

CARE California Carpet Stewardship Program MODEL TEAM UPDATE

August 29, 2019



An initiative of CARE:
Carpet America Recovery Effort

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Summary

Based on current market conditions for competitive polymers and carpet sales in CA the Modeling Team recommends no changes in the subsidy or assessment levels. Both model team and Crowe analysis reflect that the existing subsidy levels are sufficient to enable processors to be competitive in the marketplace at a price 10 cents below that of post-industrial (PI) materials for all materials that are currently produced by processors and manufacturers as shown in Table 3 for August 2019 and Table 4 for March 2020.

The Modeling Team is monitoring the N6 and N66 market prices. The N66 price is converging downwards towards the N6 price as short-term tight market supply issues unwind. This means that the current N66 subsidy, which has been well above what is required to incentivize the marketplace, will become closer to that required. The N6 price downward drift will mean the subsidy will be very close to maintaining the 10 cent gap but may require adjustment in the future should prices continue to decline.

The assessment level is sufficient to maintain the current subsidy payments given that the goals of 24% recycled output are achieved, see Figures 3 and 4. If the sales of carpet in CA continue their accelerating downward trend and as recycled output grows, the fund will show a further decline in its balance but not one that takes it below the required reserve. The Modeling Team will continue to monitor the financial model results to confirm that the balance is not threatening the long-term viability of the program.

The current status of the model components and their integration has been reviewed recently by Crowe LLP and they have made recommendations for improvements. The Modeling Team has responded to their input and is considering changes to the models that are used in support of the subsidy and assessment calculations. As there were no major flaws or concerns reported, during the next 6-month model review period the Modeling Team will re-evaluate all recommendations made in the Crowe Model Analysis report and determine if and how they may be incorporated. Specific recommendations, breaking revenue and costs apart (e.g., separate out transportation rather than reflecting as discounted material revenue rate) and expanding from an operational cash cost model by incorporating depreciation. CARE agrees with these improvement areas. Recent developments in the PET chemical recycling area are also under evaluation for modified subsidy consideration especially as it relates to densified PET feedstocks.

The main modification under consideration is to include an explicit transportation cost parameter to account for the differences in the logistics costs for carpet in different regions in CA and collected at CARE drop-off locations. Overall Crowe concluded the current subsidies and assessment are adequate to support program goals. Further, Crowe concluded the models are reasonable and effective tools.

Again, based upon both the Crowe analysis and model team examination, no adjustments to the models themselves are proposed at this time based on the latest review. Changes will be evaluated in detail and implemented as appropriate in the next model update cycle schedule and will be reported on in the March/April timeframe as required by CalRecycle.

