STATE OF NEW MEXICO
ENERGY CONSERVATION CODE
2009-2010 CODE UPDATE

~ OVERVIEW OF PROCESS AND RESULTS ~

Prepared for:

State of New Mexico
Regulation & Licensing Department
Construction Industries Division

Prepared by:

eSolved, Inc.

June 2010

PROJECT BACKGROUND

American Recovery and Reinvestment Act (ARRA) funding requires the adoption of building codes that meet or exceed the 2009 International Energy Conservation Code (IECC). New Mexico's current code is based on the 2006 IECC; therefore a code update was required to be eligible for ARRA funding.

On March 3, 2009 Governor Bill Richardson signed an assurance letter that was addressed to Secretary of Energy Steven Chu. In this letter, Governor Richardson directed the New Mexico Regulation and Licensing Department (RLD), Construction Industries Division (CID) to propose new building codes to the New Mexico Construction Industries Commission (CIC) that meet or exceed the 2009 International Energy Conservation Code.

The New Mexico Energy Efficiency Strategy, prepared for the Energy, Mineral, and Natural Resources Department (EMNRD), documented a strategy to reduce energy use in New Mexico by twenty percent. This document, along with an Executive Order from the Governor calling for increased energy efficiency, was the basis for setting goals for the new building codes. RLD and CID convened the Code Change Committee to review the 2009 IECC and address increasing the efficiency of the New Mexico energy code to a level 20 percent more efficient than the 2006 IECC.

Results

The Code Change Committee developed a package of code change proposals for the administrative, residential and commercial sections of the New Mexico Energy Conservation Code that have been submitted to the CIC for approval. This package of proposals includes measures to increase energy savings beyond those set forth in the 2009 IECC, increase flexibility of the code where needed and provide consistency with other New Mexico codes. The package of codes before the CIC for approval provides the following statewide average savings levels:

Residential Code: 20.9% above 2006 IECC
Commercial Code: 20.62% above 2006 IECC

This report provides an overview of the process undertaken to develop this package of code proposals, and includes information and data on the energy savings and cost effectiveness of administrative, residential and commercial proposed changes.

PROJECT PARTICIPANTS

CID is responsible for development and implementation of statewide building codes for New Mexico; the CIC approves the codes before they are implemented. All cities and counties in the state are required to either adopt the statewide building codes set by CID, or develop their own codes that meet or exceed the state codes.

At the beginning of the process, CID assembled a Code Change Committee which included the following members:

- Bob Golden, Golden Associates, LLC
- Derrick Childers, Childers Builders
- Fermin Aragon, Construction Industries Division
- Glenn Fellows, SMPC Architects
- Harry Dempsey, City of Albuquerque
- JB Pruett, Wooten Construction Company
- Jack Milarch, New Mexico Home Builders Association
- Jeff Hanks, Desert Eagel Engineering
- Jim Beverly, Jim Beverly Residental Designs
- Kelly O'Donnell, Regulation and Licensing Department
- Leo Hardie, City of Farmington
- Lisa Martinez, Construction Industries Division
- Martin Romero, Construction Industries Division
- Mike Brogdon, K.L. House, Inc
- Richard Lucero, Construction Industries Division
- Ron Hibner, Construction Industries Division
- Rudy Romero, Construction Industries Division
- Susie Marbury, Energy Mineral & Natural Resources Department
- Tammy Fiebelkorn, Southwest Energy Efficiency Project
- Wayne Dotson, Construction Industries Division

Additionally, members of the public were invited to participate in the code development, energy use modelling and cost analysis processes. Participants in the code update process included representatives from the following organizations as well as numerous individuals:

3CM
AGC
AIA New Mexico
All American Enterprises
Appreciated Energy
Bernalillo County
Build Green NM
Building Permits New Mexico
Casa De Corrales
CDRS
Centex/Pulte
Chapparral Materials
Chavez Roofing Company
Childers Builders
CID
City of Albuquerque

