<table>
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<th>State</th>
<th>Answer for Question 1</th>
<th>How does your state decide who has responsibility for maintenance when a signal is installed? Rural/Urban? Federal Functional class? Do you have written procedures on this and if so can you share that information?</th>
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<tr>
<td>Alabama</td>
<td>We require local entities to sign a maintenance agreement for all signals and pay a portion of the installation cost relative to the number of legs the local entity has approaching the intersection. The one exception to this has been in unincorporated areas if all approach legs are state highways, then we typically fund those 100% with State funds AND accept the maintenance as well. Municipalities still are expected to sign the maintenance agreement even if all approach legs are state highways within their city/town. The Guideline for Operation 5-9 is attached.</td>
<td></td>
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<tr>
<td>Arizona</td>
<td>If the intersection is State-State route: the State pays for construction cost and operate, maintain and pay power bill. If the intersection is State-Local route, adopted practice has been: Construction cost shared 50/50 or 67/33 depending on the number of legs; locals pay of monthly electrical bill and the State operate and maintain (in some cases the Local would operate and maintain if requested. In all cases, the agreement is addressed via an IGA (Intergovernmental Agreement).</td>
<td></td>
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<tr>
<td>Arkansas</td>
<td>The local agency, city/county, has the responsibility of ownership, maintenance, operations and energy for traffic signals in Iowa. We are looking at active ways to become more involved in the operations of the signals, but without taking ownership.</td>
<td></td>
</tr>
<tr>
<td>Delaware</td>
<td>State owns/maintains/operates almost all signals in the state except for our largest City, Wilmington. State has about 1100 signals (all types, including flashers) and Wilmington has about 280. State owns ~90% of the roads in Delaware so all but a very few of the 1100 state signals are at intersections where at least one of the roads are state owned/maintained.</td>
<td></td>
</tr>
<tr>
<td>Florida</td>
<td>Any signal installation on Florida’s State Highway System (SHS) is subject to the Florida Department of Transportation’s (FDOT) District Traffic Operations Office review, approval and coordination processes. Traffic signals and any other devices identified in the attached Traffic Signal Maintenance and Compensation Agreement (TSMCA) are included in Exhibit A for compensation of TSMCA. Devices that are included in the Exhibit are subject to compensation by FDOT in exchange for services provided as per the terms of the TSMCA.</td>
<td></td>
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<tr>
<td>Idaho</td>
<td>Responsibility for maintenance is determined locally by the district offices and local jurisdictions. ITD has agreements with some local agencies to maintain the signals within the boundaries of that agency.</td>
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<tr>
<td>Illinois</td>
<td>Maintenance of signals varies within the state, and depends on where the signal is located; for example, in certain districts locals maintain most of the signals where as in other districts the signals are maintained by a combination of locals and the state. Typically if the signal is within a municipality, that municipality is responsible for maintenance. If the signal is in a rural location or outside of city boundaries, IDOT is responsible for maintenance.</td>
<td></td>
</tr>
<tr>
<td>Iowa</td>
<td>The local agency, city/county, has the responsibility of ownership, maintenance, operations and energy for traffic signals in Iowa. We are looking at active ways to become more involved in the operations of the signals, but without taking ownership.</td>
<td></td>
</tr>
<tr>
<td>Michigan</td>
<td>Only agencies that have the skills and proper equipment are able to maintain our traffic signals. A formal maintenance agreement is developed at our individual Regions based on the attached Maintenance Manual requirements.</td>
<td></td>
</tr>
<tr>
<td>New Hampshire</td>
<td>We maintain, or are responsible for, all traffic signals on state highways. By mutual agreement, we have several signals, typically at the end of ramps where they are part of a local coordinated system, that are maintained locally through Maintenance Agreement. In these cases, we are confident in the local resources to maintain them and they typically agree because they can respond quicker.</td>
<td></td>
</tr>
<tr>
<td>New Mexico</td>
<td>Most of the traffic signal on the state facilities are taken care of by state. Exceptions are larger cities or counties. But local entities must sign an agreement that they will pay for power and minor maintenance costs. I am attaching a boiler plate for the signal and lighting agreement.</td>
<td></td>
</tr>
<tr>
<td>State</td>
<td>Answer for Question 1 ) How does your state decide who has responsibility for maintenance when a signal is installed? Rural/Urban? Federal Functional class? Do you have written procedures on this and if so can you share that information?</td>
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<tr>
<td>New York</td>
<td>If there is at least one leg of the intersection involving a state highway, then NYSDOT is responsible for the traffic signal. There are exceptions to the rule, but this applies for about 95% of our signals.</td>
<td></td>
</tr>
<tr>
<td>North Carolina</td>
<td>If a signal is installed on the State Highway System, then NCDOT is ultimately responsible for the maintenance. We do have Municipal Maintenance Agreements with our larger local governments that have a staff of traffic engineers and traffic signal technicians.</td>
<td></td>
</tr>
</tbody>
</table>
| Oregon       | a. Negotiated between the State and City/County. A limited number of Cities/Counties have the ability to maintain & operate a signal. Generally the City/County requests to maintain/operate the signal and if the State agrees we move forward with an agreement. Rural/urban, does not matter. Federal Functional class, does not matter.  

| Pennsylvania | By regulation (PA Code Title 67, Chapter 212), Traffic Signals in Pennsylvania are owned, maintained, and operated in the municipality where they are located. Recently we had legislation that allows PennDOT to perform a pilot of taking back corridors to determine if there is operation benefits instead of being owned by municipalities. Currently in Pennsylvania we have approximately 14,000 traffic signals with 1,192 signal owners (80% of signal owners own less than 10 traffic signals). We have done quite a bit of research on the issues and concerns associated with this approach which has led us to consider taking back ownership on selected corridors. Although the Department does not own, maintain and operate traffic signals it approves through a traffic signal permit process all plans to ensure conformance to national standards (MUTCD) and other state laws/policies/guidelines to ensure statewide consistency. Some of the key information can be found in the following:  

*Pa Code Title 67, Section 212.5 - regulation language on municipal ownership. ([http://www.pacode.com/secure/data/067/chapter212/chap212toc.html#212.5](http://www.pacode.com/secure/data/067/chapter212/chap212toc.html#212.5))  
*Publication 46, Chapter 4 - Traffic Signal guidelines and permit information. ([http://www.dot.state.pa.us/public/PubsForms/Publications/PUB%2046.pdf](http://www.dot.state.pa.us/public/PubsForms/Publications/PUB%2046.pdf)) Page 184 of 486  
*Publication 191 - PennDOT's maintenance guidelines to municipalities. ([http://www.dot.state.pa.us/public/PubsForms/Publications/PUB%20191.pdf](http://www.dot.state.pa.us/public/PubsForms/Publications/PUB%20191.pdf))  
*Traffic Engineering Form (TE-160) Application for Traffic Signal Permit - contains agreement language (previously we did a formal agreement and transitioned to this document because the agreements were not be completed in a timely manner) ([http://www.dot.state.pa.us/public/PubsForms/Forms/TE-160.pdf](http://www.dot.state.pa.us/public/PubsForms/Forms/TE-160.pdf))  
