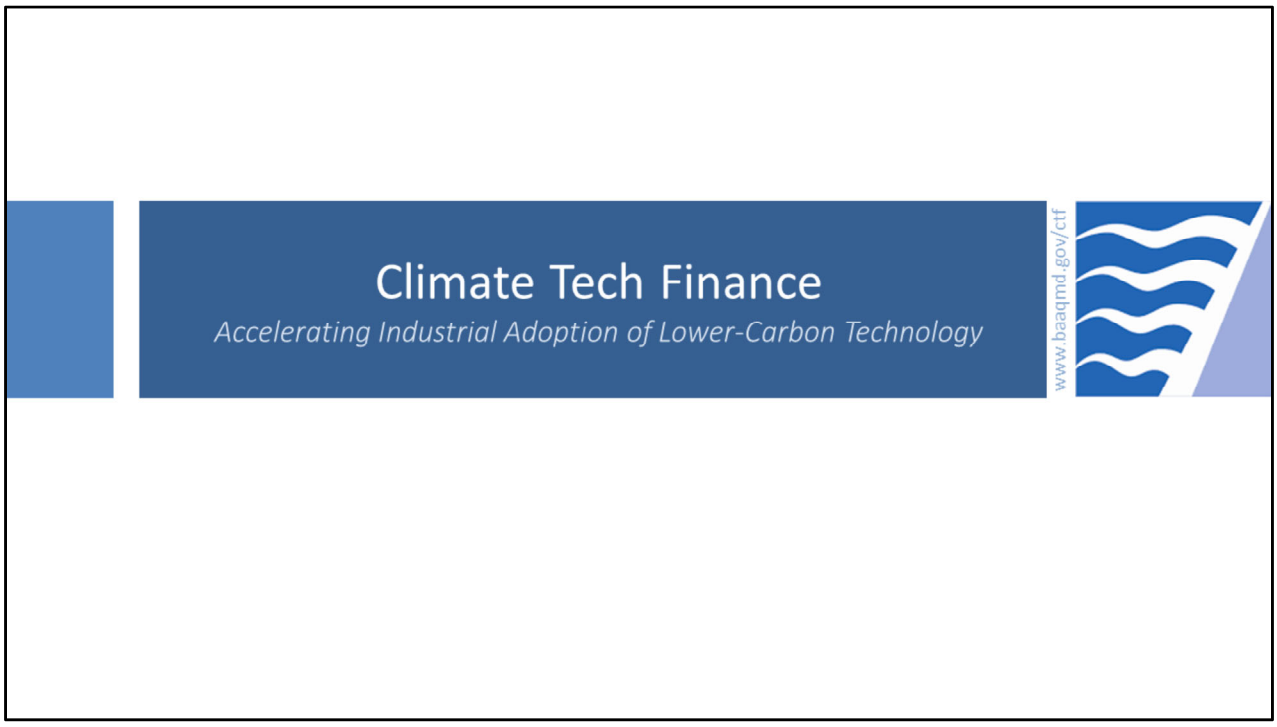


BAAQMD has developed a new incentive program to decarbonize industrial operations in the Bay Area. It is called Climate Tech Finance.

- Climate = reduction in GHG emissions or increase in GHG sequestration
- Tech = new or upgraded infrastructure
- Finance = incentive, in this case debt financing…but combined with matchmaking. (More on that later.)

In addition to introducing this program and making a bid for partners/participants, my ~10 minutes encourage attention to this dimension of "economic innovation:"

- Industrial decision making can = bureaucratically and temporally distributed decision-making.
- Distributed decision making = more complex to influence.
- Successfully incentivizing innovations > more than targeting decisions. It means bridging them.

The leitmotif: technology innovation = behavior change = bureaucratic alignment or innovation.

I am on this panel to explain a new incentive for reducing GHGs. To highlight what we are experiencing, I offer this cartoon:

(In this case, we can take the man in the buggy to be the incentive giver (like me), the horse to be the infrastructure that we seek to decarbonize, and the corner store represents the marketplace of other incentives shaping investment/decarbonization choices.)

