CA FWD & California Emerging Technology Fund
2020-21 Grant Collaboration
Final Summary Report

In 2020 California Forward (CA FWD) entered into a formal agreement with the California Emerging Technology Fund (CETF) to collaborate on providing public awareness and information through a webinar series that spotlights, analyzes, and compares innovative models for public agencies and private enterprises to consider in accelerating broadband infrastructure construction to meet the State's statutory goal of at least 99% deployment in each region. The following constitutes a final summary report of activities undertaken as a result of the grant agreement signed on December 31, 2020. The grant scope is delineated below, with activities undertaken bulleted underneath each element.

December 3, 2020, Grant Agreement Activities:

Organize and convene a webinar on November 13, 2020, including information distribution and registration, featuring the new Benton Institute for Broadband and the Society October 2020 Report, *Broadband for America Now*.

- In coordination with CETF, CA FWD planned and convened a webinar on November 13, 2020. Co-sponsors included CENIC, Inland Empire Regional Broadband Consortium, California Partnership for the San Joaquin Valley, Fresno State, Northeastern California Connect Consortium, CCABC, SBBC, Upstate California Connect Consortium, Valley Vision and the San Joaquin Valley Regional Broadband Consortium.

- Speakers included Louis Fox, Jonathan Sallet, John Windhausen, Julie Meier Wright, Amy Tong, Trish Kelly, Eduardo Gonzalez, Martha Van Rooijen, Jason Schwenkler, Sunne Wright McPeak and Micah Weinberg.

- 305 people registered for the webinar and 202 attended. The participant list may be viewed here.

- The webinar recording is available here.

Organize and convene up to 3 additional webinars spotlighting innovative approaches to and models for broadband deployment and adoption, including streamlining project approvals and permitting, consistent with the proposal submitted by CA FWD on December 21, 2020.

- In partnership with CETF, CA FWD hosted "Building Equitable Economies: Broadband Funding Innovations" on April 1, 2021. 185 people registered and 114 attended. Speakers included former State Controller and Treasurer John Chiang; Marc Powell, Michael Misrahi and Jehan Thind of Ernst & Young; and Sunne Wright McPeak of CETF. The webinar may be viewed here.

- In partnership with CETF, CA FWD hosted "Building Equitable Economies: Broadband Governance Innovations" on April 8, 2021. 163 people registered and 104 attended. Speakers included Eduardo Gonzalez of CSU Fresno, Cole Przybyla of Tuolomne County and Jacki Bacharach from the South Bay Cities Council of Governments. The webinar may be viewed here.

- In partnership with CETF, CA FWD hosted "Building Equitable Economies: Broadband Provider Innovations" on April 15, 2021. 201 people registered and 115 attended. Speakers included John Paul of Spiral Network, Kome Ajise from the Southern California Council of Governments, Doug Patterson of Crown Castle and Trish Kelly of Valley Vision. The webinar may be viewed here.

Summarize, analyze, and compare the innovative approaches and models presented in the webinars according to the agreed-upon standardized categories and metrics in comparison development by CA FWD in consultation with CETF.

- CETF and CA FWD collaborated to develop Metrics for Analyzing Innovative Broadband Models. The metrics were used to guide speakers as they prepared their presentations and to analyze and compare the approaches and models presented in the webinars.

- The analysis follows.

Ernst & Young: Mapping Economics to Drive Deployment

Presenters
- Marc Powell, Senior Managing Director and Strategy Leader
- Michael Misrahi, Principal, Strategy and Transactions
- Jahan Thind, Senior Vice President

Background
Ernst & Young helps governments and community organizations, as well as the private sector with strategies, financing and executing large infrastructure projects, including broadband deployment. Public clients include entities such as the Massachusetts Bay Transportation Authority, City of San Jose, Southern California Association of Governments, Middle Tennessee Electric, and the Oregon and Georgia Departments of Transportation.