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<tr>
<td>Rhode Island</td>
<td>Typically depends on highway/roadway jurisdiction in R.I. In R.I. the State Traffic Commission (STC) must approve of all proposed traffic control signals on State Highways. The majority of such STC-approved traffic control signals are approved under the understanding that the RIDOT will be responsible for the operation &amp; maintenance of the signal, once its installation &amp; operation has been accepted by the RIDOT Maintenance Division, Electrical Inspection Unit. Such signals are designed and eventually installed via either a RIDOT Permit or RIDOT Construction Project (for Permits, there is a mere $5,000/signal up-front fee to be submitted with the Permit application). Counties in R.I. do not maintain any signals; the State (RIDOT) maintains ~650 traffic control signals (+ ~120 other ICBs, flashing beacons, etc.); and several of the larger local Cities/Towns in R.I. maintain anywhere from a few to ~80 (Providence) traffic control signals that mostly lie on locally-owned/maintained highways (although exceptions exist). The STC (and RIDOT) historically adopt the latest MUTCD requirements for traffic control signal approval/maintenance; City/Town-installed &amp; maintained signals must conform to STC-requirements (i.e., MUTCD - see: <a href="http://webserver.rilin.state.ri.us/Statutes/TITLE31/31-13/INDEX.HTM">http://webserver.rilin.state.ri.us/Statutes/TITLE31/31-13/INDEX.HTM</a>). But aside from that, there are NOT any formal rules/regs/procedures RE: how maintenance responsibility might differ based on Rural vs. Urban, Functional Class, etc. Further, we do NOT have any state supplement to the MUTCD.</td>
<td></td>
</tr>
<tr>
<td>South Dakota</td>
<td>The local agency, city/county, has the responsibility of ownership, maintenance, operations and energy for traffic signals in Iowa. We are looking at active ways to become more involved in the operations of the signals, but without taking ownership.</td>
<td></td>
</tr>
<tr>
<td>Tennessee</td>
<td>Every signal proposed, designed, and installed by TDOT must first be accepted by the city or county for maintenance and operation or it will not happen. Cities can install as many signals on state routes as they want to maintain. Un-incorporated cities or counties have to ask permission to install a signal on a state route. State law dictates our current signal policies. State law directs local governments that they have to follow TDOT requirements regarding TDOT constructed signals. So, a combination of state law and DOT policy.</td>
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<tr>
<td>Vermont</td>
<td>Similar to New York, if there is at least one leg of the intersection involving a state highway, then VTrans is responsible for the traffic signal. The only exception for us is in Cities and certain villages where a state numbered route is under local jurisdiction.</td>
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</tr>
<tr>
<td>Virginia</td>
<td>VDOT manages and maintains traffic control devices within counties on approximately 57,000 miles of state highways, which includes over 3,000 signalized intersections. Different from other states, Virginia’s cities are legally independent meaning they are separate from counties and operate as such. Therefore, VDOT does not maintain any signals within any independent cities in Virginia. Along with independent cities, two counties (Henrico and Arlington) and all incorporated towns maintain their own traffic signals with exception to those signals that are located on state primary routes. VDOT will construct intersections on locally managed roads that are within project limits for a local jurisdiction, however, after acceptance, the signals are turned over to the locality for maintenance.</td>
<td></td>
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<tr>
<td>Washington</td>
<td>State Law, RCW 47.24.020 Section 13 (<a href="http://app.leg.wa.gov/RCW/default.aspx?cite=47.24.020">http://app.leg.wa.gov/RCW/default.aspx?cite=47.24.020</a>), determines the jurisdiction responsible for maintenance and operation of traffic signals</td>
<td></td>
</tr>
<tr>
<td>Wisconsin</td>
<td>Signal maintenance typically belongs to the roadway maintaining authority (State, County, Local). There are some exceptions – primarily in urban areas (typically with ramp signals).</td>
<td></td>
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<tr>
<td>Wyoming</td>
<td>If it involves a state highway, WYDOT will operate and maintain it, otherwise it is the city/town's responsibility.</td>
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</tr>
<tr>
<td>State</td>
<td>Question 2 - For those states that maintain traffic signals, what is the ratio of engineers/techs (responsible for signals) to the number of total state maintained signals? What percentage of work is performed by contractors?</td>
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<tr>
<td>Alabama</td>
<td>This is difficult for us to quantify as we have a procedure whereby a municipality or county can sign the maintenance agreement and then execute a Special Work Authorization with ALDOT whereby an account is established that the local entity contributes funds and as maintenance is needed, ALDOT will deduct our actual costs from that account. Once the account reaches a particular dollar threshold then the local entity must add funds to keep it going. This in effect makes us a signal contractor for many local agencies on an actual cost basis. We probably have about 20-25 signal technicians statewide within ALDOT that perform this type work on several hundred signals. Larger cities typically have their own staff for maintenance. Some smaller cities use their local electric department or private contractors. What percentage of work is performed by contractors? I would estimate approximately 20-25% is performed by private contractors.</td>
<td></td>
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<tr>
<td>Arizona</td>
<td>There 576 traffic signal systems that are operated and maintained by four regional teams. The attached files shows details (I couldn’t get all the information). In addition, there is a team of 10 engineers and technicians who assist with timing, system coordination, networking and remote monitoring. (the Regional teams also maintain and operate roadway lighting)</td>
<td></td>
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<tr>
<td>Delaware</td>
<td>1) We have 18 signal/ITS techs including 1 manager and 3 supervisors. Difficult (impossible?) to pull out their workload on signals vs. ITS devices. What percentage of work is performed by contractors? Our contractors are under the direct control of our signal/ITS techs. In no case do we have a maintenance agreement where the contractor “works on their own” like I think other agencies have. I can find our contractor budget. For the last two fiscal years our contractor budget has been roughly $1M per year. This is a mix of capital and ops budgets. The expenditures are roughly half on reactive maintenance (loops out, signal head damage, etc.), and half on proactive maintenance (signal head, head wire, cable replacement projects).</td>
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<tr>
<td>Florida</td>
<td>While FDOT does not maintain the traffic signals, experience shows that the staff strength varies by agency and the level of operations. Increasingly, the need for operations and maintenance – with traditional operations and increasing ITS devices, and management and operations – with active arterial management and a desire to staff TMCs during peak hours for arterial operations, will require increasing staff strength with special technical skills.</td>
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<tr>
<td>Idaho</td>
<td>The ratio is between 1:1 and 1:2 (Engineers: techs). There are six District Traffic Engineers and approximately 10 Electricians statewide. No work is performed by contractors except during construction.</td>
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<tr>
<td>Illinois</td>