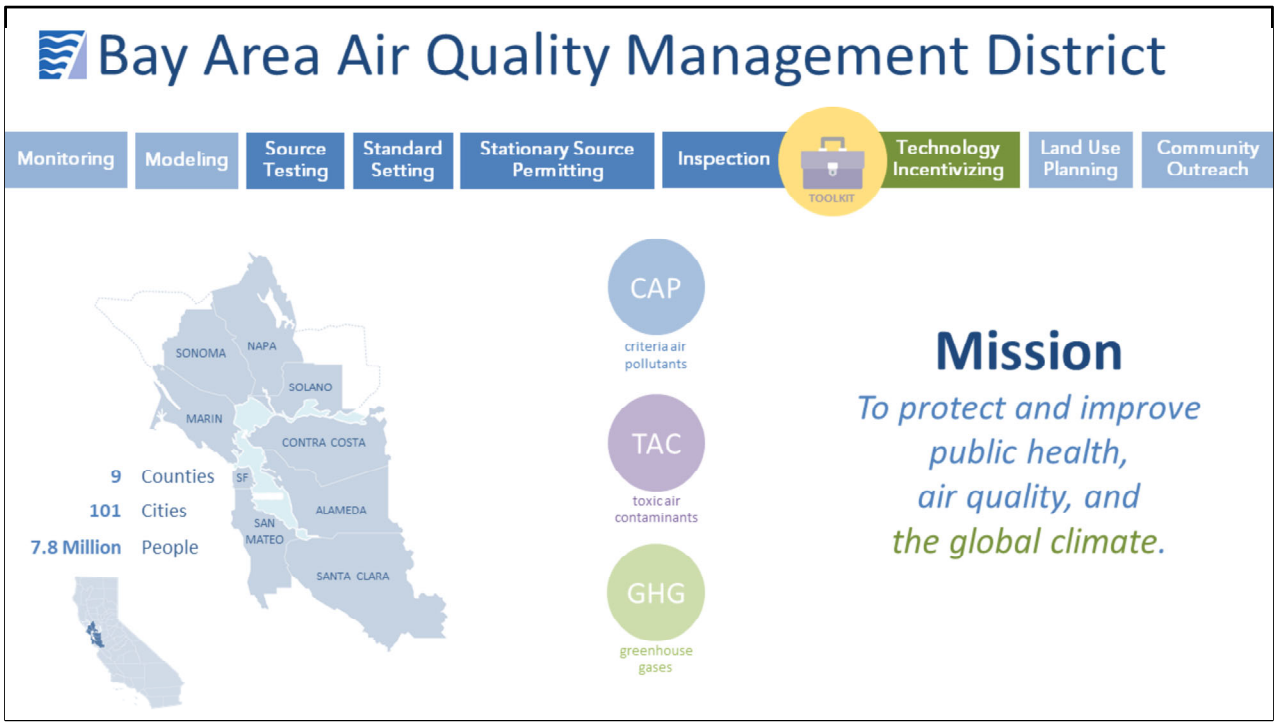
Here is what I aim to highlight:

- *An incentive needs to be not only attractive to the taker…but workable in decision cycles to induce behavior change or desired behavior.*
- *Q: How do people connect to the inducement, and what forms of cooperation are needed for them to act upon it?*

I am going to focus on the need to align GHG reduction incentives with industrial decision cycles and, we suspect, to bridge bureaucratic offices.

Presentation order:

- Quick intro to BAAQMD / GHG programs
- Innovation Gap Analysis → CTF
- CTF Beta-testing. Case study: WWTP.



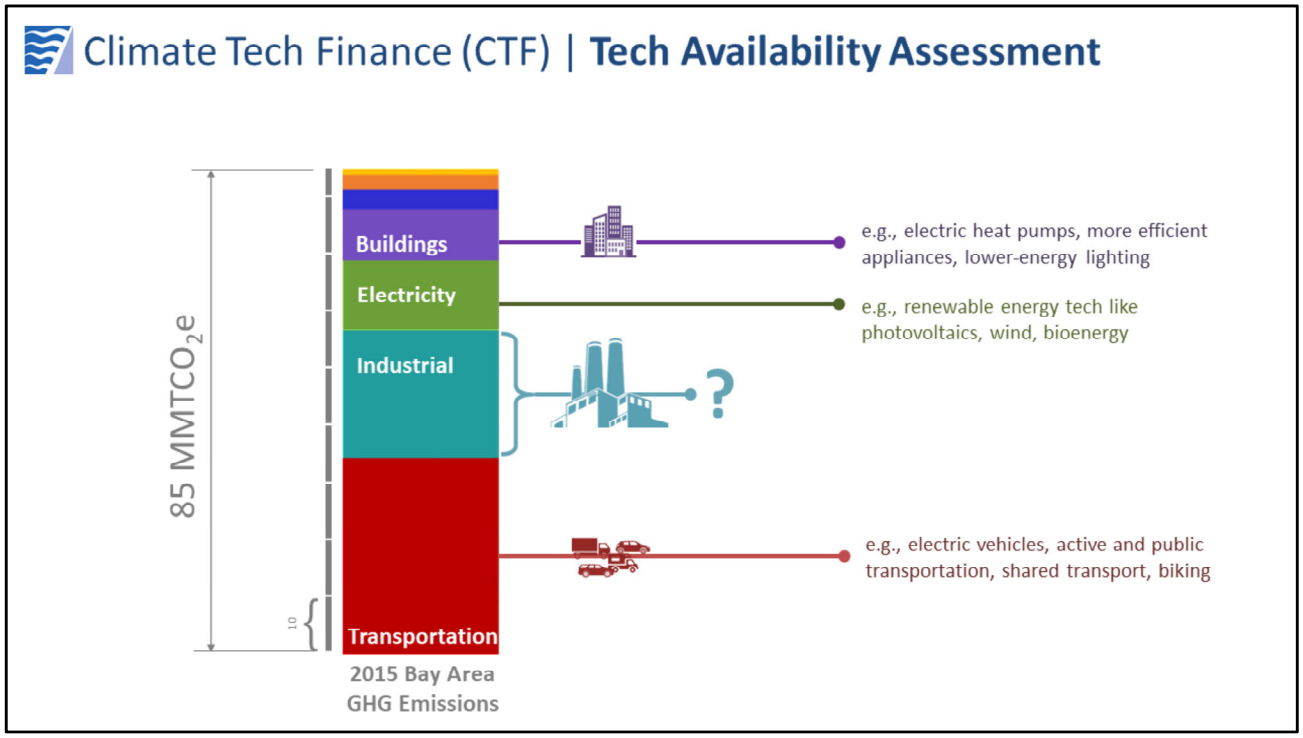
What is BAAQMD?

