivery process, including reducing regulatory burdens and improving agencies' work practices

Source: MAP-21 §1203; 23 USC 150(b)

In addition, MAP-21 and the FAST Act required the U.S. Department of Transportation (U.S. DOT) to work with states and metropolitan planning organizations (MPOs) to establish performance measures areas in several key areas. These include pavement and bridge conditions, safety, traffic congestion, emissions, and freight movement. By making these performance measures explicit, Congress opened the door to aligning apportionment formulas and discretionary programs to support national goals.

3.0 FUNDING DISTRIBUTION IN TRANSPORTATION

There are a variety of ways that the federal government provides highway money to grantees.

Large portions of federal dollars handed down to the states are distributed by formulas that are defined in legislation. This funding is subject to a set of parameters for how it can be spent. It can be in the form of a block grant or a categorical formula grant and are often tied to population. The first Federal-aid highway formula established in 1916 was based one-third on state population.[13] Often formulas incorporate more complex factors. In the case of transportation, these could be VMT, the ratio of urban to rural area, number of deficient bridges, or other transportation related statistics.[14]

Formulas based on these measures offer the benefit of simplicity. Not only are the data used in the calculations readily available, they are verifiable, and grantees can easily predict the amount of funding they will likely receive. However, formula factors of this nature correlate to system expansion and maintenance. If the federal transportation program is to distribute funds based on population, VMT, or center-lane miles, then it is effectively rewarding states that increase population, increase driving, or build new roadways. Although states generally do not take action to "perform" better based on these statistics, this apportionment approach does not effectively incentivize operational improvements, which can be effective at attaining national goals.

In some cases, funding tied to specific programs that are awarded competitively can be more adept at tying funding to specific goals and outcomes since they allow the Administration to exercise a larger amount of control over how these funds are spent.[15] However, these grants tend to be targeted to specific projects rather than spread across all states, and are more readily criticized by members of Congress and unsuccessful prospective grantees. Moreover, such grants are based on prospective performance rather than past performance, and therefore always subject to the challenges involved in projecting outcomes.

In recent years, U.S. policy makers have explored new methods of funding distribution, including making them performance-based. Allocating funding at any level of government based this way is a relatively new concept, particularly for transportation. One such program operated under SAFETEA-LU was the Highway Bridge Program (HBP) that sent funds to states for costly bridge repairs. The program was performance-based "insofar as the program allocated funding based on needs and costs."16 However, because HBP funds were dispersed to states, it was the state making the investment decision rather than the federal program guiding the investment to the bridges with the greatest national significance. Although states and localities tend to be better at assessing their local needs, it is more challenging for them to identify projects with the greatest national significance.

Finding the right metrics for performance can be challenging. Although measures for safety and bridge condition are relatively straightforward, system performance and congestion management are more difficult to determine.[17] In addition, there might not be sufficient data, resources, or technical skills within the workforce required to evaluate the performance. Since the lead-up to and aftermath of the MAP-21 performance measures rulemakings, MPOs and state DOTs have varied in how they adopted the new metrics, citing myriad challenges (including consistency and possible manipulation) as well as benefits to using them in the planning process.[18]

Another challenge to implementing performance-driven annual funding appropriations is that Congress wants to be able to predict the potential distribution of a new formula, which would necessitate applying baseline budget data. New formula factors can be both targeted to the program goals as well as not be overly cumbersome to analyze.

MAP-21 made significant steps toward requiring the federal programs to develop and implement metrics for evaluating performance, which was continued in the FAST Act. However, the performance-based variables are not tied to the actual distribution formulas to states. But tying funding to performance can have unintended consequences. For example, if funding is allocated via infrastructure condition or system reliability, regions or states that are hit by a natural disaster would have a reduction in funding. It can also incentivize states to set easily attainable metrics and not strive for the safest, most efficient transportation systems attainable for fear of financial penalty of falling short of an aggressive target. In addition, the available funding may not be sufficient to make the desired improvement in performance even if invested optimally, and states with high amounts of need may not be able to make much improvement. Finally, this approach can be difficult to implement because members of Congress tend to be largely concerned with returning the greatest amount of funding to their state.

The federal government could also provide "bonus" funding incentives to states and localities that meet certain performance goals.[19] This approach might be more politically palatable, but it would require enough funding set aside for the bonuses to be effective. It would also likely require some consideration of geographic equity, as has been used in the Better Utilizing Investments to Leverage Development (BUILD) Transportation Discretionary Grants program (previously called Transportation Investment Generating Economic Recovery (TIGER)).

Another method is to create programs that are competitive in nature. These programs involve grantees submitting competitive proposals with analysis to demonstrate that they meet standards of benefit/costs as well as other factors. These applications are then selected based on the goals of the program.

4.0 LESSONS FROM OTHER GRANT PROGRAMS

In order to inform the development of the alternative funding scenarios, this report evaluates how different federal and state programs allocate funding.[20] The cases provide a helpful cross-section of approaches used within and outside of transportation as well as the potential tradeoffs of their funding apportionment methods.

Table 3: Select Case Studies for Funding Distribution

	Name	Purpose
Federal	**No Child Left Behind Title I (NCLB)**	Provides an example of formula distribution by a federal department other than U.S. DOT.
	Race to the Top (RTTT)	Illustrates a federal competitive distribution approach that employs performance measures.
	State Energy Program (SEP)	Demonstrates an approach to formula funding that employs a combination of formula and competitive funds.
	Transit New Starts	Provides an example of competitive program within the surface transportation legislation.
	Urban Area Formula Grant (Section 5307)	Uses non-traditional formula factors and has introduced some performance-based allocations.
Non-Federal	**Colorado Department of Transportation**	Its transportation trust fund precedes the federal government's and is used in a similar way to distribute funding from the state to localities.
	Florida Department of Transportation	It is a large transportation program that functions similar to the federal government.
	Kansas Department of Transportation	Uses innovative economic analysis and local consultation in its distribution of capital funding.
	Seattle Sound Transit	Provides an example of geographic equity in funding distribution.
	San Francisco Bay Area Metropolitan Transportation Commission	Has a substantial annual budget that it allocates to its many transit agencies and is recognized as a national leader in performance-based funding distribution.

These case studies reveal several lessons that could be applied to FHWA's apportionments:

A portion of formula funding is usually distributed based on geographic equity.

Within most of the cases, geographic equity was used to provide funding to all areas within a jurisdiction (i.e., at the federal level it ensures that all states received at least a minimum level of funding). For example, the U.S. Department of Education's NCLB employed a formula grant that distributed a large portion of its funding to almost all potential grantees, while the remaining formula grants were targeted and based on the ultimate aim of the program. The Department of Energy's SEP distributed funding based on three-year grant periods, and one-third of its excess funding was distributed evenly to all potential recipients. The Urban Area Formula Grant also used calculations that ensure geographic equity.

CDOT, KDOT, FDOT, and MTC each also ensured that the needs of all of their jurisdictions are met before employing more targeted distribution methods. The only program that did not appear to distribute funding based on geographic equity was Transit New Starts. This program, informed by rigorous analysis and thorough Congressional involvement, was able to distribute funding to projects in what appeared to be states and regions that had a greater need for transit investment. This type of distribution would only be possible within a discretionary program because of its competitive, project-by-project allocation. However, Congress has proven hesitant to create new discretionary programs lacking a geographic equity component.

The cases also revealed that as a program becomes too focused on geographic equity it begins to lose its utility. Sound Transit's distribution approach resulted in it primarily becoming a conduit for taxation and if the same approach were taken at the federal level it would be difficult to determine the value added. However, as operations and maintenance become a greater portion of Sound Transit's overall budget, it may be difficult for the subarea equity principle will survive because the costs will be more fixed, and money will be apportioned where it is needed.

Formula factors that are directly related to the goals and objectives of a program are more likely to retain political support.

Since the highway formula programs in the most recent surface reauthorizations do not correspond to clear goals or objectives, political battles over funding have intensified and the formula factors have suffered from increasing criticism. However, the case studies demonstrated that programs with clear goals and objectives—and formula factors related to those objectives—are more likely to retain political support.

NCLB is a clear example of this possibility. The program's ultimate goal was to distribute federal funding to lower-income students in an effort to provide them the resources necessary to receive an adequate education. Other challenges aside, the formula factors within NCLB directly targeted funding to lower-income students, fulfilling the aim of the program.[21]

Other examples of directing funding towards stated goals and objectives are found in the SEP, RTTT, and MTC. SEP used energy consumption and population as formula factors to distribute funding. RTTT and MTC were driven by competitive performance metrics.

Grant programs can create incentives for reforms that otherwise would face political or financial barriers to implementation.

Although NCLB successfully fulfilled the aim of the program by targeting funding towards lower-income students, the program was criticized because it also required school districts and states to implement reforms that many states believed would be detrimental to their education system. An improved grant program identifies reforms that states would like to make but may face political or financial barriers to implementing. An example would be a grant program that provides funding for improved asset management programs. That is a reform that many states would like to introduce but lack the appropriate financial resources.

Transit New Starts provided funding for something that individual states and localities typically want and would have to pay for, in part, themselves: transit expansion. Within each application cycle New Starts receives far more applications than Congress has the ability to fund. Further, New Starts has continually received funding for over forty years. However, additional funding may not always be enough to garner national political support. RTTT identified and promoted reforms through financial incentives that were appealing at the federal level but encountered substantial opposition at the state and local levels. Some states, including Texas, even chose not to apply for RTTT funding because elected officials felt that the required reform would have detrimental effects on their state.[22]

Formulas can take a step toward focus and accountability if performance-based factors are combined with other distribution mechanisms to achieve established program goals.

The highway program formulas included in SAFETEA-LU generally used engineering-based measures and Census factors (such as road miles or population) to apportion funding. However, the case studies demonstrate that formulas could be more dynamic to better accomplish program goals. For example, NCLB formula targeted funding towards both school districts that have need, while also rewarding states that have distributed state education funding equitability. This allowed the formula to serve the goals of the program, but simultaneously incentivize states to be better to distribute their funding to sub-governments in a way that fosters equity.

SEP employed a unique distribution approach that uses both a formula and a competitive process. This hybrid approach ensured that each state energy office received a predictable amount of funding each year, while simultaneously incentivizing states to improve their energy efficiency. The Urban Area Formula Grant has a set aside that employs performance-based funding, targeting investments towards metropolitan areas that have large transit program but may not receive the funding otherwise.

Although these approaches are innovative, they retain the core value of a formula-based distribution, which is ensuring consistency in funding distribution to enable effective financial planning. Consistency is particularly important for infrastructure investment as projects often are completed over many years.

It is easier to distribute funding based on performance through discretionary grant programs than formula programs.

In order for a performance-based funding approach to be effective it requires an increased level of public outreach and engagement. New Starts and RTTT reviewed each applicant individually and determined which applicants would receive funding and which would not. However, RTTT failed to mediate the goals of the program and its review process with the public, and the program ultimately lost funding. MTC and KDOT incorporated local level concerns into their ultimate funding decisions. This engagement allowed projects that performed well to receive an increased level of public support, and projects that did not perform as well to be reevaluated to meet the needs of the investing agency and the locality.

Distributing funding based on performance is data-intensive and therefore can be easier to implement for a discretionary grant program rather than a larger grant program.

Congress looks more favorably on discretionary programs where its members play a role in project review and approval.

New Starts has continued to receive funding for decades, in large part because the legislative branch retains some control over funding distribution rather than leaving decisions entirely to the executive. New Starts includes an analysis component (which has been streamlined over the years) conducted by the Federal Transit Administration (FTA), but Congress ultimately has the power to appropriate funding on a project-by-project basis.[23]This allows legislators to take credit for providing money for projects within their states or districts.

Contrast this approach with two discretionary programs operated at U.S. DOT: BUILD/TIGER and the Urban Partnership Agreements (UPA). In both cases Congress was not part of the formal decision-making process. As a result, Congress prevented the continuation of the UPA, and funding for BUILD/TIGER has varied from year to year. BUILD/TIGER has also faced substantial criticism from Congress and others for allocating funding on a "political" basis, despite the extensive analysis that goes into funding decisions. Such criticism might be muted if Congress were more involved in the process, or if the process were more transparent.[24] Any new discretionary programs introduced by Congress and designed by FHWA should figure out a way to incorporate Congress into the decision-making process.

5.0 ALTERNATIVE DISTRIBUTION METHODS FOR HIGHWAY DOLLARS

This section illustrates how funding is distributed under the FAST Act and calculates how each state's share of the total funding and dollar amount would change under a specific alternative scenario. It does not recommend any particular scenario but, rather, demonstrates how different approaches affect the final distribution of dollars in the program.

These scenarios assume that it would not be possible to dramatically change how any money is distributed without a significant increase in available funds for surface transportation. Without an increase of funding many states would experience a funding decrease if apportionments were adjusted, likely making any such change politically unfeasible. Although the scenarios assume flat spending for simplicity and to help illustrate how each state would fare under the various factors, they are all assumed unlikely to be implemented without additional funding.

In FY2018, the FHWA's five core programs received a lump sum of about $41.4 billon.[25] This analysis maintains the FY2018 baseline funding levels for the illustrative scenarios and for simplicity of analysis does not take into account any mass transit programs and evaluates only the formula funds for the HTF Highway Account. Under the FAST Act, about 92 percent of highway funding from the HTF is distributed via statutory formulas.[26]

This section provides an overview of the programs that currently exist in the FAST Act and the goals that they seek to achieve, the concept of transferability, and the baseline scenario. It then describes eight scenarios for funding apportionment; the first is a reprise of the original 1916 highway apportionment, the next five employ FAST programs, the seventh introduces possible new program goals for MAP-21 era programs, and the eighth establishes a new set of potential FHWA programs.

5.1 FAST-Era Programs and Goals

MAP-21 consolidated and streamlined the large number of highway programs that were created through previous surface transportation legislation, and FAST retained that structure with one addition. As a result, there are currently six core programs within the purview of FHWA. In addition to these programs, FHWA also oversees a number of smaller programs. The core programs account for over 92 percent of FHWA's contract authority and are the focus for this research.[27]

Table 4: FHWA Core Programs

Program	Percentage (of core program funding)	Total Amount (FY18)
Congestion Mitigation and Air Quality Improvement Program	5.8	$2.4 billion
Metropolitan Planning Program	0.8	$0.3 billion
National Highway Performance Program	56.2	$23.3 billion
Surface Transportation Block Program	28.2	$11.7 billion
Highway Safety Improvement Program	6.2	$2.6 billion[28]
National Highway Freight Program	2.9	$1.2 billion
TOTAL	**100**	**$41.4 billion**

Congestion Mitigation and Air Quality Improvement Program (CMAQ) is FHWA's core environmental program with a legacy rooted in the history of the Clean Air Act. The 1990 Clean Air Act amendments included provisions for attainment and maintenance of national ambient air quality standards (ozone levels), but those amendments did not include a funding source to help nonattainment areas reach the required standards. In 1991, ISTEA provided CMAQ as an answer for that unfunded mandate. CMAQ funding is used to support surface transportation projects and related efforts that contribute to air quality improvements and provide congestion relief. Historically, this funding has been distributed in a way that ensures that states with nonattainment areas receive larger shares of the funding. The federal share is 80 percent formula funding with a 20 percent non-federal match.[29]

Metropolitan Planning Program (MPP) provides funding to states for MPO operation and for the development of long-range plans and short-range programs. States receive the funding and, under MAP-21, are directed to establish a formula to distribute funding to MPOs based on factors including population, attainment of air quality standards, status of planning, and metropolitan area transportation needs. The current federal share is 80 percent formula funding with a 20 percent non-federal match.[30]

National Highway Performance Program (NHPP) supports the designated National Highway System (NHS), provides revenues for capital construction of new facilities on the NHS, and aims to invest in the state's asset management plan for the NHS. The federal share is 80 percent, but up to 90 percent on Interstate projects; there is a special rate if the project incorporates Innovative Project Delivery.[31]

Surface Transportation Block Grant Program (STBP) provides flexible funding for Federal-aid highway, bridge, and tunnel projects on any public road, pedestrian and bicycle infrastructure, and transit capital projects, including intercity bus terminals. The federal share is 80 percent, but up to 90 percent on Interstate projects.[32]

Highway Safety Improvement Program (HSIP) program aims to achieve a significant reduction in traffic fatalities and serious injuries on all public roads, including non-state-owned public roads and roads on tribal lands. The federal share is 90 percent with a 10 percent match.[33]

National Highway Freight Program (NHFP) program, established by FAST, provides flexible funding for projects located on the National Highway Freight Network. Generally, NHFP funds must (1) contribute to the efficient movement of freight on the NHFN and (2) be identified in a freight investment plan included in the state's freight plan required under 23 U.S.C. §167(i)(4). In addition, a state may use not more than 10 percent of its total NHFP apportionment each year for freight intermodal or freight rail projects. Importantly, this program contains a rare reference to the performance measures established by MAP-21: if FHWA determines that a state has not met or made significant progress toward meeting the performance targets related to freight movement, the state must file a written report with FHWA containing a description of the actions it will undertake to achieve the targets. The current federal share is 80 percent formula funding with a 20 percent non-federal match.[34]

These programs roughly fit into the listed goals established by MAP-21, left intact by FAST and codified in 23 U.S.C. §150 (Table 2). While these programs generally aim to address many of FAST's the goals, there is currently no direct relationship between the goals of these programs and the way that funds are distributed.

5.2 Transferability Between Programs

When exploring ways to better distribute FHWA funding, it is important to understand the statutory context by which states are able to determine how to invest and spend federal funding. Transferability allows states to transfer funds that are apportioned under a specific core formula program to another core formula program. Under current law, a state can transfer up to 50 percent of its net apportionment in any of the six core FHWA programs to any of the other core program areas.[35] This liberal transferability between FHWA programs was introduced in TEA-21 and which allowed dissimilar programs to have money transferred between them.[36] Prior to that states were only able to transfer funds between similar programs.

The concept of transferability stems from an acknowledgment that Congressional authorizations and formulas are not going to distribute funding perfectly to states based on their actual needs or based on their state-level goals.[37] Transferability provides states the flexibility to better match funding levels to their priorities.

Because the apportionment distribution methodology under the current MAP-21 authorization does not use a distribution method that is targeted to specific goals, this flexibility does not really have an effect on the program's ability to achieve its goals. However, if the programs were more targeted and emphasized distributing funding to problem areas, transferability might play a role in a state's ability or incentive to improve a particular problem that has been defined as a national goal, but not as a state goal. If the distribution were to be performance-based and reward states for achieving national goals, it would be irrelevant how a state chooses to spend its funding as long as it continued to improve. Table 5 outlines the transferability of programs since 1976, providing a political and policy background for the scenarios. Each scenario considers how transferability would affect its apportionment.

Table 5: Transferability Percentages Under Various Federal Transportation Acts, 1976 - Present

	1976 STAA, FY1977-1978	1978 STAA, FY1979-1982	1982 STAA, FY1983-1986	1987 STURAA, FY 1987-1991	1991 ISTEA, FY1992-1998	1998 TEA-21, FY1999-2005	2005 SAFETEA-LU, FY2006-2012	2012 MAP-21 and 2015 FAST, FY2013-2020
Interstate	None	None	50% between Interstate and 4R	Unlimited from open-to-traffic Interstate 4R	All of Interstate constr. to NHS or IM	50% of any IM, NHS, STP, Bridge, CMAQ, or Rec trails to any other of those programs (more with DOT approval) but CMAQ limited to program amount over $1.35 billion/year	50% of any IM, NHS, STP, Bridge, CMAQ, or Rec Trails to any other of those programs (more for IM, NHS, and STBP with DOT approval) but CMAQ is limited to program amounts over $1.35 billion/year	50% of NHPP, STBP, HSIP, and CMAQ (and NHFP starting in 2015) except that STBGP funds sub-allocated to specific metro areas may not be transferred
				20% 4R to Primary	All of IM to STBP or NHS with DOT ok			
Non-Interstate	40% between Primary and Secondary	50% between Primary and Secondary	50% between Primary and Secondary	50% between Primary and Secondary	50% from NHS to STP			
	20% between Primary and Urban	50% between Primary and Urban	50% between Primary and Urban	50% between Primary and Urban	40% of Bridge to either NHS or STBP			
Safety	40% between any of Bridge, Hazard Mitigation, and Grade Crossings	40% between any of Bridge, Hazard Mitigation, and Grade Crossings	40% between any of Bridge, Hazard Mitigation, and Grade Crossings	40% between any of Bridge, Hazard Mitigation, and Grade Crossings	40% between any of Bridge, Hazard Mitigation, and Grade Crossings	No transferability of Hazard Mitigation and Grade Crossings	40% between Bridge and Grade Crossings	None except per HSIP above

4R is resurfacing, restoring, rehabilitating and reconstructing. Source: Various

5.3 The Baseline Scenario

To develop a baseline scenario for each state, CMAQ and MPP funding was taken off the top of each state's lump sum (ultimately accounting for 5.8 percent and 0.8 percent of the funding, respectively). The apportionment for each of these programs was based on the apportionment each state received for these programs in FY2009. After CMAQ and MPP were apportioned, a fixed amount of the remaining core formula total was given to NHFP. After that, each state's remaining money was divided amongst the remaining programs, with NHPP receiving 63.7 percent of the share, STBP receiving 29.3 percent of the share, and HSIP receiving 7 percent of the share (Table 6).

Table 6: FAST State Apportionments by Program, FY2016-2020

Program	State Share
CMAQ	Equal to FY2009 Share
MPP	Equal to FY2009 Share
NHFP	Fixed annual amount ($1.2 billion in FY16, rising to $1.5 billion in FY20)
NHPP	63.7 percent of the remainder (after CMAQ, MPP and NHFP)
STBP	29.3 percent of the remainder (after CMAQ, MPP and NHFP)
HSIP	7.0 percent (of the remainder (after CMAQ, MPP and NHFP)

The FY2018 distribution serves as the baseline apportionment and is used for comparative purposes to evaluate the potential scenarios. While the intent is to define innovative methods of distributing funding and help promote national goals, these innovations should be rooted in a political reality. This research uses these baseline numbers to analyze the political potential of each scenario in relationship to its policy potential.

The National Highway Freight Program in the Distribution Scenarios

The FAST Act maintained the same highway formula program structure that was created by MAP-21, with one exception. FAST created a sixth core formula program, the National Highway Freight Program (NHFP).

However, functionally speaking, it is difficult to distinguish the NHFP from the much larger NHPP. Neither is distributed to states via a real metrics-based formula, only by the overall share of total formula funding that a state received in 2009. All NHPP funds must be expended on the National Highway System, of which the Interstate System is the highest-trafficked subset; all NHFP funds must be expended on the National Highway Freight Network, which includes the entire Interstate System and over 4,000 miles of other, highly trafficked roads.

The NHFP is more freight-focused, but one of the eligible funding categories is any highway or bridge project "to improve the flow of freight on the National Highway Freight Network" and since road capacity is fungible, any new capacity project on the network would be eligible for NHFP funding.

The NHFP statute does make mention of a performance measure—the freight movement target)—but the only penalty for missing the target is for the state to send the FHWA a letter explaining how they plan to meet the target eventually.

While there are some other differences between the NHPP and the NHFP (NHPP allows funding for bike lanes; NHFP allows up to 10 percent of a state's annual funding to go towards intermodal freight project) the two programs were viewed by the Congressional staff who wrote the FAST Act as largely interchangeable. The analysis in this report incorporates NHFP funding into the much larger NHPP program using freight-based metrics when applicable.

5.4 Eight alternative distribution scenarios

The first apportionment scenario revisits the original 1916 formulas with all programs as a single block grant. The following five apportionment scenarios use the pre-existing MAP-21 era programs. These scenarios seek to answer how applying different apportionment formulas affect the state by state allocation of funds for each program. The final scenario introduces a set of new program ideas.