City of Farmington
City of Rio Rancho
City of Santa Fe
Cornerstones Community Partnerships
Desert Eagle Engineering
DR Horton
Duran Lath & Plaster
El Rey Stucco
EMNRD
Energy Matters
GCD
George Kupprath, PE
Glass Rite
GMB Old World
Harder Custom Builds
Huston Rammed Earth
ICF
JPG Engineering
Los Alamos Department of Public Utility
NM First
NMHBA
NMRCA
NMSEA
NMSPE
Northrise Ventures
PM&D Inc
PSFA
QPEC
Santa Fe County
Sierra Club
Sierra Pacific Windows
SMPC Architects
Soledad Canyon Earth Builders
Southwest Adobe Supply
Southwest Solar Adobe
Southwest Spray Foam
Sto Corp
Sunshine Plumbing
Taos County
TARP Lizard King
TC&I Construction
The Hensley Engineering Group
Town of Bernalillo
Valencia County
Village of Taos Ski Valley
Willson & Willson Architects

Committee Involvement

The Code Change Committee began meeting in July 2009 on a weekly basis. The Electrical, General Construction and Mechanical Technical Advisory Committees (TACs) also met throughout the code update process. A sub-committee of the Mechanical TAC was created to review code change proposals and met regularly during the update process. All relevant code change proposals were approved by the Code Change Committee and the appropriate TAC(s) before the final package was forwarded to the CIC for approval.

CODE UPDATE METHODOLOGY

The Code Change Committee was successful in developing a cost-effective package of codes for both residential and commercial buildings that reaches the New Mexico goal of reaching a level of savings that represents a twenty percent increase in efficiency from the 2006 IECC. The package before the CIC for approval is highly efficient, cost-effective and deemed feasible by the various business, governmental and advocacy members of the Code Change Committee.

The Code Change Committee began with a review of Chapters 1 through 5 of the 2009 IECC. The base of the package of codes before the CIC for approval is the 2009 IECC. Proposed changes to the text in the 2009 IECC were presented by various parties via code change forms. These code change forms were reviewed, and often amended, by the group as a whole during the weekly code meetings.

All suggestions for code change proposals were vetted in many ways before being included in the final package of proposal submitted to the Construction Industries Commission for final approval. The first step for each proposal was a discussion of the proposal by the Code Change Committee. Many proposals were reworded or edited by the committee before being voted through to the modelling phase. Numerous proposals were voted down at this stage, and therefore were not modelled at all. Other forms were sent to modelling, which yielded results that required the group to further amend or add provisions to the proposal and resubmit for another round of modelling. Those proposals that were deemed not to have a modellable impact on energy use, but were deemed to be needed to make the code feasible for New Mexico, were voted through to NMAC without the modelling stage.

A description of the Administrative, Residential and Commercial sections of the code update process is presented in the following sections.

IECC Chapter 1, 2 & 3 (Administration, Definitions & Climate Zones) Methodology

The Code Change Committee reviewed Chapters 1, 2 & 3 of the 2009 IECC carefully to determine what sections needed to be edited to be more effective for New Mexico.

These code change proposals center around definition changes needed to make the IECC code provisions compatible with the other codes used by New Mexico, which have slightly different definitions of some of the mechanical terms.

301.1 – General, Climate zones: The code change proposal from Chapters 1 – 3 with the largest impact is the inclusion of additional climate zones to the New Mexico code, based on weather conditions rather than geographic location. This is a much more accurate approach for determining the appropriate code provisions for New Mexico because the broad-based climate zones used in the IECC do not take into account the varied elevations in New Mexico within each of the climate zones. The climate zone determination for many New Mexico cities in this proposal are based on specific heating degree days and cooling degree days data researched and analyzed by the New Mexico Energy Minerals and Natural Resources Department.

A list of all the code change forms passed by the Code Change Committee for Chapters 1 2, & 3 is presented below. These changes, plus the base 2009 IECC for these sections, represent the entire package of codes before the CIC for approval for the administrative, definition and climate zone sections of code. (The actual code change forms are presented in Appendix A.)