<td>Where the state maintains the signals, contractors perform the majority of the work. Our signal engineers/techs are typically only involved in signal programming or minor repairs such as replacement of failed cabinet equipment in order to take a signal out of red flash. For state highway signalized intersections, I would estimate around 150 intersections per signal engineer/tech.</td>
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<tr>
<td>Indiana</td>
<td>1 engineer per 300 traffic signals, 1 tech per 60 traffic signals. What percentage of work is performed by contractors? ~6% (2 of the larger cities in Indiana maintain the state highway signals within their jurisdiction under contract).</td>
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<tr>
<td>Iowa</td>
<td>N/a</td>
<td></td>
</tr>
<tr>
<td>Michigan</td>
<td>For maintenance purposes, our Regions have typically 2-3 licensed Master electricians that handle maintenance of those devices under the Departments jurisdiction (there are seven regions). In some of the larger populations we have maintenance agreements with local road agencies (Macomb County, Oakland County, Wayne County, City of Grand Rapids, City of Lansing). They would cover any MDOT traffic signals within their geographic limits. There are 3200 traffic signals around the state. We do not use contractors for maintenance of traffic signals.</td>
<td></td>
</tr>
<tr>
<td>New Hampshire</td>
<td>We have 430 signals, 8 techs in 4 crews, one senior tech, and one senior engineer. There are probably a dozen or so maintained by towns/cities. The only contractor work is through our capital program or for traffic mitigation by developers.</td>
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<td>State</td>
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<tr>
<td>New Mexico</td>
<td>Our traffic signal lab has 2 crews of 3 technicians for entire state. They are extremely short handed. They have a state price agreement to utilize contractor. They are only used for major work or emergencies.</td>
<td></td>
</tr>
<tr>
<td>New York</td>
<td>About 1:55 It varies from as low as 1:27 to about 1:80 What percentage of work is performed by contractors? 5%</td>
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</tr>
<tr>
<td>North Carolina</td>
<td>NCDOT currently has approximately 9400 signal on the State Highway System and 82 traffic signal technicians in our 14 Highway Divisions. Approximately 5500 of these signals are maintained by NCDOT. Some signals are maintained by contractors but this is a very small percentage at this time.</td>
<td></td>
</tr>
<tr>
<td>Oregon</td>
<td>a. We have ~20 engineers and ~40 techs/electricians, so ~60 total for around 1100 signal we maintain/operate so ~1:18 ratio. Contractors do not maintain/operate signals on the State Highways.</td>
<td></td>
</tr>
<tr>
<td>Rhode Island</td>
<td>Current # of RIDOT signal techs is only 6, plus 1 supervisor. With ~650 fully actuated traffic control signals to maintain, the ratio comes out to (being generous and including the supervisor) only ~7:650 (!). If you want the ratio for ALL signals (including flashers etc.), the ratio is ~7:770 (!!). Note RIDOT does employ ~7 civil engineers who occasionally are called upon to investigate and/or implement traffic signal timing changes, but due to other priorities &amp; roles (e.g., planning, design, specs, permits, etc.) such signal work tends to make up a very small part of their workweeks --- for purposes of this response I treat such work as signal “operations” and not “maintenance”. If you include these 7 engineering staff in requested ratio, you still only get ~14:650. What percentage of work is performed by contractors? RIDOT does not yet have any Contract with a private vendor to maintain its traffic signal equipment / make repairs. Some of our RIDOT Construction Projects do include (call for Contractor to make) traffic signal ‘upgrades’ and/or ‘repairs’ that could be considered to be maintenance. However I can only estimate the % of such work compared to the signal maintenance work done by RIDOT’s own staff – my guess is maybe ~15% (based on labor hours), but the % may be higher if you are looking for the % based on cost.</td>
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<tr>
<td>Tennessee</td>
<td>n/a</td>
<td></td>
</tr>
<tr>
<td>Vermont</td>
<td>About 1:40 (4 techs, two bucket trucks), but that also includes Maintenance of 1100 Street Lights and light electrical work at Maintenance Facilities. Less than 1% utilizing contractors ($300 - $2000 annually)</td>
<td></td>
</tr>
<tr>
<td>Washington</td>
<td>WSDOT maintains 1140 signals, using up to 86 techs (not all are dedicated to just signal systems – some also do illumination or ITS equipment), and 15 Engineers whose duties include signal operations. Staff and equipment is divided into 6 main regions, and each region has a different ration of staff/signals, so they are not actually spread evenly. Statewide averages are 1 technician per 14 signals and 1 engineer per 76 signals. No work is performed by contractors, however, some WSDOT owned signals are operated/maintained by local agencies (typically cities) as part of larger network systems.</td>
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</tr>
<tr>
<td>Wisconsin</td>
<td>49 engineers/technicians to 983 WisDOT owned traffic signals. However, these engineers/technicians have other responsibilities outside of traffic signals. For new signal construction and signal reconstruction/rehabilitation, contractors perform almost 100% of the work. For day-to-day routine maintenance work (cabinet checks, repairing knockdowns, etc.), state electrical staff performs almost 100% of the work.</td>
<td></td>
</tr>
<tr>
<td>Wyoming</td>
<td>We have 19 people who work on all things electrical statewide, part of which includes the 300 state-owned traffic signals. We have one person responsible for coordination of the state-owned signals, with input from the 5 district traffic engineers, an assistant state traffic engineer and the state traffic engineer.</td>
<td></td>
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</table>

Question 3 Also what is the ratio of your total signal maintenance/operation budget to the number of signals you maintain?
<table>
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<th>Answer for Question 4 Do you use in-house or consultant staff to ensure that signal systems remain in coordination?</th>
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<td>Alabama</td>
<td>We use in-house forces to ensure coordination of systems day to day, which isn’t very often unfortunately. We have been approached by a couple of consultants in Atlanta who are seeking to provide onsite operations support similar to what Georgia DOT does with their Regional Traffic Operations Program (RTOP). At some point in the next 12-36 months, I expect we will eventually employ one of them to do just that on one or more of our bigger urban corridors.</td>
</tr>
<tr>
<td>Arizona</td>
<td>If you use consultants, do you have sample agreements you could share? Some done in house and some with consultants. Also some work elements such as concrete foundation, conduit installation are done by contractors.</td>
</tr>
<tr>
<td>Arkansas</td>
<td>Currently, the Department does not get involved in the operations unless the Department receives a number of complaints about the operations.</td>
</tr>
<tr>
<td>Delaware</td>
<td>Mix. Consultants under supervision of in-house staff, not “on their own.” If you use consultants, do you have sample agreements you could share? Nothing fancy. The work is assigned under a very general open-end, miscellaneous engineering agreement.</td>
</tr>
<tr>
<td>Florida</td>
<td>FDOT’s seven District Traffic Operations offices utilize consultant support to perform signal retiming efforts. Consultant staff may, under the traffic consulting services function, provide support as necessary including assisting FDOT while working with local agencies to support retiming or ad hoc signal coordination and related issues. The primary function of running the signal system maintenance and operations is the responsibility of the local signal maintaining agency.</td>
</tr>
<tr>
<td>Idaho</td>
<td>Most of the coordinated systems are maintained by local agencies through state and local agreements. ITD has not used consultants to maintain coordinated systems.</td>
