Draft LCFS Guidance Document for
Crude Oil Innovative Method
Application-Solar Generated Steam

This is a guidance document for the Low Carbon Fuel Standard (LCFS) regulation
(California Code of Regulations (CCR), title 17, §§ 95480-95497). The unofficial
LCFS regulation text is available on the LCFS Rulemaking website.¹

This document is intended to assist the crude oil producer (referred to as “applicant”
in this document) to apply for the solar generated steam innovative method under
LCFS section § 95489(d).

After reviewing this document, if you have additional questions please contact
California Air Resources Board (CARB) staff:

Questions about innovative crude method application:

Jim Duffy:  jduffy@arb.ca.gov
Kamran Adili: kamran.adili@arb.ca.gov

Questions about reporting to the LCFS Reporting Tool and Credit Bank and
Transfer System (LRT-CBTS):

Manisha Singh:  manisha.singh@arb.ca.gov
Greg O'Brien:  gobrien@arb.ca.gov

¹ This document is intended to provide helpful guidance in interpreting the LCFS rule, but in the case of
any discrepancy between this document and the official text found in the California Code of Regulations
(a non-official version of which is available at the following link) the text of the CCR governs what the
applicant should do:  https://www.arb.ca.gov/regact/2015/lcfs2015/lcfsfinalregorder.pdf
# Table of Contents

Table of Contents .......................................................................................................................... 2

1) Introduction/Overview .............................................................................................................. 3

*Figure 1: Application Process for a New Solar Generated Steam Project............... 3*

2) Pre-Application .......................................................................................................................... 4

3) Application Submittal ................................................................................................................ 4

4) Application Approval Process .................................................................................................. 5

5) LRT-CBTS Registration Requirements .................................................................................. 6

6) Post-approval Recordkeeping, Reporting, and Auditing ......................................................... 6

7) Credits for Producing Crude Oil Using Innovative Methods ................................................. 7

Appendix A: ................................................................................................................................. 8

A) Threshold Calculation .............................................................................................................. 8

Appendix B: ................................................................................................................................ 12

*The LRT-CBTS Online Registration Process........................................................................... 12*
1) Introduction/Overview

This guidance document is meant to assist the crude oil producer in making an application for a solar generated steam project under the Innovative Crude Oil provision of the Low Carbon Fuel Standard. In the following pages staff attempts to cover many of the issues the applicant may encounter when deciding to undertake such projects, preparing and submitting application materials, obtaining project approval, and registering and reporting to receive LCFS credit. Figure 1 depicts the steps required to obtain approval for a solar steam project.

Figure 1: Application Process for a New Solar Generated Steam Project

- **Pre-application**
  - Contact CARB staff to discuss the potential project and address any questions or concerns about project eligibility and the application process.

- **Submit Application**
  - The crude oil producer (applicant) initiates review of the innovative method by submitting a written application and supporting documents to CARB.

- **Review for Completeness**
  - Staff has 30 days to review the application for completeness. After staff review, the applicant will be notified that the application is complete or if further work is needed.

- **Public Comment**
  - After determining that an application is complete, CARB staff will post the application for a 10 day public comment period.

- **ARB Approval**
  - After the applicant addresses all pertinent comments, the Executive Officer or designee will approve or disapprove the application.

- **Register**
  - The applicant must register in the LCFS Reporting Tool (LRT) as an opt-in LCFS regulated party, either concurrently with the application submittal, or later, in order to receive credits for the approved solar generated steam project.
2) Pre-Application
After reading through this document, the LCFS regulation\textsuperscript{2}, and previously approved applications\textsuperscript{3}, CARB staff recommends that a prospective applicant contact CARB to discuss the potential project and to address any questions or concerns that the applicant may have about project eligibility, the application submittal and approval process, registration requirements, and post-approval recordkeeping and credit generation procedures.

The following are general requirements for a solar steam project:

- The project must become operational no earlier than 2010.
- The solar steam must be greater than 55 percent steam quality and be produced and consumed onsite or be provided directly to the crude oil production facility from a third-party generator.
- The project must result in either a total emission reduction of 5,000 metric tons carbon dioxide equivalent (CO\textsubscript{2}e) annually or a carbon intensity reduction of 0.10 gCO\textsubscript{2}e per MJ of crude produced. Calculations to determine if the project meets the threshold criteria are described in Appendix A of this document.
- If more than one crude producer receives steam from a single third-party facility, each crude producer must submit an independent application with the third party as a joint applicant for each submittal. The threshold requirements above may be calculated using the aggregated project total emission reduction or carbon intensity improvement across all applications.