IECC Chapters 1, 2 and 3 - Administration, Definitions and Climate Zones Code Change Proposals

Passed by Code Change Committee - Submitted to Construction Industries Commission for Approval

Code Change	Change Name	Action Taken
102.1.1	Above code programs	NMAC/to CIC
202 - C	Conditioned space	NMAC/to CIC
202 - D	Duct Insulation	NMAC/to CIC
202 - I	Indirectly conditioned space	NMAC/to CIC
202 - R	Residential building	NMAC/to CIC
202 - U	Unconditioned space	NMAC/to CIC
202 - V	Vapor retarder class	NMAC/to CIC
301.1	General, climate zones	NMAC/to CIC

IECC Chapter 4 (Residential Energy Efficiency) Methodology

The Residential Chapter of the 2009 IECC took several months to review. The Code Change Committee developed the residential package of code change proposals currently before the CIC through a series of discussions, analyses and research. The result of this process is a combination of code proposals that reaches the goal of a twenty percent increase in efficiency over the 2006 IECC, is cost-effective and technically feasible.

The final list of residential code change proposals approved by the Code Change Committee and submmitted to CIC for approval is shown in the table below. These changes, plus the base 2009 IECC for this section, represent the entire package of codes before the CIC for approval for the residential section of code. (The actual residential code change forms are presented in Appendix B.)

Of the 24 code change proposals in the final list, 19 were passed by the committee directly to NMAC (meaning no modelling), and 6 were sent to the modelling process. The code change proposals that passed straight to NMAC are those that the group felt would either have no impact on energy use, are not modellable or are measures brought forward from the existing NM code. The proposals that do not impact energy use focus mostly on definitional changes needed to make the code workable in New Mexico.

IECC Chapter 4 - Residential Energy Efficiency
Code Change Proposals

Passed by Code Change Committee - Submitted to Construction Industries Commission for Approval

Code Change	Change Name	Action Taken
401.2	General scope, compliance	NMAC/to CIC
401.3	Certificate	NMAC/to CIC
402.1.1 (Table)	Insulation & fenestration	Model/to CIC
402.2.3	Access hatches and doors	NMAC/to CIC
402.2.8.1	Slab on grade floors	NMAC/to CIC
402.2.8.2	Monolithic foundations	NMAC/to CIC
402.4.2 (Table)	Insulation inspection	NMAC/to CIC
402.4.2.2	Visual inspection option	NMAC/to CIC
402.4.3	Kiva fireplaces	NMAC/to CIC
403.1.1	Programmable thermostats	NMAC/to CIC
403.2.1	Duct insulation	Model/to CIC
403.2.2	Sealing	NMAC/to CIC
403.2.4, 403.2.5	Duct installation	Model/to CIC
403.3	Pipe insulation	Model/to CIC
403.4	Circulating hot water	NMAC/to CIC
403.6	Equipment sizing	NMAC/to CIC
403.7	Multiple dwelling units	NMAC/to CIC
403.1	Fan Performance	Model/to CIC
404.1	Lighting equipment	Model/to CIC
404.2	Outdoor lighting	NMAC/to CIC
404.3	Photovoltaic system	NMAC/to CIC
405	Simulated performance alternative	NMAC/to CIC
405.6.1	Minimum capabilities	NMAC/to CIC
406	Existing buildings	NMAC/to CIC

The code change proposals from the above list that have a measurable impact on energy use and cost are outlined below:

402.1.1 (Table) – Insulation & Fenestration: This code proposal sets forth new requirements for the building envelope that are similar to the proposals under consideration for IECC 2012. These more stringent U-factors and R-values dramatically increase the efficiency of the house.

403.2.1 – Duct Insulation: The changes in insulation requirements in this proposal provide more specificity than the base IECC code. It brings forward provisions in the existing NM Mechanical Code.

403.2.4 – 403.2.5 – Duct Installation: This proposal sets forth standards for the correct installation of ducts for maximum efficiency. It references the NM Mechanical Code and sets a limit on the length of flex duct allowed for supply- and return-air run-outs.

403.3 – Pipe Insulation: The change to this section sets forth a consistent level of insulation for all piping systems. It represents an increase in efficiency by requiring R-2 insulation for all hot water pipes, while reducing the stringency (from R-3 to R-2) for piping within the stud wall cavity which may impede the proper installation of wall insulation.

403.6 – Equipment Sizing: This proposal will require the proper sizing of HVAC equipment, which will result in significant energy savings. The requirement that the calculations used to determine the appropriate equipment size be submitted along with other construction documents will result in significantly less oversizing of equipment.