- The oldest (1955) and one of the largest of the 35 APCDs used to regulate air quality in the geologic air basins in California.
- Most of 9 counties and a population of just under 8 million.
- Countless emissions sources, some of which we permit and most of which we do not.

- Traditionally, the mission of air districts focused on local human health protection. This work's original core was scientific study and the pipeline of prescriptive (social) regulation for criteria and toxic air pollutants. Over time the policy toolkit has expanded to include financial incentives, land use planning, and mass communication.

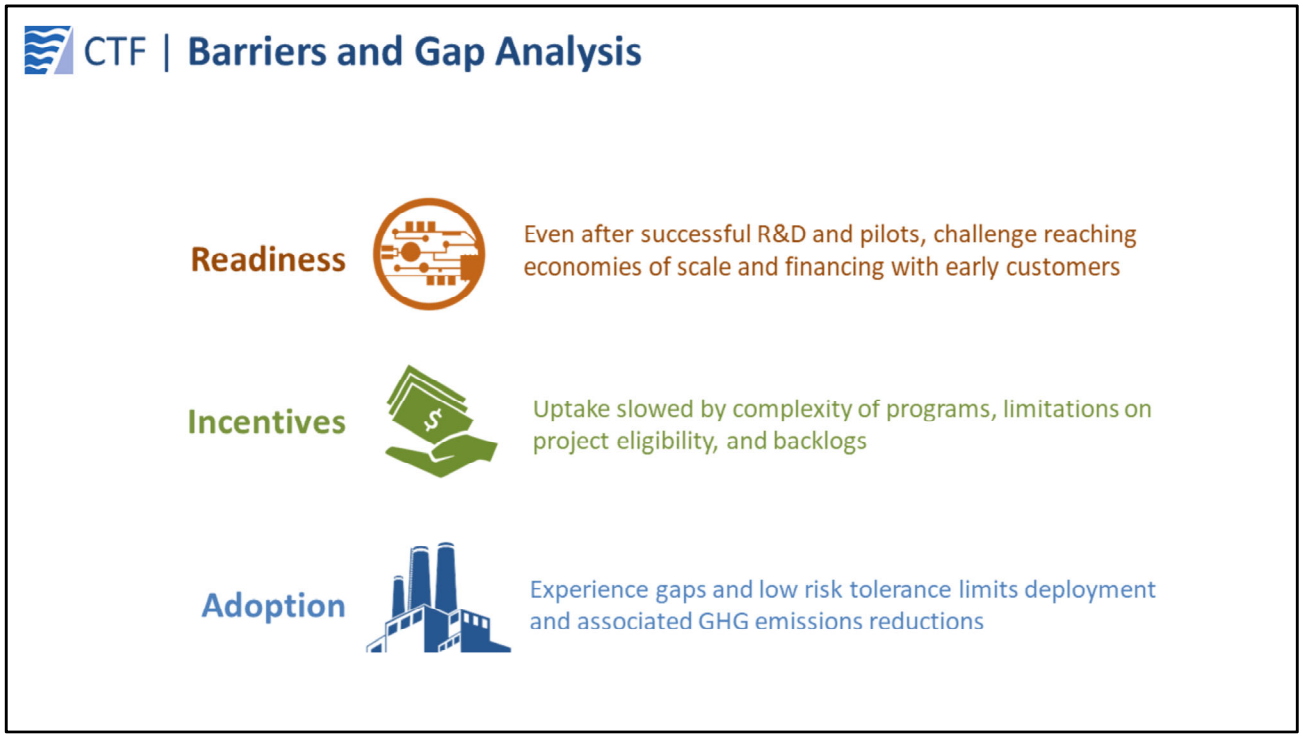
- Climate action is a newer and emerging part of BAAQMD's mission.
    - Lack legal authority to regulate like CAPs and TACs.
    - Can still study, support land use planning, and engage in mass communication.

Highlighted here: an effort to expand our technology incentive programs into GHG reduction.



Our Climate Tech Finance program is an effort to spur decarbonization. Its design is tailored to a particular problem that we see with industrial sources: a technology availability gap.

→ Here is a breakdown of the region's largest sources of GHGs. In comparison to transportation, electricity, and buildings, we observe relatively fewer carbon-lowering technologies for industrial facilities.



We have used discussions with financing agencies, technology developers, investors, customers to identify reasons for this technology gap and ways to spur innovation to close it.

Our "innovation potential and gap analysis" identified three types of barriers:

First Barrier: Technology Readiness to Deploy

- Technology gets developed, but high upfront costs, low (customer) revenue, limited access to debt financing = difficulty achieving economies of scale
- Effectively, technology does not get "over the hump."

Second barrier: funding to drive commercial readiness – i.e., to bridge demonstration to deployment.