</tr>
<tr>
<td>Illinois</td>
<td>Our district offices may handle coordination of smaller systems in-house, but typically we use consultants for signal coordination programming.</td>
</tr>
<tr>
<td>Iowa</td>
<td>Currently, the Department does not get involved in the operations unless the Department receives a number of complaints about the operations.</td>
</tr>
<tr>
<td>Michigan</td>
<td>We use in-house staff to monitor our signal systems. Unfortunately, we are not able to continually monitor but can only spot check systems when time allows.</td>
</tr>
<tr>
<td>New Hampshire</td>
<td>In house, unless required for traffic impact mitigation.</td>
</tr>
<tr>
<td>New Mexico</td>
<td>Signal and lighting agreement can address this issue with local entities. The ones on state network are addressed case by case.</td>
</tr>
<tr>
<td>New York</td>
<td>We use in-house staff which means coordination efforts are spotty at best as maintenance takes a higher priority. We are attempting to put together a contract to have signal coordination done on a statewide basis.</td>
</tr>
<tr>
<td>North Carolina</td>
<td>Yes, we use a combination of in-house and consultants to develop system timing plans. Please send your mailing address and we will send sample agreements.</td>
</tr>
<tr>
<td>Oregon</td>
<td>in-house</td>
</tr>
<tr>
<td>State</td>
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<tr>
<td>Pennsylvania</td>
<td>We have started getting into this and would recommend discussions with FHWA (Eddie Curtis) on the type of services you are considering. FHWA has helped PA, Florida and Vermont out recently by doing a peer-to-peer exchange with some of the leading states which has lead us to adopt or move towards adopting a lot of there best practices. Many consultants we are finding lack field experience and understanding of the controllers out on the street to make good decisions.</td>
</tr>
<tr>
<td>Rhode Island</td>
<td>We use both in-house and consultant staff as noted, but due to resource limitations we are typically reactive rather than proactive (i.e., we receive a complaint then react to investigate/resolve). If you use consultants, do you have sample agreements you could share? Call me (401) 222-2694 x4046 if you need a sample agreement and I can try to fish one out.</td>
</tr>
<tr>
<td>South Dakota</td>
<td>Currently, the Department does not get involved in the operations unless the Department receives a number of complaints about the operations.</td>
</tr>
<tr>
<td>Tennessee -</td>
<td>In-house staff manages traffic signal systems. Consultants and contractors are used to study, troubleshoot, and address issues in the field. Please contact us directly for sample agreements.</td>
</tr>
<tr>
<td>Nashville/Memphis</td>
<td></td>
</tr>
<tr>
<td>Tennessee - Statewide</td>
<td>Municipalities do it</td>
</tr>
<tr>
<td>Vermont</td>
<td>Again, same as New York, we use in-house staff which means coordination efforts are spotty at best as maintenance takes a higher priority. No sample agreements to date, not planned for in the near future.</td>
</tr>
<tr>
<td>Virginia</td>
<td>We use in-house and consultant staff support for signal timing and coordination, however we do not have any agreements to share. Consultant staff is used more as staff augmentation than a performance contract.</td>
</tr>
<tr>
<td>Washington</td>
<td>All signal operations are performed by in-house staff.</td>
</tr>
<tr>
<td>Wisconsin</td>
<td>Some regions have utilized in-house consultants for periods of time, but state signal engineers do the majority of this work.</td>
</tr>
<tr>
<td>Wyoming</td>
<td>In-house</td>
</tr>
<tr>
<td>State</td>
<td>Question 5 - ) Has any state privatized signal maintenance and operations? Whole state? County? Municipality? If so, do you have documentation of that process and pros and cons of moving in that direction?</td>
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</tr>
<tr>
<td>Alabama</td>
<td>No</td>
</tr>
<tr>
<td>Arizona</td>
<td>no</td>
</tr>
<tr>
<td>Delaware</td>
<td>no</td>
</tr>
<tr>
<td>Florida</td>
<td>No; however, the TSMCA has a clause for local agencies to provide a 2-year plus notice to FDOT if they choose to turn over the maintenance function to the Department. FDOT stands prepared to outsource the function when the need arises.</td>
</tr>
<tr>
<td>Idaho</td>
<td>No, but as previously noted, the maintenance and operations of about half of ITD’s signals are the responsibility of local agencies.</td>
</tr>
<tr>
<td>Illinois</td>
<td>We have not privatized signal maintenance.</td>
</tr>
<tr>
<td>Indiana</td>
<td>has not done this</td>
</tr>
<tr>
<td>Iowa</td>
<td>N/a</td>
</tr>
<tr>
<td>Michigan</td>
<td>We do contract with some larger cities and county road agencies. These agreements are done through our individual Regions - I do not have that documentation</td>
</tr>
<tr>
<td>New Hampshire</td>
<td>no</td>
</tr>
<tr>
<td>New Mexico</td>
<td>no</td>
</tr>
<tr>
<td>New York</td>
<td>N/a</td>
</tr>
<tr>
<td>North Carolina</td>
<td>no</td>
</tr>
<tr>
<td>Oregon</td>
<td>no</td>
</tr>
<tr>
<td>Rhode Island</td>
<td>As noted via #2 above, RIDOT has not yet explicitly or wholly privatized traffic signal maintenance – our in-house Maintenance Division signal techs complete the bulk of such work wherever their resources allow. However for traffic signal operations (i.e., timing changes), for several years we have been using some private forces (Consultants, via ‘On-Call’ Contract) help us address traffic signal operational needs (typically, traffic signal timing and/or coordination investigations and change implementation). In doing so, RIDOT has made no differentiation or breakdown by county or town/city (being so small in size we have it easier than most).</td>
</tr>
<tr>
<td>Tennessee</td>
<td>n/a</td>
</tr>
<tr>
<td>Vermont</td>
<td>Some of our smaller municipalities have contracts with an electrical contractor for maintenance only. Rutland City, VT has had the longest history with this. The state has not done so.</td>
</tr>
<tr>
<td>Virginia</td>
<td>We use in-house and consultant staff support for signal timing and coordination, however we do not have any agreements to share. Consultant staff is used more as staff augmentation than a performance contract.</td>
</tr>
<tr>
<td>Washington</td>
<td>WSDOT has not privatized signal maintenance and operations. We are not aware of any jurisdiction in Washington which has, but some agencies contract with other agencies (small cities with WSDOT, cities with counties, cities with other cities, etc.).</td>
</tr>
<tr>
<td>State</td>
<td>Question 5 - ) Has any state privatized signal maintenance and operations? Whole state? County? Municipality? If so, do you have documentation of that process and pros and cons of moving in that direction?</td>
</tr>
<tr>
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</tr>
<tr>
<td>Wisconsin</td>
<td>WisDOT piloted signal maintenance in a small area for about a year, it was found not to be cost effective and we have since taken back maintenance with a WisDOT electrician. However, many counties and municipalities utilize a vendor/contractor paired with a consultant to take care of their signal maintenance and operations needs.</td>
</tr>
<tr>
<td>Wyoming</td>
<td>no</td>
</tr>
<tr>
<td>State</td>
<td>Question 6 - What flavor of money is used to maintain and operate your signals? Local? State? Federal?</td>
</tr>
<tr>
<td>-------------</td>
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</tr>
<tr>
<td>Alabama</td>
<td>State funds through our Routine Maintenance Operations budget</td>
</tr>
<tr>
<td>Arizona</td>
<td>State funded $2.4M per year to maintain and system betterment, also each regional team has its own operation budget.</td>
</tr>
<tr>
<td>Delaware</td>
<td>1) Mostly state for the DelDOT signals. We justify some major rebuild projects as “enhancements” and therefore can use federal funds.</td>
</tr>
<tr>
<td>Florida</td>
<td>State funds are used exclusively for compensating local agencies.</td>
</tr>
<tr>
<td>Idaho</td>
<td>State</td>
</tr>
<tr>
<td>Illinois</td>
<td>All funding for maintenance and operation is State.</td>
</tr>
<tr>
<td>Indiana</td>
<td>State</td>
</tr>
<tr>
<td>Iowa</td>
<td>Local</td>
</tr>