403.10 – Fan Performance: This proposal will require that ventilating fans meet Energy Star requirements, which will lower energy use in the home.

404.1 – Lighting equipment: The change to this section of the code will require higher percentages of high-efficiency bulbs and fixtures be used in homes. The proposal allows flexibility so builders can choose whether to install a higer level of efficient bulbs or a lower level of fixtures, depending on costs, function and customer preferences.

Energy Use Modelling

The code change proposals that were voted through to modelling by the Code Change Committee were sent to the "Energy Use Modelling Group". This group consisted of representatives from HBA, SWEEP, EMNRD, HR Horton, CID, Electrical TAC, General Construction TAC and the Code Change Committee. The Energy Use Modelling Group and the Code Change Committee agreed upon the following assumptions for the energy use modelling:

1) All modelling would be based on a model floor plan provided by DR Horton Homes for a mid-sized house. (These floor plans are included in Appendix C)

2) Each code change proposal would be modelled individually for energy use and costs.
3) Each code change proposal would be modelled for climate zones 3, 4 and 5 individually
4) A state-wide average savings would be calculated for the entire code change package via the use of a weighted average, with the weights based on new housing starts in each of the climate zones for 2009.
5) Modelling would be completed in RemRate software, when possible. If needed, measures not modellable in RemRate would be analyzed in a commercial building software and/or via other research and estimations.

The Energy Use Modelling Group was tasked with determining:

1) which measures could be modelled in RemRate,

2) the appropriate base software assumptions to be made for each measure, and

3) what other software tools or modelling assumptions are possible for those measures that are not modellable in RemRate.

The group then met several times to model each of the code change proposals. Two of the major impact code proposals were modelled in RemRate. Three were modelled in commercial modelling software to give an approximate energy savings. One was estimated based on input from various group members, industry experts and published analyses. The results of this energy use modelling are shown below:

Residential Modelling Results
FINAL

			CZ 3		CZ 4		CZ 5	
Code Change	**Change Name**	**Model**	use	% change	use	% change	use	% change
402.1.1 (Table)	Insulation & fenestration	HERS	85.5	15.1%	84.5	12.2%	90.6	11.1%
403.2.1	Duct insulation	Commercial	- -	10.6%	- -	10.6%	- -	10.6%
403.3	Pipe insulation	Commercial	- -	10.4%	- -	10.4%	- -	10.4%
403.10 (Table)	Fan Performance	Commercial	- -	7.0%	- -	7.0%	- -	7.0%
404.1	Lighting equipment	HERS	94.4	6.3%	89.2	7.3%	94.2	7.6%

		CZ 3		CZ 4		CZ 5	
		Use	%	Use	%	Use	%
	2006 IECC	100.7		96.2		101.9	
BASELINES	2006 NMAC	103.1	-2.4%	95.5	0.7%	101.3	0.6%
	2009 IECC	95.0	5.7%	89.7	6.8%	94.7	7.1%

		CZ 3		CZ 4		CZ 5	
		Use	%	Use	%	Use	%
Cumulative Runs:	High Range	83.3	17.3%	81.7	15.1%	90.2	11.5%

Weighted Average	High Range	15.9%

		CZ 3		CZ 4		CZ 5	
Cumulative Total*	High Range		22.3%		20.1%		16.5%

Weighted Average*	High Range	20.9%

Housing Starts**	CZ 3	44.97%
	CZ 4	49.58%
	CZ 5	5.45%

* Assumes 4% increase from commercially modelled measures and measures that cannot be modelled. (list below), and 1% increase from inclusion of additional climate zones in NM.

** US Census Bureau: 2009 housing starts for Dona Ana County (CZ 3), Bernalillo County (CZ 4) and Santa Fe County (CZ 5)

Measures that are not modelled, but assumed to have a positive energy impact.

Code Change	**Change Name**
402.4.2	Insulation inspection
403.2.2	Sealing
403.2.4, 403.2.5	Duct installation
403.4	Circulating hot water

Energy Savings ~ The table above shows the results of the energy use modelling, with the percentage change identified for each measure respresenting the savings achieved from going from the base (2006 IECC) to the proposed measure.

