DOCKETED	
Docket Number:	20-IEPR-02
Project Title:	Transportation
TN #:	233635
Document Title:	Lessons Learned from Electricity Policy for Transportation Electrification
Description:	Presentation by Noel Crisostomo, CEC
Filer:	Raquel Kravitz
Organization:	Energy Commission
Submitter Role:	Commission Staff
Submission Date:	6/23/2020 9:56:46 PM
Docketed Date:	6/24/2020

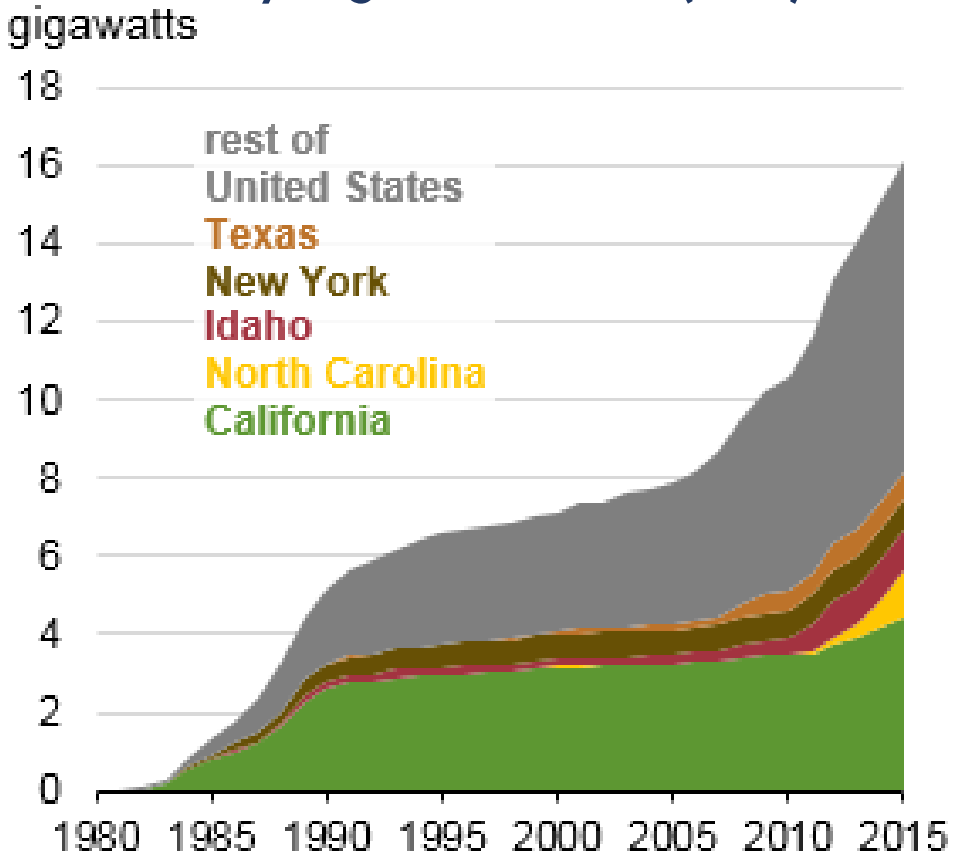
Lessons Learned from Electricity Policy for Transportation Electrification

Can California Accelerate Investments in Charging Infrastructure by Capitalizing on the "Avoided Cost of Charging"?

Noel S. Crisostomo | Fuels and Transportation Division | Integrated Energy Policy Report Workshop - June 24, 2020

Lessons learned from the federal Public Utility Regulatory Policies Act (PURPA)

EIA: Cumulative capacity of PURPA Qualifying Facilities (QF)