Scenario 1: 1916 Era Apportionments
Scenario 2: SAFETEA-LU Era Apportionments with MAP-21 Era Programs
Scenario 3: Needs Based Distribution
Scenario 4: Incentive Based Distribution
Scenario 5: Hybrid Needs and Incentive Based Formula Distribution
Scenario 6: Needs Based with Incentive Bonus
Scenario 7: Alternate Program Goals
Scenario 8: Innovative Programs

Each scenario consists of six sections: an apportionment description, defined goals of the apportionment, the benefits and drawbacks of the apportionment approach, a table of formulas, an analysis, and a table of the actual apportionment. Each apportionment is calculated twice. The first calculation employs the formulas as defined. The second calculation places a cap on the potential percentage change, both negatively and positively. Because none of the scenarios include an Equity Bonus or minimum percentage return on dollars into the HTF requirement, and because all of the scenarios remove the funding provided by SAFETEA-LU earmarks from the funding calculations, states' overall dollar amount received shifts dramatically in many of the scenarios. In order to introduce a new formula into the FHWA, it is likely that caps on overall change in a single year would have to be introduced to aid in political palatability. While Congress might decide to vary the maximum amount of change for each program, for illustrative purposes this analysis assumed each program for each state would not experience an increase or decrease in funding greater than 10 percent from one year to the next. In some cases, the analysis used a broader range because of dramatic change in state apportionments.

This research collected several data sets that were used to distribute funding in the eight scenarios. Tables in the Appendix outline some of the primary data sources used in the scenarios developed for this research and discusses ways that they could be improved for future distributions. The data used was the most recent available, and some factors (like the non-attainment areas) are a decade old. They are included here for the purposes of analysis, but any real modification to formulas would need to take into account the most updated datasets.

An accompanying spreadsheet that was used to conduct all the calculations in this report is available on Eno's website. This spreadsheet contains more comparative analysis than can be provided in this text, so readers should refer to it for more detail about the distribution of individual programs within each scenario. Included in the spreadsheet are two tabs that were used to calculate minimum apportionments and maximum absolute changes for each program and each state. The minimum apportionment formula uses the same methodology as FHWA to calculate for each state using five iterations. The maximum change calculator was adapted from FHWA's minimum apportionment calculator. As stated previously, the calculations are not intended to be recommendations for final outcomes, but to illustrate the possible effects that different distribution factors have on states.

Scenario 1: 1916 Era Apportionments

Description. Scenario 1 simply reproduces the original highway apportionment formula from the Federal Aid Road Act of 1916 (39 Stat. 355), which lasted until World War II. The 1916 formula was based on three equal factors: state population (for the Eastern states), state land area (for the Western states), and the state's share of designated postal "rural delivery routes and star routes" (for the compelling federal interest).

This scenario continues the use of state population and state land area. But since the 1916 approach of allowing states to upgrade any mile of any road it chose was specifically rejected by Congress in 1921 in favor of a designated Federal-aid system, and since the concept of a "Federal-aid highway" has had a lot of expansion in recent years, we are using National Highway System lane-miles (inclusive of the Interstate System) as the federal interest road-mile measure, consistent with the spirit of the 1921 Act that governed most of the existence of this formula. The 1916 Act did not have any minimum apportionments, so this scenario does not calculate minimums for states.

Goal. To compare current federal funding distribution with the original intent of the creators of the Federal-aid highway program.

Benefits and Challenges. This scenario has the benefit of simplicity, while also considering two needs-based factors. (It is not clear how state area is a needs-based factor in the modern age, now that the need to create new paved roads to link distant population centers within a state is no longer the main concern of the program.). The inclusion of state area is also a drawback, as shown below.

Table 7: Scenario 1 Apportionment

Program	Factors	Weight	Minimum Apportionment
All Federal-Aid Highway Programs	1. State population 2. State land area(see below for special Alaska rule) 3. NHS Lane-Miles	1. 33.3% 2. 33.3% 3. 33.3%	None

Analysis. The biggest factor in this scenario is Alaska's ascension to statehood in 1959. Under the 1916 Act, the largest share of land area by any U.S. State was Texas, at 8.8 percent, but Texas also had 4.3 percent of the U.S. population and 5.0 percent of the lane-miles, giving them 6.0 percent of highway funding. Today, Alaska has 16.2 percent of the U.S. land area but just 0.2 percent of the U.S. population and 0.6 percent of the NHS lane-miles, which would give Alaska 5.7 percent of the highway program under an unadjusted 1916 scenario (third most after Texas and California).

Alaska was actually allowed to participate in the Federal-aid highway program before statehood. Under section 107 of the Federal-Aid Highway Act of 1956, Alaska was to be included in the apportionment process just like states and the District of Columbia, "except that one-third only of the of the area of Alaska shall be used in the calculations to determine the area factor in the apportionment of such funds." Keeping the 1956 Alaska area rule and running a 1916-style scenario drops Alaska's share of total apportionments from 5.7 percent of the national total to 2.3 percent, between Missouri and Arizona.

In retrospect, some of the concerns that may have prompted the 1916 formula's emphasis on land area were since assuaged with the 1921 addition of the "sliding scale" whereby the federal cost share of a project rises above the statutory maximum in states where the federal government owns a large percentage of the land. (The authors of the 1916 Act were not sure whether or not states would pay for their road programs with property taxes.) And the advent of air travel means that in many of the large area states (and in Alaska in particular), roads will never be needed for the full amount of intrastate or interstate travel going over those large areas.

Table 8: Scenario 1 Distribution Results for FY 2018 ($, millions)

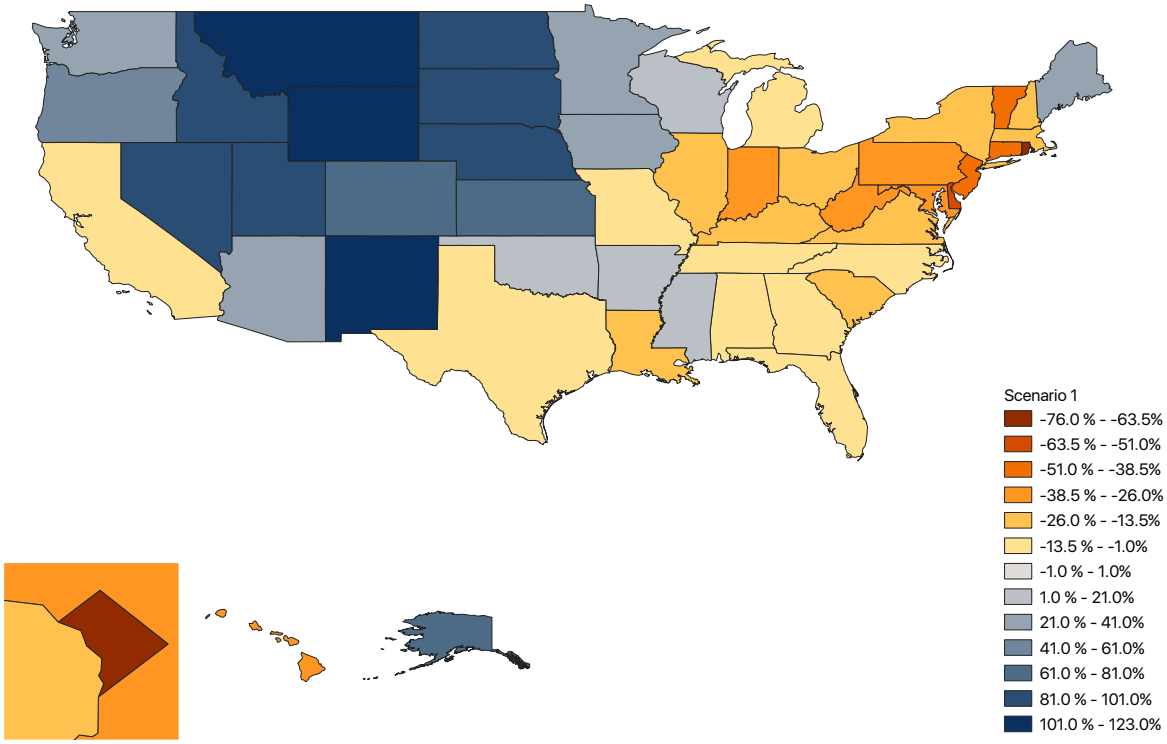
States with largest total changes in annual funding

State	State Total (Scenario 1)	State Total (2018)	Percent Change	Total Change
Montana	$889.2	$431.9	106%	$457.3
New Mexico	$824.8	$386.5	113%	$438.3
Alaska	$953.4	$527.8	81%	$425.6
Colorado	$972.6	$562.9	73%	$409.7
Nevada	$751.9	$382.2	97%	$369.6
Indiana	$675.4	$1,003.0	-33%	-$327.6
Ohio	$1,068.0	$1,410.9	-24%	-$342.9
New Jersey	$631.0	$1,051.0	-40%	-$420.0
California	$3,413.5	$3,863.4	-12%	-$449.9
Pennsylvania	$1,163.8	$1,727.1	-33%	-$563.2

States with largest percent changes in annual funding

State	State Total (Scenario 1)	State Total (2018)	Percent Change	Total Change
Wyoming	$601.9	$269.7	123%	$332.3
New Mexico	$824.8	$386.5	113%	$438.3
Montana	$889.2	$431.9	106%	$457.3
Nebraska	$600.2	$304.2	97%	$295.9
Nevada	$751.9	$382.2	97%	$369.6
Connecticut	$266.4	$528.7	-50%	-$262.3
Vermont	$107.0	$213.6	-50%	-$106.6
Delaware	$79.8	$178.1	-55%	-$98.2
Rhode Island	$83.0	$230.2	-64%	-$147.2
Dist. of Col.	$40.4	$168.0	-76%	-$127.6

Figure 3: Scenario 1 (One Third Alaska Area) Apportionment Map by Percent Change



Scenario 2: SAFETEA-LU Era Apportionments with MAP-21/FAST Era Programs

Description. Scenario 2 applies the apportionment formulas that were used in SAFETEA-LU to the programs that exist under FAST (with NHFP combined with NHPP). This scenario assumes that funding would be apportioned to the five programs separately and not in a lump sum (as it was in MAP-21). This scenario does not include Equity Bonus (nor the 95 cents on the dollar requirement), which was a cornerstone of the original SAFETEA-LU apportionment, nor do state shares reflect SAFETEA-LU earmarks. The assumption is that the HTF will continue to be a conduit for investing a substantial amount of general funds into transportation, rather than a way to return money to tax payers based on federal highway tax collections.

Scenario 2 assumes that transferability would exist as it did under SAFETEA-LU, which within MAP-21 era programs would mean that 50 percent of any of the programs could be transferred, but transferability of CMAQ would be limited to amounts over $1.35 billion a year.

Goal. To demonstrate how formulas that have already been used by FHWA would function under current programs and current data. While the programs in FAST do not function exactly as their counterpart programs in SAFETEA-LU, this scenario provides an illustration of how funding would be apportioned under formulas that have already been used by FHWA, which could provide ease in transition. Further, this scenario aims to explore if SAFETEA-LU era formulas would yield politically palatable results based on the current goals of the program.

Benefits and Challenges . The SAFETEA-LU era apportionments use data factors that are readily available and relatively straightforward to calculate. This simplicity could help to bolster political support and increase apportionment transparency because, due to their familiarity, the calculations are accessible to interested stakeholders.

SAFETEA-LU apportionments employ a needs-based approach in the sense that the formulas are intended, at least superficially, to target funding towards areas that need resources to achieve national goals. Needs-based for this particular program is defined in terms of the size of each state's physical assets, system use, and environmental degradation. For example, CMAQ's goal is to help states reach air quality attainment levels in all populated areas. The program therefore targets funding at areas that currently have non-attainment populations. Similarly, the HSIP's apportionment considers the potential number of lane miles where accidents could occur, how much those lane miles are used, and how frequently fatalities actually occur.

The apportionments also consider political factors such as ensuring that rural areas receive adequate funding. Factors including "total lane miles on principal arterial highways divided by the state's total population" (a factor in the NHPP) help to target funding toward rural areas that have critical connecting highways with smaller populations. Factors such as "estimated tax payments attributable to highway users paid into the Highway Account (HA) of the HTF," serve the political consideration of ensuring that states are receiving an amount of funding that is somewhat proportional to the amount of money they paid into the HTF.

Because the Scenario 2 formulas are from SAFETEA-LU, they have some aspects that may not translate into MAP-21's programs and program goals. For example, in SAFETEA-LU, the NHPP program excluded the Interstate System from its calculation of lane miles. While this had some logic under SAFETEA-LU because a separate Interstate program existed, the same logic does not apply with a FAST-based program structure. However, since this scenario is meant to be illustrative of SAFETEA-LU era programs as they were, almost none of the formula distributions were adjusted.

The one key adjustment from SAFETEA-LU era formulas is that this apportionment does not consider SAFETEA-LU's Equity Bonus program. Because an increasing portion of the HTF is revenue from the general fund of the U.S. Treasury, and because the aim of this exercise is exploring potential apportionments that could help states achieve policy goals (while not ignoring politics), it is assumed that SAFETEA-LU's apportionments would have more relevance if Equity Bonus was not included as a consideration.

Table 9: Scenario 2 Apportionment

Program	Factors	Weight	Minimum Apportionment
CMAQ	Non-attainment area population	100%	½ %
MPP	Urbanized area population	100%	½ %
NHPP/ NHFP	1. Lane Miles on NHS 2. VMT on NHS 3. Diesel fuel used on highways 4. Total lane miles on principal arterial highways divided by the state's total population	1. 25% 2. 35% 3. 30% 4. 10%	½ %
STBP	1. Total lane miles of Federal-aid highways 2. Total VMT on Federal-aid highways 3. Estimated tax payments attributable to highway users paid into the HTF Highway Account	1. 25% 2. 40% 3. 35%	½ %
HSIP	1. Total lane miles of Federal-aid highways 2. Total VMT on Federal-aid highways 3. Number of fatalities on Federal-aid highways	1. 33.3% 2. 33.3% 3. 33.3%	½ %

Analysis. With a few notable exceptions, states with larger areas and populations see increases in the overall funding under this scenario. California's apportionment (with the 10 percent cap on change) receives an increase of $239 million; Texas has an increase of $189 million. However, Pennsylvania, Illinois, and New York all lose a significant amount funding.

Assuming that the underlying data does not change dramatically, some states will eventually gain or lose much more than the 10 percent maximum since, in theory, these factors would be recalculated each year. The states that gain the most would be large, low population rural states. Of all the states, Alaska loses the most under this scenario due to the large boost from earmarks it received in SAFETEA-LU and the loss of its hold-harmless Equity Bonus share.

Table 10: Scenario 2 Distribution Results for FY 2018 ($, millions)

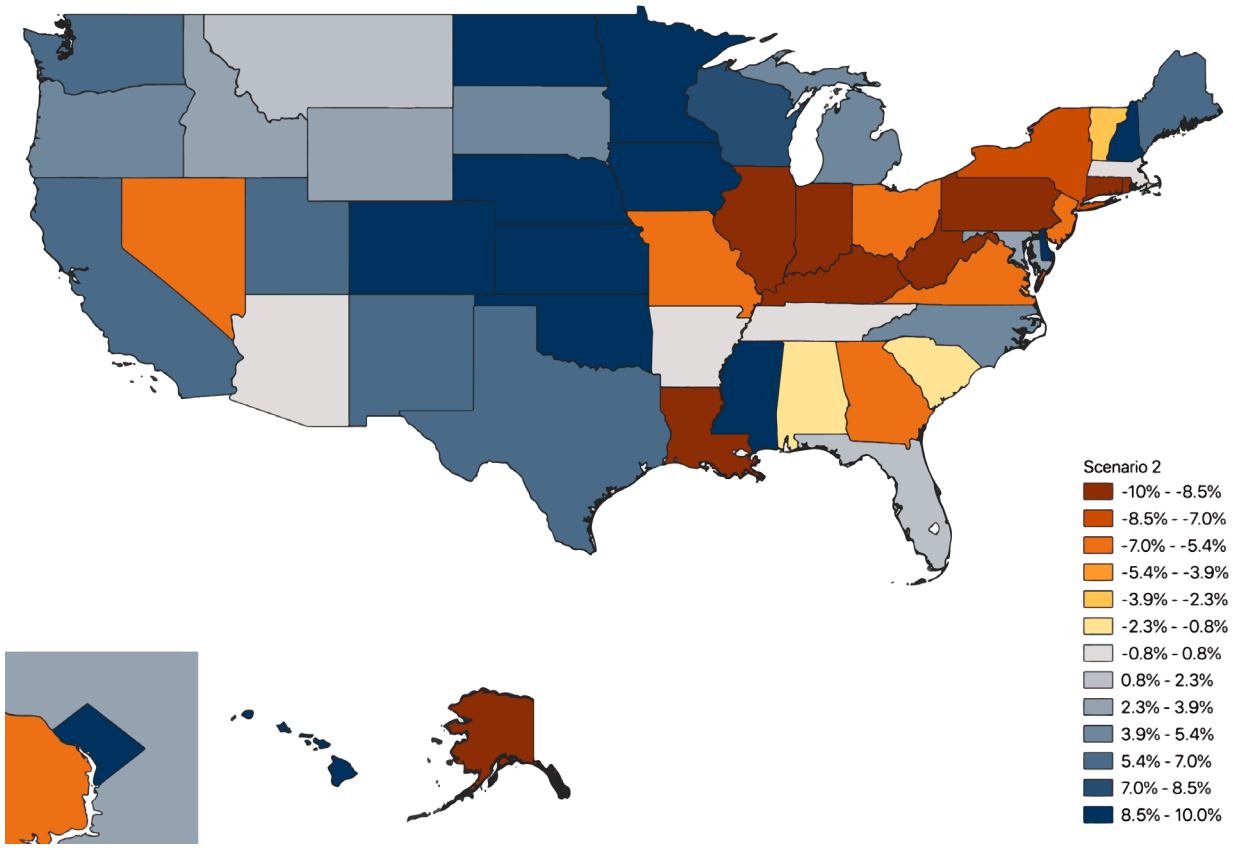
States with largest total changes in annual funding

State	State Total (Scenario 2)	State Total (2018)	Percent Change	Total Change	10% Max Change in Apportionment ($, millions)	10% Maximum Change
North Dakota	$444	$261	69.9%	$183	$286	9.3%
Wyoming	$433	$270	60.8%	$164	$278	3.0%
Colorado	$715	$563	27.1%	$152	$615	9.3%
Kansas	$548	$398	37.8%	$151	$438	10.0%
Nebraska	$441	$304	45.0%	$137	$335	10.0%
Connecticut	$390	$529	-26.2%	-$139	$480	-9.1%
West Virginia	$313	$460	-31.9%	-$147	$414	-9.9%
New York	$1,524	$1,767	-13.7%	-$243	$1,634	-7.5%
Alaska	$248	$528	-53.1%	-$280	$475	-10.0%
Pennsylvania	$1,315	$1,727	-23.9%	-$412	$1,579	-8.6%

States with largest percent changes in annual funding

State	State Total (Scenario 2)	State Total (2018)	Percent Change	Total Change	10% Max Change in Apportionment ($, millions)	10% Maximum Change
North Dakota	$444	$261	69.9%	$183	$286	9.3%
Wyoming	$434	$270	60.8%	$164	$278	3.0%
Nebraska	$441	$304	45.0%	$137	$335	10.0%
Kansas	$548	$398	37.8%	$151	$438	10.0%
South Dakota	$406	$297	36.6%	$109	$309	4.0%
Louisiana	$626	$739	-15.3%	-$113	$666	-9.9%
Pennsylvania	$1,315	$1,727	-23.9%	-$412	$1,579	-8.6%
Connecticut	$390	$529	-26.2%	-$139	$480	-9.1%
West Virginia	$313	$460	-31.9%	-$147	$414	-9.9%
Alaska	$248	$528	-53.1%	-$280	$475	-10.0%

Figure 4: Scenario 2 Apportionment Map by Capped Percent Change



Scenario 3: Needs-Based Apportionment

Description. Scenario 3 starts from the assumption that the federal program should target funding towards states with the greatest "needs" and expands on the factors used in SAFETEA-LU. For example, the aim of NHPP is to provide funding for capital investment on the NHS, which has a strong freight component. As such, the Scenario 3 NHPP apportionment considers freight ton-miles as a proxy for evaluating freight need. This replaces "diesel fuel used on highways," which was the freight proxy used in SAFETEA-LU. In addition, the NHPP considers the number of structurally deficient bridges on the NHS. This factor helps to target funding towards areas that have a demonstrated need for increased capital investment.

Whereas in Scenario 2, STBP considered political factors and lane miles, Scenario 3 tries to target funding towards more populous areas that are likely to have a greater need for general investment. Scenario 3 adds an additional factor to both CMAQ and MPP. Scenario 3 introduces a roadway congestion index (RCI) to CMAQ, as increased congestion is linked to increased automotive-related air pollution. For MPP, Scenario 3 considers median population per MPO. This factor seeks to target funding towards MPOs that are undertaking substantial planning efforts.

Under Scenario 3, transferability would be limited to 50 percent between the NHPP and the STBP. Because this scenario seeks to target funding towards areas that need it most, transferability would be limited. Formula factors are calculated with and without a 15 percent absolute value cap on change.

Goal. To use formula factors that are easy to calculate and to direct funding towards states with larger investment needs.

Benefits and Challenges. After an initial change from the current levels of funding, it provides a predictable level of funding for states (no performance-based allocations or factors that could cause significant year-over-year change). It also has the advantage of distributing funding to states that, based on metrics, arguably need it most. However, it does not actively encourage states to improve their performance or provide a vehicle to reward states for improvement.

Table 11: Scenario 3 Apportionment

Program	Factors	Weight	Minimum Apportionment
CMAQ	1. Non-attainment and maintenance area population 2. Weighted roadway congestion index	1. 50% 2. 50%	½ %
MPP	1. Urbanized area population 2. Median population per MPO	1. 50% 2. 50%	½ %
NHPP/ NHFP	1. NHS lane miles 2. Freight ton miles on the NHS 3. Pavement condition 4. Number of structurally deficient bridges on the NHS	1. 25% 2. 25% 3. 25% 4. 25%	½ %
STBP	1. Passenger miles travelled (all modes) 2. State gross domestic product (GDP) 3. Interstate Highway System lane miles 4. Job accessibility	1. 30% 2. 30% 3. 10% 4. 30%	½ %
HSIP	1. Total VMT on Federal-aid highways 2. Fatalities per capita	1. 50% 2. 50%	½ %

Analysis. Since these formulas depart from the SAFETEA-LU factors, the results show greater fluctuation between the 2018 baseline. In general, the results of Scenario 3 show that small states with dense populations and large rural states would benefit most. Large states with dense metropolitan regions such as New York, California, Illinois and Pennsylvania do not do as well because the largest grant programs use factors that benefit states with greater lane miles per capita and more miles traveled per capita.

Some of the factors that directly influenced the changes came in the large programs, such as NHPP and STBP. For example, Texas, despite being a large state, has a relatively low amount of structurally deficient bridges and Florida has relatively good pavement condition on their roadways. These factors played an outsized role in the distribution, and redirected funds to states that have poor bridge and pavement conditions, sometimes in part because of weather in states such as Illinois and Pennsylvania, or large dollar amounts of unmet bridge needs that were reflected under the SAFETEA-LU formula. While there is little direct incentive under this scenario for states to improve infrastructure condition, this at least long-term positive outcome of targeting funds to the states that have the largest problems.