<tr>
<td>Michigan</td>
<td>All maintenance activities are funded with State funds.</td>
</tr>
<tr>
<td>New Hampshire</td>
<td>State, but we have looked at federal funds, just haven't gotten anyone to give up their funds.</td>
</tr>
<tr>
<td>New Mexico</td>
<td>State</td>
</tr>
<tr>
<td>New York</td>
<td>State</td>
</tr>
<tr>
<td>North Carolina</td>
<td>State funds</td>
</tr>
<tr>
<td>Oregon</td>
<td>State</td>
</tr>
<tr>
<td>Rhode Island</td>
<td>A mixture of State &amp; Federal funds is used. While RIDOT Maintenance staff time is funded via 100% state funds (to my knowledge), some federal funds (e.g., NHPP, CMAQ, even HSIP, etc.) are used where applicable/available.</td>
</tr>
<tr>
<td>Tennessee</td>
<td>Local</td>
</tr>
<tr>
<td>Vermont</td>
<td>Currently, we use only state funds, but in discussion with our FHWA division office, we have determined that most signal maintenance activities are eligible for an 80% federal match.</td>
</tr>
<tr>
<td>Virginia</td>
<td>We have not, nor are we aware of any localities that have privatized signal maintenance and operations in Virginia</td>
</tr>
<tr>
<td>Washington</td>
<td>State</td>
</tr>
<tr>
<td>Wisconsin</td>
<td>State</td>
</tr>
<tr>
<td>Wyoming</td>
<td>State funds generally for state-owned signals, but some federal funds for special rare cases like Adaptive Signal Systems.</td>
</tr>
<tr>
<td>State</td>
<td>Question 7 - What is your criteria for selecting which signal projects get funded, i.e. which signals get upgraded and the project scope?</td>
</tr>
<tr>
<td>---------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Alabama</td>
<td>Those decisions are made at the Area/Regional level (outside the central office) and vary greatly from one Area to another depending on various factors such as growth within a corridor, age of existing signals and systems, performance concerns, etc.</td>
</tr>
<tr>
<td>Arizona</td>
<td>#1 safety; #2 operation improvement which subject to further prioritization.</td>
</tr>
<tr>
<td>Delaware</td>
<td>1) For maintenance type projects, we have developed a prioritization/ranking system for both major rebuild projects and smaller head/head cable projects.</td>
</tr>
<tr>
<td>Florida</td>
<td>FDOT has a standard program to re-time urban traffic signals every 3 years (1/3rd each year) and rural traffic signals every 5 years (1/5th each year). Other projects such as those for adaptive deployments and active arterial management are decided at the District level but with local agency coordination.</td>
</tr>
<tr>
<td>Idaho</td>
<td>Projects are scoped locally by the ITD district staff</td>
</tr>
<tr>
<td>Illinois</td>
<td>Normally the signals within a roadway corridor that is slated for construction are upgraded if needed. We do have some contracts that are exclusive to signal modernization. Often times these utilize safety funds as determined by our Bureau of Safety Programs and Engineering for work such as adding signal heads, retroreflective backplates, etc.</td>
</tr>
<tr>
<td>Indiana</td>
<td>INDOT has six district traffic engineers and they select the locations for signal modernization projects based on identified needs (e.g. existing controller models, date of last modernization, frequency of maintenance call-outs to the location, etc.).</td>
</tr>
<tr>
<td>Iowa</td>
<td>no set criteria</td>
</tr>
<tr>
<td>Michigan</td>
<td>The Signals Unit works with each of the Regions in the state to develop priorities. Our funding does not permit each Region receiving an annual capital modernization project thus we use the developed list of priorities for the state and then compare age of equipment or any ongoing maintenance issues that cannot be resolved to come up with an annual modernization program.</td>
</tr>
<tr>
<td>New Hampshire</td>
<td>work in progress</td>
</tr>
<tr>
<td>New Mexico</td>
<td>A signal priority program is in place. District can apply for installation of a new signal or upgrade of existing. A signal warrant study is required. The study ranks projects according to the warrant study. Each project may be funded by the end of the fiscal year if state funds are available. Or district can use other eligible funds on their own if they see an urgency.</td>
</tr>
<tr>
<td>New York</td>
<td>1) Regions select which signals are upgraded. If a corridor is being done, upgrading of signals along the corridor is reviewed. We also look at age and maintenance history for spot replacements.</td>
</tr>
<tr>
<td>North Carolina</td>
<td>Projects are ranked and scored according to data which consists of but not limited to volumes, crashes, pedestrian needs, travel time reliability and access management.</td>
</tr>
<tr>
<td>Oregon</td>
<td>It varies depending on the type of project. Pure rebuilds are selected based on input from maintenance staff. Modernization projects are selected based on planning and project needs. Scope of any project is based on the type of project and available funding</td>
</tr>
<tr>
<td>State</td>
<td>Question 7 - What is your criteria for selecting which signal projects get funded, i.e. which signals get upgraded and the project scope?</td>
</tr>
<tr>
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</tr>
<tr>
<td>Rhode Island</td>
<td>Various factors influence how we fund traffic signal projects, but I’m sorry I don’t have any specific set of criteria to share that we use to program/rank/prioritize. More often than not, signal improvements are included as part of a Construction Project or Permit that is proceeding on its own track/program.</td>
</tr>
<tr>
<td>Tennessee</td>
<td>1) No specific criteria for ranking signal projects. Usually signals are part of another project.</td>
</tr>
<tr>
<td>Vermont</td>
<td>Currently pretty Ad-hoc now, but I have recently developed a signal priority list based on several factors including age, volume, cabinet type, controller type, etc.</td>
</tr>
<tr>
<td>Virginia</td>
<td>State funds are used for maintenance and operations of our signals. From time to time, we will receive an allocation of money for specific repairs, replacements, or upgrades of equipment, but that money varies in quantity, frequency, and source.</td>
</tr>
<tr>
<td>Washington</td>
<td>WSDOT has established a starter criteria based on age and maintenance expenditures to determine which systems are replaced under our preservation program. This system is still being refined.</td>
</tr>
<tr>
<td>Wisconsin</td>
<td>Most traffic signal projects are funded through the roadway improvement program. The level of signal work is determined by the scope of the roadway project – sometimes all of the work requested can be included and sometimes very little of the work can be included. The Standalone Signals and ITS appropriation is the other source of funding. A committee evaluates projects to determine the highest priority and those projects are approved until the funding is fully allocated.</td>
</tr>
<tr>
<td>Wyoming</td>
<td>Each District adds signals to be upgraded to the State Transportation Improvement Program (STIP). If a corridor is being reconstructed, upgrading of signals along the corridor is reviewed. We also recently reviewed the statewide signal inventory, looking at age, deficiencies and operational issues to prioritize the top candidates for possible upgrade.</td>
</tr>
<tr>
<td>State</td>
<td>Question 8 - Can you send a copy of your typical Maintenance agreement when a Town accepts maintenance responsibility for a traffic signal?</td>
</tr>
<tr>
<td>------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Alabama</td>
<td>attached</td>
</tr>
<tr>
<td>Arizona</td>
<td>attached</td>
</tr>
<tr>
<td>Delaware</td>
<td>n/a</td>
</tr>
<tr>
<td>Florida</td>
<td>See attached.</td>
</tr>
<tr>
<td>Idaho</td>
<td>There are several of these throughout the state and the terms vary. I can put you into contact with a few of the District Traffic Engineers if you are interested in copies of the agreements</td>
</tr>
<tr>
<td>Illinois</td>
<td>attached</td>
</tr>
<tr>
<td>Indiana</td>
<td>The two cities that maintain INDOT signals have agreements that look more like maintenance contracts (e.g. 4 year term, maintenance activities identified, labor and cost rates identified). A copy of both agreements can be sent if interested.</td>
</tr>
<tr>
<td>Iowa</td>
<td>n/a</td>
</tr>
<tr>