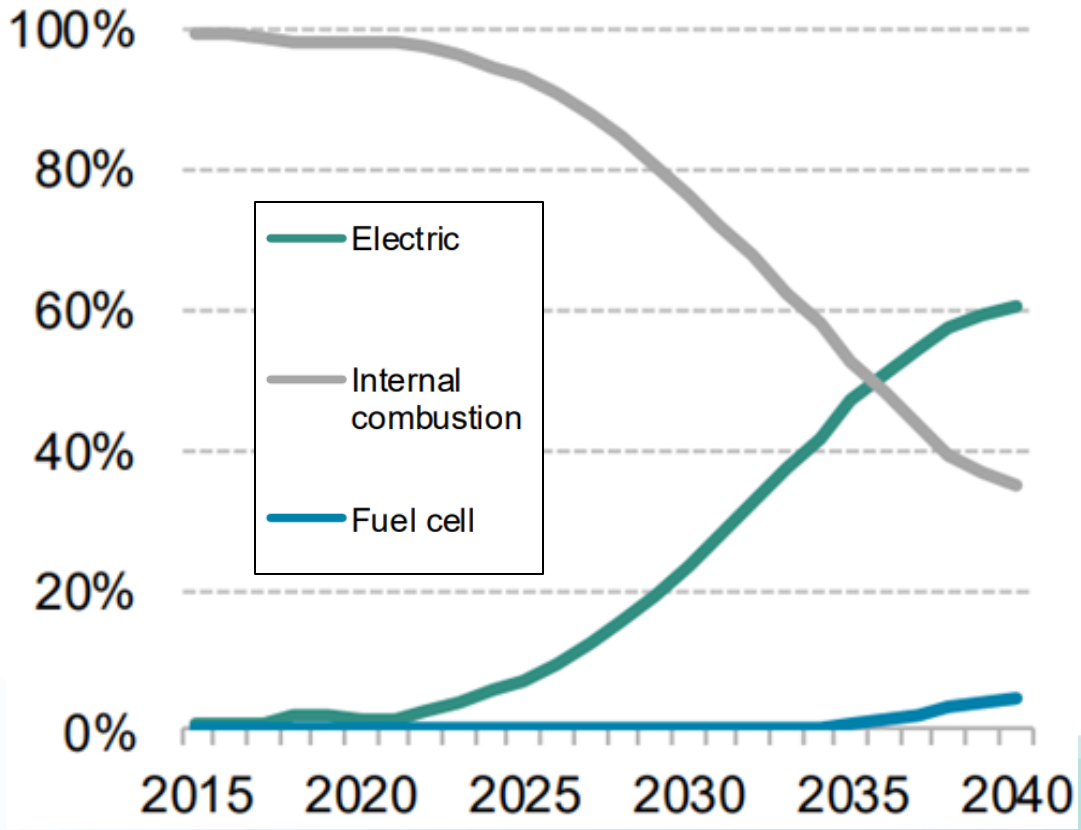


- Required utilities to buy cheaper and cleaner power from independent companies, opening up the market
- Garnered 3 GW of private investment in independent power production in California in less than 10 years
- Saved ratepayers money
- Spurred a complete transformation of the national electric sector

US EIA https://www.eia.gov/todayinenergy/detail.php?id=27632

Should California pass a Transportation Electrification Regulatory Policies Act (TERPA) modeled after PURPA?

BNEF: U.S. share of total annual passenger vehicle sales by drivetrain



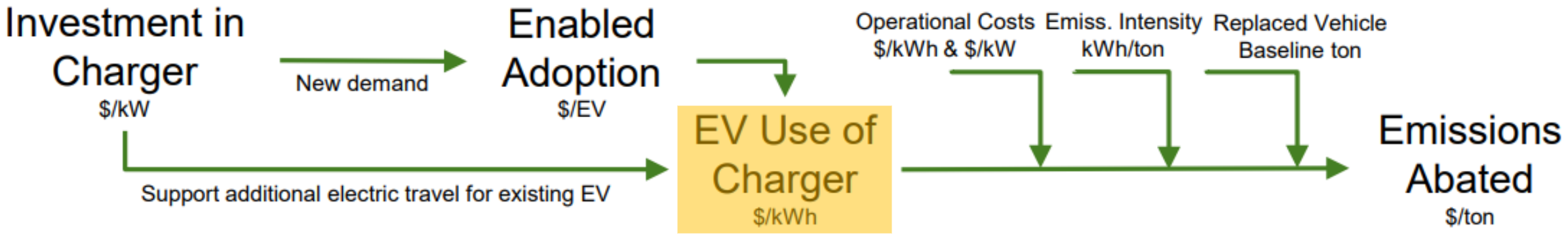
- California must invest in charging infrastructure so that the full scope of transportation end-uses can electrify at the scale and speed to meet the state's climate change and air quality goals.
- A metric is needed to account benefits, align stakeholders, and catalyze the private sector.
  - Easy to calculate
  - Robust and replicable in California, and elsewhere