Table 12: Scenario 3 Distribution Results for FY 2018 ($, millions)
(Note: the maximum increase is 12.5 percent because 10 percent was too small for the calculation)

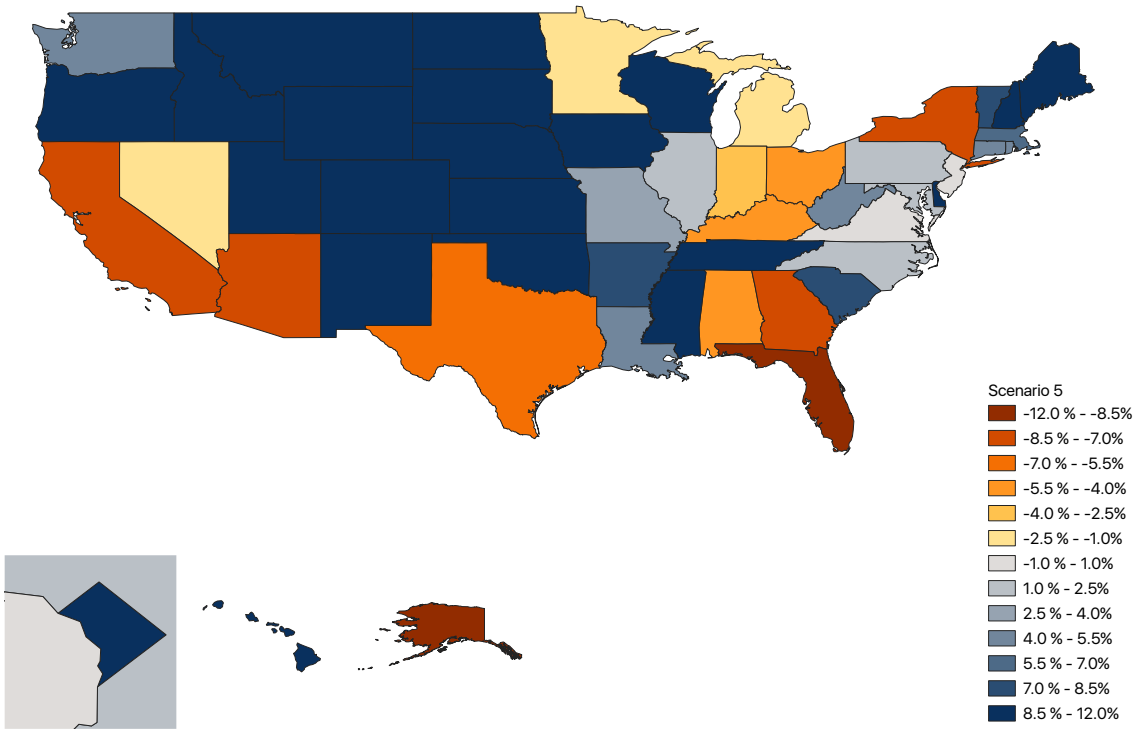
States with largest total changes in annual funding

State	State Total (Scenario 3)	State Total (2018)	Percent Change	Total Change	Limited Max Change in Apportionment ($, millions)	12.5% Maximum Increase, 10% Maximum Decrease
Dist. of Col.	$461	$168	174.2%	$293	$187	11.4%
Wyoming	$525	$270	94.8%	$256	$299	10.9%
Nebraska	$549	$304	80.5%	$245	$337	10.8%
Rhode Island	$424	$230	84.1%	$194	$243	5.4%
New Mexico	$578	$387	49.5%	$191	$428	10.7%
Georgia	$1,083	$1,359	-20.3%	-$277	$1,247.1	-8.2%
New York	$1,474	$1,767	-16.6%	-$293	$1,623.1	-8.1%
Florida	$1,457	1,994	-27.2%	-$543	$1,815.4	-9.0%
California	$2,888	$3,863	-25.3%	-$976	$3,579.9	-7.3%
Texas	$2,597	$3,832	-32.2%	-$1,235	$3,578.5	-6.6%

States with largest percent changes in annual funding

State	State Total (Scenario 3)	State Total (2018)	Percent Change	Total Change	Limited Max Change in Apportionment ($, millions)	12.5% Maximum Increase, 10% Maximum Decrease
Dist. of Col.	$460	$168	174%	$293	$187	$460
Wyoming	$525	$270	95%	$256	$299	$525
Rhode Island	$424	$230	84%	$194	$243	$424
Nebraska	$549	$304	81%	$245	$337	$549
Hawaii	$321	$178	80%	$143	$198	$321
Georgia	$1,083	$1,359	-20%	-$276	$1247	-8.2%
California	$2,888	$3,863	-25%	-$976	$3580	-7.3%
Florida	$1,452	$1,994	-27%	-$543	$1815	-9.0%
Alaska	$363	$528	-31%	-$164	$483	-8.6%
Texas	$2,597	$3,832	-32%	-$1235	$3579	-6.6%

Figure 5: Scenario 3 Apportionment Map by Capped Percent Change



Scenario 4: Incentive-Based Apportionment

Description. Scenario 4 used data factors that were closely aligned with MAP-21's performance metrics and created an apportionment and distributed funding to states based on how much they improved in specific, measurable areas. Within this scenario, if a state did not improve on the defined metrics, it would receive the half percent minimum apportionment.

Goal. To tie MAP-21 performance metrics to funding distribution, and specifically to reward states that are improving.

Benefits and Challenges. This distribution could be problematic in the sense that states that have a lot of room for improvement (or are currently poor performers) have a higher likelihood of continually improving and receiving growing shares of the apportionment. But states that have already attained high levels of performance may struggle to demonstrate annual improvement and would therefore be "punished" through receiving smaller shares of the apportionment. All funding apportioned in excess of the minimum apportionment would have transferability, meaning that states that met the goals and are performing well can be rewarded not only with extra funding, but with the ability to use that funding to meet other objectives if they desire.

Table 13: Scenario 4 Apportionment

Program	Factors	Weight	Minimum Apportionment
CMAQ	1. Decrease in non-attainment population 2. Improvement on roadway congestion index	1. 50% 2. 50%	½ %
MPP	1. Improvement on roadway congestion index 2. Median population per MPO	1. 50% 2. 50%	½ %
NHPP/ NHFP	1. Improvement in pavement condition on NHS 2. Decrease in structurally deficient ridges	1. 50% 2. 50%	½ %
STBP	1. Improvement in job access 2. Decrease in single occupancy vehicle use	1. 50% 2. 50%	½ %
HSIP	1. Decrease in fatalities per capita 2. Decrease in fatalities per VMT 3. Decrease in total fatalities	1. 33.3% 2. 33.3% 3. 33.3%	½ %

Analysis. Scenario 4 apportionment takes a dramatic departure from the previous two scenarios. Under the selected apportionment performance measures, an eclectic mix of states would see an increase in their federal share. Of all the scenarios, this one had the largest swings overall, and none could be considered long term trends as the resulting numbers could vary year over year.

As noted, states that do not show improvement under the identified metrics only receive the ½ percent minimum apportionment. This is particularly marked in the HSIP program, as if a state has seen a reduction in fatalities, this would also likely be an improvement in fatalities per capita and fatalities per VMT. Conversely, a state with increased fatalities would likely see no score in any of the three categories. Overall, this produced large swings, with New Hampshire the largest outlier. Because Mississippi scored well on multiple factors during the years analyzed, its total funding was increased from $174 million to $1.7 billion (assuming no cap).

As a result, many states that likely need increased funding rather than decreased funding are disadvantaged under this scenario. Even with some included 10-year smoothing of the data, states would have very high incentives to improve on their metrics, and those that did not improve would be met with significant funding losses. The 15 percent maximum change did help to moderate some of the changes, but in summary, this scenario highlights the significant political and policy problems associated with a purely incentive based program.

Table 14: Scenario 4 Distribution Results for FY 2018 ($, millions)
(Note: the maximum increase is 15 percent because 10 percent was too small for the calculation)

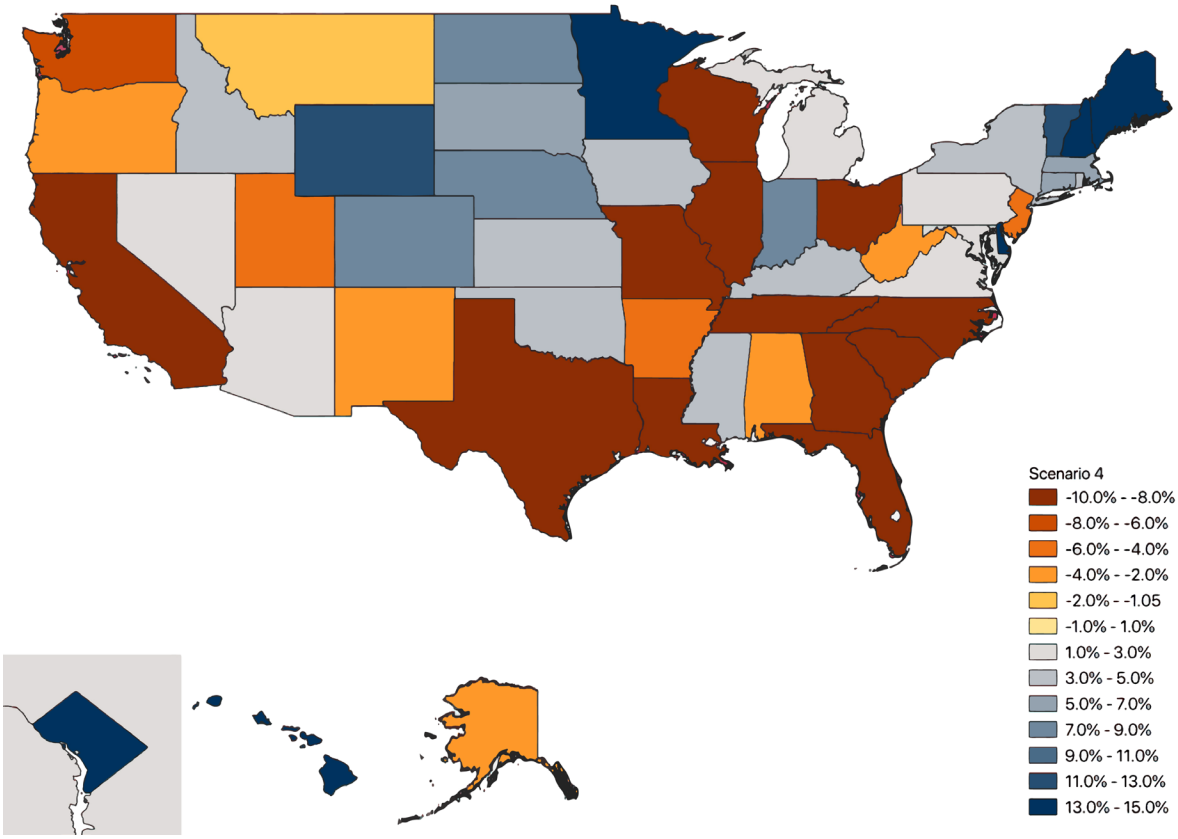
States with largest total changes in annual funding

State	State Total (Scenario 4)	State Total (2018)	Percent Change	Total Change	Limited Max Change in Apportionment ($, millions)	15% Maximum Increase, 10% Maximum Decrease
Wyoming	$2,407	$270	792.5%	$2,137	$305	12.9%
New Hampshire	$1,855	$174	966.5%	$1,681	$197	13.3%
Alaska	$1,798	$528	240.6%	$1,270	$517	-2.1%
Delaware	$1,439	$178	708.4%	$1,261	$202	13.4%
Colorado	$1,798	$563	219.4%	$1,235	$604	7.4%
Georgia	$295	$1,359	-78.3%	-$1,064	$1,226	-9.9%
Illinois	$417	$1,497	-72.1%	-$1,079	$1,347	-8.8%
Florida	$591	$1,994	-70.4%	-$1,404	$1,800	-7.5%
Texas	$795	$3,832	-79.3%	-$3,037	$3,449	-10.0%
California	$212	$3,863	-94.5%	-$3,651	$3,477	-8.6%

States with largest percent changes in annual funding

State	State Total (Scenario 4)	State Total (2018)	Percent Change	Total Change	Limited Max Change in Apportionment ($, millions)	15% Maximum Increase, 10% Maximum Decrease
New Hampshire	$1,855	$174	966.5%	$1,681	$197	13.3%
Wyoming	$2,407	$270	792.5%	$2,137	$305	12.9%
Delaware	$1,439	$178	708.4%	$1,261	$202	13.4%
Maine	$1,301	$194	569.5%	$1,106	$220	13.2%
North Dakota	$1,298	$261	396.9%	$1,037	$280	7.2%
Tennessee	$208	$889	-76.6%	-$681	$801	-10.0%
Missouri	$221	$996	-77.8%	-$775	$905	-9.2%
Georgia	$295	$1,359	-78.3%	-$1,064	$1,226	-9.8%
Texas	$795	$3,832	-79.3%	-$3,037	$3,449	-10.0%
California	$212	$3,863	-94.5%	-$3,651	$3,477	-10.0%

Figure 6: Scenario 4 Apportionment Map by Capped Percent Change



Scenario 5: Hybrid Needs-Based and Incentive-Based Formula Distribution

Description. Scenario 5 seeks to consider both states needs and performance in their apportionment. It is based on an assumption that states' needs should be considered beyond a minimum apportionment. Simultaneously, it assumes that tying national goals to funding distribution will help to encourage states to meet these goals. Within this scenario, states would be able to transfer funding from program-to-program if they are performing within the performance measures used for formula distribution.

For this distribution, needs-based factors are weighted more heavily than performance-based factors. While performance-based factors can encouraging states to meet program goals, distributing a larger portion of funding based on need is designed to help to ensure a predictable amount of funding for each state and help to provide those states the resources that they need to improve.

Goal. To tie federal funding distribution directly to performance, while simultaneously recognizing some portion of funding distribution should consider state needs.

Benefits and Challenges. This scenario has the benefit of considering factors that reward states for performance, while also considering needs-based factors, attempting to strike a balance between the two. It has the drawback of potentially conflating performance and needs, resulting in the formula's inability to properly target funding to either category.

Table 15: Scenario 5 Apportionment

Program	Factors	Weight	Minimum Apportionment
CMAQ	1. Non-attainment and maintenance area population 2. Improvement on roadway congestion index	1. 70% 2. 30%	½%
MPP	1. Urbanized area population 2. Median population per MPO 3. Improvement in Travel Time Index	1. 25% 2. 25% 3. 50%	½%
NHPP/ NHFP	1. NHS Lane Miles 2. Freight ton mile on NHS 3. Improvement in pavement condition on NHS 4. Decrease in structurally deficient bridges on the NHS	1. 25% 2. 25% 3. 25% 4. 25%	½%
STBP	1. Passenger miles traveled 2. State GDP 3. Decrease in Single Occupancy Vehicle 4. Improvement in Job Accessibility	1. 35% 2. 35% 3. 15% 4. 15%	½%
HSIP	1. Fatalities 2. Improvement in fatality per capita	1. 50% 2. 50%	½%

Analysis. This scenario's distribution is somewhat irregular, but not as variable as Scenario 4. Much like Scenario 4, it highlights the effect of the improvement factors, as states such as Maine, Wyoming, and New Hampshire scored very well.

Scenario 5 also highlights the usefulness of "per capita" measures and their outcomes in distribution. For example, the "improvement in fatalities per capita" metric, which is part of the safety program, has both benefits and drawbacks in terms of distribution. Using a per capita measure provides rural states with better opportunities to compete for significant amounts of money. It also means large states or simply states with high numbers of roadway deaths do not get to see as much of a reward for fatality reduction. Smoothing some factors with 10-year averages and changing some of the weighting factors might help decrease volatility and better target funding to both need and performance.

Table 16: Scenario 5 Distribution Results for FY 2018 ($, millions)
(Note: the maximum increase is 20 percent because 10 percent was too small for the calculation)

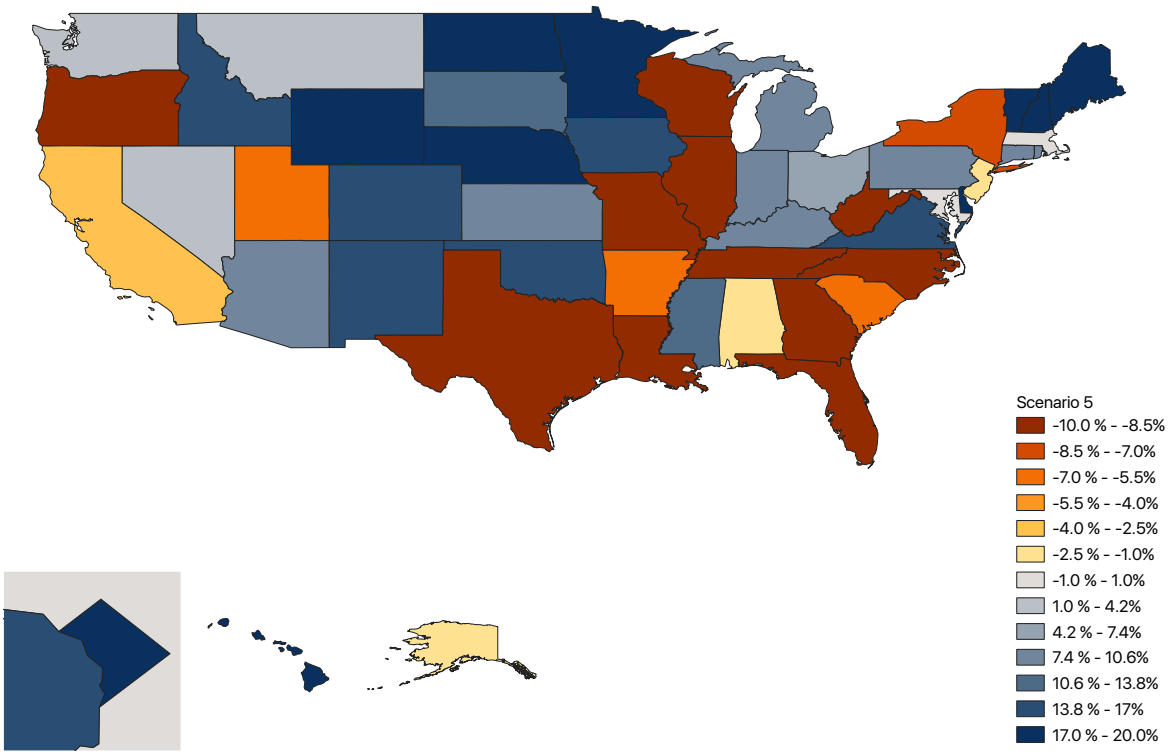
States with largest total changes in annual funding

State	State Total (Scenario 5)	State Total (2018)	Percent Change	Total Change	Limited Max Change in Apportionment ($, millions)	20% Maximum Increase, 10% Maximum Decrease
Wyoming	$1,226	$270	354.5%	$956	$322	19.3%
New Hampshire	$995	$174	471.9%	$821	$207	19.2%
North Dakota	$929	$261	255.7%	$668	$312	19.3%
Colorado	$1,228	$563	118.2%	$665	$650	15.4%
Maine	$788	$194	305.8%	$594	$232	19.3%
Georgia	$891	$1,359	-34.5%	-$468	$1,237	-9.0%
Illinois	$1,006	$1,497	-32.7%	-$490	$1,347	-10.0%
Florida	$1,390	$1,994	-30.3%	-$605	$1,798	-9.9%
California	$2,567	$3,863	-33.5%	-$1,296	$3,759	-2.7%
Texas	$2,386	$3,832	-37.7%	-$1,446	$3,449	-10.0%

States with largest percent changes in annual funding

State	State Total (Scenario 5)	State Total (2018)	Percent Change	Total Change	Limited Max Change in Apportionment ($, millions)	20% Maximum Increase, 10% Maximum Decrease
New Hampshire	$995	$174	471.9%	$821	$207	19.2%
Wyoming	$1,226	$270	354.5%	$956	$322	19.3%
Delaware	$763	$178	328.4%	$585	$212	19.1%
Maine	$788	$194	305.8%	$594	$232	19.3%
North Dakota	$929	$261	255.7%	$668	$312	19.3%
North Carolina	$663	$1,098	-39.6%	-$435	$999	-9.0%
Louisiana	$436	$739	-41.0%	-$303	$667	-9.7%
West Virginia	$264	$460	-42.7%	-$196	$415	-9.8%
Wisconsin	$446	$792	-43.7%	-$346	$713	-10.0%
Missouri	$535	$996	-46.3%	-$462	$902	-9.5%

Figure 7: Scenario 5 Apportionment Map by Capped Percent Change



Scenario 6: Needs Based Apportionment with Incentive Set-Asides

Description. Scenario 6 assumes that there are benefits to targeting funding towards states that need increased investment based on asset usage as well as incentivizing states to improve. This scenario uses the apportionment factors from Scenario 3 (needs-based) but sets aside two percent of each program.

The set-aside is intended to be a small enough set-aside to be politically feasible, but large enough to incentivize states to change behavior in an effort to receive the funding. While a larger bonus may provide a greater incentive, it may create a political challenge because it would increase the uncertainty of the overall dollars a state would receive in any given year. To distribute this bonus set-aside, FHWA would evaluate each state's ability to achieve the goals of each program through performance metrics. While each state would receive this bonus set-aside, states identified as being in the top 10 percent of achievers would receive the largest portions.

Goal. To contribute to states' funding needs, while also incentivizing states to improve performance.

Benefits and Challenges. One of the best benefits of Scenario 6 is that it does not have the potential to conflate goals and it does use different pots of money to direct funding towards needs and to reward states that are improving on national level goals. Its largest drawback is that there are no formula factors incentivizing performance, and it may be difficult to find the perfectly sized set-aside that is both small enough to be politically feasible and large enough to incentivize a change in behavior.

Table 17: Scenario 6 Apportionment

Program	Factors	Weight	Set-Aside	Minimum Apportionment
CMAQ	1. Non-attainment area population 2. Roadway congestion index (by population)	1. 50% 2. 50%	2%	½%
MPP	1. Urbanized area population 2. Median population per MPO	1. 50% 2. 50%	2%	½%
NHPP/ NHFP	1. NHS lane miles 2. Freight ton miles 3. Pavement condition on NHS 4. Number of structurally deficient bridges on the NHS	1. 25% 2. 25% 3. 25% 4. 25%	2%	½%
STBP	1. Passenger miles travelled 2. State GDP 3. Interstate Highway System lane miles 4. Job accessibility	1. 30% 2. 30% 3. 10% 4. 30%	2%	½%
HSIP	1. Total VMT on Federal-aid highways 2. Total fatalities	1. 50% 2. 50%	2%	½%

Analysis. Like the other "needs-based" distributions, this apportionment ends up favoring small population states at the expense of the largest population states. Changing factors such as lanes miles in favor of state GDP and freight ton-miles, particularly for the NHPP and STBP programs, might help lessen this discrepancy. In fact, because many of the factors and weights were the same, the results of this scenario were comparable to Scenario 3.

Some of the states' losses are accounted for by the 2 percent bonus pot, which totals $828 million. The distribution of this bonus is not captured in these numbers and this apportionment has the potential to encourage states to achieve nationally defined performance goals. With limited funding at stake, it is likely this small bonus pot would be highly competitive, but many states would have the opportunity to recuperate their funding loss by demonstrating progress and receiving a portion of this funding. An important part of the transportation policy would be to devise a fair and efficient way to distribute those funds.

Any consideration of this formula would have to place an annual cap on the year over year changes, since many of the factors, such as lane miles and state GDP, will not change significantly. Long-term trends will likely favor the states that do well in the initial distribution, but this impact would be buffered by the cap, and would allow states to respond to the changes.

