Key Topics

- Current and Future Forecasts
- Tools and System Expectations
- Technological Advancements
### Population Increase
2015: **320 million people**  
2045: **390 million people**

In 30 years, our population is expected to grow by about **70 million**—that’s more than the current populations of New York, Texas, and Florida combined.

### Older Americans — Redefining Longevity
By 2045, the number of Americans over age 65 will increase by **77%**. About **one-third of people over 65** have a disability that limits mobility. Their access to critical services will be more important than ever.

### Millennials — Shaped by Technology
There are **73 million Millennials** aged 18 to 34. They are the first to have access to the internet during their formative years and will be an important engine of our future economy.

#### Millennials are driving less. By the end of the 2000s, they drove over **20% fewer** miles than at the start of the decade.

### Income Inequality
10% of the population takes home **one-third** of our national income. Transportation is the **second-largest** expense for U.S. households.

### Megaregions and Shifts in Population Centers
11 megaregions are linked by transportation, economics, and other factors. They represent over **75%** of our population and employment. In 2014, **365,000** people moved to the South—up **25%** from 2013—and moves to the West doubled.

### Bumper-to-Bumper
On average, we spend over **40 hours** stuck in traffic each year. The annual financial cost of congestion is **$121 billion**.
Congestion Today and 2040

Recurring Peak-Period
- Uncongested
- Congested
- Highly Congested

Increase in Vehicle Miles Traveled (VMT) and Miles of Roadway (1990 – 2012)

Peak-Period Congestion on the National Highway System: 2007

Peak-Period Congestion on the National Highway System: 2040

Note: Highly congested segments are stop-and-go conditions with volume/service flow ratios greater than 0.90. Congested segments have reduced traffic speeds with volume/service flow ratios between 0.75 and 0.90. Highly uncongested segments have volume/service flow ratios less than or equal to 0.75. The volume/service flow ratio is estimated using the procedures outlined in the HCM Field Manual, Appendix H.

### Current Interstate Condition

#### Percent of travel (VMT) on Interstate Pavements with Good or Acceptable Ride Quality

<table>
<thead>
<tr>
<th>Calendar Year</th>
<th>2000</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rural Interstate</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percent Good Ride Quality</td>
<td>70%</td>
<td>79%</td>
</tr>
<tr>
<td>Percent Acceptable</td>
<td>97%</td>
<td>98%</td>
</tr>
<tr>
<td><strong>Urban Interstate</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percent Good Ride Quality</td>
<td>44%</td>
<td>63%</td>
</tr>
<tr>
<td>Percent Acceptable</td>
<td>91%</td>
<td>93%</td>
</tr>
</tbody>
</table>

Ride quality is measured in inches of pavement roughness per mile via the International Roughness Index (IRI). IRI < 95 is considered “Good”; IRI <= 170 is considered “Acceptable” (which includes “Good”).
Climate change impacts, whether rising sea levels or extreme heat, threaten the considerable Federal investment in transportation infrastructure.
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Focused on estimating costs and benefits of various levels of investment

Reviewed 4 methods; recommended a hybrid method based on existing analytic tools

Recommended using performance management and tiered performance targets

For known technologies, the current gap between best practice and prevailing practice is significant . . . by advancing to state of the art, large gains may be realized
Transportation Performance Management

- Continuing implementation of MAP-21 and FAST Act statutory provisions

- Focused on efforts to conduct the rulemaking which will establish a set of national measures

  - Includes safety, infrastructure condition, system performance, freight movement, traffic congestion, and on-road mobile source emission

  - Targets need to be established; progress needs to be achieved

  - States and MPOs will manage the highway system to balance trade-offs across all of these performance areas

  - Includes minimum condition requirements for Interstate pavements and NHS bridges that are to be maintained by States
**Investment/Performance Models**

- **Highway Economic Requirements System (HERS)**
  - Investment in highway widening and preservation on Federal-Aid highways
  - Including bridge widening as part of highway widening projects

- **National Bridge Investment Analysis System (NBIAS)**
  - Investment in bridge rehabilitation on all highway classes

- **HERS and NBIAS evaluate investment needs using a combination of:**
  - Technical adequacy (engineering) criteria
  - Benefit-cost (economic) criteria
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A Look Back ...

1985
Near-Term Innovative Enhancements

- **Every Day Counts Technologies & Innovations**
  - 3-D Engineered Models and adding 4D (schedule) & 5D (cost)
  - Interchange Geometrics: e.g. Diverging Diamond
  - Pavement Preservation

- **Strategic Highway Research Program (SHRP2)**
  - Traffic Incident Management Responder Training to create safer and more quickly resolved emergency stoppages
  - Tools to Organize for Reliability
  - Guidelines for Preservation of High-Traffic-volume Roadways
  - Innovative Bridge Designs for Rapid Renewal
Evolving Technologies

- Non-traditional mobility providers (Uber, Lyft, etc.)
- Automated/connected vehicles
- Internet of Things/Big Data
- Drones
- Artificial intelligence (AI)
- Alternative Powered vehicles
- Solar Roadways
- Hyperloop and novel transportation system
Vehicle & Infrastructure Connectivity

- Technologies available today:
  - Adaptive Cruise Control
  - Lane-Keeping Assistance
  - Braking Assistance

- In the near-term:
  - Connected Automated Cruise Control (CACC)
  - Vehicle Platooning
  - Speed Harmonization
  - Cooperative Merging
Connected Vehicle Pilot Deployment Sites

ICF/Wyoming
Reduce the number and severity of adverse weather-related incidents in the I-80 corridor to improve safety and reduce incident-related delays
Focused on the needs of commercial vehicle operators in the State of Wyoming

New York City
Improve safety and mobility of travelers in New York City through connected vehicle technologies
Vehicle-to-vehicle (V2V) technology installed in up to 10,000 vehicles in Midtown Manhattan, and vehicle-to-infrastructure (V2I) technology installed along high-accident rate arterials in Manhattan and Central Brooklyn

Tampa (THEA)
Alleviate congestion and improve safety during morning commuting hours
Deploy a variety of connected vehicle technologies on and in the vicinity of reversible express lanes and three major arterials in downtown Tampa to solve the transportation challenges
$500 million in partnerships identified in by the seven Smart City Challenge Finalists

150+ partnerships identified by the Smart City Challenge Finalist

78 applications received for the Smart City Challenge

7 Smart City Challenge Finalists announced in March 2016

1 Smart City Challenge Winner

#DOTSmartCity www.transportation.gov/smartcity

#SMARTCOLUMBUS
Alternative Fuel Initiatives

**FHWA Alternative Fuel Initiatives**

- Alternative Fuels Pooled Fund Study
- National Electric Vehicle Charging, Hydrogen, Propane and Natural Gas Fueling Corridors

**Hydrogen Fuel**

Fuel Cell can have ALL these attributes simultaneously:

- Fast Filled
- Long Range
- Zero Emissions
- Zero Criteria Pollutants
- Fueled by Renewables
- Uses Domestic Sources
- Fewer Vehicle Trade-offs
- Diverse Uses (V2B, SUVs, APUs, range extenders, etc.)

Source: U.S. Department of Energy, Brief entitled “DOE R&D Overview for DOT”, August 19th, 2016, Reuben Sarkar, Deputy Assistant Secretary
Questions?

How can we Help?

http://www.fhwa.dot.gov/research/