- low (customer) revenue
- limited access to debt financing

Observations:

- More funding is available than is utilized, but…
  - Difficult to know what opportunities are available and which are

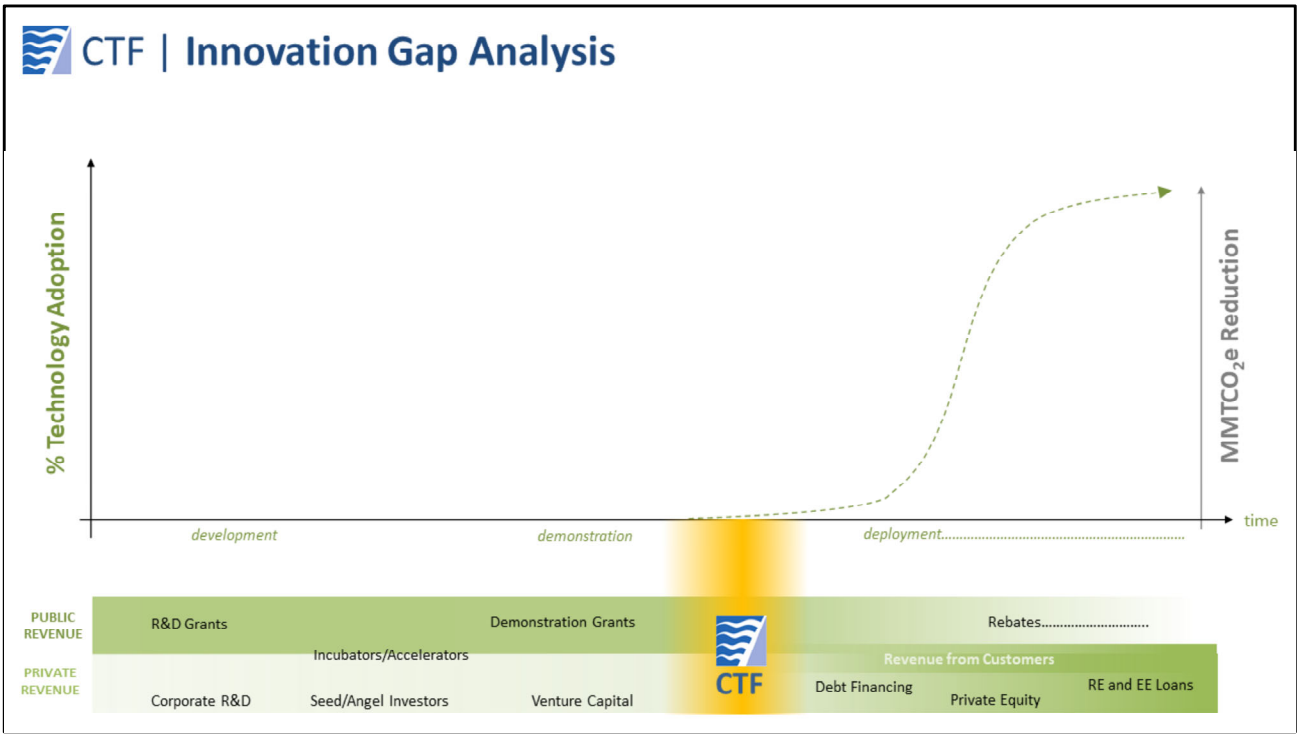
suitable
    - Limitations in eligibility

- Further, $ is not the only incentive folks need.
    - could be reduction in technology risk
    - could be cheaper information
    - could be partnerships and social learning support

So, we have been thinking broadly about incentives for climate action.

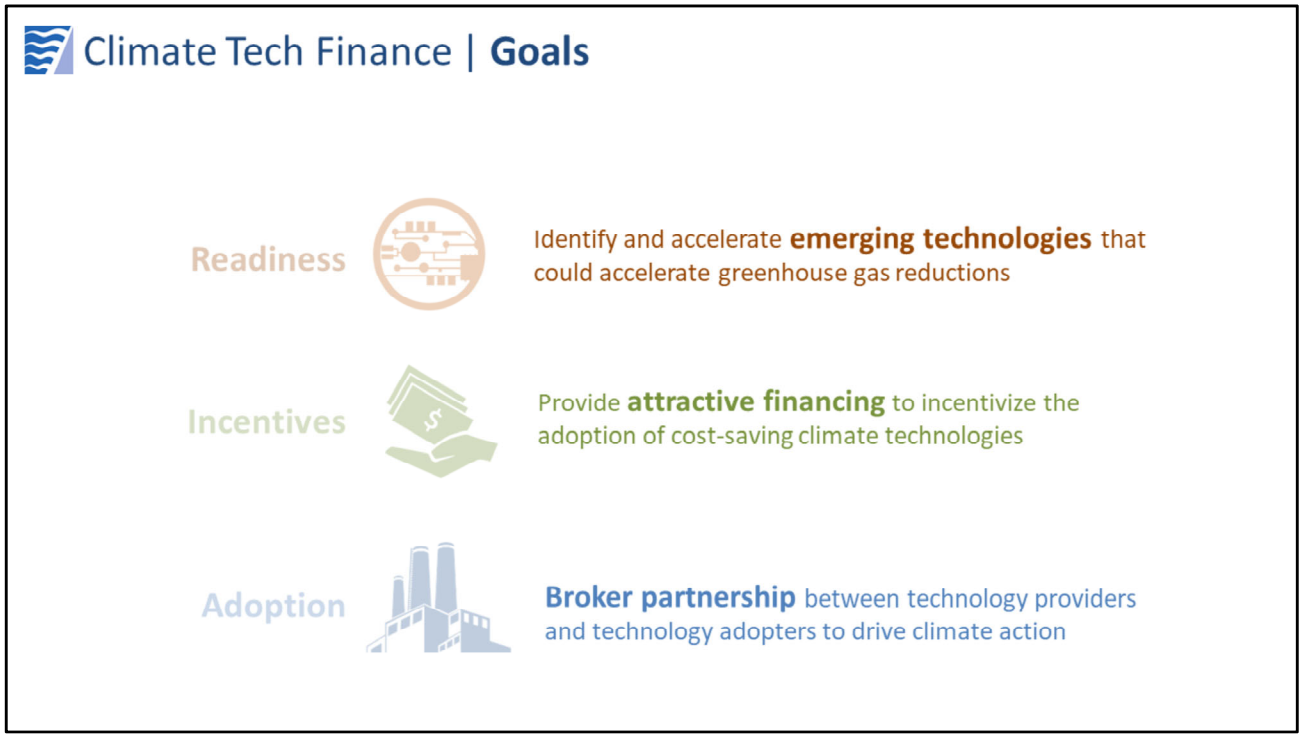
Third barrier: connections for customers to the technology.