Comparing PURPA with the Proposed "TERPA" Concept

PURPA (U.S., 1978)	"TERPA" Concept
Policy and economic objectives	
Conserve resources, diversification	Climate security, air quality, equity
Utility responsibility to the public interest	
Serve load at just and reasonable rates	Min. cost & max. benefit to serving EVs
Obligation and mechanism to encourage independent investment	
Interconnect & purchase power from QFs and SPPs at the utility's "Avoided Cost"	Connect & invest in EV service providers at the regional "Avoided Cost of Charging"
Eligibility requirements	
Efficient, reliable output, interconnection	Capable, safe, efficient, interoperable

https://www.govinfo.gov/content/pkg/STATUTE-92/pdf/STATUTE-92-Pg3117.pdf

Avoided Cost of Charging = $\frac{Public\ Investment\ (\$)}{Capability\ (kW \times h)}$



1. *Evolve* with emissions targets, EV & EVSE technology, and behavior.
2. Be *directly measurable* for proven hours of use (h_m) **or** be *reasonably projected* (h_p) for new solutions that could be better fit to regional needs.
3. *Economize* among utility-driven and independent charging services.
4. Be implemented with *technical standards* to deploy high-quality equipment.

Themes for this afternoon's discussions and questions to further develop the TERPA concept

Investment Prospects for Scaling VGI (Panel 1)

- Can using a common metric like the Avoided Cost of Charging help provide clarity for investors in TE and VGI solutions?
- Does the ACC achieve balance in accountability and flexibility?

Potential New Business Models for Private Investment (Panel 2)

- How does the *investment per capability* metric factor into the design of the EVSPs' approaches to charging infrastructure?
- What project financing models could emerge from a "TERPA"?

Please see the Appendix for a detailed explanation of the Avoided Cost of Charging model and further questions for stakeholders to develop the TERPA concept.

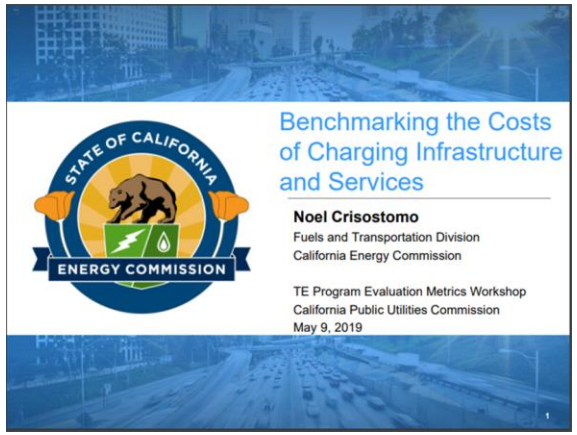
Thank You!

Comments and Questions?

Please contact:

Noel Crisostomo
Air Pollution Specialist
Fuels and Transportation Division
California Energy Commission
noel.crisostomo@energy.ca.gov

Further discussions on the Avoided Cost of Charging & Infrastructure Deployment Strategies (hyperlinked images)



https://www.cpuc.ca.gov/WorkArea/DownloadAsset.aspx?id=6442461298,
https://www.cpuc.ca.gov/WorkArea/DownloadAsset.aspx?id=6442464762