Table 18: Scenario 6 Distribution Results for FY 2018 ($, millions)

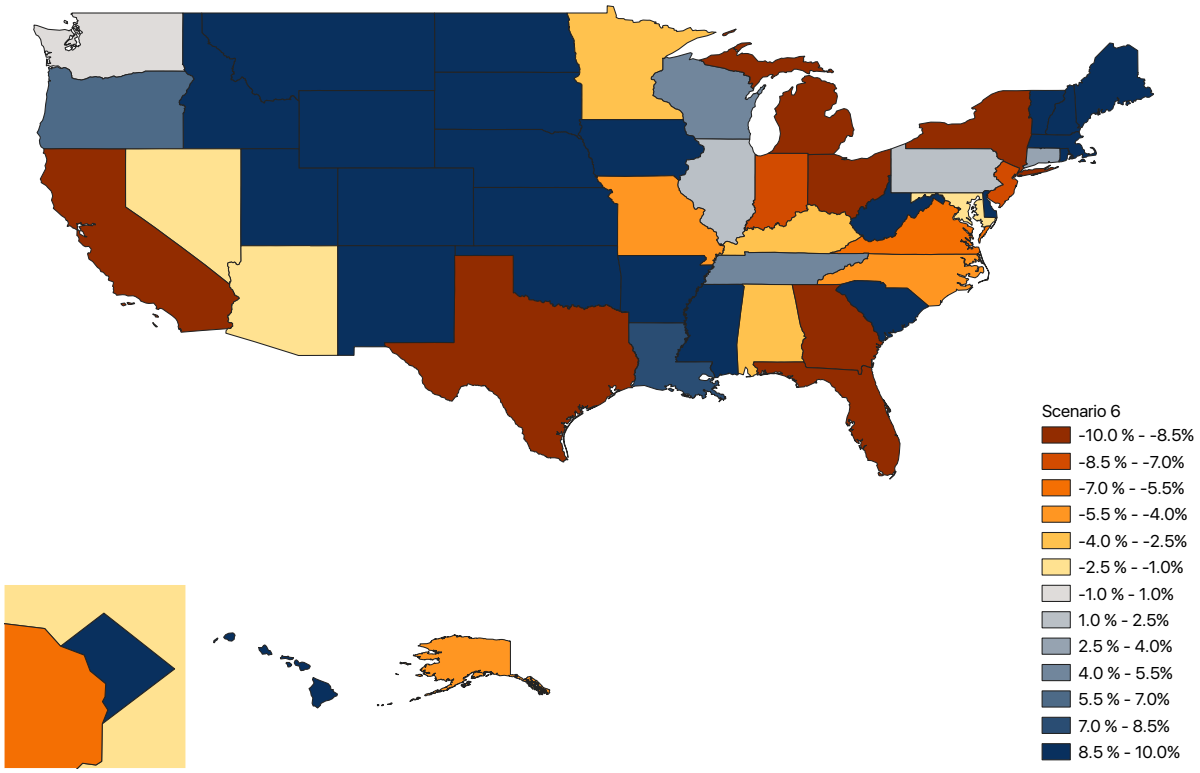
States with largest total changes in annual funding

State	State Total (Scenario 6)	State Total (2018)	Percent Change	Total Change	10% Max Change in Apportionment ($, millions)	10% Maximum Change
Dist. of Col.	$600	$168	257.0%	$432	$185	10.0%
Hawaii	$533	$178	199.2%	$355	$196	10.0%
Wyoming	$607	$270	125.1%	$337	$294	8.8%
Nebraska	$622	$304	104.4%	$317	$331	8.8%
Rhode Island	$527	$230	128.9%	$297	$251	8.9%
Georgia	$916	$1,359	-32.6%	-$443	$1,240	-8.8%
New York	$1,313	$1,767	-25.7%	-$454	$1,590	-10.0%
Florida	$1,158	$1,994	-41.9%	-$836	$1,824	-8.6%
California	$2,365	$3,863	-38.8%	-$1,499	$3,521	-8.9%
Texas	$1,819	$3,832	-52.5%	-$2,013	$3,461	-9.7%

States with largest percent changes in annual funding

State	State Total (Scenario 6)	State Total (2018)	Percent Change	Total Change	10% Max Change in Apportionment ($, millions)	10% Maximum Change
Dist. of Col	$600	$168	257.0%	$432	$185	10.0%
Hawaii	$533	$178	199.2%	$355	$196	10.0%
Delaware	$444	$178	149.5%	$266	$196	10.0%
Maine	$465	$194	139.4%	$271	$212	9.3%
New Hampshire	$407	$174	134.2%	$233	$192	10.0%
New York	$1,313	$1,767	-25.7%	-$454	$1,590	-10.0%
Georgia	$916	$1,359	-32.6%	-$443	$1,240	-8.8%
California	$2,365	$3,863	-38.8%	-$1,499	$3,521	-8.9%
Florida	$1,158	$1,994	-41.9%	-$836	$1,824	-8.6%
Texas	$1,819	$3,832	-52.5%	-$2,013	$3,461	-9.7%

Figure 8: Scenario 6 Apportionment Map by Capped Percent Change



Scenario 7: Alternative Federal Program Structure

Description. The FAST Act's program structure was a result of program consolidation and historical precedents, rather than concise policy engineering. The premise of Scenario 7 is that the FAST program structure provides a logical basis for distribution, but there could be benefits from altering the structure of the pre-existing programs, the national goals, and the national performance measures.

Table 19 provides an illustration of MAP-21's goals and performance measures. Per Scenario 7, portions of the goals and performance measures that are not considered for this scenario are crossed out and additions are highlighted in red.

Table 19: New National Goals and Performance Measures

Goal Area	National Goal	Performance Measure
Safety	To achieve a significant reduction in traffic fatalities, serious injuries, and crashes on all public roads, including involvement with transit vehicles, bicycles, and pedestrians	Fatalities, serious injuries, and crashes; all number and rate per VMT on all public roads
~~Infrastructure Condition~~ System Preservation (Maintenance)	To ~~maintain the highway infrastructure assets~~ preserve the surface transportation assets system in a state of good repair	~~Pavement condition on the Interstate system and the remainder of the NHS; bridge condition on the NHS~~. Average asset life cycle condition per average daily traffic the National Highway System.
~~Congestion Reduction~~	~~To achieve a significant reduction in congestion on the National Highway System~~	~~Traffic congestion~~
System Reliability	To improve the ~~efficiency~~ reliability of the surface transportation system	~~Performance of the Interstate system, the remainder of the NHS.~~ The additional time needed to make a trip because of unreliability on the roads
Freight Movement and Economic Vitality	To improve the national freight network, strengthen the ability of rural communities to access national and international trade market, and support regional economic development	Freight ~~movement~~ delays on the National Freight Network
Environmental and Energy Sustainability	To enhance the performance of the transportation system while protecting and enhancing the natural environment	On-road mobile source emissions, total gasoline and diesel consumption
~~Reduced Project Delivery Delays~~	~~To reduce project costs, promote jobs and the economy, and expedite the movement of people and goods by accelerating project completion through eliminating delays in the project development and delivery process, including reducing regulatory burdens and improving agencies' work practices~~	

For Scenario 7, all program goals and performance measures are designed to be multimodal. For example, the safety goal area was expanded to include crashes, not just fatalities and serious injuries. While crashes that result in fatalities or serious injuries are certainly a cause of greater concern, reporting can be influenced by judgment calls and data can have minimal statistical significance in cases with low volume exposure such as non-motorized fatalities in rural areas. For example, there could be differing interpretations of the definition of a serious injury or a change from one cyclist fatality to two from year to year. Collecting data for all crashes has the potential to be more consistent and illuminate potential problem areas that may have otherwise been overlooked and unanalyzable. It also has the potential to be very costly.

Infrastructure condition was struck and replaced with system preservation. The condition of a particular asset at a particular moment in time is not illustrative of that asset's needs, usage, or the reliability of the system. System preservation suggests that the system as a whole ought to be maintained, but that assets within that system may be at differing places in their life cycle, which can be beneficial for the system as a whole. The performance measure for system preservation would be average asset life cycle condition per average daily traffic.

Congestion reduction and reduced project delays were entirely removed from the goals and performance measures. Congestion is not inherently bad for all metropolitan areas, and in some cases can reflect a strong economy. In other circumstances, or at higher levels, congestion can be debilitating for metropolitan areas. But instead of focusing on congestion, measuring system reliability would speak to the ability for a person or consumer product to be transported from point A to point B in a predictable and reasonable amount of time.

Project delay was removed as a goal because it is generally considered to be a state-created challenge. While there certainly are some regulatory challenges for completing some projects in a timely fashion, it would be more effective to expedite these projects using a different vehicle.

Finally, energy sustainability was added to the goal of environmental sustainability. Our transportation system relies almost entirely on crude oil. While fuel prices are currently low and the United States is increasing production, oil volatility has historically been problematic to our economy. Increasing emphasis on combating climate change is a federal responsibility and encouraging the shift in our transportation system towards more sustainable sources of energy has the potential to increase the resilience of our system.

Informed by these amended program goals and performance measures, this Scenario restructures the FAST Act programs to better achieve the national aim. Similar to the previous table, initial program goals are included, the portions removed are struck out, and additions are highlighted in red.

~~Congestion Mitigation and Air Quality Improvement Program~~ Environmental and Energy Sustainability Program (2.0)

~~CMAQ~~ EESP is used to support surface transportation projects and related efforts that contribute to ~~air quality improvements and provide congestion relief based on ozone non-attainment population~~ environmental and energy sustainability.

Metropolitan, Statewide, and Regional Planning Program (2.0)

MPP provides funding to states for MPO operation and for the development of long-range plans and short-range programs. States receive the funding and, ~~under MAP-21~~, are directed to establish a formula to distribute funding to MPOs based on factors including system reliability, job access ~~population, attainment of air quality standards, status of planning~~, and metropolitan area transportation needs. States develop the formulas and the Secretary approves those formulas. This program would also include funding for states to improve their planning processes.

National Highway Performance Program (2.0)

NHPP supports the designated National Highway System, ~~provides revenues for capital construction of new facilities on the NHS~~, and aims to invest system preservation and in the State's asset management plan for the NHS, targeting roads with the highest use.

Surface Transportation Block Grant Program (2.0)

STBP provides flexible funding for the Federal-aid highway, bridge, and tunnel projects on any public road, pedestrian and bicycle infrastructure, and transit capital projects, including intercity bus terminals. STBP money targets projects that improve job access and increase system reliability.

Highway Safety Improvement Program (2.0)

The HSIP program aims to provide a means for states to achieve a significant reduction in traffic fatalities, serious injuries, and crashes on all public roads, including non-state-owned public roads and roads on tribal lands, and in transit, for bicycles, and pedestrians.

Scenario 7 uses both performance-based factors and needs based factors to distribute funding to states. Evaluations will likely be conducted within the Office of the Secretary to avoid modal favoring. In addition, Scenario 7 assumes that 2 percent of the funding appropriated for each program is set-aside into a "bonus pot."

States are ranked based on the performance metrics that are used within this scenario. States that perform better on those performance metrics receive a larger portion of the "bonus pot," and states that are not high performers receive a smaller amount of the bonus. States that are performing under the performance metrics included in this scenario, per approval of the Secretary, would have 50 percent transferability. The scenario is calculated

with an absolute value cap on change of 10 percent (note that in some cases, the fluctuation was so large that a 10 percent cap was not possible, resulting in a large permitted swing of 18 percent.

Goal. To revamp the program structures and explore an alternative distribution based them.

Benefits and Challenges. Because this scenario starts from differing assumptions, it is more challenging to directly compare to MAP-21. It has the benefit of distributing funding from a mode neutral perspective. While it targets funding towards states that need it most, it may also struggle to incentivize states to change behavior due to the size of the bonus set-aside.

Table 20: Scenario 7 Apportionment

Program	Factors	Weight	Bonus	Minimum Apportionment
EEP	1. Decrease in roadway vehicle emissions 2. Decrease in fuel consumed per GDP	1. 50% 2. 50%	2%	½ %
MPP	1. Median population per MPO 2. Improvement in Travel Time Index	1. 70% 2. 30%	2%	½ %
NHPP/ NHFP	1. NHS lane miles 2. Decrease in structurally deficient bridges 3. Freight ton miles	1. 35% 2. 30% 3. 35%	2%	½ %
STBP	1. State GDP 2. Passenger miles travelled 3. Increase in job accessibility	1. 35% 2. 35% 3. 30%	2%	½ %
HSIP	1. Total roadway fatalities 2. Decrease in total roadway fatalities	3. 70% 4. 30%	2%	½ %

Analysis. Scenario 7 takes a departure from Scenarios 2-6, creating new goals and introducing new factors. This results in substantially different winners and losers and is in some ways less variable than some of the other scenarios (though still substantial swings for several states). A select number of big population states lose share relative to some of the smaller states, yet again demonstrating the effectiveness of certain factors such as lane miles and passenger miles travelled in smaller population states.

This scenario also highlights the need for better metrics. The job accessibility metric and Travel Time Index are admittedly less than perfect ways of measuring access and efficiency. However, they play a significant role in the distribution of funds, and many states see large increases or decreases in programs that are directly related to their performance within these metrics. Any future transportation policy that uses access, efficiency, or reliability as a metric would need to carefully devise a way to measure it that is fair and provides the best incentive for addressing the problem.

With a redefinition of the goals, the factors are better tied to the goals of each specific program. Through introducing factors such as decrease in roadway emissions and gasoline use, Scenario 7 directly ties funding to overarching environmental goals. By using performance measures in its formula distribution and in the bonus pot, it provides clear incentives for states to improve within national goals. These could be improved with better data and multi-year averages.

Table 21: Scenario 7 Distribution Results for FY 2018 ($, millions)

(Note: the maximum change is 12.5 percent increase, 17.5 percent decrease, because 10 percent was too small for the calculation)

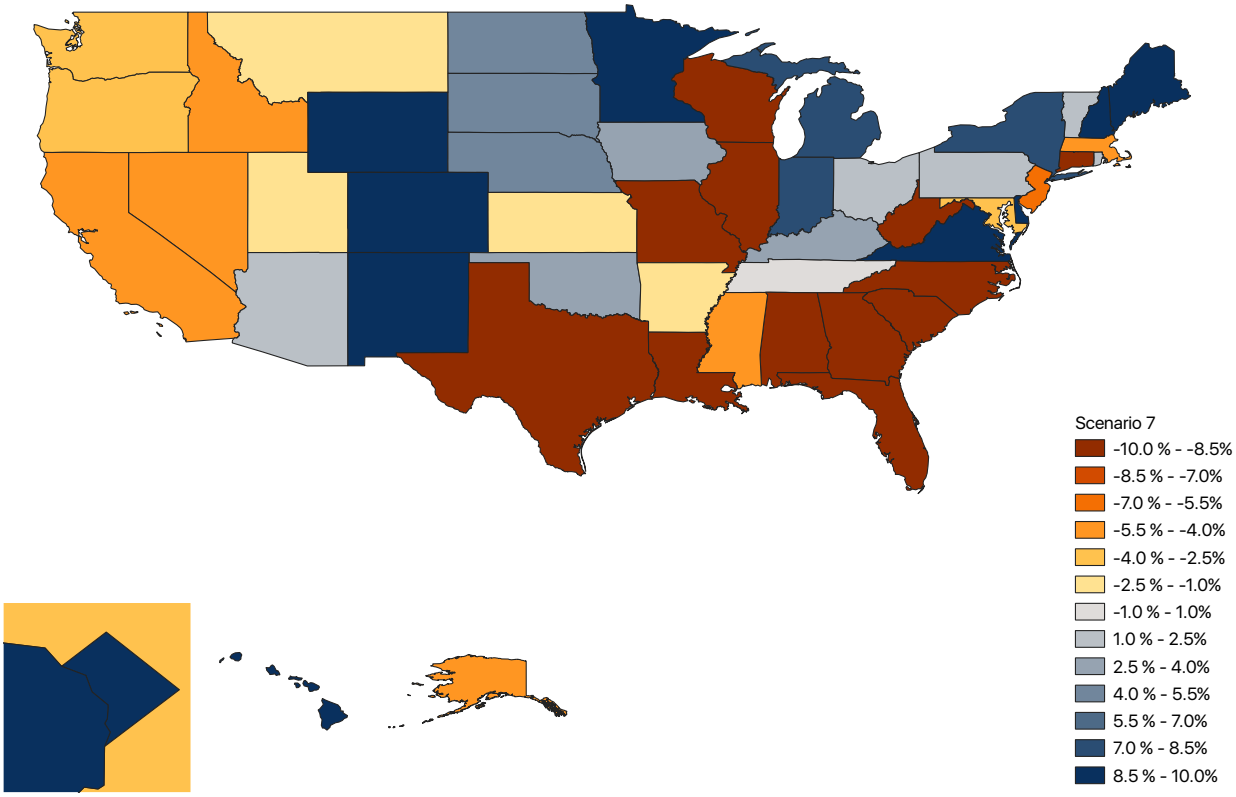
States with largest total changes in annual funding

State	State Total (Scenario 7)	State Total (2018)	Percent Change	Total Change	Limited Max Change in Apportionment ($, millions)	12.5% Maximum Increase, 17.5% Maximum Decrease
Pennsylvania	$2,695	$1,727	56%	$968	$1762	2.0%
Wyoming	$921	$270	241%	$651	$298	10.4%
Colorado	$1,072	$563	90%	$509	$615	9.3%
Oklahoma	$1,164	$668	74%	$496	$687	2.9%
Virginia	$1,425	$1,071	33%	$354	$1166	8.9%
Illinois	$1,128	$1,497	-25%	-$369	$1346	-10.1%
New Jersey	$666	$1,051	-37%	-$385	$986	-6.2%
Florida	$1,556	$1,994	-22%	-$439	$1814	-9.0%
California	$2,507	$3,863	-35%	-$1356	$3684	-4.6%
Texas	$2,391	$3,832	-38%	-$1441	$3447	-10.0%

States with largest percent changes in annual funding

State	State Total (Scenario 7)	State Total (2018)	Percent Change	Total Change	Limited Max Change in Apportionment ($, millions)	12.5% Maximum Increase, 17.5% Maximum Decrease
Wyoming	$921	$270	241%	$651	$298	10.4%
New Hampshire	$522	$174	200%	$348	$191	9.7%
Delaware	$514	$178	189%	$336	$197	10.5%
Colorado	$1,072	$563	90%	$509	$615	9.3%
Hawaii	$324	$178	82%	$146	$195	9.3%
Texas	$2,391	$3,832	-38%	-$1441	$3447	-10.0%
Alaska	$323	$528	-39%	-$205	$506	-4.1%
Connecticut	$302	$529	-43%	-$227	$475	-10.1%
Louisiana	$418	$739	-43%	-$321	$665	-10.0%
West Virginia	$237	$460	-49%	-$223	$418	-9.2%

Figure 9: Scenario 7 Apportionment Map by Capped Percent Change



Scenario 8: New Federal Programs

Description. Informed by the goals and performance measures defined in Scenario 7, and the research included in previous sections, Scenario 8 introduces a possible set of new programs to be used as a framework for distributing funds. A number of these programs are similar to programs that are currently in existence with slight tweaks in the program goals and significant departures of current funding distribution methods. Similar to Scenario 7, formula programs in Scenario 8 would set-aside 2 percent of its appropriation that would be put into a "bonus pot" that would be distributed based on the performance measures across the programs. High performers would receive a larger share than poor performers. States that were performing well could have 50 percent transferability.

FORMULA PROGRAMS

Highway Maintenance and Improvement Program (HMIP)

In order to ensure that the system has a guaranteed base level of funding, this program would distribute a large portion of federal transportation funding to states and localities based on broad economic, demographic, and system measurement factors. This would be flexible funding that could be used for maintenance and operation of the existing system, as well as capital expansion. Colorado, Florida, and Kansas all have large portions of their programs distributed based on factors that can provide certainty and predictability to local jurisdictions. From a political perspective, funding with annual predictability is necessary for states and localities to make effective planning decisions.

The HMIP would take the place of both the STBP and the NHPP, providing increased flexibility and a base level of predictable funding. As of 2018, STBP and NHPP accounted for 83.5 percent of the FHWA core formula programs; the HMIP would decrease this share to 67.8 percent. There is a precedent for smaller portions of transportation funding accounting for maintenance and preservation in our peer nations. For example, the German national government invests 56 percent of their surface transportation funding in maintenance and preservation, and Canada invests 60 percent.[38] Using current funding levels, this program would be funded at about $28.7 billion annually.

Transportation Safety Improvement Program (TSIP)

In the tradition of HSIP, this program would be aimed at improving safety. But instead of targeting funding at highway safety, this program would be focused on improving safety in the surface transportation system as a whole. It would target funding to projects that improve safety to areas that need it most, while rewarding states and localities that make significant improvements. In 2018, HSIP accounted for 6.2 percent of the program; it would be recommended that the TSIP would account for 7 percent of the program, or under the current funding levels about $2.9 billion annually.

Environmental Improvement Program (EIP)
The EIP would take on the environmental mission of CMAQ, expanding the goals of the program to reduce pollutants from surface transportation emissions, including, but not limited to, greenhouse gases (GHG), ozone, and particulate matter. States that have high pollution from transportation would receive funding to help reduce this by both infrastructure and operational means. States would also be rewarded when they are able to reduce these metrics. This would be funded under the current levels at about $2.9 billion annually.

Metropolitan Planning Program (MPP)
MPP would continue to provide money for MPOs for operation and planning. This program would be funded at current levels at about $300 million annually.

DISCRETIONARY PROGRAMS
In a departure from the current core FHWA programs, this proposed new set of programs would include a number of discretionary programs that would give states and projects an opportunity to compete for funding. The proposed programs are:

Freight Improvement Program (FIP)
This program would target funding to projects that have significant effects on freight as it relates to safety, reliability, and improved travel times in congested corridors. Applications would be evaluated on an individual basis, and would consider metrics, including estimated improvement in safety, benefit cost analysis, and reliability improvements. In order to ensure sufficient funding for large projects, this program would be funded at $3 billion annually.

Metropolitan Accessibility Program (MAP)
This program would focus on key infrastructure and operational improvements, similar to the Projects of National and Regional Significance (PNRS) program under MAP-21. It would not be limited to freight, and any transformational investment that helps regional accessibility would be eligible. This would specifically target goals such as safety, economic vitality, and system reliability.

The goal of reducing congestion poses several challenges because, for many places, it is not the most desired outcome. For example, in places where the regional economy is sluggish have less traffic congestion. Using an accessibility metric that is mode-neutral and indicative of better overall performance of the system. These data points could be measured through routine surveys, and many already exist. In order to ensure sufficient funding for large projects, this program would be funded at $3 billion annually.

Technology Pool
Encouraging technological innovation in transportation is important to ensure American competitiveness. This includes applications such as GPS, digital maps, transportation network companies, autonomous vehicles, vehicle-to-vehicle interaction, vehicle-to-infrastructure interaction, and numerous other advances. Funding for this program would not need to be as high as FIP and MAP because technology applications are relatively low cost, and a small federal incentive would go a long way in making this a highly effective program. Under this scenario, this program is funded at $500 million annually

Formula Bonus Pools
Like Scenarios 6 and 8, Scenario 8's problem-based formula apportionments with bonus pools are designed to award states that are designated as being top performers according to FHWA performance metrics. Bonus pools, which are separate from the discretionary programs, would be more targeted than the formula programs themselves.

Goal. To introduce and test the concept of new federal programs.

Benefits and Challenges. This distribution has the benefit of potentially being more effective at encouraging states to move towards national goals, but the significant drawback and shifting funding around dramatically. Because the program has both set-asides and discretionary programs, the overall amount of funding (assuming baseline spending) that is distributed by formula is much smaller than it is in other scenarios. As a result, states will see a lower apportionment number, likely creating significant political pushback. In order for new programs like the ones that are illustrated in this scenario to be politically feasible, it would likely be necessary for there to be an increase in real numbers in overall spending within the surface transportation program.