A cumulative model was also created by the modelling team. This cumulative model is meant to include all the modellable measures, and results in a significantly different result than merely adding up the percentage of savings for each individual measure. This is due to the interaction of the various measures when implemented together in a structure. The cumulative run is presented in the Cumulative Runs area of the results table. The RemRate results for the cumulative model for climate zones 3, 4 and 5 are presented in Appendix D.

A four percent increase in efficiency was then added to each of the climate zones to account for those measures that were not modellable. A one percent increase was also assumed to compensate for the code change proposal that allows climate zone determination to be based on heating degree days, which brings more stringent code requirements to colder areas of the state. The results from this addition are shown in the Cumulative Total area of the results table.

Finally, the results from the three climate zones were combined into a statewide weighted average. The climate zone weights were based on the new housing starts in each climate zone, as reported by the US Census Bureau.

The result of the analysis shows that the statewide average for the residential package of code change proposals is 20.9 percent.

Energy Cost Savings ~ The monthly savings in utility payments are shown in the RemRate analysis for each of the code change proposals modelled. For those not modellable in the RemRate software, monthly savings were estimated based on similar energy savings from other code change proposal analyses.

Measure Cost Modelling

Measure Cost Estimation ~ The code change proposal that were voted through to modelling were then analyzed for costs. Additionally, costs were gathered for those measures in the NMAC group of measures where possible and/or feasible.

Costs were gathered via submission of “cost analysis forms” from interested parties. Those forms were completed by builders, industry experts, advocates and CID staff. People had the option of providing this cost data and having it remain confidential. Therefore, individual prices were not disclosed to the group – only the results of the overall analysis.

The forms for each code change proposal were analyzed and averaged into one cost per climate zone. The forms were analyzed and the costs were edited to provide as much consistency as possible. For those costs submitted that represented material costs only, a mark-up of twenty percent was added to account for labor and other costs. (Mark-up

calculated as: Total Cost = Material Cost / 0.80) The range of costs for each proposal were presented to the Code Change Committee to verify the plausability of the cost analysis.

Once the range of costs were accepted by the Code Change Committee, a straight average of the costs for each of the code change proposals was taken. That cost was used as the basis for the monthly mortgage payment analysis.

Mortgage Payment Impact ~ The mortgage analysis assumed a 30-year fixed mortgage, with a 6 percent interest rate. The interest rate was based on the current statewide average for 30-year fixed mortgages of 5.15 percent. That percentage was rounded up to 6 percent to take into account insurance requirements and the potential for an increase in mortgage rates in the next several years.

The results of the measure cost and mortgage payment impact analysis is presented below:

Residential Code Change Proposals
Mortgage Payment Impacts

Code Change	Change Name	Notes	Measure Cost	House Cost	Down Pymt	Mortgage Amt	Monthly Pymt	Pymt Change
2006 Base house	2006 Base house		0.00	200000	40000	160000	($959.28)	~
2009 Base house	2009 Base house		1650.00	201650	40330	161320	($967.19)	$7.91
2009 Additional Measures:								
402.1.1 (Table)	Insulation & fenestration	CZ 3	1022.50	202673	40535	162138	($972.10)	$4.90
402.1.1 (Table)	Insulation & fenestration	CZ 4	425.00	202075	40415	161660	($969.23)	$2.04
402.1.1 (Table)	Insulation & fenestration	CZ 5	790.00	202440	40488	161952	($970.98)	$3.79
404.1	Lighting equipment		200.00	201850	40370	161480	($968.15)	$0.96
403.2.1	Duct insulation		-259.67	201390	40278	161112	($965.95)	($1.25)
403.2.4, 403.2.5	Duct installation		26.67	201677	40335	161341	($967.32)	$0.13
403.3	Pipe insulation		-50.00	201600	40320	161280	($966.96)	($0.24)
403.10 (Table)	Fan Performance		241.67	201892	40378	161513	($968.35)	$1.16
Cumulative (Post 09) - CZ 3		CZ 3	1181.17	202831	40566	162265	($972.86)	$5.67
Cumulative (Post 09) - CZ 4		CZ 4	583.67	202234	40447	161787	($969.99)	$2.80
Cumulative (Post 09) - CZ 5		CZ 5	948.67	202599	40520	162079	($971.75)	$4.55

Base Inputs:

2006 Base House Cost	$	200,000
Interest Rate		6.00%

Energy Savings Vs. Cost Impact
The cost determined in the cost modelling process was used to calculate the impact on the monthly mortgage payment for each climate zone. That change in mortgage payment was then compared to the decrease in the monthly energy costs, as determined by the energy use modelling process.