Modeling Team Report

Methodology

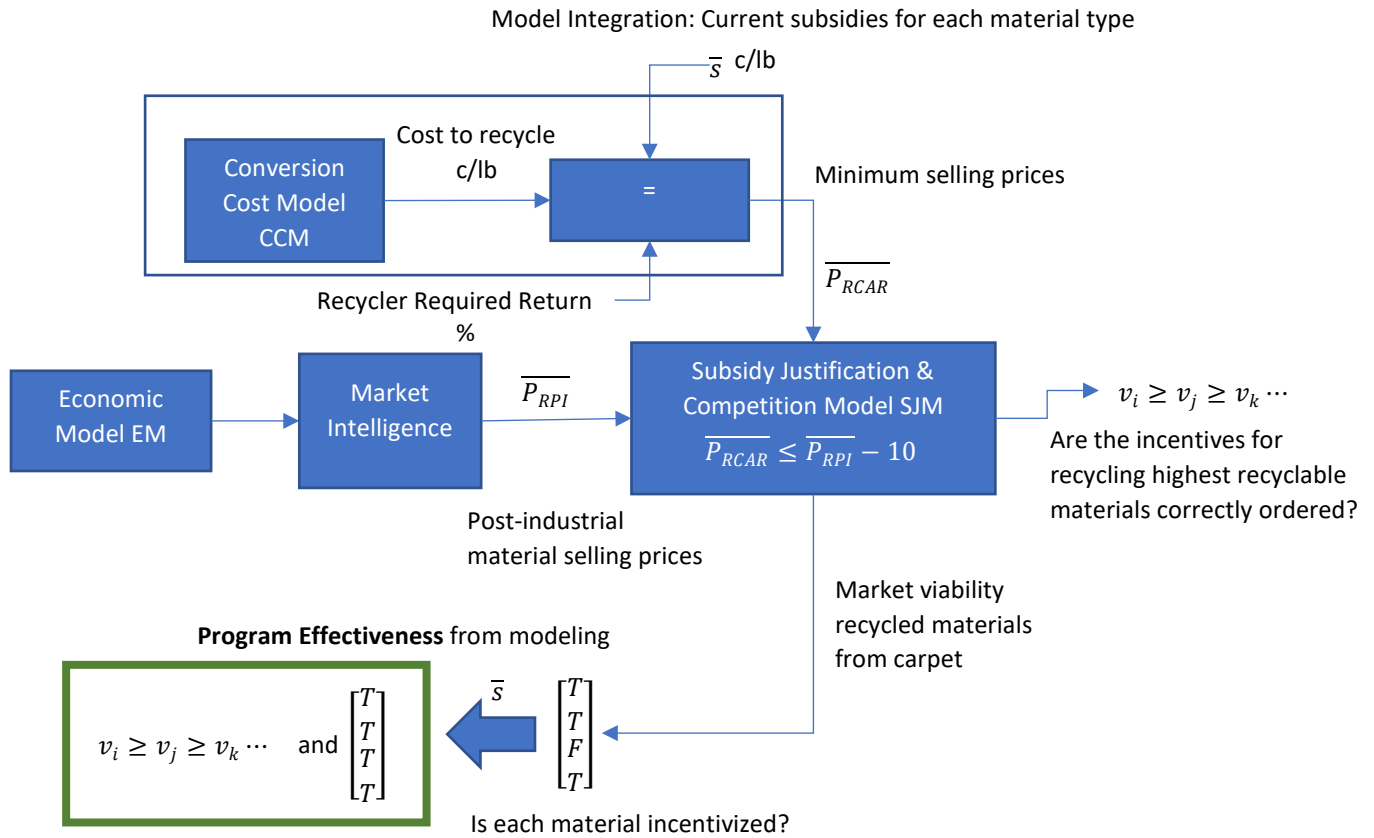
The overall method of using the models is presented in Figure 1 and has been presented previously to CalRecycle. The Economic Model (EM) was used to make price predictions for competitive PI polymers and calibrated using actual market data input from Frank Endrenyi. The Cost Conversion Model (CCM) was used to make estimates of the costs of recovering the PCC materials. The Subsidy Justification Model (SJM) was used to find the required subsidies for the PCC materials that would make them economically attractive relative to the competitive PI materials. It was confirmed that the subsidies satisfied the conditions to make the materials competitive and that the highest recyclable materials received a subsidy that made them the most attractive materials to recycle.

The use of models and recent feedback by Crowe LLP will aid CARE in future evolution of these models to guide our efforts. Given the unique and small volume of the PCC materials markets, CARE is the only source of such information and we continue our efforts to gain a deeper understanding. We will, as required, continue to update and evolve the models regularly and share those results with CalRecycle.

Methodology - Future Recommendations

The modeling approach has recently been reviewed by Crowe LLP and we are evaluating their recommendations for improving the modeling methodology. One of their recommendations was to improve the representation of the costs of carpet collection and transportation. This is currently handled in the Cost Conversion Model (CCM) with a uniform payment for carpet acquisition. In the future we will build an explicit cost of carpet acquisition model (CAM) component that will enable us to examine how logistics and collection costs change the conversion costs. Part of this CAM will be the inclusion of material from CARE drop-off sites that are distributed across rural counties as opposed to the urban centers. It should be noted that the vast majority of carpet (>85%) that is currently processed does not come from CARE drop-off sites and therefore the CCM is not significantly biased by its exclusion of this source of material.

