Attachment 1: Description of Emissions Reduction Measure Form

Title: *Forest sector public goods charge and incentive-based regulatory framework*

Type of Measure (check all that apply):

☐ Direct regulation
☑ Monetary Incentive
☑ Voluntary
☐ Other Describe:
☐ Market-based compliance:
☐ Non-monetary incentive
☐ Alternative Compliance Mechanism

Responsible agency:

The Air Resources Board (ARB) should partner closely with California Department of Fire and Forestry, the California Integrated Waste Management Board, and other state agencies. However, ARB would have primary responsibility for design, implementation and administration of the public goods charge (PGC) and emissions reductions programs. The Legislature will need to be consulted and, depending on resolution of legal questions, may need to affirmatively act to establish the PGC.

Sector:

☐ Transportation
☐ Other Industrial
☐ Agriculture
☑ Sequestration
☐ Electricity Generation
☐ Refineries
☐ Cement
☐ Other Describe:

2020 Baseline Emissions Assumed (MMT CO2E):

According to the Aug. 7 ARB staff draft inventory, net emissions from LULUCF have been increasing from -5.6 MMTCO2 in 1990 (i.e. net sequestration) to -2.1 MMTCO2 in 2004. Assuming that both removals (i.e. sinks) and emissions continue to grow at the average annual rate from 1990 to 2004 (0.06% and 1.82%, respectively), the LULUCF sector will produce net emissions of 3.1 MMTCO2 in 2020, an increase of 8.8 MMTCO2 relative to 1990 net emissions.

Percent Reduction in 2020:

With estimated annual emission reductions of 13.9 MMTCO2 in 2020, the policies proposed herein will result in net emissions of -10.8 MMTCO2 (i.e. net sequestration) in 2020 from the LULUCF sector. Projected net sectoral emissions in 2020 will be reduced by 5.2 MMTCO2 below the estimated 1990 emissions level.

Cost-Effectiveness ($/metric ton CO2E) in 2020:

The estimated average cost of emissions reductions from the full set of proposed policies is $33/metric tonne CO_2.[1]

[1] Excluding the costs of the R&D and administrative programs, the average cost of emissions reductions is $28/metric tonne CO_2.

Description:

This proposal is for a forest sector public goods charge (PGC) and an incentive-based regulatory framework to reduce net forest sector greenhouse gas emissions. The proposed incentive-based framework for the forest sector parallels the regulatory approach adopted for the electricity sector in which, for over 25 years, a fraction of the revenues from electricity consumption has been directed to investments that reduce the sector's carbon footprint.

Revenues from the forest sector PGC would be used to fund incentives to reduce emissions and increase sequestration on private forest lands, to improve wood product use efficiency, and to increase recycling of wood products. The PGC would also be used to support R&D into new technologies and management approaches to reducing forest sector emissions.

The proposed incentive-based regulatory framework has a number of components including establishment of a forest sector PGC, elaboration of a consumption-oriented accounting system, and a set of land-based and product-based programs to reduce emissions and increase sequestration. The following text provides greater detail on each of these components.

1. Consumption-oriented accounting framework:

In order to accurately determine net GHG emissions, ARB will need to adopt a consumption-oriented accounting framework for the LULUCF sector. This accounting framework will track emissions associated with wood product consumption, from growth through use to disposal. The LULUCF budget in the August 7 draft inventory is based on a consumption-oriented framework and provides an effective starting point.

It is essential, however, that state-specific estimates of harvested wood product (HWP) flows be developed including, in particular, cross-border imports and exports. Some information is already collected on forest product consumption, but this proposal will require a substantial expansion of this effort. ARB will need to develop reporting requirements and a tracking system that is not unduly burdensome on affected parties but that can provide the information that is needed to estimate total consumption with acceptable accuracy.

State-specific estimates will provide ARB a much more accurate estimate of actual emissions from the LULUCF sector, since California's land use and consumption profile is likely to be quite different than for the U.S. as a whole. Moreover, without state-specific data on HWP flows that is tracked over time, it will be impossible to evaluate progress towards the State's emissions goals for this sector.