3) Application Submittal
The crude oil producer must initiate the review of the solar steam project through a written application. The application package can be sent by mail or electronically through email. Every application package will be reviewed for completeness and applicants will be notified if any additional information or documentation is required. If the application is found to be complete and no other information is needed, staff will notify the applicant by email or the LRT-CBTS communication to indicate the application is complete.

An application must contain the following material:

\textsuperscript{2} Non-official version of the LCFS regulation text can be found at: \url{https://www.arb.ca.gov/regact/2015/lcfs2015/lcfsfinalregorder.pdf}
\textsuperscript{3} The LCFS Innovative Crude Oil Applications page: \url{https://www.arb.ca.gov/fuels/lcfs/crude-oil/innovative-crude/innovative-crude.htm}
1. A complete description of the innovative method and how emissions are reduced. This description must also clearly show that the project meets one of the threshold requirements discussed above and in Appendix A.

2. An engineering drawing(s) or process flow diagram(s) that illustrates the combined solar steam and crude oil production facilities and clearly identifies the system boundaries, relevant process equipment such as solar system piping and instrumentation, material flows, and energy flows necessary to calculate the innovative method credits. The diagrams must clearly show that the solar steam is being provided to the crude oil production fields.

3. A map including global positioning system coordinates for solar generation facilities described in item “2” above.

4. A preliminary estimate of the potential innovative method credit including descriptions and copies of production and operational data or other technical documentation utilized in support of the calculation. See Appendix A for calculation.

5. An attestation letter stating that the information sent by the applicant to CARB is accurate and represents the actual or intended long-term, steady-state operation of the solar steam innovative method.

If solar steam production is likely to exceed consumption of steam for crude oil production during periods of high steam production, then the preliminary estimates of innovative method credit and the demonstration that the project meets the eligibility threshold must take this into consideration. Only the amount of solar steam supplied for crude production will generate LCFS credit.

All documents that are claimed to contain confidential business information must prominently be labeled as “Contains Confidential Business Information” (CBI) and a separate redacted version of such documents must also be submitted.

4) Application Approval Process
The application must be approved by CARB before the crude oil producer may generate credit for the innovative method. The applicant will be able to generate LCFS credits starting with the calendar quarter in which the project is approved.

Within 30 calendar days of receipt of an application designated by the applicant as ready for formal evaluation, CARB shall advise the applicant in writing that the application is complete, or the application is incomplete, in which case CARB will identify which requirements have not been met. If deemed incomplete, the applicant may submit additional information to correct deficiencies. If the applicant is unable to achieve a complete application within 180 days of CARB’s receipt of the original
application, the application will be denied on that basis, and the applicant will be informed in writing.

Once deemed complete, the version of the application with all CBI information redacted will be posted to CARB’s webpage for a 10 day public review and comment period. CARB will forward to the applicant all comments identifying potential factual or methodological errors. Within 30 days, the applicant must either submit a revised application addressing the comments or a detailed response explaining why no revisions are necessary.

The application will then be submitted for approval by CARB’s Executive Officer or his designee. At the time of approval, CARB may prescribe conditions of the approval that contain special limitations, recordkeeping and reporting requirements, and operational conditions. If CARB determines that the application will not be approved, the applicant will be notified in writing.

5) LRT-CBTS Registration Requirements
A crude oil producer must also register under section 95483.1 of the LCFS regulation as an opt-in regulated party to receive credits for an approved innovative method. Opting into the LCFS program becomes effective when the crude oil producer establishes an account in the LRT-CBTS, pursuant to section 95483.2. Some screen shots for registering in the LRT-CBTS are shown in Appendix B.

If the crude oil producer using an approved innovative method does not register as an opt-in regulated party, credits generated by the producer’s use of the innovative method may be claimed by the California refinery (or refineries) that purchase the crude produced using the innovative method, if CARB receives all information it needs to ensure compliance with limitations and reporting requirements applied to the method.