- We observed technology developers having difficulty connecting to new customers.
- We observed adopters facing difficulty knowing about available and suitable opportunities.
- As well as low tolerance for risks – which is sector-dependent.
- And financing hurdles, even if cost savings can be achieved.



Climate Tech Finance is currently focused on incentivizing a gap between demonstration and deployment of technology.

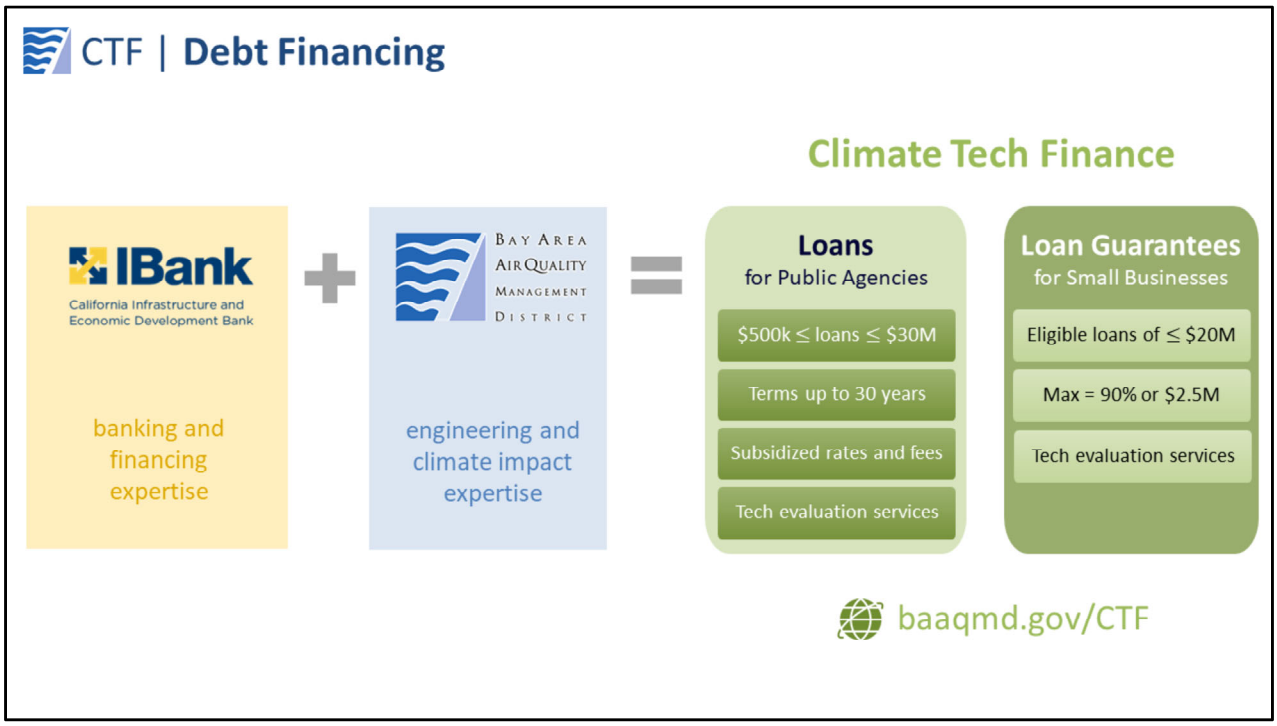
- Here depicted on a standard technology innovation curve (at the bottom), we see a gap and funding sources (double band at the top) to identify a financing gap.



Our goal is to address these three gaps simultaneously

- Help accelerate emerging tech at the financing gap
- Offer financing that fills this gap
- Support technology learning using a partnership concept.

The next three slides show the components of the climate tech finance program.