Implementation of forest sector emissions reductions measures, such as those proposed below, will also require development of a comprehensive set of accounting and verification protocols. The California Climate Action Registry (CCAR) forest protocols should be considered as the starting point for the forest sector accounting system. Improvements should be made to the existing forest protocols and additional protocols should be developed for urban forestry and product-based measures such as increased recycling of HWP.

The development of an improved accounting framework and measurement protocols will not, by itself, result in emissions reductions. However, these steps are essential to support the overall portfolio of forest sector programs.

2. Forest sector public goods charge:

The proposed forest sector PGC's primary purpose is to create a stable revenue stream to support investments in projects that reduce emissions and increase sequestration in the forest

sector. The PGC will also help improve market efficiency by internalizing the cost of carbon emissions from the consumption of wood products. This will send a price signal to consumers regarding the climate impact of their consumption and create a level playing field as the cost of carbon is internalized in other sectors that produce products that compete with wood products for market share (i.e. steel and cement).

The forest sector PGC should have the following characteristics: 1.) it should be linked to the emissions profile of the product, taking into account both the permanence of the end use and the fraction of recycled material used, e.g. a higher fee would be levied on virgin paper than recycled; 2.) it should be relatively easy to administer and should avoid creating market distortions among products; and 3.) the fee should be relatively stable and reflective of the long-term average cost of carbon savings to the State. A well-designed and stable fee structure is essential for effective program implementation. The LULUCF sector is dominated by relatively slow biological processes and long-term management decisions. A stable program structure and funding base is necessary to allow landowners and forest product users to make what will often be very long-term management decisions with confidence.

As we discuss below, we believe the state could achieve approximately 13.9 MMTCO2 of reductions in 2020 at an average cost of about $33 per metric ton CO_2, including the costs of program administration and RD&D; therefore, funding on the order of $450 to 500 million per year will be required. To achieve that, we propose that a PGC of $25/tonne CO_2 be imposed on consumption of virgin paper products. We propose that the fee on solidwood products be set at $2.5/tonne CO_2 to reflect the much longer average product lifetimes and lower decomposition rate of wood relative to paper[2]. This translates to a fee of approximately $0.04/kg of paper and $0.0025/board foot of wood. Recycled products made from 100% post-consumer waste should be exempt from the fee. If imposed at this level, the PGC will produce revenue of approximately $450-500 million/year, based on estimated statewide consumption of wood products equal to 26-37 million tons of C02E per year[3].

The PGC should be used to provide incentives for a portfolio of measures, described below, that can significantly reduce the total emissions from forest product production and consumption in California.

3. Land-based programs:

Incentives, funded by the PGC, should be provided for 1.) forest conservation, afforestation/reforestation, and conservation forest management projects on private lands, 2.) urban forestry, and 3.) product-based projects that reduce CO_2 emissions. Protocols to measure and verify the savings from projects that receive the incentives should be developed building on the CCAR protocols, as we discussed above.

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[2] The average lifetime of solidwood products is approximately 3x longer than paper products. (K. Skog, pers. communication) The maximum fraction of carbon that decomposes is also much higher for paper than wood. (see: Micales, J.A. and K. Skog "The Decomposition of Forest Products in Landfills," USDA, Madison, WI 1997)

[3] Use of a population-weighted share of national consumption results in an estimate of statewide consumption of 37.4 MMTCO2E. (K. Skog, pers. communication). The 2003 Forest and Range Assessment estimated total statewide consumption of approximately 7 billion board feet of solidwood and 13 million tons paper, which is equivalent to 26.4 MMTCO2E. ("The Changing California: Forest and Range 2003 Assessment," CDF, Oct. 2003, chap. 6) The primary difference between the two estimates is in the volume of wood consumption.

A. Afforestation/reforestation – Establishment of trees on sites that are not currently forested can reduce net emissions as growing trees sequester carbon.