Appendix

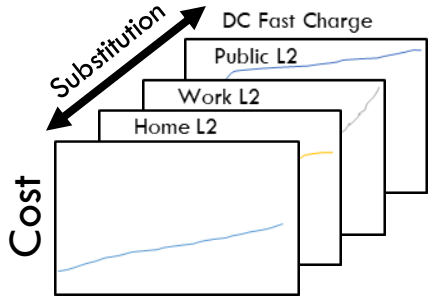
1. The following slides provide an economic model applying the Avoided Cost of Charging within a process that analyzes:
   - Regional charging infrastructure supplies and a comparison of alternatives (A) (B)
   - Statewide charging infrastructure demand that is consistent with state laws (C)
   - The prices at which the public sector could invest in pursuit of state laws (D)
   - Sensitivities in supply (e.g. non-EV factors, regulation, innovation) and demand (new decarbonization policy) (D) (E)
   - These steps help 1) determine a cost-beneficial charging supply and 2) quantify alternative options for the needed level of public charging investment (F)
2. The slides conclude with questions to guide stakeholder feedback.

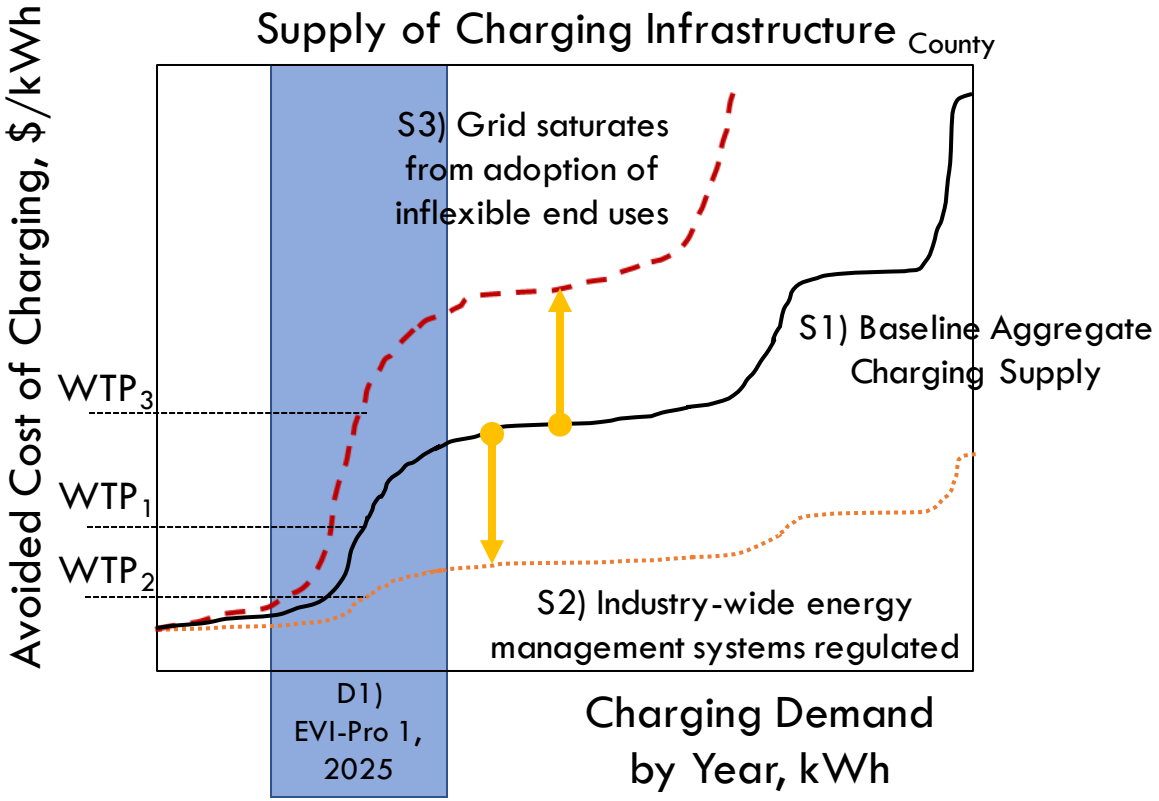
1. TERPA in Practice

A

Regional analyses suggest that the cost of energy supplied increases as more capacity is installed, by:

- Building stock & vintage
- Parking & real estate value
- Distribution loading
- Urban or rural stations
- Hard-to-reach drivers





B

Using periodically-updated local plans and requests for proposals (RFP) seeking the public investment needed to enable a charging capability, **aggregated supply (S) curves** [S1] can be compared to regulatory demands (D).