The Innovation: Mapping the Economics of Deployment to Drive Greater Coverage for People
From a supplier's perspective, three factors drive the decision to deploy in an area. Ernst & Young assists in analyzing, understanding and mapping all three factors through interactive models. The challenge is always one of economics. In some places, a project will pay for itself. In others, economic gaps must be bridged through public inputs. The three factors include:

1. Understanding demographics and "firmographics," which define the addressable market. In a city or portion of an urban area, this analysis might proceed on a block-by-block basis, while a rural area might be analyzed on a square mile basis. Elements include:
    a. Demographics: Number of households, levels of income
    b. Firmographics: Number of businesses providing service, service penetration

2. Cost to build, which drives the capital expenditure analysis. Elements include:
   a. Landscape type (flatland, mountains, wetlands, etc.)
   b. Available assets, including rail and roadway ROW, conduit, streetlights, etc.
   c. Permitting costs
3. Competition, which affects addressable revenue opportunity. Elements include:
   a. Presence of fiber
   b. Presence of cell towers
   c. Existing, lower-capacity networks

This type of analytical mapping can reveal four types of conditions:

1. The area is already covered fully.
2. The area's economics are attractive, but coverage still is lacking, and private firms won't enter the market due to conditions such as permitting costs and delays or inaccessible ROW.
3. The area's economics are marginal. It potentially could be profitable but not enough to make the zone a priority for mainline carriers.
4. The area's economics are insufficient, but not impossible.

Potential solutions to drive deployment under the three latter scenarios include:
- Addressing barriers such as permitting costs and delays or ROW availability
- Some form of public subsidy
- Bundling to create a shared infrastructure project
- Combining deployment with other opportunities such as transportation projects
- Developing a flexible operating concession with private sector investors (cases where the public entity has available capital but inadequate funding for operations and revenues are uncertain)
- Hybrids based on the above potential solutions

Key Takeaways
- It is possible to understand the economics from a carrier economic perspective through data analysis and economic mapping.
- The analysis must be done at a highly localized level, including getting down to the street level at times.
- Governments have a number of "enabling mechanisms" at their disposal to address barriers, such as streamlining permitting and encouraging financial solutions such as cost-share approaches and public-private partnerships.
- Driving to solutions requires a parallel process of identifying economic factors such as cost drivers and revenues and at the same time bringing social actors and stakeholders to the table – such as government agencies, nonprofit partners, charities, telecom carriers, and potential clients of the service – to broker feasible solutions.

Broadband Governance Innovations

South Bay Cities Council of Governments: South Bay Fiber Network Serving Municipalities

Presenter
- Jacki Bacharach, Executive Director, South Bay Cities Council of Governments

Background
The South Bay Cities Council of Governments established a regional broadband initiative to bring high-speed broadband to 15 South Bay cities in Los Angeles County that collectively are home to 1 million people. The Council led an effort to create the South Bay Fiber Network project – a municipal fiber network designed as a "middle-mile ring" with lateral connections to municipal and public agency sites around the South Bay. Built by American Dark Fiber, the network provides high-speed connectivity for carrier-grade internet service to the 15 cities as well as other local agencies.

The Innovation: South Bay Fiber Network 15-City Partnership to Improve Municipal Service at Lower Cost
This project was developed and launched following a study by Magellan Advisors, commissioned by the South Bay Workforce Investment Board and Los Angeles County Supervisor Mark Ridley Thomas, which examined needs and opportunities for network services in the region. The study found that many cities were purchasing less bandwidth than they needed for high costs. Average costs were about $4,000 per month for less than 1 gigabit of bandwidth service.

With an eye toward stimulating workforce and economic development, the South Bay Workforce Investment Board, in partnership with the South Bay Cities Council of Governments, developed a Broadband Fiber-Optic Master Plan for the region in 2017. The plan led to the issuance of a request for proposals and subsequent

agreement with American Dark Fiber to build the fiber-optic network connecting and serving the 15 cities, as well as other entities, at a much lower price of $1,000 a month for one gigabit of service and $2,750 per month for 10 GBs.

A key innovation involved how to pay for the capital costs. The Council of Governments covered the $6.9 million in capital costs by using sub-regional Measure M transportation funds.[1] According to Bacharach, the Council provided documentation justifying to the Board of the L.A. Metropolitan Transportation Authority that this was an appropriate use of transportation funding, emphasizing that in addition to serving technical needs within transportation systems, broadband is an important means of reducing traffic congestion by encouraging telecommuting, telemedicine, and digital municipal services.

Construction began just as COVID-19 restrictions took hold. Seen as an "essential" work task, the new fiber network became operational in August 2020. All South Bay cities were connected by January 2021, and at least 32 sites were connected by spring 2021. The core ring extends 98 miles – 65% of it aerial and the remainder underground – with the network covering 200 miles in total. American Dark Fiber owns the private network and cities own the lateral connection from the Right of Way into their facilities; rates are controlled under the contract. In March 2021, South Bay Cities Council of Governments won a Crown Community Award from American City and County for deployment of the network.