B. Forest conservation – Conversion of forest land to development, such as housing or commercial buildings, results in release of much or all of the carbon stored in the trees. Preventing conversion of forests by redirecting development onto already-cleared land can avoid the emissions that would otherwise have occurred. Forest conservation can also provide significant co-benefits by maintaining existing forest ecosystems and, in the case of infill development, avoiding the higher emissions associated with sprawl.

C. Conservation forest management – Some forest management practices can result in increased levels of sequestration in working forests. We recommend investment in wider stream buffers and no-harvest set aside areas on private lands which are viable and well-substantiated, relatively low cost, management measures that can result in substantial increases in the amount of carbon sequestered in managed forests.

D. Urban forestry – In addition to sequestering carbon, urban forests provide a range of co-benefits including shade and improved aesthetic values. An effective urban forestry program will need to carefully account for the net climate impact and leverage support from entities – such as homeowners and municipalities -- that benefit from the non-climate impacts.

4. Product-based programs:

The demand for forest products is a principal determinant of LULUCF emissions. Demand-side programs, such as increased recycling of forest products and improved wood-use efficiency can help to reduce net LULUCF sector emissions and should be an integral part of the regulatory framework. Funds collected by the PGC should be used support these programs as well.

5. Wood product research and development (R&D):

A key component of our proposed forest sector PGC program is support for climate-related forest sector research and development (R&D). As with the PIER program which is supported through the electricity and natural gas PGC,[4] investment in public goods R&D for the forest sector can provide enormous dividends through development of new technologies and management approaches. The focus of the forest sector R&D program should be on the following activities: 1. wood product use efficiency and recycling; 2. land management and biological sequestration; 3. forest sector accounting, measurement & verification tools and methods (including remote sensing); and 4. adaptation of forest ecosystems to climate change.

Emission Reduction Calculations and Assumptions:

The public goods charge would provide incentives for projects that deliver a total of 13.9 MMTCO2E in estimated emission reductions in 2020 from the following programs:

A. Afforestation/reforestation – The Updated Macroeconomic Analysis from the Climate Action Team estimates annual emissions reductions of 1.98 MMTC02E based on cumulative planting of 430,000 acres by 2020. However, CDF estimates that 7.1 million acres are available for

[4] The PIER program is supported by the legislatively-mandated public goods charge on electricity and natural gas and is managed by the California Energy Commission.

afforestation statewide.[5] We propose a four-fold increase in afforestation for a total emissions reduction of 7.9 MMTCO2E in 2020 from 1.72 million acres representing approximately 24% of available lands.

B. Forest conservation – The Updated Macroeconomic Analysis estimates annualized emissions reductions of 0.4 MMTC02E based on avoided conversion of 21,658 acres forestland and 6,817 acres woodland from 2000 to 2020. However, the 2003 Forest and Rangeland Assessment Program (FRAP) projected total conversion of 312,000 acres of forestland and 258,000 acres of woodland from 2000-2020[6]. We propose a four-fold increase in the forest conservation program, resulting in an estimated emissions reduction of 1.6 MMTCO2E in 2020.

C. Conservation forest management – Based on the Updated Macroeconomic Analysis, we propose that expansion of riparian buffer strips could provide 0.26 MMTCO2E in emissions reductions in 2020. We also propose that no harvest set asides in high ecosystem value forests could produce equivalent additional emissions reductions for a total of 0.52 MMTCO2E.

D. Urban forestry – Based on the Updated Macroeconomic Analysis from the Climate Action Team, we propose that urban forestry programs can produce 0.9 MMTCO2E in emissions reductions in 2020.

E. Product-based programs – We have not conducted any analysis of the potential emissions reductions from product-based programs and instead refer to the estimated impact of the "zero waste – high recycling program" from the Revised Macroeconomic Analysis which estimates emissions reductions of 3 MMTCO2E.