C

CEC's AB 2127 assessments of infrastructure needs that are commensurate with **complying with emission regulations and policy objectives** could be represented by two vertical demand curves [D1]. These reflect behavioral uncertainties and the state's willingness to pay (WTP) to achieve high levels of fuel switching from gasoline. Absent widely-available charging infrastructure to complement electric vehicles as an alternative to gasoline, switching is infeasible for drivers, causing its demand to considered to be considered "inelastic" (see footnote).

D

WTP can be calculated (with the median of D1 shown) for alternatives where external factors decrease cost [S2] or increase cost [S3], similarly affecting **the public investment required** for regulatory compliance and increasing driver confidence.

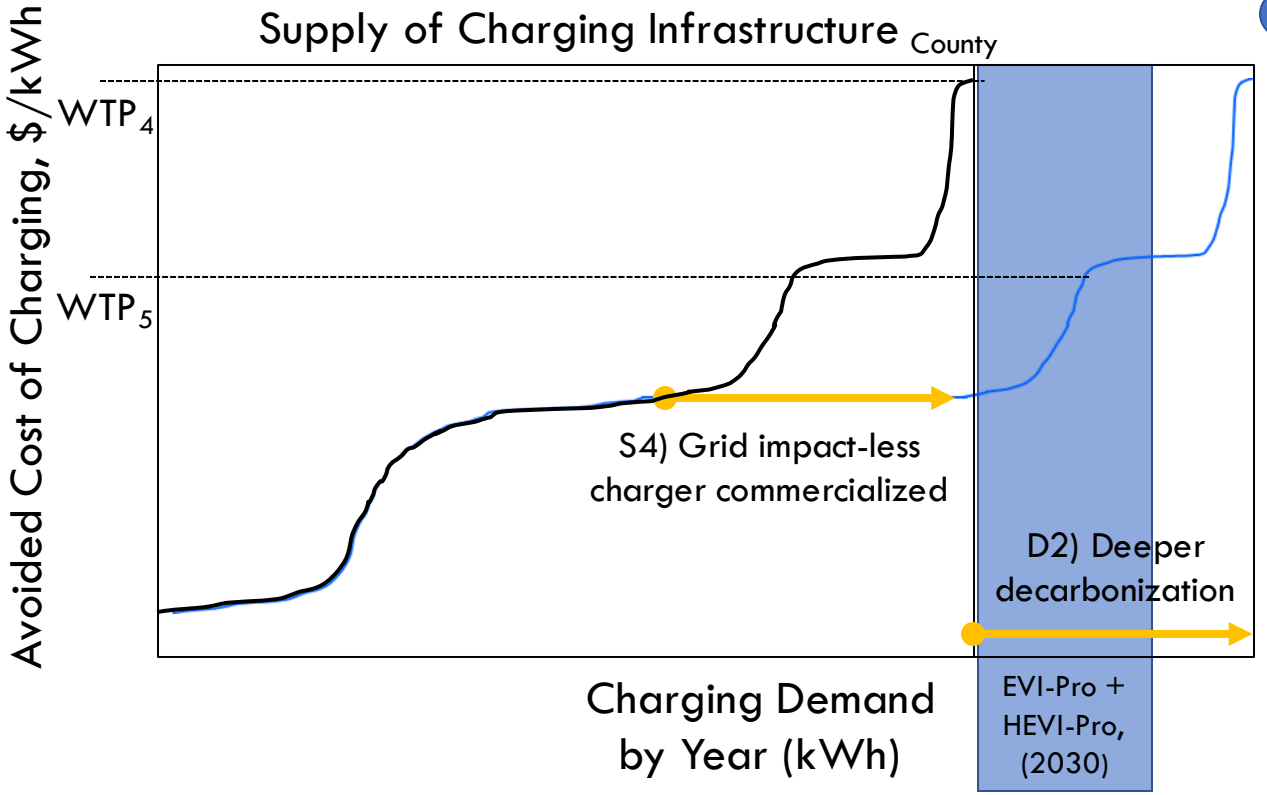
https://www.bls.gov/opub/btn/volume-5/using-gasoline-data-to-explain-inelasticity.htm

1. TERPA in Practice

E

This model accommodates **extended regulatory scope to include additional vehicle classes and target timeframes** [D2]. Since supply costs may increase as electrification scales, transparent and updated grid data is critical to send appropriate signals to the market for investment and innovation.