Results - The package of cost change proposals before the Commission for approval result in an overall benefit of $13.93 (on average, statewide) per month to the homeowner. The base 2009 IECC code results in an overall savings of well under $1.00. Therefore, the additional measures before the Commission for approval had a dramatic positive effect on the monthly savings.

The results of this comparison is shown below:

Residential Code Change Proposals
Monthly Cost/Benefit Analysis

			Energy Use Impact			Mortgage Cost Impact			Cost Benefit per Month		
Code Change	**Change Name**	**Notes**	**CZ 3**	**CZ 4**	**CZ 5**	**CZ 3**	**CZ 4**	**CZ 5**	**CZ 3**	**CZ 4**	**CZ 5**
2006 Base to 2009 Base			$ 8.00	$ 8.00	$ 9.00	$ 7.91	$7.91	$7.91	$0.09	$0.09	$1.09
2009 Additional Measures:											
402.1.1 (Table)	Insulation & fenestration	modelled	$ 7.00	$ 4.00	$ 4.00	$ 4.90	$2.04	$3.79	$2.10	$1.96	$0.21
404.1	Lighting equipment	modelled	$ 2.00	$ 1.00	$ 2.00	$ 0.96	$0.96	$0.96	$1.04	$0.04	$1.04
403.2.1	Duct insulation	estimated	$ 2.10	$ 2.10	$ 4.20	$ (1.25)	($1.25)	($1.25)	$3.35	$3.35	$5.45
403.2.4, 403.2.5	Duct installation	estimated	$ 3.78	$ 3.78	$ 2.84	$ 0.13	$0.13	$0.13	$3.66	$3.66	$2.71
403.3	Pipe insulation	estimated	$ 2.06	$ 2.06	$ 4.12	$ (0.24)	($0.24)	($0.24)	$2.30	$2.30	$4.36
403.10 (Table)	Fan Performance	estimated	$ 1.92	$ 0.96	$ 1.92	$ 1.16	$1.16	$1.16	$0.76	($0.20)	$0.76
Cumulative Model (Post 2009)			$ 18.72	$ 17.68	$ 14.56	$ 5.67	$2.80	$4.55	$13.05	$14.88	$10.01
TOTAL			$ 26.72	$ 25.68	$ 23.56	$ 13.58	$10.71	$12.46	$13.14	$14.97	$11.10

Statewide Weighted Average Monthly Benefit: $13.93

IECC Chapter 5 (Commercial Energy Efficiency) Methodology

The Commercial Chapter of the 2009 IECC took several months to review. The Code Change Committee developed the commercial package of code change proposals currently before the CIC for approval through a series of discussions, analyses and research. The result of this process is a combination of code proposals that reaches the goal of a twenty percent increase in efficiency over the 2006 IECC, is cost-effective and is technically feasible.

The majority of commercial code change proposals in the final package before the CIC are based on the proposals by the New Buildings Institute (NBI) that are currently under consideration for the 2012 IECC codes. Code Change Committee and TAC members worked with staff of NBI to amend the proposals to fit the needs of New Mexico and ensure that the twenty percent increase in efficiency for commercial buildings was achieved.

The final list of commercial code change proposals approved by the Code Change Committee and submmitted to CIC for approval is shown in the table below. These changes, plus the base 2009 IECC for these sections, represent the entire package of codes before the CIC for approval for the commercial section of code. (The actual commercial code change forms are presented in Appendix E.)