6) Post-approval Recordkeeping, Reporting, and Auditing
In order to earn LCFS credits following project approval, the applicant will be required to report on a quarterly basis beginning with the quarter in which the project is approved.

1. The quarterly volume of crude oil produced using the approved innovative method and the crude name(s) under which it is marketed. If the crude oil produced with an approved innovative method is marketed as part of a crude blend (that is not wholly refined in California), the crude oil producer must also

---

4 For the LRT-CBTS instructions, refer to the LRT-CBTS User Guide, located at: www.arb.ca.gov/lcfstrt
report the name of the blend and the volume fraction that the crude produced with the innovative method contributes to the blend;

2. Any additional records that CARB requires to be kept pursuant to project approval.

Pursuant to item 2 above, the following additional recordkeeping and reporting requirements will likely be requested for all solar steam projects.

3. Metered data on solar steam consumed for crude oil production at the oil field during the quarter (barrels cold water equivalent);
4. Total steam consumed for crude oil production at the oil field during the quarter (barrels cold water equivalent);
5. Volume-weighted average steam quality for solar steam consumed for crude oil production at the oil field during the quarter; and
6. An attestation letter stating that all solar steam was supplied directly for crude oil production at the oil field and that the solar steam reported for generating LCFS credit did not produce other renewable attributes recognized or credited by any other jurisdiction or regulatory program; and

This information must be uploaded into the LRT-CBTS within the first 45 days after the end of the quarter. It is recommended that documents be uploaded in a zip-archived format.

All records shall be retained for five years and all data and calculations supplied to CARB for credit determination are subject to verification by CARB or a third-party approved by CARB.

7) Credits for Producing Crude Oil Using Innovative Methods

After receiving the required quarterly data and verifying that the innovatively produced crude was supplied to California refineries, CARB staff will determine the number of credits to be issued to the crude oil producer (or purchasing refinery) using the credit equation for solar steam projects specified in section 95489(d)(1)(F). In general, credits will be issued during the first month of the quarter following the reporting of data. For example, solar steam produced in quarter one will be reported in quarter two, and credits will be issued during the first month of quarter three.
Appendix A:

A) Threshold Calculation
The innovative method must achieve one of the following threshold criteria:

1. An emissions reduction of at least 5,000 metric tons CO$_2$e per year, or
2. A carbon intensity reduction from the comparison baseline of at least 0.10 gCO$_2$e/MJ.

If the innovative method involves more than one crude producer using steam produced at a single third-party facility, the threshold criteria listed above may apply to the aggregated project total.

Credits for producing crude oil with innovative methods using solar steam must be calculated as specified below:

For crude oil produced using solar steam generation (generated steam of 75 percent quality or greater):

\[
\text{Emission Reduction} \left( \frac{\text{MTCO}_2\text{e}}{\text{yr}} \right) = 26765 \left( \frac{\text{gCO}_2\text{e}}{\text{bblsteam}} \right) \times \frac{V_{\text{steam}}(\text{bblsteam}) \times f_{\text{solar}}}{V_{\text{crudeproduced}}(\text{bbl})} \times V_{\text{inov}}(\text{bbl}) \times C \left( \frac{1}{10^6 \text{gCO}_2\text{e}} \right)
\]

For crude oil produced using solar steam generation (generated steam of 65 to 75 percent quality):

\[
\text{Emission Reduction} \left( \frac{\text{MTCO}_2\text{e}}{\text{yr}} \right) = 24992 \left( \frac{\text{gCO}_2\text{e}}{\text{bblsteam}} \right) \times \frac{V_{\text{steam}}(\text{bblsteam}) \times f_{\text{solar}}}{V_{\text{crudeproduced}}(\text{bbl})} \times V_{\text{inov}}(\text{bbl}) \times C \left( \frac{1}{10^6 \text{gCO}_2\text{e}} \right)
\]