(1) Debt Financing

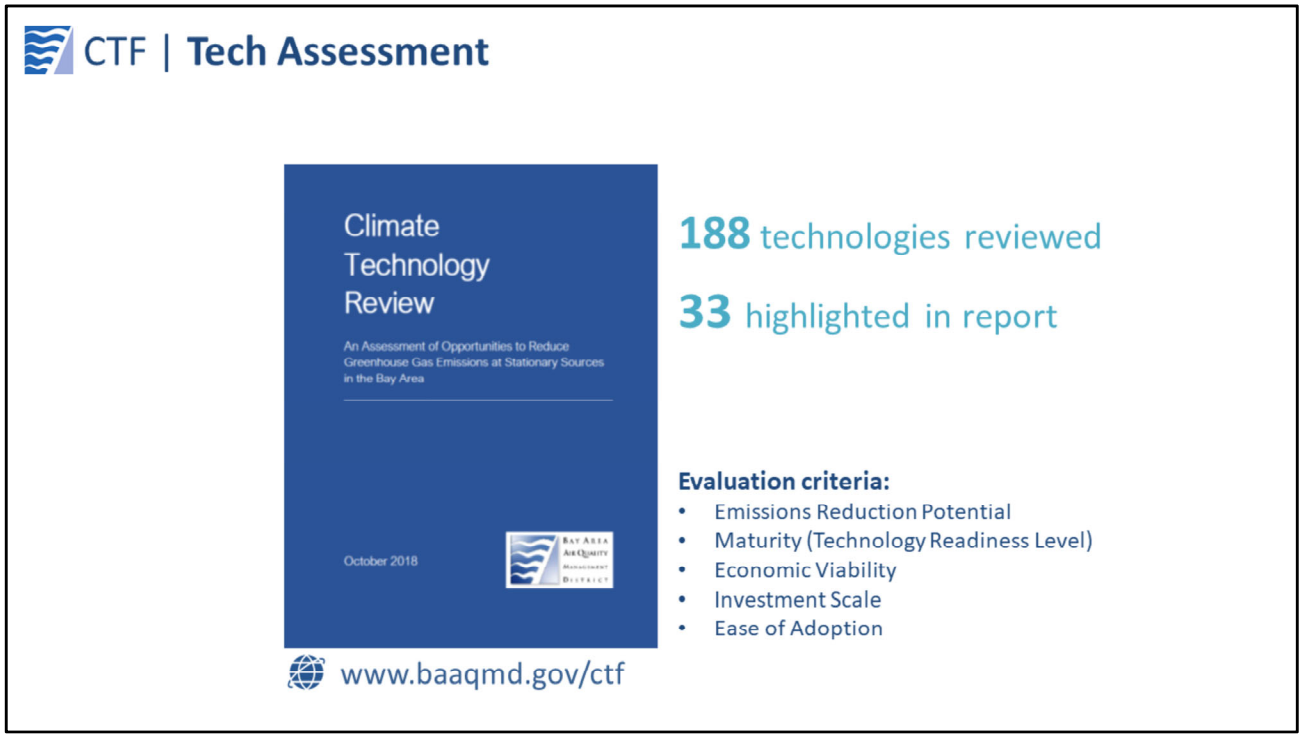
Two financial instruments:

- Low-interest and partially subsidized loans for public sector agencies (or nonprofits working closely with public sector agencies), and
  (Key partners: technology developers, technology users.)

- Loan guarantees of up to 90% (or $2.5 million) for private sector small biz. These are intended to reduce borrowing interest rates and collateral requirements.
  (Key partners: technology developers, technology users, commercial lenders.)

We are pleased to offer these products through a public-public partnership with the CA Infrastructure and Economic Development Bank.

- Meant to combine their financial expertise with our engineering and climate change mitigation expertise.
- Goal: to accelerate GHG reduction + emerging tech. That's the differentiator from existing IBank offering.



(2) Technology Assessment

We also undertook a cross-sector "Climate Technology Review." We did so to identify tech ready for deployment and to target our efforts there.

CTF | Matchmaking

Hosted exhibitor fair – Climate Tech Marketplace
(Bay Area Metro Center, Sep 2018)

Hosting networking events – Climate Tech Network
(Bay Area Metro Center, Jan 2019, May 2019, Aug 2019…)

Spoke at Energy, Utility & Environment Conference
(San Diego, Feb 2019) and AWMA West (SF, May 2019)

Sponsored and exhibited at Cleantech Forum
(San Francisco, Jan 2019) and VERGE (Oakland, Oct 2018)

(3) Matchmaking

- To facilitate partnership
- To inspire social learning between technology developers and customers
- To reduce technological change risk

CTF | Examples

Wastewater Treatment
(efficiency upgrades and redesigns)

Backup Generators
(batteries and storage technology)