Figure 1 Modeling Methodology



Economic Model Results

The predictions for the next 6-10 months – from September 2019 to June 2020 are for slow to moderate economic growth with little change in oil prices from those today.

Table 1 Expected cost of crude oil August 2019- June 2020.

Name	Spot/Contract	Unit	Aug-19	Dec-19	Mar-20	Jun-20
CRUDE OIL						
Crude Oil	OPEC	\$/bbl	69.0	67.0	63.0	63.0
Crude Oil	WTI	\$/bbl	64.2	64.5	61.6	62.8
Crude Oil	BRENT	\$/bbl	72.0	70.0	66.0	67.0



Based on these oil prices and forecasts for low to moderate economic growth we have the following ranges for the prices of virgin, post-industrial and then post-consumer prices.

Table 2 Economic Model Price Predictions

Expectations						
		Low Forecast		This Year		High Forecast
Oil	\$ / barrel	50	55	60	64	69
Nylon 6,6						
Virgin	Cents/lb.	154	157	162	166	169
Post-Industrial	Cents/lb.	85	87	89	91	93
Post-Consumer	Cents/lb.	79	80	81	82	83
Nylon 6						
Virgin	Cents/lb.	98	100	102	105	107
Post-Industrial	Cents/lb.	59	60	61	63	64
Post-Consumer	Cents/lb.	46	48	49	50	52
PET						
Virgin	Cents/lb.	57	60	65	70	74
Post-Industrial	Cents/lb.	34	36	39	42	44
Post-Consumer	Cents/lb.	29	30	32	33	34
Polypropylene						
Virgin	Cents/lb.	57	60	64	68	71
Post-Industrial	Cents/lb.	37	39	41	44	45
Post-Consumer	Cents/lb.	29	30	31	32	33

Cost Conversion and Subsidy Justification Model Results

Table 3 below shows the subsidy levels as of August 2019. The current market prices for the PI materials are given in column B. The 10c discount is applied to those materials that are sold in the market, i.e. excluding the N6 and PET fiber which are only used internally, and the prices for PCC material to be competitive are marked in column

D. The estimates of the cash cost of conversion are given in column G and the subsidy required to make the materials competitive in the marketplace in column H. The subsidies are compared line-by-line with the current subsidy from Table 8A of the approved plan. It is shown that the subsidies are all higher than required, except for PET pellets. Given the growth of PET carpet in the marketplace, and its attendant volume in the recycle stream, it is possible that this subsidy will require further support to enable PET pellet material to compete with bottle flake. The Modeling Team will continue to monitor the subsidy on PET pellets. If new market opportunities emerge for PET pellets it may be necessary to increase the subsidy to allow for market penetration, similar to the development of the PC4 market.

Table 3 SJM Results Effective August 2019

Table 7 (in Plan)	Subsidy Justification Model - In effect Today								
	B	C	D	E	F	G	H	I	J
	Competitive	PCC	PCC	PCC Carpet	15%	Conv. Cost	Subsidy Required	PCC Materials	Subsidy
	Materials	Discount	Materials	Conversion	Return	Plus	to Incentivize	Subsidy ⁶	Difference ⁴
	Market Price		Market Price	Cost ²	Conv. Cost ³	Return	PCC Materials	Table 8A	
Formula >>			B-C		E*0.15	E+F	G-D		J-H
Nylon 6 pellets	\$0.70	\$0.10	\$0.60	\$0.72	\$0.11	\$0.83	\$0.23	\$0.25	\$0.02
Nylon 6 Fiber	n/a	n/a	\$0.25	\$0.30	\$0.05	\$0.35	\$0.10	\$0.15	\$0.06
Nylon 66 pellets	\$1.00	\$0.10	\$0.90	\$0.72	\$0.11	\$0.83	-\$0.07	\$0.25	\$0.32
Nylon 66 Fiber	n/a	n/a	\$0.25	\$0.30	\$0.05	\$0.35	\$0.10	\$0.15	\$0.06
PET Pellets	\$0.47	\$0.10	\$0.37	\$0.72	\$0.11	\$0.83	\$0.46	\$0.35	-\$0.11
PET Fiber ¹	n/a	n/a	\$0.25	\$0.30	\$0.05	\$0.35	\$0.10	\$0.35	\$0.26
PP Pellets	\$0.35	\$0.10	\$0.25	\$0.45	\$0.07	\$0.52	\$0.27	\$0.35	\$0.08
PC4	\$0.02	\$0.10	\$0.08	\$0.05	\$0.01	\$0.06	\$0.14	\$0.17	\$0.03