Table 22: Apportionment of Formula Based Programs

Program	Factors	Weight	Bonus	Minimum Apportionment
HMIP	1. State population 2. State GDP 3. Lane miles – all roads 4. Freight ton miles	1. 25% 2. 25% 3. 25% 4. 25%	2%	½ %
TSIP	1. Total roadway fatalities 2. Decrease in total roadway fatalities	1. 70% 2. 30%	2%	½ %
EIP	1. Decrease in roadway vehicle emissions 2. Improvement in fuel consumed per GDP	1. 50% 2. 50%	2%	½ %
MPP	1. Median population per MPO 2. Improvement on Travel Time Index	1. 70% 2. 30%	2%	½ %

Analysis. Under Scenario 8, nearly every state loses funding assuming current total FHWA funding levels. This is because more than $7 billion (of $41.4 billion) is either for discretionary grant programs or in a bonus pool. States that manage to increase their funding levels are some of the larger, lower population states such as Kansas, Mississippi, Nebraska, New Hampshire, and D.C.

When examining the causes of some of the changes, this scenario demonstrates the effect of essentially having one large grant program that dominates the rest. HMIP is 67.8 percent of the total $34 billion, and the factors that go into it therefore has an outsized effect on the overall distribution. Factors such as lane miles and freight ton-miles, which make up 25 percent each of the HMIP program, have an outsized effect on the overall distribution of each state. It might be worth considering splitting the program or including more factors, with the complexity of the formulas benefitting states that have different transportation problems that are not associated with lane miles or freight movement. Even with a 10 percent cap on change, the long-term trends will move the program in a dramatically different distribution than today.

This scenario has several merits, including innovative factors that further the ability to target funding to goals and needs. This scenario could be improved with multi-year averages and changing some of the factors might reveal ways that both target funding to program goals without causing significant changes in allocations to states.

Table 23: Scenario 8 Distribution Results for FY 2018 ($, millions)

(Note: the maximum decrease is 12.5 percent because 10 percent was too small for the calculation)

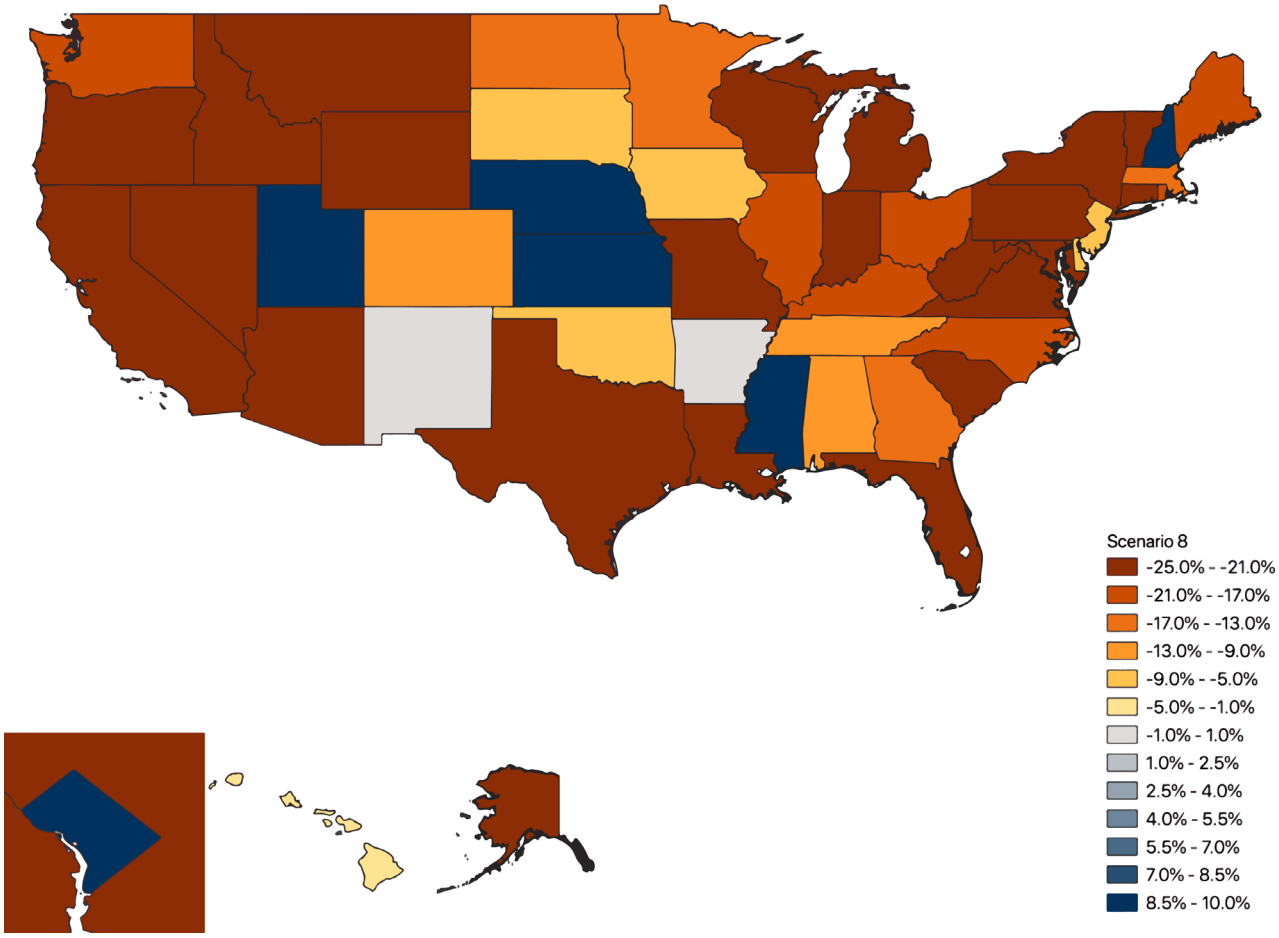
States with largest total changes in annual funding

State	State Total (Scenario 8)	State Total (2018)	Percent Change	Total Change	Limited Max Change in Apportionment ($, millions)	25% Maximum Change
Kansas	$655	$398	64.6%	$257	$402	10.0%
Nebraska	$459	$304	51.0%	$155	$307	10.0%
North Dakota	$343	$261	31.2%	$82	$208	-13.2%
New York	$1,845	$1,767	4.4%	$78	$1,227	-24.4%
Minnesota	$757	$686	10.3%	$71	$547	-13.2%
Georgia	$992	$1,359	-27.0%	-$367	$1,071	-14.2%
Florida	$1,569	$1,994	-21.3%	-$425	$1,373	-25.0%
Pennsylvania	$1,292	$1,727	-25.2%	-$435	$1,189	-25.0%
California	$2,960	$3,863	-23.4%	-$903	$2,660	-25.0%
Texas	$2,601	$3,832	-32.1%	-$1,231	$2,287	-25.0%

States with largest percent changes in annual funding

State	State Total (Scenario 8)	State Total (2018)	Percent Change	Total Change	Limited Max Change in Apportionment ($, millions)	25% Maximum Change
Kansas	$655	$398	64.6%	$257	$402	10.0%
Nebraska	$459	$304	51.0%	$155	$307	10.0%
Delaware	$236	$178	32.6%	$58	$151	-7.4%
North Dakota	$343	$261	31.2%	$82	$208	-13.2%
Wyoming	$335	$270	24.3%	$65	$193	-21.9%
Texas	$2,601	$3,832	-32.1%	-$1,231	$2,287	-25.0%
Louisiana	$481	$739	-34.9%	-$258	$526	-22.5%
West Virginia	$240	$460	-47.8%	-$220	$317	-25.0%
Connecticut	$275	$529	-47.9%	-$253	$364	-25.0%
Alaska	$174	$528	-67.1%	-$354	$363	-25.0%

Figure 10: Scenario 8 Apportionment Map by Capped Percent Change



6.0 Implications

The eight scenarios represent different program structures and funding distribution methods for future federal transportation dollars. The scenarios are meant to demonstrate various approaches and are not intended to recommend any specific options for upcoming surface transportation bills. There are, however, key implications from this work that could indirectly inform the discussions around reauthorization of the FAST Act.

The introduction of new formula factors will produce substantial variability compared to current levels of funding to states, regardless of weight. None of the scenarios resulted in an outcome that was similar to the current allocation. In most scenarios, a select number of large population states yielded funding to a select number of lower population states. Any new allocation using pure formulas, regardless of their relative intention, is likely to be met with political challenges. Variability can be reduced through several approaches, but it is likely to result in several states becoming losers and several states becoming winners. The only likely way that this could be politically feasible is if there is a substantial amount of new funding available, so states that lose share do not necessarily experience a decrease in dollars of funding. Introducing caps on change, as illustrated in this work, may help create political acceptability, but would likely need to be coupled with increased spending.

There is a policy rationale for a mixture of both needs-based and performance-based factors. Needs-based factors, such as lane-miles, population, and GDP, offer year-over-year predictability for states. Performance-based factors, such as reduction in emissions or fatalities, can incentivize states to make better decisions. Both play a helpful role in funding distribution and can be carefully crafted to ensure the proper balance. The decision of how much weight to give to need-based versus performance-based considerations will ultimately come down to what Congress can accept. However, from a policy perspective, it is helpful to include both types of factors in the distribution of funding.

A thorough sensitivity analysis would help identify which factors produced the greatest amount of variability. A full sensitivity analysis would give insight into how much variability is caused by factors over the current distribution. This would help policy makers strike a political balance between the policy rationale of including the right factors, and the political realities of limited funding and the need to decrease variability from current apportionment.

Improvements in data can help smooth allocations and better target dollars. Data can be improved in two important ways. First, most of the factors would benefit from being evaluated over longer-term averages. This would reduce year-over-year variability without dissuading states from making progress on their goals. A second improvement would be

to have better measures for system reliability and performance. Some analysts believe that there are better measures of than congestion and travel time measures. Finding an alternative way to measure regional accessibility and reliability would likely improve both goals and allocations.[39] Federal grantees often resist the use of performance-based funding distribution on the basis of a lack of data. However, it is unlikely the data will improve until funding distribution is linked to it. Once the data are critical to determining how funding is distributed, it is likely to improve rapidly.

7.0 Conclusion

As construction of the Interstate Highway System slowly ceased to be the dominant factor in federal highway funding in the early 1980s, political support for the program began to fracture. Completion of the 41,000 miles of roads designated on the map approved by the states in 1947 (together with a few thousand miles added after 1956) removed the key feature that held competing state interests together in harness for the greater good. States became increasingly concerned with the share of total funding their states would receive post-Interstate, particularly "donor states" that felt they were getting an inadequate "rate of return" on their federal gasoline tax payments. (At the Congressional level, this fracturing of support led to the extensive earmarking of projects and dollars in the reauthorization bills for individual legislators – such earmarks were largely a post-1982 phenomenon.)

The traditional real-world formula factors, such as lane-miles, VMT, population, bridge improvement cost, local air quality, and safety statistics began to have less and less meaning as fights over state program share, and earmarks, ate up more and more of the FHWA's budget. By fiscal year 2009, the last year of the 2005 SAFETEA-LU authorization law, less than two-thirds (65.1 percent) of the highway funding distributed to states was based on factor-based formulas. 23.8 percent of the funding was for adjustments to state shares to get a critical number of states to a guaranteed minimum share or minimum dollar amount, and the remaining 11.1 percent of the distributed money was earmarked for the pet projects of lawmakers.

This makes it ironic that, over a decade later, the FHWA is still distributing money to states based almost entirely on the shares of total highway funding that states received in 2009 (including earmarks). The real-world apportionment factors that those 2009 shares were based on used 2007 data. Some states could have invested in bridges, improved safety, cleaned up urban air quality, gained substantial population, or built extensive new systems since 2007 – but none of that matters. Likewise, some states may have experienced population stagnation, flat-lined VMT, had their air quality worsen, and allowed their system conditions to degrade faster than the national average since 2007 – but none of that matters, either. And, while the earmarking in the SAFETEA-LU was so ignominious that it ignited protests that helped force Congress to ban earmarks in 2011, the states whose legislators excelled at securing earmarked dollars in 2005 are still being rewarded for that success today.

Likewise, the MAP-21 law of 2012 created the first national highway performance measures and standards. States have to report performance in the safety, infrastructure condition, congestion reduction, system reliability, freight movement, and environmental sustainability fields and set targets for performance improvement. But so long as a state's

total highway funding is guaranteed to be the same percentage of the national total the state received in 2009, funding cannot be used to incentivize good performance or divert funding to where it is, objectively, most needed.

It is politically difficult to change state formula shares, particularly in the Senate, where each state has the same number of votes. The 1998 reauthorization law was able to avoid fights over state shares by flooding the program with new money, so that even states that saw their share of total funding reduced still had far more dollars than they had before. The 2005 reauthorization law was unable to provide the same massive funding increase, so Senate leaders spent months proposing distribution after distribution until a critical mass of 30+ states, meaning 60+ votes, were satisfied with their estimated shares.

In addition, the data collection and reporting that the old formulas relied on for up-to-date apportionment factors each year has been allowed to atrophy. The new performance measures required by MAP-21 are only beginning to come online, and not all formula factors that could be useful in the future will be reported via those measures.

If federal highway funding distribution was uncoupled from the political decisions of 2005 and conditions of 2007 and was instead distributed based on rational measures and the real-world conditions of today, it is inevitable that some states would see their share of total funding increased and others would see their shares decreased. If the system stays zero-sum (flatlined dollar amounts), reduction in shares would equal proportional reduction in dollars, which would cause states to resist change much more vehemently. If significant funding growth takes place, putting funding distribution on a more rational basis would be politically much easier.

A 6-year FAST Act reauthorization would take the program through fiscal 2026, which would be over 20 years since the enactment of the SAFETEA-LU law that established the state funding shares still in use. Although politically difficult, re-examining the distribution of federal highway funding in the light of updated conditions and performance might be a more rational option than allowing funding distribution to proceed on autopilot for two decades.

Appendix Tables

Select SAFETEA-LU Programs and Formula Factors

Program	Factors	Weight	Minimum Apportionment
Interstate Maintenance Program	1. IHS lane miles open to traffic 2. VMT on IHS 3. Commercial vehicles' contribution to HTF	1. 33.3% 2. 33.3% 3. 33.3%	½ %of Interstate Maintenance and NHS apportionments combined
National Highway System	1. Lane miles on principal arterial routes (not IHS) 2. VMT on principal arterial routes 3. Diesel fuel used on highways 4. Total lane miles divided by state's population	1. 25% 2. 35% 3. 30% 4. 10%	½ % of Interstate Maintenance and NHS apportionments combined
Surface Transportation Program	1. Total lane miles of Federal-aid highways 2. VMT on Federal-aid highways 3. Estimated tax payments from users to the Highway Account of the HTF	1. 25% 2. 40% 3. 35%	½ %
Highway Bridge Replacement and Rehabilitation Program	1. Relative share of total cost to repair or replace deficient highway bridges	1. 100%	¼ % (10% maximum)
CMAQ	1. Weighted non-attainment and maintenance area population	1. 100%	½ %
Highway Safety Improvement Program	1. Total lane miles of Federal-aid highways 2. VMT on Federal-aid highways 3. Number of fatalities on Federal-aid system	1. 33.3% 2. 33.3% 3. 33.3%	½ %
Railway-Highway Crossings	1. Formula for Surface Transportation Program 2. Total number of public railway crossings	1. 50% 2. 50%	½ %

Source: Federal Highway Administration, "Financing Federal-Aid Highways. Appendix D: Apportionment Formulas," 2007

Final Rule Performance Measures by Performance Area

Performance Area	Performance Measures
Safety	• Number of fatalities • Rate of fatalities to VMT • Number of serious injuries • Rate of serious injuries to VMT • Number of non-motorized fatalities • Number of non-motorized serious injuries
Pavement Condition	• Percent of main line Interstate lane miles in "good condition" • Percent of main line Interstate lane miles in "poor condition" • Percent of main line non-Interstate NHS lane miles in "good condition" • Percent of main line non-Interstate NHS lane miles in "poor condition"
Bridge Condition	• Percent of NHS bridges in "good condition" • Percent of NHS bridges in "poor condition"
System Performance	• Reliable travel time on Interstates • Reliable travel time on non-Interstate NHS
Freight Movement	• Reliable truck travel time on non-interstate NHS
Traffic Congestion	• Annual hours of peak hour delay per capita • Percent of non-SOV travel
On-Road Mobile Source Emissions	• Total emissions reduction

Source: FHWA, Transportation Performance Management (TPM) Implementation Plan, n.d.

Data Used to Develop Scenarios and Recommendations for Improvement

Factor	Source	Effects on the System	Future improvement
SYSTEM SIZE AND CONDITION			
Lane-miles of roadways by classification system	Highway Statistics, FHWA, 2016	FHWA publishes annual statistics that measure the amount of lane miles of roadways by functional classification, including IHS, NHS, Federal-aid highways, and local classifications. Lane miles are useful to measure the amount of roadway that exists and are a good proxy for the amount of roadway that departments must maintain. Lane-miles encompass not only the length of the roadways, but their width as well.	A better indicator of level of use on a particular roadway for both passenger vehicles and freight.
Lane miles divided by state population	Calculated from Highway Statistics, FHWA, 2016 and census data	Provides the ability to capture intensity of use and can provide increased levels of funding for lower density states. For example, a state with significant lane miles of roadway, which can have certain national priorities, needs to maintain those roadways with a smaller population.	An additional factor that involves level of use, to be sure that states are not only responsible for maintaining expansive networks, but states should show some level of intensity of use.
Number of bridges	Highway Statistics, FHWA, 2016	Bridges are a critical, and often expensive, part of the roadway network. states with more bridges often have a greater need for maintenance funding.	Some bridges carry a large volume of traffic while others are simply rural culverts over drainage ditches. The National Bridge Inventory database includes some of this data, but not easily divided by state. A proxy that measures bridges by average daily traffic and surface area would give a better proxy for need.

Factor	Source	Effects on the System	Future improvement
Number of structurally deficient bridges	National Bridge Inventory, FHWA 2017	Bridges that are classified as structurally deficient indicate an even greater need for repair funding.	Current measures for structural deficiency range from bridges that are in very poor shape to bridges that just barely qualify as deficient. This measure could be improved by not only including use and deck area, but also by including the severity of deficiency for each state.
Improvement in number of structurally deficient bridges	Calculated from 2016 to 2017	Intended to encourage improvement in infrastructure condition by having states reducing the number of structurally deficient bridges. The absolute number increase is used, instead of the percent, because the states with the highest numbers of deficient bridges have the most to gain with respect to the national economy.	A metric that includes deck area and average daily traffic. Also, a 5-year or 10-year rolling average, showing a trend rather than a lumpy year-by-year improvement. Long-term averages would help avoid funding variations.
Pavement condition on the NHS	Direct request from FHWA, 2013 and 2012	Current pavement condition metrics measure the roughness of the pavement surface. Can be an indicator of needed maintenance and therefore needed investment in reconditioning by state.	Pavement roughness in practice is a poor indicator of the true quality of the roadway surface. There should be a metric that evaluates the full depth of the roadway and its life cycle condition. Also, pavement condition should be measured based on average daily traffic and broken down by state.
Improvement in pavement condition on the NHS	Calculated from 2012 to 2013	Intended to encourage the improvement in pavement condition. The percent improvement is used to incentivize improvement in areas that need it most.	Taking a long-term rolling average that accounts for trends rather than one-year improvements.

Factor	Source	Effects on the System	Future improvement
SYSTEM USE			
VMT by roadway classification system	Highway Statistics, FHWA, 2016	Vehicle-miles travelled show the intensity of use of the roadway network. Data available includes VMT on various classifications of roadways, such as IHS, NHS, or principal arterials.	VMT factors can be rolling averages to help eliminate data spikes and provide more consistency between years. Also, the classification system could be improved by identifying roadways that are crucial for interstate commerce.
Payments into HTF Highway Account	Highway Statistics, FHWA, 2016	A significant factor used in SAFETEA-LU, the total payments into the HTF is seen as an important aspect of the donor-donee debate.	With a significant amount of the program coming from general fund revenues (and no indication that user taxes will be increased), this factor is not relevant to the transportation system performance, scope, or need.
Weighted annual average daily traffic per lane	Highway Statistics, FHWA, 2016	Shows the intensity of use for highway lanes and can be an indicator of how well highways are able to handle throughput.	Providing an hourly breakdown by time of day. This measure has the potential to be used as a year-to-year improvement factor to encourage better utilization of existing assets, and peak and off-peak traffic could be measured.
Passenger miles traveled	National Household Travel Survey, 2017	Similar to VMT, PMT is useful in that it counts passengers, and therefore as a metric can encourage carpooling and buses.	Increasing PMT by itself is easier to measure than other factors, but as it is a measure of mobility it does not capture the economic benefit of increased accessibility.

Factor	Source	Effects on the System	Future improvement
Truck freight ton-miles	FHWA Freight Analysis Framework Data, 2012	An important way to gauge the amount of freight moving through and within a state. Trucks cause damage to roads that is directly proportional to ton-miles, making this a good indicator of need for maintenance. Data that counts all truck ton-miles by state was difficult to find, so only freight traffic to, from, and within states is included.	Does not necessarily capture through trucks and local trucks within states. Improved data collection, including the types of facilities in which the ton-miles are driven, would improve the metric.
SAFETY			
Total roadway fatalities	NHTSA, 2015 and 2016	The overall goal is to reduce roadway deaths. Any decrease is important, and states that have the highest fatalities have the greatest need to reduce.	Some of the recent improvement in fatalities is because cars have become safer rather than a reduction in overall crashes. In addition to fatalities, crashes and serious injuries have broad economic consequences and should be included. These metrics do not exist on a consistent basis. And though it would be small, a better factor would include fatalities and injuries on all modes.
Fatality rate per 100 million annual VMT	NHTSA, 2015 and 2016	Measures the safety of the highway system. Driving safety is usually measured by "per VMT", so reductions in this factor means that the system overall is safer	Should also include serious injuries and crashes.
Fatalities per capita	NHTSA, 2015 and 2016	States that have significantly higher transit and walking have lower fatalities per capita. Can be useful in encouraging shifts to safer modes.	Should also include serious injuries and crashes.

Factor	Source	Effects on the System	Future improvement
ENERGY AND ENVIRONMENT			
Population in Clean Air Act non-attainment areas	FHWA SAFETEA-LU Tables, 2008 and 2009 (not updated since 2009)	Encompasses areas that have not attained certain environmental air standards. Helps to target funding to areas that have problems with air pollution and can be tailored to different types of pollutants.	Non-attainment data provides population numbers only for regions that are not doing well, instead of rewarding those that are doing well.
Decrease in non-attainment population	Calculated from 2008 to 2009	Rewards states that have made progress to reducing their non-attainment areas.	Does not provide any incentive for states that are above the requirements to make further improvement.
Fuel consumption	Highway Statistics, FHWA, 2016	Fuel consumption data are available for both diesel and gasoline use. For many years, this metric was a proxy for use, but in recent years with fuel economies increasing, it is increasingly used as a metric for environmental impact.	If fuel consumption is reduced, the environment is improved, and the transportation system is less reliant on oil-based fuels. However, an improved metric might be fuel consumption per GDP, as that helps measure the relative economic activity associated with fuel use.
Total journeys to work in single occupancy vehicles (SOV)	U.S. Census Factfinder, 2016 and 2017	Regional and state economies that use higher SOVs indicate a need for more highway funding and as a proxy for the amount of jobs in the region. Does not include the percent of work journeys in SOVs as that does not necessarily give an accurate indicator of need.	Provides a perverse incentive to states if the goal is to reduce environmental impact. The factor could be improved as a reduction as it is in the following factor.