Cost-Effectiveness Calculation and Assumptions:
The cost of emissions reduction will vary substantially among the recommended programs and among particular projects within each program. However, we estimate that the average cost of emissions reductions from the full set of proposed programs is approximately $33/ton of CO2E[7] and that the total annual cost of the proposed portfolio of programs is $456 million based on the following assumptions:

A. Afforestation/reforestation – The Updated Macroeconomic Analysis estimates emissions reductions from afforestation will cost an average of $10.61/tonne CO2E. The need to expand the program to include less productive and less accessible lands will tend to raise costs, but returns to scale should tend to compensate by lowering average costs. Overall, we estimate that the average cost of our proposed program will be 25% higher than the program in the Updated Macroeconomic Analysis, with an annual program cost of $105 million and an average cost of emissions reductions of approximately $13/tonne CO2E.

B. Forest conservation – The Updated Macroeconomic Analysis estimates that emissions reductions from forest conservation will cost an average of $37.50/tonne CO2E. The

[5] "Updated Macroeconomic Analysis of Climate Strategies Presented in the March 2006 Climate Action Team Report: Attachment B," Sept. 4, 2007
[6] Updated Macroeconomic Analysis: Att. B, p. 182
[7] The average cost-effectiveness of emissions reductions is calculated as the total annual cost divided by the annual savings in 2020.

significantly expanded scope of our proposed program will result in a higher average cost. Overall, we estimate that the average cost of our proposed program will be 25% higher, with an annual program cost of $75 million and an average cost of emissions reductions of approximately $47/tonne CO2E.

C. Conservation forest management – Following the Updated Macroeconomic Analysis, we estimate that the average cost of carbon sequestration from expanded riparian buffers would be approximately $19.67/tonne CO2E. We estimate that the expansion of the program to support no harvest set asides in high ecosystem value forests would double the size of the program at the same average cost of emissions. The total annual program cost is estimated to be $6.6 million.

D. Urban forestry – Based on the Updated Macroeconomic Analysis from the Climate Action Team, we estimate that an urban forestry program with a net cost of $132 million will result in an average cost of emissions reductions in 2020 of $150/tonne CO2E.

E. Product-based programs – We have not conducted any analysis of the cost of product-based programs and instead refer to the estimated cost of the "zero waste – high recycling program" from the Revised Macroeconomic Analysis which estimates a total annual cost of $69 million and an average cost of emissions reductions of $23/tonne CO2E.

F. R&D and administration – We propose allocating approximately 10% of the total revenue from the PGC to forest sector R&D or $46 million per year. We also estimate that program administration including program evaluation will cost approximately 5% of total PGC revenue or $23 million per year. There are no emissions reductions directly attributable to this investment. However, there are significant indirect benefits from targeted R&D including more effective programs, increased economic potential, and more accurate accounting of program impacts.

Implementation Barriers and Ways to Overcome Them:

Implementation barriers can be minimized by partnering with CDF, CIWMB, municipalities, CCAR and other stakeholders on the development of programs and new protocols and reporting requirements.

Potential Impact on Criteria and Toxic Pollutants:

The potential impact on criteria and toxic pollutants is likely to be relatively small. Urban forestry will reduce criteria and toxic pollutants through reduced urban temperatures (which lowers the rate of ozone formation) and adsorption into leaves. Afforestation/reforestation may result in the significant use of agricultural chemicals and local environmental impacts (e.g. erosion) during site preparation.

More generally, land-based forest sector GHG emissions reduction programs must acknowledge the significant potential ecological consequences associated with changes to forest management. Otherwise, AB32 implementation risks exchanging one set of environmental harms for another, and could well initiate an ultimately unsustainable set of land use practices. To avoid these pitfalls, the State's forest sector climate strategy must not reduce existing protections but should instead be designed to maintain and expand benefits to the forest ecosystems whose continued vitality we must be able to rely upon. The adoption of minimum performance requirements for all eligible forest sector projects will ensure that ecological and social standards are maintained and that negative impacts are avoided.

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