For crude oil produced using solar steam generation (generated steam of 55 to 65 percent quality):
\[ Emission \, Reduction \left( \frac{\text{MTCO}_2\text{e}}{\text{yr}} \right) = 23219 \left( \frac{\text{gCO}_2\text{e}}{\text{bbllsteam}} \right) \times \frac{V_{\text{steam}}(\text{bbllsteam}) \times f_{\text{solar}}}{V_{\text{crudeproduced}}(\text{bbll})} \times V_{\text{Innov}}(\frac{\text{bbll}}{\text{yr}}) \times \frac{1 \text{ MTCO}_2\text{e}}{10^6 \text{ gCO}_2\text{e}} \]

where,

\( V_{\text{steam}} \) means the overall volume, in barrels cold water equivalent, of steam injected;

\( f_{\text{solar}} \) means the fraction of injected steam that is produced using solar;

\( V_{\text{crudeproduced}} \) means the volume, in barrels, of crude oil produced using the innovative method;

\( V_{\text{Innov}} \) means the volume, in barrels, of crude oil produced using the innovative method and delivered to California refineries for processing. If the crude produced using the innovative method and delivered to California refineries is part of a blend, then \( V_{\text{Innov}} \) is the volume of blend delivered to California refineries multiplied times the volume fraction of the crude within the blend that was produced using the innovative method.

\[ C = 1.0 \times 10^{-6} \frac{\text{MTCO}_2\text{e}}{\text{gCO}_2\text{e}} \]

A carbon intensity reduction from the comparison baseline is estimated using the following equation:

\[ \Delta CI_{\text{Innov}} \left( \frac{\text{gCO}_2\text{e}}{\text{MJ}} \right) = \frac{Emission \, Reduction \left( \frac{\text{MTCO}_2\text{e}}{\text{yr}} \right) \times 10^6 \frac{\text{gCO}_2\text{e}}{\text{MTCO}_2\text{e}}}{V_{\text{crudeproduced}}(\frac{\text{bbll}}{\text{yr}}) \times LHV_{\text{crude}}(\frac{\text{MJ}}{\text{bbll}})} \]

For convenience, approximate lower heating values (\( LHV_{\text{crude}} \)) are shown in Table A1 as a function of crude density (API gravity or specific gravity).
## Table A1: Crude oil heating values

<table>
<thead>
<tr>
<th>Degree API</th>
<th>SG</th>
<th>MJ/bbl</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>1.01</td>
<td>6437</td>
</tr>
<tr>
<td>9</td>
<td>1.01</td>
<td>6412</td>
</tr>
<tr>
<td>10</td>
<td>1</td>
<td>6381</td>
</tr>
<tr>
<td>11</td>
<td>0.99</td>
<td>6355</td>
</tr>
<tr>
<td>12</td>
<td>0.99</td>
<td>6324</td>
</tr>
<tr>
<td>13</td>
<td>0.98</td>
<td>6294</td>
</tr>
<tr>
<td>14</td>
<td>0.97</td>
<td>6268</td>
</tr>
<tr>
<td>15</td>
<td>0.97</td>
<td>6237</td>
</tr>
<tr>
<td>16</td>
<td>0.96</td>
<td>6211</td>
</tr>
<tr>
<td>17</td>
<td>0.95</td>
<td>6180</td>
</tr>
<tr>
<td>18</td>
<td>0.95</td>
<td>6150</td>
</tr>
<tr>
<td>19</td>
<td>0.94</td>
<td>6124</td>
</tr>
<tr>
<td>20</td>
<td>0.93</td>
<td>6093</td>
</tr>
<tr>
<td>21</td>
<td>0.93</td>
<td>6067</td>
</tr>
<tr>
<td>22</td>
<td>0.92</td>
<td>6037</td>
</tr>
<tr>
<td>23</td>
<td>0.92</td>
<td>6011</td>
</tr>
<tr>
<td>24</td>
<td>0.91</td>
<td>5984</td>
</tr>
<tr>
<td>25</td>
<td>0.9</td>
<td>5953</td>
</tr>
<tr>
<td>26</td>
<td>0.9</td>
<td>5927</td>
</tr>
<tr>
<td>27</td>
<td>0.89</td>
<td>5901</td>
</tr>
<tr>
<td>28</td>
<td>0.89</td>
<td>5875</td>
</tr>
<tr>
<td>29</td>
<td>0.88</td>
<td>5844</td>
</tr>
<tr>
<td>30</td>
<td>0.88</td>
<td>5818</td>
</tr>
<tr>
<td>31</td>
<td>0.87</td>
<td>5792</td>
</tr>
<tr>
<td>32</td>
<td>0.87</td>
<td>5766</td>
</tr>
<tr>
<td>33</td>
<td>0.86</td>
<td>5740</td>
</tr>
<tr>
<td>34</td>
<td>0.85</td>
<td>5714</td>
</tr>
<tr>
<td>35</td>
<td>0.85</td>
<td>5687</td>
</tr>
<tr>
<td>36</td>
<td>0.84</td>
<td>5652</td>
</tr>
<tr>
<td>37</td>
<td>0.84</td>
<td>5635</td>
</tr>
<tr>
<td>38</td>
<td>0.83</td>
<td>5609</td>
</tr>
<tr>
<td>39</td>
<td>0.83</td>
<td>5582</td>
</tr>
<tr>
<td>40</td>
<td>0.83</td>
<td>5556</td>
</tr>
<tr>
<td>41</td>
<td>0.82</td>
<td>5530</td>
</tr>
<tr>
<td>42</td>
<td>0.82</td>
<td>5508</td>
</tr>
<tr>
<td>Crude density</td>
<td>LHV - SI units</td>
<td></td>
</tr>
<tr>
<td>---------------</td>
<td>----------------</td>
<td></td>
</tr>
<tr>
<td>Degree API</td>
<td>SG</td>
<td>MJ/bbl</td>
</tr>
<tr>
<td>43</td>
<td>0.81</td>
<td>5482</td>
</tr>
<tr>
<td>44</td>
<td>0.81</td>
<td>5456</td>
</tr>
<tr>
<td>45</td>
<td>0.8</td>
<td>5430</td>
</tr>
<tr>
<td>45</td>
<td>0.8</td>
<td>5430</td>
</tr>
</tbody>
</table>
Appendix B:

The LRT-CBTS Online Registration Process

Registration Process Flowchart

To participate in California’s Low Carbon Fuels Standard Program, Regulated Parties, Opt-In Parties, and Brokers must have an LRT-CBTS account(s). This is required for reporting purposes and to bank, transfer, and retire LCFS credits. To obtain an LRT-CBTS account, each organization must complete the registration process as instructed in this section. The figure below provides an overview of the account registration process for Regulated and Opt-In Parties.
LRT-CBTS Account Registration Process for Regulated and Opt-In Parties

The Account Registration Form is provided for download which must be completed per the instructions and uploaded by the applicant in Step 2. The form downloads in a fillable PDF format (typed enabled).
Complete and sign the Account Registration Form and save it in PDF format. Upload the completed form using the upload button as shown below.
Applicants must agree to LRT-CBTS General Use Conditions & Disclaimer before they can proceed with the registration.

On the LCFS Organization Registration page, the applicant needs to check the box labeled “A producer of crude oil that has an innovative production method…”. The applicant also has to provide organization and administrator details along with primary contact information. All fields marked with an asterisk (*) are mandatory.
### LCFS Organization Registration

**Registration of Reporting Party in LCFS**

Select any applicable fuels/biobedstocks from the following list for which your organization/company is a "Regulated Party" under the LCFS Program per section 95483 of the LCFS regulation:

- California reformulated gasoline blendstock for oxygenate blending ("gasoline" or "CFB148")
- California diesel fuel ("diesel fuel" or "CFB160")
- A fuel blend containing biomass-based diesel
- A fuel blend containing bio-oil ("bio-oil")
- Fossil liquefied natural gas ("Fossil LNG"), or fossil liquefied compressed natural gas ("Fossil L CNG")
- A fuel blend containing greater than 10 percent ethanol by volume
- Regulated Fuels for Electricity
- A fuel blend containing biomass-based diesel
- Biomass-based diesel ("BB100")
- Any other liquid or non-liquid fuel

Also, complete the following if your company is opting into the LCFS Program as an "Opt-in" Party per section 95483.1 of the LCFS regulation:

- A producer of one or more fuels from the following list of "opt-in" fuels specified in section 95482(b) and meets the requirements of section 95483(d), (e) or (f), whichever applies to that fuel as selected below:
  - Electricity
  - Hydrogen
  - A hydrogen blend
  - Fossil LNG derived from North American sources
  - Bio-CNG
  - Bio-LNG
  - Bio-oil

An out-of-state producer of oxygenate, with diego, or biomass-based the LCFS regulation as an importer. A credit generator under this subsection may retain the compliance obligation, for a specific volume of fuel or blendstock, only if that portion sells the fuel to a regulated party.