Key Takeaways

- Development of the fiber network was viewed as critical for supporting the region's digital economy, smart-city initiatives and connection to other public agencies, and addressing the digital divide while stimulating future commercial and economic development. Differentiating the South Bay as a tech-savvy place to live, work, and learn was a key driver. The concept was to incrementally build out fiber-optic connectivity starting with the cities, enabling them to improve operations and service by acquiring more bandwidth for less cost.

- Next steps involve expanding connections to more government buildings, community anchor institutions, private buildings, and office parks. Several cities are exploring how the Network can be leveraged to provide broadband services to residents.

- New collaborations also are envisioned, including forming partnerships with funding agencies, technology providers, community-based organizations and local governments to develop neighborhood centers anchored by public middle-mile direct network access where residents can engage in telehealth, telelearning and workforce development.

Tuolumne County: Central Sierra Broadband Roadmap

Presenter

- Cole Przybyla, Director of Innovation and Business Assistance, Tuolumne County

Background

Tuolumne County is banding together with other nearby counties in the Central Sierra to find ways to improve broadband service to residents, businesses and government institutions. In addition to Tuolumne, the counties

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[1] Measure M was approved by Los Angeles County voters in 2016 to fund rail and bus improvements and bike networks.

include Calaveras, Alpine, Amador and Mariposa, where spotty and inadequate broadband service has left many residents and businesses struggling to engage in the modern digital world. This digital crisis was exacerbated during the pandemic by the shutdowns of businesses, in-person schooling, and other services.

The Innovation: Five-County Regional Plan to Improve Broadband Availability

Tuolumne County recently learned it will receive a $500,000 federal CARES Act grant through the U.S. Department of Commerce's Economic Development Administration to create a plan to improve broadband availability in the five-county Central Sierra Region. The grant announcement on April 8 followed more than a year of collaborative work and effort led by Tuolumne County and the region's county supervisors.

In February 2020, Tuolumne County led a five-county broadband conference to collaborate on such a plan, where 250 people attended. Critical to the success of the conference was a series of pre-conference meetings designed to connect county elected leaders with broadband experts and advocates, including the U.S. Department of Agriculture, the California Department of Technology, California Emerging Technology Fund, the California Public Utilities Commission, government associations, and independent service providers.

During the conference, the "Preferred Scenarios Report for the Gold Country and Central Sierra Regional Broadband Consortia," prepared by CENIC,[2] was presented. This report highlighted the high numbers of unserved households in the region and developed preferred scenarios for achieving the 98% deployment goal under the 2017 legislation, AB 1665.

The remote and rough terrain of the Central Sierra region poses serious challenges in bringing high-speed internet to area businesses and residents. In one example, Przybyla explained that the developer of a potential 100-room hotel 15 miles from Yosemite National Park and eight miles from an established broadband fiber line, found it would cost $1 million per mile to connect the hotel, which was "out of reach" for a business to get connected.

The goal of the roadmap, which will be developed under contractual arrangement with a firm or firms pursuant to an RFP, will be to accomplish the following:
- Identify assets, including municipal, state and federal rights of way.
- Develop policy recommendations, based on inputs from private service providers, that can help with deployment, such as permit streamlining across the region.
- Identify top priorities for broadband deployment within each of the five counties.
- Continue exploring the preferred scenario prepared by CENIC.
- Develop a model that will attract private internet provider investment in infrastructure while also attracting federal grant dollars.
- Develop "project-ready" infrastructure projects to promptly apply for grant funds as available.

Key Takeaways
- In areas with great challenges in deployment, regional cooperation and collaboration are critical to success.
- It is important to provide sufficient outreach and education to busy local elected officials about the technical aspects of broadband deployment to foster understanding around the need for government policies, such as streamlined permitting, that will enable private providers to serve their constituents.
- Partnerships between the public and private sectors are imperative in bridging the divide.

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[2] Corporation for Network Education Initiatives in California

Spiral Fiber: Bringing Service to Homes and Businesses in Nevada County

Presenter
- John Paul, Chief Business Development Officer, Spiral Fiber

Background
Western Nevada County, anchored by Nevada City and Grass Valley and a rich gold mining history, has faced challenges in bringing high-speed broadband service to many areas because of forestation and rough terrain. Fixed wireless providers serve only about a quarter of the area due to these geographic limitations. DSL services are coming to an end. Cable companies lean toward serving only densely populated areas in this county. And the region is facing grave wildfire threats, underscoring the need for reliable broadband service.