<td>Michigan</td>
<td>The maintenance document that is included discusses expectations for routine maintenance of traffic signals.</td>
</tr>
<tr>
<td>New Hampshire</td>
<td>N/a</td>
</tr>
<tr>
<td>New Mexico</td>
<td>attached</td>
</tr>
<tr>
<td>New York</td>
<td>1) N/A, but we have what are called arterial agreements whereby a municipality is paid to maintain all features along the state arterial including signs, markings, signals, pavement, etc. The amount paid per square foot of pavement has not been increased in about 25 years and as a result, municipalities are defaulting on the maintenance. In some instances, we have taken back the signals.</td>
</tr>
<tr>
<td>North Carolina</td>
<td>will send</td>
</tr>
<tr>
<td>Oregon</td>
<td>see attached</td>
</tr>
<tr>
<td>Rhode Island</td>
<td>if you need a sample agreement and I can try to fish one out.</td>
</tr>
<tr>
<td>Tennessee</td>
<td>yes</td>
</tr>
<tr>
<td>Vermont</td>
<td>This is pretty rare, and only occurs when a municipality accepts full responsibility for a segment of state numbered highway (We call it a Class 1 Town Highway)</td>
</tr>
<tr>
<td>State</td>
<td>Question 8 - Can you send a copy of your typical Maintenance agreement when a Town accepts maintenance responsibility for a traffic signal?</td>
</tr>
<tr>
<td>-----------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Virginia</td>
<td>For maintenance upgrades and replacements, each region is in charge of prioritizing their upgrades and maintenance replacements. There has been an effort in recent years to move from span wire signals to mast arm, which has elevated those signals for upgrade above mast arm signals. Structural inspections also contribute to prioritization if signal poles or foundations have structural issues. Otherwise, signals replacements are prioritized based on age and condition of existing equipment, likelihood to be included in upcoming larger projects, and other miscellaneous conditions. For system wide improvements (e.g. retro reflective back plates, controller upgrades, etc.), Corridors of Statewide Significance (CoSS) are often a priority. The CoSS routes are primarily larger corridors with high volumes, and high speeds. For more information about the CoSS, refer to: <a href="http://www.vtrans.org/significant_corridors.asp">http://www.vtrans.org/significant_corridors.asp</a>. From a project perspective, Virginia recently put in place a transportation project prioritization process which quantifies the value of any transportation project in relation to the cost of the project. You can find out more about this program at <a href="http://smartscale.org/">http://smartscale.org/</a>. VDOT is not allowed to submit projects through SMART SCALE, however MPOs, cities, towns, counties, and other transportation providers and agencies may submit projects. Many signalized intersection projects have scored well and been funded because of their high benefit to cost value.</td>
</tr>
<tr>
<td>Washington</td>
<td>Yes, we could. Please contact Flint Jackson to coordinate this if you would like to pursue this.</td>
</tr>
<tr>
<td>Wisconsin</td>
<td>This is not a typical practice so there isn’t a dedicated form. If a municipality does take on the maintenance of a state-owned traffic signal, an agreement is drawn up as needed.</td>
</tr>
<tr>
<td>Wyoming</td>
<td>n/a</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>State</th>
<th>Question 9 - If a Town does not properly maintain a traffic signal (detection not working, coordination not happening), what incentives or penalties do you have to encourage them to do this maintenance?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alabama</td>
<td>Based on the agreement form, ALDOT can perform the needed maintenance and invoice the local entity or place the signal into flashing operation or if presenting a hazardous condition, it can be removed.</td>
</tr>
<tr>
<td>Arizona</td>
<td>Have not experienced such situation.</td>
</tr>
<tr>
<td>Delaware</td>
<td>N/a</td>
</tr>
<tr>
<td>Florida</td>
<td>TSMCA has built in performance metrics with retainage clauses for such aspects as preventative maintenance, critical and pedestrian detection repairs, conflict monitor test etc. FDOT signal engineers at the Districts play an active role in partnering with local agencies to address detection repair issues, coordination concerns and retiming needs. FDOT is actively looking for ways to measure performance of its signal systems.</td>
</tr>
<tr>
<td>Idaho</td>
<td>This varies on how the agreement was written. ITD retains some input in some instances and turns over all maintenance and operations in others.</td>
</tr>
<tr>
<td>Illinois</td>
<td>See Part 5 of the attached agreement. There is a section for Deficiencies in Maintenance.</td>
</tr>
<tr>
<td>Indiana</td>
<td>Generally not applicable to INDOT as we are not a home rule state and do (usually) control our corridors. The two cities with agreements cannot be paid if the maintenance work is not performed and the agreements would not be renewed if problems occur on a frequent or regular basis. Relative to coordination between INDOT and local systems for example in Indianapolis our Signal Systems Office has a good relationship with their Traffic Operations group and has right-of-entry, as appropriate, to local cabinets and can make adjustments as needed. Our Signal Systems Office noted that they have experienced issues with one town where the town installed an ineffective adaptive technology on a system that crosses our interstate ramps but the issue here more relates to the technology than the maintenance.</td>
</tr>
<tr>
<td>Iowa</td>
<td>nne</td>
</tr>
<tr>
<td>Michigan</td>
<td>We periodically spot check individual locations to verify maintenance is in compliance. We meet regularly with all of our maintaining agencies semi-annually to discuss issues. In only one case, have we resorted to cancelling the maintenance agreement with a local agency due to lack of performance. In that case, we were able to take over maintenance by our own forces.</td>
</tr>
<tr>
<td>New Hampshire</td>
<td>hasn’t been an issue</td>
</tr>
<tr>
<td>New Mexico</td>
<td>1) The signal and lighting agreement addresses this issue. We have a clause that states; state will do the repair and must be compensated within 30 days after the work. But we have no method of enforcing it short of taking them to court, which is not desirable. We have gone to this extreme!</td>
</tr>
<tr>
<td>New York</td>
<td>We can go out and do it ourselves and back charge them. Some Regions don’t like to do charge them as they are sympathetic to the fact that the municipalities are trying to maintain the corridor with inadequate funding.</td>
</tr>
<tr>
<td>State</td>
<td>Question 9 - ) If a Town does not properly maintain a traffic signal (detection not working, coordination not happening), what incentives or penalties do you have to encourage them to do this maintenance?</td>
</tr>
<tr>
<td>--------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>North Carolina</td>
<td>We can withhold quarterly reimbursement if the traffic signal/system is not maintained to acceptable standards</td>
</tr>
<tr>
<td>Oregon</td>
<td>The State can assume maintenance and operation and then charge the City/County via the agreement shown in Question #1 above web link</td>
</tr>
<tr>
<td>Rhode Island</td>
<td>We don’t have any incentive or penalty for this. Obviously when a locally- or privately-owned traffic signal is affecting operations on a State Highway and maintenance is needed to resolve, RIDOT will reach out to the owner to try and push them to fix the problem(s).</td>
</tr>
<tr>
<td>Tennessee</td>
<td>1) None. Lawsuits have been the incentive in the past but I would like the state to be more proactive. This is an ongoing discussion.</td>
</tr>
<tr>
<td>Vermont</td>
<td>n/a</td>
</tr>
<tr>
<td>Virginia</td>
<td>As stated previously, in Virginia independent cities and towns maintain their own signals, and there is no formal agreement document since it is in the code of Virginia. Each town and city is given money by the General Assembly based on lane miles of roadway in their jurisdiction, which they use to maintain the roadway and assets on the roadway including signals.</td>
</tr>
<tr>
<td>Washington</td>