Factor	Source	Effects on the System	Future improvement
Decrease in SOV use	Calculated, 2016 and 2017	Funding distributed with this factor would encourage states to reduce the number of journeys to work in SOVs but leave them the flexibility on how they want to achieve that.	A rolling 10-year average would help to smooth variances. Could reward states that see job loss and decrease funding to states that are rapidly adding jobs. A proportional factor (% of access in SOV) might be a better factor in a future scenario, but these numbers are more difficult to capture on a state-by-state basis.
Decrease in fuel consumed per GDP	Calculated, 2015 to 2016	Encourages states to grow their economies while using less fuel. states have flexibility in how they can show improvement.	Another way to state this metric could be an improvement in GDP per fuel consumed. Other improvements might come from using emissions instead of fuel consumed.
Transportation carbon dioxide emissions, all modes	EPA, 2014 and 2015	Measures CO2 produced by all transportation modes, therefore capturing alternative fuels. The goal is more closely tied with climate change rather than urban regional air quality.	It is not entirely clear how extensive this is tied to electricity modes, nor is it clear how this data accounts for cross-border trips.
Improvement in carbon emissions	Calculated, 2014 to 2015	States should be encouraged to take steps to reduce their carbon emissions from transportation in ways they find most effective.	Taking multi-year reductions or 5-year average reductions. Tie-in to GDP to account for the environmental efficiency of a state's economy.

Factor	Source	Effects on the System	Future improvement
CONGESTION AND RELIABILITY			
Average travel time to work	American Community Survey, 3-year, 2017	A measure of both job accessibility and congestion in a region. States that have higher average travel time to work indicate a higher need to reduce bottlenecks and accessibility.	Though the data does not readily exist, could be improved by measuring average trip time for all trips instead of just the travel to work.
Weighted roadway congestion index	Texas Transportation Institute (TTI), 2006 and 2011	Measures the amount of delay experienced by congested roadways. The Roadway Congestion Index (RCI) is a measure of vehicle travel density on major roadways in an urban area. An RCI exceeding 1.0 indicates an undesirable congestion level, on an average, on the freeways and principal arterial street systems during the peak period.	The metric is by metro area, instead of state, so aggregating is somewhat difficult. Also, many have criticized this as a useful metric since some delay on roadways is desirable and healthy in a robust economy, and the goal of free-flowing conditions is unrealistic and/or undesirable.
Improvement in weighted roadway congestion index	Calculated 2006 to 2011	Would encourage states to improve upon the congestion metric in metro areas.	The same criticism applies as above, and improvement in this metric is done mostly with new pavement expansion, which is sometimes a perverse incentive.
Travel Time Index	Texas Transportation Institute, 2006 and 2011	Displays the ratio of the travel time during the peak period to the time required to make the same trip at free-flow speeds, aggregated from metro areas.	Like the congestion metric, this metric highlights the need for free flow speed rather than efficient use of roadway capacity
Improvement in Travel Time Index	Calculated 2006 to 2011	Encourages states to improve on the travel time metric within their states	The same criticism applies as above, and improvement in this metric has historically been accomplished mostly with new pavement expansion, which is sometimes a perverse incentive.

Factor	Source	Effects on the System	Future improvement
ECONOMY AND POPULATION			
State population	American Community Survey, 3-year	A basic distribution factor that can be used to apportion funding by need.	Population alone is not always the best indicator of need. Also, multi-year rolling averages can help smooth any large increases or decreases for a particular state.
State GDP	Bureau of Economic Analysis	Like population, GDP can give an indication of need that is more closely tied with the economy.	Should be used in concert with other factors, and a 10-year rolling average can help smooth discrepancies or reporting errors.
Urbanized area population	Background Table 1 2010 Census	This is population within urban areas, indicating need in the most congested areas of the country.	Urban areas often spread over state boundaries and finding the cutoff for urban populations (or GDP, for that matter) can be challenging. Transportation should be regional in nature, not limited by state boundaries
Median MPO population per state	FHWA, calculated by state	Encourages states to consolidate MPOs to get more comprehensive regional planning. Median, instead of average, MPO size was chosen as there is less variance between states and, therefore, more even distribution while maintaining the incentive.	Might need to be balanced with some form of size limit, so states are encouraged to increase the MPO size but not make them overly large.
Metropolitan area GDP by state	Bureau of Economic Analysis, 2017	This GDP metric focuses on the economies of metropolitan areas instead of total state GDP. Metro area GDP helps to focus funding on areas that have the greatest accessibility problems.	Might be challenging for rural states to accept.

Factor	Source	Effects on the System	Future improvement
Job access	U.S. census	Job access is a good way to measure how well a transportation system is connecting residents to jobs. This economic outcome is a root goal of the transportation network.	Not much data on job access that can be aggregated to the state level. As a placeholder, this metric only measures the number of people who both live and work in the same MSA but could be improved with a measure of time or transportation cost, leaving states the flexibility to make an improvement how they see fit.
Percent improvement in job access by state	Calculated, 2015 to 2016	Improving job access through transportation is a positive incentive.	Some of the data problems as mentioned above still exist and should be improved to calculate the percent improvement properly.
State Land Area	FHWA	Land area is somewhat proportional to roadway length, giving significant advantage to large states.	Alaska's state land area is so large that it (as it was in 1916) was cut into 1/3 for the Scenario 1 distribution.

Scenario 1 Distribution Results for FY 2018 ($, millions)

STATE	State Total	State Total (2018)	Percent Change	Total Change
ALABAMA	708.3	798.6	-11.3%	-90.3
ALASKA	953.4	527.8	80.6%	425.6
ARIZONA	1,031.2	770.2	33.9%	261.0
ARKANSAS	553.5	545.0	1.6%	8.5
CALIFORNIA	3,413.5	3,863.4	-11.6%	-449.9
COLORADO	972.6	562.9	72.8%	409.7
CONNECTICUT	266.4	528.7	-49.6%	-262.3
DELAWARE	79.8	178.1	-55.2%	-98.2
DIST. OF COL.	40.4	168.0	-76.0%	-127.6
FLORIDA	1,790.3	1,994.3	-10.2%	-204.0
GEORGIA	1,179.0	1,359.1	-13.3%	-180.1
HAWAII	116.0	178.0	-34.8%	-62.0
IDAHO	572.7	301.1	90.2%	271.7
ILLINOIS	1,268.9	1,496.5	-15.2%	-227.6
INDIANA	675.4	1,003.0	-32.7%	-327.6
IOWA	654.6	517.3	26.5%	137.3
KANSAS	710.2	397.8	78.5%	312.4
KENTUCKY	586.1	699.4	-16.2%	-113.3
LOUISIANA	600.8	738.8	-18.7%	-138.0
MAINE	257.9	194.3	32.7%	63.6
MARYLAND	468.7	632.6	-25.9%	-163.9
MASSACHUSETTS	515.0	639.3	-19.4%	-124.3
MICHIGAN	1,077.1	1,108.3	-2.8%	-31.2
MINNESOTA	875.7	686.4	27.6%	189.3
MISSISSIPPI	576.8	509.1	13.3%	67.7
MISSOURI	938.1	996.5	-5.9%	-58.4
MONTANA	889.2	431.9	105.9%	457.3
NEBRASKA	600.2	304.2	97.3%	295.9
NEVADA	751.9	382.2	96.7%	369.6
NEW HAMPSHIRE	146.7	173.9	-15.6%	-27.2
NEW JERSEY	631.0	1,051.0	-40.0%	-420.0
NEW MEXICO	824.8	386.5	113.4%	438.3
NEW YORK	1,525.2	1,766.9	-13.7%	-241.6
NORTH CAROLINA	1,036.4	1,097.8	-5.6%	-61.5
NORTH DAKOTA	513.0	261.3	96.3%	251.7
OHIO	1,068.0	1,410.9	-24.3%	-342.9
OKLAHOMA	709.5	667.6	6.3%	42.0
OREGON	815.0	526.1	54.9%	288.8

STATE	State Total	State Total (2018)	Percent Change	Total Change
PENNSYLVANIA	1,163.8	1,727.1	-32.6%	-563.2
RHODE ISLAND	83.0	230.2	-64.0%	-147.2
SOUTH CAROLINA	583.1	704.9	-17.3%	-121.8
SOUTH DAKOTA	546.7	296.8	84.2%	249.8
TENNESSEE	805.8	889.5	-9.4%	-83.7
TEXAS	3,609.3	3,831.9	-5.8%	-222.6
UTAH	664.8	365.5	81.9%	299.3
VERMONT	107.0	213.6	-49.9%	-106.6
VIRGINIA	874.8	1,071.2	-18.3%	-196.3
WASHINGTON	874.1	713.6	22.5%	160.5
WEST VIRGINIA	296.1	460.0	-35.6%	-163.9
WISCONSIN	816.9	792.0	3.1%	24.9
WYOMING	601.9	269.7	123.2%	332.3
Total	**41,420.5**	**41,420.5**		**0.0**

Scenario 2 Distribution Results for FY 2018 ($, millions)

STATE	CMAQ Scenario 2	MPP Scenario 2	NHPP Scenario 2	STBGP Scenario 2	HSIP Scenario 2	State Total	State Total (2018)	Percent Change	Total Change	10% Max Apportionment ($, millions)	10% Maximum Change
ALABAMA	12.0	2.8	480.8	238.7	59.0	793.2	798.6	-0.7%	-5.4.	799.2	0.1%
ALASKA	12.0	1.7	162.9	58.3	12.8	247.7	527.8	-53.1%	-280.1.	474.7	-10.1%
ARIZONA	51.4	5.2	426.5	222.3	53.5	758.9	770.2	-1.5%	-11.2.	764.2	-0.8%
ARKANSAS	12.0	2.1	333.3	159.7	39.1	546.2	545.0	0.2%	1.3.	550.6	1.0%
CALIFORNIA	500.8	34.3	2,108.2	1,086.0	236.9	3,966.3	3,863.4	2.7%	102.9.	3,992.8	3.3%
COLORADO	46.6	4.1	429.9	191.7	43.0	715.3	562.9	27.1%	152.4.	615.3	9.3%
CONNECTICUT	45.2	22.2	199.7	102.5	20.5	390.1	528.7	-26.2%	-138.6.	480.4	-9.1%
DELAWARE	12.0	5.5	122.3	58.3	12.8	210.9	178.1	18.5%	32.9.	194.5	9.3%
DIST. OF COL.	12.0	4.8	122.3	58.3	12.8	210.2	168.0	25.2%	42.3.	184.8	10.0%
FLORIDA	12.0	17.5	1,127.9	591.4	158.7	1,907.6	1,994.3	-4.4%	-86.8.	1,915.5	-4.0%
GEORGIA	62.5	6.9	766.7	391.9	90.7	1,318.7	1,359.1	-3.0%	-40.5.	1,331.6	-2.0%
HAWAII	12.0	1.7	122.3	58.3	12.8	207.1	178.0	16.3%	29.1.	195.9	10.0%
IDAHO	12.0	1.7	214.4	76.9	18.3	323.4	301.1	7.4%	22.3.	308.5	2.5%
ILLINOIS	104.3	12.5	799.3	397.2	81.3	1,394.6	1,496.5	-6.8%	-101.9.	1,406.1	-6.0%
INDIANA	43.3	13.8	520.2	270.8	55.6	903.7	1,003.0	-9.9%	-99.3.	912.5	-9.0%
IOWA	12.0	2.1	395.5	170.6	37.8	618.0	517.3	19.5%	100.7.	568.2	9.8%
KANSAS	12.0	2.3	315.1	175.9	43.0	548.3	397.8	37.8%	150.5.	437.6	10.0%
KENTUCKY	13.7	3.7	395.9	180.4	42.3	636.0	699.4	-9.1%	-63.4.	648.6	-7.3%
LOUISIANA	12.0	2.8	384.1	184.8	42.1	625.9	738.8	-15.3%	-112.9.	665.5	-9.9%
MAINE	12.0	1.7	129.0	58.3	12.8	213.8	194.3	10.0%	19.5.	210.2	8.2%
MARYLAND	62.5	13.1	369.5	187.3	35.6	667.9	632.6	5.6%	35.4.	666.4	5.4%
MASSACHUSETTS	80.1	7.2	353.1	186.9	34.3	661.6	639.3	3.5%	22.3.	661.3	3.4%
MICHIGAN	81.6	7.0	639.0	367.1	81.3	1,176.0	1,108.3	6.1%	67.7.	1,156.1	4.3%
MINNESOTA	32.3	3.4	444.3	241.0	49.8	770.8	686.4	12.3%	84.4.	748.7	9.1%
MISSISSIPPI	12.0	1.7	381.9	167.1	39.2	601.9	509.1	18.2%	92.8.	559.2	9.8%
MISSOURI	22.9	4.6	590.1	281.3	64.5	963.4	996.5	-3.3%	-33.1.	972.7	-2.4%
MONTANA	12.0	1.7	315.3	74.0	18.2	421.2	431.9	-2.5%	-10.7.	441.6	2.2%
NEBRASKA	12.0	1.7	287.9	114.4	25.0	441.1	304.2	45.0%	136.8.	334.7	10.0%
NEVADA	27.1	2.4	221.3	90.2	20.8	361.8	382.2	-5.4%	-20.5.	373.7	-2.2%

STATE	CMAQ Scenario 2	MPP Scenario 2	NHPP Scenario 2	STBGP Scenario 2	HSIP Scenario 2	State Total	State Total (2018)	Percent Change	Total Change	10% Max Apportionment ($, millions)	10% Maximum Change
NEW HAMPSHIRE	12.0	4.8	122.3	58.3	12.8	210.2	173.9	20.8%	36.3.	191.4	10.0%
NEW JERSEY	107.8	25.3	503.1	248.5	44.1	928.9	1,051.0	-11.6%	-122.1.	958.6	-8.8%
NEW MEXICO	12.0	1.7	337.2	110.7	26.8	488.4	386.5	26.4%	101.9.	408.5	5.7%
NEW YORK	213.7	22.7	818.4	398.2	71.2	1,524.2	1,766.9	-13.7%	-242.7.	1,634.2	-7.5%
NORTH CAROLINA	52.3	5.8	654.3	343.7	78.2	1,134.4	1,097.8	3.3%	36.6.	1,141.6	4.0%
NORTH DAKOTA	12.0	1.7	329.9	82.0	18.4	444.1	261.3	69.9%	182.8.	285.6	9.3%
OHIO	98.9	8.0	792.5	404.5	80.7	1,384.8	1,410.9	-1.9%	-26.2.	1,395.2	-1.1%
OKLAHOMA	12.0	1.9	433.8	220.4	53.3	721.4	667.6	8.1%	53.8.	721.9	8.1%
OREGON	20.2	2.8	333.9	149.8	35.6	542.3	526.1	3.1%	16.2.	546.9	3.9%
PENNSYLVANIA	120.8	10.7	739.4	370.6	73.6	1,315.1	1,727.1	-23.9%	-412.0.	1,579.1	-8.6%
RHODE ISLAND	12.1	5.6	122.3	58.3	12.8	211.0	230.2	-8.3%	-19.2.	209.8	-8.9%
SOUTH CAROLINA	12.0	4.5	429.3	217.9	57.0	720.8	704.9	2.3%	15.9.	719.6	2.1%
SOUTH DAKOTA	12.0	1.7	291.6	80.8	19.4	405.6	296.8	36.6%	108.7.	308.9	4.0%
TENNESSEE	36.0	3.7	562.6	260.2	59.0	921.5	889.5	3.6%	32.0.	929.1	4.4%
TEXAS	144.0	20.5	2,298.5	1,143.1	231.6	3,837.7	3,831.9	0.2%	5.8.	3,895.3	1.7%
UTAH	12.0	2.4	316.4	110.9	22.6	464.3	365.5	27.0%	98.8.	388.5	6.3%
VERMONT	12.0	1.7	122.3	58.3	12.8	207.1	213.6	-3.1%	-6.5.	209.4	-2.0%
VIRGINIA	54.8	8.2	610.9	302.2	59.3	1,035.4	1,071.2	-3.3%	-35.8.	1,045.1	-2.4%
WASHINGTON	43.4	6.9	440.2	221.3	45.1	756.9	713.6	6.1%	43.3.	763.1	6.9%
WEST VIRGINIA	12.0	1.7	196.7	83.0	19.7	313.1	460.0	-31.9%	-146.9.	414.4	-9.9%
WISCONSIN	24.4	6.1	490.6	245.5	51.9	818.5	792.0	3.3%	26.5.	825.5	4.2%
WYOMING	12.0	1.7	348.7	58.3	12.8	433.6	269.7	60.8%	163.9.	277.8	3.0%
Total	**2,402.9**	**342.7**	**24,453.4**	**11,668.5**	**2,552.9**	**41,420.5**	**41,420.5**				

Scenario 3 Distribution Results ($, millions)

STATE	CMAQ Scenario 3	MPP Scenario 3	NHPP/ NHFP Scenario 3	STBP Scenario 3	HSIP Scenario 3	State Total	State Total (2018)	Percent Change	Total Change	15% Max Apportionment ($, millions)	15% Maximum Change
ALABAMA	32.5	3.3	430.5	223.2	56.3	745.9	798.6	-6.6%	-52.7. M	779.2	-2.4%
ALASKA	17.8	1.7	230.1	279.4	36.0	565.0	527.8	7.1%	37.3. M	519.7	-1.5%
ARIZONA	46.8	3.9	397.7	289.6	58.2	796.2	770.2	3.4%	26.0. M	757.1	-1.7%
ARKANSAS	28.4	2.1	454.9	226.8	46.9	759.1	545.0	39.3%	214.2. M	609.8	11.9%
CALIFORNIA	154.1	23.1	1,533.7	288.5	170.9	2,170.3	3,863.4	-43.8%	-1693.1. M	3,477.1	-10.0%
COLORADO	37.4	6.7	428.4	203.4	46.7	722.6	562.9	28.4%	159.7. M	618.9	9.9%
CONNECTICUT	103.4	14.5	314.9	224.3	33.2	690.3	528.7	30.6%	161.6. M	586.3	10.9%
DELAWARE	44.4	7.1	166.7	236.4	28.9	483.5	178.1	171.5%	305.4. M	200.1	12.4%
DIST. OF COL.	49.6	9.9	325.4	226.7	17.3	628.8	168.0	274.4%	460.9. M	188.7	12.3%
FLORIDA	90.6	13.6	698.1	260.6	111.3	1,174.1	1,994.3	-41.1%	-820.2. M	1,799.5	-9.8%
GEORGIA	53.9	5.1	586.3	185.8	71.5	902.6	1,359.1	-33.6%	-456.5. M	1,223.2	-10.0%
HAWAII	26.6	6.3	201.8	298.6	27.7	561.0	178.0	215.1%	382.9. M	199.9	12.3%
IDAHO	25.1	1.7	235.1	241.8	37.7	541.3	301.1	79.8%	240.2. M	337.6	12.1%
ILLINOIS	73.6	7.9	996.7	229.4	65.0	1,372.7	1,496.5	-8.3%	-123.8. M	1,519.5	1.5%
INDIANA	76.4	8.8	578.3	208.2	49.1	920.7	1,003.0	-8.2%	-82.3. M	973.8	-2.9%
IOWA	32.1	2.3	395.7	235.2	39.5	704.9	517.3	36.3%	187.5. M	578.8	11.9%
KANSAS	23.7	2.7	307.3	230.4	41.5	605.5	397.8	52.2%	207.7. M	445.2	11.9%
KENTUCKY	38.1	3.2	389.5	209.1	55.5	695.5	699.4	-0.6%	-3.9. M	707.5	1.2%
LOUISIANA	35.3	3.3	559.0	215.6	53.6	866.9	738.8	17.3%	128.1. M	823.0	11.4%
MAINE	25.6	1.7	196.3	234.7	28.9	487.1	194.3	150.7%	292.8. M	218.1	12.2%
MARYLAND	78.6	8.9	329.9	166.4	43.3	627.1	632.6	-0.9%	-5.5. M	648.6	2.5%
MASSACHUSETTS	47.1	7.0	499.3	204.6	38.5	796.4	639.3	24.6%	157.1. M	697.5	9.1%
MICHIGAN	48.3	5.7	611.7	216.7	64.9	947.2	1,108.3	-14.5%	-161.0. M	1,056.1	-4.7%
MINNESOTA	37.2	3.3	359.1	196.4	37.9	634.0	686.4	-7.6%	-52.4. M	675.3	-1.6%
MISSISSIPPI	26.8	4.1	384.6	194.7	50.8	661.0	509.1	29.8%	151.9. M	569.6	11.9%
MISSOURI	36.0	3.6	627.2	200.6	55.1	922.6	996.5	-7.4%	-73.9. M	998.8	0.2%
MONTANA	25.2	1.7	305.3	274.4	36.8	643.4	431.9	49.0%	211.5. M	483.9	12.0%
NEBRASKA	25.2	3.6	352.3	241.6	30.7	653.4	304.2	114.8%	349.2. M	340.8	12.0%
NEVADA	36.3	3.9	186.4	286.3	35.7	548.5	382.2	43.5%	166.3. M	383.1	0.2%

STATE	CMAQ Scenario 3	MPP Scenario 3	NHPP/ NHFP Scenario 3	STBP Scenario 3	HSIP Scenario 3	State Total	State Total (2018)	Percent Change	Total Change	15% Max Apportionment ($, millions)	15% Maximum Change
NEW HAMPSHIRE	42.2	4.6	171.3	195.8	27.0	440.9	173.9	153.5%	267.0. M	195.3	12.3%
NEW JERSEY	116.4	51.2	572.3	174.5	47.4	961.8	1,051.0	-8.5%	-89.2. M	1,031.0	-1.9%
NEW MEXICO	30.1	2.3	343.6	257.0	40.8	673.8	386.5	74.3%	287.2. M	432.8	12.0%
NEW YORK	103.7	14.9	900.0	206.8	65.0	1,290.3	1,766.9	-27.0%	-476.6. M	1,632.0	-7.6%
NORTH CAROLINA	41.3	5.7	653.5	220.5	69.0	989.9	1,097.8	-9.8%	-107.9. M	1,084.1	-1.3%
NORTH DAKOTA	25.5	1.7	210.3	260.5	28.4	526.4	261.3	101.4%	265.1. M	293.0	12.1%
OHIO	50.4	8.5	767.5	220.1	66.4	1,112.9	1,410.9	-21.1%	-298.1. M	1,318.4	-6.6%
OKLAHOMA	25.7	9.2	563.9	231.1	48.7	878.6	667.6	31.6%	211.0. M	746.6	11.8%
OREGON	32.4	2.8	350.8	233.8	43.7	663.6	526.1	26.1%	137.4. M	588.8	11.9%
PENNSYLVANIA	59.7	9.5	1,182.5	221.0	65.6	1,538.4	1,727.1	-10.9%	-188.7. M	1,757.4	1.8%
RHODE ISLAND	42.8	14.1	291.5	189.7	17.1	555.2	230.2	141.2%	325.0. M	258.2	12.2%
SOUTH CAROLINA	41.1	4.4	512.8	216.6	62.8	837.7	704.9	18.9%	132.9. M	788.4	11.8%
SOUTH DAKOTA	25.6	1.7	240.9	239.4	30.0	537.5	296.8	81.1%	240.7. M	332.8	12.1%
TENNESSEE	37.4	3.4	614.3	222.3	58.6	936.0	889.5	5.2%	46.5. M	924.2	3.9%
TEXAS	96.6	13.1	1,240.9	260.7	149.4	1,760.7	3,831.9	-54.1%	-2071.2. M	3,448.7	-10.0%
UTAH	32.7	4.5	270.3	249.8	31.0	588.3	365.5	61.0%	222.8. M	409.5	12.0%
VERMONT	24.7	1.7	142.0	232.5	20.6	421.5	213.6	97.3%	207.9. M	239.4	12.1%
VIRGINIA	55.4	5.6	633.2	154.6	54.9	903.8	1,071.2	-15.6%	-167.4. M	1,047.9	-2.2%
WASHINGTON	47.8	4.9	422.4	251.4	44.2	770.8	713.6	8.0%	57.2. M	768.5	7.7%
WEST VIRGINIA	27.2	1.9	460.5	203.1	37.5	730.1	460.0	58.7%	270.1. M	515.2	12.0%
WISCONSIN	43.5	4.2	523.4	221.3	46.5	838.9	792.0	5.9%	46.9. M	873.4	10.3%
WYOMING	24.8	1.7	303.5	276.8	29.0	635.8	269.7	135.8%	366.2. M	302.2	12.1%
Total	**2,402.9**	**342.7**	**24,453.4**	**11,668.5**	**2,552.9**	**41,420.5**	**41,420.5**		**13,848.7**	**41,404.7**	