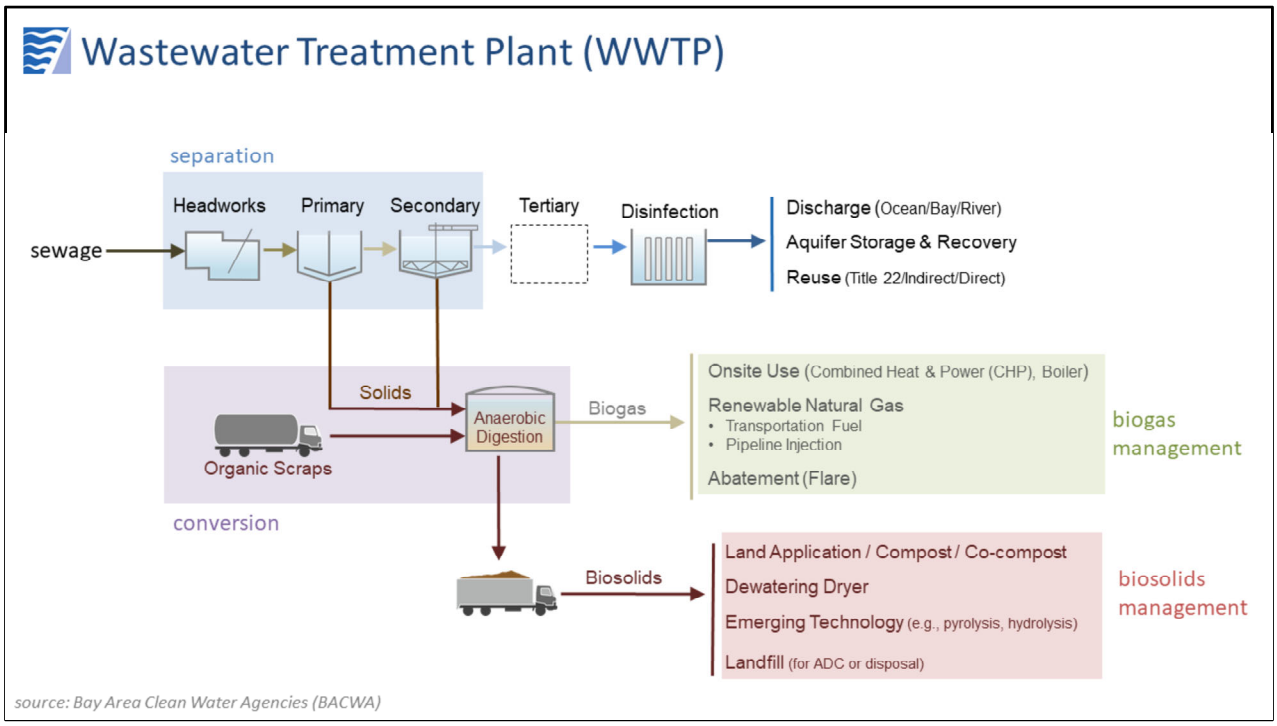
Resource Recovery
(landfill gas capture, WTE, sequestration)

Drawing on our Climate Tech Review, we have moved into “beta-testing.”

- Wastewater treatment: financing upgrades to increase energy efficient nitrogen removal.
- Backup generators: financing the replacement of diesel generators with battery generators.
- Resource Recovery: financing upgrades at landfill to cap gas emissions and use them to generate energy (i.e. waste-to-energy).

Dive into WWTP as a case study.

Here is a representative wastewater treatment plant. Major components are highlighted and labeled.

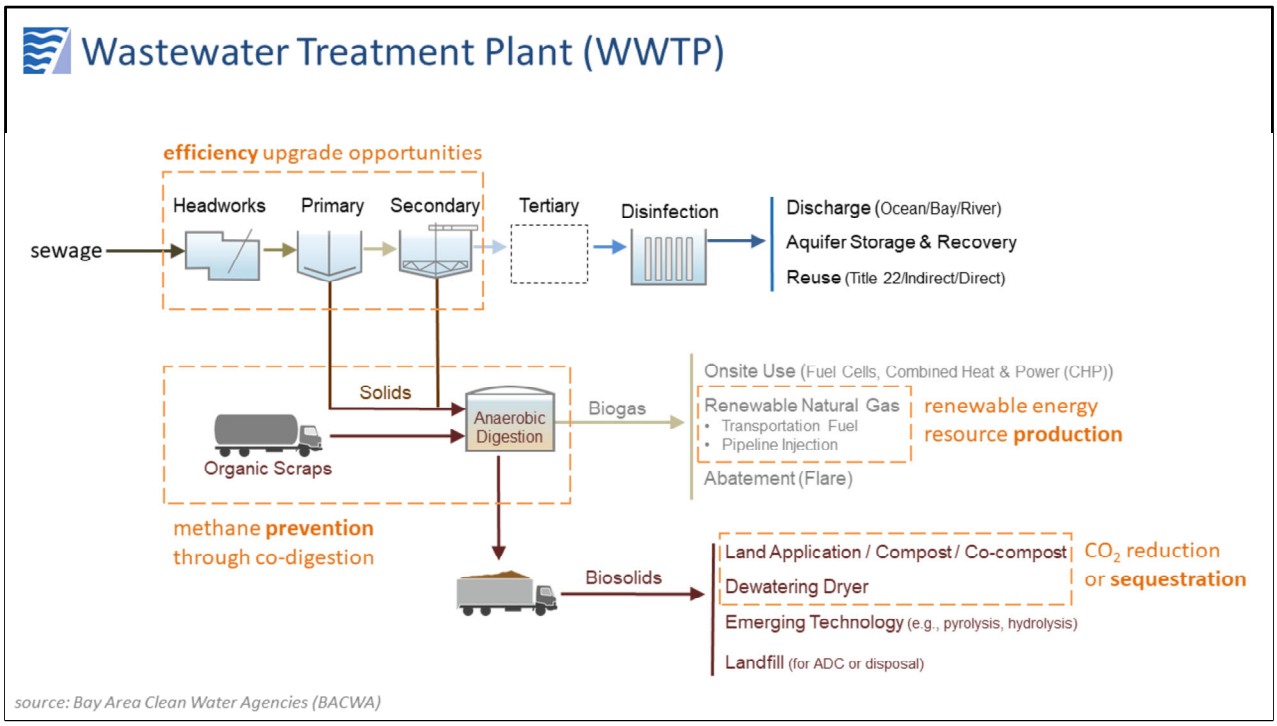


This slides generalizes the design of a wastewater treatment plant.