The Innovation: Building Community Support and Capacity for Private Sector Deployment
In March of 2010, Google held a competition to identify the first American city to launch Google Fiber. Nevada City didn't win (Kansas City did) but the effort to compete helped to galvanize community and business leaders around the need for a modern, high-speed broadband network serving the entire community. In subsequent years, Spiral Internet, a small private provider now known as Spiral Fiber, applied for and eventually received approximately $16 million from the California Advanced Services Fund to advance this work.

Incumbent challenges have slowed the process. And securing the required matching funds of $12 million in private investment was a challenge, but the necessary private funding is now materializing for a larger project because of nationwide interest in infrastructure investment, according to Paul. Additionally, government funds are becoming available to meet demand and local political will has been strong. As a result, Spiral Fiber is

moving forward with plans to construct an all-underground fiber optic network to serve 12,000 homes and 400 businesses in Western Nevada County.

A key part of the effort has been to drum up interest and knowledge and to educate local residents and their elected leaders about the importance, barriers, and intricacies of bringing high-speed broadband to such challenging terrains and business environments. Neighborhood workshops, person-to-person educational strategies, public rallies, political outreach, and multi-media videos – all have been used to educate and energize the local community around solutions.

An already existing middle-mile network, which was deployed by Vast Network with American Recovery and Reinvestment Act funding, has been critical to this effort to bring service to homes and businesses. In April 2021, the Nevada County Board of Supervisors awarded $500,000 in broadband grants to four local internet providers to achieve last-mile connections in critical areas. The awards included $205,000 to Spiral Fiber, which will enable service to 380 Nevada County homes and help leverage investment for the broader build-out to the 12,000 homes envisioned in this effort.

Key Takeaways
- When a community or a smaller provider seeks to provide internet service, it takes perseverance and an understanding that it will be a long and difficult process.
- Political will is critical. Thus, educating local government leaders and keeping them up to date is imperative.
- Educating the community also is key. People need to understand how broadband works and the technology and policies that are needed to improve their service.

Crown Castle and Southern California Council of Governments Microtrenching and Streamlined Permitting

Presenters
- Doug Patterson, Regional Director, Crown Castle
- Kome Ajise, Executive Director, Southern California Association of Governments (SCAG)

Background
Crown Castle is a "shared infrastructure company," with 40,000-plus cell towers across the country, 80,000-plus small cells operating or under contract, and 80,000-plus route miles of fiber. The company is expanding its use of microtrenching, an underground fiber construction technique that allows for faster deployment of fiber infrastructure while minimizing disruption to traffic and to surrounding businesses and communities. Crown Castle also is working to promote streamlined government permitting and processes, including in Southern California. Additionally, the Southern California Association of Governments has developed a model resolution to streamline permitting processes across multiple jurisdictions.

The Innovations: Microtrenching and Permit Streamlining
According to Crown Castle, microtrenching is a means of driving investment in fiber deployment. Unlike traditional boring methods, which can disrupt traffic and surrounding communities, microtrenching has a more minimal impact when deploying fiber. Under this technology, installations of conduit and microfiber are typically

2 inches wide and between 16 inches and 26 inches deep. The depths help in avoiding other deeper undergrounded utility infrastructure while also being deep enough to protect infrastructure when future surface road work occurs.

The work can be done swiftly to minimize traffic disruption, waste and debris generation, and materials used to reinstate the roadways. Deployments can take days instead of weeks and months.

To date, Crown Castle has achieved nearly 40 miles of microtrenching in the City of Los Angeles over a 14-month period. Through this work, Patterson said, thousands of strands of fiber optic cable have been deployed in neighborhoods. The City of Los Angeles adopted an ordinance incorporating the technique into the Municipal Code, and the Bureau of Engineering established a microtrenching standard plan governing deployment.

In a related advancement involving aerial deployment, Crown Castle also worked with the City of San Jose to install several miles of network in the city's right of way under a single "term permit." The work involved installing more than 40,000 feet of fiber in multiple neighborhoods, which ordinarily might have required 25 to 30 permits to be processed individually. Patterson noted that the term permit, which involved a single design standard, enabled the work to proceed quickly, limited impacts to streets and communities, and improved broadband wireless capability to more than a half million residents.

In a similar effort, the Southern California Association of Governments (SCAG) developed a model resolution to streamline and coordinate permitting processes for broadband deployment across jurisdictions. The model resolution treats broadband as critical infrastructure essential to education, health and the well-being of people and communities. The resolution has been adopted by four of the six counties within SCAG, as well as by SCAG and the San Diego Association of Governments.