Scenario 4 Distribution Results ($, millions)

STATE	CMAQ Scenario 4	MPP Scenario 4	NHPP/ NHFP Scenario 4	STBP Scenario 4	HSIP Scenario 4	State Total	State Total (2018)	Percent Change	Total Change	15% Max Apportionment ($, millions)	15% Maximum Change
ALABAMA	52.5	9.8	122.3	551.5	12.8	748.8	798.6	-6.2%	-49.8 M	771.5	-3.4%
ALASKA	29.4	5.4	122.3	1,627.7	12.8	1,797.5	527.8	240.6%	1269.7 M	516.6	-2.1%
ARIZONA	37.8	6.9	457.3	58.3	12.8	573.1	770.2	-25.6%	-197.1 M	785.0	1.9%
ARKANSAS	31.5	5.7	122.3	58.3	58.2	275.9	545.0	-49.4%	-269.0 M	514.9	-5.5%
CALIFORNIA	12.0	6.9	122.3	58.3	12.8	212.3	3,863.4	-94.5%	-3651.1 M	3,477.1	-10.0%
COLORADO	22.4	7.9	1,138.1	616.4	12.8	1,797.6	562.9	219.4%	1234.7 M	604.4	7.4%
CONNECTICUT	86.1	6.6	467.9	58.3	12.8	631.7	528.7	19.5%	103.0 M	555.2	5.0%
DELAWARE	42.0	10.6	494.1	748.5	144.3	1,439.5	178.1	708.4%	1261.4 M	202.0	13.4%
DIST. OF COL.	12.0	7.3	333.8	58.3	12.8	424.3	168.0	152.6%	256.3 M	190.4	13.3%
FLORIDA	57.0	13.1	449.3	58.3	12.8	590.5	1,994.3	-70.4%	-1403.8 M	1,800.2	-9.7%
GEORGIA	58.8	10.4	154.6	58.3	12.8	294.9	1,359.1	-78.3%	-1064.2 M	1,225.9	-9.8%
HAWAII	46.2	12.7	122.3	205.5	12.8	399.4	178.0	124.3%	221.4 M	201.7	13.3%
IDAHO	12.0	1.7	740.4	58.3	12.8	825.2	301.1	174.1%	524.1 M	311.2	3.4%
ILLINOIS	12.0	1.7	314.8	76.2	12.8	417.4	1,496.5	-72.1%	-1079.1 M	1,346.9	-10.0%
INDIANA	18.2	4.4	574.3	381.7	39.1	1,017.7	1,003.0	1.5%	14.7 M	1,079.9	7.7%
IOWA	12.0	1.7	649.1	58.3	12.8	733.9	517.3	41.9%	216.6 M	533.7	3.2%
KANSAS	18.9	4.3	604.4	58.3	12.8	698.7	397.8	75.7%	300.9 M	411.2	3.4%
KENTUCKY	23.1	4.8	812.6	58.3	12.8	911.6	699.4	30.3%	212.2 M	722.0	3.2%
LOUISIANA	12.0	1.8	122.3	58.3	15.6	210.1	738.8	-71.6%	-528.7 M	669.4	-9.4%
MAINE	40.1	1.7	1,187.9	58.3	12.8	1,300.8	194.3	569.5%	1106.5 M	220.0	13.2%
MARYLAND	70.5	2.1	122.3	410.9	72.8	678.6	632.6	7.3%	46.0 M	645.1	2.0%
MASSACHUSETTS	24.1	6.9	362.5	205.5	12.8	611.8	639.3	-4.3%	-27.5 M	680.8	6.5%
MICHIGAN	22.4	5.5	633.0	205.5	12.8	879.2	1,108.3	-20.7%	-229.1 M	1,126.6	1.7%
MINNESOTA	58.8	10.4	419.5	205.5	89.6	783.7	686.4	14.2%	97.3 M	776.2	13.1%
MISSISSIPPI	25.2	7.0	595.0	58.3	12.8	698.3	509.1	37.2%	189.3 M	525.9	3.3%
MISSOURI	23.1	4.7	122.3	58.3	12.8	221.2	996.5	-77.8%	-775.3 M	904.6	-9.2%
MONTANA	12.0	1.7	122.3	410.9	311.0	857.9	431.9	98.6%	426.0 M	429.1	-0.6%
NEBRASKA	33.6	8.0	534.3	58.3	195.8	830.1	304.2	172.8%	525.8 M	325.8	7.1%

STATE	CMAQ Scenario 4	MPP Scenario 4	NHPP/ NHFP Scenario 4	STBP Scenario 4	HSIP Scenario 4	State Total	State Total (2018)	Percent Change	Total Change	15% Max Apportionment ($, millions)	15% Maximum Change
NEVADA	96.6	17.1	127.2	205.5	31.3	477.6	382.2	25.0%	95.4 M	391.0	2.3%
NEW HAMPSHIRE	33.6	7.1	1,390.4	410.9	12.8	1,854.9	173.9	966.5%	1680.9 M	197.1	13.3%
NEW JERSEY	762.6	41.9	122.3	58.3	12.8	997.9	1,051.0	-5.1%	-53.1 M	991.0	-5.7%
NEW MEXICO	12.0	1.7	165.2	1,213.9	12.8	1,405.6	386.5	263.6%	1019.0 M	375.4	-2.9%
NEW YORK	24.5	6.8	949.8	58.3	296.0	1,335.5	1,766.9	-24.4%	-431.3 M	1,841.4	4.2%
NORTH CAROLINA	32.5	7.6	163.2	58.3	12.8	274.4	1,097.8	-75.0%	-823.4 M	990.0	-9.8%
NORTH DAKOTA	12.0	1.7	1,068.7	58.3	157.7	1,298.5	261.3	396.9%	1037.2 M	280.2	7.2%
OHIO	40.9	9.6	582.0	58.3	23.5	714.4	1,410.9	-49.4%	-696.6 M	1,269.8	-10.0%
OKLAHOMA	29.4	12.6	927.7	58.3	12.8	1,040.9	667.6	55.9%	373.3 M	688.9	3.2%
OREGON	28.0	5.5	122.3	205.5	12.8	374.0	526.1	-28.9%	-152.1 M	512.6	-2.6%
PENNSYLVANIA	35.0	9.2	2,606.5	58.3	42.6	2,751.7	1,727.1	59.3%	1024.6 M	1,757.4	1.8%
RHODE ISLAND	190.6	16.2	220.9	58.3	12.8	498.8	230.2	116.7%	268.6 M	239.4	4.0%
SOUTH CAROLINA	18.2	4.8	132.5	58.3	23.5	237.4	704.9	-66.3%	-467.5 M	640.6	-9.1%
SOUTH DAKOTA	12.0	1.7	786.9	58.3	212.5	1,071.5	296.8	260.9%	774.6 M	317.6	7.0%
TENNESSEE	12.0	2.7	122.3	58.3	12.8	208.1	889.5	-76.6%	-681.4 M	800.5	-10.0%
TEXAS	22.3	5.8	695.8	58.3	12.8	795.0	3,831.9	-79.3%	-3036.9 M	3,448.7	-10.0%
UTAH	12.0	4.2	122.3	58.3	39.1	236.0	365.5	-35.4%	-129.5 M	345.9	-5.4%
VERMONT	12.0	1.7	122.3	313.4	12.8	462.1	213.6	116.3%	248.5 M	240.3	12.5%
VIRGINIA	12.0	2.6	990.9	205.5	12.8	1,223.8	1,071.2	14.2%	152.6 M	1,091.3	1.9%
WASHINGTON	21.0	4.5	122.3	58.3	62.7	268.8	713.6	-62.3%	-444.7 M	666.0	-6.7%
WEST VIRGINIA	53.9	1.7	122.3	227.2	12.8	417.9	460.0	-9.2%	-42.1 M	446.9	-2.8%
WISCONSIN	12.0	2.3	122.3	58.3	12.8	207.7	792.0	-73.8%	-584.3 M	712.8	-10.0%
WYOMING	12.0	1.7	644.2	1,432.3	316.6	2,406.7	269.7	792.5%	2137.0 M	304.6	12.9%
Total	**2,402.9**	**342.7**	**24,453.4**	**11,668.5**	**2,552.9**	**41,420.5**	**41,420.5**		**33,635.6**		

Scenario 5 Distribution Results ($, millions)

STATE	CMAQ Scenario 5	MPP Scenario 5	NHPP/ NHFP Scenario 5	STBP Scenario 5	HSIP Scenario 5	State Total	State Total (2018)	Percent Change	Total Change	20% Max Apportionment ($, millions)	20% Maximum Change
ALABAMA	38.3	1.7	329.3	320.2	34.3	723.8	798.6	-9.4%	-74.8 M	787.2	-1.4%
ALASKA	20.7	1.7	122.3	594.2	12.8	751.7	527.8	42.4%	223.9 M	517.0	-2.0%
ARIZONA	60.6	1.9	469.2	184.5	31.8	748.0	770.2	-2.9%	-22.2 M	829.6	7.7%
ARKANSAS	19.6	1.7	237.4	58.3	58.5	375.6	545.0	-31.1%	-169.4 M	511.7	-6.1%
CALIFORNIA	372.4	11.3	994.7	1,069.5	119.6	2,567.4	3,863.4	-33.5%	-1296.0 M	3,759.3	-2.7%
COLORADO	47.7	3.3	795.3	361.8	20.1	1,228.2	562.9	118.2%	665.3 M	649.7	15.4%
CONNECTICUT	47.3	7.1	314.5	87.5	12.8	469.2	528.7	-11.3%	-59.5 M	572.6	8.3%
DELAWARE	32.8	46.6	283.6	294.6	105.3	762.9	178.1	328.4%	584.8 M	212.2	19.1%
DIST. OF COL.	12.0	4.8	180.7	58.3	12.8	268.6	168.0	59.9%	100.7 M	200.2	19.2%
FLORIDA	34.7	6.6	818.5	425.3	104.8	1,389.8	1,994.3	-30.3%	-604.5 M	1,797.7	-9.9%
GEORGIA	81.5	2.5	504.2	251.2	51.3	890.7	1,359.1	-34.5%	-468.5 M	1,237.2	-9.0%
HAWAII	28.1	3.1	122.3	105.6	12.8	271.8	178.0	52.7%	93.8 M	212.2	19.2%
IDAHO	12.0	1.7	492.3	94.6	12.8	613.4	301.1	103.7%	312.3 M	349.1	15.9%
ILLINOIS	76.3	3.9	644.8	245.7	35.7	1,006.5	1,496.5	-32.7%	-490.0 M	1,346.9	-10.0%
INDIANA	42.7	4.3	620.3	227.4	60.9	955.6	1,003.0	-4.7%	-47.3 M	1,102.0	9.9%
IOWA	12.0	1.7	545.4	192.2	13.3	764.6	517.3	47.8%	247.3 M	599.6	15.9%
KANSAS	12.0	1.7	493.9	60.3	14.2	582.1	397.8	46.3%	184.3 M	428.3	7.7%
KENTUCKY	24.1	1.7	671.1	84.5	27.5	808.9	699.4	15.7%	109.5 M	753.2	7.7%
LOUISIANA	12.0	1.7	204.4	178.9	38.5	435.6	738.8	-41.0%	-303.2 M	667.3	-9.7%
MAINE	12.0	1.7	676.7	85.2	12.8	788.4	194.3	305.8%	594.1. M	231.7	19.3%
MARYLAND	45.7	4.3	182.1	295.2	50.5	577.8	632.6	-8.7%	-54.7 M	636.3	0.6%
MASSACHUSETTS	73.3	3.4	302.5	299.1	12.8	691.1	639.3	8.1%	51.8 M	636.2	-0.5%
MICHIGAN	73.3	2.8	650.6	267.7	35.1	1,029.6	1,108.3	-7.1%	-78.7 M	1,193.5	7.7%
MINNESOTA	59.4	1.7	421.9	207.1	53.5	743.5	686.4	8.3%	57.2 M	815.4	18.8%
MISSISSIPPI	15.3	2.0	527.7	62.6	29.5	637.2	509.1	25.2%	128.1 M	564.6	10.9%
MISSOURI	30.8	1.8	386.2	84.7	31.2	534.7	996.5	-46.3%	-461.8 M	901.7	-9.5%
MONTANA	12.0	1.7	143.2	171.1	209.0	537.0	431.9	24.3%	105.1 M	438.5	1.5%
NEBRASKA	20.4	1.8	436.7	167.2	122.1	748.1	304.2	145.9%	443.9 M	363.0	19.3%
NEVADA	78.6	88.2	173.9	124.3	37.9	502.8	382.2	31.6%	120.6 M	393.4	2.9%

STATE	CMAQ Scenario 5	MPP Scenario 5	NHPP/ NHFP Scenario 5	STBP Scenario 5	HSIP Scenario 5	State Total	State Total (2018)	Percent Change	Total Change	20% Max Apportionment ($, millions)	20% Maximum Change
NEW HAMPSHIRE	28.5	2.2	764.9	186.2	12.8	994.6	173.9	471.9%	820.7 M	207.3	19.2%
NEW JERSEY	95.1	24.9	184.2	337.8	19.8	661.9	1,051.0	-37.0%	-389.1 M	1,032.6	-1.7%
NEW MEXICO	12.0	22.7	293.9	457.8	13.3	799.8	386.5	106.9%	413.2 M	448.8	16.1%
NEW YORK	171.3	7.2	837.0	347.8	74.4	1,437.6	1,766.9	-18.6%	-329.2 M	1,621.7	-8.2%
NORTH CAROLINA	58.1	2.8	423.0	131.6	47.9	663.3	1,097.8	-39.6%	-434.5 M	998.6	-9.0%
NORTH DAKOTA	12.0	1.7	670.3	140.4	105.1	929.5	261.3	255.7%	668.1 M	311.7	19.3%
OHIO	93.7	4.1	799.7	260.9	57.6	1,216.1	1,410.9	-13.8%	-194.8 M	1,501.3	6.4%
OKLAHOMA	17.9	4.5	770.1	181.4	22.5	996.4	667.6	49.3%	328.9 M	766.2	14.8%
OREGON	31.8	1.7	213.1	132.7	16.3	395.7	526.1	-24.8%	-130.5 M	477.5	-9.2%
PENNSYLVANIA	109.7	4.6	1,808.2	222.6	52.7	2,197.8	1,727.1	27.3%	470.7 M	1,860.2	7.7%
RHODE ISLAND	29.3	6.9	135.6	58.9	12.8	243.4	230.2	5.7%	13.2 M	248.1	7.8%
SOUTH CAROLINA	12.8	16.5	286.3	112.6	53.8	482.0	704.9	-31.6%	-222.8 M	661.9	-6.1%
SOUTH DAKOTA	12.0	1.7	517.2	58.3	152.5	741.8	296.8	149.9%	444.9 M	330.2	11.2%
TENNESSEE	31.5	1.7	394.2	169.6	34.4	631.3	889.5	-29.0%	-258.2 M	800.5	-10.0%
TEXAS	118.9	6.4	1,415.5	720.3	124.7	2,385.8	3,831.9	-37.7%	-1446.2 M	3,448.7	-10.0%
UTAH	12.0	2.2	156.3	71.9	43.1	285.5	365.5	-21.9%	-80.1 M	342.6	-6.3%
VERMONT	12.0	1.7	122.3	125.9	12.8	274.7	213.6	28.6%	61.0 M	250.2	17.1%
VIRGINIA	45.2	2.7	859.5	307.5	31.8	1,246.7	1,071.2	16.4%	175.6 M	1,227.3	14.6%
WASHINGTON	44.5	2.4	201.5	204.2	44.8	497.4	713.6	-30.3%	-216.2 M	728.3	2.1%
WEST VIRGINIA	12.0	1.7	122.3	115.0	12.8	263.8	460.0	-42.7%	-196.3 M	415.1	-9.8%
WISCONSIN	22.9	2.1	256.9	143.6	20.0	445.6	792.0	-43.7%	-346.5 M	712.8	-10.0%
WYOMING	12.0	1.7	476.0	522.7	213.2	1,225.6	269.7	354.5%	956.0 M	321.6	19.3%
Total	**2,402.9**	**342.7**	**24,453.4**	**11,668.5**	**2,552.9**	**41,420.5**	**41,420.5**		**16,749.9**		

Scenario 6 Distribution Results ($, millions)

STATE	CMAQ Scenario 6	MPP Scenario 6	NHPP/ NHFP Scenario 6	STBP Scenario 6	HSIP Scenario 6	State Total	State Total (2018)	Percent Change	Total Change	10% Max Apportionment ($, millions)	10% Maximum Change
ALABAMA	26.7	3.3	421.9	218.7	57.2	727.8	798.6	-8.9%	-70.8 M	767.1	-3.9%
ALASKA	18.5	1.7	225.5	274.2	12.5	532.5	527.8	0.9%	4.7 M	505.0	-4.3%
ARIZONA	54.8	3.8	389.7	283.9	57.3	789.5	770.2	2.5%	19.4 M	756.7	-1.8%
ARKANSAS	20.5	2.0	445.8	222.5	31.7	722.6	545.0	32.6%	177.6 M	592.8	8.8%
CALIFORNIA	298.4	22.7	1,503.1	281.3	259.3	2,364.7	3,863.4	-38.8%	-1498.7 M	3,520.8	-8.9%
COLORADO	47.0	6.6	419.8	199.3	40.7	713.3	562.9	26.7%	150.4 M	620.2	10.2%
CONNECTICUT	46.3	14.2	308.7	220.2	22.4	611.7	528.7	15.7%	83.0 M	543.8	2.9%
DELAWARE	29.1	7.0	163.3	232.3	12.5	444.2	178.1	149.5%	266.2 M	196.2	10.2%
DIST. OF COL.	35.7	9.7	318.9	222.8	12.5	599.6	168.0	257.0%	431.6 M	185.1	10.2%
FLORIDA	26.3	13.3	684.1	254.9	179.7	1,158.4	1,994.3	-41.9%	-836.0 M	1,823.8	-8.6%
GEORGIA	61.7	5.0	574.6	181.6	93.1	916.0	1,359.1	-32.6%	-443.1 M	1,240.1	-8.8%
HAWAII	22.8	6.2	197.7	293.4	12.5	532.7	178.0	199.2%	354.7 M	196.1	10.2%
IDAHO	21.6	1.7	230.4	237.3	14.4	505.4	301.1	67.9%	204.3 M	327.7	8.8%
ILLINOIS	83.8	7.8	976.8	224.0	76.8	1,369.2	1,496.5	-8.5%	-127.3 M	1,519.5	1.5%
INDIANA	48.7	8.6	566.7	203.8	53.5	881.3	1,003.0	-12.1%	-121.7 M	925.5	-7.7%
IOWA	23.8	2.3	387.8	230.7	26.4	670.9	517.3	29.7%	153.6 M	562.7	8.8%
KANSAS	15.0	2.6	301.2	225.9	26.4	571.1	397.8	43.6%	173.3 M	435.2	9.4%
KENTUCKY	31.7	3.1	381.7	204.9	45.9	667.3	699.4	-4.6%	-32.0 M	677.9	-3.1%
LOUISIANA	28.9	3.2	547.8	211.4	44.6	836.0	738.8	13.2%	97.2 M	801.6	8.5%
MAINE	28.2	1.7	192.3	230.4	12.5	465.1	194.3	139.4%	270.8 M	212.3	9.3%
MARYLAND	63.8	8.7	323.3	163.1	40.5	599.4	632.6	-5.2%	-33.1 M	617.7	-2.4%
MASSACHUSETTS	63.6	6.9	489.3	200.6	36.6	797.0	639.3	24.7%	157.7 M	695.2	8.7%
MICHIGAN	66.3	5.6	599.4	212.1	74.9	958.3	1,108.3	-13.5%	-150.0 M	1,012.7	-8.6%
MINNESOTA	41.6	3.3	351.9	192.5	35.6	624.8	686.4	-9.0%	-61.6 M	663.8	-3.3%
MISSISSIPPI	20.3	4.1	376.9	190.8	36.7	628.8	509.1	23.5%	119.7 M	560.3	10.1%
MISSOURI	31.0	3.6	614.7	196.2	57.5	902.9	996.5	-9.4%	-93.6 M	949.3	-4.7%
MONTANA	24.4	1.7	299.2	269.0	12.5	606.7	431.9	40.5%	174.9 M	469.8	8.8%
NEBRASKA	20.7	3.5	345.3	237.1	15.1	621.7	304.2	104.4%	317.5 M	331.1	8.8%
NEVADA	41.5	3.8	182.7	281.0	20.0	528.9	382.2	38.4%	146.7 M	373.0	-2.4%

STATE	CMAQ Scenario 6	MPP Scenario 6	NHPP/ NHFP Scenario 6	STBP Scenario 6	HSIP Scenario 6	State Total	State Total (2018)	Percent Change	Total Change	10% Max Apportionment ($, millions)	10% Maximum Change
NEW HAMPSHIRE	30.2	4.5	167.9	192.3	12.5	407.4	173.9	134.2%	233.4 M	191.6	10.2%
NEW JERSEY	81.7	50.1	560.9	171.1	49.0	912.8	1,051.0	-13.1%	-138.2 M	965.9	-8.1%
NEW MEXICO	26.8	2.3	336.7	252.0	22.8	640.6	386.5	65.7%	254.1 M	420.6	8.8%
NEW YORK	135.7	14.6	882.0	202.1	78.5	1,312.8	1,766.9	-25.7%	-454.0 M	1,590.2	-10.0%
NORTH CAROLINA	48.1	5.6	640.4	215.8	87.9	997.7	1,097.8	-9.1%	-100.1 M	1,041.1	-5.2%
NORTH DAKOTA	23.8	1.7	206.0	255.7	12.5	499.7	261.3	91.2%	238.4 M	284.4	8.8%
OHIO	74.1	8.3	752.1	215.1	81.0	1,130.5	1,410.9	-19.9%	-280.4 M	1,270.6	-9.9%
OKLAHOMA	18.4	9.1	552.6	226.5	40.5	847.1	667.6	26.9%	179.6 M	726.2	8.8%
OREGON	32.5	2.8	343.8	229.4	30.5	638.8	526.1	21.4%	112.7 M	556.4	5.7%
PENNSYLVANIA	85.4	9.3	1,158.9	216.1	77.6	1,547.2	1,727.1	-10.4%	-179.8 M	1,757.4	1.8%
RHODE ISLAND	28.5	13.8	285.7	186.4	12.5	526.8	230.2	128.9%	296.6 M	250.7	8.9%
SOUTH CAROLINA	25.4	4.4	502.5	212.3	55.3	799.8	704.9	13.5%	95.0 M	775.8	10.1%
SOUTH DAKOTA	23.8	1.7	236.0	234.9	12.5	508.9	296.8	71.4%	212.1 M	323.0	8.8%
TENNESSEE	42.7	3.3	602.0	217.6	62.4	928.1	889.5	4.3%	38.6 M	926.8	4.2%
TEXAS	98.9	12.8	1,216.1	253.8	237.3	1,818.9	3,831.9	-52.5%	-2013.1 M	3,461.4	-9.7%
UTAH	27.5	4.4	264.8	244.9	20.7	562.3	365.5	53.9%	196.8 M	397.9	8.9%
VERMONT	23.8	1.7	139.2	228.3	12.5	405.5	213.6	89.8%	191.8 M	232.3	8.7%
VIRGINIA	54.4	5.5	620.5	151.2	58.9	890.5	1,071.2	-16.9%	-180.6 M	1,004.6	-6.2%
WASHINGTON	45.7	4.8	414.0	246.5	41.9	752.8	713.6	5.5%	39.2 M	713.6	0.0%
WEST VIRGINIA	27.1	1.8	451.3	199.2	16.6	696.1	460.0	51.3%	236.1 M	500.5	8.8%
WISCONSIN	33.8	4.2	512.9	216.9	44.9	812.7	792.0	2.6%	20.7 M	824.6	4.1%
WYOMING	23.8	1.7	297.5	271.6	12.5	607.0	269.7	125.1%	337.3 M	293.5	8.8%
Total	**2,354.9**	**335.9**	**23,964.3**	**11,435.1**	**2,501.9**	**40,592.1**	**41,420.5**		**12,799.8**		