IECC Chapter 5 - Commercial Energy Efficiency
Code Change Proposals

Passed by Code Change Committee - Submitted to Construction Industries Commission for Approval

Code Change	Change Name	Action Taken
501.1, 501.2	Scope, Application	NMAC/to CIC
502.1.2, 502.2(1), 502.2(2) (Tables)	Building envelope	Model/to CIC
502.3 Table	Fenestration	Model/to CIC
502.4.5	Outdoor air intakes & exhaust	Model/to CIC
503.2.1	Calculation of heating & cooling loads	Model/to CIC
503.2.2	Equipment and system sizing	Model/to CIC
503.2.4	Controls	Model/to CIC
503.2.4.3.3	Automatic start capabilities	Model/to CIC
503.2.4.4	Shutoff damper controls, exception	Model/to CIC
503.2.4.6	Freeze protection	Model/to CIC
503.2.5.1	Demand controlled ventilation	Model/to CIC
503.2.5.2	Kitchen hoods	Model/to CIC
503.2.6	Energy recovery ventilation systems	Model/to CIC
503.2.9.1 - 503.2.9.3	Air system balancing	Model/to CIC
503.3 - 503.4.1	Economizers	Model/to CIC
503.4.2	VAV fan control	Model/to CIC
505.1	Lighting requirements	Model/to CIC
505.2.2.1	Light reduction controls	Model/to CIC
505.2.2.2-505.2.4	Controls	Model/to CIC
505.2.4	Functional Testing	Model/to CIC
505.5.2 (Table)	Lighting power density	Model/to CIC
506	Efficiency package options	Model/to CIC

Of the 22 code change proposals in the final list, one went straight to NMAC (meaning no modelling), and 21 were sent to the modelling process. The proposals with significant impact in energy use and/or project costs are explained below:

502.1.2, 502.2(1), 502.2(2) – Building Envelope and 502.3 - Fenestration: These code proposals set forth new requirements for the building envelope that are similar to the proposals under consideration for the 2012 IECC. These more stringent insulation and fenestration requirements will dramatically increase the efficiency of the buildings.

503.2.1 – Calculation of Heating & Cooling Loads: This proposal will require the proper sizing of HVAC equipment, which will result in significant energy savings. A requirement that the calculations used to determine the appropriate equipment size be submitted along with other construction documents will result in significantly few instances of equipment oversizing.

503.2.9.1-503.2.9.3 – Air System Balancing: This code proposal requires that mechanical systems are tested to ensure they are installed and operating properly. A plan for the installation and testing of the system is required at the beginning of the project under this proposal.

503.3 – 503.4.1 – Economizers: The purpose of this proposal is to clarify requirements for air and water economizers to make the code more easily understood. The existing 2009 IECC text was unclear on the differences for these types of systems, and edits similar to those in this proposal are under consideration for the 2012 IECC.

505.1 – Lighting Requirements: The change to this section of the code will require higher percentages of high-efficiency bulbs and fixtures be used in buildings. The proposal allows flexibility so builders can choose whether to install a higer level of efficient bulbs or a lower level of fixtures, depending on costs, function and customer preferences.

505.5.2.(Table) – Lighting Power Density: The changes set forth in this proposal provide more detailed specifications for lighting density in various commercial space types. It expands the lighting power density table to include space by space requirements instead of the existing entire building requirements. This allows flexibility needed for specific area types to be more efficient in areas where lighting is less important and more dense in areas where lighting is more important

506 – Efficiency Package Options: This new section of code provides a set of three efficiency options for commercial buildings. Builders must choose one of the three, based on the needs of each project. The options are efficient HVAC systems, efficient lighting systems or on-site renewable energy.

Energy Use Modelling

The code change proposals that were voted through to modelling by the Code Change Committee were modelled by The Hensley Engineering Group, a local engineering firm that was active in the code change process, using commercial energy use analysis

software. This analysis was led by Raymond Hensley, owner of The Hensley Engineering Group. The Code Change Committee agreed upon the following assumptions for the energy use modelling:

1) Four business types would be included:
    a. 80,000 sq ft office building
    b. 80,000 sq ft public school
    c. 16,000 sq ft medical clinic
    d. 25,000 sq ft medical building
2) Each building is assumed to be a "metal framed building" as defined and used in the 2009 IECC.
3) Air conditioning equipment is assumed to be packaged roof mount units having cooling capacities between 65,000 BTU and 135,000 BTU.
4) Each unit is assumed to have a natural gas fired furnace.
5) Hot water is assumed to be gas fired.
6) Detailed assumptions for each building type were agreed upon and are outlined in Appendix F.