SCAG is in the process of mapping at a granular level the area's gaps in broadband service. According to Ajise, when private sector providers were asked what could be done immediately to increase deployment, the "consensus chorus was we need to rationalize the permit process." The streamlining approach in the model resolution was modeled after the standardized processes that currently apply to road construction projects across all government levels. SCAG is currently surveying the 191 cities and six counties in the region to continue to advance permit streamlining efforts.

Key Takeaways
- Microtrenching is a means of scaling up broadband deployment by reducing construction disturbance in ROWS and increasing the pace of installation. Deployments can take days, compared to weeks and months under traditional trenching approaches.
- Communities and local governments understandably have concerns about protecting their roadways and underground utilities. Thus, it is important to work in partnership with local governments to establish ordinances and standards that will enable the technology to go forward while protecting public interests.
- From an industry perspective, permit streamlining – through such mechanisms as term permits and coordinated permitting across jurisdictions – is an important way local government can help to increase the pace of deployment.

Broadband Deployment Innovations Side by Side Comparison

	Ernst & Young	Central Sierra Broadband Roadmap	South Bay Cities Council of Governments	Spiral Fiber, Nevada County	Crown Castle and So. Cal. Council of Governments
Brief description of innovation	Assisting government and community groups to map local economics of broadband deployment.	Tuolumne County leading development of a 5-county broadband roadmap to spur deployment.	"South Bay Fiber Network" middle-mile ring serving 15 cities and other entities with potential to grow.	Private provider bringing needed broadband service to 12,000 homes and 400 businesses.	Micro-trenching and permit streamlining to ease and hasten deployment.
Governance and ownership strategy	This will vary based on analysis tailored to the locality.	Roadmap will inform and drive decisions.	Private company owns middle-mile ring; cities own lateral connection between ROW and facilities; rates pursuant to contract.	Small private provider will own and operate network directly serving homes and businesses.	Crown Castle installs fiber infrastructure for customers. Relevant parties include public works staffs, private utilities, and private service providers. SCAG supports regional permit streamlining.
Barriers and challenges that it overcomes	Deployment costs outstrip revenues, time-consuming permitting, need for cost-share and public-private approaches.	Challenging terrain, remote service locations, low subscriber base, lack of willing carriers.	Funding was key challenge. $6.9 million in Measure M transportation funds were solution innovation.	Remote, forested terrain and service locations; lack of willing incumbent carriers to serve.	Slow and expensive deployment. Traffic, residential and ROW disruption. Cumbersome permitting processes.
Beneficiaries	Service to unserved and underserved communities. Business and commercial enterprises. Transportation systems and smart city initiatives.	Existing businesses, residences and institutions without adequate or affordable service.	Municipalities and other entities benefit by higher quality service at lower price; eventual extension for other institutions, office parks, neighborhood centers, and in some cases residences.	Unserved and underserved areas of western Nevada County; residential, commercial and institutions.	Residences, businesses and institutions benefit with timely access to new fiber connections. Potential in urban, suburban, and agricultural settings.

Enhance and serve: **• Telehealth** **• Education** **• Public safety** **• Local & regional resilience** **• Individual and community well-being**	Potential for all of these categories to be served and enhanced.	Potential for all of these categories to be served and enhanced.	Potential for all of these categories to be served and enhanced.	Potential for all of these categories to be served and enhanced.	Potential for all of these categories to be served and enhanced.
Financial model and investment plan	This will vary based on analysis and economic mapping.	This will depend on outcomes in the roadmap.	Measure M proceeds covered capital costs; entities pay private provider for monthly service from public operating funds.	$16 Million from CASF and $12 million private investment funding. Revenues to cover service delivery costs.	Private company serving paying customers; local government organization addressing industry and public solutions.
Other factors required to successfully implement	Varies based on analysis and economic mapping.	Successful RFP and contracting process to produce roadmap.	Collaboration with cities, regional workforce board, Metro, and other entities.	Patience and tenacity. Cultivate local political will. Community education.	Collaboration between private sector and public sector; compromise to respect and protect all interests.
Contribution to statutory goal of achieving 98% deployment in each region	This will depend on which communities engage in this type of economic mapping.	This is the goal, to get to full deployment in the region.	The Network's middle mile deployment into all South Bay cities will enable future expansion to businesses, residences, and neighborhood centers serving disadvantaged communities with telehealth, tele-education, city services, and workforce and digital training.	With 400 businesses and 12,000 homes to be served, this goal is expected to be advanced.	Micro-trenching and permit streamlining can accelerate deployment and offer replicable, scalable strategies for increasing deployment in various regions.