A person ("intermediate entity") who is in the distribution/marketing chain of imported fuel and is positioned on that chain between the section 95483.1(a)(2) producer and the importer. See section 95483.1(a)(2).

The gas company, utility, or energy service provider that supplies natural gas ("natural gas supplier") to a person that falls within the provisions of section 95483(d). See section 95483.1(a)(4).

A producer of crude oil that has an innovative production method approved by the executive officer under section 95483(d). See section 95483(d).

**Organization Details**

- Authorization Form: [link](#)
- Enter Organization Name
- Address Line 1
- City
- Zip Code
- Email
- Do you want the email address emailed to you? (which is optional to be included in the list of Reporting Parties published on the ARB website?)

**Primary Contact**

- Enter Primary Contact Name
- Business Phone
- Mobile Phone
- Enter Email
- Confirm Email

**Primary Administrator Details**

- First Name
- Last Name
- BUSINESS PHONE
- Mobile Phone
- Enter User Name
- Password

Note: Password length must be between 7 and 16 alphanumeric characters. Include at least one upper and lower case letter and one numeric character.

[Register Organization] [Back]

---

**Instructions:**

- Ensure the box is checked.
- Click on the link to read full LRT-CBTS General Use Conditions.
- Enter email only if checking the box.
- Click here to complete the application.
An automated email will be generated confirming receipt of the application. The LRT Administrator will review the submitted information and send an email notification indicating if the account has been approved or not. If approved, the account will be activated. If the account is not approved, an explanation of the outstanding issues will be emailed to the registrant and an opportunity to resubmit the application is provided.

**Terms of System Use for LRT-CBTS**

The LCFS Systems Administrator will activate the account for the requesting user upon approval. All users are required to accept the Terms of System Use Agreement (TOU) for the system as part of their first login.

As shown below, there are two sections of the TOU that need to be read and acknowledged. This is accomplished by checking the boxes that follow each of the two sections and entering the user’s name (see top right of the TOU web page) to “Electronically Sign” the document. All users have access to the TOU for reference via a hyperlink on each web page of the LRT-CBTS.
Adding User Accounts

Additional user accounts can be added by the account administrators of the registered organization. To add a new user account, follow these steps.

**Step 1:** Go to **User Profile** tab. A form will appear requesting **User Details, User Role, Username** and **Password**.

**Step 2:** Complete all the required fields marked under **User Details**. Select other options as required. *(Ensure User Active is checked for all new users)*

- **User Locked**: Select to lock the user account.
- **User Active**: Select to ensure user account is active.
- **Password Reset**: Select when a password reset is required.
- **Primary Contact**: Select if user needs to be a primary contact for communication with ARB regarding the account.
Step 3: Select the **User Role** through the drop down and select options as required. User roles include Administrator, Credit Facilitator, Contributor, and Reviewer. For more detail refer to Section 3 of this document.

- **Signatory Authority**: Select if the user needs signatory authority to submit quarterly/annual LCFS reports. This designation is not available to all user roles, but only to Administrators and Reviewers.
- **Data Tab**: Select to provide the user account access to LCFS reported data for download.

Step 4: Create a **username** and **password** for the user and click **Add User Profile**.

User Profile Management

The existing user (account) profile can only be updated by the account administrator. To update an existing user profile follow these steps:

Step 1: Go to **User Profile** tab. A grid table containing a list of existing user accounts will be displayed below the new user top section of the page.
Step 2: Click on **See Details** from the list for the User Profile you want to update.

Step 3: This will repopulate the fields in the form with the information included for the user account. To complete this step makes the required updates and click **Update User Profile**.

**Correspondence Feature in the LRT-CBTS**

The Correspondence tab is used to post questions and/or issues by either users of the LRT or by the LRT administrator. An accompanying email notice is sent by the system to the recipient of the correspondence instructing them to login and access the posted correspondence in the LRT.