Same color scheme used in a flow diagram of the plant.

Complicated picture.

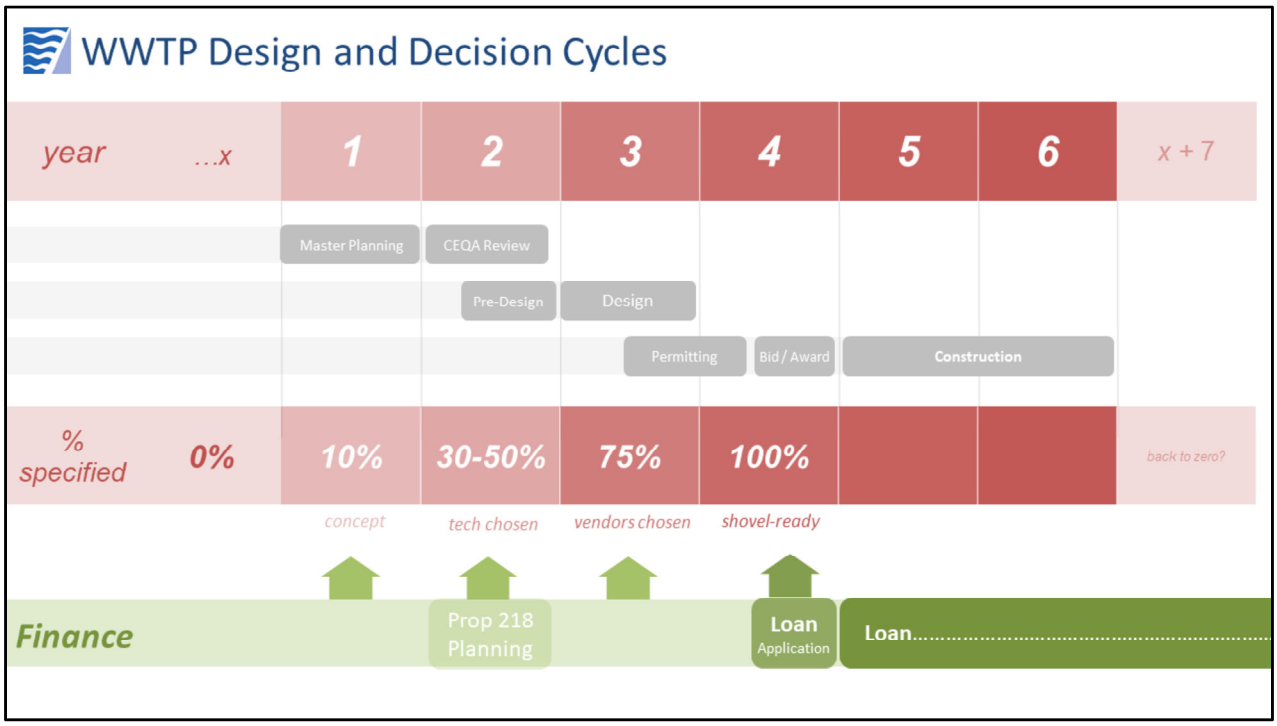
Simple point: a complex, multi-step, interdependent industrial facility.



There are different areas/ways that plants can upgrade:

- Newer / more efficient primary and secondary separation technology
- Retrofit to allow food waste co-digestion
- Improved capture and utilization of their methane-based biogas
- Recovery of biosolids for their nutrient and carbon content

In short, there are emerging technology-based, GHG reductions possibilities.



As shown at the top…

- Completing tech changes or upgrades like this stretches across somewhere between 5-10 years. (*Here illustrated as 6.*)

As shown in the middle…

- Over the course of these years, the operating concept and technologies get increasingly specified by analyses and bureaucratic decision making. *(Note: not pictured are any board approvals that WW treatment districts go through.)*

As shown at the bottom, one more line for financing

- Offering debt financing means that the decision to use CTF comes late in the process.
- At that point, the concept and technologies are locked down.

Insight: spurring emerging, carbon-lowering technology into a WWTP means these things:

- Aligning with a years-long process, and
- Encouraging engagement points or analyses at the concept, technology choice, and vendor choices phases.

Interested in participating? We are seeking partners.

Chad White, PhD
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Bay Area Air Quality Management District

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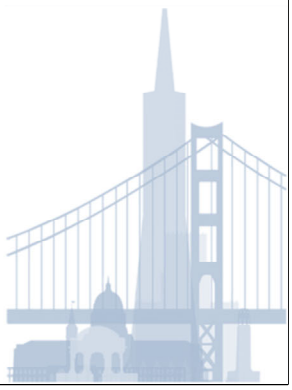

Thank you for this opportunity to participate in this conversation.

I want to wrap up by expressing interest in program participants, discussion partners, and even critics to help us launch and refine this effort.