<td>Where a local jurisdiction is maintaining a signal that would normally be WSDOT responsibility, withholding of funding for maintenance, and in some cases taking back maintenance responsibility have occurred as a result of poor or non-existent maintenance practices.</td>
</tr>
<tr>
<td>Wisconsin</td>
<td>There aren’t really any incentives/penalties. Connecting highway routes (locally maintained state/ US highways) are tied to some funding, but I’m not sure that reducing that funding as a penalty has been explored in the past.</td>
</tr>
<tr>
<td>Wyoming</td>
<td>n/a</td>
</tr>
<tr>
<td>State</td>
<td>Question 10 - What state or local standards do you have for the monitoring and maintenance of traffic signal operation and timing? How is accountability managed? Do you have example documents to share?</td>
</tr>
<tr>
<td>------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Alabama</td>
<td>Our Traffic Signal Design and Timing Manual is supposed to be followed. How is accountability managed? Each Area Traffic Engineer is responsible for compliance to this document in their geographic area. Do you have example documents to share? Link is attached below.</td>
</tr>
<tr>
<td>Arizona</td>
<td>Yes, and work is in progress.</td>
</tr>
<tr>
<td>Delaware</td>
<td>1) No specific standards/documents. We coordinate with our MPOs on what corridors should be retimed and then perform the work, mostly with consultants. Obviously we also dispatch techs whenever we get a detection or other signal related complaint that may indicate a malfunctioning traffic signal.</td>
</tr>
<tr>
<td>Florida</td>
<td>TSMCA requires local signal maintaining agencies to submit annual reports. FDOT is pursuing performance monitoring efforts.</td>
</tr>
<tr>
<td>Idaho</td>
<td>ITD has no state standards for monitoring and measuring operation and timing.</td>
</tr>
<tr>
<td>Illinois</td>
<td>See Exhibit B of the attached agreement which sets the maintenance provisions</td>
</tr>
<tr>
<td>Indiana</td>
<td>INDOT has a recurring special provision (805-T-086) and an Operations Memorandum (06-05) with signal maintenance and operations standards. System Engineers are charged with monitoring the signal operation and maintaining timings in their assigned areas. The assigned areas require that each System Engineer maintain timing on between 250 and 500 signals including 200 to 350 coordinated signals in a system. We have job descriptions and performance expectations for these positions but no standards that apply to timing.</td>
</tr>
<tr>
<td>Iowa</td>
<td>no standards</td>
</tr>
<tr>
<td>Michigan</td>
<td>work in progress</td>
</tr>
<tr>
<td>New Hampshire</td>
<td>work in progress</td>
</tr>
<tr>
<td>New Mexico</td>
<td>none</td>
</tr>
<tr>
<td>New York</td>
<td>1) No specific standards, we monitor complaints and by our own observation of problems that may be occurring in the field.</td>
</tr>
<tr>
<td>North Carolina</td>
<td>Please send mailing address and we can provide a copy of the North Carolina Traffic Signal Operations and Maintenance Practices Report.</td>
</tr>
<tr>
<td>Oregon</td>
<td>a. We typically document in an Intergovernmental Agreement (IGA). See the attached PDF IGA.</td>
</tr>
<tr>
<td>Rhode Island</td>
<td>No R.I.-specific standards published/issued; when needed RIDOT refers to national sources as needed (e.g., FHWA Signal Timing Manual, ITE, etc.). However, given our state law makes the STC adopt “a manual of regulations and specifications establishing a uniform system of traffic control signals, devices, signs, and markings … for use upon (all) public highways”, which historically has just been the latest national MUTCD (see <a href="http://webserver.rilin.state.ri.us/Statutes/TITLE31/31-13/31-13-1.HTM">http://webserver.rilin.state.ri.us/Statutes/TITLE31/31-13/31-13-1.HTM</a>), the general language RE: signal monitoring, operations, and maintenance that is included in the MUTCD is supposed to be “the standard”.</td>
</tr>
<tr>
<td>State</td>
<td>Question 10 - What state or local standards do you have for the monitoring and maintenance of traffic signal operation and timing? How is accountability managed? Do you have example documents to share?</td>
</tr>
<tr>
<td>---------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Tennessee</td>
<td>NA... Not sure about local partners but probably complaints/congestion</td>
</tr>
<tr>
<td>Vermont</td>
<td>Nothing currently, but we are working on a draft Traffic Signal Management Plan, that we will share with our RPC’s and Municipalities if they’re interested which will have our proposals for traffic monitoring and performance measures. We’ll be happy to share our TS management plan with you as well once we’re past the draft stage.</td>
</tr>
<tr>
<td>Virginia</td>
<td>If a town does not properly maintain their signals, we do not typically have any authority to incentivize or penalize their actions. Due to the limited resources of many Virginia towns with just a few signals, VDOT signal technicians occasionally provide maintenance and operational assistance to the town if requested.</td>
</tr>
<tr>
<td>Washington</td>
<td>For WSDOT, each region periodically reviews operations for delay/LOS and tracks this information. Periodic review frequency varies by region due to variations in traffic volumes / number of signals – frequency no greater than once every 5 years for any region. Region operations managers track routine reviews – separate department wide system for tracking responses to citizen inquiries/complaints.</td>
</tr>
<tr>
<td>Wisconsin</td>
<td>For signal maintenance, the electricians have cabinet checks and MMU tests/checks that they perform. These are scheduled to occur yearly. Our Traffic Signal Design Manual (TSDM) and Traffic Guidelines Manual (TGM) cover various topics (clearance intervals, EVP, overlaps, phasing – left turns/pedestrians/interchanges, etc.). Some regions maintain more specific timing guidelines, but that is not consistent in each of the WisDOT regions.</td>
</tr>
<tr>
<td>Wyoming</td>
<td>Nothing standard at this time, but we are working toward a central system with Automated Traffic Signal Performance Measures (ATSPMs). How is accountability managed? We currently do spot inspections which focus on documentation of routine maintenance and inspection. Do you have example documents to share? No.</td>
</tr>
<tr>
<td>State</td>
<td>Question 11 - Do you use an ITS systems architecture (statewide or more local) and a documented systems engineering process on your traffic signal projects?</td>
</tr>
<tr>
<td>-----------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Alabama</td>
<td>no</td>
</tr>
<tr>
<td>Delaware</td>
<td>no</td>
</tr>
<tr>
<td>Florida</td>
<td>One of the objectives of FDOT’s Statewide Arterial Management Program (STAMP) is to move towards a more streamlined approach with systems engineering, and possibly develop a Traffic Signal Management Plan. Any federally funded project requires a Systems Engineering approach and is pursued accordingly.</td>
</tr>
<tr>
<td>Idaho</td>
<td>ITD has a statewide ITS systems architecture, but it doesn’t really include traffic signal projects</td>
</tr>
<tr>
<td>Illinois</td>
<td>We have a statewide and regional ITS systems architecture which we are currently in the process of updating. We have not used a systems engineering process for signal projects other than for adaptive signal control systems.</td>
</tr>
<tr>
<td>Indiana</td>
<td>ITS infrastructure supports communication with signal devices. ITS involvement in contracts is enacted where possible, as appropriate. Signal systems operate within the architecture to the extent that those systems have static IP’s unique within the system (or behind a router within the ITS system). Those IP’s are unique to that system.</td>
</tr>
<tr>
<td>Iowa</td>
<td>Only for adaptive signal control technologies.</td>
</tr>
<tr>
<td>Michigan</td>
<td>In the past we have not used a documented system engineering process for projects. We are now using this process for proposed traffic responsive or adaptive signal systems on future projects.</td>
</tr>
<tr>
<td>New Hampshire</td>
<td>Not yet, at least not often.</td>
</tr>
<tr>
<td>New Mexico</td>
<td>no</td>
</tr>
<tr>
<td>New York</td>
<td>We have standards for equipment to be used (e.g. 2070 controllers)</td>