As of August, all material subsidies are sufficient except for PET pellets for which no one is producing at this time. We expect this may change in the not too distant future and thus consideration of this product outlet will be revisited at that time.

It is expected that prices will fall between August 2019 and March 2020 under anticipated global market/business conditions. Specifically, the N66 price margin over N6 will decline from its current 30 cents to 13 cents. This reflects the expiry of force majeure on N66 production which will increase the supply of virgin N66 and hence the virgin price will decline causing the PI price to similarly decline. The decline in prices causes the N6 pellet price to drop 1 cent below that required for the current subsidy to provide a 10 cent incentive over PI material. This is not considered to be sufficient to

warrant adjusting the subsidy for N6 given the uncertainty in the predictions of both the price and the costs.

The new SJM Table 7 implies a subsidy adjustment may be needed for N6. However, it is important to note that the market pricing is an educated judgement and since pricing is dynamic and individualized, prices can easily vary by 3-5 cents. Thus, CARE will monitor the market closely to determine if an adjustment is needed.

Table 4 SJM Results Effective March 2020

New Table 7	Subsidy Justification Model - Forecast March 2020								
	B	C	D	E	F	G	H	I	J
	Competitive	PCC	PCC	PCC Carpet	15%	Conv. Cost	Subsidy Required	PCC Materials	Subsidy
	Materials	Discount	Materials	Conversion	Return	Plus	to Incentivize	Subsidy ⁶	Difference ⁴
	Market Price		Market Price	Cost ²	Conv. Cost ³	Return	PCC Materials	Table 8A	
Formula >>			B-C		E*0.15	E+F	G-D		J-H
Nylon 6 pellets	\$0.67	\$0.10	\$0.57	\$0.72	\$0.11	\$0.83	\$0.26	\$0.25	-\$0.01
Nylon 6 Fiber	n/a	n/a	\$0.25	\$0.30	\$0.05	\$0.35	\$0.10	\$0.15	\$0.06
Nylon 66 pellets	\$0.80	\$0.10	\$0.70	\$0.72	\$0.11	\$0.83	\$0.13	\$0.25	\$0.12
Nylon 66 Fiber	n/a	n/a	\$0.25	\$0.30	\$0.05	\$0.35	\$0.10	\$0.15	\$0.06
PET Pellets	\$0.40	\$0.10	\$0.30	\$0.72	\$0.11	\$0.83	\$0.53	\$0.35	-\$0.18
PET Fiber ¹	n/a	n/a	\$0.25	\$0.30	\$0.05	\$0.35	\$0.10	\$0.35	\$0.26
PP Pellets	\$0.40	\$0.10	\$0.30	\$0.45	\$0.07	\$0.52	\$0.22	\$0.35	\$0.13
PC4	\$0.02	\$0.10	\$0.08	\$0.05	\$0.01	\$0.06	\$0.14	\$0.17	\$0.03

Table 4 Subsidy level as of March 2020 with forecast prices for materials. Subsidies for materials on the market are all sufficient to maintain a 10c incentive over PI material except for N6 which is within the margin of error.

Based on current market conditions for competitive polymers and carpet sales in CA the Modeling Team recommends no change in the subsidy or assessment levels based. The existing subsidy levels are sufficient to enable processors to be competitive in the market place at a price 10 cents below that of post-industrial materials for all materials that are currently produced by processors and manufacturers.