Scenario 7 Distribution Results ($, millions)

STATE	CMAQ Scenario 7	MPP Scenario 7	NHPP/ NHFP Scenario 7	STBP Scenario 7	HSIP Scenario 7	State Total	State Total (2018)	Percent Change	Total Change	18% Max Apportionment ($, millions)	18% Maximum Change
ALABAMA	56.6	2.6	440.3	122.2	47.4	669.1	798.6	-16.2%	-129.5 M	666.4	-16.6%
ALASKA	11.8	1.7	138.4	160.2	12.5	324.6	527.8	-38.5%	-203.2 M	440.4	-16.6%
ARIZONA	37.7	1.7	570.2	179.7	43.9	833.3	770.2	8.2%	63.2 M	783.5	1.7%
ARKANSAS	72.2	1.7	323.9	57.2	36.4	491.3	545.0	-9.8%	-53.7 M	457.7	-16.0%
CALIFORNIA	18.3	7.5	1,287.2	1,042.0	165.3	2,520.3	3,863.4	-34.8%	-1343.1 M	3,199.0	-17.2%
COLORADO	76.1	6.3	404.2	564.6	27.7	1,079.0	562.9	91.7%	516.2 M	534.5	-5.0%
CONNECTICUT	11.8	4.2	188.4	85.3	13.4	303.0	528.7	-42.7%	-225.7 M	443.1	-16.2%
DELAWARE	21.3	32.0	119.8	312.3	33.0	518.3	178.1	191.1%	340.3 M	168.2	-5.5%
DIST. OF COL.	11.8	10.1	119.8	57.2	12.5	211.4	168.0	25.9%	43.5 M	149.6	-10.9%
FLORIDA	24.4	6.3	971.0	414.3	144.9	1,560.9	1,994.3	-21.7%	-433.4 M	1,682.5	-15.6%
GEORGIA	11.8	2.2	672.1	244.7	70.9	1,001.7	1,359.1	-26.3%	-357.4 M	1,134.2	-16.6%
HAWAII	11.8	8.0	119.8	173.6	12.5	325.7	178.0	83.0%	147.7.M	165.7	-6.9%
IDAHO	47.1	1.7	167.5	92.2	12.5	320.9	301.1	6.6%	19.8 M	253.9	-15.7%
ILLINOIS	14.1	2.1	749.1	213.2	49.4	1,027.9	1,496.5	-31.3%	-468.7 M	1,236.3	-17.4%
INDIANA	20.8	2.3	787.5	231.6	37.5	1,079.7	1,003.0	7.7%	76.8 M	1,022.6	2.0%
IOWA	95.2	1.7	387.0	187.2	18.4	689.6	517.3	33.3%	172.3 M	454.1	-12.2%
KANSAS	150.8	2.0	240.1	58.8	19.6	471.3	397.8	18.5%	73.5 M	333.2	-16.2%
KENTUCKY	32.0	1.8	699.4	82.3	38.1	853.5	699.4	22.0%	154.1 M	718.4	2.7%
LOUISIANA	11.8	2.5	278.9	173.4	34.5	501.1	738.8	-32.2%	-237.6 M	614.9	-16.8%
MAINE	30.8	1.7	179.5	83.0	12.5	307.4	194.3	58.2%	113.1 M	217.0	11.7%
MARYLAND	11.8	2.9	239.4	429.1	57.5	740.6	632.6	17.1%	108.1 M	588.3	-7.0%
MASSACHUSETTS	13.2	4.5	152.6	362.1	17.8	550.2	639.3	-13.9%	-89.1 M	587.5	-8.1%
MICHIGAN	23.5	2.9	773.1	331.6	48.6	1,179.7	1,108.3	6.4%	71.4.M	930.0	-16.1%
MINNESOTA	95.6	2.2	424.1	272.5	61.5	855.8	686.4	24.7%	169.5 M	645.2	-6.0%
MISSISSIPPI	49.6	4.5	293.0	61.0	31.5	439.6	509.1	-13.7%	-69.5 M	425.8	-16.4%
MISSOURI	58.5	1.7	450.4	82.5	43.1	636.2	996.5	-36.2%	-360.2 M	834.8	-16.2%
MONTANA	39.6	1.7	195.3	308.1	86.8	631.5	431.9	46.2%	199.6 M	404.6	-6.3%
NEBRASKA	32.8	4.2	334.6	162.9	74.3	608.8	304.2	100.1%	304.6 M	342.4	12.5%
NEVADA	32.2	55.7	146.0	191.8	15.0	440.8	382.2	15.3%	58.6 M	350.6	-8.3%

STATE	CMAQ Scenario 7	MPP Scenario 7	NHPP/ NHFP Scenario 7	STBP Scenario 7	HSIP Scenario 7	State Total	State Total (2018)	Percent Change	Total Change	18% Max Apportionment ($, millions)	18% Maximum Change
NEW HAMPSHIRE	12.2	2.9	181.6	322.8	12.5	532.0	173.9	205.9%	358.1 M	194.4	11.8%
NEW JERSEY	83.1	52.4	246.8	329.1	27.4	738.9	1,051.0	-29.7%	-312.1 M	905.5	-13.8%
NEW MEXICO	20.0	15.0	350.5	169.8	18.3	573.6	386.5	48.4%	187.1 M	430.0	11.2%
NEW YORK	126.3	4.4	1,044.7	338.8	301.7	1,815.9	1,766.9	2.8%	49.1 M	1,480.3	-16.2%
NORTH CAROLINA	168.1	3.8	460.1	128.2	66.2	826.3	1,097.8	-24.7%	-271.5 M	926.8	-15.6%
NORTH DAKOTA	58.3	1.7	283.4	136.8	46.5	526.7	261.3	101.5%	265.4 M	294.1	12.5%
OHIO	18.1	6.0	972.4	254.2	51.7	1,302.4	1,410.9	-7.7%	-108.5 M	1,180.7	-16.3%
OKLAHOMA	65.5	11.4	955.7	176.7	31.2	1,240.4	667.6	85.8%	572.9 M	685.7	2.7%
OREGON	61.8	1.8	259.4	200.0	22.6	545.6	526.1	3.7%	19.5 M	487.0	-7.4%
PENNSYLVANIA	119.3	5.5	2,200.0	216.8	81.8	2,623.4	1,727.1	51.9%	896.4 M	1,764.4	2.2%
RHODE ISLAND	11.8	15.4	162.4	57.4	12.5	259.4	230.2	12.7%	29.2 M	192.8	-16.3%
SOUTH CAROLINA	52.0	11.6	377.0	109.7	46.3	596.6	704.9	-15.4%	-108.2 M	590.8	-16.2%
SOUTH DAKOTA	19.3	2.1	304.0	57.2	46.6	429.3	296.8	44.6%	132.4 M	309.3	4.2%
TENNESSEE	31.8	2.0	537.8	165.2	47.5	784.4	889.5	-11.8%	-105.1 M	741.7	-16.6%
TEXAS	36.2	3.4	1,486.4	701.8	172.3	2,400.1	3,831.9	-37.4%	-1431.9 M	3,169.9	-17.3%
UTAH	22.4	4.5	213.2	70.0	12.8	323.1	365.5	-11.6%	-42.4 M	308.0	-15.7%
VERMONT	14.5	2.3	119.8	57.2	12.5	206.3	213.6	-3.4%	-7.3 M	181.3	-15.1%
VIRGINIA	139.7	1.9	882.8	370.2	34.7	1,429.4	1,071.2	33.4%	358.2 M	1,139.0	6.3%
WASHINGTON	14.7	1.9	245.6	199.0	56.7	517.9	713.6	-27.4%	-195.7 M	606.0	-15.1%
WEST VIRGINIA	24.5	2.0	140.6	57.2	12.5	236.8	460.0	-48.5%	-223.2 M	386.0	-16.1%
WISCONSIN	64.0	1.7	350.5	140.0	27.7	583.8	792.0	-26.3%	-208.2 M	666.1	-15.9%
WYOMING	66.2	1.7	336.7	440.6	80.9	926.1	269.7	243.4%	656.4 M	303.4	12.5%
Total	**2,354.9**	**335.9**	**23,964.3**	**11,435.1**	**2,501.9**	**40,592.1**	**41,420.5**		**13,141.8**		

Scenario 8 Distribution Results ($, millions)

STATE	HIMP Scenario 8	TSIP Scenario 8	EIP Scenario 8	MPP Scenario 8	State Total	State Total (2018)	Percent Change	Total Change	10% Max Gain, 25% Max Loss Apportionment ($, millions)	10% Max Gain, 25% Max Loss Total Change (percent)	10% Max Gain, 25% Max Loss Total Change ($, millions)
ALABAMA	543.7	56.2	71.4	2.3	667.9	798.6	-16.4%	-130.7	654.0	-10.8%	-144.6
ALASKA	143.9	14.8	14.8	1.5	173.6	527.8	-67.1%	-354.2	363.4	-25.0%	-164.4
ARIZONA	533.7	52.1	47.6	1.5	629.4	770.2	-18.3%	-140.7	537.7	-23.9%	-232.5
ARKANSAS	457.2	43.1	91.0	1.5	587.9	545.0	7.9%	42.9	504.4	0.8%	-40.6
CALIFORNIA	2,759.8	196.2	23.1	6.6	2,960.4	3,863.4	-23.4%	-903.0	2,659.9	-25.0%	-1,203.5
COLORADO	484.5	32.9	95.9	5.5	613.7	562.9	9.0%	50.8	455.4	-11.9%	-107.5
CONNECTICUT	243.2	15.9	14.8	3.7	275.3	528.7	-47.9%	-253.4	364.0	-25.0%	-164.7
DELAWARE	143.9	39.1	26.8	28.0	236.0	178.1	32.6%	58.0	151.3	-7.4%	-26.8
DIST. OF COL.	143.9	14.8	14.8	8.9	181.0	168.0	7.7%	13.0	169.6	10.0%	1.6
FLORIDA	1,374.2	171.9	30.8	5.6	1,569.1	1,994.3	-21.3%	-425.3	1,373.1	-25.0%	-621.3
GEORGIA	899.5	84.1	14.8	1.9	992.0	1,359.1	-27.0%	-367.1	1,071.1	-14.2%	-288.1
HAWAII	143.9	14.8	14.8	7.0	179.1	178.0	0.6%	1.1	157.5	-3.7%	-20.6
IDAHO	198.6	14.8	59.3	1.5	272.0	301.1	-9.7%	-29.1	212.0	-23.3%	-89.1
ILLINOIS	1,141.1	58.6	17.8	1.8	1,209.0	1,496.5	-19.2%	-287.5	1,092.4	-20.5%	-404.1
INDIANA	677.3	44.5	26.2	2.0	743.7	1,003.0	-25.9%	-259.3	690.5	-25.0%	-312.4
IOWA	426.1	21.9	120.0	1.5	564.7	517.3	9.2%	47.4	435.6	-6.3%	-81.7
KANSAS	445.0	23.2	190.1	1.8	654.6	397.8	64.6%	256.8	401.7	10.0%	3.9
KENTUCKY	476.3	45.2	40.3	1.6	558.6	699.4	-20.1%	-140.8	529.5	-17.5%	-169.9
LOUISIANA	427.0	41.0	14.8	2.2	480.9	738.8	-34.9%	-257.8	525.7	-22.5%	-213.1
MAINE	143.9	14.8	38.8	1.5	197.3	194.3	1.5%	3.0	147.1	-17.5%	-47.2
MARYLAND	404.4	68.2	14.8	2.6	485.9	632.6	-23.2%	-146.7	434.3	-25.0%	-198.3
MASSACHUSETTS	446.2	21.1	16.6	4.0	483.8	639.3	-24.3%	-155.5	492.8	-16.0%	-146.5
MICHIGAN	772.7	57.6	29.6	2.6	855.2	1,108.3	-22.8%	-253.1	763.0	-25.0%	-345.2
MINNESOTA	568.1	73.0	120.5	1.9	757.1	686.4	10.3%	70.7	547.2	-13.2%	-139.2
MISSISSIPPI	362.6	37.4	62.6	3.9	462.6	509.1	-9.1%	-46.5	514.1	10.0%	5.0
MISSOURI	660.1	51.2	73.8	1.5	779.9	996.5	-21.7%	-216.6	686.1	-25.0%	-310.4
MONTANA	224.2	102.9	49.9	1.5	375.3	431.9	-13.1%	-56.5	297.3	-25.0%	-134.5

STATE	HIMP Scenario 8	TSIP Scenario 8	EIP Scenario 8	MPP Scenario 8	State Total	State Total (2018)	Percent Change	Total Change	10% Max Gain, 25% Max Loss Apportionment ($, millions)	10% Max Gain, 25% Max Loss Total Change (percent)	10% Max Gain, 25% Max Loss Total Change ($, millions)
NEBRASKA	330.2	88.1	41.4	3.6	459.4	304.2	51.0%	155.2	307.2	10.0%	3.0
NEVADA	246.8	17.8	40.6	48.8	351.3	382.2	-8.1%	-30.9	263.2	-25.0%	-119.1
NEW HAMPSHIRE	143.9	14.8	15.4	2.5	175.1	173.9	0.7%	1.2	175.6	10.0%	1.7
NEW JERSEY	556.5	32.5	104.7	45.9	733.8	1,051.0	-30.2%	-317.2	896.8	-7.1%	-154.2
NEW MEXICO	326.9	21.8	25.2	13.2	383.9	386.5	-0.7%	-2.7	355.8	0.3%	-30.8
NEW YORK	1,339.2	358.0	159.2	3.8	1,844.6	1,766.9	4.4%	77.7	1,226.6	-24.4%	-540.3
NORTH CAROLINA	799.7	78.5	211.9	3.3	1,084.2	1,097.8	-1.2%	-13.6	801.2	-20.3%	-296.6
NORTH DAKOTA	215.7	55.2	73.5	1.5	342.9	261.3	31.2%	81.6	208.3	-13.2%	-53.0
OHIO	1,051.5	61.3	22.8	5.3	1,131.3	1,410.9	-19.8%	-279.7	1,037.6	-19.9%	-373.4
OKLAHOMA	540.0	37.0	82.6	9.9	663.9	667.6	-0.6%	-3.7	562.1	-8.3%	-105.5
OREGON	409.5	26.8	77.9	1.6	511.4	526.1	-2.8%	-14.7	374.4	-22.5%	-151.7
PENNSYLVANIA	1,050.5	97.0	150.4	4.8	1,291.7	1,727.1	-25.2%	-435.3	1,189.1	-25.0%	-538.0
RHODE ISLAND	143.9	14.8	14.8	13.5	185.5	230.2	-19.4%	-44.7	176.0	-16.7%	-54.2
SOUTH CAROLINA	450.5	55.0	65.5	10.1	576.3	704.9	-18.2%	-128.5	455.0	-25.0%	-249.9
SOUTH DAKOTA	204.4	55.3	24.4	1.9	283.5	296.8	-4.5%	-13.3	257.9	-5.4%	-38.9
TENNESSEE	723.3	56.4	40.1	1.8	814.6	889.5	-8.4%	-74.9	731.3	-10.4%	-158.2
TEXAS	2,370.1	204.5	45.6	3.0	2,601.0	3,831.9	-32.1%	-1,230.9	2,287.0	-25.0%	-1,545.0
UTAH	285.4	15.2	28.3	4.0	330.1	365.5	-9.7%	-35.4	342.4	10.0%	-23.1
VERMONT	143.9	14.8	18.3	2.0	177.5	213.6	-16.9%	-36.1	147.6	-24.7%	-66.0
VIRGINIA	722.8	41.2	176.1	1.7	933.8	1,071.2	-12.8%	-137.3	737.5	-25.0%	-333.7
WASHINGTON	555.3	67.2	18.6	1.7	637.4	713.6	-10.7%	-76.2	520.6	-20.5%	-193.0
WEST VIRGINIA	194.8	14.8	30.9	1.8	240.2	460.0	-47.8%	-219.8	316.7	-25.0%	-143.3
WISCONSIN	567.8	32.9	80.6	1.5	677.0	792.0	-14.5%	-115.0	563.5	-22.5%	-228.5
WYOMING	157.0	96.0	83.5	1.5	335.1	269.7	24.3%	65.5	193.4	-21.9%	-76.3
Total	**28,774.5**	**2,968.4**	**2,968.4**	**294.0**	**34,711.6**	**41,420.5**		**8,558.6**	**30,357.3**		**11,093.6**

Endnotes

1 Ellis Katz, "American Federalism, Past, Present, and Future," Houghton Mifflin Company's History Companion, 1997.

2 Robert J. Dilger, "Federalism Issues in Surface Transportation Policy: Past and Present," Congressional Research Service, 2012. The Articles of Confederation did not provide this authority and in the Constitutional Convention of 1787, the amendment to give Congress the power to establish post roads only passed by a vote of six states to five. See: Joseph Story, Commentaries on the Constitution of the United States, Vol. 3, sec. 1122, 1833.

3 One exception was federal funds for the National Road, which is now U.S. 40 from Maryland to Illinois. Also, the federal government did offer land grants to private railroad companies to help finance transcontinental connections (many states also provided similar land grants to support regional railroad investments).

4 Alan R. Kooney, "Review and Analysis of Federal-Aid Apportionment Factors," FHWA Policy Planning Division,1969.

5 U.S. Senate, Committee on Post Offices and Post Roads, "Federal Aid in the Construction of Rural Post Roads," Senate Report No. 250, 64th Congress to accompany H.R. 7617, March 10, 1916.

6 Katz, 1997.

7 Dilger, 2012.

8 Funding for new Interstate Highway System construction was apportioned through 1995 and it was declared complete in 1991. Although it was a primary driver in apportionment formulas until that time, it would be fair to say that the majority of the system was constructed by the 1980s.

9 FHWA, "Financing Federal-Aid Highways. Appendix D: Apportionment Formulas," 2007.

10 Ibid.

11 U.S. Government Accountability Office, "Alternatives for Distributing Federal Highway Funds," GAO/RCED-96-6, 1995, p. 21.

12 Jack Faucett Associates, "Development and Evaluation of Alternative Factors and Formulas," FHWA, JACFAU-86-327, 1986.

13 The Census Bureau recently examined 140 federal assistance programs and found that 30.7 percent directly use statistics on population and/or income in their funding algorithms. See: Lisa M. Blumerman and Philip M. Vidal, "Uses of Population and Income Statistics in Federal Funds Distribution with a Focus on Census Bureau Data," U.S. Census Bureau, 2009.

14 The Public Policy Institute of California conducted a study on the various formula factors and components and found that "a State's success or failure at garnering federal dollars has much to do with the types of factors selected for each formula program." See: Tim Ransdell, "Factors Determining California's Share of Federal Formula Grants," Public Policy Institute of California, 2004.

15 Congressional Budget Office, "Federal Grants to State and Local Governments, March 2013.

16 National Transportation Policy Project, "Performance Driven: A New Vision for U.S. Transportation Policy," Bipartisan Policy Center, 2009.

17 Traditional measures of congestion do not address local and regional desires for different patterns of urban development. Average trip time and system reliability are appropriate measures of congestion and system performance and access to jobs and labor is a better indicator of regional accessibility. See: Eno Center for Transportation, "Evaluating Potential Performance Measures for Congestion and System Performance," 2013.

18 Alice Grossman, "Adoption of Performance Measures in Regional Transportation Planning: Current Practice and Lessons for Future Applications," Dissertation: Georgia Institute of Technology, 2018.

19 National Surface Transportation Infrastructure Financing Commission, "Paying Our Way: A New Framework for Transportation Finance," 2009.

20 The initial analysis of those programs was conducted in 2015 and although it has not been updated to reflect any modifications or changes since then, the lessons and findings of that work are instructive to for rethinking federal distribution.

21 The Every Student Succeeds Act replaced NCLB in 2015.

22 Due to its unpopularity, Congress did not provide funding for RTTT in the 2015 "CRomnibus."

23 Under their current self-imposed restrictions on earmarks, Congress may not initiate its own projects, but does get to select which of the new projects proposed by FTA may move forward each year.

24 Eno Center for Transportation, "Lessons learned from the TIGER Discretionary Grant Program," 2013; Jeffrey Davis and Paul Lewis, "Life in the FASTLANE," Eno Center for Transportation, 2017.

25 This research uses the FAST Act's set spending of $41.4 billion. However, the Budget Control Act subsequently sequestered $42.2 million of the NHPP funding for FY 2018.

26 Chicago Metropolitan Agency for Planning, "MAP-21: Major Programmatic Policy Changes," 2012.

27 Robert Kirk and others, "Surface Transportation Funding and Programs Under Map-21: Moving Ahead for Progress in the 21st Century Act," Congressional Research Service, 2012.

28 This amount includes funding for the Railway-Highways Crossing Program. The HSIP net of the Rwy-Hwy was $2.2 billion (pre-rescission).

29 FHWA, "CMAQ Policy and Guidance, Section F," 2013.

30 FHWA, "Metropolitan Planning," 2013.

31 FHWA, "MAP 21 Fact Sheet, Section B," Undated.

32 ibid.

33 FHWA, "MAP 21 Fact Sheet, Federal Share," Undated.

34 FHWA, "National Highway Freight Program" Undated.

35 FHWA, "Transferability of Apportioned Funds Between Programs Questions & Answers," 2013.

36 FHWA, "Transferability of Highway Program Funds, 1998.

37 Nancy Bennett, "Financing Federal-Aid Highways," FHWA, 1979.

38 Eno Center for Transportation, "How We Fund Transportation: The Life and Death of the Highway Trust Fund," 2014. a

39 See e.g., Stephen Lee Davis, "New Traffic Congestion Report Raises More Questions than it Answers," Transportation for America, 2015; Todd Littman, "Congestion Costing Critique," Vitoria Transport Policy Institute, 2014; and Anthony Downs, Still Stuck in Traffic, Brookings Press, 2004.

www.enotrans.org

@EnoTrans

@EnoCenterForTransportation

bit.ly/EnoLinkedIn

1629 K St. NW
Suite 200
Washington D.C. 20006

CONTACT US:
publicaffairs@enotrans.org
202-879-4700