</tr>
<tr>
<td>North Carolina</td>
<td>yes</td>
</tr>
<tr>
<td>Rhode Island</td>
<td>Not usually, since traditionally RIDOT has treated and administered traffic control signals as “separate” from other ITS devices (e.g., surveillance cameras, VMS/DMS, HAR, RWIS, etc.). However RIDOT is beginning to treat traffic signals as “ITS” which should ideally fit into any FHWA-required ITS Architecture and systems engineering processes. Technology advancements are spurring this.</td>
</tr>
<tr>
<td>Tennessee</td>
<td>yes</td>
</tr>
<tr>
<td>Vermont</td>
<td>We have in the past, to procure an adaptive system on an arterial as well as recently for purchasing a central system via a project.</td>
</tr>
<tr>
<td>Virginia</td>
<td>We are using a documented systems engineering process on the statewide procurement of new traffic signal controllers and a central signal system, however we have not traditionally used this process. In the future we plan to establish a streamlined systems engineering process for regional procurement of equipment.</td>
</tr>
<tr>
<td>Washington</td>
<td>We do not use these particular systems, but we do use an overall system approach to selecting equipment.</td>
</tr>
<tr>
<td>State</td>
<td>Question 11 - ) Do you use an ITS systems architecture (statewide or more local) and a documented systems engineering process on your traffic signal projects?</td>
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</tr>
<tr>
<td>Wisconsin</td>
<td>Yes, WisDOT’s ITS architecture is maintained by the UW TOPS Lab. Systems engineering has been used on multiple projects and WisDOT follows the model systems engineering documents published by FHWA. These projects are typically for exploring the feasibility of traffic responsive/adaptive signal control. We are working on aligning our traffic signal communication standards with the ITS standards.</td>
</tr>
<tr>
<td>Wyoming</td>
<td>We have standardized control equipment (2070). We don't have a systems engineering process for individual projects; but are we are using a systems engineering process to acquire a new statewide central traffic signal control system and local controller software.</td>
</tr>
<tr>
<td>State</td>
<td>Question 12 - What Measures of Effectiveness (MOEs) does your state or controlling authority use to operate and monitor traffic signal systems (i.e. travel speeds/times, average delay, length of Q’s, Occupancy, etc.)?</td>
</tr>
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<tr>
<td>Alabama</td>
<td>None at the moment but we have a professor at the University of Alabama who was involved in the Purdue MOEs as well as implementation in Utah who is working to do the same in Alabama....needless to say we are excited about working with him in this endeavor.</td>
</tr>
<tr>
<td>Delaware</td>
<td>1) Typically this is done on our signal timing enhancement projects and usually is based on travel time. Sometimes delays, queues, etc. are noted. We are starting to get into the use of high resolution data for this purpose.</td>
</tr>
<tr>
<td>Florida</td>
<td><em>Paragraph 31 of the TSMCA identifies measures that could potentially serve as MOEs. FDOT’s contract with HERE and data available through RITIS are being explored for developing MOEs on corridors listed under the newly developed Routes of Significance package.</em></td>
</tr>
<tr>
<td>Idaho</td>
<td>ITD has no uniform MOE’s</td>
</tr>
<tr>
<td>Illinois</td>
<td>We do not have defined MOEs. The district offices use their judgment typically based on travel times, delay, and queue lengths.</td>
</tr>
<tr>
<td>Indiana</td>
<td>Performance Measures such as the PCD, Platoon Ratio, V/C, Queue, etc., are available at: <a href="https://signalmetrics.trafficwise.org/index.php">https://signalmetrics.trafficwise.org/index.php</a> Maintaining this system is difficult although numerous signals west of I-465 on US 36 on the west side of Indianapolis are producing good data; this can be viewed without a log-in.</td>
</tr>
<tr>
<td>Iowa</td>
<td>no MOE's</td>
</tr>
<tr>
<td>Michigan</td>
<td>At this time we just beginning to look at a formal MOE for signal performance. Currently it is anecdotal information on signal performance.</td>
</tr>
<tr>
<td>New Hampshire</td>
<td>work in progress</td>
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<tr>
<td>New Mexico</td>
<td>1) We are planning to start to experiment with large entities to utilize the Purdue ATSPM’s measures similar to UDOT.</td>
</tr>
<tr>
<td>New York</td>
<td>1) None although we are looking into this. There is more of an emphasis on pedestrian and bicyclist safety, so the end all is no longer how many and how fast can you move traffic through an intersection or corridor. It is a balancing act to provide a system that fits all the user needs.</td>
</tr>
</tbody>
</table>
| North Carolina | The primary MOE used for signal system timing is the comparison of the “before” and “after” travel times. In addition to travel times, the following MOE are collected and compared:  
  - Delay - CD Cumulative Delay (seconds),  
  - Stop - CStops Cumulative number of stops in the Run. A “Stop” is counted when the speed drops below 5 mph after exceeding 15 mph.  
  - Stopped Delay – CstopD Cumulative stopped delay (seconds),  
  - Speed -CAS cumulative Actual Average Speed (mph).  
In additions, road-user complaints are considered while monitoring the effective operations of signal systems. |
<table>
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<th>Question 12 - What Measures of Effectiveness (MOEs) does your state or controlling authority use to operate and monitor traffic signal systems (i.e. travel speeds/times, average delay, length of Q's, Occupancy, etc.)?</th>
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<tr>
<td>Oregon</td>
<td>a. The primary focus has been for local agencies to regularly inspect and maintain the signals per the attached IGA. For operations we have specified that they shall time the yellow and red clearance values per ODOT signal policy. We have not set any MOE’s for overall operation. Typically local agencies that have the capability to time and operate our traffic signals have done so in a reasonable manor. When questions have come up, we typically have addressed the manor in a more conversational manor after observing certain operational aspects such as long queueing that needs to be addressed rather than try to analyze certain MOE’s.</td>
</tr>
<tr>
<td>Rhode Island</td>
<td>Nothing formalized yet at the State (RIDOT) level in R.I. for traffic signal systems; unfortunately we often are responsive based on road user feedback (complaints), but with FHWA push for Performance Management I hope this will change.</td>
</tr>
<tr>
<td>Tennessee</td>
<td>NA.. I will forward your inquiry to a few of our larger cities.</td>
</tr>
<tr>
<td>Vermont</td>
<td>We are planning to utilize the Purdue ATSPM’s measures internally via a website developed and shared by UDOT and eventually with our upcoming Central system. Hopefully testing the SPM website in the next few months.</td>
</tr>
<tr>
<td>Virginia</td>
<td>We are currently testing two Automated Signal Performance Measures (ATSPM) MOEs on select corridors: Platoon Progression (arrival on Red) and Split Monitor (gap out vs force off). We are using these MOEs to evaluate the benefit of high speed data logging. For corridors where we utilize adaptive signal control technology (approximately 130 intersections), MOEs such as travel time, number of stops, corridor speed, and travel time reliability are used.</td>
</tr>
<tr>
<td>Washington</td>
<td>At the moment, delay (level of service) is the primary factor (both intersection and corridor). We are currently starting an evaluation of other MOEs for possible use in the near future.</td>
</tr>
<tr>
<td>Wisconsin</td>
<td>MOEs are utilized when they are available to us (i.e. through Centracs, UDOT Signal Performance Metrics, etc.). Typical MOEs that are most utilized are: Purdue Coordination Diagram (PCD)/Arrivals on Green (or Red); Split Monitor/Split Failures; etc.</td>
</tr>
<tr>
<td>Wyoming</td>
<td>Currently limited to travel time measurements using Bluetooth travel time units on 12 designated travel time performance measures corridors; but working toward ATSPMs</td>
</tr>
</tbody>
</table>