Periodic RFPs **facilitate new technologies** [S4] that aid the cost-benefit of TE and maintain competition. These RFPs offer ex ante market transparency, which can be compared to further RFPs to track improvement without analysis of confidential business data in detail.



F

This WTP discovery process identifies the most **cost-beneficial local portfolio of charging supplies needed to meet an electrification objective** without discriminating against edge case business models that target high use (but requiring fewer stations) or defect from the grid (which decrease the system benefits where EV revenues exceed the cost of serving them).

Like its namesake, the Avoided Cost of Charging (ACC) provides an indicator that public investors and advocates can use to compare conventional program expenditures. As an improvement to the PURPA Avoided Cost, the ACC can be a **basis for budgeting and specializing incentives that accommodate solutions according to their capital or operational barriers** (see formulas below).

$$Aggressive\ Public\ Investment, 2030\ (\$) = WTP_5 * (EVIPro + HEVIPro)$$

$$At\ Cost\ Public\ Investment, 2030\ (\$) = Area\ under\ S4\ fr.0\ to\ EVIPro + HEVIPro$$

1. TERPA supports stakeholders' common interests to advance Transportation Electrification:

- CARB – Quantifies and can improve cost-benefit of necessary electrification to meet goals
- CPUC – Reduces ratepayer burdens; procurement structure creates incentives innovation and private leverage (e.g. Aggressive or At Cost)
- Municipal & regional government – Ensures that charging complements a locality's built environment goals
- Transportation planners – ACC can be applied to quantify emissions reductions across modes to encourage shifting
- Advocates – Harmonizes ratepayer and environmental metrics and is based on framework that diversified and cleaned power grid
- Disadvantaged and Low-Income Communities – Local needs can be directly incorporated within the demand analysis to ensure investment
- Automakers – Helps serve EVs quickly by creating a value target for the development of new use cases and charging technologies
- EVSE Manufacturers – Provides market certainty necessary for economies of scale production
- EV Service Providers – RFP based on ACC does not discriminate by minimizing component first cost, encouraging new business models
- Utilities – Provides regulatory certainty; opportunities to fairly leverage grid and customer data to expedite scaled load service
- Community Choice Aggregators – ACC can internalize the benefits of low carbon intensity and target installations
- DER Aggregators – Smart charging and vehicle-to-grid can be valued as deferred or avoided infrastructure expansion
- Installers – Improved certainty in types of project deployments improves guarantee of work
- Permitting authorities – Can quantify "readiness" and reach codes within the investment effort
- Universities and Laboratories – ACC raises new analytical need to optimize local infrastructure choices (forms and lifecycle operations)
- Financial Community – provides long-term market certainty and mechanism for contracting with variety of emerging solutions

2. Questions and Prompts

1. What level of detailed regional market analysis is needed to build charging "supply curves"? What data should be solicited to derive a fair and accurate ACC? How frequently should RFPs be conducted?
2. Should charging infrastructure "needs" be considered an inelastic demand (as portrayed with a range of vertical demand curves)?
3. Given your response to Q2 and its effect on the public's "WTP," what other sensitivities should be incorporated into this model to most accurately quantify supply? How can the ACC be just and reasonable in meeting goals?
4. Comment on the formulations of "Aggressive" and "At Cost" Public Investment. As these principally vary in the level of *producer surplus,* which of these best offers opportunities to highly-leverage private capital?
5. Do stakeholders agree with the prospective benefits in the policy as conceptualized? What are additional benefits (pros) and challenges (cons)?
6. Please provide other feedback to improve the policy development.