The package of code change proposals were modelled together to determine the estimated savings per climate zone, for each building type. An weighted average savings level was calculated for each climate zone based on 2008-2009 Bureau of Business and Economic Research (BBER) data which provides the number of buildings in each climate zone. (This BBER data is a compilation of information provided by CID and some municipalities in New Mexico. The data was analyzed and matched, where possible, to the four building types used in the energy use analysis.)

The climate zone weighted averages were then combined to develop a statewide average, using the same weights as those used in the residential analysis. (The Code Change Committee agreed that housing starts in each climate zone is a relatively reliable indicator of new commercial building starts. In the absense of commercial building start data, the group decided to use the housing start data as an approximation.) A four percent increase was added to that average to account for those measures that were not modellable. This brings the statewide weighted average savings to 20.62 percent.

The full results of this energy use modelling are shown below:

Commercial Modelling Results

	CZ 3				CZ 4				CZ 5			
	Office	School	Medical	Retail	Office	School	Medical	Retail	Office	School	Medical	Retail
% Savings	22.06%	12.21%	18.71%	33.21%	13.83%	10.35%	17.44%	39.27%	9.30%	12.90%	16.69%	30.59%
Avg Savings - per CZ	18.19%				15.46%				14.29%			

Avg Savings - statewide	16.62%

** Assume additional 3-4% savings from measures that were not modellable.

Total Avg Savings - NM	20.62%

	Office	School	Medical	Retail
Weights:	29.59%	50.51%	7.65%	12.24%

CZ 3	CZ 4	CZ 5
44.97%	49.58%	5.45%

Building Type Weights: based on data provided by BBER
Climate Zone Weights: based on housing starts statewide, US Census Bureau data.

Cost Analysis

The Hensley Engineering Group also completed a cost analysis for each of the building types. The level of cost increase is 1 – 2 percent to comply with the proposed set of codes recommended by the Code Change Committee. Approximately one-half of this incremental cost, 0.5 – 1 percent, represents the incremental cost of going from the 2006 IECC to the 2009 IECC. The remaining 0.5 – 1 percent is the result of the additional measures proposed by the Code Change Committee.

The cost analysis completed by The Hensley Engineering Group is in keeping with the cost data collected from various industry experts throughout the process of reviewing the proposed code changes. For most of the measures included in the final commercial code change packet before the CIC, costs are extremely close to zero because of flexibility and options built into the code change proposals. The small 1-2 percent increase in costs comes predominantly from those measures with the largest increase in energy savings: testing & balancing, functional testing and efficiency package options.

The Hensley Engineering Group's report is included in Appendix F.

Energy Savings Vs. Cost Impact

Results - The package of proposed commercial codes results in a statewide weighted average increase in efficiency of 20.62 percent. Based on The Hensley Engineering Group's analysis, this equates to a reduction in utility costs for buildings of $1,000 - $6,000 per year, depending on building type and size. Using a life-cycle-cost analysis, the average payback for each building type is less than 10 years.

IMPLEMENTATION PLANS

Regulation and Licensing Department (RLD), Construction Industries Division (CID) and Energy, Minerals and Natural Resources Department (EMNRD) staff, with input from stake holders in the building community, have developed the following plan in order to move forward with the implementation of the 2009 New Mexico Energy Conservation Code.

The three state agencies, are currently developing check lists and compliance tools that will be incorporated in training sessions they provide to achieve 90 percent code compliance. The checklists and tools help in bridging conservation code concepts to real-time field applications.

One- and two-day trainings, which will be free of charge, will be offered in Farmington, Santa Fe, Albuquerque, Roswell and Las Cruces and are tailored to the three major audiences that have been identified. The first audience consists of state, municipal and county building officials, authorities having jurisdiction, and plan reviewers. The second audience includes design professionals, members of the construction industries, and product suppliers. The third group includes real estate and mortgage finance professionals, members of state, county and city governing bodies, and other interested community members.

Each training will be audience and trade specific. Concepts of Green Building practices, with an emphasis on the integrated design/build process will be included. In Addition, participants who successfully complete the training are eligible to obtain continuing education units applicable to their field of expertise.