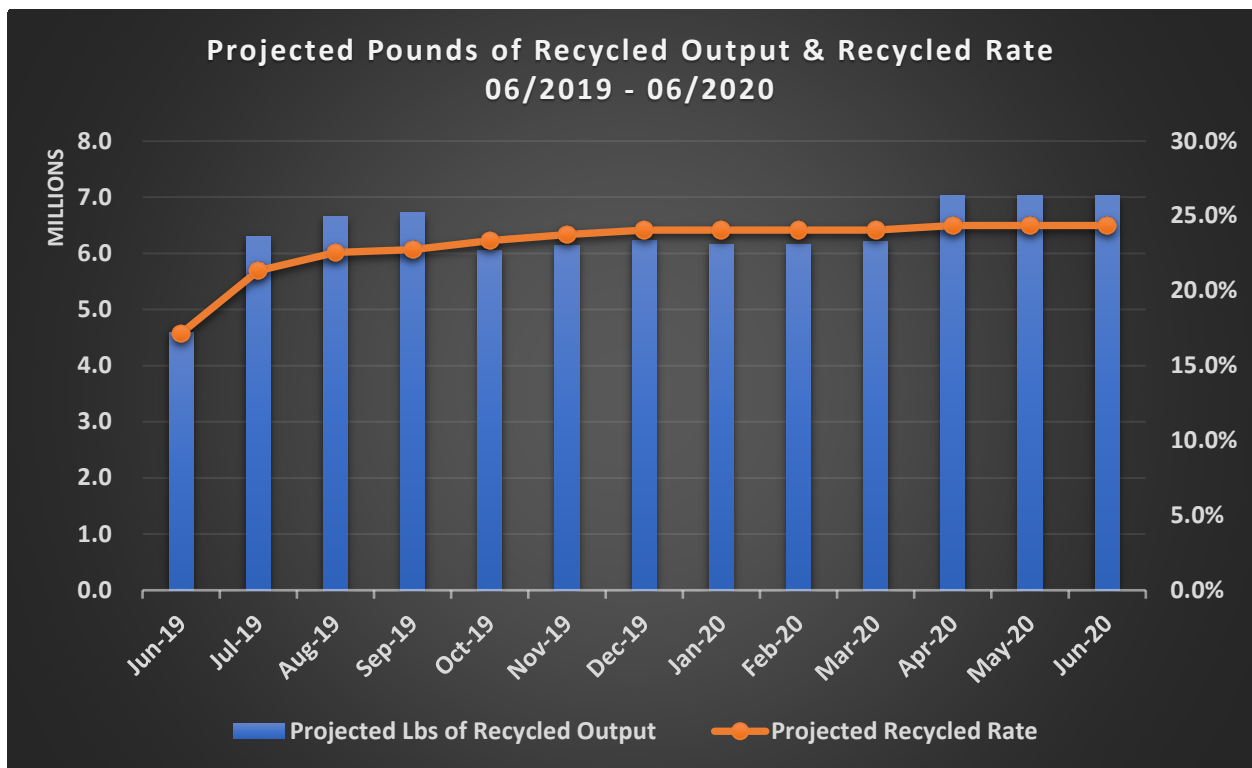
CARE Financial Model Results

The projected pounds of output and recycling rate are given in Figure 2 below. These projections, along with projected carpet sales are used in the Financial Model to

compute the CARE fund balance as shown in Figure 3. This shows about a \$3 million decline over the next 12 months, but the ending balance is still above the required minimum reserve and so is not considered to be a risk but an appropriate adjustment of the funds that have been built up over the previous years.

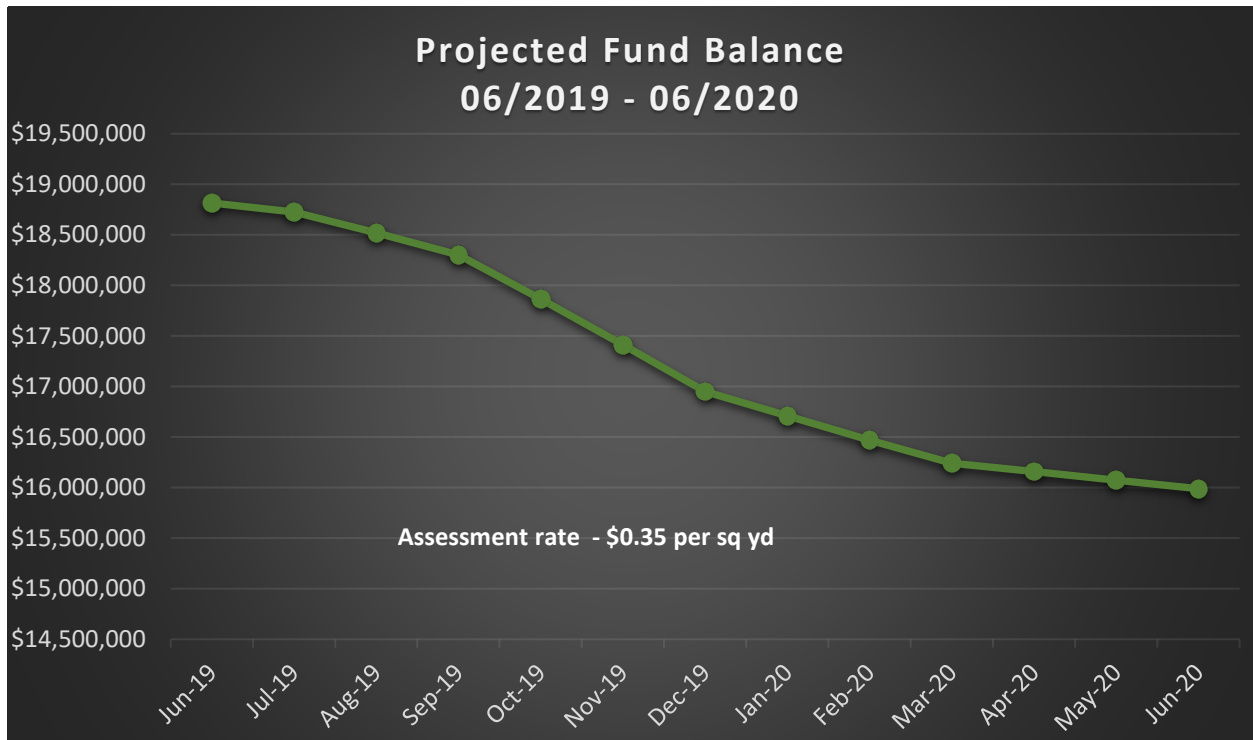
Crowe LLP recently completed their model evaluation. As it relates to the FM, there were no specific recommendations beyond running scenarios, which is one of the key uses of the tool in evaluating the cash flow implications of subsidy and assessment scenarios.

Figure 2 Projected Pounds of Recycled Output and Recycling Rate*



* Based on 88M square yards of carpet sales in 2019 and 87M square yards in 2020

Figure 3 CARE Projected Fund Balance



Conclusions

- Current subsidies are appropriate under the current market conditions: no changes recommended at this time, but the subsidy for making PET pellets should continue to be monitored
- Current assessment is sufficient to fund the program to meet the 24% recycling rate: no changes recommended
- Current assessment is sufficient to ensure as fully funded reserve given projected sales and expenses: no changes recommended
- Models are functional and no changes were recommended at this point in time
- Feedback from the Crowe assessment is being evaluated by the Model Team and will lead to one or more changes in the current Cost Conversion Model. Other changes will be considered, including further integration.
- No major excursions in the price of oil or competitive virgin or PI feedstocks are projected over the next 6 months
- CARE remains the leading authoritative source of PCC materials intelligence on flows, pricing, and technology evaluations